Asia-Pacific Economic Cooperation

The Impacts and Benefits of Structural Reforms in the Transport, Energy and Telecommunications Sectors in APEC Economies

APEC Policy Support Unit

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EXECUTIVE SUMMARY

This Executive Summary condenses more than 460 pages of detailed analysis and economic modelling into a digestible brief. We consider the material available in this summary and the main report can be used to develop easily communicated messages for APEC members to promote further structural reform. We also hope the Executive Summary will entice officials to read the more detailed analyses, as they contain useful examples of structural reforms and lessons on how to implement them effectively.

The study as a whole seeks to catalogue many of the substantial, tangible benefits for consumers and for small and medium businesses arising from APEC members' structural reform efforts in recent years, focusing on the transport, energy and telecommunications sectors. As well, economic modelling was undertaken to provide empirical estimates of reform impacts in those sectors.

INFRASTRUCTURE AND STRUCTURAL REFORM

Structural reform in APEC economies refers to policy change related to 'institutional frameworks, regulations and government policy [designed] so that barriers to market-based incentives, competition, regional economic integration and improved economic performance are minimized'.

Infrastructure is a significant and quantitatively important determinant of growth and development. Economies with fully open telecommunications and financial services sectors, for example, grow up to 1.5 percentage points faster than other economies. Improving destination infrastructure by a factor of 16% reduces transport costs by an amount equivalent to a reduction of 6500 sea km or 1000km of overland travel. Better infrastructure also contributes to better health outcomes, including key indicators in the Millennium Development Goals.

While competition in domestic markets and openness to foreign investors might usually be expected to lead to better quality services, the link is not straightforward in infrastructure industries where the nature of an asset that is essential in service delivery can cause market and competition failures.

Where this occurs, the asset or infrastructure industries have natural monopoly characteristics. Their owners can seek to charge higher prices in the absence of competition or they may not allow others to use the infrastructure (e.g., a gas pipeline or a telephone cable) duct, at reasonable cost. Some infrastructure activities involve externalities (i.e., side effects which are not priced) so that market price signals may not convey the accurate information about the real cost and value of the activity to the economy as a whole. Noise and air pollution are examples. Even where market competition can deliver efficient outcomes, governments may distort efficiency by seeking to implement equity objectives.

The best way to achieve good outcomes is not only to design better policy, but also to match the most effective and least distorting policy instruments to the objectives being sought. Good microeconomic policy also requires policy coherence. The APEC Leaders' Agenda to Implement Structural Reform is directed at exactly these issues.

PROGRESS TO DATE

Air transport

In air transport the initial instances of competition often occur in domestic markets through the introduction of low cost carriers (LCCs). For example, in Korea fares fell by 20–30% as a result of the entry of LCCs in 2006. The LCC share of the domestic market in Korea is now 25% and close to 30% on some routes.

Reform of international markets, which involve sovereign treaties as well as operating airlines, moves more slowly than that in domestic markets, but there is a shift towards liberalisation. For example, in 2006 Korea and China entered a more liberalised agreement for routes between Korea and China's Shandong province. As a result, fares fell by an average of more than 8% on these routes and traffic grew much faster (by a factor of 2) compared to other routes between the two economies.

Other studies rank economies according to their degree of liberalisation in international markets. An economy moving from the bottom quarter of the ranking to the top quarter would see substantial benefits. Such a move would see traffic volumes between economies linked by direct air services increase by about 30%. Signing Open Skies agreements has lowered air cargo freight rates by 8%.

Regulations remaining in APEC economies, particularly in international markets, maintain barriers to the entry of new airlines. Econometric analysis undertaken for this project finds that conversion to full openness in air transport would lead to an average reduction in margins for all APEC economies of 15%. Exporters able to reap such benefits from more competitive world aviation markets would be able to capture these reduced margins and pass them on to consumers.

Rail transport

In rail transport the separation of track (below-the-rail) and train (above-the-rail) operations and the introduction of competition between train operators provide significant benefits. Free entry of new operators and the resulting dynamics of competition are critical for better performance. One study found that free entry adds over three times as much to productivity as separation.

The separation of track ownership and operations is increasingly common in APEC economies, along with the specification of regimes that provide access for new competitors. Financing challenges in relation to track investment, however, remain. Between 2001 and 2008 the annual average rate of productivity growth in the rail sector for APEC members was 3.5%. There is still room for improvement, since for non-APEC members, productivity grew by 4.8% a year over the same period.

Tenders to operate the Auckland urban rail system were called in 2002. The track was owned and managed by a government enterprise. Traffic doubled between 2005 and 2010 under this

competitive model. Services more than doubled between 2005 and 2009. Reliability also improved. In March 2005 only 77% of trains arrived on time. This figure exceeded 85% for most of 2009. Over 5 years 21 of the 41 stations on the network were upgraded. There were more services, higher frequencies, greater punctuality and better trains. Under this model, the government continued to invest in the track. It also subsidised fares on the grounds of rail's contribution to the reduction in road congestion. The subsidy was transparent. Modelling suggests that this subsidy per passenger could be halved if further investment, including electrification, adds to service quality and attracts more passengers.

The process of privatisation in the New Zealand rail system in 1993 also had a significant effect on volumes and user satisfaction. Between 1994 and 1997 prices fell 7% per annum in the bulk goods sector and by more than 4% per annum for export goods. Significant improvements were found in customer satisfaction surveys, with recommendation rates improving from just over 30% to nearly 80%. Issues remained however in relation to investment in the rail track.

In Chile fares were 40% lower after the government-owned rail corporation divested its southern operations. The track remained in the hands of the state organisation which provided maintenance and facilities.

Road transport

Regulation of passenger and freight transport by road must juggle conflicting demands of avoiding congestion, bringing home to users the costs of road use and damage created, funding investment in the network, meeting safety targets and providing access to services. The package of regulations that is created, however, may induce a market response that in turn illustrates the opportunities available from better policy.

In Bangkok an opportunity was created for new entrants offering a differentiated passenger transport service at unregulated prices. When they began in the mid 1980s, these new services, or 'vans', were illegal, but later many were licensed. The vans were smaller than buses and charged higher prices but offered shorter and faster routes with guaranteed seats. Although passengers were required to go to terminals rather than usual bus stops, by 2008 there were more than 6500 vans operating in Bangkok. They provided consumers with more variety and wider access to services.

Freight rates fell by 20–30% when quotas on cross-border freight licences were removed between Thailand and Laos in 2004.

For international road freight, as for trade more generally as tariffs are lowered, greater importance now attaches to infrastructure and other regulatory constraints, such as arrangements for customs clearance.

Maritime transport

Shipping services markets are now regarded as largely competitive, but residual regulation of maritime services remains in some economies. The emerging issue is access to port services – in particular, access to ancillary services required to berth, load and unload.

Another common restriction in maritime services is that on cabotage rights. The Australian approach has been not to remove the regulation. Rather, the manner of its implementation has

been changed and greater flexibility is obtained through a permit system. Technological improvements and rationalisation of staffing scales resulted in a downward trend in real interstate non-bulk freight rates from the early 1980s. Regulatory changes sustained this trend. Rates were 40% lower in 2005 compared to the start of the 1990s. The Australian coastal fleet capacity was 60% lower in 2007 compared to 1999 but productivity more than doubled as a result of a rise in capacity utilisation.

New econometric work undertaken in this study finds that a movement from the current policy regime to full liberalisation for all APEC economies would on average reduce maritime freight rates by about 20%. This saves real resources and provides benefits to shippers and their customers.

Electricity

Regulatory reform in OECD economies has contributed to lower industrial electricity prices. Competitive wholesale markets and retail competition also reduced prices significantly in the United States of America: retail competition reduced prices by 5–10% for residential customers and by 5% for industrial customers.

Given the complexities involved, structural reforms that have taken place since 2004 in the energy sector in APEC economies have mostly been incremental – there have been few 'big bang' initiatives.

Russia is an exception. The extent of reform of the Russian electricity sector is remarkable. There has been a complete transformation of the system to separation and a wholesale market. The Californian experience of reform, where blackouts followed measures to increase competition, has not been a deterrent in Russia, where the reforms have been designed with lessons learned from earlier international experience.

The first stage of electricity reforms in Korea included the separation of generators from the distribution company. Utilisation of capacity increased: planned outages of 25 days across 109 units of generators in 2000 dropped after restructuring to about 19 days across 117 units in 2003. Productivity also increased through a substantial rise in the capacity utilisation rate of coal-fired plants – from 75% in 1999 to 89% in 2003.

Econometric analysis in this report shows that further structural reforms in APEC electricity markets would reduce prices and increase efficiency. In electricity markets:

- the introduction of competition through a third party access regime would be associated with electricity prices being almost 5% lower than otherwise, on an indicative basis and holding all other factors constant;
- the introduction of a wholesale electricity market would be associated with electricity prices being about 7% lower; and
- unbundling of generation from transmission would be associated with a fall in electricity prices by more than 11%.

This study estimates that the combined effect of all three of these initiatives would be electricity prices that are 23% lower than otherwise.

Gas

In general, reforms in natural gas have been less extensive than in electricity. In part, this is because the scope for competition in natural gas production depends on the range of sources of supply. A remarkable development in China began in 2005 with reform to the system for pricing gas. Gas prices had been based on a cost-plus formula, but from 2005 they were 'hooked' to the prices of other sources of energy. This began to correct the problem of pricing gas too low, which in 2009 had led to gas shortages.

Econometric analysis in this report identifies the effects that further structural reforms in APEC gas markets would have on prices and efficiency. The introduction of retail competition would be associated with gas prices being about 15% lower than otherwise, all other things being constant. The unbundling of gas production/import from distribution would lower gas prices by more than 23%.

Telecommunications

Telecommunications reform, which embraces information and communications technology as well as traditional telephony, leads to productivity improvements. A contributor is the greater use of the Internet for business transactions. Productivity improvements reduce costs in supply chains and enable goods to move to market more quickly and more cheaply.

As of 2009 the majority of APEC economies have adopted full market entry liberalisation. However, a common practice is to limit foreign investment from gaining dominant positions in fixed-line operators. This is a major issue in current telecommunications regulatory settings. As of 2009 all APEC economies have liberalised their mobile telecommunications sectors. In most economies new licences are granted based on market-oriented approaches unless limited by the availability of spectrum. APEC members have undertaken – as required by their respective General Agreement on Trade in Services (GATS) treaty commitments – to allocate spectrum in an objective, timely, transparent and non-discriminatory manner.

A liberalisation program began in Chinese Taipei in 1997, first in mobile then in fixed-line services. The subsequent change in performance has been remarkable in comparison with its APEC peers. Fixed-line penetration in Chinese Taipei exceeded that of Australia and Japan in 1998 and of the USA in 2003: it peaked at 65% in 2005. It has since been falling, as in many economies. Mobile penetration in Chinese Taipei exceeds 100%. Broadband penetration is at the same level as these comparator economies.

Fixed-line development in Viet Nam is outstanding when compared with other APEC economies with similar levels of economic/telecommunications development. Prior to 2003 Viet Nam had a similar level of fixed-line penetration as Indonesia and the Philippines of around 5%. Yet starting from 2003, access jumped. In fixed-line availability, Viet Nam is now at 35% and mobile penetration is at 80%. Monthly subscription charges for mobile services had fallen to zero by 2004, compared to $US17 in 1999. Structural reform efforts contributed to this outcome, including the establishment of the universal service fund.

The introduction of competition into the mobile sector in PNG has led to universal coverage, following a rise of 700% in the number of mobile subscribers since mid 2007. Charges have fallen by 11% in the peak times for domestic calls and 51% in off-peak periods. In an economy like PNG with such a difficult terrain, the benefits cannot be underestimated. Social interaction, such as the rate of response to medical emergencies, is better, mobile banking initiatives are underway and market pricing information is more readily available.

THE NEXT STEPS AND THEIR EFFECTS

What are 'the next steps' to achieve greater benefits still? A common theme for all sectors is the introduction of more competition:

- air transport – through a range of reforms to air services agreements, to entry conditions for domestic and foreign carriers, and ownership;
- maritime transport – by the dismantling of remaining entry restrictions, quotas or cargo sharing arrangements and the granting of domestic-vessel treatment to foreign-owned carriers located domestically;
- rail transport – through free entry in freight operations in those economies that do not have them;
- electricity and gas – by providing third party access, unbundling, wholesale prices set through market arrangements and/or retail competition in economies that have not implemented them; and
- telecommunications – through the removal of remaining foreign equity limits.

A package of reforms based on the measures outlined above would have a significant effect. Across the whole APEC region, USD175 billion a year in additional real income (in 2004 dollars) could be generated relative to what would have accrued had these reforms not occurred. This is a snapshot of the gains projected after a 10-year adjustment period.

The reforms can be translated into productivity effects, and the estimated first round impacts of these reforms suggest that they could lead to weighted average productivity improvements in the range of 2–14% across the transport, energy and telecommunications sectors. The largest productivity gains (above 10%) would occur in Indonesia; Malaysia; Mexico; the Philippines; Chinese Taipei; and Viet Nam.

There is no compelling reason for an APEC economy to wait for others to start. In all economies an overwhelming proportion of these gains come from reforms domestically, rather than reforms in other economies. Of course, the gains from joint reforms are also considerable.

APEC-wide, the projected gains from these structural reforms are almost twice as big as the gains from further liberalisation of merchandise trade. Yet the sectors where the structural reforms occur are less than a quarter of the size of those engaged in merchandise trade. When structural reforms lead to lower real production costs, even by half as much as is estimated here, they create a return to reform effort that is much greater than that from trade reforms.

These findings, therefore, vindicate APEC Leaders' decision to move beyond a 'border' focused trade reform agenda to one that focuses on 'behind the border' issues. Yet along with generating significant gains, structural reforms often require significant structural adjustments. These must be managed carefully and sensitively and often take a considerable transition period when implementing policy measures.

The essence of a productivity improvement is that an industry can produce more with less. To ensure that efficiency gains are passed on to consumers, competition is required. Competition also allows dynamic gains to be achieved as new ways of doing things are found and best practice is transmitted more widely across market players.

Employment effects of greater efficiency are always a concern to policy makers. Modelling work for this study indicates that sectors which show relatively high reductions in

employment do so not as a result of their own productivity improvements but because the domestic industries that use their services lose their position as other economies reform. In the extreme cases, modelling indicates relative losses in unskilled employment in a particular sector after 10 years can accumulate to upwards of 30%. But this modelling result needs to be kept in perspective. Employment changes occur over time and can be addressed through targeted structural assistance measures. Secondly, as long as an economy grows overall employment will increase, so the modelling shows that structural reforms may require significant relative shifts of labour across sectors over time. Thirdly, the model projects the generation of higher real wages for all workers in all economies. Modelling and real world examples demonstrate that displaced workers earn higher real wages in their new occupations.

To reiterate, employment opportunities overall depend on the growth of an economy. Thus, one of the best ways that APEC economies can guard against any adverse employment effects of structural reform is to maintain healthy underlying rates of economic growth. Structural reform itself makes a contribution to this goal, since it adds to productivity, stimulates activity and increases the resilience of the economy, but prudent macroeconomic management is also crucial.

A STRONGER AGENDA FOR APEC

This research shows the value of the APEC Leaders' adoption of an agenda to implement structural reform. It also reveals the importance of structural reform as providing strong bridges behind the border to capture the full benefits of improving regional economic integration. This study has found that:

- structural reform is challenging because it takes time amid the economic and political complexities in all economies;
- structural reform can create winners and losers but yields more inclusive development when it is carried out dynamically, with transitional measures and with other economic reforms; and
- structural reform is worth undertaking and provides potentially greater gains than trade liberalisation and generates economic sustainability.

These results suggest the scope to build an even stronger APEC agenda and work program. Structural reform is a vital process to achieve growth and to provide greater flexibility and resilience with which to deal with and withstand shocks, both domestic and external. However, it requires changes in economic structures, innovation and the adoption of new technologies and market responses to shape effective regulation as well as transform APEC economies and their current regulatory systems.

Steady adaptation is required, not least because expectations will rise as development proceeds. Pressure from the rest of the world, both competition from other economies and new commitments for cooperation, creates further forces for change. APEC economies are at various stages of reform, and their experiences to date are valuable to other APEC members. The sharing of this experience remains a priority, not just to learn about what is possible but also about the strategies for implementation. This will enable economies to examine measures and strategies and then shape and adapt them to their own situation.

To be effective, structural reform must be adopted for a purpose and specific outcomes should be the goal. Otherwise it is impossible to specify a method and explain its rationale in an often complex and sensitive environment. Another requirement to assess the impact of

implemented policy measures is the design and implementation of reporting systems and monitoring arrangements for the progress of reform. The impacts of reform and their economy-wide effects are worthy of regular attention. Evidence of gaps between good practice, allowing for the varying stages of development, and the costs of those gaps are drivers of reform. But in the end what matters is the outcome.

A reform program focused on structural reform will create new sources of growth. This growth will be driven by productivity. Often these new sources of growth are unable to be identified or forecast because it is the dynamics of competition, the near limitless imagination of enterprise and the innovative use of changing technology that gives rise to new beginnings. Reform at the border remains significant for the efficiency and growth of member economies but the empirical work here demonstrates the significance of the productivity effects of even a modest set of 'next steps', all primarily focused on the introduction of competition.

Another consequence of reform will be economic resilience. More efficient market operations, macroeconomic stability and higher productivity all follow from structural reform and will contribute to higher standards of living. The concern with resilience and macroeconomic stability is even more relevant in the context of responding to the recent global financial crisis.

Programs of structural reform in each economy, designed and implemented to suit the situation in that economy but which take into account lessons learned from other members to achieve clearly defined outcomes, can deliver new growth and economic resilience. Support in the APEC region through cooperation to learn these lessons and perhaps sequence reforms may also give rise to even more dynamic gains in APEC economies.

Chapter 1

THE IMPACTS AND BENEFITS OF STRUCTURAL REFORMS IN THE TRANSPORT, ENERGY AND TELECOMMUNICATIONS SECTORS IN APEC ECONOMIES

Christopher Findlay[1]

1.1 INTRODUCTION

APEC Leaders committed to a program of work on structural reform in August 2004 when they endorsed a significant reform program in this area: the Leaders' Agenda to Implement Structural Reform (LAISR).

Structural reform in APEC, as defined by Leaders, relates to 'institutional frameworks, regulations and government policy (designed) so that barriers to market-based incentives, competition, regional economic integration and improved economic performance are minimized'. The aim is to avoid 'excessive regulation, poor economic legal infrastructure and governance arrangements (in both public and private sectors), unclear property rights and the lack of effective laws to foster competition'.

The purpose of this study is to demonstrate the benefits of structural reform and publicise a range of reforms in APEC economies. Strategies for success and bottlenecks to further progress are identified. It also develops a complementary program of work in APEC to support further reform.

Structural reform matters across the whole economy, but the focus of this study is the transport, energy and telecommunications sectors. These are valuable choices, given the significant economy-wide impacts of reform on these sectors. The effects of the reforms in these sectors are identified and the extent of their effects estimated. This includes the benefits for both consumers and small and medium enterprises.

The pace and success of reforms is expected to vary between economies and even between the three sectors within economies. It is useful to understand the reasons for the differences in degrees of success and degrees of impact on the key performance indicators. This understanding then helps define the ways in which APEC members may support each other in implementing and managing the reforms and improving their application in the three sectors.

Officials in earlier work on these issues have stressed the political economy challenges to be overcome. There are losers from policy change who oppose and seek to prevent its implementation. Often they constitute advantaged parties who have a monopoly or an excessive market power position, which can detract from overall economic welfare. Therefore, assessments of the overall benefits and transparency of effects are important contributions to sustaining reform.

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Against this background, this study reports a range of structural reforms in APEC and the impacts in terms of price, choice and quality for a range of stakeholders. The study is based on a series of steps – review, case studies, estimation and modelling.

The first step was to review existing material on the foundations for structural reform, to identify the potential impacts and benefits of APEC's structural reform agenda, to characterise different policy approaches and to discuss different measures of the contribution of structural reform to economic growth.

The next step was the selection of sectors in APEC member economies for further study, based on evidence of actual reform in sectors of interest, along with geographical and developmental diversity. The work on the case studies (Box 1.1) was guided by questionnaires on structural reforms that have been developed from existing templates available in work carried out by the OECD (OECD 2005, Conway, Janod & Nicoletti 2005) and the Australian Productivity Commission (Findlay & Warren 2000, Doove et al. 2001). The questionnaires were designed to cover the scope of the structural reform agenda as specified in the Leaders' Agenda, in particular regulation, competition policy and legal infrastructure.

Box 1.1: Case studies.

- Telecommunications in Viet Nam
- Telecommunications in Chinese Taipei
- Telecommunications in PNG
- Gas in Thailand
- Gas in China
- Electricity in Russia
- Electricity in Korea
- Rail transport in Chile
- Rail transport in New Zealand
- Maritime transport in Australia
- Maritime transport in the USA
- Air transport in Korea and Northeast Asia
- Road transport in Thailand
- Logistics in Indonesia

Initial impacts of the structural reforms on prices and productivity were also estimated. The use of econometric models for this purpose can correct for the influence of other changes that might have taken place at the same time as the structural reforms, and hence reduce the chance of incorrect attribution of impacts. Econometric models are already available for the air transport, maritime, electricity and telecommunications sectors (including Findlay & Warren 2000, Doove et al. 2001). New work was done here on air passenger traffic and freight, productivity in rail systems, cif/fob margins in international sea and air transport, penetration rates in telecommunications and prices and performance in electricity and gas.

Use of a multi-country computable general equilibrium model to estimate the national and regional effects of sectoral productivity and price changes arising from structural reform initiatives is also an important step. This model was used to provide projected impacts on macroeconomic aggregates such as GDP and national income, as well as the projected patterns of sectoral adjustment. Importantly, this sectoral examination provides empirical evidence of sectors likely to expand, sectors of increased activity, business opportunities and employment as a result of structural reform.

The case for structural reform is outlined in section 1.2. Following that is a discussion of key issues that confront policy makers working on the infrastructure sectors followed by a review of the main results for the sectors targeted in this report. General messages for managing structural reform programs are outlined and the results of the modelling of the cross-sectoral effects are presented. The report concludes with a discussion of some areas for stronger cooperation among APEC members.

1.2 THE STRUCTURAL REFORM FRAMEWORK[2]

Effective structural reform requires two things.[3] The first is a commitment to the entrenchment of well functioning markets and to letting market competition determine economic outcomes in all circumstances where competition is appropriate. The second is good regulations (rules) to guide economic outcomes when competition is not effective.

The choice of the rules will not be 'black and white' and will not involve the immediate adoption of something some may define as 'global best practice': it will depend on the circumstances of the economy involved. There will be a continuum of options and the important target will relate to the trajectory of the evolution of policy as development proceeds. The options will depend not only on domestic considerations but also on emerging ideas in the rest of the world, and in the context of events in the rest of the world.

The forces of competition can exert powerful pressure on producers to find the least costly way of serving customer needs and to innovate, in order to better serve those needs. Individual producers can benefit from any cost savings they make in the form of higher profit, and consumers and downstream using industries can also benefit as competition from other producers squeezes those profits and drives prices down towards costs. This dynamic process leads to prices that reflect production costs, and to costs that are as low as possible. Both types of efficiency ensure the highest possible levels of income. Not only do falling costs and prices matter but so too do choice, variety and quality. Many consumers always look for new options and better delivery.

Competition helps to maximise income levels, and in an administratively efficient way. Similar patterns of production and consumption could be achieved through a system of centralised decision-making. But the administrative requirements for such central planning are burdensome, and the information requirements for doing it successfully are prohibitive. By contrast, the market place achieves these outcomes as a result of the direct interaction between many producers and consumers. No bureaucrat needs to decide which individuals should run which companies producing which products at what price. For those economies where regulatory capacities are scarce, there can be significant benefits from letting the market place decide.

But there are administrative or legislative requirements for market competition to succeed. Basic laws are needed to set the boundaries of that competition (e.g., corporation law is needed to allow for limited liability companies), thus limiting the downside risks to shareholders from poor corporate performance. Accounting standards, disclosure requirements and good systems of corporate governance are all needed so that equity holders and creditors can assess the economic performance of companies in a transparent way.

[2] Readers not interested in this overview of the reasoning that underlies structural reform might best go to section 1.3: Structural reform of infrastructure industries.

[3] This discussion and that in the next section are based on Dee 2009.

Bankruptcy laws are needed so as to limit the downside risks to outside creditors from poor corporate performance. But once these legal foundations are set, no case-by-case decisions are needed about which producers should survive and which should go out of business.

Another benefit of competition and decentralised decision making is that it can make an economy more flexible and robust to external shocks. Producers used to out-guessing rivals on a daily basis will be better placed to react to adverse global market developments than producers who have no rivals, or are used to being told what to do by bureaucrats. Furthermore, producers with rivals will have a financial incentive to be better informed about likely global market developments than those rivals. In contrast, bureaucrats have no legal profit motive to collect such information. Finally, producers with rivals are likely to be the best placed to respond to adverse shocks, because competition is likely to have weeded out the poorer performers. Small economies in particular need to be relatively open to global markets, because they do not have the variety of resources to produce everything at home. Flexibility is the key to protecting themselves from the variability of global markets. And competition can enhance flexibility.

Potential rivals are as important as actual ones. Even a monopoly supplier will be unable to inflate costs or profits on a sustained basis if this attracts the entry of a competitor who can produce at lower cost or with a smaller profit margin. So long as it is possible for a competitor to enter at any time with few irreversible costs, this will discipline an incumbent's behaviour. So the number of actual competitors may be less important than the absence of barriers to entry and exit. Contestability, or the potential to compete, is the key to effective competition.

In summary, effective structural reform means protecting competition, not protecting particular competitors. The difference is crucial. The benefits of competition will only emerge if firms and workers have the incentive to enter into or exit out of specific activities. Entry, exit or survival of any particular player should not be preserved by administrative means. There is a growing body of empirical literature that supports the idea that the entry and exit of firms is a key determinant of productivity in developing economies (Roberts & Tybout 1997).

Foreign competition can play an important part. It can come from allowing cross-border trade to occur in an unimpeded fashion or it can come from allowing foreign direct investment, so that foreign suppliers set up a permanent local presence. The latter sort of competition can bring additional benefits, in the form of new capital, technologies and business processes. But any attempt to 'manage' the process by allowing only a specific number of foreign players, rather than allowing free entry and exit of foreign players, is an instance of protecting particular competitors rather than protecting competition. Further, creating managed competition risks handing over existing monopoly profits from domestic to a few foreign players, with little benefit to domestic consumers and users in the form of lower prices. It also creates a net loss to the economy as a whole.

Competition from domestic new entrants is arguably even more important than foreign competition. A recent study examined the empirical evidence, from among a group of East Asian economies, of the relative importance of discriminatory barriers to foreign competition and non-discriminatory barriers to any new competition. The results were striking. The gains to the region from unilaterally reforming the non-discriminatory restrictions on competition in seven selected services sectors were almost six times those from forming an East Asian preferential trade area, and three times those from a successful Doha Round (Dee 2007). The

Asia-Pacific region need not fear that unleashing the forces of competition would see their economies overrun by foreign multinationals. The critical barriers to competition are often those protecting incumbents against domestic new entrants.

Promoting competition is a much broader agenda than putting in place narrowly defined competition law. Anti-trust legislation is about ensuring that abuses of monopoly power by private players do not occur. Competition policy, broadly defined, is about removing the barriers to entry and exit so that positions of monopoly power do not persist.

Structural reform is therefore about competition policy in its broadest possible sense. The policy agenda includes the six items in Box 1.2.

Box 1.2: The six item structural reform agenda.

1. Removing barriers to the entry of domestic new entrants, and allowing existing firms to exit the marketplace in an orderly fashion if the market dictates that they cannot survive.
2. Removing barriers to foreign competition, be it from cross-border trade or from foreign direct investment, and not just for particular trading partners.
3. Ensuring that the minimum regulation exists to guide economic outcomes in those circumstances where markets alone may not deliver the most efficient outcomes.
4. Ensuring that the right institutions are in place to review and remove the unnecessary impediments to the functioning of markets.
5. Ensuring that the right institutions are in place to design, implement, enforce and review the functioning of more appropriate regulation.
6. Developing transparency of institutional processes, including public sector management, so as to better serve the public good.

1.3 STRUCTURAL REFORM OF INFRASTRUCTURE INDUSTRIES

A well-functioning and open infrastructure sector is an important determinant of economic growth and improving living standards. Infrastructure is a significant and qualitatively important determinant of transport costs and bilateral trade flows (Limao & Venables 2001). Improving destination infrastructure by factor of 16% reduces transport costs by an amount equivalent to a reduction of 6500 sea km or 1000km of overland travel. Openness in two key infrastructure services – telecommunications and finance – influences long run growth performance (Mattoo, Rathindran & Subramanian 2001). Economies with fully open telecommunications and financial services sectors grow up to 1.5 percentage points faster than other economies. Infrastructure affects three child-health outcomes related to the Millennium Development Goals – the infant mortality rate, the child mortality rate and the prevalence of malnutrition (Fay et al. 2003). Apart from the traditional determinants (income, assets, education and direct health interventions), better access to basic infrastructure services has an important role in improving health outcomes. But infrastructure industries include areas where competition may not lead to the most efficient economic outcomes.

Some technologies in infrastructure industries have natural monopoly characteristics. This means that a single firm can produce all the output(s) that the market requires more cheaply than could two or more firms – so-called economies of scale. This poses the following policy dilemma: introducing competition by allowing more than one firm may lead to productive inefficiency, so that total costs per unit of service are not at their lowest, but in the absence of competition (actual or threatened), the incumbent firm has an incentive to exploit its monopoly position by restricting output and inflating prices above costs.

Some infrastructure activities involve unpriced spillovers or externalities, so that market price signals do not convey the required information about the value of the activity to the economy

as a whole. For example, the pollution generated by transport or energy activities can create negative externalities, because the pollution is disposed of using a medium (the air) the use of which is unpriced. Also, traffic congestion can create negative externalities, because drivers fail to take into account their impact on other drivers. Where spillovers are unpriced, there may be a need for intervention; for example, to establish a form of pricing mechanism or incentive to encourage efficient behaviour. But this is not a case where efficiency is promoted by limiting competition.

Even where market competition can deliver efficient outcomes, governments may have additional policy objectives besides economic efficiency. They often have equity objectives – either a concern for the overall distribution of income, or of particular services (such as telephone, Internet) or a concern for certain vulnerable groups. They may also have concerns about safety, diversity or any number of other objectives. They may also have concerns about adjustment costs associated with policy reform.

The overriding principle of structural reform is to match the number of policy instruments to the number of economic objectives. Only then can more than one objective be achieved simultaneously. Partly as a corollary, successful structural reform requires that if there is a policy problem (either a current market failure or suboptimal regulation), the first-best policy response is to fix the problem directly, rather than redirecting a less suitable policy instrument towards that end.

However, successful structural reform also requires policy coherence to ensure that:

- different elements or levels of government are not pursuing mutually inconsistent objectives;
- elements or levels of government each have control of, or access to, the policy instruments that best deal with the economic problems under their responsibility;
- policy instruments designed to meet one problem do not unintentionally cut across the achievement of other objectives; and
- each policy area has the appropriate enforcement strategies.

These principles and requirements are specific to the infrastructure sector and to the services which that sector provides. They are also consistent with the principles of good public sector management, including:

- rule of law;
- transparency;
- accountability – oversight and control;
- performance management;
- public sector ethics and probity – the culture and values; and
- responsiveness to stakeholders.

1.4 SECTORAL PROGRESS AND IMPACTS

This section includes an outline of the progress of certain structural reforms across APEC economies, some assessment of business trends in APEC and a discussion of the challenges involved. Quantitative analysis of the impacts of these reforms undertaken for this study is reviewed and some aspects of the reforms are illustrated by material from the case studies.

1.4.1 Transport

1.4.1.1 Air transport

Air services have typically been heavily regulated. At the international level, a system of bilateral air services arrangements between the authorities of economies has regulated various aspects of aviation production and trade for more than 50 years. However, the political bilateral system has also created various limits on competition and trade in aviation services. The progress of APEC reform is summarised in Table 1.1. The items are rated from open to restrictive and a darker colour indicates a more restrictive regime (details are in Chapter 4).

There are some features which are relatively open, including the use of Open Skies agreements and the presence of low cost carriers (LCCs). Some items are either 'on' or 'off' (e.g., the use of liberal cargo arrangements) and within others there is more variation (e.g., privatisation). Interestingly, there is more likely to be less restriction on foreign equity in domestic carriers (the ASA rules inhibit foreign investment in international airlines).

Table 1.1: Structural reform in air transport.

APEC member	Privatisation of the national airline	Foreign equity allowed in domestic airlines	Presence of low cost airline(s)	Ease of entry of new operators	Use of multiple designation of international carriers	Extent of use of Open Skies agreements	Use of 7th freedom cargo rights
Australia							
Brunei							
Canada							
Chile							
China							
Hong Kong, China							
Indonesia							
Japan							
Korea							
Malaysia							
Mexico							
New Zealand							
Peru							
Philippines							
Russia							
Singapore							
Chinese Taipei							
Thailand							
United States							
Viet Nam							

Source: Chapter 4

Many economies in this sample are relatively liberal in their aviation sector, measured by our indicators. However, considerable variation remains. Structural reform has also extended to domestic factors, including as noted in the figure the extent of competition in domestic markets. In some economies, this is extended to the operation of airports (not included in the indicators in Table 1.1), so that restrictions on access to flight and gate slots at airports do not act as barriers to competition in air transport services.

Even though substantial regulation exists, many air transport markets show high levels of competitive behaviour, such as price and service competition. The regulatory system in that situation is not likely to be imposing a wedge that lifts prices for consumers.

There is competition, for example, not only between the bilaterally designated operators but also between routes, and the latter becomes more intense as traffic density rises. Also some regions like the European Union (EU) and, more recently, the combination of the USA and the EU are moving to integrate markets. Their airlines face a wider set of competitors but also benefit from the wider access and the network flexibilities those integrated markets provide. The efficiencies these carriers gain may spill over as greater competitiveness in other markets in which they operate, or may be expected to enter. This leads to further pressure for reform, as is happening in Northeast Asia (Box 1.3).

Box 1.3: Air transport market integration in Northeast Asia.

Korea has signed a series of Open Skies agreements. Of particular interest is an agreement with China that opened routes to Shandong. Traffic grew much faster on those routes compared to other routes between Korea and China (by a factor of 2) and fares fell by an average of more than 8%. This experience and the potential for growth in traffic between Korea, China and Japan, for both passengers and freight, have led to further discussion about a common approach to Open Skies. The idea is to build an integrated Northeast Asian market for air transport. There is further urgency for this effort as carriers there expect a 'competition spillover' from the efficiency-enhancing effects of the open arrangements between the USA and the EU.
Source: Chapter 9

Some airlines themselves are now arguing for regulatory reform. Their international representative body (the International Air Transport Association) uses the term 'pillars of stagnation' when talking about the regulatory system (along with its ownership rules, which are used to establish eligibility for access to markets, and the concern of competition authorities about the anti-competitive effects of mergers) (Findlay & Round 2006).

A further source of competition for established carriers is the new business model – that of the LCCs. Box 1.4 illustrates its impact in Korea.

Box 1.4: Low cost carriers in Korea.

The low cost carriers (LCCs) began to enter domestic routes in Korea in 2006 in response to the growth of domestic tourism in 2005 and a change in regulation. The full service carriers faced competition from high-speed trains which began in 2004 and the use of the LCC model was a competitive response. Another driver was the interest of regional governments willing to invest and to develop their local airports. Six were set up and four remain in operation (and there are recent reports that one may resume this year). Most charge fares of up to 30% lower than the full service operator or the fare prior to their entry. Two of the airlines are subsidiaries of the established carriers and two are not. The LCC share is now 25% of the domestic market, with Korean Air having 48% and Asiana Airlines 27%. The LCC share is close to 30% on some routes, such as Gimpo-Jeju. Clearly the established full service carriers see the LCCs as a threat. Recently the Korean competition authority, the Korea Fair Trade Commission (KFTC) ruled as anti-competitive some practices of the full service carriers, including offering loyalty rebates to travel agents. The KFCT also warned against Full Service Carriers (FSCs) asking agents to restrain sales of tickets on LCCs by threatening access to fewer seats on FSCs at peak times or on certain routes. The Korean experience of the impact of LCCs on domestic routes is also evident in other APEC economies.
Source: Chapter 9

Econometric analysis of the impact of reform on passenger traffic and transport margins finds that further reform in APEC would have a significant effect. Reductions in the degrees of restrictiveness led to significant increases in passenger traffic and cargo growth (Chapter 4) and to a reduction in air freight rates (Chapter 3): a conversion to full openness according to the set of indicators in Table 1.1 would lead to average reduction in those rates for APEC economies by 15%.

Other studies, reviewed in Chapter 2, have also quantified the cost of some of the more restrictive provisions of these agreements, including provisions that designate only one airline from each economy on a particular route, and provisions that restrict capacity and airfare competition: an increase in the degree of liberalisation from that in the bottom quarter of economies (as measured by indicators of reform) to the top quarter would increase traffic volumes between economies linked by direct air services by about 30%. Other work has found that an improvement in airport infrastructure by the same extent reduces air transport costs by 15% while a similar improvement in the quality of regulation reduces air transport costs by 14%. Open Skies agreements further reduce air transport costs by 8%.

1.4.1.2 Rail transport

Rail services consist of the construction, ownership and maintenance of railway track, the purchase, ownership and maintenance of railway rolling stock (carriages etc.), and the operation of railway rolling stock along railway lines to provide passenger and freight transportation services. As with many other forms of physical infrastructure, the track displays the characteristics of a natural monopoly up to the point at which is becomes congested. So, prior to the point of congestion, the aim of economic regulation should be to ensure its capacity is utilised effectively – a problem of static efficiency. Beyond the point of congestion, the aim of economic regulation should be to ensure an efficient level of investment in new track infrastructure – a problem of dynamic efficiency.

One way to ensure the efficient use of rail track infrastructure is to encourage competition in the provision of 'above-the-rail' rail passenger and freight services. However, historically, rail services in many economies have been provided by a single, integrated, often government-owned monopoly. Thus structural reform of rail services has tended to proceed by encouraging private sector participation in the provision of rail services, while making use of the existing track infrastructure, through contractual arrangements. Sometimes reform has also involved the privatisation of the incumbent service provider and/or the structural separation of the ownership and maintenance of track infrastructure from the provision of rail transport services. The rationale for structural separation is to reduce conflicts of interest – otherwise the owner of the track infrastructure would have an incentive to use its control of that infrastructure to thwart competitors.

APEC members differ significantly in the importance of freight and passenger volumes on their rail networks. Separation between track ownership and operations is increasingly common, with the specification of associated access regimes. These are summarised in Table 1.2.

The regimes in different economies are described in terms of whether they separate track and service operators (separation in the vertical dimension) and their treatment, whether there is tendering in passenger markets and whether freight operators can enter the tracks of other operators.

Rail in New Zealand, one of the case studies, provides an interesting example. The railways were run by a government department until 1982 when they were converted to a corporate management system, although retained in government ownership, and required to make a profit. In 1990 work began to prepare the 'core rail operations' for privatisation, which then occurred in 1993. The business changed to another private owner in 2004, with the understanding it would sell the track to the government for NZD1, which would then reinvest in the infrastructure but with the private firm maintaining operations. However, both track and operations returned to government ownership in 2008. Regulation therefore moved in a

Table 1.2: Main features of the APEC members' rail networks.

APEC member	Vertical dimension			Horizontal dimension	
	Integrated monopoly	Competitive access	Vertical unbundling	Franchising system	Entry new operators
Australia			✓	✓	✓
Canada		✓			✓
Chile			✓	✓	✓
China	✓				
Indonesia			✓		
Japan		✓			✓
Korea			✓		
Malaysia	✓				
Mexico			✓	✓	✓
Peru			✓	✓	✓
Philippines	✓				
Russia			✓[1]	✓[2]	✓[1]
Chinese Taipei	✓				
Thailand	✓				
USA		✓			✓
Viet Nam	✓				

[1] Implemented in 2003; [2] Implemented in 2006
Source: Chapter 5

full cycle. Control of fares, without subsidies and restrictions on exit, is not consistent with a sustainable role for private operators, especially in a situation where the features of the transport to be provided may not suit the use of rail. However privatisation was associated with some improvements in performance (Box 1.5) and the introduction of tendering for rail services in Auckland was associated with higher patronage and improved service quality (Box 1.6).

Box 1.5: Effects of rail privatisation in New Zealand.

The process of privatisation in the NZ rail system did have a significant effect on performance. Marketing research led to an improved understanding of customer needs. Volumes for the bulk goods segment increased by 5.5% p.a. over 1994–97 in response to price falls of 7% p.a. In the export goods segment volumes grew at 12% p.a. in response to price falls of 4.4% p.a. Significant improvements were found in customer satisfaction surveys conducted in 2000 and 2003, with positive responses to the question 'Would you recommend (the operator) to another potential customer?' improving from just over 30% to nearly 80%. The operator improved productivity and returned the first operating profits for rail in many years. Costs were reduced, including by cutting uneconomic services. Freight volumes grew, peaking in 2000 and rail's share of the land freight market peaked at 29% in 1998. However, over this period profits were not covering the cost of capital and debt was increasing, while track maintenance was falling. The constraints were the combination of the underlying economics of rail and the constraints on operations imposed by the government. This led eventually to the return of the track to the government.
Source: Chapter 10

Box 1.6: City rail in Auckland, New Zealand.

In 2002 tenders were called for the operation of the Auckland urban rail system. The government retained ownership of the track and provided subsidies for fares (which were NZD7-8 per trip). However, the winning tenderer also improved service quality with more services, higher frequencies, greater punctuality and better trains. Services increased from 635 per week in 2005 to 1475 in 2009. In March 2005 only 77% of trains arrived on time and this figure was over 85% for most of 2009. Over 5 years 21 of the 41 stations on the network were upgraded. Patronage doubled between 2005 and 2010. The fare subsidies (in part offsetting, it was argued, the lack of congestion pricing for roads) were able to be combined with better performance. Now being planned is how to electrify the track. This is expected to increase patronage and lower the subsidy per passenger.
Source: Chapter 10

The decision to vertically separate network businesses is not straightforward, since it can lead to the loss of the advantages of economies of joint management. Integrated rail operators make better choices about investments in tracks compared to those in operations. They are more aware of the trade-offs involved. The advantage of separation is that it changes the incentives of the track operator to favour volumes of traffic. There is no incentive to hold back competitors. If separation is not undertaken, then some mechanism to avoid the bad effects of that decision on competition has to be identified, contracts for access to track by competitors for example.

Work reviewed in Chapter 2 on the European rail system found that combining vertical separation and horizontal competition provides significant benefit and that efficiency and productivity levels in economies that only introduced vertical separation are similar to those in economies that did nothing. Free entry of new operators is critical for better performance. In this respect, the experience of reform in southern Chile is reported in Box 1.7.

Box 1.7: Rail freight in southern Chile.

The government-owned rail corporation in Chile sold its southern operations to the private sector. Later a second private operator entered the market, prompted by a change in sanitary and environmental regulations that prohibited truck transport of sulphuric acid through urban areas, thus leading a major mining operation to transfer the service to the private railway. These carriers had non-exclusive 20-year contracts or 'concessions' that allow free entry of carriers to facilities and require the payment of fixed and variable tariffs for the use of the infrastructure. The track remained in the hands of the state organisation, which was required to provide maintenance and facilities. Tariffs after concessioning were around 40% lower than those prevailing before privatisation, indicating a substantial benefit to consumers. Both private carriers operated by exploiting market niches rather than providing a full range of services to the general public. They concentrated their business on the transport of bulk commodities in large volumes (paper pulp, iron ore etc.) and not in general freight, where competition from trucks was intense. Although traffic volumes did not increase in the initial years after privatisation, revenue and traffic per worker increased markedly. The slow beginning was the result of numerous issues relating to labour and line rehabilitation. After a decade of operations traffic and revenue per worker expanded markedly. Determining the fixed and variable fees for track use has been controversial. The track operator has noted that trucks are not charged the marginal social cost of their use of roads, labelling this unfair competition.
Source: Chapter 11

The work relating to the European rail system has been extended in this study to a limited group of APEC members and it was found that, on average, the productivity, efficiency and technical changes are slightly lower for APEC rail systems (Chapter 5). In particular, the average rate of productivity change for APEC rail systems rose by 3.5% per year, while for non-APEC economies productivity rose by 4.8%. Russia; Viet Nam; and China show the highest rates, while Chinese Taipei and Korea have the lowest. However, China; Japan; and the USA are efficient during the whole period. In any case, we observe again that, on average and excepting Viet Nam, APEC rail systems did not improve the efficiency scores while non-APEC economies improved the efficiency scores by 1.4% per year. Finally, APEC economies improved, on average, their rate of technical change by 3.2%, while non-APEC economies improved by 3.7%.

1.4.1.3 Road transport

Studies of the economic characteristics of road transport suggest that there is little need for intervention by government to ensure efficient allocation of resources, except to ensure that there is competition and that safety, environmental and other externality considerations are taken fully into account. In particular, there is little evidence of economies of scale in either trucking or bus operations.

Nevertheless, the damage that vehicles do to roads rises dramatically with increasing axle weight.[4] A key rationale for regulating road freight and passenger services is therefore to limit road damage, to provide a mechanism for recovering the maintenance costs of the damage that is done and sometimes (as in the case of toll roads) to recover construction costs. Another rationale is to deal with road congestion.

In some economies, licensing requirements, price controls and other regulatory restrictions can extend beyond those required for legitimate purposes, and can be used to restrict entry into and limit competition within the industry, to the benefit of existing road service providers. Sometimes such entry barriers and price restrictions are imposed and/or enforced by professional bodies or representatives of trade and commercial interests, rather than by governments. In these cases, structural reform can follow naturally from systematic reviews of anti-competitive regulation.

In other economies, overly restrictive road transport regulations may arise from the desire to give protection to railways and/or bus operators. It may be possible to phase out such road transport regulations following structural reforms in rail that improve the productivity of the rail transport sector.

Another source of inefficiency in some economies is the over-exploitation of road transport as a source of revenue (through licence fees, charges for trip permits etc.) for regional and local levels of government, in the absence of more efficient revenue sources, as well as road transport being a source of informal payments to police and other agents. Thus reform of road regulation may be contingent on better systems of public sector management as well as broader anti-corruption strategies.[5]

A further issue is price control, with caps on fares designed to achieve higher levels of access for poorer households or those living further from city centres. However, these controls can lead to market responses. The case of passenger vans in Bangkok is reviewed in Box 1.8.

Box 1.8: Passenger vans in Bangkok.

The bus service in Thailand had a feature that is familiar in regimes with fare control – demand exceeded supply. This created the opportunity for new entrants at unregulated prices. These new services, or 'vans', were strictly illegal at first in the mid 1980s, but later were licensed. The vans charged higher prices but offered shorter faster routes with guaranteed seats, although they were also smaller vehicles than buses, and required passengers to go to terminals. The vans competed with buses and were eventually brought within a licensing system with a cap on the number of licenses available (although many continue to operate outside that system). However, the initial stage of their development could be regarded as an experiment with deregulation. The dynamic force that was created which led eventually to re-regulation is not surprising. When the vans were licensed, the fees charged for access to the terminals and for their use were also increased by the investors in those facilities, attempting to capture some of the profits that re-regulation made possible.
Source: Chapter 12

There are in addition continuing concerns about the lack of pricing for congestion in Thailand and also in the freight sector for the costs of road usage by heavy trucks. The entry of the vans described in Box 1.8 added to road congestion in Bangkok, and while the vans are not supposed to stop at bus stops or elsewhere to pick up, they do so if the police fail to enforce

[4] Damage being related to axle loads and not total loads means that vehicle design and load limits are critical components to designing and maintaining roads.

[5] A good assessment of some of the more common problems with road transport regulation is available at www.worldbank.org/transport/roads/rdt_docs/annex2.pdf.

that requirement. This further slows down the traffic flow. While congestion pricing has an advantage of allocating available space in the road system more efficiently, there is a problem if the authority collecting the congestion pricing revenue is also the constructor of the road system. The incentives in that case are to under-invest in the road capacity and collect revenue from the congestion charges.

APEC economies are similar in the application of road transport licensing systems, most of which are managed by governments and come with safety requirements. Lower levels of government also have regulations which might also affect operations (e.g., requirements for trip permits and rules on vehicle size), and which are often more burdensome than national government policy.

Opportunities for cross border trade and the rules on foreign investment in local trucking companies are important issues. Policy may also differ between markets; for example, where a different policy is adopted on international routes compared to domestic routes. The experience of reform on routes between Thailand and Laos PDR is noted in Box 1.9.

Box 1.9: Road freight to Laos PDR.

Thailand has land connections with many neighbours but generally cross-border freight transport is not open to competition. An exception is transport to Laos PDR. Following the removal of quotas on cross-border licenses in 2004 freight rates fell by 20–30%. More important now are infrastructure constraints and other regulatory constraints, such as arrangements for customs clearance. There is a risk that the gains from deregulation, and also the construction of new infrastructure, will be captured and retained at other points in the overall transport and logistics system.
Source: Chapter 12

1.4.1.4 Maritime transport

As in other network industries, key rationales for regulating maritime services are to minimise the damage from natural monopoly and to meet safety requirements. The port facilities in a particular location may have natural monopoly characteristics, depending on the scale of the port facilities relative to traffic. However, it may be possible to encourage competition between ports as well as to encourage competition for the right to operate existing port facilities.

Because there are economies of scale from coordinating international ship movements (e.g., to avoid the movement of empty ships on one direction, even if maritime trade between two economies in unbalanced in volume terms), a variety of arrangements have also developed over time to facilitate such coordination. But as with bilateral air service agreements, many of the arrangements in maritime transport have been seen to unduly limit competition. Examples are various cargo sharing arrangements, which include bilateral agreements as well as the UN Liner Code. Another example is liner shipping conferences, which are private sector arrangements among major liner shipping companies, ostensibly to facilitate coordination but which have at times included restrictive agreements on both capacity and pricing.

As with most collusive and cartel arrangements, both cargo sharing and conference arrangements are hard to sustain when competitive pressures encourage defection. Nevertheless, they have at times been costly to the economies imposing them. The general assessment is that the provision of maritime services is now competitive in international markets. The bottleneck in the provision of maritime services is then more likely to be associated with the provision of port services.

Another arrangement common in maritime services is restrictions on cabotage rights. Cabotage is the transport of goods or passengers between two points in the same economy.

Many economies reserve such domestic shipping either for domestically owned ships or for ships that fly the APEC member's flag. Such cabotage restrictions clearly reduce competition, although they have proved resistant to reform through WTO trade negotiating channels. They have nevertheless been shown to be costly, especially for developing economies, as in research reviewed in Chapter 2. This remains the major issue in APEC.

In many economies, the provision of port services was reserved as a state-owned monopoly. Not only was there no competition in providing port services but many port services (e.g., pilotage, towing, tug assistance, use of navigational aids, use of berthing services, waste disposal, anchorage and casting off) were deemed to be mandatory, meaning that ships visiting a port had to pay for them whether they used them or not. Finally, some APEC economies have restrictive regulations governing access to ports (e.g., determining which ships and which cargoes can visit which ports). These arrangements too have proved to be costly. The case studies on Australia (Chapter 13) and the United States (Chapter 14) identify current issues in port reform in those economies (Boxes 1.10 and 1.11).

Box 1.10: Cabotage in Australia.

The Australian approach to cabotage has been not to remove the regulation but to change the manner of its implementation. The use of a permit system, introduced in the 1990s, has had two effects. At first, it sustained a downward trend in real interstate non-bulk freight rate which was already underway since the early 1980s due to technological factors and to rationalisation of manning scales introduced by the Australian government. The impact of the change in coastal shipping policy is clear from the mid 1990s, when the decrease of the freight rate for journeys between east and west Australia accelerated despite rising fuel prices. Rates were 40% lower in 2005 compared to the start of the 1990s. A second effect was that the size of the Australian fleet decreased in deadweight tonnage (carrying capacity) by almost half between 1999 and 2007, with a much larger decrease in the coastal fleet. At the same time capacity utilisation increased and productivity more than doubled.
Source: Chapter 13

Box 1.11: Cabotage in the USA.

Only vessels owned by a US corporation can carry freight on domestic routes – a company's maximum foreign equity is 25%, 75% of its employees must be US citizens and cabotage is reserved for ships built in the US. Any domestic leg of an international journey is covered by these rules. Subsidies are also provided to US shipyards to make this policy feasible. However, the higher cost of domestic freight by this mode has led to a move to other transport modes and the volume of domestic freight by sea has fallen, as has the size of the USA fleet. The shipbuilding sector has also declined. Businesses which consign freight have been lobbying against the regulation but have not been effective compared to the concentrated influence of the remaining shipping companies (now a duopoly). The complexity of the policy package and the lack of transparency make its assessment more difficult.
Source: Chapter 14

APEC members' policies are summarised in Table 1.3, where darker cells indicate a more restrictive arrangement. There has been little change in policy over the last decade, as generally, in the transport sectors, economies at later stages of development have more open regimes. Yet the story is mixed for maritime transport, with some high income economies having relatively closed regimes, including:

- not applying competition policy to maritime transport;
- the use of rules on nationality of staff and directors; and
- restrictions on cargo allocations (for only a few economies).

Lower income economies are more likely to have restrictions on foreign investment. New econometric work was undertaken for this study (see Chapter 3). It finds that a movement to full liberalisation in the dimensions shown in Table 1.3 for all APEC economies would on average reduce maritime freight rates by about 20%.

Table 1.3: Structural reform in maritime transport.

APEC member	Quotas	Exemption of carrier agreements from competition law	Form of the ownership	Caps on percentage of ownership	Acquisition domestic entity	Cabotage	Cargo Handling	Regulatory authority independent
Australia								
Canada								
Chile								
China								
Hong Kong, China						n.r.		
Indonesia								
Japan								
Korea								
Malaysia								
Mexico								
New Zealand								
Peru								
Philippines								
Russia								
Singapore						n.r.		
Chinese Taipei								
Thailand								
United States								
Viet Nam								

Source: Chapter 13

1.4.2 Energy

1.4.2.1 Electricity

While electricity transmission (and perhaps retail distribution) may possess natural monopoly characteristics, industry performance can be enhanced by encouraging competition in electricity generation (and perhaps retail distribution). Recent technological advances, such as cogeneration (of electricity and usable heat) have changed the economics of generating electricity and created options for competitive supply. A regulatory regime that encourages competition in electricity generation would:

- unbundle those activities that are considered to be competitive (generation and retailing) from those that are thought to be natural monopoly activities (transmission), so as to avoid conflicts of interest in promoting competition;
- allow third party access by guaranteeing open and non-discriminatory access for all generators to the transmission grid (subject to available transmission capacity); and
- introduce a wholesale pool, or spot market, for electricity (either mandatory or optional) to overcome limitations associated with the use of direct (bilateral) contracts between generators and retailers.

These characteristics of regulatory reform contributed to lower industrial electricity prices in OECD economies, correcting for a number of economy-specific features, according to work reviewed in Chapter 6: competitive wholesale markets and retail competition reduced prices (relative to their absence) significantly in the USA, with retail competition reducing prices by 5–10% for residential customers and 5% for industrial customers.

In a wholesale price pool there is the possibility of dominant generators using their market power to play a 'game' by manipulating the bidding system to deliver electricity at prices that are still above cost. Thus, while the United Kingdom established a wholesale electricity market in March 1990, the 'gaming' problem led to the pool's being replaced by a system of bilateral contracts in March 2001. It was not clear that the alternative price setting mechanism would deliver lower prices than a wholesale pool, as the underlying problem was the same in both regimes – the market power of the generators. In any event, there are vertical economies between generation and retail. To the extent that vertical integration of these activities increases the proportion of wholesale transactions that are intra-firm transactions, it may mean that explicit wholesale markets will tend to be thin. For this reason, the use of a wholesale price pool rather than long term contracts may be contentious.

Other, less controversial, aspects of a pro-competitive regulatory regime include:

- allowing new generators to enter the market and new sources of supply generally, such as wind, solar and demand management mechanisms;
- allowing customers (sometimes large customers such as retailers or large industrial users, sometimes all retail customers) to purchase electricity directly from the generator or retailer of their choice; and
- introducing a regulator independent of industry players and day-to-day political influence.

Previous research has confirmed the benefits of true retail competition, which includes both choice of generator and choice in billing and contract terms. However, retail competition is only likely to be as extensive as competition in generation, because vertical economies mean that non-integrated retail companies have little chance of success at any reasonable scale.
Generally, the structural reforms that have taken place since 2004 in the energy sector in APEC economies have been incremental – there have been few big-bang initiatives. Korea made a start. But, for reasons discussed in Box 1.12, these stalled. However, according to some studies the partial reforms had some effect on productivity. Russia is another exception, where a successful reform program is reviewed in Box 1.13.

Box 1.12: Electricity in Korea.

Korean reforms in electricity established in 2000 led to the separation of the generators from the distribution company. Little progress has been made since then. The original company continued to own the generators, even though the next step in the reform had been their sale. The reforms stalled because of resistance, especially from labour unions, coinciding with a new government which was not committed to the original reform plan. The partial reforms may have created some efficiency gains, though researchers continue to debate their significance and there are conflicting conclusions. Some indicators show positive results. Reliability improved as planned outages, which required 25.0 days across 109 units of generators in 2000, dropped to 19.4 days across 117 units in 2003 after restructuring. The heat efficiency of the generation facilities and the maintenance of frequency and voltage seem to have also improved after restructuring. There was a substantial rise in the capacity utilisation rate of coal-fired plants and a subsequent reduction in generation cost after the divestiture. The utilisation rate surged from 74.8% in 1999 to 89.0% in 2003. The gains arise from improved management after the divestiture. A pattern of cross-subsidies (including from profits from constructing generation capacity) keeps industry-user prices low but this reduces incentives for those preferred in this way to support a resurgence of reforms. It may also not be sustainable with expectations of falling greenhouse gas emissions.
Source: Chapter 15

In electricity generation, the lack of 'big bang' initiatives is partly because introducing competition into generation and retail is a highly complex regulatory process. In electricity, the 'product' is completely non-storable. New capacity needs to be brought on stream in a way that does not overload or risk system stability in the network, which would result in a reduction in quality of supply. The regulatory requirements for competitive new producers and/or

Box 1.13: Electricity in Russia.

The extent of reform of the Russian electricity sector is remarkable. There has been a complete transformation of the system to separation and a wholesale market. The motivation was the urgency to mobilise investment in capacity. Demand for electric energy had been rising with an upturn in economic activity since 1999 but capacity was not expected to be sufficient. Reform was conceived around the idea of maintaining government regulation over the natural monopoly components of the sector, while introducing competition and private investment in the generating segment. The stated goals of the reform included: Increase in efficiency through restructuring and private ownership (2003–08); price deregulation according to a schedule and full competition in generation (by 2011); and competition by ensuring third party access to network infrastructure. The consequence was significant increases in capacity from 2008 onwards. Unfortunately, in part because of the effects of the global financial crisis, increases in capacity have not met expectations. But expansion is continuing. Price regulation remains to 2015 for retail consumers. With a rising share of sales procured in the wholesale market, the shortfall had to be made up and this was done via connection fees, which fell as the level of economic activity fell. The 2010 Russian budget commits to further electricity tariff increases to reduce the extent of the subsidies. The Californian experience of reform has not been a deterrent in Russia, where the reforms have been designed with its lessons in mind.
Source: Chapter 16

wholesalers to gain access to existing transmission and distribution networks need to be compatible with the technical requirements for the safety and physical integrity of the system.

Table 1.4 identifies the member economies which have unbundled generation, provide third party access to the distribution system and operate a wholesale pool.

Table 1.4: Summary of current regulation in APEC electricity markets, 2009.

APEC member	Unbundling generation	Third party access	Wholesale pool
Australia	✓	✓	✓
Canada		✓	✓
Chile	✓	✓	✓
China	✓		✓
Hong Kong, China			
Indonesia			
Japan		✓	✓
Republic of Korea	✓	✓	✓
Malaysia			
Mexico			
New Zealand	✓	✓	✓
Peru	✓	✓	
Philippines	✓		
Russia	✓	✓	✓
Singapore	✓	✓	✓
Chinese Taipei			
Thailand			
United States	✓	✓	
Viet Nam			

Source: Chapter 6

Econometric analysis used in Chapter 6 identifies the effects that further structural reforms in APEC electricity and gas markets would have on prices and efficiency. In electricity markets:

- the introduction of a third party access regime would be associated with about 4.7% lower electricity prices than otherwise, on an indicative basis and holding all other factors constant;
- the introduction of a wholesale electricity market would be associated with about 7.2% lower electricity prices; and
- unbundling of generation from transmission would be associated with 11.1% lower electricity prices.

The combined effect of all three initiatives would be electricity prices estimated to be 23% lower than otherwise.

The econometric results also suggest that wholly private ownership of electricity operators would be associated with prices that were 23.1% higher than if ownership were wholly public (with no other changes in policy). One reason is that, as studies have noted, private ownership can make it difficult to get reforms under way. Furthermore, and as might be expected, the positive relationship between price and private ownership is strongest when there is a monopoly provider – private sector monopolists might be more likely to pursue higher profits than government monopolists, and hence to raise electricity prices by exploiting their market power. This effect is unlikely to persist over time as reform efforts continue.

1.4.2.2 Gas

The rationale for structural reform in gas is similar to that for electricity. While high-pressure transmission pipelines and (perhaps) lower pressure distribution pipelines have natural monopoly characteristics, efficiency can be improved by promoting competition in the production and import of gas and in gas retailing, that is, competition for supply into the pipeline system and in the extraction from that system. An additional benefit of retail competition is that it allows retailers to offer bundles of services, such as combined electricity and gas services.

Traditionally, natural gas markets were either local – the gas was used where it was produced – or bilateral – gas consumption and production occurred at either end of a gas pipeline. Now liquefied natural gas (LNG) technology has made it possible to ship gas from a single source to multiple markets. The international market for gas can thus be expected to become much more competitive over time, in the same way that oil markets have become 'thick', making it easier for importing economies to shop around. On the one hand, this can be expected to promote competitive importing. Arrangements for access to pipeline systems also allow LPG to be replaced by reticulated LNG. On the other hand, LNG terminals are themselves expensive and highly capital intensive, and may display natural monopoly characteristics, depending on their capacity relative to market size. Thus, in the future, competitive importing may require arrangements that allow users other than the owners to have access to LNG facilities as well as for pipelines. These are called third party regimes.

In general, reforms in natural gas have been less extensive than in electricity. In part, this is because the scope for competition in natural gas production depends on the range of sources of supply. Indeed, many of those economies with extensive reserves had already undertaken significant reform prior to 2004. Boxes 1.14 and 1.15 review China's progress towards price reform and the reform so far in Thailand; Table 1.5 contains a summary, and further economy detail is included in Chapter 6.

Box 1.14: Gas in China.

A remarkable development in China was the reform which began in 2005 to the system for pricing gas. Previously gas prices were based on a cost-plus formula. From 2005 they were 'hooked' to the prices of other sources of energy, although the application of this formula varied according to the gas field. City gas prices then varied because of the different sources of gas and the distance to gas fields. The hooking mechanism did begin to correct a problem of pricing gas too low which in some cities led to gas shortages in 2009. However gas prices remain low relative to world levels. Growing demand, environmental pressures and rising world or LNG prices are not likely to permit this situation to continue and further pressure for price rises is expected. The mechanism for arranging those changes has been established.
Source: Chapter 17

Box 1.15: Gas in Thailand.

A gas market reform plan was developed in the late 1990s which would have separated the gas transmission pipeline from the retail trading operations and from production. However, when implemented, following a change of government, the main change was the privatisation of the gas company. There was no separation, nor was an independent regulator established as had been planned. The goal had become the mobilisation of funds to invest in the network. In this the change was remarkably successful, and offshore gas fields were connected. A side effect was that domestic capacity increased so quickly that imports fell. There were no evident efficiency gains, prices remained controlled and questions remain about the quality of gas relative to global benchmarks. Prices remained relatively low, despite the lack of competition in the market. But this was due to access to low cost gas from domestic sources and government subsidies. As growth continues and local sources are used up, this situation is not likely to continue.
Source: Chapter 18

Table 1.5: Summary of current regulation in APEC gas markets, 2009.

APEC member	Unbundling transmission	Third party access	Retail competition
Australia	Yes	Yes	Yes
Canada	Yes	Yes	Yes
Chile	Yes		
China			Yes
Hong Kong, China			
Indonesia	Yes	Yes	
Japan		Yes	Yes
Republic of Korea			
Malaysia			
Mexico		Yes	Yes
New Zealand	Yes	Yes	Yes
Peru	Yes	Yes	
Philippines			
Russia			
Singapore	Yes	Yes	Yes
Chinese Taipei			
Thailand	Yes	Yes	
United States	Yes	Yes	Yes
Viet Nam			

Source: Chapter 6

Econometric analysis for this study, reported in Chapter 6, identifies the effects that further structural reforms in APEC gas markets would have on prices and efficiency. In gas markets the introduction of retail competition would be associated with gas prices being about 15% lower than otherwise, all other things being constant, and the unbundling of gas production/import from other segments of the market would be associated with about 23.4% lower gas prices. Both these percentages would be lower if initial gas prices were higher than the average in the OECD sample, as they are currently.

As noted, these results are indicative only and are not fine-tuned to the individual circumstances of each APEC economy. However, they do suggest that the slow, incremental approach to reform of APEC energy markets is worth reviving or continuing, despite the considerable burdens imposed on regulatory capacity. APEC economies can learn by doing, they can learn from the general lessons of reform in other economies and they can learn from close interaction and cooperation among industry regulators. APEC processes are well-tuned to providing the sort of experience sharing and capacity building that can make the regulatory burden easier. Gains to industrial users, and by inference to households, would be considerable.

1.4.3 Telecommunications

One key rationale for regulating telecommunications is to avoid the abuse of market power, when at least some elements of the telecommunications network have the characteristics of a natural monopoly and where the exercise of that monopoly power would create greater damage than the cost of regulatory mistakes. Another key objective is often to regulate to ensure that the industry meets universal service obligations, that is, to meet community expectations of the level of access to services of particular quality.

Technology changes very rapidly in this sector and so judgements about which elements may constitute a natural monopoly also change rapidly. But the current consensus is that there is little in mobile technology that is a natural monopoly, while in fixed-line networks the 'last mile' (the copper wire connection, and the ducts or infrastructure associated with it, between an individual subscriber and the first switch in the network) may still have natural monopoly characteristics. The regulatory challenge is to prevent the economic waste associated with duplication of the bottleneck facility (the 'last mile') while encouraging competition elsewhere in the network. One of the common regulatory approaches to this problem is to establish an access regime, whereby other providers pay a wholesale charge for access to the incumbent's bottleneck facility, so they can offer retail services (e.g., retail telephony or ISP services) that use this facility. If the access charge is set appropriately, this can encourage competition in retail services while discouraging inefficient duplication of the 'last mile'. If the access charge is set too high, retail competition will be thwarted and there will be an incentive for inefficient duplication of the 'last mile', but if the access charge is set too low, the incumbent will have little incentive to invest to maintain or extend the bottleneck facility. A common regulatory solution is to price access at long run incremental cost – a charge that includes a capital component towards maintenance and eventual replacement of the asset, but does not include any 'super normal' profits for the incumbent.

Nevertheless, other aspects of the regulatory regime may still thwart competition indirectly. Typically, subscriber access charges were kept low to encourage participation by the poor, and usage charges were too high, particularly on long-distance calls, to compensate. Universal service obligations such as these were traditionally met in many economies by cross-subsidies in this form which were built into the incumbent's retail pricing structure. But when competition is introduced, entrants are attracted to the high-profit parts of the market and the cross-subsidies cannot be sustained. The failure of some developing economies to find ways other than cross-subsidisation to fund universal service obligations is still thwarting the development of effective competition in telecommunications, even where the economies have made commitments to do so.

The direct benefits of effective competition in telecommunications markets are reviewed in Chapter 7 and found to be considerable. To illustrate, an effect of telecommunications reform, which embraces information and communication technology as well as traditional telephony, is productivity improvements as a result of greater use of the Internet for business transactions. One study found that this could reduce the gap between wholesale and retail prices from 19.6% to 5% of prices.

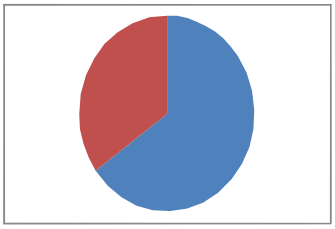
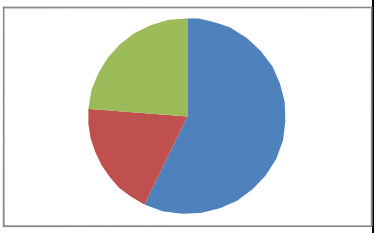
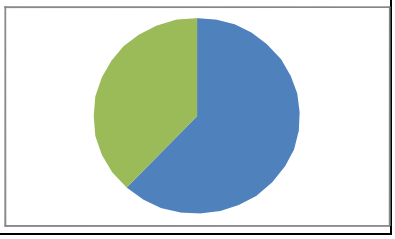
Nevertheless, there is considerable uncertainty about what the prevailing next-generation technologies will be. This in turn implies considerable uncertainty about where the natural monopoly elements (if any) will be in the future, and therefore what the appropriate future regulatory responses should be. Certainly regulation should not be designed to be specific to a particular technology and it should be designed to facilitate competition between technologies.

As of 2009 most APEC economies have adopted full market entry liberalisation. Some APEC economies allow full foreign ownership for fixed-line operators and these economies impose no restrictions on legal forms either. Others do not allow foreign investment in their fixed-line networks at all. The common practice is to limit foreign investment from gaining dominant positions in fixed-line operators (i.e., below the 50% threshold). The efficiency restrictions this FDI requirement places on telecommunications is a current major issue in this sector.

As of 2009 all APEC economies have liberalised their mobile sector. In most economies new licences are granted based on market-oriented approaches unless limited by the availability of spectrum. The scope of regulatory reform is summarised in Figure 1.1. There is little variation in the role of the independent regulator but greater variation in the measures in the table blue represents implemented, green partially done or under consideration and red is not yet implemented.

The growth of the telecom sector itself adds to GDP, but the initial impact of liberalisation on competitive market entry is often a contraction of the workforce. This is partly a response to competitive pressures by the incumbent to become more efficient. More importantly, over time it is a response by the incumbent to accelerate the adoption of new digital technologies, which are far less labour intensive. New technologies are associated with innovation in services in two ways: through more effective delivery channels (such as DSL and IP-based mobile cellular etc.) and through new services (e.g., converged services such as IPTV and mobile TV). As new entrants make their mark, users become more aware of the benefits and availability of telecoms and new services create new markets, so employment in the sector grows again. Further details of the experiences of reform in Chinese Taipei; Viet Nam; and PNG are presented in Boxes 1.16, 1.17 and 1.18.

Figure 1.1: Summary of APEC economies' implementation of the WTO regulatory principles.

Regulatory elements	APEC performance
Establishing an access regime	
Implementing rules on interconnection	
Making licensing criteria publicly available	

Source: Chapter 7

Box 1.16: Telecommunications in Chinese Taipei.

A liberalisation program began in Chinese Taipei in 1997, first in mobile then in fixed-line services. The subsequent change in performance was remarkable in comparison with its APEC peers. Fixed-line, mobile and broadband service penetration were significantly improved over the last two decades, while price has been decreasing rapidly over the same period. In terms of accessibility performance, fixed-line penetration in Chinese Taipei exceeded that of Australia and Japan in 1998 and of the USA in 2003. Broadband penetration is also performing well compared to these economies. Mobile penetration in Chinese Taipei represents the most direct link between structural reform and performance. A sharp increase in mobile penetration took place around 1998 when competitive 2G operators began, surpassing many pioneer economies in the region, such as the USA; Australia; and Japan. This trend of rapid development continued until it reached its saturation point in 2004. The entry of 3G mobile operators in 2003 is likely to be the reason for a rebound in penetration since 2005. In relation to the change in price, performance in Chinese Taipei also demonstrates a positive relationship between structural reform and performance. A significant reduction in charges for mobile service connection and monthly subscription charges, as well as the connection charge for fixed-line services, took place around the beginning of the structural reform period. Of note is that the average connection and monthly subscription charges for mobile services reduced to zero since 2004, after the introduction of 3G mobile services. This pricing model facilitates access to services, while suppliers recoup costs through use charges.
Source: Chapter 19

Box 1.17: Telecommunications in Viet Nam.

Fixed-line development in Viet Nam seems modest compared to mobile growth, yet it is outstanding when compared to other APEC economies with similar levels of economic/telecom developments. Prior to 2003 Viet Nam shared a similar level of fixed-line penetration rate with Indonesia and the Philippines of around 5%. Yet starting from 2003, access jumped. In fixed-line availability Viet Nam is now at 35% and mobile penetration is at 80%. Monthly subscription charges for mobile services had fallen to zero by 2004, compared to $US17 in 1999. Structural reform efforts contributed to this outcome, including the establishment of the universal service fund (VTF). There was also a relatively transparent and predictable regulatory environment to foster competition and network investment. Further, the growth of Viet Nam's Internet subscribers (from zero in 2002 to 6% in 2008) offers yet another good example of the correlation between reform and performance. Two primary reform initiatives are responsible for the sharp increase in Internet subscription: the first, the Internet services sector was liberalised and the VTF was established, which includes public Internet access as part of the universal service scheme. In relation to price, the experience in Viet Nam demonstrates a positive relationship between market liberalisation and performance. Monthly subscription charges for mobile services have been reduced from nearly USD17 in 1999 to zero in 2004. For the average tariff of a 3-minute off-peak mobile call, as at 2005 Viet Nam was the highest of the three sample economies, yet by 2008 it became the economy with the lowest rate.
Source: Chapter 20

Box 1.18: Telecommunications in PNG.

While the fixed-line service remained in the hands of a government enterprise, competition was introduced into the mobile sector when entrant Digicel joined the incumbent B-Mobile. The number of mobile phone subscribers (through B-Mobile) was estimated to be between 130 000 and 140 000 prior to the entrance of Digicel in July 2007. The firms now claim to have over 500 000 customers each, which suggests a remarkable 700% growth in the number of mobile phone subscribers. This result could be regarded as universal coverage. Average peak and off-peak domestic call billing rates have fallen by 11% for peak times and by 51% for off-peak times since the introduction of Digicel. Average peak and off-peak international call rates have fallen by 40% and 38%, respectively. As well, calling rates for both carriers and for both domestic and international calls have moved from 30-second billing increments to per second billing increments. Digicel has a wide range of market products and services such as a prepaid handset pack, 24/7 customer care, post-paid price plans, international text messaging, missed call alerts, and other promotional products such as 'talk-for-free' and 'Happy Fridays'. It claims to have provided employment opportunities to some 300 people of whom 90% are Papua New Guineans and indirect employment for about 500 people through dealer stores, top-up vendors, distributors etc. Furthermore, it has committed itself to a busy community relations program. In a land with a terrain as difficult as PNG's, the benefits to the many remote communities of being able to interact with other people cannot be underestimated. Already the availability of mobile phone services has done much for social interaction as well as being helpful in medical emergencies. Moreover, the mobile banking initiatives now underway will be enormously helpful because, hitherto, banking services in rural areas have been very limited. Further, the provision of market pricing information through mobile phone services will be very helpful because the livelihood of the bulk of the population is from agricultural and fishing activities.
Source: Chapter 21

1.5 TEN LESSONS OF REFORMS TO DATE

In this section, ten general lessons of the reform in APEC economies to date are put forward. The themes of these lessons include the value of transparency, of having a clear view about goals and of having the expectation of continuing change. In other words, the process of reform is continuous.

1.5.1 Competition is more important than ownership

Generally the result of the review of reform to date stresses the value of competition and contestability and the value of preceding changes in ownership by the introduction of competition. Most important is competition, since privatisation without it can lead to the continuation of the same problems under a new owner. At least competition for the market or regulation of the critical infrastructure, whose owners might otherwise capture the gains from trade, is required. This is illustrated for instance in the case studies on markets for gas electricity, as well as reform of the international road freight sector in Thailand. Whether or not different stages of the production of the services are separated (independent of ownership) – and there is debate about the value of separation – the focus should be on the introduction of competition.

At the same time, there may be some concerns about introducing competition. For example, the result may be market structures in which a small number of firms compete, that is, oligopolies, or foreign firms might enter, try to drive out competitors by lowering prices, that is, demonstrated predatory behaviour, and highlight the lack of capacity of local firms to compete. If that is a problem, options include a regulatory response and capacity building or support to market failure problems related to research and development or training skilled staff. Complementary reforms in other sectors help with adjustment costs, and there is value in packaging and sequencing reform. Predatory behaviour is also more rewarding to producers but not consumers. Therefore, it is more likely in the presence of remaining entry barriers, to which constant attention should be given.

1.5.2 Take a forward looking view and provide a leadership commitment

A forward looking view that is regularly and clearly explained helps avoid a trajectory to landing in an ‘undesirable equilibrium’, becoming stuck at that point because of the emergence of new vested interests. One example might be in an urban transport system where not acting might result in the system descending into congestion from which a number of vested interests extract significant benefit. The situation with urban transport in Bangkok is an example. Another is undertaking a partial reform, such as privatisation in gas or electricity but then not proceeding past that point. The experiences of gas in Thailand and electricity in Korea highlight the challenges. Along with this, it is important that there is a commitment by leaders to structural reform (e.g., to a set of national development goals) and that they have the ability to explain structural reforms.

1.5.3 Be aware of ‘the gap’ in regulatory practice

It is important to have some sense of ‘the gap’, that is, how far away the current regime is from relevant ‘good practice.’ This level of performance is not the same as ‘best practice’ in global terms but it is the regulatory process that would be regarded as efficient at the state of development. APEC has a key role to play in sharing this experience, as discussed with reference to the material on gas markets in the previous section. Reform in electricity is also complex, and concerns remain about the Californian experience where reform, which later was

argued to be incomplete, was followed by blackouts and by attempts by suppliers to extract higher prices from newly created markets. The designers of electricity reform in Russia, for example, drew on advice and experience from the rest of the world to design a new system.

1.5.4 Know the costs of the current regime

For reform to proceed it is important that the community has some sense of the costs of the gap, which might be poor performance and choice in various dimensions, for example, low quality services or prices too high. High prices are not the only cost of incorrect choices or a lack of action. It could be, as in many energy markets where the sustainability of policy is critical in environmental terms, that prices are too low. Gas markets provide examples of this.

Other points that help make the case for change are:

- the scope for efficiency gains, like those available from electricity reform, or even a partial reform, as in Korea;
- the capacity to respond to other shocks or developments, such as responding to climate change, an emerging pressure in markets for gas in China for example;
- the easing of otherwise tightening fiscal constraints and interests from within the industry itself, such as its capacity to raise finance, which was a driver of reform in Russia;
- technological change which leaves some interests 'stranded', as is becoming more apparent in air transport markets and in telecommunications; and
- environmental impacts which are getting worse, including congestion, which may be worsened by inappropriate regulation, as in the case of Bangkok despite its otherwise beneficial effects.

Reform driven by efficiency gains to the general public may be important in terms of economic welfare but the dilemma is that reforms of this type may be very difficult to implement and manage. How can it be done? Is this a case where compensation is required? How could efficiency gains be presented as a benefit to the public or small business? Some more appealing communication of the challenges as well as the likely gains will be important. The cases in this study include instances where service quality also improved because of reform, for example, the van market in Bangkok and the Korea–China air routes.

1.5.5 The commitment to structural reform is continuous and never stops

Structural reform is a dynamic process resulting in dynamic benefits. Yesterday there may not have been a performance gap of note but as times change, gaps will re-emerge. For example, investment in capacity lags behind the growth in demand – this was a driver of reform in the electricity sector in Russia where a key figure in the industry played a lead role in identifying that 'gap'. Markets will continue to anticipate where momentum exists. They will respond to regulation and changes in costs and benefits: the reaction of markets to cabotage rules in Australia and the USA illustrates this process, as does the impact of competition in air transport markets. New technologies may also provide new sources of competition and undermine the rationale for existing regulation, as in telecommunications. Equally, new bottlenecks may emerge because of technological change and demand attention, so the regulatory focus has to shift. In maritime transport, for example, a key issue is no longer the anti-competitive behaviour of shipping companies but the management of ports, as the Australian and USA cases illustrate.

The choice, therefore, is not simply one between good and bad practice in a static sense. There is a need to adjust the regime as new gaps to good practice emerge. This is not easy. Also, since

structural reform is dynamic (as are its benefits), it is important to avoid the problems of 'reform indigestion', that is, a build-up a valuable reforms which are not implemented. Monitoring of performance and reporting on it is part of the process to avoid indigestion.

1.5.6 Promoting engagement from within

Is there pressure from the regulated businesses within a sector or constrained businesses in a contestable position? And when can it work as a source of pressure for reform? Relevant factors might be:

- reform to help correct an internal weakness and improve performance;
- pressures from shareholders;
- pressure from competitors (who might operate in a different regulatory environment, for example, the same market in technical terms providing substitute services but a different institutional setting);
- financing constraints; and
- pressure from downstream sectors which place flow-on pressure.

Reform happens faster when motivated from within. A clearly defined end point is required for a particular reform initiative. Otherwise, incumbents can recapture a process. But, due recognition needs to be paid to the need to keep up with competitive and regulatory benchmarks set by others. It will be interesting to see if there is a change in regulation in international aviation as interests shift and attitudes to the current regime change: the lively discussion about options in air transport in Northeast Asia is an illustration of this.

It is easier to prevent special pleading from particular regulated industries if structural reform is taken as a package across all state owned enterprises, or at least a group of them. It also helps to establish structural reform as part of a better governance campaign or a budget 'clean-up' based on good principles. It need not be simultaneous but it can be a rolling reform.

1.5.7 The use of experiments

Experiments can be useful to demonstrate the value of reform. In air transport, for example, the experience with the result of deregulation in the freight sector and the introduction of LCCs has been vital for wider progress. The 'testing' going on at present in Northeast Asia with regional reform is very influential. The experience of the passenger van market in Bangkok, although not originally officially sanctioned and later re-captured by regulation, is an example of a market-led, natural experiment that grew out of the regulation itself. Experiments can be useful to break bottlenecks to change – they demonstrate benefits in smaller areas, even regions, or parts of markets. Criteria for selection (or acceptance) might be the extent of change required or the capability to execute change and the capacity to quantify effects. Complementary research efforts are important to capture the experience end distribute the messages.

1.5.8 The value of independent evaluation for designing options

Independent evaluation can be very important, either in the formal sector or utilising the second track. Those organisations help to offset the lobbying efforts of the vested interests. They also can challenge the 'good performer' myth, that a structure looks to be working well because it is profitable (perhaps too much so) or financing its own investment and maintaining capacity (to too great an extent). To some extent, this is an issue in the progress

of reform in the gas market in Thailand. These agencies are also important in that they identify options, engage the stakeholders in a process to choose between options, maintain attention on the efficiency case, then propose a reform plan, publicise targets, monitor reform and report back on progress. Researchers working on air transport in Northeast Asia have played a key role in driving change there.

To facilitate the conduct of voluntary reviews of institutional frameworks and processes for structural reform, the APEC Policy Support Unit has prepared a guidance manual that sets out in a single document the objectives, scope and desired outcomes of the reviews. It is designed to assist reviewers, volunteering economies and their respective agencies and other interested stakeholders to prepare for and participate in the reviews.[6]

1.5.9 Coordination and when it matters

Some problems demand coordination across infrastructure services for a solution, for example, in public transport where coordination across modes is important to avoid congestion. This is also relevant to logistics, as illustrated in the case of Indonesia where policy across a number of modes of transport has to be coordinated. It is illustrated in the case of Thailand with respect to investment in road networks. According to experience to date, the Indonesian case study provides a checklist of action items for success in setting up and managing this coordination. Critical activities include:

- establishing a formal process in which all relevant parties are involved;
- providing funding for it;
- providing the process with relevant powers to make changes to policies and practices;
- including all the stakeholders, not just suppliers but also users of the services – public and private – from the beginning;
- having a functional organisation; and
- monitoring progress.

Other examples of the value of coordination include setting up integrated ticketing systems, which requires as much coordination as does network wide traffic signal coordination. It is important to recognise this as it has beneficial efficiency impacts. To say how it has or has not been dealt with can be, but it is not always, critical. Other structures are easier to operate on their own account, for example, railways and highways. However, when co-ordination is critical, the question is how to get it done? This requires leadership and external advice.

1.5.10 Universal service obligations

Viet Nam in the telecommunications sector demonstrates yet again the value of dealing with universal service obligations directly. To embed them in the commitments of incumbents creates a disincentive for reform. Separating them makes the cost transparent.

1.6 THE NEXT STEPS

1.6.1 Effects of further reform

Chapter 2 examines the economy- and region-wide effects of prospective structural reforms in the transport energy and telecommunications sectors of APEC economies. What are the next steps to complete the programs of structural reform already begun in these sectors?

[6] The PSU manual is available at http://publications.apec.org/publication-detail.php?pub_id=960.

The theme of these next steps is the introduction of competition into each sector. This implies a series of changes, such as in:

- air transport, a range of reforms to air services agreements, to entry conditions for domestic and foreign carriers, and to ownership;
- maritime transport, the dismantling of remaining entry restrictions, quotas or cargo sharing arrangements and the granting of national treatment to foreign-owned carriers located domestically;
- rail transport, vertical separation and free entry in freight operations in those economies that do not yet have them;
- electricity and gas, third party access, unbundling, wholesale markets and/or retail competition in economies that have not yet implemented them; and
- telecommunications, the removal of remaining foreign equity limits.

The study uses modelling work to assess the implication of this package of 'next steps' in structural reform. The modelling assumes no privatisation of incumbents in rail, electricity or gas. Key results, discussed in more detail in Chapter 2, include the following four points.

Firstly, this package of reform would have significant effects. They can be translated into productivity effects, and the estimated first-round impacts of these reforms suggest that they could lead to weighted average productivity improvements in the range of 2–14% across the sectors involved. The most extensive reform effort, and the largest productivity gains (i.e., above 10%), are projected to occur in Indonesia; Malaysia; Mexico; the Philippines; Chinese Taipei; and Viet Nam.

Secondly, economy-wide gains can also be estimated, as there is strong correlation between the size of the reform tasks and the economy-wide gains they generate. Furthermore, in all economies, an overwhelming proportion of these gains come from reforms at home, rather than reforms in other economies. Thus, while the gains from joint reforms are considerable, there is no compelling reason for each APEC economy to wait for others to start.

Thirdly, while most APEC economies are also projected to reap small gains from reforms elsewhere, this is not a foregone conclusion, because productivity improvements elsewhere are a two-edged sword. The income and price effects of productivity gains in other economies on the home economy work in opposite directions, and very often the adverse price effects dominate. The difference here is that structural reforms in other economies also reduce the cost of transporting merchandise exports from the home economy. In most cases, this restores the balance in favour of the home economy.

Fourthly, across the APEC region, structural reforms in transport, energy and telecommunications as outlined above are projected to generate USD175 billion a year in additional real income (in 2004 dollars), relative to what would have accrued had no reforms occurred. This is a snapshot of the steady state gains after a 10-year adjustment period, during which smaller gains accrue.

1.6.2 Gains from structural reform compared to other agendas

APEC-wide, the projected gains from these structural reforms are almost twice as big as the gains from further liberalisation of merchandise trade. Yet the sectors where the structural reforms occur are less than a quarter of the size of those engaged in merchandise trade. When structural reforms lower real production costs, even by half as much as is estimated here, they

generate a 'bang for the buck' that is much greater than from trade reforms. However, cost bases can also contribute to further trade gains. Exporters which capture benefits can use cost advantages to decrease the costs of the products they export.

The findings of Chapter 2, therefore, vindicate the decision of APEC Leaders to move beyond a 'border' agenda to one that focuses on behind-the-border reforms. Yet structural reforms to generate significant gains are also likely to generate significant structural adjustment costs. The expected size and extent of those adjustments has also been examined.

At the sectoral level, the projected output gains tend to be in the services sectors undergoing reform, and in the sectors that use their services intensively. These can include metals (intensive users of electricity), chemicals (intensive users of gas), wood and paper products (intensive users of domestic transport services), and a range of industries (meat and livestock, forestry and fishing, grains, dairy, other manufacturing) that are intensive users of international transport services. Construction is typically also projected to gain slightly from the additional impetus given to industry investment.

The sectors projected not to gain (and, therefore, could be viewed as losing in relative terms) are typically those that do not fall into the above categories. They suffer indirectly from higher wages and rates of return, effects that are induced primarily by the expansions in overall activity. Industries typically losing in this way include textiles and clothing, motor vehicles, other transport equipment, electronic equipment and other machinery and equipment.

The relative losses in industry output in these sectors are relatively minor, however. And they are even smaller when reforms in other APEC economies are taken into account. Thus, structural reforms in other APEC economies can play a useful role in helping to cushion the adjustment costs of reforms at home, even if they do not add greatly to the overall gains from reform.

The employment effects of structural reforms can be significant. The essence of a productivity improvement is that an industry can produce more with less. As a result, input usage can fall, even when output rises. Sectors which according to the modelling lose employment to a relatively large extent do so not as a result of their own productivity improvements but because the home industries that use their services lose their position as other economies reform.

In the extreme cases, modelling indicates relative losses in unskilled employment in a particular sector after 10 years can accumulate to upwards of 30%. But this modelling result needs to be kept in perspective. Employment changes occur over time and can be addressed through targeted structural assistance measures. Secondly, as long as an economy grows, overall employment will increase so the modelling shows that structural reforms may require significant relative shifts of labour across sectors over time. Thirdly, the model projects higher real wages for all workers in all economies. Modelling and real world examples demonstrate that displaced workers earn higher real wages in their new occupations.

To reiterate, employment opportunities overall depend on the growth of an economy. Thus, one of the best ways that APEC economies can guard against any adverse employment effects of structural reform is to maintain healthy underlying rates of economic growth. Structural reform itself makes a contribution to this goal, since it adds to productivity, stimulates activity and increases the resilience of the economy, but prudent macroeconomic management is also crucial.

1.6.3 The LAISR agenda

The importance of structural reform in APEC economies and how it is conducted cannot be overestimated. This research shows the value of the APEC Leaders' adoption of an agenda of structural reform.

The case studies and the associated research also reveal the importance of structural reform as providing strong bridges behind the border to the benefits of regional economic integration. This study has found that:

- structural reforms are very challenging and require balanced reform and political commitment amid the economic and political complexities in all economies;
- structural reforms can create winners and losers but yield more inclusive development when they are carried out dynamically and with other economic reforms; and
- structural reforms are worth undertaking and provide much greater gains than trade liberalisation and generate economic sustainability.

These results suggest the need for APEC to build an even stronger structural reform agenda and work program. Structural reform will be a continuing process, as growth, changes in economic structures, new technologies and market responses to existing regulation continue to change the situations in which APEC economies and their regulatory systems operate. Steady adaptation is required, not the least because expectations will rise as development proceeds. Pressure from the rest of the world, both competition from other economies and new commitments for cooperation, create further forces for change. APEC economies, as the tables and figures in this report illustrate, are at various stages of reform and their experiences to date are valuable to other members. The sharing of this experience remains a priority as they assist to learn about what is possible. But, what is most important, are the strategies for implementation and starting the reforms – turning shared experiences into concrete actions.

Effective structural reform is adopted for a purpose and to achieve a stated outcome. A key to progress is first to be clear about that purpose and the outcomes sought. Another area of cooperation is the design and implementation of reporting systems and monitoring arrangements for the progress of reform. The impacts of reform and their economy-wide effects are worthy of regular attention. Evidence of gaps between good practice, given the stage of development, and the costs of those gaps are drivers of reform. The pace of reform is important. But in the end what matters is the outcome.

More efficient market operations, greater resilience, macroeconomic stability, higher productivity that follow from structural reform contribute to growth and thereby to higher standards of living. The concern with resilience and macroeconomic stability is even more relevant in the context of the response to the global financial crisis.

A reform program focused on structural reform will create new sources of growth. The new growth will be driven by productivity. Reform at the border remains significant for efficiency and growth of member economy but the empirical work here demonstrates the significance of the productivity effects of even a modest set of 'next steps', all primarily focussed on the introduction of competition. New growth, more dynamic economies and a stronger APEC would be the result.

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Chapter 2

MODELLING THE BENEFITS OF STRUCTURAL REFORMS IN APEC ECONOMIES

Philippa Dee[1]

- A general equilibrium model is used to assess the effects of a package of structural reforms, focused on the introduction of competition into markets for transport and energy.
- APEC-wide, the projected gains are significant and almost twice as big as the gains from further liberalisation of merchandise trade.
- At the sectoral level, the projected output gains tend to be in the services sectors undergoing reform, and in the sectors that use their services intensively.

2.1 INTRODUCTION

Structural reform in transport, energy and telecommunications is not synonymous with deregulation but with better regulation. Nor is privatisation the key. The critical aim of structural reform is to encourage as much competition as is appropriate in these sectors, while configuring the regulation targeted at other legitimate economic and social objectives so that it does least damage to that competition, and therefore to economic efficiency. Competition can be a powerful method of squeezing excess profits and driving producers to find lower cost ways of doing business. Ownership matters primarily to the extent that it affects the incentives of producers to respond in these ways to competitive pressures, and government-owned enterprises can respond quite adequately to private sector competition if they are adequately capitalised and operate under appropriate governance structures. As will be seen, there can be significant gains from structural reforms in some of these sectors, even when they continue to operate with current ownership structures.

The appropriate level of competition depends on the sector in question. Many of these activities involve networks – of railway lines, of electricity transmission and distribution lines, of gas transmission and distribution pipelines and of telecommunications transmission and distribution lines. At least some components of these networks have the characteristics of a 'natural monopoly', meaning that it is less costly for their operation to be carried out by a single producer using a single set of facilities, rather than having two or more operators with duplicate facilities.

The structural reforms in these sectors are typically aimed at introducing competition into those parts of the production chain that are not natural monopolies. This requires the competitive suppliers to have access to those parts of the network that are natural monopolies. Successful reform also requires that the restructuring be done in such a way that

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the benefits of competition in the competitive sectors outweigh the loss of any economies of scope that may have prevailed when the monopoly and competitive activities were operated together under single ownership.

In maritime and air transport, the natural monopoly elements are more likely to be at the ports or airports than in the transport operation *per se*. But maritime and aviation networks operate across national boundaries, and in both activities a degree of regulatory cooperation may be required to ensure safety and coordination along international routes. But such regulation should not unduly impede competition, nor should competition be unduly stifled in the interests of promoting or protecting 'national champions'.

This paper draws on studies in this report that have identified the types of regulatory structures that unduly impede competition and have quantified their first round impact on economic performance in the sectors in question. The purpose of the paper is to go one step further: to quantify the effects of reforming those regulatory structures, not just on the sectors in question but also on sectors that might use these services, on whole economies, and ultimately on the region as a whole. It also aims to quantify the adjustment costs that these prospective reforms might generate.

2.2 THE REFORM AGENDA

2.2.1 Air transport

International air services are governed by a system of bilateral air services agreements. While these agreements cover a wide range of topics that would be deemed legitimate targets of regulation (such as aviation security, incident investigation, immigration and control of travel documents), they also include seven key features that have been identified by the WTO Secretariat as restricting scheduled air passenger services (WTO 2006):

- *Designation*
  Governs the right to designate one (single designation) or more than one (multiple designation) airline from the home economy to operate the agreed services between the two economies.
- *Withholding*
  Defines the ownership conditions required for the designated airline(s) of the foreign economy to be allowed to operate the agreed services. The most restrictive conditions require substantial ownership and effective control to be vested in the designating economy or its nationals. The most liberal regime (principal place of business) removes the substantial ownership requirement but still requires the designated airline to be incorporated in the designating economy and to have its principal place of business there. This falls far short of the relatively generous 'rules of origin' typically written into services trade agreements. These would typically require only 'substantial business' in the designated economy, irrespective of ownership.
- *Grant of rights*
  Covers the rights to provide air services between two economies. The dimensions in which air services agreements are generally being liberalised is in the granting of the 5th, 6th and 7th freedoms and cabotage. The 5th freedom is the freedom to carry passengers between two economies by an airline of a third economy on a route with origin or destination in its home economy. The 6th freedom is the freedom to carry passengers between two economies by an airline of a third economy on a route that goes via its home economy. (Note that 6th freedoms can also be constructed via a

combination of the 3rd and 4th freedoms from different bilateral agreements, and so are rarely specified explicitly.) The 7th freedom is the freedom to carry passengers between two economies by an airline of a third economy on a route with no connection to its home economy. Cabotage is the freedom to carry passengers within an economy by an airline of another economy on a route with origin or destination in its home economy.

- *Capacity clause*
  Determines the capacity of an agreed service, where capacity refers to the volume of traffic, frequency of service and/or aircraft type.
- *Tariff approval*
  Refers to the fare setting regime. Under the most restrictive regime, the aeronautical authorities of both economies have to approve a fare before it can be applied. Under the most liberal regime, fares are not subject to the approval of either authority.
- *Statistics*
  Establishes rules on the exchange of statistics between economies or their airlines. If an exchange of statistics is or can be requested, it is a sign that the parties intend to monitor the performance of each other's airline and is thus viewed as a restrictive feature of an agreement.
- *Cooperative arrangements*
  Defines the rights of the designated airlines to enter into cooperative marketing arrangements such as code sharing and alliances. This right is considered a liberal feature because it provides a means to rationalise networks in the absence of liberalisation of the ownership clause.

These restrictive features of air services agreements have been shown to impose costs by raising international airfares and restricting international traffic. Gonenc and Nicoletti (2000) and Doove et al. (2001) found a positive and significant effect of the restrictiveness of air services agreements on passenger air fares. For example, Doove et al. (2001) estimated that the restrictive provisions of the agreements in place at the time had inflated international airfares from Indonesia and the Philippines by over 20%, and from Malaysia, Singapore and Thailand by 16–18%. Piermartini and Rousová (2008) found that an increase in the degree of liberalisation from the 25th to the 75th percentile would increase passenger traffic volumes between economies linked by a direct air service by about 30%. In particular, they found that the removal of restrictions on the determination of prices and capacity, cabotage rights and designation were found to be the most traffic-enhancing provisions.

The restrictive provisions of air services agreements also impose costs on air freight services. Most air freight is carried in the belly of passenger aircraft and is thus affected by exactly the same provisions as passenger traffic. Freight-only flights are generally also governed by the same provisions as passenger flights, although in some instances they are granted more liberal traffic rights. Grosso (2008) found a positive and statistically significant relationship between relaxing restrictions and the value of merchandise trade. Achard (2009) found a significant correlation between liberal air services agreements and the volume of air cargo.

In recognition of such costs, a growing number of economies are negotiating more liberal air services agreements. The typical 'open skies' agreement grants 3rd, 4th and 5th freedom rights and removes restrictions on designation, capacity, frequencies, code-sharing and fares. Open skies agreements typically do not grant cabotage rights or lift foreign ownership restrictions on domestic airlines. Seventh freedom rights are sometimes included, but often restricted to cargo-only traffic.

Increasingly, economies have also liberalised their domestic aviation services, which they can do on a unilateral basis. Such liberalisation has typically included allowing additional domestic and foreign entry on domestic routes, particularly by low cost carriers, and freeing up restrictions on domestic air fares. Sometimes, liberalisation has also included the full or partial privatisation of government-owned carriers.

The index of policy restrictions compiled by Zhang and Findlay (2010) covers some of the key measures affecting both domestic and international aviation: the privatisation of national airlines, foreign equity participation in domestic airlines, the existence of low cost carriers, the number of effective passenger airlines (indicating ease of entry), whether there is multiple designation on international routes, whether there are more than two open skies agreements and whether 7th freedom cargo rights are granted to at least some foreign carriers.

Table 2.1 shows the index and its components, where an index value of 1 indicates full restrictiveness, a value of 0 denotes no restriction, and intermediate values denote partial restrictions. (See the original paper for details, noting that the analysis is restricted to APEC members that have been included in the computable general equilibrium model, based on data available from the GTAP model database [Hertel 1997]. It therefore excludes Brunei and Papua New Guinea.)

The table indicates that China; Viet Nam; the Russian Federation; the Philippines; and Chinese Taipei currently have the most restrictive regulatory regimes among APEC economies. The United States of America; Australia; Singapore; Malaysia; and Thailand have the least restrictive regimes.

Table 2.1: Index of policy restrictions in air transport.

APEC member	Privatised	Foreign equity	Low cost airline	Effective competitors	Designation	Open skies	7th freedom	Total score
Australia	0	0	0	0.5	0.5	0	0	1
Canada	0	0.75	0	1	1	0	0	2.75
Chile	0	0	1	1	1	0	0	3
China	0.67	0.5	0.5	0	0.5	1	1	4.17
Hong Kong, China	0	0	0.5	1	1	0	1	3.5
Indonesia	1	0.5	0.5	0	0.5	0.5	0	3
Japan	0	0.75	0.5	0	0	0.5	1	2.75
Republic of Korea	0	0.5	0.5	0.5	0	0.5	1	3
Malaysia	0.67	0.5	0	0	0.5	0	0	1.67
Mexico	0	0.5	0.5	0.5	0	0	1	2.5
New Zealand	0.67	0	0.5	0.5	0.5	0	0	2.17
Peru	0	0.5	0.5	0.5	0.5	0	0	2
Philippines	0	0.5	0.5	0	0.5	1	1	3.5
Russia	0.67	0.75	0.5	0	0.5	0	1	3.42
Singapore	0.67	0	0	0.5	0	0	0	1.17
Chinese Taipei	0.67	0.5	1	0.5	0	0.5	0	3.17
Thailand	0.67	0.5	0	0	0.5	0	0	1.67
United States	0	0.75	0	0	0	0	0	0.75
Viet Nam	1	0.5	0.5	0.5	1	0.5	0	4

Source*:* Zhang & Findlay 2010.
Note: 0 = no restriction, 1 = full restriction

2.2.2 Maritime transport

McGuire, Schuele and Smith (2000) surveyed the maritime policy regimes in several APEC, Latin American and European economies. They described the key restrictions affecting shipping services as follows:

- *Right to fly the national flag*
  Requires ships to be registered or licensed to provide maritime services on domestic and international routes. The conditions on registration may include legitimate requirements, such as meeting seaworthiness and safety requirements, but may also include restrictions, such as the ship having a commercial presence in the domestic economy and being built and/or owned domestically.
- *Cabotage restrictions*
  These restrict shipping services on domestic and coastal routes to vessels that meet certain conditions. Shipping services between domestic ports may be required to be carried out by domestically owned, operated, built and/or crewed ships.
- *Conferences*
  Private sector arrangements between shippers that are held out to facilitate the planning and coordination of shipping traffic but typically also include anti-competitive provisions. Governments that have enacted general competition laws usually permit the existence of conferences through exemptions from the price setting and collusion provisions of their domestic competition legislation.
- *UN Convention on a Code of Conduct for Liner Conferences (UN Liner Code)*
  Stipulates that conference trade between two economies can allocate cargo according to the 40:40:20 rule, whereby 40% of tonnage is reserved for the national flag lines of each economy and 20% is allocated to liner ships from a third economy.
- *Cargo sharing*
  Other types of arrangements that stipulate the allocation of cargo on particular routes between parties to bilateral and multilateral agreements.
- *Bilateral agreements*
  Agreements between two economies that primarily restrict the supply of shipping services and the allocation of cargo. Some bilateral agreements also restrict the use of port facilities.

Many developing economies do not have general competition laws or any legislative framework for regulating the behaviour of shipping conferences. However, in recent times conferences have been subjected to increasing competition. They no longer dominate shipping routes and are no longer regarded as the impediments to maritime performance that they once were. PDP Australia and Meyrick and Associates (2005) note that within ASEAN, cargo reservation measures have been very significantly reduced and in many cases completely abandoned. Similarly, a growing number of economies have 'open' ship registries, which means that local ship registration is no longer tightly tied to local ownership of the shipping company. This leaves cabotage restrictions, along with inadequate and aging infrastructure, as the main impediments to economic performance in shipping services in many economies.

These regulatory restrictions on shipping services have been shown to be costly, particularly to developing economies. Kang (2000) found that the maritime restrictions imposed by goods exporting economies appear to have a much greater impact on bilateral shipping margins (as measured by cif/fob ratios) than those imposed by importing economies. He also found that in exporting economies, lowering restrictions such as cabotage and port services restrictions had a greater effect on margins than reducing restrictions on the commercial presence of foreign suppliers. In several applications of these findings, the sum total of restrictions on shipping and port services was found to have inflated shipping costs by around 30% in Morocco (Dee 2006) and by around 26% in Indonesia (Dee 2008).

The index of regulatory openness compiled by Bertho (2010) covers some of the key measures affecting maritime transportation. Table 2.2 shows the index and its components, where an index value of 1 indicates full openness, a value of 0 denotes full restrictiveness and intermediate values denote partial restrictions (see the original paper for details). The index covers cabotage restrictions, cargo handling restrictions, quotas for private or government cargo, the availability of exemptions for carrier agreements from competition law and the existence of an independent regulatory authority. It also covers measures that fall squarely into the category of barriers to services trade – foreign equity limits, limits on the legal form of establishment (branches, subsidiaries) of foreign greenfield operations, whether foreign operators can take a controlling stake in existing private or public entities and whether there are nationality requirements on the employees or boards of directors of foreign companies.

The table confirms that cabotage restrictions are the predominant restrictions on maritime services among APEC economies. Hong Kong, China is the most liberal APEC member, followed by Chile; New Zealand; and Australia. The least liberal is Viet Nam, which does not have a deep sea port, so most goods are transported to Singapore and Hong Kong, China before going on to final destinations. Foreign firms usually provide cross-border services via a Vietnamese (wholly domestic) agency, which does everything on behalf of foreign suppliers in Viet Nam and earns a commission from the foreign partners (Dee 2010a).

2.2.3 Rail transport

Rail can be a very efficient means of transporting cargoes, especially bulky ones, once they are loaded onto the trains, but the loading and unloading is costly. By contrast, road freight transport may be less efficient in moving large cargos but it can operate door-to-door, often avoiding a cycle of loading and unloading. Similar tradeoffs apply in the economics of rail passenger transport. Furthermore, rail operating costs make it more economic than road for moving freight over longer distances, while over short distances road transport dominates. For these reasons, rail transport plays a surprisingly minor role in many economies' transport networks. For example, in Indonesia rail transport accounts for only 7% of passenger transport and less than 1% of freight transport (Dee 2008).

In rail services the natural monopoly elements are the track bed, while rolling stock (railcars) can be leased or bought by competitors and operated on the incumbent's rail tracks (subject to an adequate access regime, timetabling and safety standards). 'Horizontal separation' is the term given to competition in the market (e.g., via the free entry of freight operators) or for the market (e.g., via tendering or franchising arrangements for passenger services). However, to promote effective competition, it may be necessary to require the track operator to become a separate corporate entity without any interest in passenger or freight operations ('vertical separation'). Without such an interest, the track operator will have an incentive to maximise its revenue by maximising traffic. With such an interest, it may have an incentive to restrict the access of competitors to promote the profitability of its own passenger or freight operations.

Cantos, Pastor and Serrano (2010a) examined the effects of horizontal and vertical separation in European railways. They found that the reforms had been beneficial in terms of efficiency (allowing laggards to catch up to leaders) and productivity (also incorporating the benefits of technical change through innovation). Key drivers of both types of benefits were vertical separation and the free entry of new freight operators. No significant effects on either efficiency or productivity were found for the introduction of tendering systems in passenger traffic.

Table 2.2: Index of policy openness in maritime transport.

APEC member	Quotas	Competition law exemptions	Form of ownership	Percentage of ownership	Acquisition domestic entity	Nationality reqt employees	Nationality reqt BOD	Cabotage	Cargo handling	Independent regulatory authority	Simple average
Australia	1	0	0.5	1	1	0	1	1	1	1	0.75
Canada	1	1	0.5	1	1	0	0	0	na	1	0.61
Chile	1	1	1	1	1	na	na	0	na	1	0.86
China	1	1	0.5	0.49	0	1	1	0	1	0	0.60
Hong Kong, China	1	1	1	1	na	na	na	nr	1	na	1.00
Indonesia	0.5	1	0.5	0.49	1	1	1	0	1	0	0.65
Japan	1	0	0.5	1	1	na	0	0	1	1	0.61
Republic of Korea	1	0	0.5	1	1	0	1	0	na	1	0.61
Malaysia	1	1	1	0.3	0	na	na	0	na	1	0.61
Mexico	1	1	1	1	1	0	1	0	na	0	0.67
New Zealand	1	0	0.5	1	1	na	na	1	1	1	0.81
Peru	1	1	1	1	1	0	0	0	na	0	0.56
Philippines	0	1	0.5	0.4	na	1	0	0	0	1	0.43
Russia	0	1	0.5	1	1	1	1	0	1	0	0.65
Singapore	1	0	0.5	1	na	na	na	nr	1	na	0.70
Chinese Taipei	1	0	1	na	na	na	na	0.5	0	0	0.42
Thailand	0.5	1	1	0.49	0	1	0	0	0	0	0.40
United States	0	0	0.5	1	1	0	0	0	1	1	0.45
Viet Nam	1	1	0	0	0.5	0	0	0	0	0	0.25

Source: Bertho 2010.

Note: na = not available; nr = not relevant; 0 = close, 1 = open.

The index of policy openness compiled by Cantos, Pastor and Serrano (2010b) covers some of these elements of rail regimes in APEC economies. Table 2.3 shows their index components (some values available when this study was undertaken are provisional), where an index value of 1 indicates openness, and a value of 0 denotes restrictiveness. The index covers vertical separation, free entry into freight operations and franchising in passenger services.

The table indicates that Australia; Chile; Mexico; Peru; and Russia have regimes that are most conducive to competition in rail services. The most restrictive regulatory regimes are in many of the East Asian members of APEC.

Table 2.3: Index of policy openness in rail transport.

APEC member	Vertical separation of infrastructure and operations	Free entry in freight operations	Franchising in passenger services
Australia	1	1	1
Canada	0	0	1
Chile	1	1	1
China	0	0	0
Hong Kong, China	nr	nr	nr
Indonesia	1	0	0
Japan	0	1	1
Republic of Korea	1	0	0
Malaysia	0	0	0
Mexico	1	1	1
New Zealand	0	1	1
Peru	1	1	1
Philippines	0	0	0
Russia	1	1	1
Singapore	nr	nr	nr
Chinese Taipei	0	0	0
Thailand	0	0	0
United States	0	1	1
Viet Nam	0	0	0

Source: Cantos et al. 2010b.
Note: nr = not relevant; 0 = close, 1 = open.

2.2.4 Electricity

The production of electricity involves generation, transportation over high voltage lines (transmission), transportation over low voltage lines (distribution) and marketing to retail consumers (supply). Transport operations are considered to be natural monopolies and typically remain regulated, even after structural reform. But generation is seen as a competitive activity and is generally the first activity to be opened to competition, followed by wholesale trading and retail supply. However, retail prices may remain regulated in some economies, even after structural reform.

Doove et al. (2001) describe the broad outlines of the structural reform agenda in electricity as:

- structurally separating (unbundling) the competitive activities (particularly generation, but sometimes also retailing) from the natural monopoly elements (particularly transmission, but occasionally sometimes also distribution);
- dividing existing generation capacity among a number of different generation companies, who then compete with each other (horizontal separation);
- allowing new generators to enter the market;

- guaranteeing open and non-discriminatory access for all generators to the transmission grid (subject to available capacity), so they can sell directly to downstream suppliers or users rather than to the incumbent (third party access);
- establishing a wholesale price pool, or spot wholesale market, for electricity (either mandatory or optional), so that new entrants are not obliged to enter both the generation and retailing sector at the same time, thus lowering entry costs;
- regulating natural monopoly activities to prevent any abuse of market power;
- introducing a regulator that is independent of industry players and day-to-day influence, and typically separate from the system operator;
- enabling large customers (retailers and sometimes large industrial users) to buy electricity directly from the generator of their choice;
- introducing competition into metering and billing activities and contract terms, thus allowing retail customers the freedom to choose among different electricity suppliers;
- providing a full range of tradable financial instruments (e.g., futures contracts and options);
- undertaking partial or complete privatisation or corporatisation of publicly-owned assets;
- introducing cross-ownership restrictions, especially between competitive and natural monopoly activities;
- liberalising restrictions on foreign investment and ownership;
- mandating service quality standards; and
- allowing retailers to introduce innovative services (e.g., the ability to switch retailers over the Internet or providing electricity jointly with other services such as telephony and gas).

One of the first empirical assessments of the effects of electricity reform was Steiner's (2000) study of OECD members over the 1986–96 period. She found that unbundling of generation, third party access and the introduction of wholesale electricity markets were all associated with lower electricity prices. However, she found that private ownership was not necessarily associated with increased competition. Nevertheless, both private ownership and unbundling of generation and transmission were found to be associated with a higher rate of utilisation of existing generation capacity, and with reserve plant margins that were closer to optimal.

Two other recent studies have been less definitive. Hattori and Tsutsui (2004) undertook a similar study of OECD members over the slightly later period of 1987–99, although their measurement of variables (particularly prices) was different. They found that giving customers access to alternative suppliers (which they argue is highly correlated with third party access) was associated with lower prices. However, unlike Steiner, they did not find a significant effect of unbundling or the introduction of a wholesale spot market on prices. Nagayama (2007) undertook a broadly similar study of 83 economies over the 1985–2002 period. He found that neither unbundling nor the introduction of a wholesale pool market on their own would necessarily reduce electricity prices. In fact, contrary to expectations, there was a tendency for the price to rise. However, coexistent with an independent regulatory, unbundling could work to reduce prices. He also found that privatisation, the introduction of foreign independent producers and retail competition could lower electricity prices in some regions, but not all.

To some extent these mixed results are a sign that in some economies reforms may not have been taken far enough. Either the reforms were not taken far enough to have any real effect or there were not enough reforms in the chosen samples for econometric techniques to discern any significant effects. Dee (2010b) found more evidence of significant benefits from

structural reforms among OECD members, over a period of more active reform associated with the European Union's Second Electricity Directive.

The index of policy openness compiled by Dee (2010b) covers some key dimensions of electricity regimes in APEC economies. Table 2.4 shows the index components, where an index value of 1 indicates openness and a value of 0 denotes restrictiveness. The index covers unbundling, third party access and the existence of a deregulated wholesale electricity market.

APEC economies with regimes that are most conducive to competition in electricity generation are Australia; Chile; the Republic of Korea; New Zealand; the Russian Federation; and Singapore. The most restrictive regulatory regimes are in Indonesia; Hong Kong, China; Malaysia; Mexico; Chinese Taipei; and Viet Nam.

Table 2.4: Index of policy openness in electricity.

APEC member	Third party access	Wholesale price pool	Unbundling
Australia	1	1	1
Canada	1	1	0
Chile	1	1	1
China	0	1	1
Hong Kong, China	0	0	0
Indonesia	0	0	0
Japan	1	1	0
Republic of Korea	1	1	1
Malaysia	0	0	0
Mexico	0	0	0
New Zealand	1	1	1
Peru	1	0	1
Philippines	0	0	1
Russia	1	1	1
Singapore	1	1	1
Chinese Taipei	0	0	0
Thailand	0	0	0
United States	1	0	1
Viet Nam	0	0	0

Source: Dee 2010b.
Note: 0 = closed, 1 = open.

2.2.5 Gas

Natural gas is found in underground reserves, often in combination with oil and condensate products. Exploration and production is generally done by oil companies, and there are few synergies between this and other activities in gas markets. In economies without indigenous production, however, the primary supply activity is undertaken by importers, who may also be involved in downstream activities.

In many economies, gas importation, transmission and storage was traditionally undertaken by a single monopolist, or several companies with regional monopolies. Sometimes the monopoly importer also sold to end users, or else these sales were handled by downstream monopolies.

Like electricity, structural reform of gas markets involves allowing new entrants into the potentially competitive segments of the market, without requiring them to be vertically integrated. This can involve new companies producing gas or importing it from external sources, in competition with the incumbent(s). It can involve new shipper/suppliers buying gas on wholesale markets, arranging for its transportation with the network company and signing

retail contracts with consumers. It can also involve pure traders buying and selling on wholesale markets to take advantage of arbitrage opportunities (European Commission 2007).

These new activities rely on the development of functioning wholesale markets and on third party access to transmission and distribution networks. To reduce the possibility of incumbents using their control over pipeline or terminal facilities to thwart competition, both transmission and distribution can be unbundled into separate transmission system operators and distribution system operators. When such operators are sufficiently independent from incumbents, they have an incentive to maximise, rather than restrict, the amount of gas sold through their networks, thus facilitating competition.

Thus the broad features of structural reform in gas markets are similar to those in electricity markets, though the scope for competition in primary production/importing is somewhat more limited than in electricity generation.

There are relatively few studies of the effects of structural reform in gas markets. Jamasb, Pollitt and Triebs (2008) studied the effects of United States regulatory reform on productivity and found that encouraging competition has been rather successful in raising productivity. Hawdon (2003) found evidence that the types of reforms introduced in the United Kingdom are associated with higher levels of efficiency, good utilisation of labour and levels of underutilisation of capital sufficient to support the development of competitive markets. Nevertheless, Brakman, van Marrewijk and van Witteloostuijn (2009) warn that lack of competition and capacity constraints in gas production/import can prevent these gains being passed on to consumers.

The index of policy openness compiled by Dee (2010b) covers some of these key dimensions of gas regimes in APEC economies. Table 2.5 shows the index components, where an index value of 1 indicates openness and a value of 0 denotes restrictiveness. The index covers unbundling of production/import, unbundling of supply, third party access, the absence of entry restrictions and the presence of retail competition.

APEC economies with regimes that are most conducive to competition in gas markets are Australia; Canada; New Zealand; and the USA. The most restrictive regulatory regimes are in Hong Kong, China; the Republic of Korea; Malaysia; the Russian Federation; Chinese Taipei; and Viet Nam.

2.2.6 Telecommunications

As reflected in the WTO Reference Paper on telecommunications, the reforms of the 1990s recognised that efficiency gains could be had by introducing competition into those components of the telecommunications network that were not natural monopolies. However, competitors would need access to the monopoly elements (typically the ‘last mile’) in order to provide a full retail service. According to the Reference Paper, access regimes should provide competitors with access to essential facilities at access charges that were cost-based and non-discriminatory. The appropriate regulation of access charges is a complex issue, although sometimes made more complex than necessary when access charges (as a single policy instrument) are used to pursue multiple objectives (Dee & Findlay 2008).

A related requirement for promoting contestability was to ensure the general interconnectivity of the facilities of various competitors, whether or not they constituted essential facilities. This was required so the subscribers of one provider could make calls to subscribers of all other providers, irrespective of the ownership of the various network components involved. Various

Table 2.5: Index of policy openness in gas.

APEC member	Third party access	Retail competition	Absence of entry restrictions	Unbundling of production/import	Unbundling of supply
Australia	1	1	1	1	0
Canada	1	1	1	1	1
Chile	0	0	1	1	0
China	0	1	1	0	1
Hong Kong, China	0	0	0	0	0
Indonesia	1	0	1	1	0
Japan	1	1	0	0	0
Republic of Korea	0	0	0	0	0
Malaysia	0	0	0	0	1
Mexico	1	1	0	0	0
New Zealand	1	1	1	1	0
Peru	1	0	0	1	0
Philippines	0	0	0	0	0
Russia	0	0	0	0	0
Singapore	1	1	0	1	0
Chinese Taipei	0	0	0	0	0
Thailand	1	0	0	1	0
United States	1	1	1	1	1
Viet Nam	0	0	0	0	0

Source: Dee 2010b.
Noted: 0 = closed, 1= open.

regulatory principles were also developed to ensure that interconnection charges were not used by the incumbent to preserve network dominance (Economides, Lopomo & Woroch 1996, ITU 2000).

A further component of these reforms was ensuring number portability, so that retail subscribers could take their original phone number with them if they switched providers. This was necessary to reduce the cost of 'shopping around', and thus to increase the competitive pressures on providers.

A key supporting component of these pro-competitive reforms was to revise the ways in which universal service obligations were met. To that point these obligations had often been met by cross-subsidies built into the retail prices of telecommunications services that provided competitors with a chance to cherry-pick the lucrative long-distance parts of the market and left incumbents with fewer options to cover their fixed costs. Their response was often to inflate the wholesale access prices charged to competitors for access to the essential facility. Of course, this worked to defeat the introduction of competition. A key reform component of the 1990s, therefore, was to 'rebalance' retail prices to remove the cross-subsidies and ensure that fixed costs were covered, and to find other ways to fund universal service obligations – typically either directly from the government budget or through an industry levy imposed on all service providers.

Since then, a number of technological advances have in some ways radically transformed the industry. The first key development has been the phenomenal growth of mobile telephony. This technology has few natural monopoly elements, so it has allowed extensive entry by new providers. To the extent that mobile services provide a close substitute to fixed-line services, competition from this source can discipline the behaviour of fixed-line service providers and reduce the need for regulatory intervention or oversight. The two services are close substitutes for individuals and perhaps even households. But businesses of any size

typically also need fixed-line connections to meet the sheer volume of their voice and data needs. Most governments have therefore retained the kind of regulatory structures described in the WTO Reference Paper.

A second key development has been the growth of internet services, particularly broadband. These services, which combine developments in the size and nature of the 'pipe' with developments in switching and signal transmission technology, have made it technologically meaningless to distinguish voice from data traffic. This is the essence of 'convergence'. So now there is an imperative for regulatory structures to acknowledge this convergence. The key way in which this is happening is in the move from 'individual' to 'general' or 'class' licensing, not just for carrier licences but also for licences to access the spectrum required for mobile and fixed wireless technologies. Typically, individual licences were not only attached to a particular technology, they were also attached to a particular service. General licences are less tied to particular services, and will often allow both voice and data transmission, although most governments are not yet ready to include broadcasting services in the bundle.

The proliferation of delivery technologies for broadband services (such as ADSL, fibre optic, fixed wireless) has also provided an imperative for regulatory structures to be 'technology-neutral'. This is also facilitated by the move from 'individual' to 'general' or 'class' licensing, since general licences are typically no longer tied to a particular technology.

But there are limits on the extent to which regulatory structures can be completely technology-neutral. This is because a key rationale for regulatory intervention remains dealing with 'natural monopoly' components of the network, and the nature and extent of the natural monopoly problem depends on the particular technology in question. Thus, given the rapid development and proliferation of technologies, there may be no 'one-size-fits-all' best approach to regulation. The most recent ITU survey of trends in reform (ITU 2008) stresses the importance of ensuring interconnectivity across all technologies and all providers, in order to maximise the use that will be made of any particular facility. The report is subtitled 'Six Degrees of Sharing', and notes (p. 1):

> In a way, many regulatory practices can be viewed as sharing. What is new and innovative is their application to meet the needs of developing economies. What is the same is that they use time-tested, pro-competitive tools, such as the regulation of essential or bottleneck facilities, transparency, and the promotion of collocation and interconnection.

Nevertheless, there is considerable current uncertainty about which technologies may become dominant in the future, and as noted, the scope of such regulation depends on the technology. Economies may not necessarily be sure to 'pick the best winner' but they can at least ensure that their regulatory regimes are internally consistent. For example, economies making a serious commitment to fibre optic technologies could need to put more regulatory effort into access regimes than economies relying more on mobile and fixed wireless technologies.

As well as technological developments, services trade reform has also been an important vehicle for promoting the contestability of market, and the potential benefits have been shown to be significant. Mattoo, Rathindran and Subramanian (2001) estimated that economies with fully open telecommunications and financial sectors grow up to 1.5 percentage points faster than other economies. The analysis of Warren (2000) suggested that in the ASEAN 5, the regulatory restrictions then affecting domestic new entrants would have raised the prices of their services by an average of over 10%, while the additional discrimination (including foreign equity limits) against foreign-invested suppliers would have raised the cost of their services by more than 80%.

The overall coherence of regulatory regimes can ultimately be judged according to whether they have engendered a competitive market structure. An index of policy openness has been compiled for this paper, using information from Lee, Ure and Lee (2010) and ITU sources. It focuses mainly on market structure and is based on that used by Warren (2000). Tables 2.6 and 2.7 show the index components, where a higher value denotes more openness and a

Table 2.6: Index of policy openness in fixed-line telecommunications.

APEC member	Number of competitors	Comp. - local	Comp. - long dist.	Comp. - internat.	Comp. - data	Comp. - leased lines	Portion incumb. privat-ised	Max % FDI in comp. carriers
Australia	3	1	1	1	1	0.5	0.5	1
Canada	3	1	1	1	1	1	0.5	0.46
Chile	3	1	1	1	1	1	1	1
China	3	1	1	0.5	1	1	0.5	0.49
Hong Kong, China	3	1	1	1	1	1	1	1
Indonesia	3	0.5	0.5	0.5	1	1	0.5	0.3
Japan	3	1	1	1	1	1	1	1
Republic of Korea	2	1	1	1	1	1	1	0.49
Malaysia	3	1	1	1	1	1	0.5	0.49
Mexico	3	1	1	1	1	1	1	0.49
New Zealand	3	1	0.5	1	0.5	1	1	1
Peru	3	1	1	1	1	1	1	1
Philippines	3	1	1	1	1	1	1	0.4
Russia	2	0.5	0.5	0.5	1	0	0.5	0
Singapore	2	1	1	1	1	1	0.5	1
Chinese Taipei	3	1	1	1	1	1	0.5	0.6
Thailand	3	1	1	1	1	1	0	0.49
United States	3	1	1	1	1	1	1	1
Viet Nam	3	1	1	1	1	1	0.5	0

Source: Based on Chapter 7 in this report and ITU sources.
Note: 0 = close, 1 = open.

Table 2.7: Index of policy openness in mobile telecommunications.

APEC member	Number of competitors	Competition	Portion incumbent privatised	Max % FDI in competitive carriers
Australia	3	1	0.5	1
Canada	3	1	0.5	0.46
Chile	3	1	1	1
China	3	1	0.5	0.49
Hong Kong, China	3	1	1	1
Indonesia	3	1	0.5	0.3
Japan	3	1	1	1
Republic of Korea	3	1	1	0.49
Malaysia	3	1	0.5	0.49
Mexico	3	1	1	0.49
New Zealand	3	1	1	1
Peru	3	1	1	1
Philippines	3	1	1	0.4
Russia	2	1	0.5	0
Singapore	2	1	0.5	1
Chinese Taipei	3	1	0.5	0.6
Thailand	2	1	0	0.49
United States	3	1	1	1
Viet Nam	3	1	0.5	0

Source: Based on Lee, Ure & Lee 2010 and ITU sources.
Note; 0 = closed, 1= open.

lower value denotes less. The tables give the number of competitors in fixed and mobile markets (where more than three competitors receive a score of three). They record the state of competition in the mobile market and various segments of the fixed-line market, and record the portion of fixed and mobile incumbent operators that are privatised (where any type of partial privatisation receives a score of 0.5), and the portion of foreign ownership that is allowed in competitive carriers in fixed and mobile markets.

The results confirm that fixed and mobile markets in most APEC economies are now fully competitive. Despite this, there are residual restrictions on foreign ownership in most APEC economies. These are hard to rationalise, given the extent of competition that already exists.

2.3 QUANTIFYING THE FIRST ROUND EFFECTS OF REFORM

The policy indexes are arbitrary but they are not important by themselves. Instead, they provide inputs into econometric exercises that quantify the first round effects of policy restrictions on measures of economic performance in the sectors in question, while controlling for all the other factors that affect economic performance in those sectors. This methodology has been developed in the context of measuring and evaluating barriers to services trade (e.g., Findlay & Warren 2000), and can also be used to evaluate the effects of structural reforms. The performance measures used in the econometric exercises are often prices or price-cost margins, but sometimes quantities or costs.

The econometric estimates of the effects of policy indexes on these measures of performance can be used to construct the counterfactual – what economic performance would be in the absence of the regulatory restrictions, holding all other factors constant. This counterfactual comparison gives the first round effects of structural reform. It can be seen as a 'tax equivalent' if the restrictions have raised price-cost margins, or a 'productivity equivalent' if the restrictions have raised real resource costs. Ideally, the econometric exercises should include a rich enough menu of performance measures to be able to determine which of these applies (Dee 2005).

2.3.1 Air and maritime transport

In this paper the first round effects of structural reforms in air and maritime transport have been derived from the econometric study by Sourdin (2010). She estimated the effects of policy restrictions in these sectors using the policy indexes presented in the previous section. Her measure of economic performance was the *ad valorem* transport costs incurred in shipping goods internationally using air or sea transport. She made use of data from four APEC economies – Australia; Brazil; Chile; and the USA – that compile detailed (6-digit), consistent data on import values on both a fob (free on board) and a cif (cost, insurance, freight) basis. Her measure of *ad valorem* transport costs was the percentage difference between cif and fob valuations, calculated separately (by commodity and source economy) for imports transported by air and by sea. Her controls in the estimation were the value of total imports between the economy pairs, the distance between them, the value-to-weight ratio of the particular import shipment and a product-specific fixed effect. Her estimated semi-elasticity of air transport costs with respect to the air transport restrictiveness index was 0.055, meaning that a 0.1 unit reduction in the openness index would reduce transport costs by 0.55%. Her estimated semi-elasticity of maritime transport costs with respect to the maritime transport openness index was -0.487, meaning that a 0.1 unit increase in the openness index would reduce transport costs by 4.87%

Given further structural reforms in air and maritime transport in each APEC economy, it is assumed that the air restrictiveness indexes would all reach a value of zero, and the maritime openness indexes would all reach a value of unity. In air transport, this implies a range of reforms to air services agreements, to entry conditions for domestic and foreign carriers, and to ownership. In maritime transport, it implies the dismantling of any remaining entry restrictions, quotas or cargo sharing arrangements, and the granting of national treatment to foreign-owned carriers located domestically. The above semi-elasticities can be used to calculate the resulting percentage changes in air and maritime transport costs for each APEC economy.

One key question for modelling purposes is whether to interpret these prospective cost changes as coming about because the price–cost margins of transport operators would be squeezed or because the real resource cost of shipping goods by air or sea would fall. Should the first round effects be interpreted as 'tax equivalents' or 'productivity equivalents'? As will be seen, this difference in treatment can have a marked effect on the projected economy-wide effects of structural reform. By itself, however, Sourdin's (2010) econometrics does not resolve the issue.

The issue is decided on *a priori* grounds. Price–cost markups are only likely to be inflated for significant periods of time if regulatory restrictions prevent entry – otherwise the excess profits are likely to be eroded by the entry of new service providers. But many kinds of regulatory restrictions are likely to raise real resource costs, particularly regulations that lead to shipping delays or prevent transport operators from configuring their transport routes to achieve network economies. In air transport, restrictive designation provisions can limit the entry of any new carriers on international routes, but other provisions, such as restrictive traffic rights, can prevent the achievement of network economies. In maritime, cabotage restrictions limit foreign but not domestic entry on domestic routes. Quotas and cargo handling restrictions can lead to shipping delays that add significantly to shipping costs.

Overall, it is judged that the regulatory restrictions in air and maritime transport are likely to have raised transport costs rather than inflated the price-cost margins of international transport operators. So the first round effects of structural reform are interpreted as productivity improvements. They are shown for each APEC economy in Figures 2.1 and 2.2. Nevertheless, this assumption is subjected to sensitivity testing in the next section, by assessing the economy-wide effects of an alternative treatment whereby half the first round impact is assumed to fall on price–cost margins.

A second key question for modelling purposes is whether the first round impacts would fall only on the cost of shipping goods internationally or whether they would also affect the costs of domestic maritime and air services. Sourdin (2010) only measured the first effect. Nevertheless, the policy indexes for both air and maritime include regulatory restrictions that would also be expected to affect domestic services. Accordingly, in the modelling of the next section, the first-round productivity effects are assumed to fall on international air and sea transport margins, as well as on the domestic production of air and maritime transport services. Further, the effects are assumed to fall equally on domestically owned and foreign-owned service providers, even though a few components of the indexes would be expected to affect foreign-owned carriers more than domestic ones.

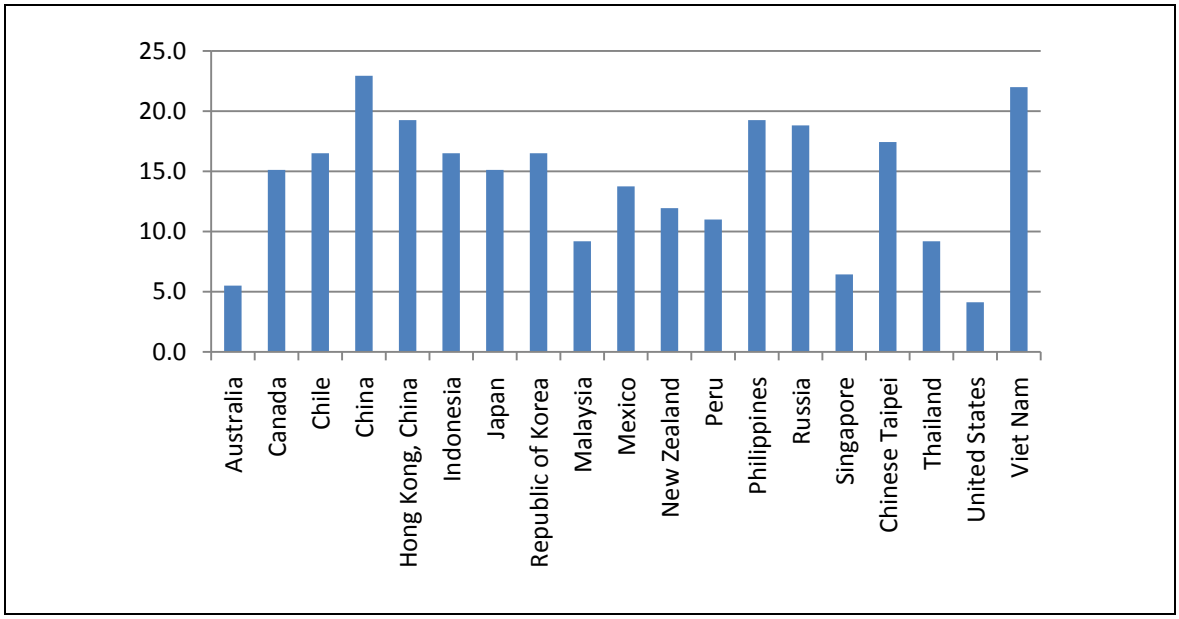

Figure 2.1: Productivity improvements from structural reforms in air transport (%). (Source: Table 2.1 and Sourdin 2010).

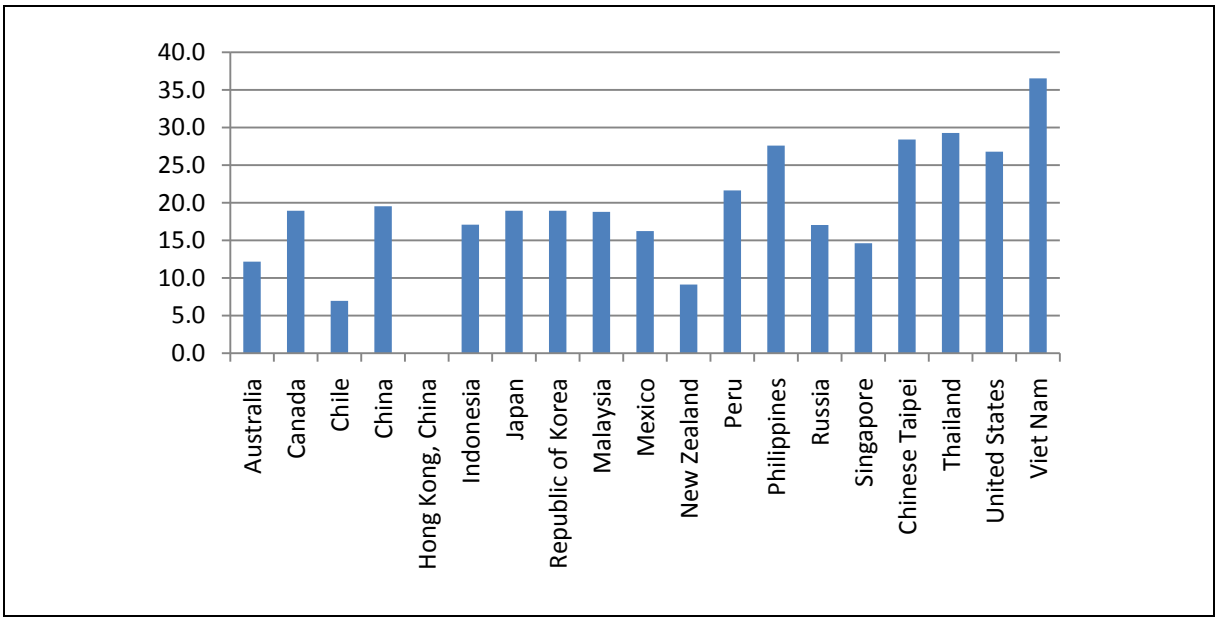

Figure 2.2: Productivity improvements from structural reforms in maritime transport (%). (Source: Table 2:2 and Sourdin 2010).

2.3.2 Rail transport

The first round effects of structural reform in rail transport have been derived from the econometric study by Cantos, Pastor and Serrano (2010a). They estimated the effects of horizontal and vertical separation on the efficiency and productivity of rail operations, using data on 16 European railway systems from 1985 to 2005. In measuring efficiency and productivity, they used a production structure that recognised two outputs (passenger and freight transport) and four inputs (employees, passenger train supply, freight train supply and railway infrastructure). In examining the determinants of efficiency and productivity, they controlled for the share of passengers in the total transport task, measures of the size and density of the network, measures of passenger and freight occupancy, and individual and time fixed effects.

Their measured impacts of structural reforms on efficiency indicate how structural reforms can encourage railway operators to move towards the production frontier from a point inside it (typically by making better use of existing infrastructure facilities). The measured impacts on productivity also show how structural reforms can encourage technical progress in rail operations, moving the production frontier outwards (typically by encouraging better infrastructure facilities). In the context of rail operations in contiguous European economies, one of the ways in which technical progress could be achieved is via investments that lead to more seamless international rail services. This option is less easily available to APEC economies, which are spread around the Pacific Rim. In recognition of this, the current paper only makes use of the estimates of the effects of structural reforms on efficiency. Cantos, Pastor and Serrano (2010a) estimate the semi-elasticity of efficiency with respect to vertical separation as 0.025 and the semi-elasticity of efficiency with respect to free entry in freight operations as 0.083. Thus, free entry has a greater effect on efficiency than vertical separation (the relative impacts on productivity are the reverse).

Given further structural reforms in rail transport in each APEC economy, it is assumed that the rail openness indexes would all reach a value of unity. This implies vertical separation and free entry in freight operations in those economies that do not yet have them. It does not necessarily imply any change in ownership.

The above semi-elasticities can be used to calculate the resulting percentage changes in 'productivity' (a term now used more broadly than by Cantos, Pastor and Serrano 2010a) in rail operations for each APEC economy. These are shown in Figure 2.3.

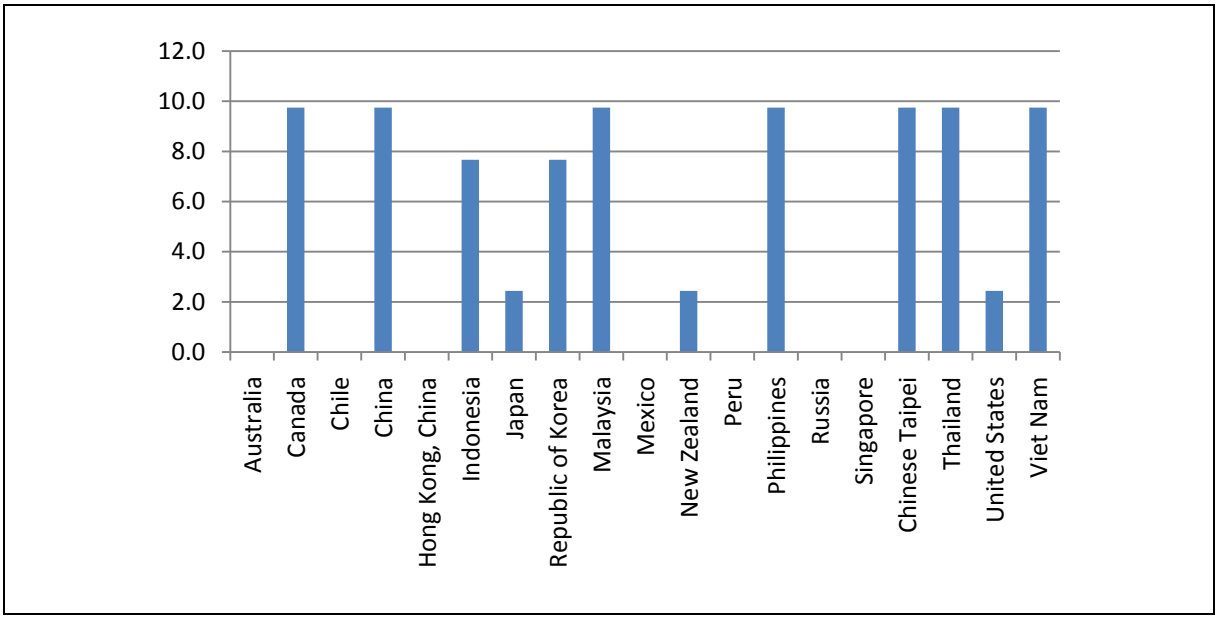

Figure 2.3: Productivity improvements from structural reforms in rail transport (%). (Source: Table 2.3 and Cantos, Pastor & Serrano 2010b).

2.3.3 Electricity and gas

The first round effects of structural reforms in electricity and gas have been derived from the econometric study by Dee (2010). She estimated the effects of policy restrictions in these sectors using the policy indexes presented in the previous section. Her measures of economic performance were electricity and gas prices to industrial users in OECD economies over the 1990–2008 period. Her controls for electricity prices were *per capita* GDP, the rate of urbanisation, the shares of hydro and nuclear in total generation and a linear time trend. Her

controls for gas prices were *per capita* GDP, the rate of urbanisation, pipeline length and a non-linear time trend (to capture the upward movement of gas input costs). Looking only at the policy coefficients that were significantly different from zero, the coefficients measuring the impact on electricity prices (measured in USD PPP/kWh) of third party access, a wholesale price pool and unbundling were -0.0032, -0.0049 and -0.0075 respectively. This means that the introduction of third party access, a wholesale price pool and unbundling would reduce electricity prices by USD0.32, 0.49 and 0.75 per kWh, respectively. The coefficients measuring the impact on gas prices (measured in USD PPP/10e+7 kcal) of retail competition and the unbundling of production/import were -30.446 and -47.5065 respectively. This means that the introduction of retail competition and unbundling would reduce gas prices by USD30.45 and USD47.51 per 10+e7kcal, respectively.

Given further structural reforms in electricity and gas in each APEC economy, it is assumed that the electricity and gas openness indexes would all reach a value of unity. This implies third party access, unbundling, wholesale markets and/or retail competition in economies that have not yet implemented these. It does not imply any change in ownership.

The above coefficients can be used to calculate the resulting percentage changes in electricity and gas prices. It remains to decide whether these price changes would come about through changes in price-cost margins or through changes in productivity, because the econometrics does not resolve the issue. Consistent with the presumption of Steiner (2000), and with anecdotal evidence in economies such as Australia that have undergone significant reform, it is assumed that structural reforms would manifest primarily as productivity improvements. The estimated improvements are shown in Figures 2.4 and 2.5. This assumption is tested later via sensitivity analysis.

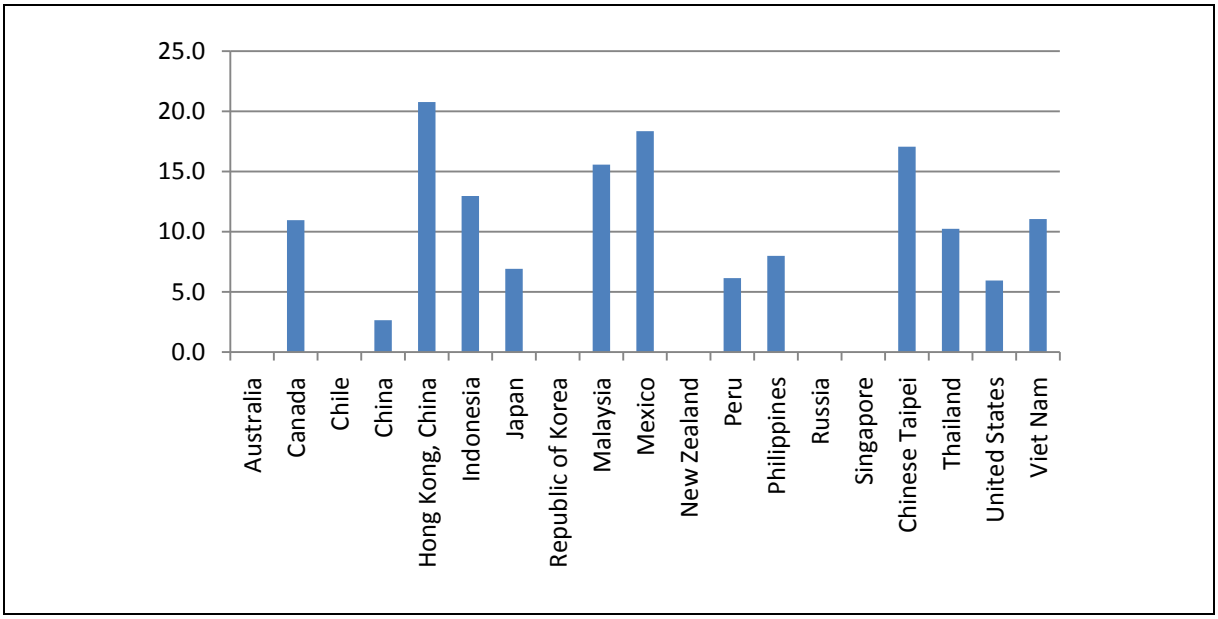

Figure 2.4: Productivity improvements from structural reforms in electricity (%) (Source: Table 2.4 and Dee 2010b)

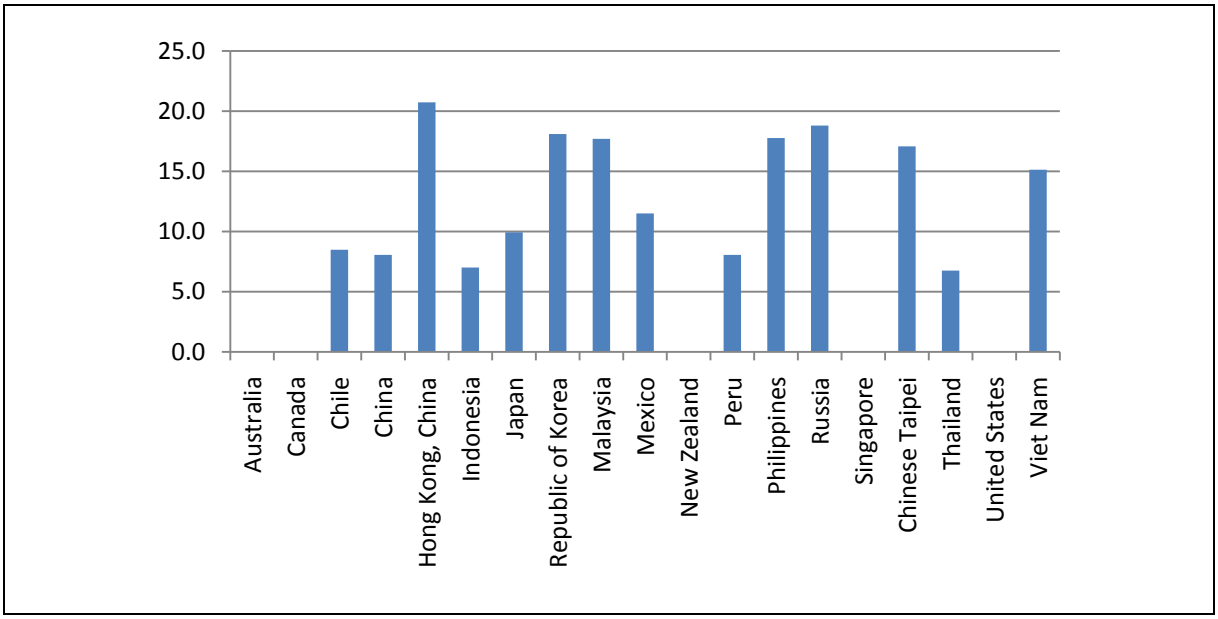

Figure 2.5: Productivity improvements from structural reforms in gas (%). (Source: Table 2.5 and Dee 2010b)

2.3.4 Telecommunications

The first round effects of structural reforms in telecommunications have been derived from an updated version of the econometric study by Warren (2000) (see Dee 2005). The main contribution of the updated study was to use a database with a slightly expanded coverage of economies, and to enter the subcomponents of the policy indexes separately into the econometric estimation. The database covered many more economies than just APEC members. The performance measures were the number of mainlines per 100 inhabitants and the number of cellular phones per 100 inhabitants. The controls in the fixed-line estimation were GDP *per capita*, household density, the percentage of mainlines connected to digital exchange and waiting lists as a percentage of mainlines. The controls in the mobile estimation were GDP *per capita* and population density. In both cases the relationship with *per capita* GDP was assumed to be cubic, to allow for 'saturation' levels of penetration. The policy variables were combinations of the indexes shown in Tables 2.6 and 2.7. Separate weighted average indexes of market access and national treatment for fixed and mobile telephony were calculated as in Warren (2000), where these indexes ranged between zero and one. The coefficients of fixed-mainline penetration with respect to market access and national treatment were 2.892 and 3.529 respectively, meaning that the full introduction of market access and national treatment would raise fixed-line penetration by 2.892 and 3.529 percentage points respectively. The coefficients of mobile penetration with respect to market access and national treatment were 1.898 and 1.075 respectively, meaning that the full introduction of market access and national treatment would raise mobile penetration by 1.898 and 1.075 percentage points respectively.

Given further structural reforms in telecommunications in each APEC economy, it is assumed that the telecommunications indexes of market access and national treatment would all reach a value of unity. These reforms would predominantly involve the removal of remaining foreign equity limits.

The above coefficients can be used to calculate the small percentage changes in fixed and mobile penetration. With the same price elasticity of -1.2 as assumed by Warren (2000), the

quantity effects can be converted to equivalent changes in price. It remains to be decided whether these changes would come about through changes in price–cost margins or through changes in productivity. In previous exercises, when strict licensing requirements limited entry, it was reasonable to assume that reforms would squeeze price–cost margins (e.g., Dee & Hanslow 2001). By now, most such entry requirements have been relaxed. Accordingly, the remaining small price reductions are assumed to accrue through changes in productivity, though once again this assumption is tested via sensitivity analysis. But as in previous exercises, the impact is assumed to be greater on foreign-invested than on domestic operators, because a greater portion of the limitations on market access and national treatment apply to them. The estimated improvements for foreign-invested operators are shown in Figure 2.6. The values for domestic operators are not shown, but are smaller.

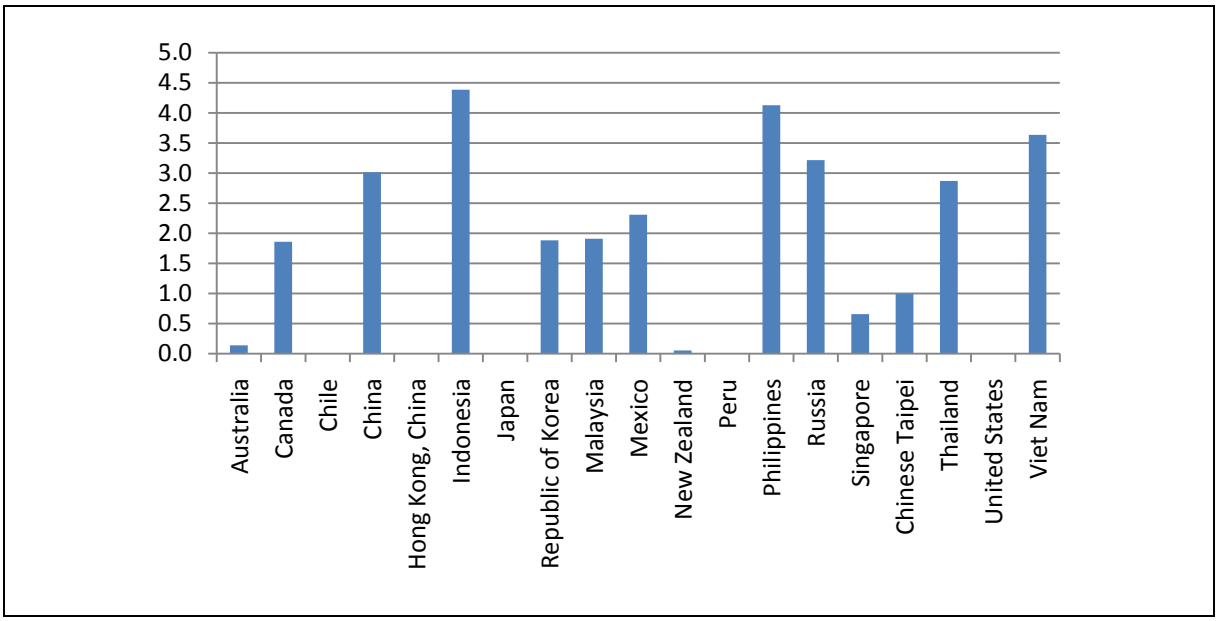

Figure 2.6: Productivity improvements from structural reforms in telecommunications (%). (Source: Tables 2.6–2.7 and Dee 2005).

2.3.5 Summary

In order to get an overall picture of the prospective reform task, Figure 2.7 presents an output-weighted average of the productivity improvements across all sectors in each APEC economy. The weighted average productivity improvements fall roughly in the range of 2% to 14%. The most extensive reform effort, and the largest resulting productivity gains (i.e., above 10%), are projected to occur in Indonesia; Malaysia; Mexico; the Philippines; Chinese Taipei; Thailand; and Viet Nam.

To put these projected first round impacts of structural reform in perspective, Figures 2.8 and 2.9 show the simple average tariff rates on agriculture and food and on manufacturing in each APEC economy. These would be the targets of further 'at-the-border' trade reforms. (Trade reform in agriculture and food would also target explicit subsidies on output and exports, and implicit subsidies on inputs, though these measures are not shown here.) The tariff estimates are derived from version 7 of the GTAP model database (Hertel 1997). The model's tariff estimates are import weighted when aggregating from GTAP's 57 sectors to the 25 sectors used in the current model. Simple averages are then taken when aggregating from 25 sectors to the two broad sectors shown in Figures 2.8 and 2.9. The average tariffs on manufacturing are in the same order of magnitude as the prospective productivity improvements from

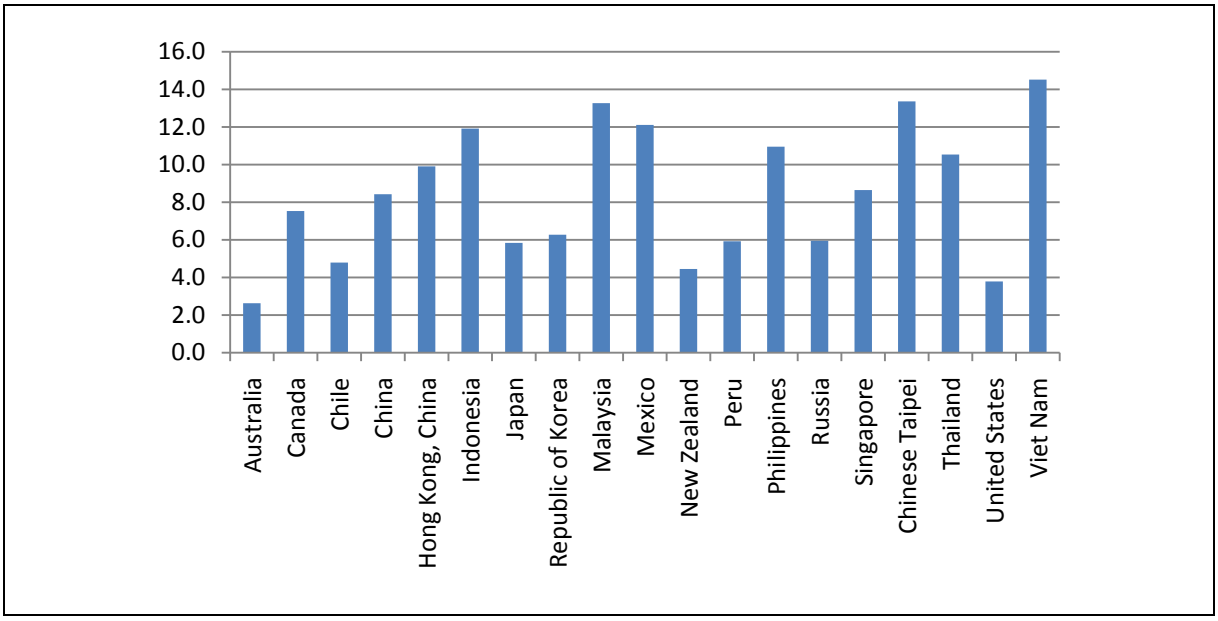

Figure 2.7: Weighted average productivity improvements from structural reforms in transport, energy and telecommunications (%). (Source: Figures 2.1–2.6 and GTAP model database, version 7 in Hertel 1997).

structural reforms – up to 13%. In strictly numerical terms, the average tariffs on agriculture and food in some economies are far higher – up to 45%.

The relative numerical magnitudes do not indicate relative economic significance, however. Tariffs induce large transfers from consumers to producers but much smaller welfare losses to the economy as a whole. By contrast, foregone productivity gains are a pure loss to the economy, so the welfare costs are much greater than those of a tariff of equivalent numerical size. The relative sizes are examined further in Section 2.4.

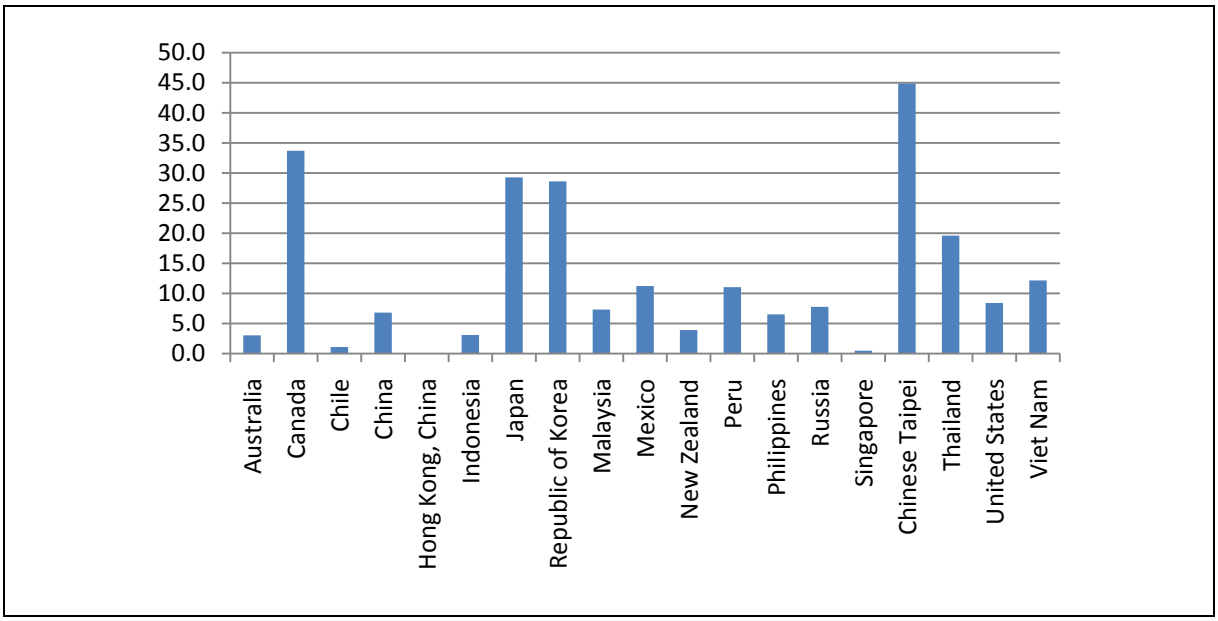

Figure 2.8: Simple average tariffs on agriculture and food (%). (Source: GTAP model database, version 7 in Hertel 1997)

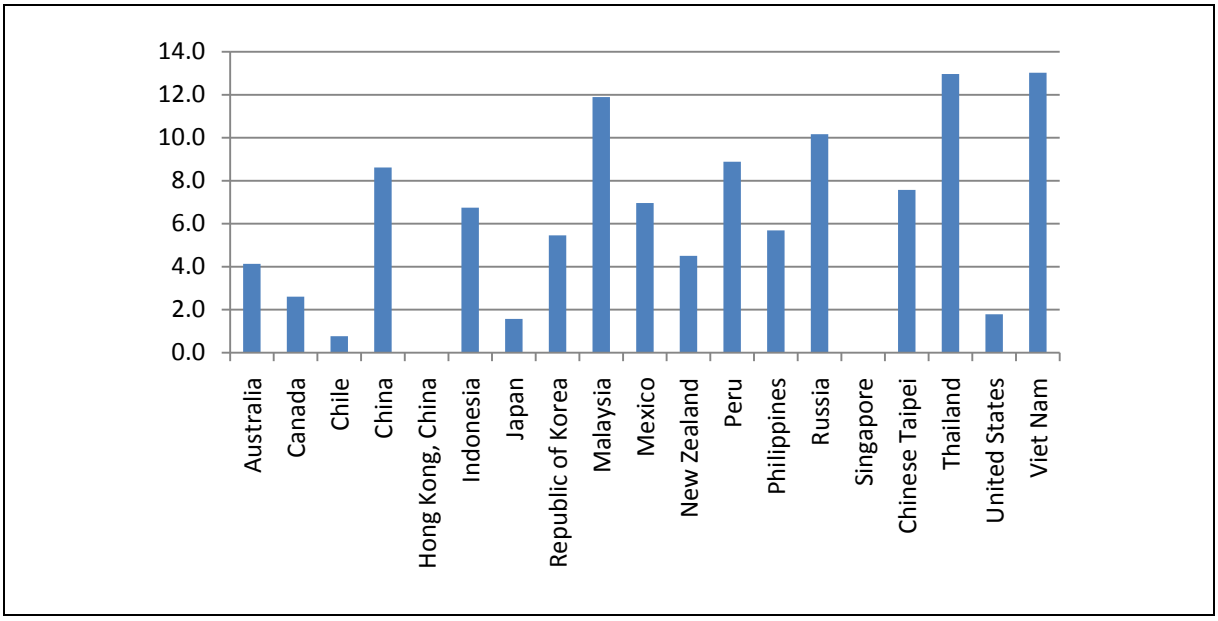

Figure 2.9: Simple average tariffs on manufacturing (%). (Source: GTAP model database, version 7 in Hertel 1997)

2.4 QUANTIFYING THE ECONOMY AND REGION-WIDE EFFECTS OF STRUCTURAL REFORMS

The economy and region-wide effects of structural reforms have been projected using FTAP, a computable general equilibrium model of the world economy that is described in Box 2.1, documented fully in Hanslow, Phamduc and Verikios (1999), and is available for download at http://www.crawford.anu.edu.au/staff/pdee.php. This model differs from the GTAP model (from which it is derived) by including a treatment of foreign direct investment, an important mode by which services are delivered.

The measure of welfare in the FTAP model takes into account not just changes in the level of activity generated in each economy but changes in the amount of income from that activity that is retained by the residents of each economy. The distinction is important in a long-run context. One of the possible impacts of productivity-enhancing reforms is that they make each economy a more attractive destination for foreign direct investment. Not all the income from that investment will necessarily stay in the economy. However, the model has a fully articulated treatment of savings, investment and capital accumulation, so it takes into account how much of the return on foreign investment is repatriated overseas, and how much is re-invested. Thus, the measure of economic well-being is related to the concept of gross national product (the income earned by residents of a region) rather than gross domestic product (the income generated in region). Hanslow (2000) has a good general treatment of welfare measures and welfare decomposition in computable general equilibrium models.

The version of FTAP used here contains 20 regions – 19 APEC regions (excluding Brunei and Papua New Guinea, which are not represented in the underlying GTAP database) and a single 'Rest of the world' region. It contains 25 sectors, shown in Table 2.8.

Box 2.1: The FTAP model – GTAP with foreign direct investment.

The FTAP model is a computable general equilibrium model incorporating services delivered via FDI. It was developed by Dee and Hanslow (2001). It differs in turn from GTAP (Hertel 1997), the 'plain vanilla' model from which it was derived, in three important respects.

Firstly, because many services are delivered primarily via commercial presence, the modelling framework includes foreign direct investment and covers the production and trading activity of foreign multinationals separately. In other words, GTAP, the conventional multi-economy model, is split out by ownership as well as location. In the current version of FTAP, foreign ownership shares are estimated in the following way. International data on FDI stocks by sector and source economy have been compiled and extrapolated where necessary by the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Provisional estimates were kindly made available at the GTAP level of aggregation by Terry Walmsley. These data are scaled up from FDI stocks to the output of foreign affiliates, using FDI to sales ratios obtained from the United States International Trade Commission, and derived from the detailed statistics on the activities of foreign affiliates collected by the US Bureau of Economic Analysis. These estimates of the output of foreign affiliates by sector and source economy are then used to split out their costs and sales structures on a simple *pro rata* basis. Unfortunately, even the best statistics on the activities of foreign affiliates would not support a much more sophisticated derivation of costs and sales structures than this, and few economies collect such statistics.

Secondly, by virtue of foreign ownership, at least some of the profits of foreign multinationals will be repatriated back to the home economies. Thus the profit streams in the conventional multi-economy model have to be reallocated from the host to the home economy, after provision is made for them to be taxed in either the home or host economy. This reallocation leads to a distinction between GDP – the income *generated* in a region –and GNP – the income *received by residents* of a region. The latter forms the basis of (although is not identical to) the welfare measure in FTAP. The information on profit repatriation comes from the Balance of Payments Statistics of the IMF.

Finally, not all profits of foreign multinationals need be repatriated to the home economy. Some may be reinvested in the host economy. To account for this phenomenon and to allow for the effect that regulatory reform may have on both domestic and foreign direct investment more generally, the model makes provision for savings and capital accumulation. This is particularly important, since some regulatory barriers are aimed directly at limiting domestic or foreign equity participation. It is therefore important to capture how regulatory reform will affect not just foreign ownership *shares*, but also the *total amount* of productivity capacity available to an economy. National savings rates are derived from the macroeconomic data in the International Financial Statistics and Balance of Payments Statistics of the IMF. Government savings rates are derived from the Government Finance Statistics of the IMF. Household savings rates are calculated as a residual.

The FTAP model also differs from GTAP in other respects. In particular, it allows for firm-level product differentiation, economies of scale and large-group monopolistic competition. This is also important, since services tend to be highly specialised, being tailored to the needs of individual customers. In the current version, economies of scale are assumed to be regional for services and global for all other sectors (Dee 2003).

Source: Based on Dee & Hanslow 2001.

Table 2.8: FTAP model sectors.

Agriculture and food	**Other primary**	**Manufacturing**	**Services**
Grains	Forestry and fishing	Textiles and clothing	Electricity
Livestock and meat	Mining	Wood and paper products	Gas
Dairy		Chemicals	Construction
Other agriculture and food		Metals	Trade
		Fabricated metal products	Other transport
		Motor vehicles	Water transport
		Other transport equipment	Air transport
		Electronic equipment	Communication
		Other machinery and equip.	Other services
		Other manufacturing	

Source: FTAP model.

The first round impacts of prospective structural reforms in each economy are modelled via the productivity improvements to the transport, energy and telecommunications sectors shown in Figures 2.1 to 2.6. In each sector the productivity improvements are applied to domestic production, whether domestically owned or foreign invested, although as noted above the productivity shocks to domestic telecommunications firms are smaller than those to foreign-invested firms. In the case of rail transport, the productivity improvement can only be applied to a bigger 'Other Transport' sector, which also includes road transport and storage. Detailed input–output data available for the USA and Australia suggest that the rail industry could account for about 14% of this bigger aggregate, so 14% of the productivity improvements from Figure 2.3 is applied to the bigger sector.

In air and maritime transport the productivity improvements are also applied to the international air and maritime transport margins used to transport merchandise out of each economy. In the model, as in the real world, such transport margins could be provided by transport operators in the source economy, the destination economy or any third party. As the econometrics of Sourdin (2010) demonstrates, the regulatory restrictions in these sectors currently penalise all these transport providers.

In an alternative treatment of structural reform, half of the domestic gains are modelled as accruing in the form of productivity gains and half as reductions in the price-cost margins of domestically located service providers. This treatment is more in line with recent findings for the insurance sector, where licensing restrictions on entry still apply (Dee & Dinh 2008). It is not possible to provide a comparable 'split' treatment of the impact on international transport margins, because the FTAP model, like its GTAP source, does not allow for 'taxes' on international transport margins. In this alternative treatment, the initial 'tax equivalents' of regulatory restrictions on domestic producers are injected into the model's database in as neutral a fashion as possible while maintaining database balance (using an FTAP analogue of GTAP's Altertax procedure, Malcolm 1998), before being eliminated via a policy simulation. In the FTAP theoretical structure, the rents from such 'tax equivalents' in services accrue to producers rather than to the government.

The FTAP model provides a long-run snapshot of how different each economy would look about 10 years after the reforms, compared to the situation at that same point in time if the reforms had not taken place. During the 10-year adjustment period, many other changes would affect each economy but they are not taken into account in the current analysis. For this reason, the results should not be interpreted as indicating the likely changes that would occur over time – this would require all changes, not just those in regulatory restrictions, to be taken into account.

The distinction is important to keep in mind. Sometimes, to aid fluency, the results are couched as if key indicators 'rise' or 'fall'. This does not mean that the indicators would be higher or lower than they are now. It means that at some future time they would be higher or lower than they would otherwise be. In both cases, in a growing economy, they could be higher than they are now.

2.4.1 The economy and region-wide effects of structural reforms

The projected effects of the structural reforms, undertaken jointly, on each APEC economy are shown in Figure 2.10, where to normalise for economic size, the absolute welfare gain in each economy has been expressed relative to its initial GDP. As noted, welfare changes give the effects on the economic well being of the residents in each economy, while real GDP

measures the effects on its level of activity. Figure 2.11 also shows the projected effects on real GDP, measured as the percentage deviations from baseline, 10 years after the structural reforms.

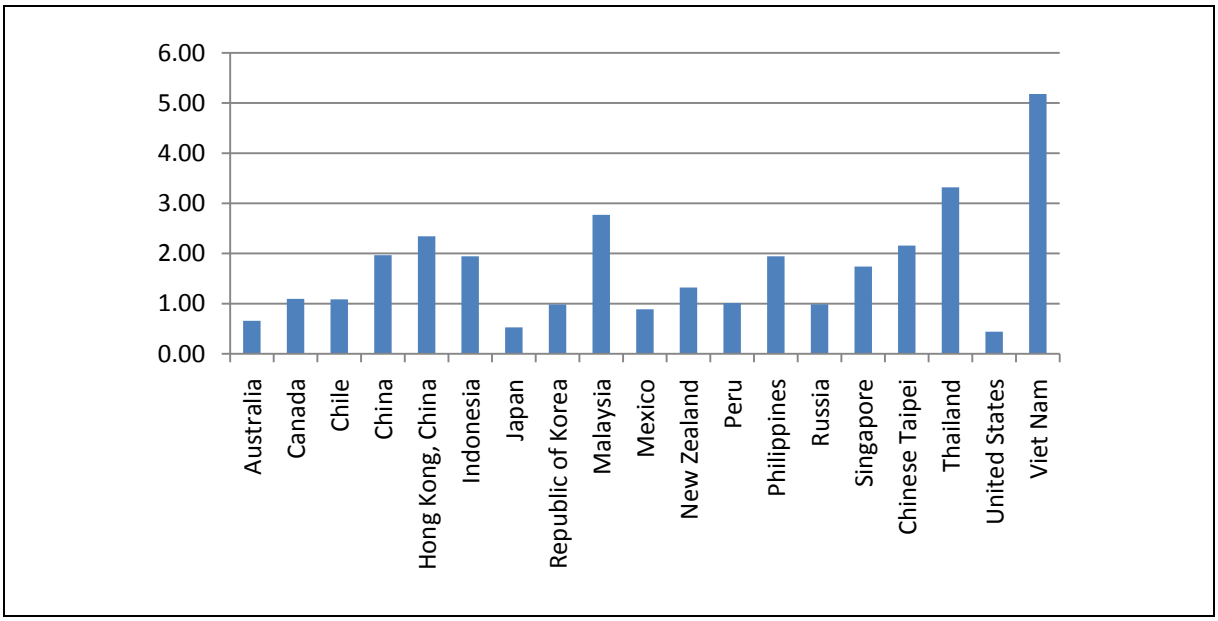

Figure 2.10: Welfare gains from structural reforms, relative to initial economic size (%). (Source: FTAP model projections)

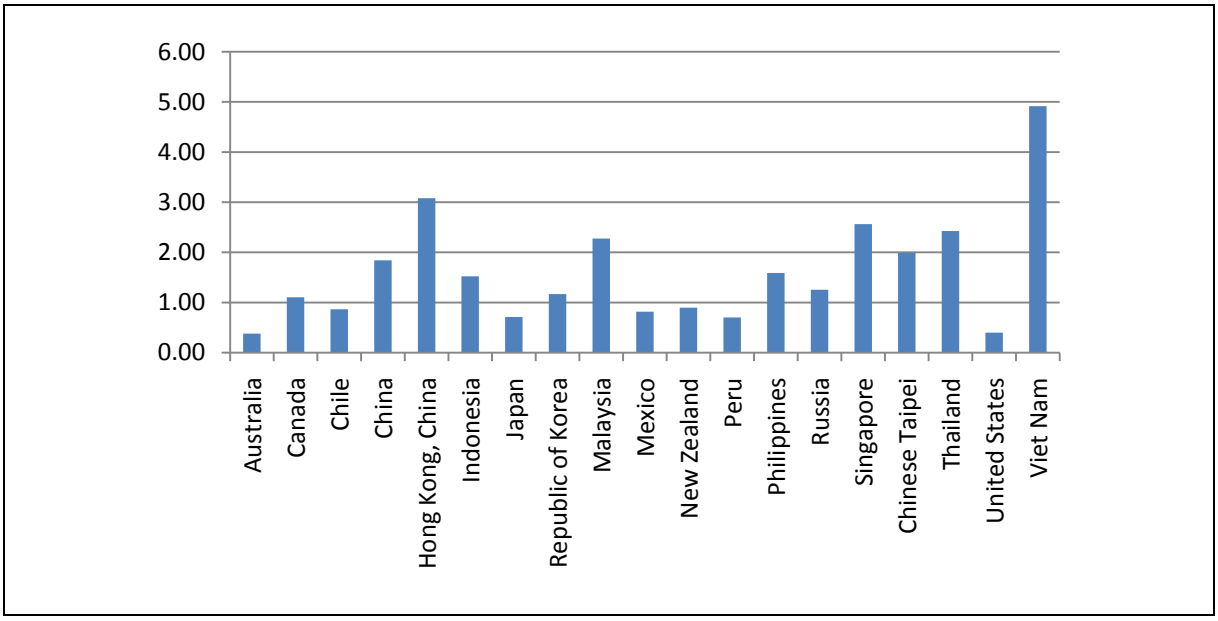

Figure 2.11: Gains in real GDP (% deviation from baseline). (Source: FTAP model projections)

In both cases, not surprisingly, there is a strong correlation between the gains from reform and the size of the reform task. The biggest gains in both welfare and real GDP, at about 5%, are projected to occur in Viet Nam, where the reform task is largest. Across all APEC economies, the simple correlation coefficient between the welfare gains in Figure 2.10 and the average productivity improvement in Figure 2.7 is 0.75. The correlation between the real GDP gains in Figure 2.11 and the average productivity improvements in Figure 2.7 is 0.71. The latter is slightly smaller than the former because economic activity in each economy is affected, more so than welfare, by reforms in other economies, not just reforms at home.

To get an initial indication of the extent of these 'cross' effects, Figure 2.12 shows the proportion of the welfare gain in each economy that is attributable to reforms at home, relative to reforms in all other APEC economies. The first observation is that, in all economies, an overwhelming proportion of the gains come from reforms at home rather than reforms in other economies. Thus, while the gains from joint reforms are considerable, there is no compelling reason for each APEC economy to wait for others to start.

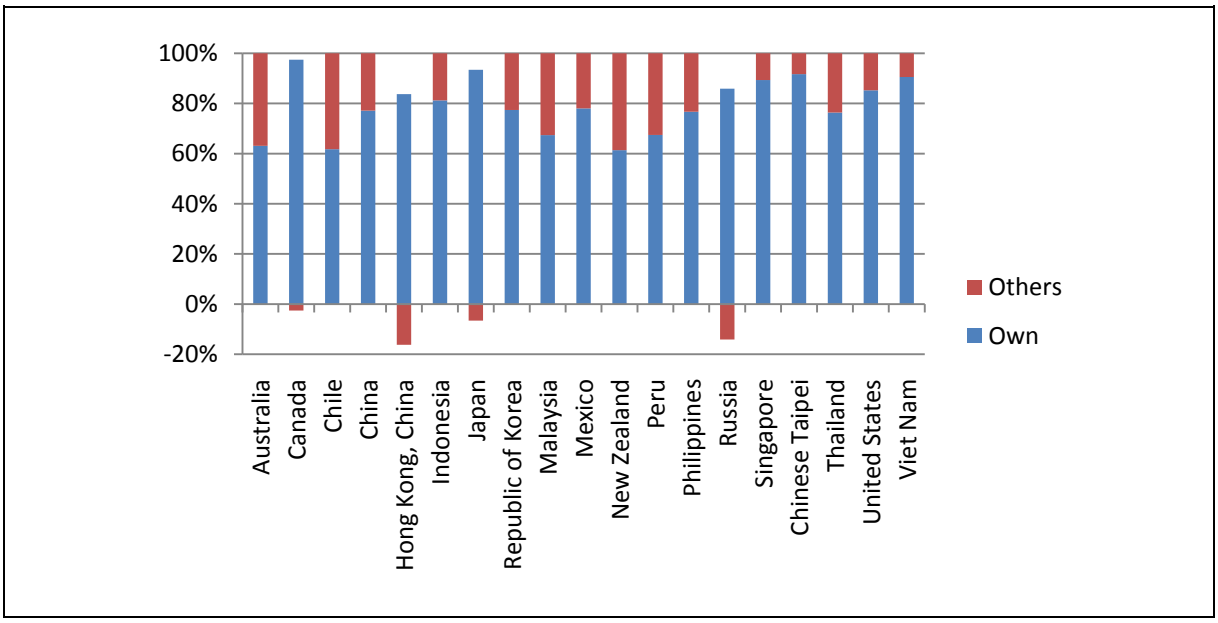

Figure 2.12: Contribution to welfare from own and others' structural reforms (% of total). (Source: FTAP model projections)

The second observation is that in most APEC economies there are small gains to be had from the reforms of others. This is not a foregone conclusion, because productivity improvements are typically a double-edged sword – while they increase incomes in other economies and can encourage them to buy more from the home economy, they also improve the price competitiveness of other economies and induce substitution away from the home economy. Typically in these types of simulations, the latter effects dominate. The difference here is that structural reforms in other economies also reduce the cost of transporting merchandise exports from the home economy, because in most APEC economies a large portion of that transport task is undertaken by foreign rather than domestic transport operators. So this restores the balance in favour of the home economy.

The three APEC economies that are not projected to gain from reforms elsewhere in the APEC region – Hong Kong, China; Japan; and the Russian Federation – all experience gains from their own reforms. Because Hong Kong, China is already an efficient and substantial supplier of maritime transport services to the rest of the region, it is projected to lose its relative position as others become more efficient in maritime services. Russia is already relatively efficient in electricity generation, having undertaken a virtual revolution in the organisation of its electricity sector in recent years, but it is projected to lose from more intensive competition in energy-intensive products as others become more efficient in electricity generation. Japan is also projected to lose from reforms in the gas sector in other economies. As will be seen later, one of the sectors that is often 'crowded out' in relative terms from these reforms is the motor vehicle sector, and Japan is a significant producer of motor vehicles, not only at home but also via its foreign direct investments elsewhere in the region. Figure 2.13 confirms these sectoral sources of loss to each of these economies.

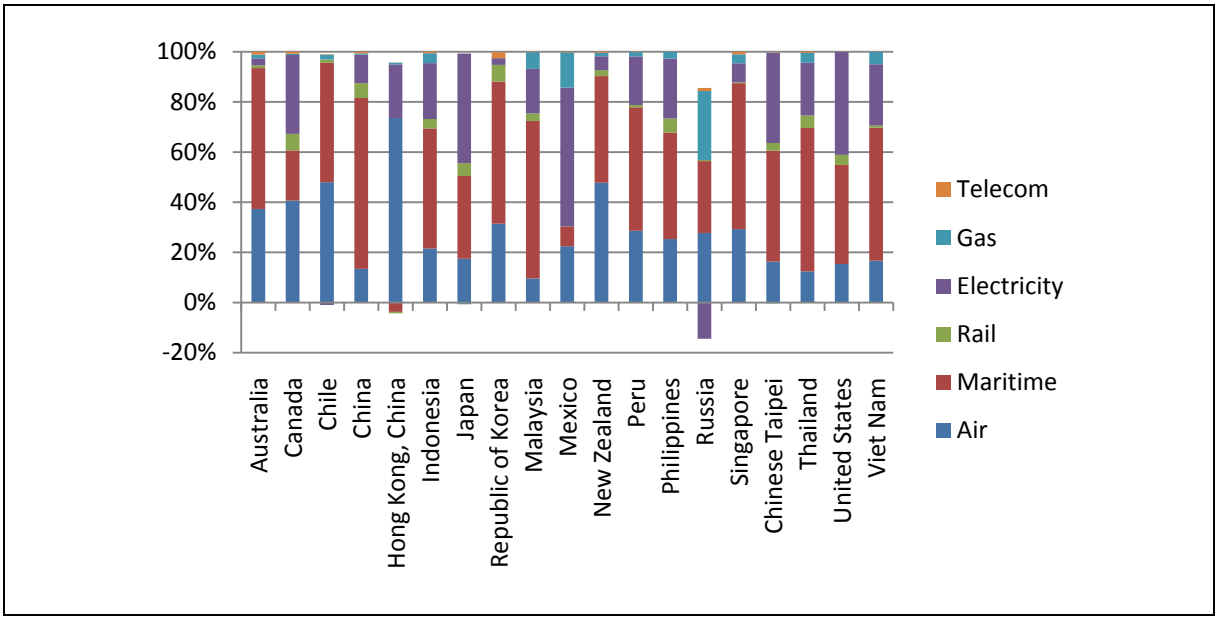

Figure 2.13: Contribution to welfare from structural reforms in each sector (% of total). (Source: FTAP model projections)

More broadly, Figure 2.13 gives the percentage contributions to the overall gains in each economy from the structural reforms in each sector. The biggest gains tend to come from reforms in air and maritime transport, because as Figures 2.1–2.6 demonstrate, this is where the biggest reforms tend to occur.

2.4.2 Putting the gains in perspective

Across the whole APEC region, structural reforms in transport, energy and telecommunications are projected to generate USD175 billion a year in additional real income (in 2004 dollars) relative to what would have accrued had no reforms occurred. This is a snapshot of the gains after a 10-year adjustment period.

These gains can be put in perspective by comparing them to the potential gains from further at-the-border trade reform. Complete liberalisation of all remaining trade barriers in agriculture and food, other primary products and manufacturing by all APEC economies is projected to generate real income gains of just over USD100 billion a year after about 10 years. These gains would be generated in sectors that currently produce about USD16 300 billion in output annually. This compares with the output of USD 3700 billion annually in the transport, energy and telecommunications sectors that are undergoing the structural reforms.

APEC-wide, therefore, the projected gains from the structural reforms are almost twice as big as the gains from liberalisation of merchandise trade. Yet the sectors where the structural reforms are occurring are less than a quarter of the size of those engaged in merchandise trade. When structural reforms lower real production costs rather than just squeeze profit margins, they can generate a 'bang for the buck' that is much greater than from trade reforms.

As noted, however, it is not always certain that the structural reforms considered here would have their first round effects on productivity levels rather than price–cost margins, although there are *a priori* arguments in favour of this treatment. As a sensitivity test, half of the domestic gains are modelled as accruing in the form of productivity gains and half as

reductions in the price–cost margins of domestically located service providers. For technical reasons, the impact on international transport margins continues to accrue as a productivity gain, as before. In this alternative treatment, the APEC-wide real income gains from structural reforms are smaller, at USD116 billion a year. Part of this accrues from the domestic impacts of reform, which are now about 60% of those previously (about USD86 billion a year rather than USD145 billion a year). The remaining gains accrue from the impacts on international transport margins, which are the same as before (about USD30 billion a year).

2.4.3 Adjustment costs

As the term suggests, structural reforms cannot generate significant gains without also generating significant structural adjustments.

Computable general equilibrium models can help to identify and quantify the extent of structural adjustments, measured by the relative gains and losses to sectoral output and employment in each economy. However, in a model with 20 regions and 25 sectors, the amount of detail that could potentially be presented is considerable (full detail is available on request from the author). In an attempt to condense the detail, Figures 2.14 and 2.15 show the output-weighted average, across all APEC economies, of the projected deviations from

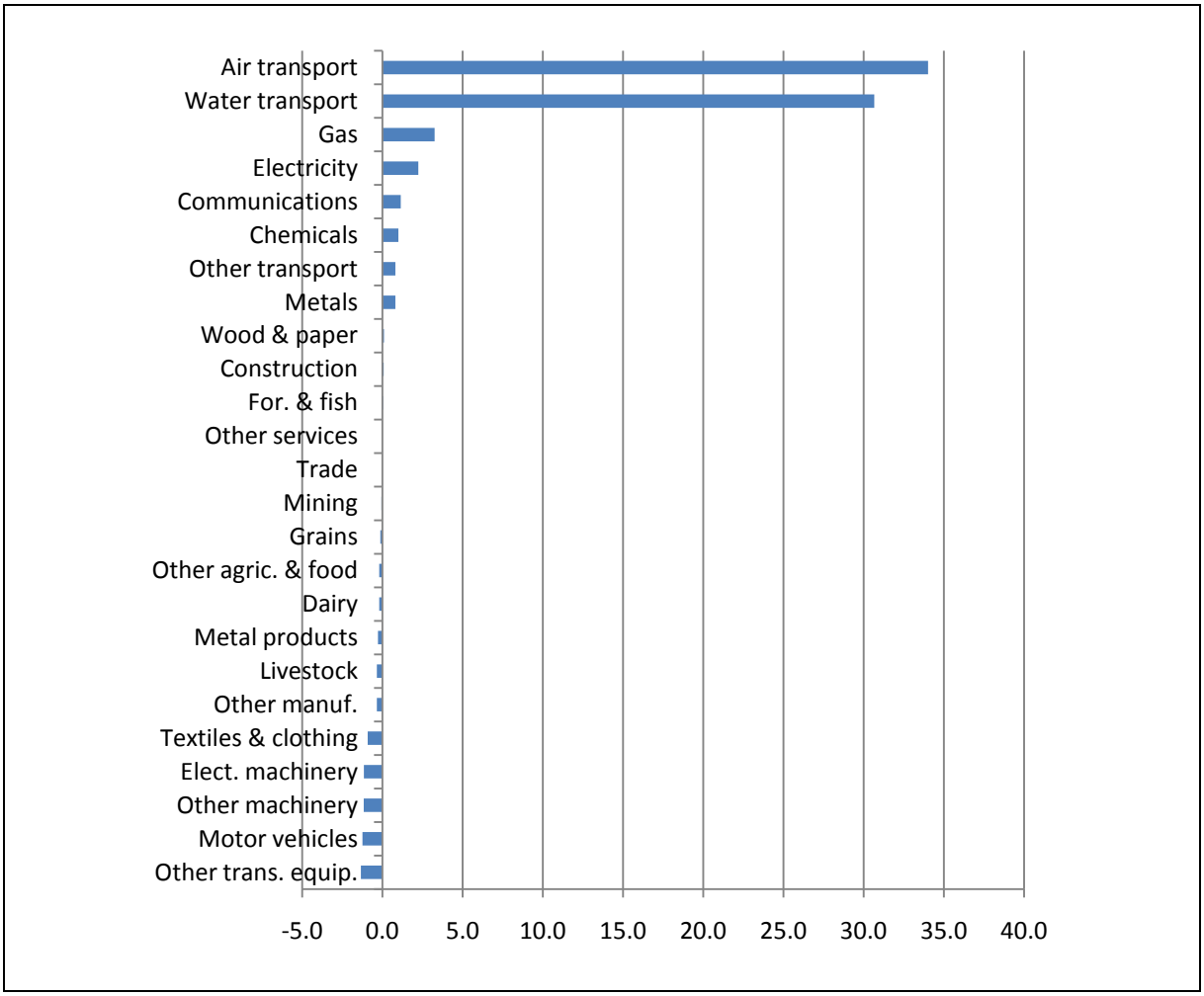

Figure 2.14: Deviation from baseline in sectoral output from own structural reforms – weighted average of all APEC economies (%). (Source: FTAP model projections)

baseline in sectoral output in each economy. Figure 2.14 shows the 'typical' (in this sense) sectoral response to an economy's own reforms. Figure 2.15 shows the 'typical' response in one economy to reforms by all APEC economies. Obviously, the percentage deviations from baseline in at least some individual economies are more severe than the weighted averages. The extremes are examined shortly, in the context of employment changes rather than output changes.

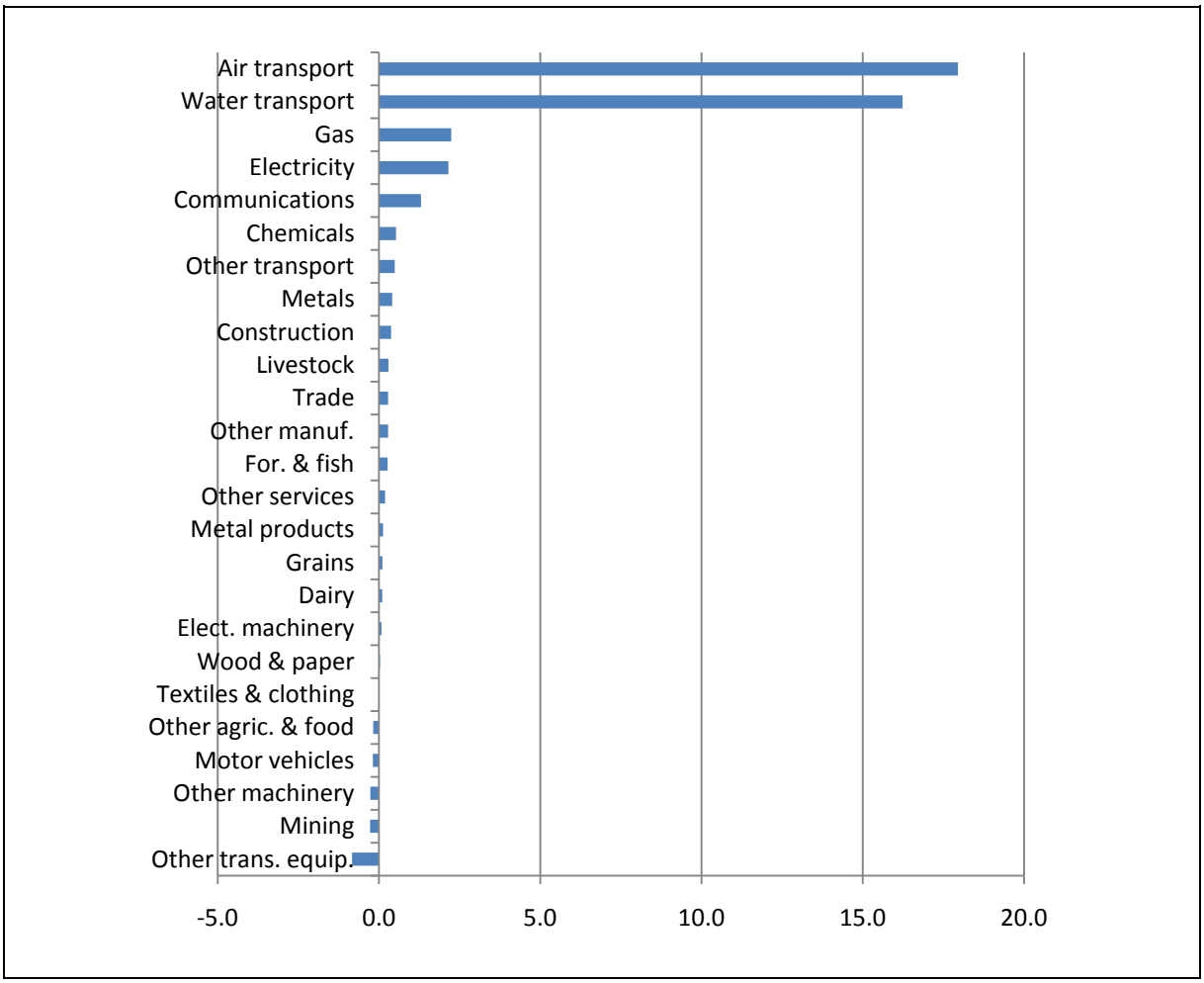

Figure 2.15: Deviation from baseline in sectoral output from all structural reforms – weighted average of all APEC economies (%). (Source: FTAP model projections)

In the typical response to 'own' reforms, the sectors with output higher than otherwise are the services sectors undergoing the reforms. Their output deviations tend to be in direct proportion to their reform effort. Other sectors to gain in relative terms are those that are heavy users of these services. They tend to be metals (an intensive user of electricity), chemicals (an intensive user of gas) and wood and paper products (an intensive user of domestic transport services). Construction also typically gains slightly from the additional impetus given to industry investment.

The sectors projected to lose in relative terms from an economy's own structural reforms are typically those that do not fall into the above categories. They suffer indirectly from higher wages and rates of return, effects that are induced primarily by expansions in overall activity. Industries typically losing in this way include textiles and clothing, motor vehicles, other transport equipment, electronic equipment and other machinery and equipment. The relative losses in industry output in these sectors are relatively minor, however.

When reforms in other APEC economies are taken into account, the deviations from baseline in sectoral output are typically smaller than for 'own' reforms. Thus structural reforms in other APEC economies can play a useful role in helping to cushion the adjustment costs of reforms at home, even if they do not add greatly to the overall gains from reform.

Furthermore, a slightly wider set of industries are projected to gain in relative terms, including sectors that are intensive users of international transport margins and that benefit from transport reforms elsewhere. They can include meat and livestock, forestry and fishing, grains, dairy and other manufacturing. The relative output losses are therefore concentrated in a smaller set of industries, but are typically not as severe as with own reforms because of the gains from reforms elsewhere.

Figures 2.14 and 2.15 give an indication of the typical industry output responses to reforms. But they do not show the full extent of adjustment costs. They show average responses rather than extreme ones and in sectors undergoing productivity improvements the employment effects can be much more severe than the output effects. The essence of productivity improvement is that an industry can produce more with less and, as a result, input usage can fall even as output rises.

To capture the full extent of adjustment costs, Figure 2.16 shows, for each industry, the biggest relative gain and the biggest relative loss in sectoral employment of unskilled labour projected in any of the APEC economies. In air transport, for example, Figure 2.16 shows that the biggest relative gain in unskilled employment is projected to be about 150% (Hong Kong, China) while the biggest relative loss in unskilled employment is projected to be about 10% (the USA). In water transport the biggest relative gain is shown to be about 90% (Thailand), while the biggest relative loss is almost 50% (Hong Kong, China). In dairy the biggest projected gain is over 70% (Malaysia, from a very small base), while the biggest relative loss is around 4% (Chinese Taipei). As the examples show, the particular economies in which the minimums and maximums occur can vary from sector to sector. The corresponding diagram showing the minimum and maximum changes in employment of skilled labour is similar, so is not shown here.

By far the biggest relative losses in unskilled employment are projected to occur in the gas industry in Singapore (67%), the water transport industry in Hong Kong, China (46%) and the electricity industry in Chinese Taipei (34%). The first two cases are where substantial reform in the home economy has already taken place. These sectors lose employment, not as a result of their own productivity improvements but because the electricity or gas using industries in these economies lose their position as other economies reform.

These relative employment losses need to be kept in perspective. If unskilled employment in maritime transport in Hong Kong, China is projected to be 46% lower than otherwise after 10 years, then annual economic growth of 6.2% a year over each of those 10 years would ensure that the relative loss did not translate into an absolute one. Such a growth rate is not unreasonable for Hong Kong, China's economy, particularly with the added boost to economic activity arising from reforms in other sectors. Similarly, if unskilled employment in electricity in Chinese Taipei is projected to be 34% lower than otherwise after 10 years, then annual economic growth of just over 4% a year would ensure that the relative loss did not translate into an absolute one. Perhaps the only sector that might experience an absolute employment loss as a result of the reforms considered here would be the gas industry in Singapore (where annual growth of over 9% would be required to prevent this outcome).

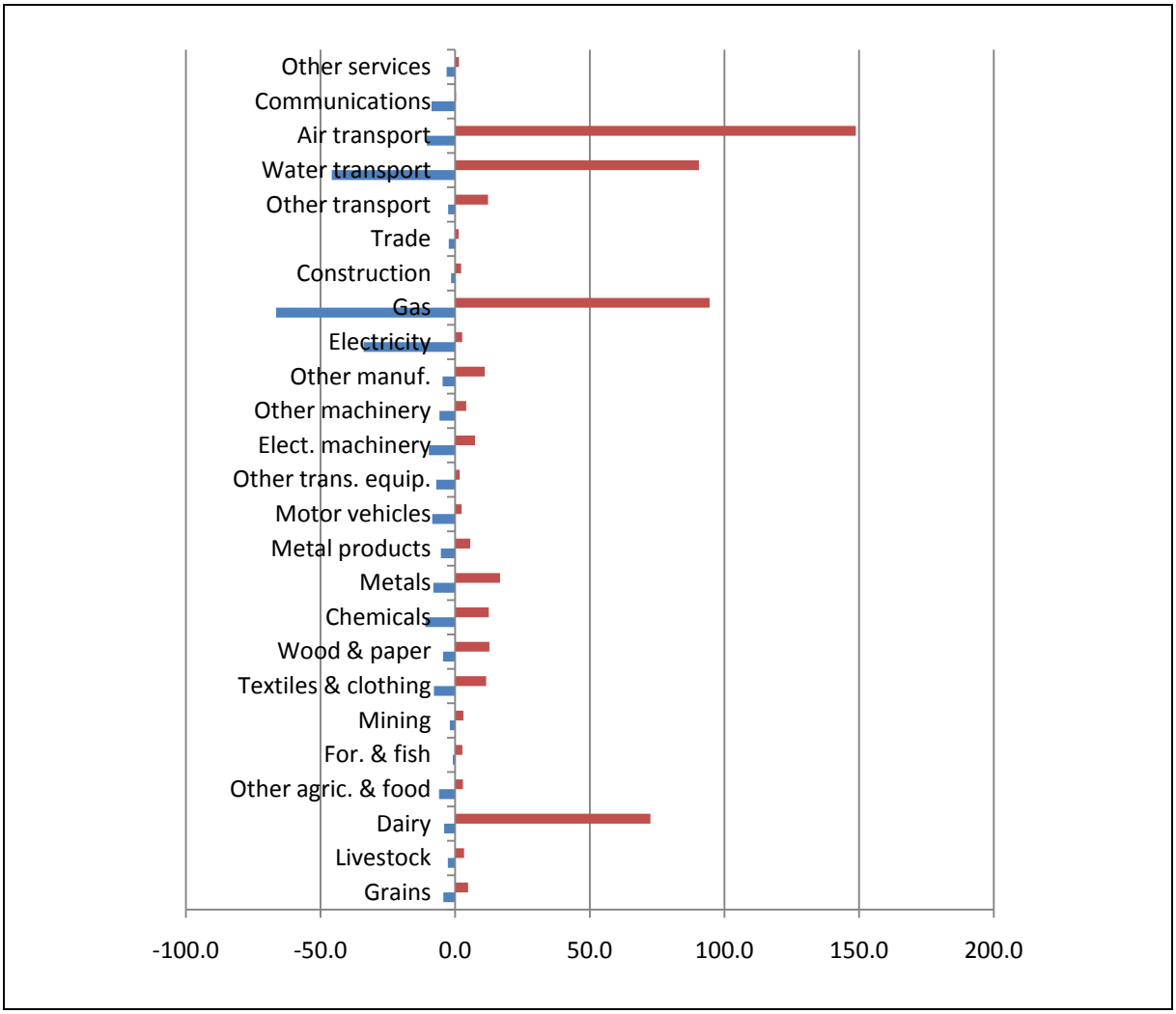

Figure 2.16: Deviation from baseline in unskilled employment from all structural reforms – APEC minimum and maximum (%). For clarity of presentation, the biggest relative employment gains in water and air transport, which are projected to occur in Viet Nam, are suppressed. If the more than four-fold increase in unskilled employment in these sectors were shown, it would unduly compress the results for other sectors. (Source: FTAP model projections)

A further consideration is that while structural reforms may require significant reallocations of unskilled labour between sectors, they also generate higher real wages for unskilled workers. Figure 2.17 shows projected increases in real wages of unskilled labour of up to 6% as a result of structural reforms throughout the APEC region (the increases in skilled wages are similar).

One of the best ways that APEC economies can guard against the adjustment costs associated with structural reforms is to maintain healthy underlying rates of economic growth. To some extent, structural reforms provide their own reward, in terms of stimulating activity and increasing the resilience of the economy, but prudent macroeconomic management is also crucial.

For the particular structural reforms considered here, there is not much prospect that adjustment costs could be cushioned by accompanying the structural reforms with trade reforms. The reasons were hinted at earlier – the sectors that tend to lose in output terms from these structural reforms include textiles and clothing and motor vehicles, sectors that would also be penalised in at least some economies from trade reforms. However, there are prospects that a wider set of structural reforms could be more complementary with trade

reforms, in terms of cushioning adjustment costs. Such offsets are more likely if reforms targeted at the traded goods sectors are combined with reforms in sectors that cater more to the needs of households (e.g., Dee 2008).

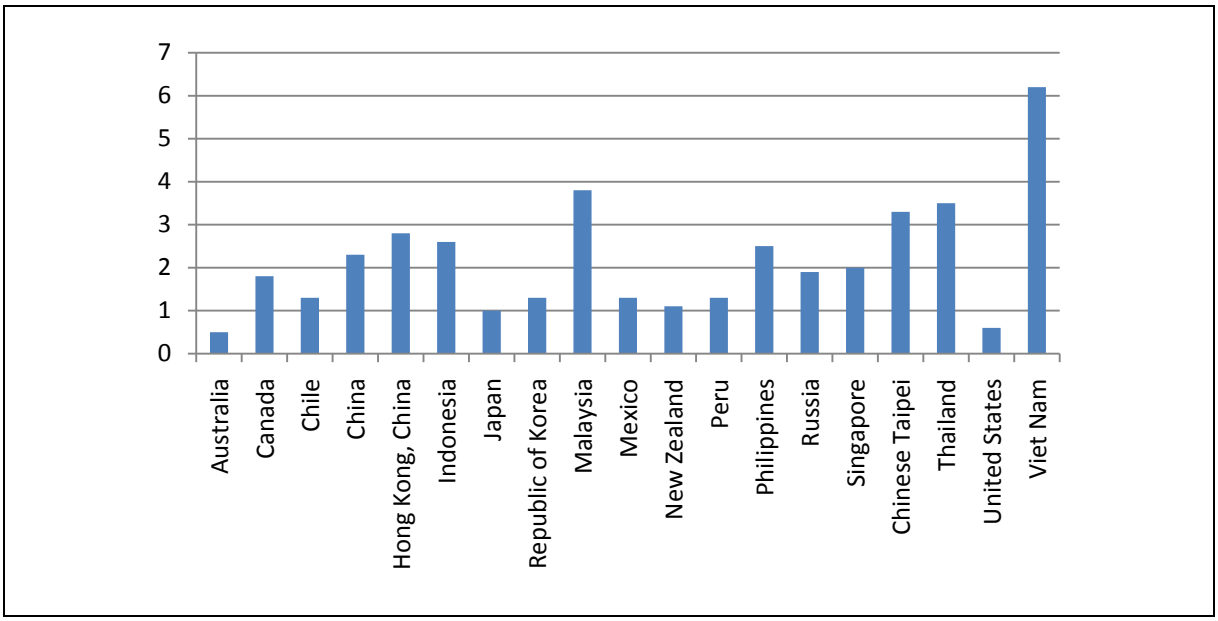

Figure 2.17: Deviation from baseline in real wages of unskilled labour arising from all structural reforms (%). (Source: FTAP model projections)

2.5 CONCLUSION

This paper has examined the economy- and region-wide effects of prospective structural reforms in the transport, energy and telecommunications sectors of APEC economies. Key to these reforms is the introduction of additional competition into each sector.

In air transport this implies a range of reforms to air services agreements, to entry conditions for domestic and foreign carriers and to ownership. In maritime transport it implies the dismantling of any remaining entry restrictions, quotas or cargo sharing arrangements and the granting of national treatment to foreign-owned carriers located domestically. In rail transport it implies vertical separation and free entry in freight operations in those economies that do not yet have them. In electricity and gas it implies third party access, unbundling, wholesale markets and/or retail competition in economies that have not yet implemented them. Note that no privatisation of incumbents is assumed in rail, electricity or gas. In telecommunications, the reforms predominantly involve the removal of remaining foreign equity limits.

The estimated first round impacts of these reforms suggest that they could lead to weighted average productivity improvements in the range 2% to 14% across the sectors involved. The most extensive reform effort, but the largest productivity gains (i.e., above 10%), are projected to occur in Indonesia; Malaysia; Mexico; the Philippines; Chinese Taipei; and Viet Nam.

There is strong correlation between the sizes of the reform tasks and the economy-wide gains they generate. Furthermore, in all economies, an overwhelming proportion of the gains come from reforms at home rather than in other economies. Thus, while the gains from joint reforms are considerable, there is no compelling reason for each APEC economy to wait for others to start.

Nevertheless, most APEC economies are also projected to reap small gains from reforms elsewhere. This is not a foregone conclusion, because productivity improvements elsewhere are a double-edged sword. The income and price effects on the home economy work in opposite directions, and very often the adverse price effects dominate. The difference here is that structural reforms in other economies also reduce the cost of transporting merchandise exports from the home economy. In most cases, this restores the balance in favour of the home economy.

Across the whole APEC region, structural reforms in transport, energy and telecommunications are projected to generate USD175 billion a year in additional real income (in 2004 dollars), relative to what would have accrued had no reforms occurred. This is a snapshot of the gains after a 10-year adjustment period.

APEC-wide, the projected gains from these structural reforms are almost twice as big as the gains from further liberalisation of merchandise trade. Yet the sectors where the structural reforms occur are less than a quarter of the size of those engaged in merchandise trade. When structural reforms lower real production costs, even by half as much as is estimated here, they generate a 'bang for the buck' that is much greater than from trade reforms. The findings of this paper therefore vindicate the decision of APEC leaders to move beyond a 'border' agenda to one that focuses on behind-the-border reforms.

Yet structural reforms cannot generate significant gains without also generating significant structural adjustments. This paper has also examined the expected size and extent of those adjustments.

At the sectoral level, the projected output gains tend to be in the services sectors undergoing reform and in the sectors that use those services intensively. These can include metals (intensive users of electricity), chemicals (intensive users of gas), wood and paper products (intensive users of domestic transport services), and a range of industries (meat and livestock, forestry and fishing, grains, dairy, other manufacturing) that are intensive users of international transport services. Construction is typically also projected to gain slightly from the additional impetus given to industry investment.

The sectors projected to lose in relative terms are typically those that do not fall into the above categories. They suffer indirectly from higher wages and rates of return, effects that are induced primarily by the expansions in overall activity. Industries typically losing in this way include textiles and clothing, motor vehicles, other transport equipment, electronic equipment and other machinery and equipment.

The relative losses in industry output in these sectors are relatively minor, however, and they are even smaller when reforms in other APEC economies are taken into account. Thus, structural reforms in other APEC economies can play a useful role in helping to cushion the adjustment costs of reforms at home, even if they do not add greatly to the overall gains from reform.

The employment effects of structural reforms can be significant. The essence of a productivity improvement is that an industry can produce more with less. As a result, input usage can fall, even when output rises. Sectors which according to the modelling lose employment to a relatively large extent do so not as a result of their own productivity improvements but because the home industries that use their services lose their position as other economies reform.

In extreme cases, modelling indicates that relative losses in unskilled employment in a particular sector after 10 years can accumulate to upwards of 30%. But this modelling result needs to be kept in perspective. Employment changes occur over time and can be addressed through targeted structural assistance measures. Secondly, as long as an economy grows overall employment will increase, so the modelling shows that structural reforms may require significant relative shifts of labour across sectors over time. Thirdly, the model projects higher real wages for all workers in all economies. Modelling and real world examples demonstrate that displaced workers earn higher real wages in their new occupations.

To reiterate, employment opportunities overall depend on the growth of an economy. Thus, one of the best ways that APEC economies can guard against any adverse employment effects of structural reform is to maintain healthy underlying rates of economic growth. Structural reform itself makes a contribution to this goal, since it adds to productivity, stimulates activity and increases the resilience of the economy, but prudent macroeconomic management is also crucial.

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Chapter 3

QUANTIFYING THE IMPACTS OF STRUCTURAL REFORMS ON INTERNATIONAL TRANSPORT MARGINS

Patricia Sourdin[1]

- Transport costs using sea and air freight are assessed using data on the difference between cif and fob prices of imported goods in a number of economies where those data are available.
- The differences or 'margins' are explained by a variety of factors, including distance and the characteristics of the goods.
- Having removed the influence of those factors, the maritime and air transport policy environments are significant explanators of variations in margins – more open environments lead to lower margins.

3.1 INTRODUCTION

Transport costs are often viewed as technologically determined but in practice they vary considerably across different bilateral trade flows. Some of the variation is due to distance and other geographical constraints and some reflects commodity composition of trade. However, port infrastructure and corrupt customs officials are policy-related trade barriers, while other determinants of transport costs may be indirectly policy related. For example, a lack of competition among shippers may be due to low volumes or to the non-implementation of an anti-monopoly policy. Variations related to institutional settings such as poor law enforcement increase trade risks and hence affect insurance rates and inventory costs.

Understanding better what determines trade costs stems from their impact on international trade flows. Higher trade costs significantly impede trade for some, and since the major component of trade costs is undoubtedly the transport component, a better understanding of its determinants ensures policy makers are equipped with the best instruments with which to reduce them.

This paper attempts to identify the major determinants of air and maritime transport costs for exports from APEC members towards four major trading partners – Australia; Brazil; Chile; and the United States of America (USA) – using commodity level data at the 6-digit level of aggregation of the Harmonised System (HS).[2]

The paper is organised as follows: Section 3.1 presents the background, Section 3.2 describes the data and presents some summary findings and trends, Section 3.3 discusses the determinants of transport cost, Section 3.4 presents the econometric analysis and results and Section 3.5 presents some conclusions.

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3.2 DATA DESCRIPTION

The dataset used in all the analyses consists of import data collected by the customs agencies of four importing economies – Australia; Brazil; Chile; and the USA – at the 6-digit level of aggregation of the HS. The data contain detailed records of import value, weight, cost, insurance and freight (cif) values and free on board (fob) values and commodity codes for the years 1990–2008. In this section of the paper the trends in *ad valorem* transport costs over time are analysed as well as trends across exporting APEC members for 1990–2008. *Ad valorem* transport costs are calculated from the data as the difference between the cif and fob values divided by the fob value ((*cif-fob*)/*fob*) for each importer/exporter, year and 6-digit product combination.

Trends in transport costs over time are calculated and analysed in the following ways: aggregate, *ad valorem* and import-weighted transport costs calculated for each exporting APEC member for each year by mode of transport. In addition, and following Hummels (2007) and Moreira, Volpe and Blyde (2008), *ad valorem* transport costs are calculated and adjusted for commodity composition and changes in the value to weight ratio over time. This is achieved by regressing 6-digit *ad valorem* transport costs on the value to weight ratio and year dummies and economy-pair-product fixed effects. The exponentiated, predicted *ad valorem* transport costs by year are the adjusted values which control for changing commodity composition and trade partners over time.

Tables A1 to A3 (Annex 3) report the import-weighted *ad valorem* transport costs overall and by mode of transport for each APEC member to all four pooled importers. (The importers are pooled to alleviate the problem of a small number of transactions for some of the smaller APEC economies.) Table A1 highlights the fact that, in 2008, Mexico; Singapore; Malaysia; Canada; and Japan had the lowest value of *ad valorem* transport costs. Low values are also evident for Brunei and Papua New Guinea. However, the small number of trade flows from these two economies renders the values less statistically reliable. Overall, several APEC members had a reduction in transport costs of over 50% over the period under consideration. These include Chile; Mexico; New Zealand; Peru; the Russian Federation (where data is only available since 1992); Papua New Guinea; and Brunei. For ocean transport, the economies with a greater than 50% reduction in transport costs are Mexico; Chile; and Brunei, while for air transport they are Canada; China; Indonesia; Korea; and Chinese Taipei.

Analysing trends by importing economy, Figures A1–A4 (Annex 3) graph average, import-weighted *ad valorem* transport costs for each of the importing economies in the dataset. For the USA (Figure A1), the trend is downward for air transport costs, but otherwise there is not a great decline for sea transport or for APEC members in general. Australian imports, on the other hand, show a clear downward trend for all four series (Figure A2). Chilean and Brazilian imports (Figures A3 and A4) are more volatile but the trend is downward overall. Pooling the four importers in Figure A5 (Annex 3), shows a clear downward trend for air freight charges and significantly less so for sea freight, APEC freight costs and overall freight charges.

Once we adjust for commodity composition, the changing value to weight ratios and changes in trading partners over time, the average overall transport costs are higher and exhibit smaller percentage declines over time (Table A4, Annex 3). The individual APEC economies' adjusted transport costs are graphed in Figures A6a–A6c (Annex 3).

3.3 DETERMINANTS OF TRANSPORT COSTS

There is an extensive literature which has examined the determinants of transport costs. Several factors have been found to have robustly and significantly influenced transport costs.

Higher volumes of bilateral trade on routes allow shippers to take advantage of scale economies and thus lower freight charges. This is most likely to influence ocean shipped goods more than air shipped goods. Related to volume are trade imbalances, where high volumes of trade in one direction are not matched by the volumes of trade on the return leg. If vessels are forced to return empty, this will be reflected in the price charged for shipping. On some routes there are significant differences in the prices of hauling containers on eastbound and westbound directions of a unique route. When the trade imbalance is very high, such as the USA–Asia and Asia–USA routes, the price of transporting a container one way can be close to double the price of hauling it back (Containerisation International 2010).

An obvious determinant of transport costs is geography, especially distance. Transport costs are increasing in distance but there are clearly non-linearities in this relation due to high fixed costs. Distance is strongly positively correlated with time, and increasingly, time costs influence the ability for exporters to fit into global supply chains which crucially depends on timely delivery.

The presence of market power and lack of competition on routes will adversely affect freight charges. Similarly, restrictive regulatory policies related to transport services would significantly raise prices above marginal cost if they act to impede the competitive environment in which the transport sector operates. A measure of competition is the number of carriers servicing a particular economy as well as measures of restrictive regulatory environments. The number of carriers is obtained from UNCTAD's Liner Shipping Connectivity Index (LSCI) which lists the number of liner companies operating on a route. For the general regulatory environment in the air and ocean transport sectors, two constructed indices are used – one for air and one for sea. Table 3.1 shows the values for APEC for the year 2008. China; the USA; and Hong Kong, China are the economies which have the highest number of liner companies operating on the route, which is to be expected given the large volumes of containerised trade for these economies. Table 3.1 also reports the values of the restrictiveness indexes for air and sea transport. For the sea index, higher values are associated with fewer restrictions while for the air index, higher values are indicative of a greater degree of restrictiveness. These policy indices were prepared as part of this project, by Bertho (Chapters 13 and 14) for sea transport and Zhang and Findlay (Chapter 4) for air transport. Annex 3 provides more detail on all the data and Chapter 4 includes a more detailed discussion of the air policy index.

Higher quality infrastructure, higher quality of logistics services and improvements in and implementation of trade facilitation measures also play significant roles in lowering transport costs. Port and airport infrastructure affect transport costs in several ways. For example, technological advances mean that cargo can be loaded and unloaded more rapidly and thus create gains in efficiency. Infrastructure levels are highly correlated with economic development and GDP *per capita*. The World Economic Forum's *Global Competitiveness Report* surveys enterprises regarding port and airport infrastructure and efficiency in 135 economies (Porter & Schwab 2008). Among APEC members, Singapore and Hong Kong, China are ranked 1st and 2nd respectively with respect to port and airport infrastructure quality. Of the APEC members, only Australia; Canada; Hong Kong, China; and Singapore rank in the top 20 for airport infrastructure, while Canada; Hong Kong, China; Malaysia; Singapore; and Chinese Taipei rank in the top 20 for port infrastructure (Table 3.2). The GCR

survey assigns economies a score on a scale of 1 to 7, with a score of 1 for underdeveloped infrastructure and 7 for infrastructure that is as developed as the world's best, and then ranks them according to the results.

Table 3.1: Measures of restrictiveness and competition for APEC members, 2008.

APEC member	Liner companies	Air index	Sea index
China	88	4.17	0.599
USA	84	0.75	0.45
Singapore	80	1.17	n.a.
Hong Kong, China	70	3.5	n.a.
Korea	69	3	0.611
Malaysia	68	1.67	0.614
Japan	65	2.75	0.611
Chinese Taipei	49	3.17	n.a.
Thailand	46	1.67	0.399
Viet Nam	41	4	0.25
Indonesia	38	3	0.649
Australia	37	1	0.75
Russian Federation	36	3.42	0.75
Canada	35	2.75	0.611
Mexico	30	2.5	0.667
New Zealand	27	2.17	0.813
Philippines	26	3.5	0.39
Peru	23	2	0.556
Chile	21	3	0.857
Brunei	6	4	n.a.
Papua New Guinea	6	n.a.	n.a.

Source: Number of liner companies: UNCTAD, Liner Shipping Connectivity Index – Index values based on Bertho (2010) and Zhang & Findlay (2010)

Notes: For air index, a higher number signifies a less restrictive environment.
For sea index, a higher value indicates more restrictive.

Table 3.2: *Global Competitiveness Report* infrastructure rankings.

APEC member	Airport Rank	Port Rank
Australia	20	42
Brunei	39	36
Canada	18	15
Chile	25	37
China	75	55
Hong Kong, China	2	2
Indonesia	76	105
Japan	50	26
Korea	27	30
Mexico	57	95
Malaysia	21	16
New Zealand	24	24
Peru	95	128
Philippines	90	101
Papua New Guinea	n/a	n/a
Russian Federation	89	77
Singapore	1	1
Thailand	29	49
Chinese Taipei	33	19
Viet Nam	93	113
USA	13	12

Source: Porter & Schwab 2008

General institutional quality and corruption is another potentially important determinant of transport costs. Where there is a known problem of bribe taking by customs officials at port or at airport level or where there may be uncertainty or risk to the merchandise being transported, transport firms will pass some of these costs on to exporters, so transport costs will be higher from those destinations. Sequiera and Djankov (2008) provide detailed evidence from two African ports. An indicator of corruption is the Corruption Perceptions Index (*cpi*) (Transparency International 2008). This is a general perceptions index of the level of public and political sector corruption and bribe taking which may impact on transport costs. The *cpi* relates perceptions of the degree of corruption and ranges between 10 (highly clean) and 0 (highly corrupt). APEC members range between 2 and 9.3 for 2008 (Table 3.3). For 2008 the *cpi* is highly correlated with air and port infrastructure (0.82 for port and 0.79 for air).

Table 3.3: APEC rankings in the Corruption Perceptions Index, 2008.

New Zealand	9.3	Chile	6.9	Thailand	3.5
Singapore	9.2	Chinese Taipei	5.7	Viet Nam	2.7
Australia	8.7	Korea	5.6	Indonesia	2.6
Canada	8.7	Malaysia	5.1	Philippines	2.3
Hong Kong, China	8.1	China	3.6	Russian Federation	2.1
Japan	7.3	Mexico	3.6	Papua New Guinea	2
USA	7.3	Peru	3.6	Brunei	n/a

Source: Transparency International 2008.

Transport costs are influenced by a good's value-to-weight ratio, since heavy, low value-added items are more expensive to transport than are light, high value-added ones. In part, this is due to higher insurance charges, which are included in the transport cost variable ((*cif-fob*)/*fob*) but are generally proportional to the value of the goods, since higher value-added goods may also attract higher quality freight services. There is a trend for goods to become lighter with technological advances, so that changes in the value-to-weight ratio (increasing) over time means that air transport becomes more attractive and less costly. Consequently, we expect the share of air shipped goods to be increasing over time. Figure 3.1 graphs the air share of imports for Australia; Brazil; Chile; and the USA between 1990 and 2008. The air share of imports from APEC economies by value and by reporter is not exhibiting any clear trend over the period 1990–2008. For Australia; Brazil; and Chile there was an increase in the share of imports in the mid to late 1990s, while for the USA the rise in the share commenced earlier. All four economies have experienced a reduction in the air share of their imports since around 2000.

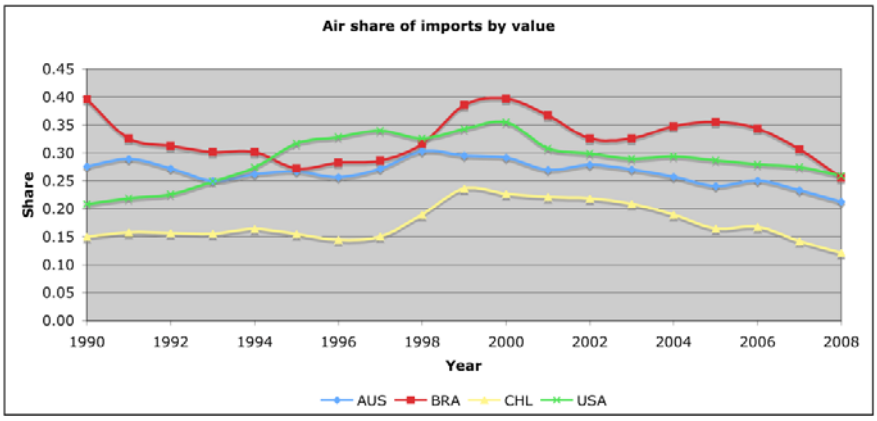

Figure 3.1: Air share of imports by value for Australia; Brazil; Chile; and the USA, 1990–2008.

3.4 ESTIMATING A MODEL OF TRANSPORT COSTS

3.4.1 Determination of freight costs

In this section, the determinants of air and sea transport costs for APEC member exports to four large economies – Australia; Brazil; Chile; and the USA – are analysed econometrically. The modelling approach incorporates as many of the factors identified above as possible.

As the previous discussion has highlighted, there are many factors contributing to the determination of freight costs. Our modelling strategy follows earlier studies (e.g., Micco & Serebrisky 2006, Clark, Dollar & Micco 2004, Fink, Mattoo & Neagu 2002, Wilmsmeier & Hoffmann 2008, Hummels 2007, Hummels, Lygovysky & Skiba (forthcoming), Micco & Perez 2002, Mirza & Habib 2009, Moreira, Volpe & Blyde 2008 and Wilmsmeier, Hoffmann & Sanchez 2006) where we incorporate as many of the determinants as possible. Since many of the variables are highly correlated, it is not possible to include them all in one model as this leads to unstable coefficients across specifications. The modelling strategy begins with a baseline specification in which the main determinants of transport costs are considered. Several additional models are estimated which specifically control for factors such as those affecting competition on a route, factors related to infrastructure and efficiency and those which capture the general quality of the exporting economy's institutions.

For each transport mode, the baseline specification models transport costs in the following way:

$$\ln\left(f_{ijkt}\right) = \beta_0 + \beta_1 \ln\left(dist\right)_{ij} + \beta_2 \ln\left(imports_{ijt}\right) + \beta_3 \ln\left(\frac{val}{wgt}\right)_{ijkt} + \alpha_k + \gamma_t + u_{ijkt} \quad (1)$$

where *i* indexes partner economies, *j* indexes reporting economies, *k* indexes commodities imported by economy *j* disaggregated at the 6-digit level of the Harmonised System, and *t* indexes time. The dependent variable, $\ln\left(f_{ijkt}\right)$, is the log of *ad valorem* freight charges. The baseline determinants of freight include $\ln\left(imports_{ijt}\right)$ which is the log of the value of total imports from economy *i* to economy *j* in period *t* for each transport mode, $\ln\left(\frac{val}{wgt}\right)_{ijkt}$ is the log of the unit value of each good shipped and $\ln\left(dist\right)_{ij}$ is the log of distance between each economy pair. Distance is from Centre d'Etudes Prospectives et d'Information Internationales (CEPII) and is measured as the distance between two economies based on bilateral distances between the biggest cities of those two economies, those inter-city distances being weighted by the share of the city in the economy's overall population. In addition, a product specific fixed effect α_k is included and u_{ijkt} is the idiosyncratic error. The product-fixed effects capture any commodity-specific features which influence freight costs but are difficult to quantify and not explicitly included in the models. For instance, these effects control for such things as the fact that bulky goods have higher transportation costs in every period than, say, shipping shoes. Freight costs are expected to be positively related to distance and negatively related to the value of imports since there exist economies of scale in transport, but this is perhaps more important for ocean freight. The value of imports may be endogenous in the model since imports also depend on transport costs. Ignoring this endogeneity may lead to biased estimates of the model parameters. When the models were estimated by two-stage least squares using GDP as an instrument, this resulted in implausible estimates with incorrect signs.

In the second specification, the focus is primarily on factors that affect the level of competition on shipping routes. For this, the baseline specification is augmented in turn with several variables which capture either a restrictive regulatory environment or the presence of market power. For these specifications, the baseline model for ocean freight is modified by the addition of sea index and airfreight for air freighted goods. These indexes capture the degree of restrictions in force on a route. Additional models for ocean-freighted imports are estimated, which include elements to capture the competitive features of the route (see Data sources in Annex 3). These second set of market power models include such things as number of carriers, number of ships or liner services operating on a route. These variables make up a composite index – the Liner Services Connectivity Index (LSCI) – compiled by UNCTAD – which is also included on its own.

The third focus is on institutional quality in the exporting economy. To capture this feature, we include the *cpi* for the exporting economy (Transparency International 2008). This index is a general 'catch-all' variable which is expected to be negatively related to freight charges – that is, the higher the index, the better the institutional quality and the lower the transport charge.

The final focus of this study accounts for the quality of infrastructure and trade facilitation measures. For these specifications, the baseline model is augmented by two measures to capture these features. The first infrastructure variable included is an index of port infrastructure quality (for ocean transport) in the exporting economy and a measure of air infrastructure quality (for air transport), both obtained from Porter and Schwab (2008). For trade facilitation quality, we include the Enabling Trade Index (*eti*) for the exporting economy also from Porter and Schwab. Table 3.4 summarises the expected direction of the relationships between the various determinants and transport costs.

Table 3.4: Expected sign of determinants of transport costs.

Determinants	Expected sign
Value total imports	(–)
Value/weight	(+)
Distance	(+)
LSCI and components	(–)
Port/air infrastructure	(–)
Enabling trade index	(–)
Corruption perception index	(–)

3.4.2 Results

The results from estimating transport cost models for ocean and air freight are presented in Tables 3.5 and 3.6. The positive relationship between distance and *ad valorem* transport costs is as expected, with robustly estimated elasticities ranging between 0.26 and 0.4.

The negative relationship expected between import volumes and transport costs is evident in the econometric results: depending on the model specification and other things being equal, the estimated elasticity is between -0.036 and as high as -0.07 for ocean freight (Table 3.5) and between -0.084 and -0.120 for air freight (Table 3.6). In comparing model results, this is partly due to greater economies of scale on routes. Note that the coefficient on imports loses all of its explanatory power and changes signs when estimated within models with the LSCI competition variables included (models 4 and 5), and so has been omitted.

Table 3.5: Transport cost regressions for ocean shipped goods.

	(1)	(2)	(3)	(4)	(4a)	(4b)	(4c)	(5)	(6)	(7)
Years covered	**1990-2008**	**2007-2008**	**1990-2008**	**2004-2008**	**2004-2008**	**2004-2008**	**2004-2008**	**2004-2008**	**2008**	**1998-2008**
Log(dist)	0.268***	0.304***	0.280***	0.322***	0.323***	0.319***	0.328***	0.315***	0.305***	0.273***
	(0.004)	(0.007)	(0.004)	(0.006)	(0.006)	(0.006)	(0.010)	(0.006)	(0.009)	(0.004)
Log(sea imports)	-0.068***	-0.036***	-0.071***						-0.041***	-0.040***
	(0.001)	(0.002)	(0.001)						(0.002)	(0.001)
Log(value/wgt)	-0.390***	-0.403***	-0.386***	-0.423***	-0.429***	-0.430***	-0.418***	-0.431***	-0.410***	-0.396***
	(0.003)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.006)	(0.003)
eti		-0.019***								
		(0.004)								
Sea index			-0.487***							
			(0.013)							
Log(ships)				-0.046***						
				(0.003)						
Log(liner services)					-0.024***					
					(0.003)					
Log(liner companies)						-0.033***				
						(0.005)				
Log(max ship size)							-0.027***			
							(0.008)			
LSCI								-0.000***		
								(0.000)		
Port infrastructure									-0.002	
									(0.003)	
cpi										-0.010***
										(0.001)
R-squared	0.271	0.200	0.279	0.214	0.236	0.239	0.210	0.239	0.202	0.244
N	1156239	137035	942441	217018	275996	284779	63115	284779	69601	713108

* p<0.1, ** p<0.05, *** p<0.01. Year dummies included but output suppressed. All models estimated by fixed effects with product-fixed effects. Robust standard errors in parentheses. R-squared value is from the 'within transformation' of the data in the fixed effects regression. Models 4 and 5 are estimated for containerised shipments only as the LSCI relates to containerised traffic only.

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Table 3.6: Transport cost regressions for air shipped goods

	(1)	(2)	(3)	(4)	(5)
Years covered	**1990-2008**	**2007-2008**	**2008**	**2008**	**1998-2008**
Log(distance)	0.394***	0.257***	0.239***	0.250***	0.338***
	(0.003)	(0.006)	(0.007)	(0.007)	(0.004)
Log(air imports)	-0.084***	-0.108***	-0.117***	-0.120***	-0.102***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Log(value/wgt)	-0.362***	-0.304***	-0.278***	-0.271***	-0.333***
	(0.004)	(0.005)	(0.006)	(0.006)	(0.004)
eti		-0.030***			
		(0.005)			
airindex			0.055***		
			(0.004)		
Air infrastructure				-0.099***	
				(0.006)	
cpi					-0.036***
					(0.001)
R-squared	0.274	0.178	0.166	0.170	0.257
N	931667	113728	58054	47516	479416

* p<0.1, ** p<0.05, *** p<0.01. Year dummies included but output suppressed. All models estimated by fixed effects with product-fixed effects. Robust standard errors in parentheses. R-squared value is from the 'within transformation' of the data in the fixed effects regression.

Port infrastructure is found to have no significant effect on maritime transport costs. These results are somewhat surprising, since other studies have found this variable significant (e.g., Micco & Perez 2002 and Clark, Dollar & Micco 2004).

Using an alternative measure of port infrastructure (maximum ship size), we find the impact of the size of ships that ports can accommodate has a strong negative impact on shipping costs. The coefficient is not high but is statistically significant. This result has implications for economies of scale and potential cost savings for economies that can take advantage of technological improvements. Ship size and port infrastructure are highly correlated with the total level of imports: if imports are high then ship size is generally larger.

As expected, the components of the LSCI (models 4 and 4b) which capture the competitive environment in which the exporting economy is operating, all have a negative and statistically significant impact on shipping costs. Similarly, including the LSCI on its own also negatively impacts shipping charges but the effect is very small.

Turning to the restrictiveness index for ocean freight, the coefficient is negative and statistically significant. That is, a higher sea index is associated with a less restrictive environment and we would expect shipping costs to be lower. The estimated coefficient indicates that a one unit increase in the index would see *ad valorem* transport costs fall by approximately 48%, *ceteris paribus* (APEC index values are about 0.6 at present, on average). For air freight, the air index is found to have a statistically positive effect on *ad valorem* freight: higher values of the index indicate a greater degree of restrictiveness on a route and therefore higher *ad valorem* air transport costs.

Institutional quality, captured by the *cpi*, has more than three times the estimated impact on transport costs for air freight compared to ocean freight. This is plausible if higher value goods, which are generally shipped by air, attract more bribe-taking behaviour. The *eti* also has a greater negative impact on air freighted goods compared to ocean-freighted goods, suggesting that improvements in trade facilitation measures may be better directed at airport procedures, where the benefits would be greater.

3.5 CONCLUSION

Transport costs are important and amenable to reduction by technical progress and by policy measures. The richness of the customs data for Australia; Brazil; Chile; and the USA allows us to break down transport costs into the various determinants. However, transport costs remain a significant component of the wedge between the prices of domestic and imported goods.

Transport costs depend on more than distance or bulk or scale, and the role of the determinants vary by mode of transport. Transport costs are related to distance and to weight.

Sea freight is cheaper than air per kilogram but imports arriving by air have lower *ad valorem* trade costs because air freight is used for higher value goods. The choice of transport mode is, however, more complex than simply having more valuable and lighter goods shipped by air. Air transport will be favoured when speed is important, and for such goods in poor exporting-economy institutions this may be a particularly significant obstacle.

The econometric results reported in Tables 3.5 and 3.6 indicate that distance and bulk have the expected relationship to transport costs, and that transport costs fall with the volume of trade. The distance and weight variables are statistically significant for both modes, but the coefficients are larger and confidence intervals tighter for sea than for air. Good institutions, as measured by the *cpi* (Transparency International 2008), are associated with lower trade costs, but the impact is greater for air freight.

There are caveats to our conclusions. With just two modes there is an important feedback mechanism because the choice of mode is not simple and it is related to the impact of exporting-economy institutions. There is also an endogeneity concern related to the vicious cycle of high transport costs reducing trade flows and low trade volumes being a cause of high transport costs. Moreover, by focusing only on dollar values of transport costs we do not directly address the role of time, which some authors (Hummels 2001) identify as more important than financial costs, at least for some goods.

Using indicators of restrictiveness in transport services sectors, the econometric results highlight the importance of competitive environments for reducing transport costs for both air and sea transport.

The relevance of research on trade and transport costs is on how transport costs impact on trade flows. Future research should focus on the analysis of the effect of transport costs on exports of the APEC member economies to reporting economies such as USA; Australia; Chile; and Brazil. Since similar detailed customs level data exist for other economies, notably New Zealand and a selection of Latin American economies through Asociación Latinoamericana de Integración (ALADI), future research should focus on the analysis of APEC export flows to these economies.

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ANNEX 3

Data sources

Figures A1–A6

Figure A1: Imports to the USA.
Figure A2: Imports to Australia.
Figure A3: Imports to Chile.
Figure A4: Imports to Brazil.
Figure A5: Imports to the USA; Australia; Chile; and Brazil.
Figure A6a: Average adjusted *ad valorem* transport costs, selected APEC members.
Figure A6b: Average adjusted *ad valorem* transport costs, selected APEC members.
Figure A6c: Average adjusted *ad valorem* transport costs, selected APEC members.

Tables A1–A5

Table A1: Import weighted *ad valorem* transport costs, APEC members' exports to the USA; Australia; Brazil; and Chile.
Table A2: Import weighted *ad valorem* transport costs by sea, APEC members' exports by sea.
Table A3: Import weighted *ad valorem* transport costs by air, APEC members' exports by air.
Table A4: Average *ad valorem* transport costs adjusted for commodity composition.
Table A5: Weighted and adjusted *ad valorem* freight to the USA; Australia; Brazil; and Chile.

DATA SOURCES

This study makes use of detailed customs data as available. These data record the export (*fob*) value of goods, the cost of freight and insurance and the corresponding import (*cif*) data for all imports from all destinations at the product level by mode of entry (ship, air or rail). In this way, the transport and insurance costs of only those imports that have arrived by ship can be analysed. The detailed customs data available are used to calculate *ad valorem* transport costs (USD paid in freight charges per $ of merchandise import value [*fob*]) at the product level.

The Enabling Trade Index (*eti*) from the World Economic Forum. The *eti* is designed to measure the 'institutions, policies, and services facilitating the free flow of goods over borders and to final destinations'. The index is composed of four sub indexes to capture the main enablers of trade: (1) market access, (2) border administration, (3) transport and communications infrastructure, and (4) the business environment. We use the 2009 index which is the latest available and relates to the year 2008. A higher value of the index indicates higher quality trade enabling measures in place.

The measure of overall infrastructure quality is taken from the World Economic Forum's *Global Competitiveness Report* (Porter & Schwab 2008). The port infrastructure index and the air infrastructure index are two of the components of the Global Competitiveness Index. A higher index is indicative of higher quality infrastructure.

The Corruptions Perceptions Index (*cpi*) is obtained from Transparency International (2008) and indicates the degree of public sector corruption as perceived by the business community and economy analysts. The *cpi* is measured on a scale of 0–10, with a higher number indicating less corruption.

UNCTAD's Liner Shipping Connectivity Index (LSCI) is a composite index composed of liner shipping connectivity between the importing economy and the exporting economy. In the empirical analysis of the paper, different aspects and components of the LSCI were used. The LSCI is derived from principal component analysis and includes the following elements of connectivity: number of carriers, TEU deployed, number of vessels, shipping opportunities and maximum size (TEU) of a ship on a specific route.

The abbreviated names of the APEC member economies are:

Australia	AUS	Japan	JPN	The Republic of the Philippines	RP
Brunei Darussalam	BD	Republic of Korea	ROK	The Russian Federation	RUS
Canada	CDA	Malaysia	MAS	Singapore	SIN
Chile	CHL	Mexico	MEX	Chinese Taipei	CT
People's Republic of China	PRC	New Zealand	NZ	Thailand	THA
Hong Kong, China	HGC	Papua New Guinea	PNG	United States	USA
Indonesia	INA	Peru	PE	Viet Nam	VN

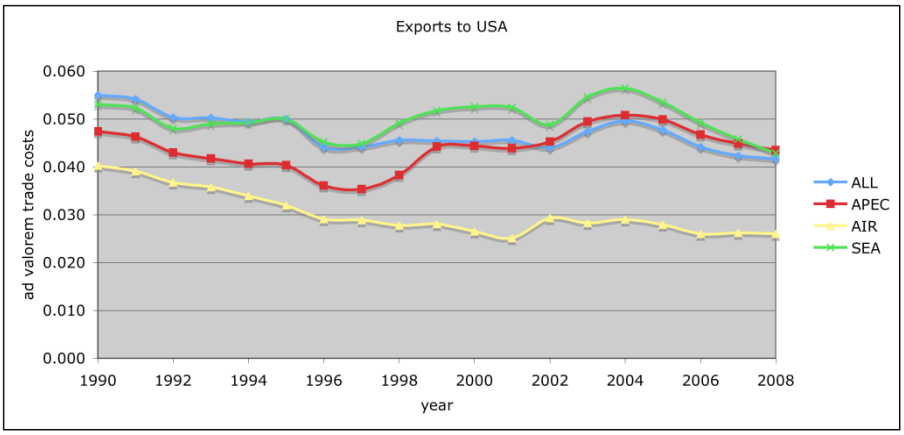

Figure A1: Imports to the USA.

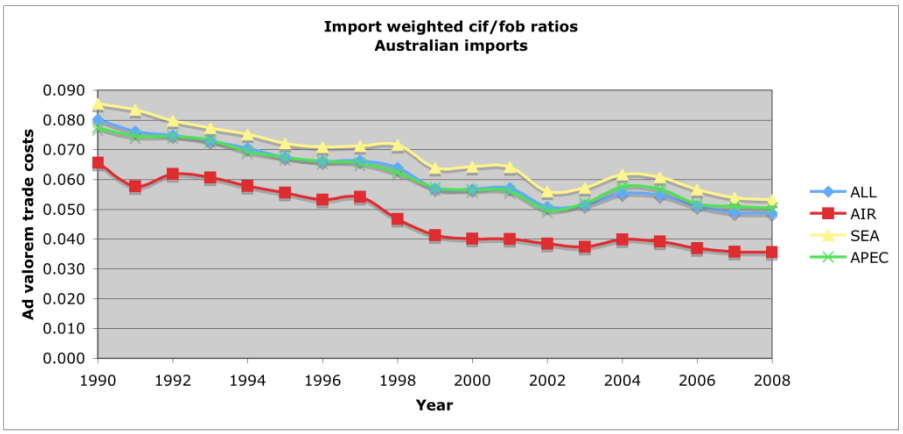

Figure A2: Imports to Australia.

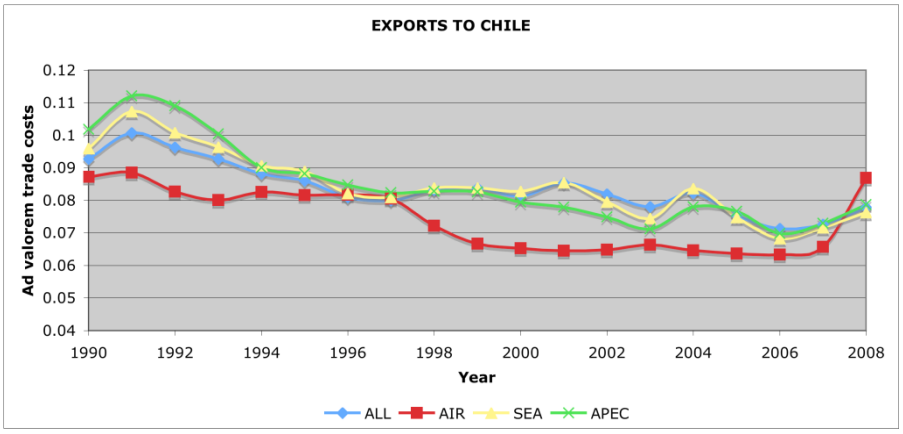

Figure A3: Imports to Chile.

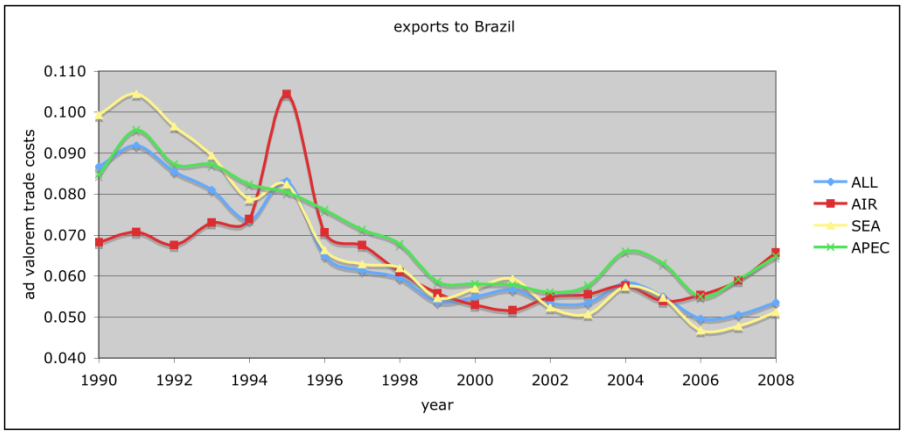

Figure A4: Imports to Brazil.

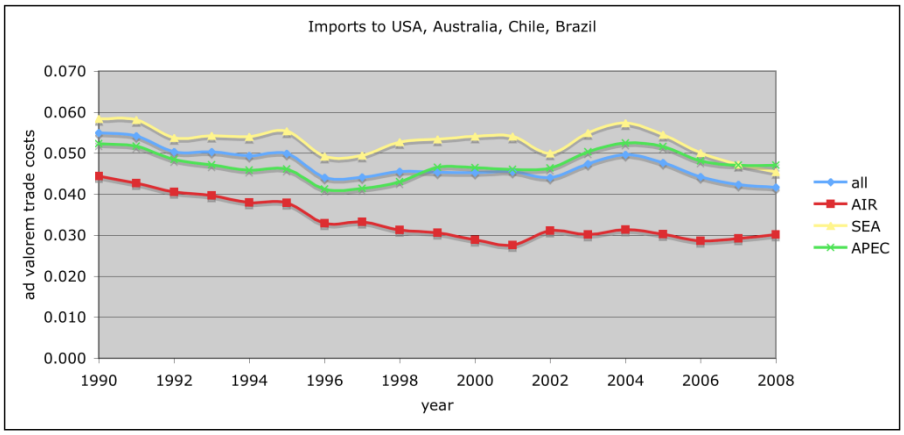

Figure A5: Imports to the USA; Australia; Chile; and Brazil.

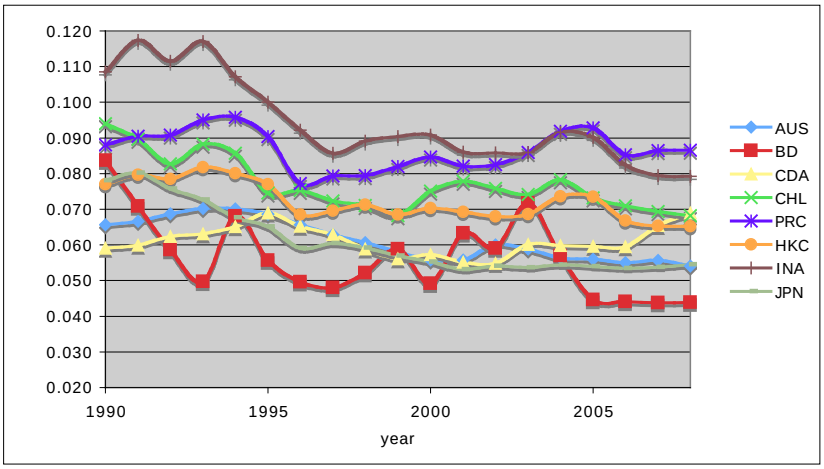

Figure A6a: Average adjusted *ad valorem* transport costs, selected APEC members.

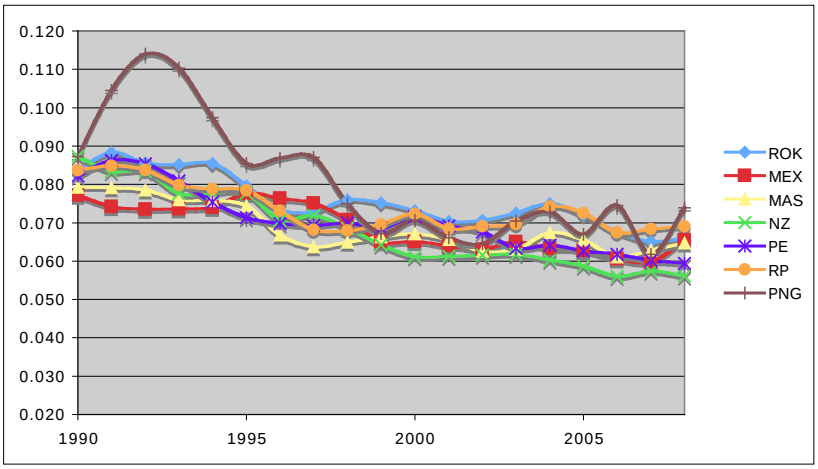

Figure A6b: Average adjusted *ad valorem* transport costs, selected APEC members.

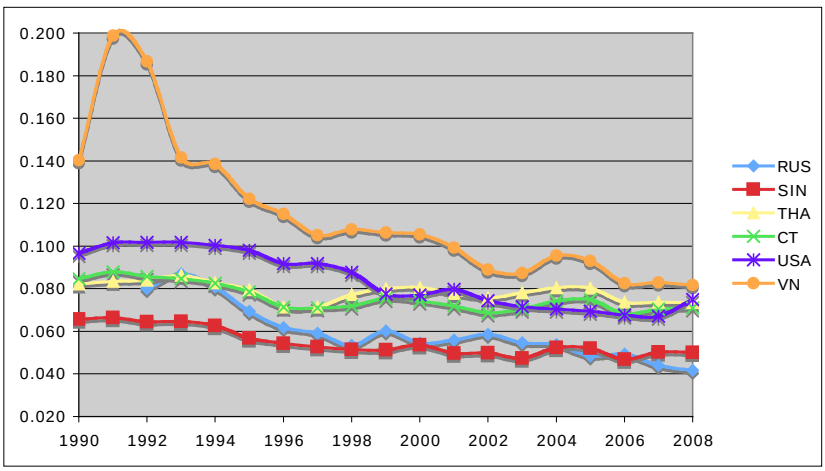

Figure A6c: Average adjusted *ad valorem* transport costs, selected APEC members.

Table A1: Import weighted *ad valorem* transport costs, APEC members' exports to the USA; Australia; Brazil; and Chile.

Year	AUS	BD	CDA	CHL	PRC	HGC	INA	JPN	ROK	MAS	MEX	NZ	PNG	PE	RP	RUS	SIN	CT	THA	USA	VN
1990	0.085	0.072	0.048	0.160	0.074	0.051	0.102	0.042	0.045	0.050	0.049	0.096	0.017	0.061	0.074		0.030	0.054	0.059	0.073	0.072
1991	0.082	0.073	0.039	0.143	0.073	0.051	0.102	0.042	0.045	0.047	0.054	0.092	0.009	0.063	0.071		0.028	0.054	0.057	0.076	0.127
1992	0.086	0.056	0.036	0.143	0.070	0.050	0.085	0.036	0.043	0.041	0.055	0.091	0.013	0.062	0.063	0.086	0.025	0.051	0.055	0.079	0.085
1993	0.086	0.056	0.035	0.144	0.071	0.049	0.083	0.034	0.043	0.038	0.056	0.090	0.027	0.067	0.059	0.066	0.023	0.050	0.054	0.079	0.076
1994	0.088	0.036	0.040	0.122	0.069	0.050	0.079	0.032	0.041	0.035	0.050	0.086	0.033	0.067	0.055	0.067	0.023	0.048	0.050	0.073	0.087
1995	0.088	0.045	0.053	0.112	0.067	0.050	0.073	0.033	0.035	0.032	0.053	0.085	0.032	0.058	0.052	0.064	0.021	0.044	0.046	0.074	0.067
1996	0.082	0.042	0.046	0.128	0.059	0.044	0.067	0.027	0.034	0.031	0.043	0.084	0.033	0.063	0.042	0.057	0.017	0.040	0.043	0.072	0.077
1997	0.077	0.040	0.046	0.126	0.055	0.042	0.066	0.028	0.035	0.031	0.046	0.078	0.035	0.053	0.036	0.060	0.018	0.037	0.039	0.068	0.073
1998	0.071	0.063	0.044	0.134	0.058	0.042	0.070	0.030	0.042	0.031	0.049	0.078	0.041	0.052	0.033	0.051	0.019	0.040	0.043	0.061	0.079
1999	0.067	0.069	0.039	0.113	0.074	0.047	0.081	0.030	0.043	0.033	0.041	0.074	0.036	0.056	0.038	0.040	0.022	0.047	0.059	0.053	0.065
2000	0.065	0.062	0.031	0.120	0.076	0.048	0.082	0.031	0.039	0.035	0.032	0.069	0.025	0.060	0.039	0.034	0.022	0.045	0.062	0.051	0.069
2001	0.059	0.072	0.033	0.133	0.071	0.046	0.080	0.028	0.041	0.036	0.028	0.069	0.034	0.073	0.040	0.046	0.023	0.044	0.059	0.050	0.084
2002	0.059	0.058	0.036	0.140	0.067	0.049	0.074	0.029	0.040	0.032	0.028	0.069	0.022	0.073	0.041	0.050	0.024	0.042	0.061	0.048	0.071
2003	0.059	0.061	0.039	0.149	0.072	0.051	0.074	0.030	0.040	0.032	0.033	0.067	0.019	0.066	0.043	0.059	0.027	0.046	0.061	0.049	0.077
2004	0.064	0.070	0.040	0.124	0.072	0.053	0.081	0.032	0.039	0.035	0.033	0.063	0.018	0.054	0.049	0.066	0.027	0.048	0.062	0.054	0.084
2005	0.061	0.047	0.036	0.103	0.069	0.049	0.079	0.031	0.043	0.032	0.032	0.063	0.018	0.048	0.050	0.061	0.028	0.047	0.059	0.054	0.080
2006	0.054	0.043	0.033	0.066	0.064	0.045	0.069	0.031	0.043	0.030	0.021	0.061	0.020	0.041	0.047	0.051	0.026	0.044	0.055	0.049	0.072
2007	0.056	0.035	0.035	0.071	0.061	0.046	0.064	0.031	0.042	0.031	0.020	0.056	0.015	0.044	0.045	0.048	0.026	0.043	0.047	0.050	0.067
2008	0.053	0.036	0.033	0.075	0.058	0.044	0.059	0.034	0.043	0.032	0.021	0.049	0.013	0.041	0.047	0.046	0.028	0.043	0.047	0.059	0.066
% change	**-36.94**	**-50.11**	**-31.16**	**-53.07**	**-21.38**	**-14.45**	**-41.82**	**-19.07**	**-5.44**	**-36.42**	**-56.75**	**-48.80**	**-26.24**	**-32.28**	**-35.97**	**-46.04**	**-5.76**	**-20.69**	**-19.38**	**-19.81**	**-7.10**

Table A2: Import weighted *ad valorem* transport costs by sea, APEC members' exports by sea.

Year	AUS	BD	CDA	CHL	PRC	HGC	INA	JPN	ROK	MAS	MEX	NZ	PNG	PE	RP	RUS	SIN	CT	THA	USA	VN
1990	0.092	0.080	0.059	0.166	0.068	0.042	0.097	0.040	0.043	0.064	0.051	0.101	0.071	0.073	0.084		0.040	0.048	0.065	0.090	0.071
1991	0.090	0.073	0.048	0.152	0.066	0.040	0.097	0.039	0.043	0.056	0.057	0.097	0.071	0.078	0.078		0.036	0.048	0.061	0.099	0.127
1992	0.095	0.057	0.044	0.159	0.064	0.040	0.079	0.034	0.044	0.049	0.059	0.099	0.046	0.070	0.070	0.113	0.037	0.047	0.059	0.095	0.084
1993	0.096	0.053	0.043	0.158	0.065	0.041	0.078	0.032	0.045	0.044	0.060	0.098	0.046	0.074	0.068	0.081	0.035	0.048	0.059	0.091	0.075
1994	0.099	0.042	0.058	0.133	0.064	0.042	0.074	0.031	0.048	0.041	0.054	0.097	0.046	0.075	0.065	0.077	0.039	0.047	0.054	0.085	0.086
1995	0.096	0.042	0.091	0.116	0.063	0.046	0.069	0.033	0.049	0.041	0.056	0.096	0.040	0.063	0.066	0.074	0.033	0.045	0.051	0.085	0.065
1996	0.091	0.034	0.081	0.135	0.055	0.038	0.062	0.025	0.045	0.039	0.045	0.091	0.043	0.071	0.056	0.070	0.027	0.041	0.047	0.080	0.072
1997	0.086	0.032	0.085	0.130	0.050	0.037	0.061	0.027	0.046	0.041	0.050	0.086	0.045	0.059	0.051	0.070	0.030	0.038	0.041	0.078	0.070
1998	0.090	0.075	0.090	0.134	0.054	0.038	0.072	0.030	0.057	0.046	0.054	0.084	0.058	0.069	0.053	0.064	0.036	0.043	0.047	0.071	0.076
1999	0.079	0.067	0.082	0.110	0.072	0.044	0.080	0.030	0.059	0.054	0.045	0.078	0.046	0.059	0.065	0.055	0.040	0.056	0.067	0.064	0.060
2000	0.074	0.055	0.063	0.117	0.075	0.047	0.081	0.032	0.055	0.058	0.035	0.074	0.033	0.050	0.073	0.048	0.041	0.056	0.071	0.063	0.064
2001	0.068	0.070	0.063	0.125	0.070	0.044	0.080	0.028	0.051	0.056	0.031	0.072	0.048	0.063	0.067	0.062	0.041	0.051	0.066	0.060	0.079
2002	0.064	0.052	0.062	0.130	0.065	0.042	0.073	0.027	0.049	0.050	0.028	0.071	0.039	0.062	0.064	0.055	0.040	0.048	0.063	0.056	0.058
2003	0.066	0.059	0.060	0.138	0.074	0.050	0.077	0.030	0.052	0.056	0.033	0.069	0.042	0.059	0.069	0.063	0.043	0.054	0.070	0.059	0.065
2004	0.071	0.067	0.059	0.116	0.077	0.051	0.082	0.031	0.050	0.065	0.034	0.063	0.040	0.058	0.072	0.070	0.046	0.058	0.074	0.064	0.074
2005	0.068	0.045	0.048	0.096	0.075	0.048	0.079	0.031	0.052	0.066	0.032	0.064	0.029	0.052	0.071	0.065	0.049	0.055	0.075	0.064	0.073
2006	0.062	0.043	0.043	0.060	0.071	0.046	0.069	0.032	0.051	0.062	0.020	0.062	0.033	0.038	0.063	0.053	0.048	0.052	0.066	0.058	0.066
2007	0.065	0.034	0.042	0.063	0.066	0.046	0.064	0.032	0.050	0.054	0.019	0.056	0.024	0.037	0.059	0.051	0.044	0.052	0.057	0.058	0.062
2008	0.060	0.036	0.037	0.070	0.062	0.047	0.059	0.035	0.053	0.048	0.020	0.049	0.025	0.037	0.062	0.049	0.036	0.049	0.056	0.065	0.062
% change	**-34.61**	**-55.33**	**-37.20**	**-57.75**	**-9.98**	**10.51**	**-39.53**	**-10.41**	**22.74**	**-24.62**	**-61.34**	**-51.69**	**-64.18**	**-49.16**	**-25.72**	**-56.70**	**-10.12**	**2.40**	**-14.62**	**-27.93**	**-12.48**

Table A3: Import weighted *ad valorem* transport costs by air, APEC members' exports by air.

Year	AUS	BD	CDA	CHL	PRC	HGC	INA	JPN	ROK	MAS	MEX	NZ	PNG	PE	RP	RUS	SIN	CT	THA	USA	VN
1990	0.036	0.012	0.014	0.145	0.130	0.065	0.172	0.055	0.054	0.028	0.030	0.074	0.001	0.033	0.052		0.023	0.089	0.041	0.053	0.166
1991	0.036	0.091	0.014	0.109	0.137	0.068	0.160	0.053	0.052	0.030	0.028	0.071	0.001	0.035	0.054		0.022	0.087	0.043	0.050	0.297
1992	0.034	0.025	0.012	0.092	0.123	0.065	0.171	0.044	0.043	0.027	0.027	0.063	0.000	0.042	0.050	0.012	0.019	0.071	0.042	0.059	0.251
1993	0.037	0.075	0.013	0.101	0.121	0.060	0.156	0.040	0.037	0.028	0.030	0.060	0.001	0.049	0.043	0.013	0.018	0.059	0.039	0.060	0.157
1994	0.043	0.029	0.012	0.088	0.115	0.061	0.148	0.035	0.028	0.025	0.029	0.054	0.001	0.051	0.038	0.013	0.018	0.053	0.039	0.056	0.240
1995	0.052	0.079	0.016	0.102	0.102	0.056	0.123	0.034	0.018	0.022	0.035	0.053	0.002	0.050	0.034	0.014	0.017	0.041	0.035	0.057	0.243
1996	0.046	0.087	0.012	0.118	0.091	0.052	0.108	0.031	0.018	0.022	0.031	0.055	0.003	0.043	0.027	0.011	0.014	0.038	0.034	0.057	0.218
1997	0.042	0.095	0.015	0.135	0.091	0.048	0.103	0.031	0.019	0.023	0.029	0.050	0.004	0.038	0.024	0.012	0.014	0.035	0.035	0.056	0.156
1998	0.025	0.023	0.014	0.158	0.086	0.048	0.060	0.030	0.020	0.018	0.029	0.057	0.008	0.025	0.020	0.008	0.015	0.035	0.031	0.048	0.208
1999	0.033	0.118	0.013	0.137	0.090	0.051	0.084	0.029	0.022	0.019	0.028	0.057	0.005	0.048	0.021	0.007	0.018	0.034	0.041	0.041	0.246
2000	0.035	0.176	0.012	0.158	0.083	0.049	0.083	0.027	0.019	0.019	0.022	0.050	0.003	0.095	0.020	0.006	0.017	0.033	0.039	0.039	0.260
2001	0.029	0.123	0.011	0.209	0.074	0.051	0.075	0.025	0.023	0.020	0.019	0.054	0.003	0.117	0.021	0.006	0.017	0.034	0.038	0.039	0.298
2002	0.038	0.158	0.012	0.229	0.079	0.060	0.079	0.033	0.025	0.020	0.027	0.056	0.003	0.109	0.027	0.016	0.019	0.035	0.054	0.037	0.247
2003	0.035	0.159	0.014	0.253	0.062	0.053	0.057	0.032	0.021	0.017	0.031	0.060	0.003	0.089	0.024	0.016	0.020	0.035	0.039	0.037	0.229
2004	0.036	0.158	0.015	0.245	0.055	0.055	0.072	0.035	0.021	0.015	0.030	0.061	0.003	0.053	0.027	0.011	0.018	0.033	0.037	0.040	0.216
2005	0.034	0.150	0.015	0.206	0.050	0.050	0.077	0.032	0.025	0.015	0.028	0.060	0.004	0.043	0.026	0.008	0.016	0.032	0.030	0.040	0.204
2006	0.025	0.082	0.016	0.137	0.045	0.044	0.068	0.030	0.024	0.014	0.027	0.055	0.003	0.049	0.029	0.010	0.015	0.030	0.032	0.037	0.169
2007	0.027	0.119	0.022	0.160	0.045	0.046	0.072	0.027	0.023	0.017	0.029	0.056	0.002	0.084	0.027	0.010	0.015	0.029	0.029	0.039	0.134
2008	0.027	0.090	0.023	0.133	0.047	0.040	0.064	0.030	0.022	0.019	0.031	0.051	0.002	0.067	0.027	0.008	0.018	0.030	0.031	0.047	0.122
% change	**-23.64**	**647.87**	**58.73**	**-8.03**	**-63.90**	**-39.33**	**-62.69**	**-45.36**	**-59.80**	**-32.43**	**5.60**	**-31.72**	**42.92**	**103.58**	**-47.63**	**-37.69**	**-21.42**	**-66.05**	**-24.23**	**-10.30**	**-26.27**

Table A4: Average *ad valorem* transport costs adjusted for commodity composition.

YEAR	AUS	BD	CDA	CHL	PRC	HGC	INA	JPN	ROK	MAS	MEX	NZ	PNG	PE	RP	RUS	SIN	CT	THA	USA	VN
1990	0.066	0.084	0.059	0.094	0.088	0.077	0.109	0.078	0.084	0.079	0.077	0.087	0.087	0.082	0.084		0.066	0.085	0.082	0.097	0.14
1991	0.067	0.071	0.06	0.09	0.091	0.08	0.117	0.08	0.088	0.079	0.074	0.083	0.104	0.086	0.085		0.066	0.088	0.083	0.102	0.199
1992	0.069	0.059	0.062	0.083	0.091	0.078	0.112	0.076	0.086	0.079	0.074	0.083	0.114	0.085	0.084	0.08	0.064	0.086	0.084	0.102	0.187
1993	0.07	0.05	0.063	0.088	0.095	0.082	0.117	0.073	0.085	0.076	0.074	0.078	0.11	0.081	0.08	0.087	0.065	0.085	0.086	0.102	0.141
1994	0.07	0.068	0.065	0.086	0.096	0.08	0.107	0.068	0.085	0.076	0.074	0.078	0.097	0.075	0.079	0.081	0.063	0.082	0.083	0.1	0.139
1995	0.069	0.056	0.069	0.075	0.09	0.077	0.1	0.065	0.08	0.074	0.078	0.078	0.085	0.071	0.078	0.069	0.057	0.078	0.08	0.098	0.122
1996	0.066	0.05	0.065	0.075	0.077	0.069	0.092	0.059	0.073	0.067	0.076	0.071	0.087	0.07	0.073	0.062	0.054	0.071	0.071	0.092	0.115
1997	0.063	0.048	0.063	0.072	0.079	0.07	0.086	0.06	0.073	0.064	0.075	0.072	0.087	0.069	0.068	0.059	0.053	0.071	0.071	0.092	0.105
1998	0.061	0.052	0.059	0.071	0.079	0.071	0.089	0.059	0.076	0.065	0.071	0.069	0.075	0.07	0.068	0.053	0.052	0.072	0.077	0.088	0.108
1999	0.058	0.059	0.056	0.068	0.082	0.068	0.09	0.057	0.075	0.066	0.065	0.064	0.067	0.069	0.07	0.06	0.051	0.075	0.08	0.077	0.106
2000	0.056	0.049	0.057	0.075	0.085	0.07	0.091	0.055	0.073	0.067	0.065	0.061	0.071	0.072	0.072	0.054	0.054	0.074	0.081	0.077	0.105
2001	0.056	0.063	0.055	0.078	0.082	0.069	0.086	0.053	0.07	0.066	0.064	0.061	0.066	0.069	0.069	0.056	0.05	0.072	0.078	0.08	0.099
2002	0.06	0.059	0.055	0.076	0.083	0.068	0.086	0.054	0.071	0.063	0.063	0.062	0.065	0.068	0.069	0.059	0.05	0.069	0.076	0.074	0.089
2003	0.059	0.072	0.06	0.074	0.086	0.069	0.086	0.054	0.072	0.063	0.065	0.062	0.07	0.063	0.07	0.055	0.047	0.071	0.078	0.072	0.087
2004	0.056	0.057	0.06	0.078	0.092	0.074	0.092	0.054	0.075	0.067	0.063	0.06	0.073	0.064	0.074	0.054	0.052	0.074	0.08	0.07	0.095
2005	0.056	0.045	0.06	0.073	0.093	0.073	0.09	0.054	0.072	0.066	0.063	0.059	0.067	0.063	0.073	0.048	0.052	0.075	0.08	0.069	0.093
2006	0.055	0.044	0.059	0.071	0.085	0.067	0.082	0.053	0.068	0.061	0.061	0.056	0.074	0.062	0.067	0.049	0.047	0.068	0.074	0.068	0.083
2007	0.056	0.044	0.065	0.069	0.086	0.065	0.079	0.054	0.065	0.063	0.06	0.057	0.062	0.06	0.068	0.044	0.05	0.071	0.074	0.067	0.083
2008	0.054	0.044	0.069	0.068	0.087	0.065	0.079	0.054	0.066	0.065	0.066	0.056	0.074	0.059	0.069	0.042	0.05	0.071	0.074	0.075	0.082
% change	**-18.18**	**-47.62**	**16.95**	**-27.66**	**-1.14**	**-15.58**	**-27.52**	**-30.77**	**-21.43**	**-17.72**	**-14.29**	**-35.63**	**-14.94**	**-28.05**	**-17.86**	**-47.50**	**-24.24**	**-16.47**	**-9.76**	**-22.68**	**-41.43**

Table A5: Weighted and adjusted *ad valorem* freight to the USA; Australia; Brazil; and Chile.

Year	Adjusted air freight[#]	Adjusted sea freight[#]	Import-weighted air freight[*]	Import-weighted sea freight[*]	APEC			
					Adjusted air freight	Import-weighted air freight	Adjusted sea freight	Import-weighted sea freight
1990	0.141	0.084	0.043	0.055	0.18	0.05	0.088	0.05
1991	0.144	0.084	0.041	0.055	0.19	0.049	0.09	0.049
1992	0.148	0.082	0.039	0.051	0.193	0.044	0.09	0.047
1993	0.15	0.082	0.038	0.052	0.201	0.042	0.091	0.046
1994	0.149	0.079	0.037	0.051	0.195	0.038	0.086	0.046
1995	0.156	0.076	0.037	0.053	0.193	0.035	0.084	0.048
1996	0.143	0.072	0.032	0.047	0.183	0.032	0.08	0.043
1997	0.145	0.069	0.032	0.047	0.186	0.033	0.077	0.043
1998	0.144	0.068	0.03	0.05	0.18	0.031	0.078	0.046
1999	0.135	0.066	0.03	0.051	0.169	0.031	0.079	0.051
2000	0.131	0.068	0.028	0.051	0.163	0.03	0.078	0.052
2001	0.13	0.067	0.027	0.051	0.161	0.03	0.076	0.05
2002	0.135	0.063	0.03	0.048	0.168	0.036	0.069	0.048
2003	0.139	0.061	0.029	0.052	0.167	0.034	0.069	0.054
2004	0.137	0.062	0.03	0.054	0.168	0.035	0.073	0.056
2005	0.136	0.062	0.029	0.052	0.166	0.034	0.073	0.055
2006	0.132	0.058	0.028	0.048	0.164	0.032	0.067	0.051
2007	0.141	0.054	0.028	0.045	0.177	0.033	0.065	0.05
2008	0.154	0.053	0.029	0.043	0.197	0.035	0.064	0.048

Notes: # *Ad valorem* freight rate adjusted for commodity composition and value to weight. Includes economy-pair-product effects.
**Ad valorem* freight weighted by imports. Pooled data from the USA; Australia; Chile; and Brazil.

Chapter 4

QUANTIFYING THE IMPACTS OF STRUCTURAL REFORMS ON AIR TRAFFIC FLOWS IN APEC ECONOMIES

Yahua Zhang[1] and Christopher Findlay[2]

- More liberal arrangements for freight, passenger charters, designation of international airlines, code sharing and ground handling are common among APEC members.
- Restrictions on foreign ownership and on cabotage remain.
- Further reform would have a significant effect on traffic flows.

4.1 INTRODUCTION

Air transport services are provided within a structure of a network of bilateral agreements. These agreements are similar to free trade agreements but they apply to only one service. A typical air service agreement specifies the rights of access to the terms of the agreement, that is, they allocate to airlines designated by the signatories the rights to fly across borders between APEC member economies and around the globe. Designation usually applies only to the airlines owned and controlled by residents of the economy making the designation. As a result, airlines from third parties are discriminated against: they either cannot fly on the routes between the economies involved in the bilateral agreement or they have only restricted access. Some bilateral agreements also restrict the capacity and frequency of the services which the designated airlines provide.

Some agreements that do not have so many restrictions are called 'Open Skies' agreements. However, even these agreements have restrictions on access to routes by third parties. In the past, agreements have also attempted to control fares but that now is rare. In fact, the control of fares is redundant in the context of the control of capacity. The International Air Transport Association's (IATA's) Director General once labelled the bilateral system, the ownership rules and the attitude of competition authorities towards airline mergers and alliances as 'the three pillars of stagnation' for they have hindered the modernisation of air transport industry.[3]

The interest of this paper is the impact of air transport policy on the performance of the markets in which air transport services are provided. This has been prompted by the apparently highly restrictive regimes operating under a series of these bilateral agreements in which economies exchange rights of access to markets. These arrangements might be expected to raise costs and prices, and possibly also to raise profits, leading to a 'tax' on the movement of goods and people and inhibiting the extent of international integration. The severity of these effects is the question, the answers to which can be used to make the case

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[3] See http://www.iata.org/pressroom/speeches/Pages/2003-08-06-02.aspx, accessed on 1 February 2010.

for reform. Options for reform were explored by Findlay and Round (2006), and as an extension of their analysis, this paper examines the policy environments in the APEC economies in air transport and provides empirical evidence of the cost of the restrictions to liberalisation – a significantly lower level of movement of people and goods.

Section 4.2 provides a brief overview of the current policy and recent reforms that have occurred in the major APEC economies. This is followed by a methodology for converting the policy information into a series of quantitative measures that can be compared across economies. The impact of the policy on route traffic flows between the major capital cities of APEC economies is then illustrated using a gravity model. The final section contains some summary remarks.

4.2 LIBERALISATION OF AIR SERVICES

APEC was founded in 1989 with a commitment to pursuing cooperation and economic prosperity in the Asia-Pacific region. However, its members are not bound by any treaty obligations and decisions within APEC are made on a consensus basis and implemented voluntarily. The Bogor Goals specify APEC objectives for free and open trade and investment in the Asia-Pacific region by 2010 for industrialised economies and 2020 for developing members. The fast economic growth in many APEC economies is powered by fast increasing international trade and the rapidly growing tourism industry, both of which in turn need the support of well developed air transportation systems.

At their meeting in Auckland in 1999, reforms in the air transport sector were endorsed by the APEC leaders. The Eight Options for More Competitive Air Services with Fair and Equitable Opportunity reforms include air carrier ownership and control, doing-business matters, air freight, multiple airline designation, tariffs, charter services, cooperative arrangements between airlines and market access. The Eight Options were prioritised as high, medium and low, based on their ease of implementation. It was acknowledged that the member economies could have their own ways to achieve the goals set in the Eight Options and in fact there have been some successes.

The single aviation market between Australia and New Zealand was created in 1996, and the domestic air market has subsequently been opened up to the airlines of the other side of the Tasman Sea. A formal Open Skies agreement was signed in 2002, further eliminating the limitation of beyond rights and allowing the international airlines of both economies to operate from any international airport in Australia and New Zealand to third economies for cargo services (7th freedom rights, see Box 4.1 for the details of the nine freedoms and an illustration of the aircraft movements involved).

In 2004 the Association of Southeast Asian Nations (ASEAN) adopted the Roadmap for Integration of the Air Travel Sector (RIATS) and the Action Plan for ASEAN Air Transport Integration and Liberalisation 2005–2015, with the aims 'to advance the full liberalisation of air transport services in ASEAN, to achieve the ASEAN Leaders' vision of Open Sky in the ASEAN region'.[4] Full liberalisation will be achieved through a staged and progressive approach. The RIATS encourages two or more members to negotiate and sign liberal bilateral or multinational agreements on a sub-regional basis in the move to full liberalisation.

[4] See http://www.aseansec.org/16666.htm, accessed on 1 March 2010.

Box 4.1: Freedoms of the air.

First Freedom of the Air – the right of over-flight

Second Freedom of the Air – the right to land for non-traffic purposes

Third Freedom of the Air – the right to put down traffic originating from the carrier's home base

Fourth Freedom of the Air – the right to pick up passengers bound for the carrier's home base

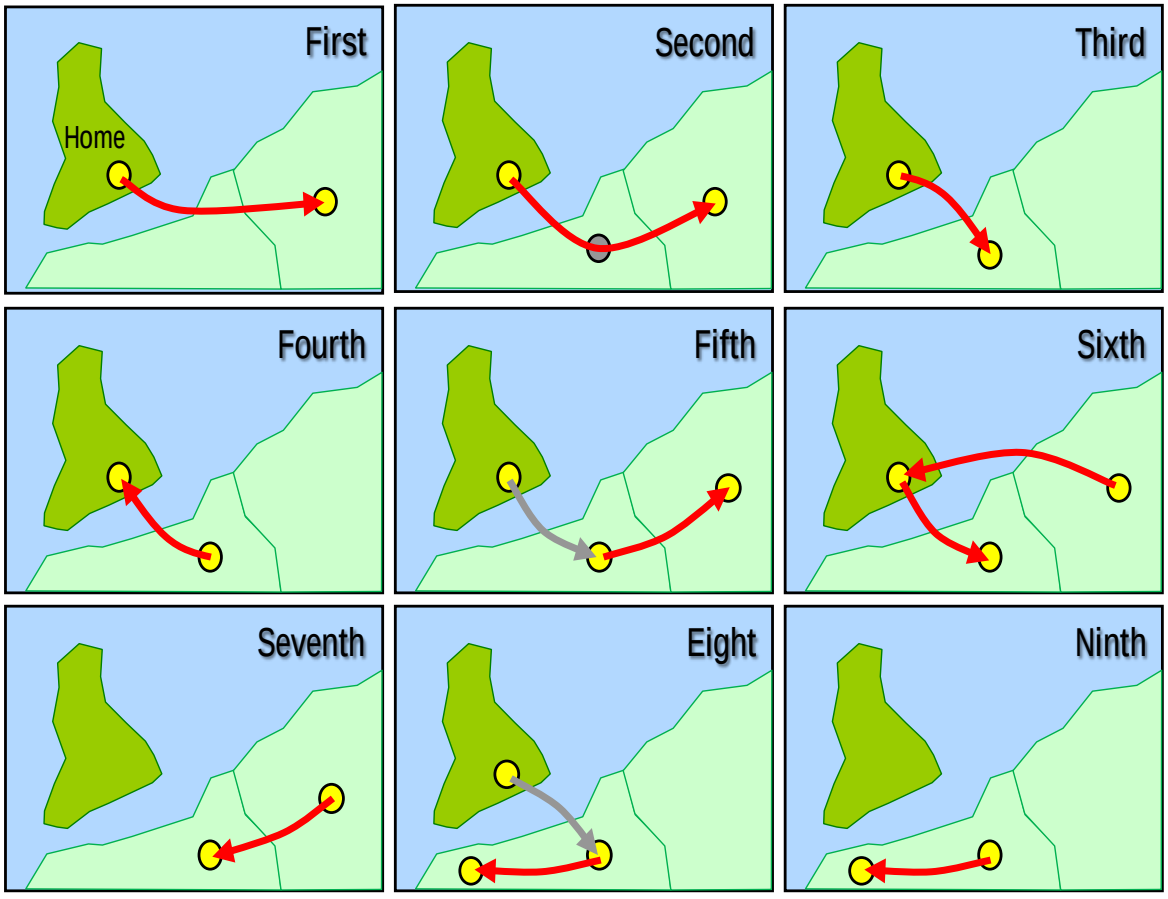
Fifth Freedom of the Air – the right to put down or pick up passengers from or bound for third locations on a flight either bound for or originating at the carrier's home base

Sixth Freedom of the Air – the right to transport, via the home base of the carrier, traffic moving between two other locations

Seventh Freedom of the Air – the right to transport traffic between two other locations without stopping at or having a connection to the home base of the carrier (i.e., the right to base aircraft offshore)

Eighth Freedom of the Air –the right to carry traffic between two domestic points within another economy on a flight bound for or originating at the carrier's home base

Ninth Freedom of the Air – 'stand alone' cabotage, that is, carrying traffic between domestic points offshore without any connection to the carrier's home base



Based on ICAO (2004): graphic provided by Dr Jean-Paul Rodrigue, Department of Global Studies and Geography, Hofstra University (permission provided).
http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/airfreedom.html

In 2003 Cambodia, Laos, Myanmar and Viet Nam concluded a Multilateral Agreement on Air Transport of the Sub-region consisting of air transport liberalisation and comprehensive cooperation among the four economies, and in 2004 Brunei; Singapore; and Thailand signed a Multilateral Agreement (MA) on the Liberalisation of Passenger Air Services in Bangkok, which allowed for unlimited flights among the three economies. It is expected that an Open Skies pact with no limitations on 5th freedom traffic rights for the capital cities will be signed by the ASEAN members in 2010.

In 2001 Brunei; Chile; New Zealand; Singapore; and the United States of America (USA) signed a multilateral Open Skies agreement including the 7th freedom rights. However, this agreement was amended in 2004 for freight services only. By the end of 2009 twelve APEC economies had concluded agreements with the USA – Singapore; Chinese Taipei; New Zealand; Chile; Thailand; Malaysia; Brunei; Peru; Korea; Indonesia; Canada; and Australia (see Table 4.1).

Table 4.1: Open Skies agreements signed by APEC economies.

APEC member	Economies with which Open Skies agreement signed (year signed)
Japan	Partial with Korea (2007), Thailand (2007) (Tokyo excluded)
Korea	USA (1998), Mexico (2008), partial with Japan (Tokyo excluded) (2007), Shandong province, China (2006), Malaysia (2007)
China	Hainan (2003) and Shandong (2006) provinces
Singapore	More than 30 economies, including USA, 15 European economies, Thailand (2004), Brunei (2004)
Thailand	Singapore (2004), Brunei (2004), USA (2005), partial with Japan (2007), Kuwait (2008)
Malaysia	Sri Lanka (2005), USA (1997), Chinese Taipei (1997), Korea (2007), New Zealand (1997), Qatar, United Arab Emirates, Yemen, Scandinavian economies, USA
Indonesia	USA (2004)
Philippines	Cargo Open Skies in two international airports (2003)
Brunei	Singapore (2004), Thailand (2004), USA (2001), New Zealand (2001), Hong Kong, China
Viet Nam	USA (2008) cargo only
Australia	New Zealand (2002), USA (2008). No restrictions on capacity with Singapore and UK
United States	Over 90 economies and regions as of 2009
Canada	More than 34 economies, including USA and European Union
Mexico	UAE (2007), Korea (2008), Hong Kong, China
Hong Kong, China	Mexico, Brunei
Chinese Taipei	USA (1997), Malaysia (1997)
Chile	Singapore (2001), New Zealand (2001), Brunei (2001), USA (2001), Uruguay (2003), Paraguay (2005), Finland (2005), United Arab Emirates (2005), UK (2008) etc.
Peru	USA (1998), Singapore (2009)

There have been regular meetings among the aviation authorities of the three Northeast Asian economies. Korea is keen to pursue an Open Skies deal in this region, given its relatively small domestic market and its close cultural and economic links with China and Japan. The signing of an Open Skies agreement between Japan and Korea has lifted restrictions on frequency, capacity and destinations, with the exception of the congested Tokyo airports, covering both cargo and passenger services. Chinese aviation authorities acknowledge the need for liberalisation but prefer a progressive approach, especially when the major Chinese airlines are still less competitive than their foreign counterparts. Interestingly, the local provincial governments are always keen to push for more liberal arrangements as they understand the benefits to their local economies.

China opened 5th freedom rights to all foreign airlines in Hainan Province in 2004. The effect of this unilateral Open Skies policy on the tourism industry has been tremendous. In 2002 Hainan Province received less than 400 000 overseas tourists but this figure had increased to about 1 million in 2008. Open Skies arrangements have also been implemented between Chinese Shandong province and Korea since 1996. As a result, fares on the routes between Seoul and Shandong's major cities have now decreased.

APEC Air Services Sub-group published the Second Eight Options survey outcomes in 2009, providing progress on the Eight Options for Liberalisation of Air Services from the first

survey in 2006 to the second survey in 2008.[5] The main points of this can be summarised as follows:

- Substantial ownership and effective control remains the most common barrier in most economies.
- Although double approval of tariffs remains in places, the filing requirement has been eased. In reality, market forces play key role in determining fares.
- Most economies are relaxing the restrictions on ground handling services and competition is being introduced. Airlines including foreign carriers are allowed to offer ground handling services at some airports.
- A significant number of economies have open freight arrangements with their partners in APEC.
- Multiple designation provisions have become common in the new bilateral agreements.
- The majority of APEC economies are willing to approve charter services as supplements and complements to the scheduled services.
- Code sharing and airline alliances are becoming common with little opposition from authorities.
- Significant progress has been made in terms of relaxing 3rd and 4th freedoms. However, 5th freedoms operations and 7th in cargo services are less common, but are increasing in number. Cabotage remains rare in the APEC region.

4.3 METHODOLOGY AND THE POLICY INDICES

The air transport sector around the world has been undergoing significant changes towards liberalisation over the past three decades. As a result of deregulation and the emergence of the low cost carriers, productive efficiency in the industry has increased and fares have declined. Fares on most domestic and international routes are largely determined by market forces and, although most bilateral agreements still restrict outputs such as frequency and the number of seats offered, these restrictions have been largely relaxed. In some instances the agreed capacity and frequency are so large that the designated airlines do not use their full allocation. Occasionally, 5th freedoms have been granted to a foreign carrier even though the two economies have not signed an Open Skies agreement.

The main elements of an Open Skies agreement include free determination of the frequency of services and fares, no restrictions on engaging in code-sharing, pro-competitive doing-business provisions and grant of the 5th freedom – allowing the other economy's airline to carry traffic to a third economy.[6] However, the so-called Open Skies agreements are not as open as people imagine. A typical agreement does not touch the issues of relaxing foreign ownership restrictions or the adoption of 'principal place of business', nor does it mention cabotage rights.

Regulatory systems that impede entry and discriminate among suppliers would be expected to have some impact on the costs of air transport and the profits of the incumbents. Since air transport is an input into other traded sectors, this system reduces the volume of trade and of people movement and therefore the extent of integration among economies. Higher costs of air transport add to the costs of international trade and reduce international demand for the

[5] See http://www.apec-tptwg.org.cn/new/Modal-Expert-Groups/Aviation/AEG-SRV/air-services-group.htm, accessed on 25 June 2010.

[6] See http://www.state.gov/e/eeb/rls/fs/2009/119760.htm for Open Skies agreement highlights, accessed on 15 March 2010.

exports of the tourism sector and other sectors dependent on people movement – education or health services, for example.

The steps in the work examining regulation cost are first to characterise the policy environment in a number of economies (preferably over time) and then to relate that index to indicators of performance such as the price/quantity of the services provided (Hoekman 1995). Even better is to infer the effects on markets from the effects on the costs and profits of firms operating in those markets. There are special challenges in the case of air transport, since firms operate in more than one jurisdiction and are subject to different policy environments. However, with sufficient data, the contribution of different policy regimes could be identified.

There have been some studies of the impact of these regulatory arrangements. Doove et al. (2001) extended earlier work by the OECD (Gonence & Nicoletti 2001) to examine the impact of the agreements on prices. Other studies have examined the effect of Open Skies agreements. In a study of freight routes from the USA, Micco and Serebrisky (2006) found that signing an Open Skies agreement reduced air transport costs by 9% and increased by 7% the share of imports arriving by air. Using the Air Liberalisation Index (ALI) – the sum of the points obtainable by a given Air Services Agreement (2005 database), prepared by the WTO (2006), Geloso Grosso (2008) and Geloso Grosso and Shepherd (2009) – evidence showed that there is a positive relationship between the openness of the bilateral agreement and passenger movement and bilateral trade in APEC. Piermartini and Rousova (2008) provides a similar conclusion, using a sample of 184 economies. However, the ALI values used by these studies were based on incomplete and outdated bilateral agreement data.

This study seeks to build on and improve this method by constructing policy indices using the most up-to-date information, but not generated from bilateral agreements, and by addressing the same problem from a slightly different perspective. The construction of the indices has been guided by APEC's Eight Options, with a focus on areas covered by a typical Open Skies agreement as well as indicators that can reflect the aviation authorities' attitude towards domestic and international market liberalisation. Although to some extent the coverage of the indices is restricted to items for which comparable data are available, the indicators of restrictiveness are closely linked to deregulation in market access.

The components of the first set of indices are shown in Table 4.2. They include ownership conditions (for private equity and for foreign equity), the existence of established low cost carriers and the number of effective passenger airlines (reflecting the ease of entry in the domestic market), multiple designation of local airlines on international routes, the presence of Open Skies agreements and the grant of the so-called 7th freedom rights for cargo services. The information for various components comes from the economies' aviation authorities and relevant airlines' websites and was valid to mid 2009.

There are good reasons for the inclusion of these indicators in constructing the policy index. The first is that it is important not to underestimate the cost of restrictions on ownership. Findlay and Round (2006, p. 259) point out that concern about ownership rules has been made more intense by the emergence of a new low cost carrier business model in air transport: 'the incumbent full service operators can respond to that threat by stressing their network advantages and will be assisted by a relaxation of ownership rules'. The ability of airlines to enter markets for air transport services, or to enter markets for inputs to air transport, is increased by foreign investment in air transport that they host. The current regulatory system impedes that investment, which denies opportunities to both incumbents and newcomer suppliers.

Table 4.2: Policy indicators.

Aviation market regulations and liberalisation constraints		**Score**
Ownership	Government does not have majority ownership control, nor retain 'golden share' veto right	0
	Government does not control the majority of the ownership, but retains 'golden share' veto right	0.33
	Government controls the majority of the ownership	0.67
	No	1
Foreign equity participation in domestic airlines	No cap: domestic market open to foreign investment/adopt principal place of business	0
	A cap greater than 50%	0.25
	A cap between 35% and 50% (inclusive)	0.5
	A cap less than 35%	0.75
	Foreign investment in airlines not allowed	1
Existence of low cost carriers (reflecting ease of market access and fair competition)	Has an established low cost carrier which has actively engaged in both domestic and international service provisions	0
	Has a relatively new/small sized low cost carrier	0.5
	No low cost carrier	1
Number of effective passenger airlines (reflecting ease of entry)	More than 5	0
	3 to 5 (inclusive)	0.5
	2 or fewer	1
Multiple designation on international routes Private airlines allowed to fly international routes	2 or more carriers, including private carriers roughly have the equal right in being designated for flying international routes	0
	The flag carrier (usually government-owned) has priority in gaining international rights over domestic private carriers; or domestic private carriers are not eligible to fly international routes before fulfilling some conditions such as servicing domestic market for a certain period of time	0.5
	The flag carrier is predominantly the designated airline servicing international routes	1
Open Skies agreement	Number of Open Skies agreements is greater than 2	0
	Number of Open Skies agreements is 2 or fewer	0.5
	Not yet signed any Open Skies agreement	1
7th freedom rights (cargo)	7th freedom rights (cargo) are granted to some foreign carriers	0
	No	1

Secondly, it is quite often difficult to observe an economy's policy on market access by low cost carriers. In some economies it has been argued that conditions on the launch of a new carrier are not transparent.[7] Some anti-trust authorities do not treat the incumbent and new airlines equally when enforcing the anti-trust laws, so low cost and new private airlines would find it difficult to survive in such an environment. For example, price-fixing activities and price wars among Chinese major airlines have never received any serious investigation, while a new low cost airline was fined for selling cheap tickets. A government's favouring of incumbents would be a significant barrier preventing new airlines from accessing lucrative domestic and international markets. The existence of the established low cost carrier and the number of effective passenger airlines can be used as a proxy to represent an economy's policy towards new carriers.[8] It is believed that fairness and openness will encourage competition and thereby

[7] A call for clear air transport policy in Malaysia is available at http://www.mmail.com.my/content/38500-tan-sri-abdul-aziz-abdul-rahman-urgent-need-air-transport-policy, viewed on 13 August 2010.

[8] Effective passenger airlines are defined as airlines that have at least five aircraft and provide regular services. If one airline is wholly owned by another airline in the same economy, such as Dragonair and Cathay Pacific in Hong Kong and Jetstar and Qantas in Australia, they are not regarded as effective competitors in this study even though they operate separately. However, we acknowledge that competition in economies with a small population may not be less than those with a large population and thus this indicator may underestimate the openness of the small economies. The results need to be interpreted bearing this limitation in mind.

foster more efficient and effective competitors. Multiple designation rules would not be an issue if there were no discrimination against the new and private airlines. Two issues should be distinguished regarding multiple designation: multiple designation provisions in the Air Services Agreements (ASAs) and the allocation of the negotiated capacity to the carriers of an economy. The former is no longer a significant issue in many economies, including Hong Kong, China; Australia; and New Zealand, because most of the ASAs allow for multiple designation. This study focuses on whether the flag and non-flag airlines have been treated equally in allocating the negotiated traffic rights.

Finally, despite criticism of the USA version of Open Skies agreements (e.g., the exclusion of the ownership issue), that model has been widely accepted and pursued by many economies. It is also expected access to 7th freedom rights will be the next step in reform towards a more liberal air transport regime. The number of Open Skies agreements signed clearly demonstrates an economy's resolution to pursue liberalisation and can be used as an indicator to reflect an economy's openness in air transport. For the same reason, the 7th freedom (cargo only) has been included as an indicator in the construction of the policy index. Excluded are the very rare 7th freedom rights for passenger services.

The scores for each component of the index can be found in Table 4.3. The components can be added up to form an overall index, values of which range from 0 to 7. The higher the score, the higher is the level of restrictiveness.[9]

Table 4.3: Scores of the policy index components.

APEC member	Privatised	Foreign equity	Low cost airline	Effective competitors	Designation	Open Skies	7th freedom	Total score
Australia	0	0	0	0.5	0.5	0	0	1
Brunei	1	0	1	1	1	0	0	4
Canada	0	0.75	0	1	1	0	0	2.75
Chile	0	0	1	1	1	0	0	3
China	0.67	0.5	0.5	0	0.5	1	1	4.17
Hong Kong, China	0	0	0.5	1	0.5	0	1	3
Indonesia	1	0.5	0.5	0	0.5	0.5	0	3
Japan	0	0.75	0.5	0	0	0.5	1	2.75
Korea	0	0.5	0.5	0.5	0	0.5	1	3
Malaysia	0.67	0.5	0	0	0.5	0	0	1.67
Mexico	0	0.5	0.5	0.5	0	0	1	2.5
New Zealand	0.67	0	0.5	0.5	0.5	0	0	2.17
Peru	0	0.5	0.5	0.5	0.5	0	0	2
Philippines	0	0.5	0.5	0	0.5	1	1	3.5
Russia	0.67	0.75	0.5	0	0.5	0	1	3.42
Singapore	0.67	0	0	0.5	0	0	0	1.17
Chinese Taipei	0.67	0.5	1	0.5	0	0.5	0	3.17
Thailand	0.67	0.5	0	0	0.5	0	0	1.67
United States	0	0.75	0	0	0	0	0	0.75
Viet Nam	1	0.5	0.5	0.5	1	0.5	0	4

[9] The index values reported so far are based on the sum of the component values without any weights being assigned. A factor analysis approach could be used to give statistical weight and to avoid the subjectivity of using expert judgement for weight assignment (see Nicoletti et al. 1999, Doove et al. 2001). However, given the small sample in this study, it is inappropriate to use this method.

Figure 4.1 presents the total scores for each of the 20 economies under study. Measured by the abovementioned indicators, many economies in this sample are relatively liberal in their aviation sector. It is not surprising that the USA is the leader in pursuing more liberal policies but it is not a leader in relaxing foreign ownership limits, when most of the other economies have already allowed a participation in domestic airline equity of up to 49%. The debate of increasing the limit to 49% has been going on for many years but it still remains at 25%.

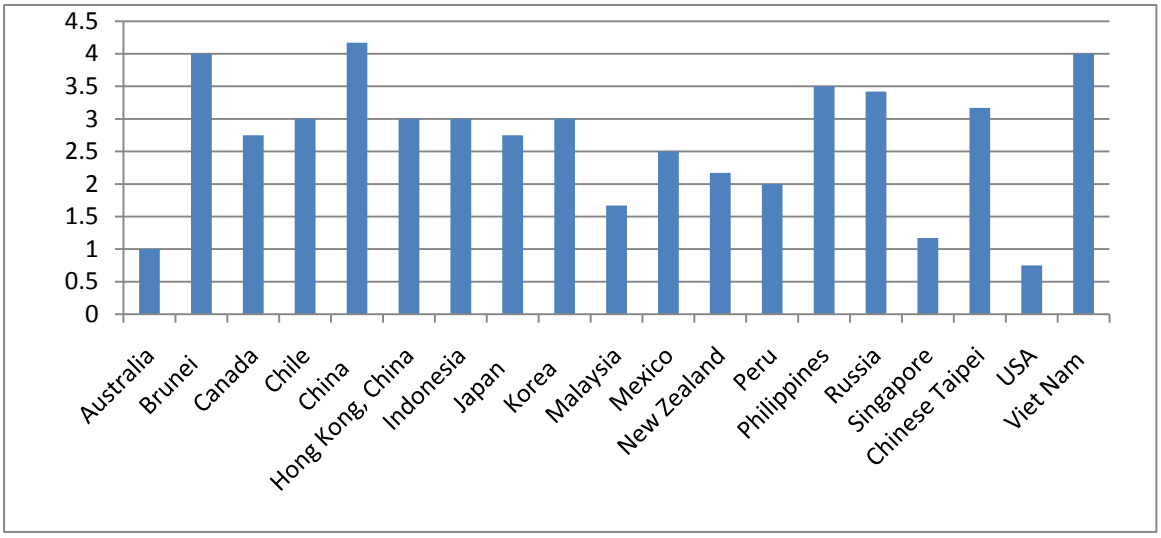


Figure 4.1: The aviation regulation and liberalisation restrictiveness indices for APEC economies.

A related issue is a clause which is embedded in almost all bilateral agreements, even the 'liberal' ones, which requires that the designated airline must be 'substantially owned and effectively controlled' by the designating economy. Hong Kong, China; and Chile are the only two economies in this region to have accepted the 'principal place of business' in place of this clause. In fact, for all the policy indicators used to construct the index, ownership is central. Once ownership control has been loosened, it is likely that government interference will be reduced and further liberalisation measures would be expected to follow. It would then be no longer necessary to restrict the 5th and 7th freedom rights as well as the cabotage rights.

Canada's 'Blue Sky' policy states that it will proactively pursue Open Skies arrangements similar to the one negotiated with the USA in 2005. However, it excludes the possibility of a cabotage right in the negotiation. The CEO of Air Canada was reported to have lobbied the government for relief in 2008, claiming that job and service cuts would be lost as he criticised Emirates Airlines' service expansion plan in Canada although the provincial government and tourism and trade groups were in favour of it (Vancouver Sun 2010). Similar reports have appeared in Australia. Although some may argue that a particular market is not big enough to support more than one carrier[10], the market in which an airline can provide services would expand if more liberal bilateral and multilateral arrangements are pursued.

Australia and Singapore have the most liberalised environment in the Asia-Pacific region. Although Australia still retains a 49% cap on foreign investment in Australian international airlines it has allowed 100% foreign investment in domestic airlines (i.e., right of establishment, which also applies in New Zealand). Singapore has signed more than 30 Open

[10] See, for example, the view expressed by Air Canada's former president, Hollis Harris, at http://www.canadianencyclopedia.ca/index.cfm?PgNm=TCE&Params=M1ARTM0010589, accessed on 15 August 2010.

Skies agreements and has even called for more liberal arrangements than its current Open Skies framework. Thailand and Malaysia are two leaders in liberalising their aviation sector in ASEAN. These economies have well established aviation industries and their airlines, including the low cost airlines, are relatively competitive in this region.

The three Northeast Asian economies are in the middle ranking position. Arrangements have been made that allow the flights linking Shanghai, Seoul and Tokyo to use those three cities' domestic airports (i.e., Shanghai Hongqiao, Kimpo and Haneda) to reduce travel time and cost. As noted earlier, even without any formal pre-set procedures, these economies are moving towards greater liberalisation in air transport. In the meantime, as can be seen from Table 4.1, both Japan and Korea have struck partial Open Skies deals with several ASEAN economies. China has also expressed interest in inking an Open Skies deal with ASEAN.

Since 2008, apart from a handful of busy cities, there have been no restrictions on the frequency of flights and the number of airlines flying between mainland China and Hong Kong, China. Restrictions on the frequency of flights to busy cities like Shanghai have made fares artificially high, and many passengers have complained (Yang 2010). In mid 2009, after several years of charter flight services, scheduled flights were finally launched between mainland China and Chinese Taipei. The integration of air transport in these three economies will be an interesting research topic in the next few years.

Some people may argue that there is a big change in performance once an airline is in private hands, but this is not so evident if the government controls the majority share, no matter what percentage it commands. It has also been argued that the competition outcome does not differ greatly when the number of competitors in a market increases from two to three. Following these arguments, and to test the sensitivity of the results to changes in the design of the index, changes to the scores assigned to some of the policy indicators are shown in Table 4.4.

Table 4.4: The alternative policy index indicators.

Aviation market regulations and liberalisation constraints		**Score**
Ownership	Government does not have a majority ownership control	0
	Government controls the majority of the ownership	1
Foreign equity participation in the domestic airline	A cap greater than 50%; domestic markets open to foreign investment/adopt principal place of business	0
	A cap less than 50%(inclusive)	1
Existence of low cost carriers	Has an established low cost carrier which has actively engaged in both domestic and international service provision	0
	No effective low cost carriers/small in size with limited services	1
Number of effective passenger airlines	3 or more	0
	2 or fewer	1
Multiple designation on international routes	2 or more carriers including the private carriers roughly have the equal right in being designated for flying international routes	0
Private airlines allowed to fly international routes	The flag carrier (usually government-owned) has priority in gaining international rights over domestic private carriers; or domestic private carriers are not eligible to fly international routes before fulfilling some conditions such as servicing domestic market for a certain period of time	0.5
	The flag carrier is predominantly the designated airline servicing international routes	1
Open Skies agreement	Number of Open Skies agreements is greater than 2	0
	Number of Open Skies agreements is 2 or fewer	0.5
	Not yet signed any Open Skies agreement	1

As the 7th freedom rights, although optional, are frequently granted when an Open Skies agreement is concluded, this indicator has been dropped in the new policy index (hereinafter called the alternative policy index). Details can be found in Table 4.5 and observed in Figure 4.2. The results of the two sets of indices are consistent. Figure 4.2 shows that while Australia; the USA; and Singapore remain the leaders in liberalisation, Australia has overtaken the USA to be first. The alternative policy index will also serve as a sensitivity test of our gravity model to be discussed below.

Table 4.5: Scores of the alternative policy index components.

APEC member	Privatised	Foreign equity	Low cost airline	Effective competitors	Designation	Open Skies	Total score
Australia	0	0	0	0	0.5	0	0.5
Brunei	1	0	1	1	1	0	4
Canada	0	1	0	1	1	0	3
Chile	0	0	1	1	1	0	3
China	1	1	1	0	0.5	1	4.5
Hong Kong, China	0	0	1	1	0.5	0	2.5
Indonesia	1	1	1	0	0.5	0.5	4
Japan	0	1	1	0	0	0.5	2.5
Korea	0	1	1	0	0	0.5	2.5
Malaysia	1	1	0	0	0.5	0	2.5
Mexico	0	1	1	0	0	0	2
New Zealand	1	0	1	0	0.5	0	2.5
Peru	0	1	1	0	0.5	0	2.5
Philippines	0	1	1	0	0.5	1	3.5
Russia	1	1	1	0	0.5	1	4.5
Singapore	1	0	0	0	0	0	1
Chinese Taipei	1	1	1	0	0	0.5	3.5
Thailand	1	1	0	0	0.5	0	2.5
United States	0	1	0	0	0	0	1
Viet Nam	1	1	1	0	1	0.5	4.5

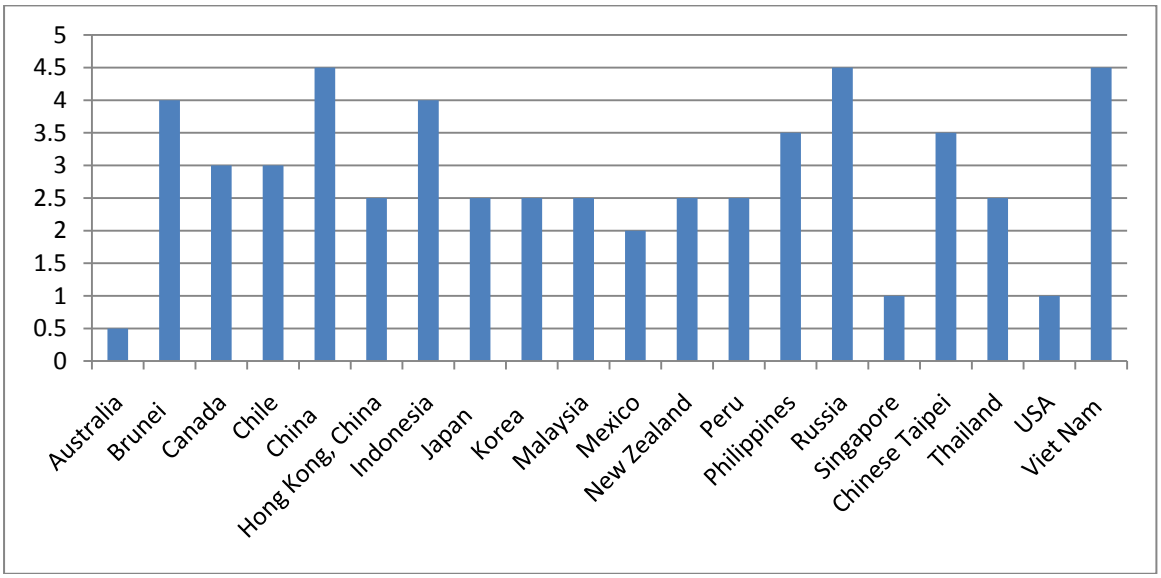


Figure 4.2: The alternative policy indices.

4.4 IMPACT OF POLICY ON TRAFFIC FLOWS

A relationship is expected between passenger and cargo traffic flows and the policy environment, other things being equal. More restrictive regimes would be associated with low traffic movement. This relationship has been estimated using a gravity model which is widely used for predicting bilateral trade flows. The form of the model used in this study is:

$\ln(\text{traffic})=\beta_0+ \beta_1\ln(\text{GDPpc1})+ \beta_2\ln(\text{GDPpc2})+ \beta_3\ln(\text{pop1})+ \beta_4\ln(\text{pop2})+ \beta_5\ln(\text{area1})+ \beta_6 \ln(\text{area2})+ \beta_7 \ln(\text{distance})+ \beta_8\text{index1}+ \beta_9\text{index2}+ \text{other dummies} +\varepsilon$

Due to difficulty in gathering the traffic data at the economy level, the 2008 ICAO city-pair passenger and cargo traffic data has been used. The dependent variable is air traffic (passenger numbers and cargo volume respectively) carried from the capital city of economy 1 to that of economy 2. The capital cities can be either a political centre or a major commercial centre of an economy. As major political and commercial centres are usually the gateways through which an economy's residents travel internationally, it is appropriate to use an economy's GDP per capita in the model with 1 denoting the departure economy and 2 denoting the destination economy. Likewise, pop1 and pop2 denotes the populations of the original economy and arrival economy respectively, representing the sizes of the economies. The GDP and population data are from the World Development Indicators Database, World Bank (July 2009).[11] It is expected that GDP per capita and population variables are positively linked to the traffic flows. Land area variables (area1 and area2) are also included on the right hand of the equation. In large economies, there are usually two or more international cities, and the use of traffic flows between the major capital cities may underestimate the movement of people and goods. Therefore, land area variables should have negative signs. The land area data can be found in the CIA World Factbook.[12]

The distance variable is also included and should have an inverse relationship with the traffic flow in a typical gravity model. The departure and arrival economies' air transport policy indices (index1 and index2 respectively) developed earlier in this paper, which are the main interest of this study, are included together with the following regional dummy variables: Northeast Asia, North America and ASEAN. The Northeast Asia dummy represents traffic movement between cities within China; Korea; and Japan. Similarly, the North America dummy takes value 1 when the traffic is carried between two cities within the USA; Canada; and Mexico. The ASEAN dummy is used to see if the traffic flows within the Southeast Asian region are higher or lower than other regions, *ceteris paribus*. An FTA dummy is included if two economies have signed a Free Trade Agreement. As with many other studies using gravity models, a common border dummy is used in the equation.

The estimation results are reported in Table 4.6. Robust standard errors are reported to accommodate a possible heteroskedasticity problem. The effects of the policy indices are statistically significant at the 5% level with expected negative signs, that is, higher restrictiveness in aviation policy leads to lower levels of movement of people and goods between international cities. The impact of the policy on cargo flows is greater than on the movement of people. On average, if the policy value of the departure economy were to decrease by 1 point at the current values of the policy index and of passenger flows, the passenger traffic would increase by 36%, whereas the decrease in policy value of the

[11] Available at http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20535285~menuPK:1192694~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html, accessed on 16 March 2010.

[12] Available at https://www.cia.gov/library/publications/the-world-factbook/, accessed on 1 March 2010.

Table 4.6: Impact of the policy index (the first set).

	Dependent variable: passenger		Dependent variable: cargo	
	Coefficient	Robust std. err.	Coefficient	Robust std err
Constant	11.773***	1.663	16.573***	4.094
pop1	0.274***	0.043	0.593***	0.119
pop2	0.248***	0.046	0.436**	0.115
GDPpc1	0.131	0.108	-0.188	0.147
GDPpc2	0.267***	0.096	0.145	0.156
area1	-0.172***	0.020	-0.451***	0.063
area2	-0.152***	0.024	-0.358***	0.051
index1	-0.358***	0.098	-0.797***	0.173
index2	-0.230**	0.109	-0.685***	0.164
Distance	-0.403***	0.110	-0.543**	0.256
Northeast Asia	0.472	0.277	1.301**	0.483
North America	-0.470***	0.159	-1.384***	0.483
ASEAN	-0.786**	0.345	-1.936***	0.449
FTA	0.185	0.134	0.008	0.274
Border	0.015	0.209	-0.320	0.457
R^2	0.55		0.63	
Observations	152		146	

All variables except index1, index2 and dummies are expressed in natural logarithms. *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

destination economy by 1 point leads to an increase in passengers carried by 23%. The magnitudes are 80% and 69% respectively for the transport of freight at current values of both the index and freight volumes. This shows that both departure and arrival economies' air transport policies matter in promoting the movement of people and goods. When the index1 and index2 variables take logarithmic form, the coefficients are 0.64 and 0.44 for passenger movement equation and 1.44 and 1.32 for cargo movement, all with negative signs.[13] The elasticities of policy indices show that the cargo flows are more sensitive to the change in policy.[14]

The variables of population, land area and distance also have the expected signs and are statistically significant at the 5% level for both passenger and cargo traffic models, as can be seen from Table 4.4. Destination economy's GDP per capita is significant in the model, using passenger traffic as the dependent variable. However, the FTA and common border dummies are not significant for both models – in fact, the common border dummy is not consistently significant in other studies such as Geloso Grosso (2008).

Interestingly, cargo movement within Northeast Asia is significantly higher (at the 5% level) after other variables are controlled for, indicating the close economic ties between those three economies. It is a different story for the North America and ASEAN dummies, where the coefficients are significant but with negative signs. The possible explanation might be that in North America there are many international cities and the choice of looking at the traffic between the major capital cities in this study (Vancouver, Toronto, New York, Los Angeles, Chicago and Mexico City only) obviously understates the true traffic movement in this region. Surface transport also plays an important role in this region. The negative sign for the ASEAN dummy might suggest that there is room for taking action to promote the movement of people and goods in Southeast Asia.

[13] The coefficients of other variables are similar to those in Table 4.6, but are not reported here. They can be provided on request. The elasticity magnitude is greater than estimated by Geloso Grosso (2008) whose index is based on the ICAO Air Services Agreements.

[14] It is worth noting that the use of the 2008 traffic data may underestimate the effects of the air transport policy. The long-run effect could be even higher.

The regression was re-estimated by replacing the first set of policy index with the alternative policy index (variables aindex1 and aindex2) and the results are reported in Table 4.7. For both regressions, the indices of departure and arrival economies are statistically significant. However, the magnitudes do not too greatly differ from those reported in Table 4.6, although the scales of the two sets of policy indices are different (only six indicators in the alternative index). The coefficients of other control variables are largely consistent.

Table 4.7: Impact of the alternative policy index.

	Dependent variable: passenger		**Dependent variable: cargo**	
	Coefficient	Robust std err	Coefficient	Robust std err
Constant	11.479***	1.590	16.945***	4.156
Pop1	0.273***	0.046	0.608***	0.117
Pop2	0.255***	0.042	0.450***	0.116
GDPpc1	0.176**	0.072	-0.212	0.173
GDPpc2	0.193**	0.084	0.019	0.169
area1	-0.162***	0.020	-0.429***	0.085
area2	-0.149***	0.020	-0.341***	0.051
aindex1	-0.224***	0.059	-0.688***	0.181
aindex2	-0.284***	0.065	-0.728***	0.152
Distance	-0.387***	0.114	-0.531*	0.262
Northeast Asia	0.372	0.283	1.029**	0.524
North America	-0.553***	0.150	-1.571***	0.454
ASEAN	-0.645*	0.350	-1.551***	0.459
FTA	0.265**	0.124	0.138	0.267
Border	0.146	0.191	-0.070	0.438
R^2	0.54		0.63	
Observations	152		146	

All variables except index1, index2 and dummies are expressed in natural logarithms. *, **, and *** denote significance at the 10%, 5% and 1% level, respectively.

4.5 CONCLUSION

This paper has summarised the air transport policies of 20 APEC economies by constructing two sets of policy indices. The policy measures show wide variation between economies and in some cases the data indicate that the policy regimes are relatively restrictive. Our gravity model using cross-sectional data suggests that liberalisation is significantly and positively associated with the movement of people and goods. Passenger travel is clearly hampered by restrictive air transport policies.

It is important in future work to break down the cost and profit effects of policy reform, since their relative sizes affect the welfare gains from reform. Because of the restrictions imposed by current arrangements on network design, the cost effect of restrictions in air transport is likely to be significant. This adds to the gains from reform, compared to that of reform of measures that act mainly as barriers to entry and create profits. This analysis is vital in the next stages of policy design. It can help build the momentum for change and provide guidance on its direction. The creation of the EU single aviation market and the recent development of ASEAN's single aviation market suggest that the likely next steps in reform will be plurilateral, which will be especially valuable if the costs of the constraints on network design are as significant as expected.

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Chapter 5

QUANTIFYING THE BENEFITS FROM STRUCTURAL REFORMS IN RAILWAY TRANSPORT MARKETS IN APEC ECONOMIES

Pedro Cantos,[1] José M Pastor[2] and Lorenzo Serrano[2]

- Productivity has increased in a sample of rail systems among APEC economies: the average rate of productivity change for APEC rail systems rose by 3.5% per year
- However productivity growth in non-APEC economies productivity rose by 4.8% per year, indicating the scope for further gain in the APEC group.
- Nearly all the productivity growth in rail in APEC economies is associated with technical change and not with changes in efficiency.

5.1 INTRODUCTION

During the past 50 years the most common market structure in many economies' rail sectors was a single, publicly-owned firm entrusted with the unified management of both infrastructure and services. Despite some differences in their degree of commercial autonomy, the traditional methods of regulation and control of this sort of company have been relatively homogeneous. In general, it was assumed that the monopoly power of the national company required price and service regulation to protect the general interest. In addition, there was an obligation, often referred to as 'common carrier' status, on the part of the companies to meet any demand at those prices. The closure of existing lines or the opening of new services required government approval. Thus, competition was rare and often discouraged, and the preservation of the national character of the industry was considered the key factor governing the overall regulatory system.

Under this protective environment, most national rail companies incurred growing financial deficits during the 1970s and 1980s. Furthermore, social obligations to their staff made it nearly impossible to reach any agreement on redundancies or even wage adjustments. In some economies the companies were forced to finance their deficits by borrowing, so their accounts lost all resemblance to reality. The main problems associated with the traditional policies for railways were increasing losses, which were usually financed by public subsidies, a high degree of managerial inefficiency and business activities oriented exclusively toward production targets rather than commercial and market targets.

These distortions did not come from any artificial reduction in the range of services provided or from excessively high fares but, more commonly, from an unjustified increase in the supply of services (and where costs exceeded revenues). Such behaviour implied larger public subsidies. In many cases, the lack of commercially oriented tariffs and investment policies explained many of the difficulties faced by the companies. Together with the burden imposed by the

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technical characteristics of the sector, this placed most railways in a very weak position to compete against alternative transport modes. However, fierce intermodal competition alone was not able to improve the competitiveness of the railway system, it was necessary to adopt measures affecting the internal behaviour and structure of the sector itself. Therefore, the sector's overall decline sparked a widespread, restructuring movement around the world.

The worldwide restructuring process of the rail industry began with timid reforms. Many economies began by replacing their railways with autonomous commercial bodies possessing independent, realistic balance sheets, in which only public service obligations could be explicitly subsidised by the government. Other economies opted to substitute their old geographically based management with a multi-divisional structure, defined by the companies' different lines of business or services.

Some economies have carried out relatively long-term restructuring whereas others have preferred a quicker implementation. For example, privatisation in New Zealand and Japan was phased in over several years, while in Argentina and the United Kingdom it took less than 2 years. Yet a common characteristic is that all restructuring processes were undertaken to make the companies attractive to private investors, although full privatisation has been less preferred than concessioning.

The changes have involved the revision of laws and other regulations affecting railways: reducing staff, dealing with pension issues and deciding how much property should be sold and how much should be retained by the government. In addition, several arrangements for paying for unprofitable (but socially needed) train services were put into place, together with a precise definition of the concession contracts and their main terms.

With regard to results, in general most of the restructuring experiences detailed below seem to have been positive. The objectives of stopping the industry's drain on public sector resources, along with the stabilisation of market share for both passengers and freight, were achieved in most economies. Likewise, the companies succeeded in raising their levels of productivity.

The objective of this paper is to assess the effectiveness of the main restructuring measures in the world rail sector, with special emphasis in the assessment of the national rail networks of the Asia-Pacific Economic Cooperation (APEC) economies. The study is based on a sample of European and APEC economies with data for the period from 2001 to 2008, and uses non-parametric techniques (DEA and the Malmquist productivity index) to calculate indexes of productivity growth, while also disaggregating their various components. This latter aspect is important, as we aim to determine the impact of changes in the sector, not only in efficiency but also in the overall evolution of productivity and its components (technical change and changes in efficiency).

The results of the work show that, on average, productivity, efficiency and technical changes are slightly lower for APEC members' rail systems than for other national rail systems. In particular, the average rate of productivity change for APEC rail systems rose by 3.5% per year, while for non-APEC economies it rose by 4.8%. We also find that the productivity improvements are mainly explained by the technical change, while changes in efficiency are less relevant. In particular, for APEC member economies our results show that no rail system, except Viet Nam, improved its efficiency. Finally, APEC member economies improved, on average, their rate of technical change by 3.2% while non-APEC economies improved by 3.7%.

The paper is structured as follows: Section 5.2 briefly describes the restructuring measures for the world rail industry; Section 5.3 provides a short review of the literature; Section 5.4 presents the methodology, the data used in the study and estimations of productivity growth and its components; and Section 5.5 presents the main conclusions.

5.2 RESTRUCTURING MEASURES FOR THE RAIL INDUSTRY

Despite all these changes, the most salient characteristic of the restructuring process of the rail industry in the last decades has been the consolidation of different and alternative organisational structures for the industry as a whole. These structures differ in three main features to be analysed in detail: how access and infrastructure and multimodal competition are considered; what extent of vertical separation is introduced after the change; and what degree of competition (and private participation) is allowed in the industry after the reform.

The next subsections are devoted to describing the main restructuring measures undertaken in the vertical and horizontal dimensions.

5.2.1 The degree of vertical separation

The management of rail infrastructure not only includes simple pricing principles, it also encompasses access rights and long-term development provisions. Each economy addresses these matters differently: while most have opted to retain infrastructure in public hands, creating government management agencies to regulate private train operators, others have established nominally independent (actual control from political independence varies) but government-owned enterprises to manage stations and tracks.

One of the most clearly defined patterns emerging from deregulation and restructuring is that they carry out two critical dimensions: the degree of vertical separation between infrastructure and services and the promotion of competition within the sector. With respect to the first dimension, there are three main options for the vertical organisation of the railway industry: vertical integration, competitive access and vertical separation.

The first option of vertical integration corresponds to the traditional, historical model of railway organisation described above, where a single (usually public) entity controls all the infrastructure facilities as well as the operating and administrative functions. Less frequent competitive access is characterised by the existence of an integrated operator, who is required to make rail facilities (tracks, stations etc.) available to other operators on a fair and equal basis through the trading of, for example, circulation rights. This has the advantage of integration (economies of scope, coordinated planning and reduction of transaction costs) but its overall effectiveness may be jeopardised if the integrated company has incentives to leave out other operators.

Alternatively, in the complete vertical separation scenario, the management (and possibly the ownership) of facilities is fully separated from other rail functions. This is very attractive because, although infrastructure may remain a natural monopoly, it is separated from rail services, where potential competition among different operators is possible. In general, the main advantage of this vertical unbundling is that rail transport is placed in a similar situation to road transport, especially regarding the tariff system and infrastructure planning. Investment proposals could be studied on the basis of a cost-benefit analysis, while pricing policies could be based on social cost. In addition, separating infrastructure from services greatly facilitates the entry of more than one operator in a single route. For profitable services

this would permit notable improvements in efficiency by allowing direct competition among operators. For non-profitable services, infrastructure separation can be accompanied by tendering to stimulate increased efficiency through competition for the market, the introduction of innovations and marketing improvements.

However, the vertical unbundling of the rail industry also implies several disadvantages. The main problem is the potential loss of economies of scope derived from the joint operation of tracks and services. It is often noted that the relationship between the services supplied and the rolling stock used, as well as the quality, quantity and technical characteristics of the infrastructure, is so close that both aspects need to be planned together. Thus, assigning different services to several operators may decrease the utilisation of the sector's staff and physical assets. Also, the new system may become less attractive to the user than an integrated system because of the lack of interchangeable ticketing, the absence of an integrated national network and the high risk. Vertical separation may also require such a complex institutional arrangement that the resulting transaction costs may be prohibitive for many economies. A final consideration with vertical separation is the reduction of investment incentives. For example, an infrastructure owner considering an investment in a facility with only one potential buyer will anticipate bargaining away some of the benefit from the new service once it comes on line. This problem becomes less relevant with more competition in the market, since competition weakens the bargaining position of individual operators by reducing the specificity of the assets.

5.2.2 Promotion of competition (horizontal dimension)

Reforms to the horizontal dimension have been very different all over the world. Horizontal level reforms in Europe have been very moderate and have consisted mainly of new operators entering the freight sector and of a franchising system in passenger services. In contrast, there are many instances across the world where some of these measures have been undertaken.

Although it is accepted that infrastructure (characterised by its high levels of sunk costs) may be managed under monopoly conditions, competition can be introduced into operations in two different ways. The first option consists of directly facilitating the free entry of new companies into the railway network. This can be done in either passenger transport or freight transport sectors, but, it has been much more usual in the latter.

The alternative is to foster competition for the market by means of a franchising or concessions system in which the franchised companies compete for the right to use the infrastructure during a certain period of time, which is in all cases notably shorter than the infrastructure concession period. This second option has proved to be very attractive in the European context, in which many railway services are heavily subsidised.

However, this new structure can also have serious drawbacks. As Nash and Rivera-Trujillo (2004) point out, the entry of various companies using the same infrastructure leads to obvious problems in a schedule design that must efficiently assign slots among companies and operations and at the same time satisfy all of them. These problems significantly affect service quality, since coordination is lost as a result of the separate management of infrastructure and operations.

Table 5.1 summarises the features of the APEC rail networks. We observe that China; Malaysia; the Philippines; Chinese Taipei; and Viet Nam maintain a vertically integrated structure without introducing horizontal reforms. Canada; Japan; and the USA maintain a

vertically integrated industry but allow the entry of new rail operators, and the rest of the rail systems have fully separated the infrastructure and the rail operations. Finally, some economies like Chile; Mexico; Peru; and Russia have introduced franchising systems and free open systems in their rail networks, while Canada; Japan; and the USA have only reformed the sector at horizontal level by allowing the free entry of new operators.

Table 5.1: The main features of APEC members' rail networks.

	Vertical dimension			Horizontal dimension	
APEC member	**Integrated monopoly**	**Competitive access**	**Vertical unbundling**	**Franchising system**	**Entry new operators**
Canada		✓			✓
Chile			✓	✓	✓
China	✓				
Indonesia			✓		
Japan		✓			✓
Korea			✓		
Malaysia	✓				
Mexico			✓	✓	✓
Peru			✓	✓	✓
Philippines	✓				
Russia			✓[1]	✓[2]	✓[1]
Chinese Taipei	✓				
Thailand	✓				
USA		✓			✓
Viet Nam	✓				

Note: [1] Implemented in 2003; [2] Implemented in 2006

5.3 LITERATURE REVIEW

There are many studies in the literature analysing productivity and efficiency in the railway sector. However, most of the vertical, and particularly horizontal, separation processes have taken place in recent years, and as a result there is very little conclusive empirical evidence on the effects of these processes on productivity and efficiency. Furthermore, most of the studies are focused on analysis in the European rail network; there are few studies devoted to other, and different, experiences.

In general terms, the first studies in this field (see Gathon & Perelman 1992; Oum & Yu 1994; Gathon & Pestieau 1995) indicated that the economies with the most liberalised railway sectors were the most efficient. An excellent survey can be found in Oum et al. (1999) covering many of the results obtained in the previous literature.

Likewise, more recent studies have obtained similar results. Cantos et al. (1999; 2010) also conclude that rail operators with a higher degree of autonomy and independence are the most efficient, are more technologically advanced and achieve higher gains in productivity. Similarly, Cantos and Maudos (2001) estimate efficiency in costs and revenue, and show that companies need to move towards more commercial policies that also encourage their competitiveness.

Friebel et al. (2005) carried out an initial analysis of some of the restructuring measures in the sector for the 1995–2000 period, focusing on measures designed to separate the industry vertically. Their results suggest that, in general, the reforms have furthered more efficient behaviour; however, these reforms must be carried out sequentially if they are to be effective. In addition, Driessen et al. (2006) study the efficiency of a sample of European companies for

the period 1990–2001. These authors do not come to a decisive conclusion on the impact of vertical separation of infrastructure and operations. They find that vertical separation does not seem to be necessary to achieve an increase in productive efficiency, although tendering processes do appear to favour an increase in efficiency. In all events, these authors recognise certain data definition problems and particularly acknowledge that many of the predicted effects may still not have been in evidence, since the sample period ended in 2001.

Positions supporting disparate opinions on the efficiency of separating infrastructure and operations are therefore not difficult to find. Evans (2003) states that the process leads to gains in efficiency, transparency and greater competition. Other authors such as Pfund (2003) believe, however, that the disadvantages clearly outweigh the benefits of separation. In the same vein, as noted above, the initial empirical studies to approach the subject (Friebel et al. 2005; Driesden et al. 2006) provide no conclusive results.

Very little analysis has been conducted on the changes stemming from the horizontal restructuring of the industry. In particular, Driessen et al. (2006) find that processes of competition for the market (through concessions) encourage efficiency more than processes that foster competition in the market (through free entry), and that greater managerial independence does not encourage greater efficiency. These results contradict those from the previous literature (Gathon & Pestieau 1995; Cantos et al. 1999; Friebel et al. 2005).

Recent works have evaluated some of these reforms, particularly in those economies that have advanced more in these types of measures. Mulder et al. (2005) used an analysis on the basis of cost-benefit techniques in order to evaluate the efficiency of the reforms in the railway industry in the Netherlands. Their results indicate that separating the industry vertically is beneficial when competition is increased in an efficient way in the sector. Furthermore, the authors show that the introduction of competition in the freight sector has increased both efficiency and performance. Passenger transport, however, has had difficulties in realising historical performance levels. Similarly, in the case of the franchising process in passenger services in Sweden, Alexandersson and Hultén (2005) note some significant problems associated with very low bids in tenders, and the very low number of firms that compete in each tender. Some of these problems have also been observed in the Australian experience (Kain 2006).

To sum up, results from the majority of studies indicate that most of the reforms have made railway systems more efficient and productive (Cantos et al. 2010). However, a greater effort is still required in order to delineate the relevance and significance of each measure.

5.4 RESULTS

Before presenting the results, we must stress that the railway systems included in the sample vary significantly in terms of technology and quality of service. The comparison of their efficiency levels can therefore lead to misleading or confusing conclusions. For this reason, we will focus our results on the changes in productivity, efficiency and technical change and compare these changes mainly between the APEC economies and other economies. Our methodology is described in the Appendix.

Figure 5.1 shows the accumulated productivity index since 2001. Table 5.2 shows the productivity change for pairs of consecutive years as well as the average for the whole period. Results show that between 2001 and 2005, productivity growth was similar between APEC member economies and other economies. In 2006 the productivity for the non-APEC

railway systems increased at a clearly higher rate than the rate for the APEC economies (12.1% against 0.3%). In the following 2 years productivity increased more for the APEC economies. On average, productivity for APEC economies rose by 3.5% per year, while for non-APEC economies productivity rose by 4.8%.

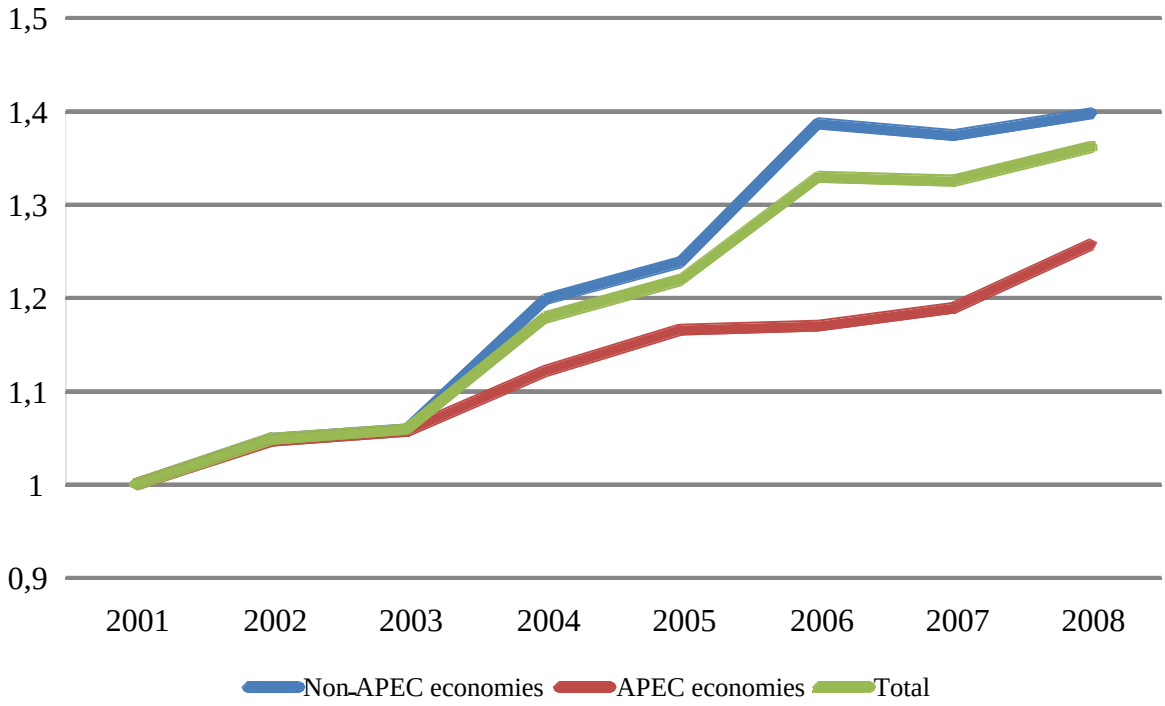

Figure 5.1: Productivity change (2001=1).

We then decompose the productivity change between efficiency changes and technical change in order to analyse the causes of the productivity changes. As we see in Figure 5.2, until 2005 the evolution of efficiency is similar, but in 2005 the efficiency notably improved for non-APEC economies, which partially explains the increase in productivity for these economies. But the efficiency of non-APEC economies decreased in 2007: the rates are again similar between the two groups of economies for the last year of the sample. At aggregate level, there were no significant efficiency improvements for APEC economies, while efficiency improved by 1.4% per year for non-APEC economies.

Regarding technical change, Figure 5.3 shows that the differences are not significant between the two groups of economies. However, from 2005 the technical change improved at a higher rate for non-APEC economies. At aggregate level, technical changes for APEC economies increased by 3.2% per year, while for non-APEC economies productivity increased by 3.7%.

Table 5.2 analyses the annual results per economy for pairs of consecutive years in terms of productivity. The last column expresses the average outcome over the whole sample period per economy.

Regarding productivity change, we can observe that the Russian Federation; Viet Nam; and China have the highest rates, while Chinese Taipei and Korea have the lowest. At aggregate level, APEC economies obtained an average increase of 3.5%, while non-APEC economies obtained an average increase of 4.8%.

Table 5.2: Productivity change.

Economy	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	Average 2001–08
Austria	1,056	1,055	1,042	0,950	1,088	1,006	1,064	1,037
Belgium	1,067	1,006	1,085	1,042	1,116	0,977	0,999	1,042
Bulgaria	0,919	1,095	1,058	1,025	1,000	1,015	0,910	1,003
Czech Republic	0,990	1,016	1,002	0,991	1,138	1,048	0,948	1,019
Denmark	0,808	0,914						0,861
Estonia	1,127	1,031	1,064	1,131	1,066	0,791	0,804	1,002
Finland	1,043	1,071	1,320	0,856	2,417	0,465	1,060	1,176
France	1,070	1,030	0,994	0,666	1,640	1,029	1,087	1,074
Germany	0,992	0,854	1,281	0,923	1,019	1,007	1,004	1,012
Greece	1,099	0,889	1,114	1,162	1,040	1,159	1,086	1,078
Hungary	1,009	1,098	1,118	1,006	1,139	0,966	0,964	1,043
Ireland	1,018	1,007	0,989	1,190	1,057	1,143	1,458	1,123
Italy	1,006	0,961	1,029	0,985	1,014	1,010	0,985	0,999
Latvia	1,122	1,203	0,975	1,132	0,877	0,968	1,059	1,048
Lithuania	1,266	1,194	1,019	1,101	1,041	1,016	0,992	1,090
Luxembourg	0,876	0,981	1,026	0,852	1,117	0,848	0,994	0,956
Netherlands	1,152	1,083						1,118
Norway	0,999	1,225						1,112
Poland	1,010	1,085	1,008	0,958	0,970	1,022	0,958	1,002
Portugal	1,137	1,012	1,074	1,043	1,122	1,049	1,049	1,070
Romania	0,915	1,091	1,052	1,102	0,915	1,046	0,821	0,992
Slovak Republic	0,963	0,971	1,009	0,965	1,065	0,979	1,005	0,994
Slovenia	1,084	1,180	1,056	1,007	0,987	1,047	1,013	1,053
Spain	1,056	1,021	1,010	2,076	1,035	1,010	1,098	1,187
Sweden	1,458	0,291	2,722	0,424	0,896	1,042	1,019	1,122
Switzerland	1,049	0,911	0,948	1,158	1,031	1,131	1,042	1,039
Canada	0,999	1,047	1,088	1,011	1,016	0,979	1,018	1,023
China	1,050	1,022	1,108	1,042	0,931	1,071	1,160	1,055
Japan	1,013	1,055	0,992	1,020	1,023	1,014	1,037	1,022
Korea	0,981	1,019	0,995	0,998	1,006	1,010	1,014	1,003
Russia	1,210	1,099	1,000	1,079	1,037			1,085
Chinese Taipei	0,963	0,903	1,068	1,023	0,984	0,957	0,978	0,982
USA	1,028	1,035	1,050	1,106	1,028	0,994	1,011	1,036
Viet Nam	1,143	0,891	1,179	1,045	1,000	1,102	1,183	1,078
Total	1,049	1,010	1,112	1,034	1,091	0,997	1,027	1,045
APEC members	1,048	1,009	1,060	1,040	1,003	1,018	1,057	1,035
Non-APEC	1,050	1,011	1,130	1,032	1,121	0,990	1,018	1,048

Note: Blank cells correspond to missing data in the sample.

Table 5.3 presents the results for the efficiency change. The results show that China; Japan; Russia; and the USA were efficient during the whole period and thus cannot obtain efficiency changes. In any case, we observe again that, on average, APEC members' rail systems improved their efficiency level only by 0.2%, while non-APEC economies improved the efficiency scores by 1.4%.

Rates of technical change are expressed in Table 5.4. At aggregate level, we can conclude that APEC economies improved their rate of technical change an average of 3.2%, while non-APEC economies improved 3.7%. Distinguishing between economies, Russia obtains the highest score (8.5%), followed by China (5.5%) and the USA (3.6%). The reasons for this increase may be related in a higher investment in the technology of the railway infrastructure and rolling stock systems.

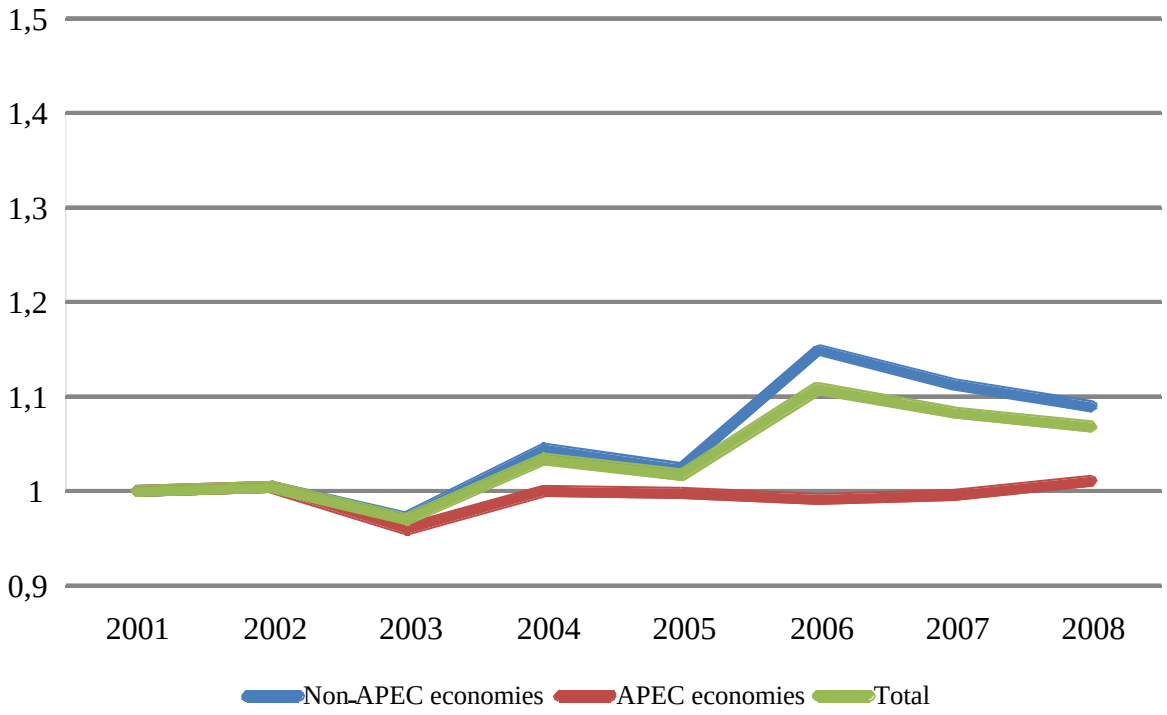

Figure 5.2: Efficiency change (2001=1).

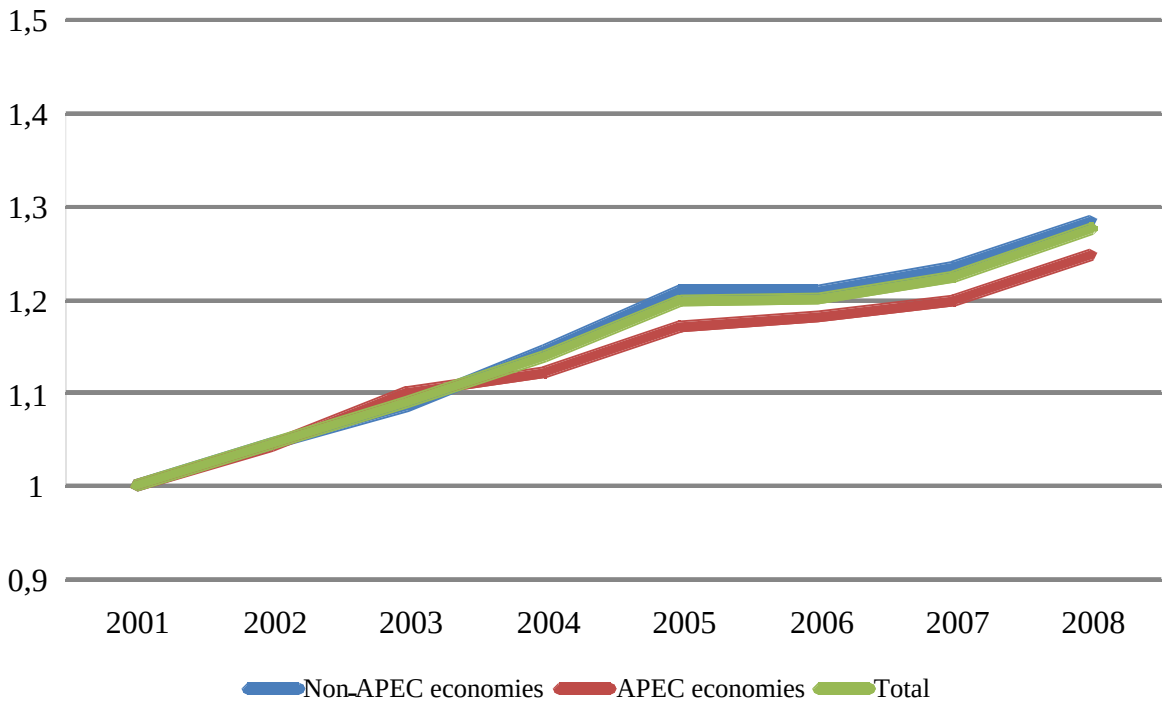

Figure 5.3: Technical change (2001=1).

From these results we conclude that productivity improvements are mainly explained by technical change, while changes in efficiency are less relevant. In particular, for APEC economies our results show that no rail system other than Viet Nam improved its efficiency significantly. Figures 5.4 to 5.6 summarise the results for each APEC member economy.

Table 5.3: Efficiency change.

Economy	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	Average 2001–08
Austria	1,024	1,027	0,987	0,896	1,068	0,974	1,014	0,999
Belgium	1,033	0,948	1,026	1,001	1,197	0,940	0,942	1,012
Bulgaria	0,892	1,043	1,002	0,969	0,967	0,991	0,858	0,960
Czech Republic	0,958	0,969	0,927	0,928	1,189	1,023	0,913	0,987
Denmark	0,753	0,845						0,799
Estonia	1,087	0,984	0,990	1,037	1,054	0,785	0,793	0,961
Finland	1,016	1,006	1,241	0,802	2,345	0,457	1,031	1,128
France	1,032	0,998	0,971	0,628	1,608	1,023	1,058	1,045
Germany	0,981	0,803	1,242	0,874	1,044	0,983	0,966	0,985
Greece	1,081	0,829	1,049	1,135	0,998	1,144	1,050	1,041
Hungary	0,990	1,032	1,083	0,945	1,108	0,964	0,932	1,008
Ireland	1,001	0,939	0,930	1,163	1,026	1,127	1,418	1,086
Italy	0,994	0,895	1,022	0,952	1,000	0,996	0,965	0,975
Latvia	1,098	1,158	0,951	1,044	0,866	0,928	0,991	1,005
Lithuania	1,224	1,129	0,966	1,011	1,023	0,992	0,961	1,044
Luxembourg	0,843	0,934	0,943	0,807	1,223	0,813	0,929	0,928
Netherlands	1,123	1,060						1,092
Norway	0,956	1,317						1,136
Poland	0,980	1,034	0,938	0,894	1,017	0,996	0,921	0,968
Portugal	1,117	0,945	1,011	1,015	1,078	1,036	1,016	1,031
Romania	0,889	1,034	0,999	1,037	0,918	1,034	0,792	0,957
Slovak Republic	0,920	0,932	0,929	0,917	1,155	0,937	0,940	0,961
Slovenia	1,049	1,128	1,010	0,948	0,973	1,029	0,972	1,016
Spain	1,037	0,954	0,950	2,023	0,994	0,997	1,062	1,145
Sweden	1,024	0,372	2,637	0,394	0,868	1,042	0,984	1,046
Switzerland	1,025	0,854	0,915	1,113	1,075	1,099	0,997	1,011
Canada	1,001	1,025	1,000	1,000	1,000	1,000	1,000	1,004
China	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Japan	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Korea	0,962	0,949	1,010	0,980	0,997	0,990	0,988	0,982
Russia	1,000	1,000	1,000	1,000	1,000			1,000
Chinese Taipei	0,961	0,828	1,153	1,007	0,972	0,943	0,964	0,975
USA	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Viet Nam	1,105	0,853	1,168	1,000	0,978	1,098	1,147	1,050
Total	1,005	0,965	1,066	0,985	1,088	0,978	0,987	1,011
APEC members	1,004	0,957	1,041	0,998	0,993	1,004	1,014	1,002
Non-APEC	1,005	0,968	1,075	0,980	1,121	0,970	0,978	1,014

Table 5.4: Technical change.

Economy	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	Average 2001–08
Austria	1,031	1,027	1,056	1,060	1,019	1,033	1,050	1,039
Belgium	1,033	1,060	1,058	1,042	0,932	1,040	1,061	1,032
Bulgaria	1,030	1,050	1,056	1,059	1,034	1,024	1,061	1,045
Czech Republic	1,034	1,049	1,081	1,067	0,957	1,024	1,038	1,036
Denmark	1,073	1,082						1,077
Estonia	1,037	1,049	1,075	1,090	1,012	1,007	1,014	1,041
Finland	1,027	1,065	1,064	1,068	1,031	1,018	1,028	1,043
France	1,036	1,032	1,024	1,060	1,020	1,006	1,028	1,029
Germany	1,011	1,064	1,031	1,057	0,976	1,024	1,040	1,029
Greece	1,017	1,072	1,063	1,024	1,042	1,013	1,034	1,038
Hungary	1,019	1,064	1,033	1,064	1,029	1,001	1,034	1,035
Ireland	1,017	1,072	1,063	1,023	1,031	1,014	1,028	1,035
Italy	1,011	1,074	1,007	1,035	1,014	1,015	1,020	1,025
Latvia	1,022	1,038	1,025	1,085	1,012	1,040	1,069	1,042
Lithuania	1,034	1,058	1,055	1,089	1,018	1,025	1,032	1,044
Luxembourg	1,039	1,050	1,088	1,056	0,913	1,044	1,069	1,037
Netherlands	1,026	1,022						1,024
Norway	1,045	0,930						0,988
Poland	1,031	1,050	1,074	1,072	0,954	1,027	1,041	1,035
Portugal	1,019	1,071	1,063	1,027	1,041	1,013	1,033	1,038
Romania	1,029	1,056	1,053	1,063	0,997	1,011	1,037	1,035
Slovak Republic	1,046	1,041	1,086	1,053	0,923	1,045	1,069	1,037
Slovenia	1,033	1,046	1,045	1,062	1,015	1,018	1,042	1,037
Spain	1,019	1,071	1,063	1,026	1,041	1,013	1,034	1,038
Sweden	1,425	0,783	1,032	1,078	1,032	1,000	1,036	1,055
Switzerland	1,024	1,066	1,036	1,040	0,959	1,029	1,046	1,029
Canada	0,998	1,022	1,088	1,011	1,016	0,979	1,018	1,019
China	1,050	1,022	1,108	1,042	0,931	1,071	1,160	1,055
Japan	1,013	1,055	0,992	1,020	1,023	1,014	1,037	1,022
Korea	1,020	1,074	0,985	1,018	1,009	1,020	1,027	1,022
Russia	1,210	1,099	1,000	1,079	1,037			1,085
Chinese Taipei	1,002	1,090	0,926	1,016	1,013	1,014	1,014	1,011
USA	1,028	1,035	1,050	1,106	1,028	0,994	1,011	1,036
Viet Nam	1,034	1,045	1,009	1,046	1,022	1,004	1,031	1,027
Total	1,045	1,044	1,045	1,053	1,003	1,019	1,041	1,036
APEC members	1,044	1,055	1,020	1,042	1,010	1,014	1,042	1,032
Non-APEC	1,045	1,040	1,053	1,056	1,000	1,021	1,041	1,037

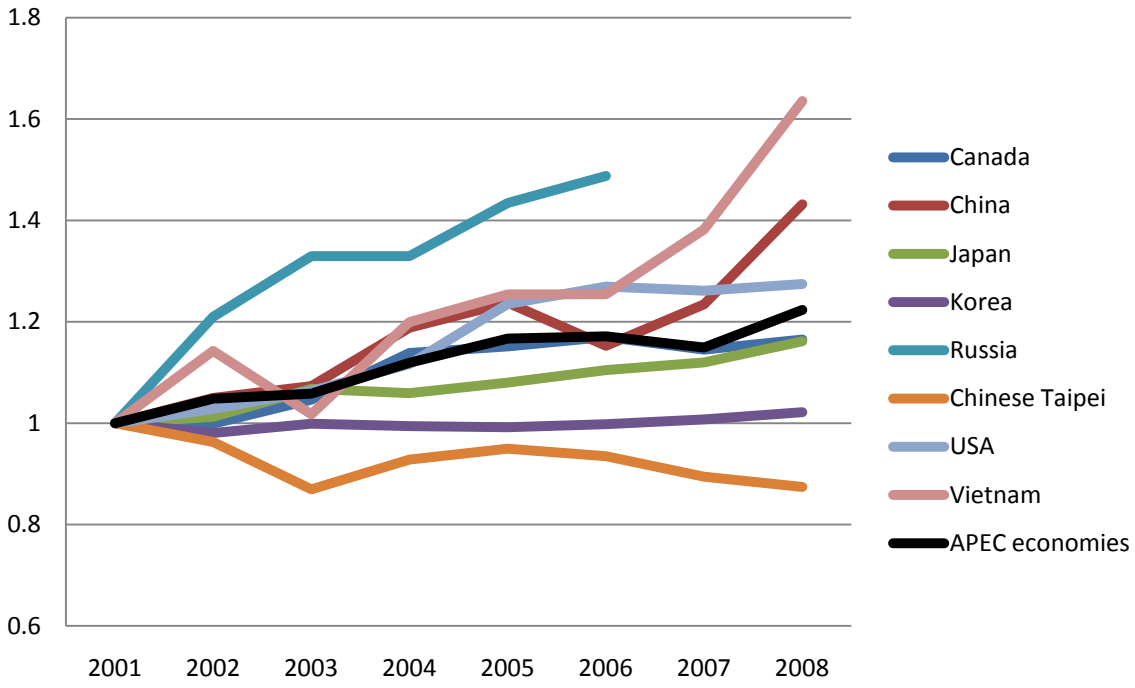

Figure 5.4: Productivity change for APEC economies (2001=1).

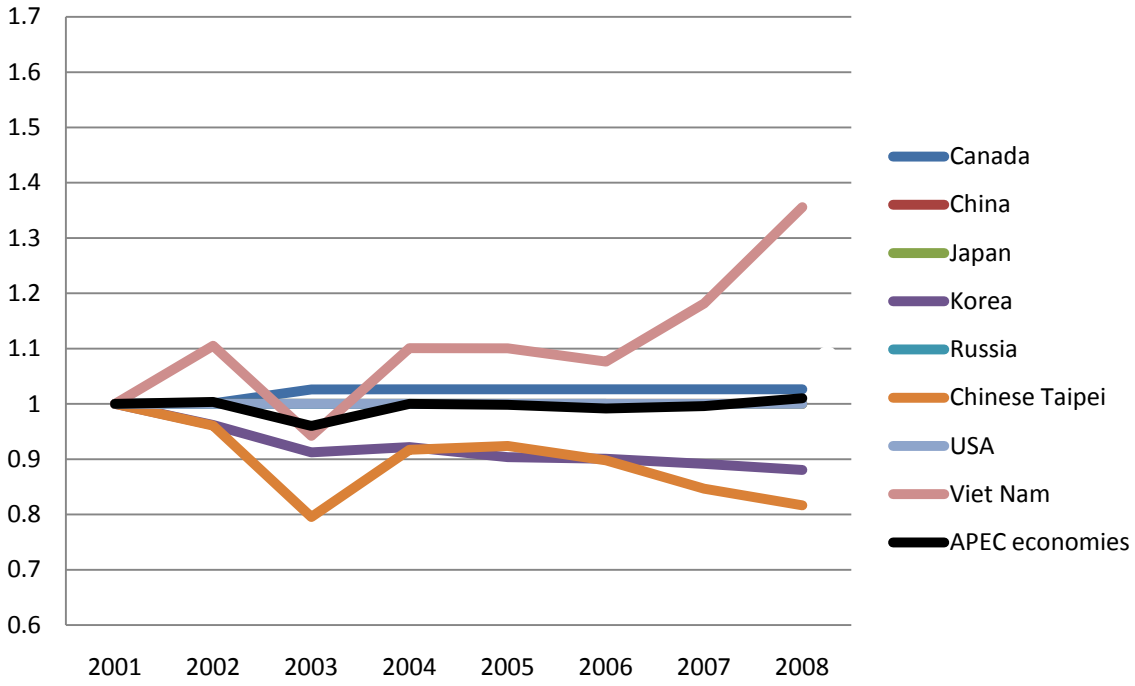

Figure 5.5: Efficiency change for APEC economies (2001=1).

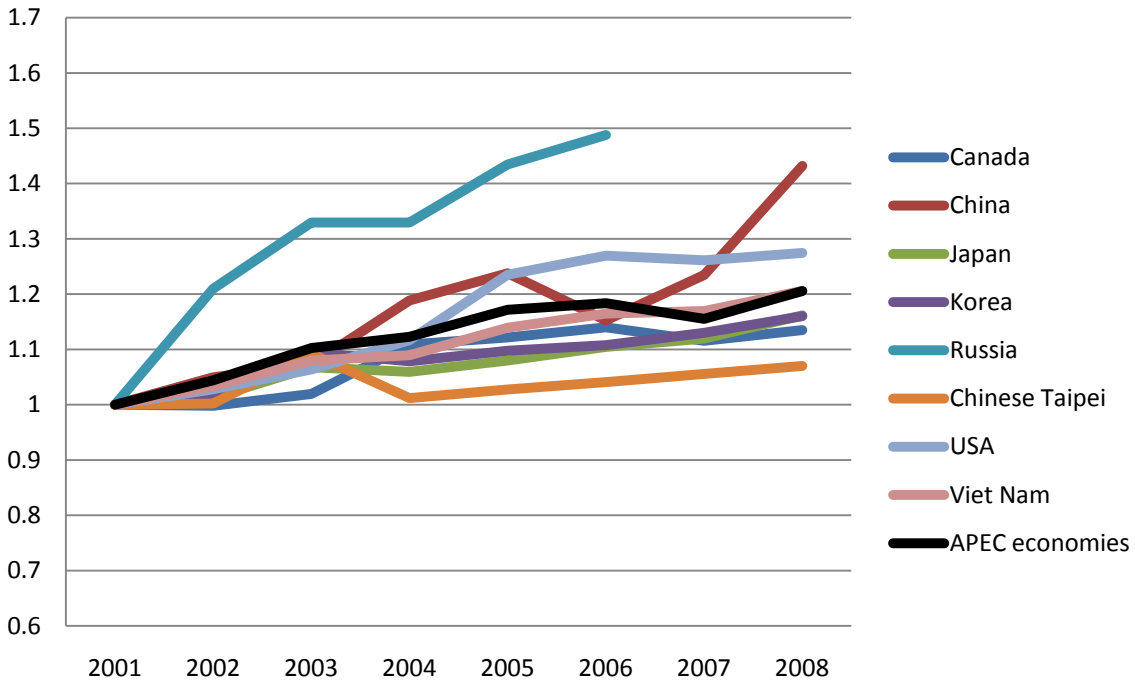

Figure 5.6: Technical change for APEC economies (2001=1).

5.5 CONCLUSION

We have estimated productivity change indicators for a sample of 34 railway systems during the period from 2001 to 2008. These indexes have been decomposed in efficiency changes and technical change. The methodology used to estimate these indexes has been the DEA approach. We must point out that, as the railway systems are very heterogeneous, it is very difficult to compare them individually.

We carried out a first analysis where APEC rail systems may be compared with non-APEC rail systems. The results show that, on average, the productivity, efficiency and technical changes are slightly lower for the APEC rail systems. In particular, the average rate of productivity change for APEC rail systems rose by 3.5% per year, while for non-APEC economies productivity rose by 4.8%. The Russian Federation; Viet Nam; and China showed the highest rates, while Chinese Taipei and Korea had the lowest.

However, China; Japan; and the USA were efficient during the whole period. In any case, we observe again that, on average and excepting Viet Nam, APEC rail systems did not improve their efficiency scores, while non-APEC economies did improve their efficiency scores by 1.4% per year.

Finally, APEC member economies improved, on average, their rate of technical change by 3.2%, while non-APEC economies improved by 3.7%.

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APPENDIX: METHODOLOGY

The Malmquist productivity index (Malmquist 1953) allows changes in productivity of railway companies to be broken down into changes in efficiency and technical change. Furthermore, it allows a different rate of technical change for each railway company. Also, if it is estimated using a non-parametric frontier model (data envelopment analysis; DEA), which is the most commonly used approach, it is not necessary to impose any functional form on the data or make distributional assumptions for the inefficiency term, unlike the Stochastic Frontier Approach (SFA). The main disadvantage of this approach is that the estimation of inefficiency may show an upward bias, capturing as inefficiency the influence of other factors, such as errors in data measurement, bad luck etc.

The Malmquist productivity index uses the notion of distance function, so its calculation requires prior estimation of the corresponding frontier. In this study we use the determinist DEA.

To illustrate the calculation of the Malmquist productivity index, let us assume that the transformation function that describes the technology in each period *t* is:

$$F^t(y^t, x^t) = 0; \quad t = 1, \ldots, T \qquad [1]$$

where $y^t=(y_1{}^t,\ldots,y_N{}^t)\in R_N{}^+$ is the output vector and $x^t=(x_1{}^t,\ldots,x_M{}^t)\in R_M{}^+$ the input vector corresponding to period *t*.

Following Caves et al. (1982), technology can be represented alternatively by means of the input distance function:

$$D^t(y^t, x^t) = Max\left[m^{t,t} : F^t\left(y^t, x^t / m^{t,t}\right) = 0\right] \qquad [2]$$

This function is defined as the maximum reduction to which it is necessary to subject the vector of inputs of period t (x^t), given the level of outputs (y^t), so that the new observation $(y^t, x^t / m^{t,t})$ is at the frontier of period *t*.

This function characterises completely the technology in such a way that $D^t(y^t, x^t) \geq 1$ if and only if $(y^t, x^t) \in F^t$. Furthermore, $D^t(y^t, x^t) = 1$ if and only if the observation stands at the limits of the frontier, which occurs when the observation is efficient in the sense used by Farrell (1957).

Figure A5.1 illustrates the above concepts for a situation with a single output and a single input. The observation (y^t, x^t) stands below the technological frontier of period *t*, which means that it is not technologically efficient. The distance function would be calculated as the maximum reduction in inputs, given the output, in such a way that the deflected input reaches the technological frontier. In the graph, this reduction in inputs would be represented by $x^{t,t} = x^t / m^{t,t}$. Farrell's output-oriented measurement of technical efficiency measures how much input could decrease, given the output.

In Figure A5.1 it can be observed that Farrell's measurement of technical efficiency for the observation (y^t, x^t) is $OD / OB = x^t / x^{t,t} = m^{t,t}$.

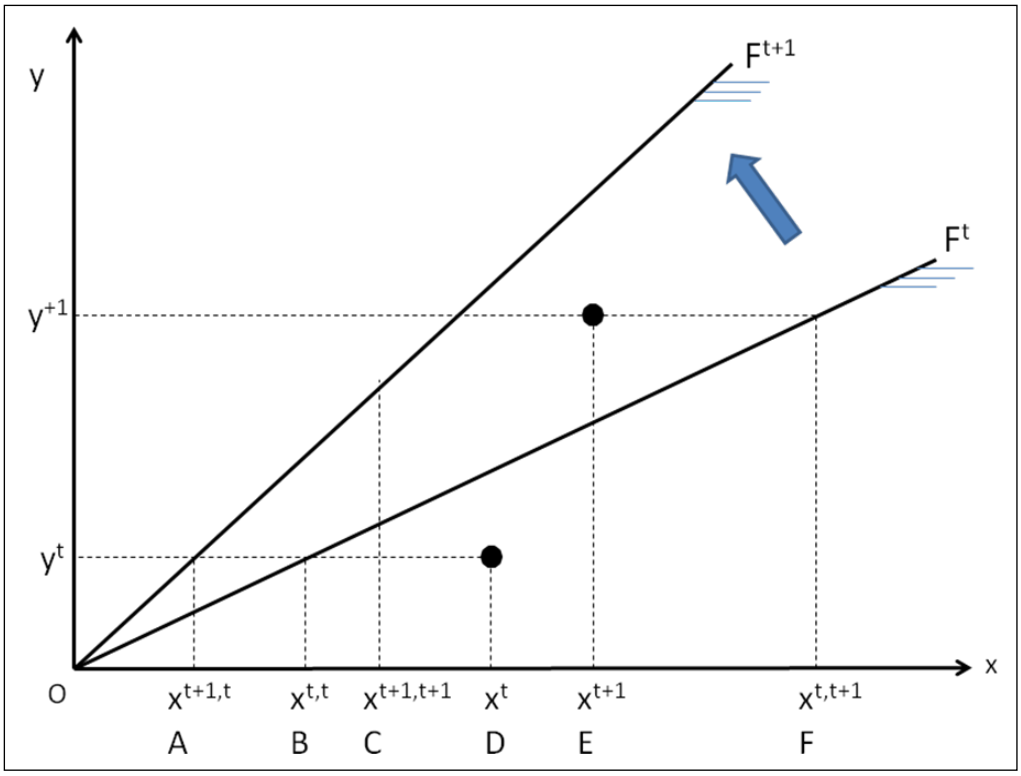

Figure A5.1: The input-based Malmquist productivity index.

Note that so far the distance function has been defined for a single period. Specifically, we have composed observations of one period with the technology of the same period. To define the Malmquist productivity index it is necessary to define distance functions with respect to technologies of different periods.

$$D^t\left(y^{t+1}, x^{t+1}\right) = Max\left[m^{t,t+1} : F^t\left(y^{t+1}, x^t / m^{t,t+1}\right) = 0\right] \qquad [3]$$

In the above expression, the distance function $D^t\left(y^{t+1}, x^{t+1}\right)$ measures the maximum proportional reduction in inputs, given the outputs, to make the observation of period t+1, $\left(y^{t+1}, x^{t+1}\right)$, feasible in period t. In the situation represented in Figure A5.1 the observation $\left(y^{t+1}, x^{t+1}\right)$ is outside the feasible set represented by the technology in t, so the value of the distance function will be lower than one $\left(OE / OF = x^{t+1} / x^{t,t+1} < 1\right)$.

In a similar way, it is possible to define the distance function of an observation in t, $\left(y^t, x^t\right)$, to make it feasible in relation to a technology current in t + 1, $D^{t+1}\left(y^t, x^t\right)$.

Note that when comparing observations of one period with technologies of different periods, the distance function may be less than unity. In particular $D^t\left(y^{t+1}, x^{t+1}\right)$ and $D^{t+1}\left(y^t, x^t\right)$ may be less than unity if there has been technical progress and technical regress, respectively. And note further that in the situation represented in Figure A5.1 $D^t\left(y^{t+1}, x^{t+1}\right) < 1$, indicates that there has been technical progress.

On the basis of the above concepts, the input based Malmquist productivity index used to analyse productivity change between periods *t* and *t + 1*, taking the technology of period *t* as reference, is defined as (see Caves et al. [1982]):

$$M^t\left(y^{t+1}, x^{t+1}, y^t, x^t\right) = \frac{D^t\left(y^t, x^t\right)}{D^t\left(y^{t+1}, x^{t+1}\right)} \qquad [4]$$

$M^t > 1$ indicates that the productivity of period *t + 1* is higher than that of period *t*, since the reduction of the input vector of period *t + 1* to reach the frontier of period *t* is higher than that applicable to the inputs of period *t*. But $M^t < 1$ indicates that productivity has decreased between period *t* and *t + 1*.

Alternatively, it is possible to define the Malmquist productivity index by taking the technology of period *t* + 1:

$$M^{t+1}\left(y^{t+1}, x^{t+1}, y^t, x^t\right) = \frac{D^{t+1}\left(y^t, x^t\right)}{D^{t+1}\left(y^{t+1}, x^{t+1}\right)} \qquad [5]$$

In this case the interpretation is similar. *Mt* > 1 indicates that the productivity of period *t* + 1 is higher than that of period *t*, since the reduction necessary in the inputs of the period *t* + 1 for the observation to be feasible in *t* + 1 is lower than that applicable to the inputs of period *t*.

In all the above definitions only two periods (*t* and *t* + 1) have been considered, and the definitions have been made taking as reference the technology of period *t* or *t* + 1. However, when we wish to analyse the productivity change for a longer time series, the use of a fixed technology may cause problems the further away we are from the base year. Also Moorsten (1961) shows that the choice of base year is not neutral in the results. To attempt to solve these problems two methodologies are offered. The first consists of calculating two indices based on pairs of consecutive years which take as base the technology of the two periods *t* and *t* + 1 and calculating the geometric mean of the two, thus allowing the technology of reference to change, minimising the problems caused by the change (Färe et al. 1994).

Another procedure, used by Berg et al. (1992) to solve the above-mentioned problems is to consider two frontiers of reference corresponding to the initial and final years and to take the geometric mean of the two Malmquist indices.

In this study we will use the first of the alternatives:

$$M(y^{t+1}, x^{t+1}, y^t, x^t) = \left[\left(\frac{D^t(y^t, x^t)}{D^t(y^{t+1}, x^{t+1})}\right)\left(\frac{D^{t+1}(y^t, x^t)}{D^{t+1}(y^{t+1}, x^{t+1})}\right)\right]^{1/2} \qquad [6]$$

Rewriting the above expression, it is possible to break down the Malmquist productivity index into the catching-up effect and technical change or movement of the frontier:

$$M(y^{t+1}, x^{t+1}, y^t, x^t) = \underbrace{\underbrace{\frac{D^t(y^t, x^t)}{D^{t+1}(y^{t+1}, x^{t+1})}}_{\text{Catching-up effect}} \underbrace{\left[\left(\frac{D^{t+1}(y^{t+1}, x^{t+1})}{D^t(y^{t+1}, x^{t+1})}\right)\left(\frac{D^{t+1}(y^t, x^t)}{D^t(y^t, x^t)}\right)\right]^{1/2}}_{\text{Technical change}}}_{\text{Productivity change}} \qquad [7]$$

The catching-up effect or change in relative efficiency between periods *t* and *t* + 1 is represented by the first ratio, which will be higher than unity if there has been an increase in efficiency. Similarly, the geometric mean of the two ratios between brackets measures the change or movement of technology between periods *t* and *t* + 1.

Recent developments in the Malmquist productivity index have included an additional component to measure the contribution of the output bias on Total Factor Productivity (Färe et al. 1997).

The above breakdown can again be illustrated using Figure A5.1.

$$M(y^{t+1}, x^{t+1}, y^t, x^t) = \underbrace{\underbrace{\frac{OD/OB}{OE/OC}}_{Catching-up\ effect} \underbrace{\left[\left(\frac{OE/OC}{OE/OF}\right)\left(\frac{OD/OA}{OD/OB}\right)\right]^{1/2}}_{Technical\ change}}_{Productivity\ change} = \underbrace{\underbrace{\frac{OD/OB}{OE/OC}}_{Catching-up\ effect} \underbrace{\left(\frac{OF}{OC}\cdot\frac{OB}{OA}\right)^{1/2}}_{Technical\ change}}_{Productivity\ change} \quad [8]$$

If the observation has not varied its efficiency between *t* and *t* + 1, the first term will be equal to 1 and the productive change experienced between the two periods (*M*) will be explained only by the movement of the frontier.

However, if the second term is 1 (the frontier has not moved), the changes in productivity estimated by *M* will be explained only by the changes in efficiency of firms in the two periods (catching-up). In other cases, the productive changes reflected in *M* will be a mixture of changes in efficiency and movements of the frontier.

The Malmquist productivity index can be calculated in several ways (Caves et al. 1982). In this study, as noted, we calculate the Malmquist productivity index using DEA, a non-parametric technique of linear programming.

Suppose that in each period *t* there exist $k = 1,...,K$ firms which use $n = 1,...,N$ inputs (x_{nk}^t) to produce $m = 1,...,M$ outputs (y_{nk}^t). The calculation of the Malmquist productivity index for a firm *j* requires calculation of four types of distance function: $D^t(x^t, y^t)$, $D^{t+1}(x^{t+1}, y^{t+1})$, $D^t(x^{t+1}, y^{t+1})$ and $D^{t+1}(x^t, y^t)$.

Making use of the property whereby the input distance function is equal to the reciprocal of the Farrell input-oriented efficiency measure (Färe & Lovell 1978), we have that for $D^t(x^t, y^t)$,

$$\left[D^t\left(x_j^t, y_j^t\right)\right]^{-1} = Min \quad \vartheta_j^{t,t}$$

s.t.

$$\sum_{k=1}^{K} \lambda_k^t y_{mk}^t \geq y_{mj}^t \qquad m = 1,...,M$$

$$\sum_{k=1}^{K} \lambda_k^t x_{nk}^t \leq x_{nj}^t \vartheta_j^{t,t} \qquad n = 1,...,N$$

$$\lambda_k^t \geq 0 \qquad k = 1,...,K \qquad [9]$$

Note that we assume constant returns to scale (Caves et al. 1982; Cantos et al. 1999, Färe et al. 2008). Also note that this efficiency measure is radial and therefore can leave slacks, which constitute a non-radial form of inefficiency. This fact led some authors such as Grifell-Tatjé et al. (1998) to develop a non-radial efficiency measure which incorporates the slacks. Replacing the conventional radial efficiency measure with this new measure generates what the author calls the 'quasi-Malmquist productivity index'.

The calculation of $D^{t+1}(x^{t+1}, y^{t+1})$ is obtained in a similar way but substituting *t* for *t* + 1. Finally, the calculation of the first of the distances referred to two different moments in time $D^t(x^{t+1}, y^{t+1})$ is done in the following way:

$$\left[D^t\left(x_j^{t+1}, y_j^{t+1}\right)\right]^{-1} = Min \quad \vartheta_j^{t,t+1}$$

s.t.

$$\sum_{k=1}^{K} \lambda_k^t y_{mk}^t \geq y_{mj}^{t+1} \qquad m = 1,...,M$$

$$\sum_{k=1}^{K} \lambda_k^t x_{nk}^t \leq x_{nj}^{t+1} \vartheta_j^{t,t+1} \qquad n = 1,...,N$$

$$\lambda_k^t \geq 0 \qquad k = 1,...,K \qquad [10]$$

Note that the observation (x^{t+1}, y^{t+1}) is compared with the technology in *t*, formed by the set of observations existing in *t*, and so it may occur that the observation is not feasible, given the technology current in *t* (*Ft*) and the solution is greater than unity.

The second, $D^{t+1}(x^t, y^t)$, is done in the same way but substituting *t* for *t* + 1, and *t* + 1 for *t*.

The data correspond to a sample of 34 world railway systems from 2001 to 2008. The information was taken from reports published by the Union Internationale des Chemins de Fer and completed with data published in the organisation's statistical memoranda. Specifically, the different railway systems established in each economy are evaluated. Thus, in the first years of the sample, the systems were run by one single company with vertically integrated infrastructure and operations and horizontally integrated operating services. Over the years, as many of the railway systems began to be separated both vertically and horizontally, different companies took over their management. In this case, the data corresponding to all the companies making up a railway system are aggregated for each variable.

Two outputs and three inputs are considered. The variables selected as outputs are the number of passengers/km transported for passenger transport and tonnes/km transported for freight transport. In the case of input variables, the following are considered (Table A5.1):
Number of employees in all of the railways making up the railway system;
Two measures of the rolling stock:

A variable indicating the number of locomotives, including light rail motor tractors; and
A variable calculated as the annual fleet wagons and the number of coaches, railcars and railcar trailers; and

Number of kilometres of railway infrastructure in each economy.

Table A5.1: Average values for the variables (2001–08).

Economy	PKT (millions)	TKT (millions)	LLT (km)	LOCOM	WAG	EMP (,000)
Austria	8,761	18,176	5,786	1,232	20,457	46
Belgium	9,041	8,309	3,502	776	15,883	39
Bulgaria	2,538	5,041	4,215	602	14,700	35
Czech Republic	6,749	16,313	9,492	2,180	39,814	69
Denmark	5,478	1,941	2,122	57	5,294	12
Estonia	224	8,838	924	128	3,904	4
Finland	8,017	13,287	5,827	784	14,535	21
France	72,307	45,918	29,456	4,355	57,971	164
Germany	68,707	75,502	34,901	4,976	123,848	201
Greece	1,806	581	2,476	162	4,046	8
Hungary	7,000	8,127	7,951	1,034	18,894	48
Ireland	1,745	305	1,919	94	1,772	6
Italy	47,158	21,589	16,538	3,286	58,449	101
Latvia	855	16,414	2,303	217	5,962	14
Lithuania	446	11,885	1,763	249	9,857	12
Luxembourg	297	461	275	100	3,334	3
Netherlands	14,176	3,848	2,809	275	5,190	26
Norway	2,406	2,723	4,111	156	2,765	9
Poland	17,818	45,115	19,738	3,711	88,993	134
Portugal	3,591	2,474	2,840	182	4,456	9
Romania	7,895	13,656	11,007	1,966	61,314	69
Slovak Republic	2,352	9,809	3,647	1,041	18,581	38
Slovenia	778	3,239	1,229	165	4,821	8
Spain	19,888	11,820	12,853	732	19,348	23
Sweden	6,042	12,945	10,004	398	8,149	12
Switzerland	14,716	12,216	3,357	1,654	15,854	29
Canada	1,484	334,820	55,893	2,913	94,015	36
China	579,817	1,890,285	61,266	16,157	560,396	1.679
Japan	246,085	22,547	19,884	1,218	34,356	140
Korea	30,165	10,766	3,260	580	12,225	30
Russia	155,149	1,639,928	86,703	11,945	596,127	1.219
Chinese Taipei	9,285	889	1,096	323	4,692	14
USA	8,985	2,526,146	194,228	22,476	476,044	183
Viet Nam	4,142	2,898	2,804	356	5,588	42
Total	41,202	200,267	18,787	2,610	70,724	130

Source: Union Internationale des Chemins de Fer.
PKT = number of passengers/km transported for passenger transport; TKT = tonnes/km transported for freight transport; EMP = number of employees in all of the railways making up the railway system; LOCOM = number of locomotives, including light rail motor tractors; WAG = annual fleet wagons (coaches, railcars and railcar trailers); and LLT = number of kilometres of railway infrastructure in each economy.

Chapter 6

QUANTIFYING THE BENEFITS FROM STRUCTURAL REFORMS IN ELECTRICITY AND GAS MARKETS IN APEC ECONOMIES

Philippa Dee[1]

- Structural reforms in electricity sectors in APEC economies since 2004 have generally been incremental; and those in gas have been less extensive than in electricity.
- Partial reforms have had significant effects on productivity.
- Reform to introduce competition, in particular, is expected to lead to further efficiency gains and lower prices.

6.1 INTRODUCTION

The production and distribution of electricity and gas involves networks – networks of electricity transmission and distribution lines, and networks of gas transmission and distribution pipelines. At least some components of these networks have the characteristics of a 'natural monopoly', meaning that it is less costly for their operation to be carried out by a single producer using a single set of facilities, rather than having two or more operators with duplicate facilities. In addition, there are strict technical requirements for operating electricity and gas networks, so as to preserve the physical integrity of the distribution systems. For these reasons, electricity and gas have traditionally been supplied by single, vertically integrated monopolies often in government ownership.

The absence of competition meant that there were few (if any) incentives for electricity and gas providers to keep costs to a minimum and to operate efficiently. Unless prices were regulated, there was also scope for operators to abuse their monopoly power and price above cost.[2]

Structural reforms in electricity and gas have aimed to overcome these two key problems. The reforms have typically aimed to introduce competition to allow competitive suppliers having access to those parts of the network that are natural monopolies. Successful reform also requires that the restructuring be done in such a way that the benefits of competition in the competitive sectors outweigh the loss of any economies of scope that may have prevailed when the monopoly and competitive activities were operated together under single ownership.

Beyond these common features, there are some differences in the physical characteristics of electricity and gas markets, which have led to differences in the extent of reforms carried out.

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[2] Notwithstanding higher prices, government owners often received returns on equity and capital that were below average.

6.2 KEY FEATURES OF ELECTRICITY AND GAS MARKETS

6.2.1 Electricity markets

The production of electricity involves: generation, transport over high-voltage lines (transmission), transport over low-voltage lines (distribution), marketing to consumers (supply) and buying and selling on wholesale markets (trading). What follows is drawn from European Commission (2007).

Transport operations are considered to be natural monopolies, and typically remain regulated even after structural reform. But generation is seen as a competitive activity, and is generally the first activity to be opened to competition, followed by wholesale trading and retail supply. However, retail prices may remain regulated in some economies, even after structural reform.

Unlike gas, electricity cannot be stored economically once it is produced, so supply has to be matched to demand on a second-by-second basis, even though demand may vary significantly over different times of the day and over different seasons. The introduction of new competitive generators needs to be managed in a way that does not jeopardise this supply–demand matching or bring down the grid network.[3] After structural reform, this balancing is typically achieved by having balancing markets run by an independent system operator.

Electricity can be generated using a variety of technologies, each of which has different cost characteristics. Nuclear plants tend to have low operating (variable) costs, so are typically used for base-load supply (i.e., operated all the time). Hydro plants also have low operating costs and are used for base-load supply when water availability allows. However, nuclear plants (and some hydro plants) also have very high capital costs, so the prices to consumers from this source may have to be high if operators are to receive an adequate return on capital. The operating (variable) costs of thermal plants depend largely on the prices of their input fuels. At current prices, coal-fired plants tend to have the next lowest operating costs after hydro and nuclear, and thus are next on the 'merit order'. Combined cycle and gas turbine plants tend to have the highest operating costs, and tend to be used as 'peaking plant' (i.e., used to meet peak demand). However, combined cycle and gas plants have low capital costs, so consumer prices from this source can be relatively low. In general terms, therefore, electricity prices to consumers depend not just on the extent of structural reform but also on the mix of production technologies available.

Finally, like most network industries, electricity transmission and distribution are subject to economies of density – costs are lower, the shorter the distances over which electricity has to be transported. Thus geography also has an impact on electricity prices to users.

England and Wales took the lead in structural reform of electricity markets in 1990, but many OECD economies (and some non-OECD ones) have gone at least some of the way down similar paths. In the European Union (EU) structural reform has received an additional impetus with the Second Electricity Directive of 2003 (discussed below). Doove et al. (2001) describe the broad outlines of the structural reform agenda as follows:

- structurally separating ('unbundling') the competitive activities (particularly generation, but sometimes also retailing) from the natural monopoly elements (particularly transmission but sometimes also distribution) – this is called 'vertical separation';

[3] This applies particularly to wind and solar sources which may be generating at a time supply is not required.

- dividing existing generation capacity among a number of different generation companies, who then compete with each other – this is called 'horizontal separation';
- allowing new generators to enter the market – these are sometimes called independent power producers (IPPs);
- guaranteeing open and non-discriminatory access for all generators to the transmission grid (subject to available capacity), so that they can sell directly to downstream suppliers or users, rather than selling to the incumbent – this is called 'third party access (TPA)';
- establishing a wholesale price pool or spot wholesale market for electricity (either mandatory or optional, and broader than, but interconnected with, the balancing market), so that new entrants are not obliged to enter both the generation and retailing sector at the same time, thus lowering entry costs;
- regulating the natural monopoly activities to prevent any abuse of market power;
- introducing an economic regulator independent of industry players and day-to-day influence, and typically separate from the (technical) system operator;
- enabling large customers (retailers and sometimes large industrial users) to buy electricity directly from the generator of their choice;
- introducing competition into metering and billing activities and contract terms, thus allowing retail customers freedom to choose among different electricity suppliers;
- providing a full range of tradable financial instruments (e.g., futures contracts and options);
- undertaking partial or complete privatisation or corporatisation of publicly-owned assets;
- introducing cross-ownership restrictions, especially between competitive and natural monopoly activities;
- liberalising restrictions on foreign investment and ownership;
- mandating service quality standards; and
- allowing retailers to introduce innovative services (e.g., the ability to switch retailers over the internet or providing electricity jointly with other services such as telephony and gas).

The possible benefits of these reforms are discussed below.

6.2.2 Gas markets

Natural gas is found in underground reserves, often in combination with oil and condensate products. Exploration and production is generally done by oil companies, and there are few synergies between these and other activities in gas markets. In economies without indigenous production, however, the primary supply activity is undertaken by importers, who may also be involved in downstream activities. What follows is also drawn from European Commission (2007).

Natural gas is mostly transported from production to market by high-volume, high-pressure transmission pipelines. Natural gas can also be cooled and condensed, and then shipped overseas in liquid form (liquefied natural gas [LNG]). Both forms of transport are expensive relative to the value of the gas transported, but pipeline is cheaper for shorter distances while shipment is more viable for longer distances. Both transmission pipelines and LNG terminal facilities involve substantial sunk costs, giving both activities natural monopoly characteristics.

Once natural gas reaches the market, it is distributed to customers over low-volume, low-pressure distribution pipelines. These distribution networks also have the characteristics of a natural monopoly.

Unlike electricity, there is essentially only one technology for producing natural gas. Also unlike electricity, natural gas can be stored, so there is no necessity to instantaneously match supply to demand. Nevertheless, flexibility is somewhat limited because the physical characteristics of storage facilities may limit the speed with which gas can be injected or withdrawn. Flexibility is also limited because gas extraction rates from underground reserves may depend on geology rather than demand, and the ability to alter pipeline pressures is also somewhat limited.

In many economies, gas importation, transmission and storage was traditionally undertaken by a single monopolist (or several companies with regional monopolies). Sometimes the monopoly importer also sold to consumers, or else these sales were handled by downstream monopolies.

Like electricity, structural reform of gas markets involves allowing new entrants into the potentially competitive segments of the market, without requiring them to be vertically integrated. Possible new business models include the following:

- new companies that produce gas or import it from external sources, in competition with the incumbent(s);
- new shipper/suppliers who buy gas on wholesale markets, arrange for its transportation with the network company and sign retail contracts with consumers;
- pure traders who buy and sell on wholesale markets to take advantage of arbitrage opportunities.

These new business models rely on the development of functioning wholesale markets and on third party access to transmission and distribution networks. To reduce the possibility of incumbents using their control over pipeline or terminal facilities to thwart competition, both transmission and distribution should be unbundled into separate transmission system operators (TSOs) and distribution system operators (DSOs). If such operators are sufficiently independent from incumbents, they should have an incentive to maximise, rather than restrict, the amount of gas sold through their networks, thus facilitating competition.

Thus the broad features of structural reform in gas markets are similar to those in electricity markets, though the scope for competition in primary production/importing is somewhat more limited than in electricity generation.

6.3 THE STATE OF PLAY IN APEC ECONOMIES

The state of play in APEC electricity and gas markets is summarised in Table 6.1, for those APEC economies for which adequate information has been collected via desk research (the exceptions are Brunei and Papua New Guinea). More details are in Tables 6.2 and 6.3 (Annex 6), which also note the extent of reforms since 2004. There are variations in regimes between regional jurisdictions in many economies. These are acknowledged in Tables 6.2 and 6.3. The status reported by Dee (2010; Tables 2.4 and 2.5) is based on reform in at least some significant regional jurisdictions or, in the case of the United States of America, on the situation in California, an area most relevant to the APEC region.

According to Table 6.1, very few APEC economies have achieved substantial reform of both electricity and gas markets, and those that have are essentially developed economies –

Table 6.1: Summary of current regulation in APEC electricity and gas markets, 2009

APEC member	Electricity				Gas		
	Unbundling generation	Third party access	Wholesale pool		Unbundling transmission	Third party access	Retail competition
Australia	Yes	Yes	Yes		Yes	Yes	Yes
Canada		Yes	Yes		Yes	Yes	Yes
Chile	Yes	Yes	Yes		Yes		
China	Yes		Yes				Yes
Hong Kong, China							
Indonesia					Yes	Yes	
Japan		Yes	Yes			Yes	Yes
Republic of Korea	Yes	Yes	Yes				
Malaysia							
Mexico						Yes	Yes
New Zealand	Yes	Yes	Yes		Yes	Yes	Yes
Peru	Yes	Yes			Yes	Yes	
Philippines	Yes						
Russia	Yes	Yes	Yes				
Singapore	Yes	Yes	Yes		Yes	Yes	Yes
Chinese Taipei							
Thailand					Yes	Yes	
United States	Yes	Yes			Yes	Yes	Yes
Viet Nam							

Sources: See Tables 6.2 and 6.3 in Annex 6.

Australia; Canada; New Zealand; Singapore; and the United States of America. Japan and Peru have achieved some reform in both markets, though in Japan's case this has been without vertically unbundling its incumbent operators. China has also started to reform both markets, though its electricity reform is only on an experimental basis in a few geographic areas. A few APEC economies have achieved substantial reform in electricity but not in gas – Chile; the Republic of Korea; and Russia – though Table 6.2 indicates only partial electricity reform in the Republic of Korea. A few more APEC economies have achieved substantial reform in gas but not electricity – Indonesia; Mexico; and Thailand.

Tables 6.2 and 6.3 (Annex 6) indicate that, to the extent that structural reforms have taken place in electricity and gas markets since 2004, they have tended to be incremental – there have been few 'big bang' initiatives.

6.3.1 APEC electricity markets

Reform in electricity is incremental partly because introducing competition into generation and retail is a highly complex regulatory process. The regulatory requirements for competitive new producers and/or wholesalers to get access to existing transmission and distribution networks need to be compatible with the technical requirements for the safety and physical integrity of the system. The Californian electricity crisis of 2000 and 2001 had a chilling effect on reforms in Malaysia. Reforms have also been stymied by domestic legal or political considerations. For example, in 2004 Indonesia's electricity reform legislation was annulled by the Constitutional Court; only in late 2009 was amended legislation passed. Similarly, in the Philippines reform has been handicapped by a legislative requirement that liberalisation can proceed only after key players have been privatised. In Mexico, under Article 27 of the Constitution, the state has exclusive responsibility for generating, transporting, transforming, distributing and supplying electricity as a public service. In Chinese Taipei, the incumbent had a legislated monopoly until 2008, though it now only produces 75% of the island's electricity. In Thailand, after a change of government in 2001, reform plans were converted into a plan to create a 'National Champion'.

However, by 2004 some economies in the APEC region had already achieved major structural reforms in electricity generation. These included Australia; Chile; New Zealand;

Peru; and parts of the USA. In Hong Kong, China the electricity market is a duopoly, but this appears to be 'natural' as neither party has exclusivity.

Thus the post-2004 reform experience in the region has been concentrated in a few economies – Canada and Japan have undergone minor reforms, while the Republic of Korea; Russia; and Singapore have undergone more significant ones. In several Canadian provinces and Japan, wholesale price pools have been introduced. The Republic of Korea has gone through a more extensive process of separating transmission from generating capacity and introducing one-way bidding in a wholesale pool but it has yet to introduce competition in the retail sector, and the six separate generating companies are still wholly owned subsidiaries of the majority state-owned incumbent. Singapore had already separated generation from transmission prior to 2004, and has been gradually introducing both wholesale and retail competition since then. Russia has undertaken the most comprehensive reform since 2004, by separating generation capacity into separate companies (though still under partial ownership of the incumbent) and, from 2008, introducing both wholesale and retail competition.

6.3.2 APEC gas markets

Reforms in natural gas since 2004 have been less extensive than in electricity. In part this is because the scope for competition in natural gas production depends on the range of sources of supply. Indeed, many of those economies with extensive indigenous reserves had already undertaken significant reform prior to 2004. These included Australia; Canada; Mexico; New Zealand; Peru; and the USA. At the other extreme, the Philippines has little domestic production and no imports, meaning the market is essentially still nascent. In Chile the scope for competition is limited, given that there is deemed little scope for sources of gas other than Argentina. Import-dependent economies such as the Republic of Korea and Chinese Taipei have extended their sources of supply by building terminals to handle LNG, but so far their natural gas industries are still dominated by incumbents.

There have been four main instances of reform since 2004. China reformed its retail price controls so that they can more closely match production costs. New Zealand introduced a regulated third party access regime for one of its pipelines. Following earlier reforms in 2002, Singapore introduced a Gas Code in 2005 that details the terms and conditions for gas transportation on an equitable and non-discriminatory basis. Similarly, Thailand introduced third party access to pipelines to facilitate wholesale competition among its four major producers.

6.4 THE GAINS FROM REFORM – EVIDENCE TO DATE

The evidence of gains from the reforms to date has been qualitative and quantitative. Most of it has been based on the ongoing reform experiences in the developed economies, particularly in Europe and the USA. Reviews of the reform experience have also had to evaluate instances of possible reform failure – the first being the Californian electricity crisis of 2000–01 and the second the United Kingdom's retreat from a wholesale price pool back to bilateral contracts in 2001. Empirical evidence on these two issues is presented later.

6.4.1 Qualitative evidence

In several recent papers Pollitt (2007, 2008) summarises the gains from reform in electricity markets (and by extension, he claims, in gas markets), based primarily on the UK experience, which in many respects is a best-case scenario. While the UK is not a member of APEC, the research provides some guidance to impacts from reform.

Competition reduces costs (and prices) significantly, relative to what they might have been without reform, even if it does not reduce them in absolute terms over time. It does this by encouraging efficient operation and least-cost and timely investment. It also exposes pre-existing market power.

Retail competition has been revealed to be an important complement to competition in generation. Retail competition involves more than the choice of buying wholesale power from a non-incumbent generator. It also involves competition in billing, contract terms and the bundling of other services (i.e., competition at the supplier level).

Consumers do respond to price signals, both by switching suppliers and by demand reduction. This contradicts the previous conventional wisdom that demand was very unresponsive to price. Further, Pollitt (2008) claims that household consumers do not need institutionalised protection from fluctuations in wholesale prices – where they prefer fixed tariffs, suppliers have generally offered these voluntarily, providing a form of insurance as part of their bundled package of services. Pollitt (2007) also claims that with sufficient competition in generation, regulation of the level of retail prices should also become unnecessary (though incentive regulation of transmission prices, through CPI-X price caps, remains a critical part of the regulatory landscape).

Vertical separation is costly, but the vertical economies of joint operation between networks and competitive segments of the industry are not sufficient to outweigh the increased competitive pressure that comes from clear separation of the monopoly networks from the rest of the supply chain. Pollitt (2008) claims that this has been proved for electricity transmission, gas transmission and may be in the process of being proved for gas distribution in the UK. For APEC members this finding suggests that vertical separation should not be pursued for its own sake, but only where it can facilitate greater competition.

However, Pollitt (2007) notes that vertical economies between generation and transmission are not sufficient to offset the benefits of competition in wholesale power markets but they do appear to be significant between generation and retail. This is because the integration of generation and retail offers advantages in terms of matching supply and demand, and it means that retail-only companies are likely to struggle, as they have in the UK, the Netherlands and New Zealand. One side effect of generation and retail integration, however, is that it makes wholesale markets much thinner, which can have its own effect on the ease of new entry.

Finally, markets have been good at choosing between technologies on the basis of price, as demonstrated by the move to combined cycle gas turbines in the 1990s and by the resurgence of interest in nuclear power more recently. It is sometimes claimed that regulated markets are good at ensuring the efficient use of existing capacity but are not as good at ensuring appropriate investments in new capacity. However, Pollitt (2008) notes that as network capacity limits are reached the X factor in CPI-X price caps should become less driven by squeezing monopoly profits and more driven by the need to finance new investments. Nevertheless, new regulatory mechanisms may be necessary to ensure that the new investments are least cost, rather than simply undertaken to the incumbents' specifications.

Despite these potential gains from structural reforms, they have been implemented the farthest only in jurisdictions where supranational bodies (the European Commission), central governments (the USA) or inspired individuals (in Russia) have pushed hard and consistently. But even parts of the USA do not yet have full retail competition. In many other jurisdictions, reforms have stalled at some early or intermediate stage.

Clearly, local physical, institutional and other factors have a role to play in the ability of reforms to deliver real gains. According to Pollitt (2007), key institutional factors that seem to have been important are significant initial public ownership and prices that more than cover efficient economic cost (as in Australia; Chile; New Zealand; and the UK). Initial private ownership (e.g., in Japan and the USA) and prices below economic cost (e.g., in India) have made reform much more difficult. This is a significant qualification, since subsidisation of energy prices is relatively widespread in the APEC region. Also critical has been the capacity and flexibility of regulators to tailor reforms to local conditions and to adapt as network conditions change.

Beyond local conditions, Correlje and De Vries (2008) identify four key lessons from reforms that have taken place in:

- ownership separation (not just accounting or legal separation) of electricity transmission from the rest of the network has been critical to improving access for competitive generation and removing incentives to under-invest in transmission;
- getting the market structure right in electricity generation is crucial for the success of reforms, and allowing new entry alone may not be sufficient – horizontal separation may also be required;
- incentive regulation based on CPI-X price control of monopoly transmission networks can deliver significant incentives to reduce costs and facilitate efficient operation, while proving a stable cash flow for new investment, and economies with tougher incentive regulation of networks have significantly lower network costs as a result;
- regulation can address market failures such as those associated with the quality of supply, but it requires a degree of regulatory sophistication to balance efficiency and quality objectives.

Reviewing the experience of electricity reform in developing economies, Jamasb (2006) notes that the cost savings from wholesale markets or independent power producers will not be passed on to consumers if there is not enough competition in generation. While retail competition may be feasible only in the long term, competition among independent generators is possible even in a single-buyer market, and economies with small markets can also introduce competition *for* the market.

Reform in developing economies can take place even without privatisation. Reform requires a well-functioning transmission system, which should probably remain in public ownership in the early stages of reform. Incentive regulation can also drive efficiency improvements in distribution activities and ensure that they are passed on to consumers, even when distribution companies remain in public or local ownership.

Jamasb (2006) also confirms that cost-reflective tariffs and proper subsidy schemes (i.e., funded transparently and not relying on cross-subsidies) are crucial for the sustainability of reforms. He notes that stable macroeconomic conditions are crucial for attracting the necessary investments from domestic and foreign sources. Finally, he notes that progress in developing economies is likely to be evolutionary, particularly since regulatory capabilities and experience and the necessary institutional structures take time to develop.

6.4.2 Empirical evidence

The empirical evidence on the gains from reform is mixed. To some extent, the mixed results are themselves a sign that reforms may not have been taken far enough in some economies or are still in progress. Either reforms have not been taken far enough to have any real effect or

there are not enough reforms in the chosen samples for econometric techniques to discern any significant effects.

The mixed results may also reflect the difficulty of the empirical task. Establishing the effects of reform requires a data sample in which there has been a variety of reform experiences. This typically requires a data sample involving a number of different economies, and it can be difficult to correct for all the other economy-specific factors (other than reform) that may also account for the performance of the electricity sector. Even if it is possible to establish the effects of reform (correcting for other factors), it is typically very difficult to get robust evidence on which dimensions of the reform experience are responsible for those effects. As noted earlier, reform involves a number of inter-related steps, many of which are often taken together. This makes it very difficult to isolate which particular steps are responsible for the effects.

One of the first empirical assessments of the effects of electricity reform was Steiner's (2000) study of OECD members over the 1986–96 period. She found that unbundling of generation, third party access and the introduction of wholesale electricity markets were all associated with lower electricity prices. However, she also confirmed that private ownership was not necessarily associated with increased competition. Nevertheless, both private ownership and unbundling of generation and transmission were found to be associated with a higher rate of utilisation of existing generation capacity, and with reserve plant margins that were closer to optimal.

Hattori and Tsutsui (2004) undertook a similar study of OECD members over a slightly later period of 1987–99. Their findings were less definitive than Steiner's, though this could in part be because of differences in their measurement of variables (including prices). They found that giving customers access to alternative suppliers (which they argue is highly correlated with third party access) was associated with lower prices. However, unlike Steiner, they did not find a significant effect of unbundling or the introduction of a wholesale spot market on prices.

Nagayama (2007) undertook a broadly similar study of 83 economies over the 1985–2002 period. He found that neither unbundling nor the introduction of a wholesale pool market on their own would necessarily reduce electricity prices. In fact, contrary to expectations, there was a tendency for the price to rise. However, coexistent with an independent regulatory authority, unbundling could work to reduce prices. He also found that privatisation, the introduction of foreign independent producers and retail competition could lower electricity prices in some regions, but not all.

There have also been in-depth before-and-after studies of reform experiences in individual economies. Two areas of interest are the Californian electricity crisis and the UK's apparent reversal of reforms in the early 2000s. Both of these demonstrate the dangers of incomplete or inconsistent reforms.

Joskow's (2001) detailed analysis of the Californian crisis shows that when demand spikes, individual generators may have considerable market power to increase prices and withhold generating capacity, even when there is not collusion among them. This was found to be a factor contributing to a ten-fold rise in wholesale electricity prices in California in 2000. But regulatory problems also contributed significantly. One problem was wholesale market-design rules that prevented a smoothing of wholesale prices. Another problem was the maintenance of retail price caps that prevented signals about market conditions being passed

on to consumers. The caps led to the bankruptcy of major suppliers when wholesale prices rose above the capped retail prices.

Evans and Green (2003) examined why electricity prices fell in the UK after the abandonment of the wholesale price pool and the return to bilateral contracts. One problem with the pool had been collusion or manipulation by dominant players (arguably because of insufficient horizontal separation). Evans and Green attempt to distinguish the impact of a subsequent decline in market concentration from the introduction of the new electricity trading arrangements in 2001. They found that it was declining concentration that explained the fall in wholesale prices. This shows that effective regulatory action to reduce incumbent market shares can be more important than market design per se.

There are fewer studies of the effects of reform in gas markets. Jamasb, Pollitt and Triebs (2008) studied the effects of US regulatory reform on productivity, and found that encouraging competition has been rather successful in raising productivity. Hawdon (2003) found evidence that the types of reforms introduced in the UK are associated with higher levels of efficiency, good utilisation of labour and levels of underutilisation of capital sufficient to support the development of competitive markets. Nevertheless, Brakman, van Marrewijk and van Witteloostuijn (2009) warn that lack of competition and capacity constraints in gas production/import can prevent these gains being passed on to consumers.

6.5 NEW EVIDENCE ON THE GAINS FROM REFORM IN ELECTRICITY AND GAS MARKETS

One of the limitations of empirical studies of the effects of regulatory reform is that the studies are somewhat 'captive' to the nature and extent of reforms that are present in the sample. As the recent APEC experience shows, regulatory reform in the developing world has tended to be slow and incremental, so that samples taken from developing economies will not necessarily encompass a wide variety of reform experiences. Samples drawn from the developed world may not match the local conditions of developing economies, so that any extrapolation needs to be done with care. But samples from developed economies may capture a wider set of reforms and, therefore, give a clearer picture of the *potential* benefits of reform.

A recent round of new EU directives has provided a fresh impetus to regulatory reform of electricity and gas markets in these economies. This provides a rich new source of reform experience with which to test the empirical findings of earlier studies.

The First Electricity Directive (Directive 96/92/EC) of 1996 removed legal monopolies by requiring EU member states to allow large electricity users to choose their suppliers.[4] It also obliged vertically integrated companies to grant third party access to transmission and distribution networks and a minimum level of unbundling of vertically integrated companies. Gradually, this regime was seen to have various limitations. It allowed the terms of third party access to be negotiated rather than regulated. The unbundling obligations were limited, allowing accounting separation as well as legal or ownership separation. And the directive did not require the establishment of a national energy regulator. As a result, there were significant differences across member states in the extent of market opening.

To overcome these limitations, the Second Electricity Directive (2003/54/EC) was introduced in 2003, seven years after the original Directive. This obliged EU members to introduce a

[4] This is competitive because it involves large and informed consumers dealing with large informed producers.

regulated third party access regime, and removed the possibility of negotiated third party access. It also mandated the appointment of a national regulator that is independent of the industry. It required legal separation, rather than just accounting or management separation, between network activities (transmission and distribution) and all other activities. Finally, it required non-household customers to have choice of supplier by mid 2004, and household customers to have choice by mid 2007. These regulations tightened up a range of market opening requirements, and led to significant additional regulatory changes in lagging member states during the 2000s. In particular, the new regulations also stimulated the development of wholesale electricity markets in those members, so they could meet their obligations regarding consumer choice.

A similar slow evolution of regulation occurred in EU gas markets. The legislative process began in the 1990s with a series of directives aimed at abolishing import monopolies, gradually opening markets, mandating accounting separation for vertically integrated network companies and the adoption of regulated third party access. The Second Gas Directive (2003/55/EC) of 2003 required full market opening, national sector regulators, regulated third party network access, regulated or negotiated access to storage facilities and further unbundling of integrated companies. Supporting regulation set obligatory minimum requirements for access to transmission systems, including network tariffs, third party access services, capacity allocation, transparency, balancing and trading of capacity rights.

In analysing the impact of these regulatory frameworks, European Commission (2007) stresses how incomplete unbundling can seriously undermine attempts to introduce competition into electricity and gas markets. If network operators are not sufficiently independent from incumbent service suppliers, they will find a myriad of ways to thwart the activities of new entrants, despite third party access legislation.

The remainder of this section describes econometric analysis of the effects of electricity and gas reforms on prices and non-price measures of efficiency, using data for OECD members (including a significant number of EU members) over the 1990–2008 period. Thus the sample captures regulatory changes induced by both the first and second waves of EU reforms. The choice of OECD members is dictated largely by the availability of price information. A key source of relatively consistent information on energy prices across economies is the ‘Energy Prices and Taxes’ publication of the International Energy Agency, the data from which is available for sale online. However, the price information is only available for OECD members. Ideally, the exercise would have included the effects of reform on quality measures such as the reliability of supply. Unfortunately, there is no comprehensive international data on these measures.

6.5.1 Analysis of electricity markets

The analysis closely follows the approach of Steiner (2000). Electricity prices are modelled as being determined by measures of regulatory policy, as well as a number of non-regulatory controls. The regulatory measures are the presence of a regulated or negotiated third party access regime, the existence of a liberalised wholesale market for electricity, the existence of vertical unbundling between transmission and generation, and the prevalence of private ownership. The non-regulatory controls are the level of GDP, the shares of electricity generation accounted for by nuclear sources and hydro sources, and the urban share of the population, as a measure of the density of the network. These explanatory variables are the same as in Steiner, except for the addition of the degree of urbanisation, a higher value of which could be associated with lower prices if there were significant economies of density.

Missing from the current analysis are Steiner's measures of the time to privatisation and the time to liberalisation, since these performed perversely in her regressions, suggesting that they were correlated with each other and with other variables, so their own effects would not be established with precision.

Ideally, the model of electricity prices should include the prices of thermal fuel inputs (i.e., oil, coal and gas) as controls. However, the coverage of input prices from International Energy Agency sources is very patchy, and restricting the estimation to those economies and time periods for which it was available would severely restrict the range and extent of electricity reform in the sample. To some extent, controlling for hydro and nuclear shares helps to control for variations in generating input costs. The estimation also corrects for unobservable differences across economies, as will be explained shortly.

The current analysis also examines the effects of regulatory policy on capacity utilisation, and on the extent of deviation of reserve plant margins from optimal. Efficient generators typically plan to meet demands with a capacity buffer that is prudent but not excessive. This analysis follows Steiner in using a 15% margin as a rough indicator of the optimal reserve plant margin. Both measures of efficiency are modelled as being determined in part by the extent of third party access, the extent of unbundling, and the degree of private ownership. The existence of a wholesale price pool is not expected to influence efficiency, though it is expected to influence prices. These measures of efficiency are also affected by non-regulatory controls, including the degree of urbanisation. Instead of Steiner's measures of state preferences in favour of coal technology or against nuclear technology (both of which would be expected to reduce measured efficiency), the current formulation uses the actual shares of hydro, nuclear and coal technologies on total generating capacity.

The data sources are similar to those used by Steiner though including more APEC members. Electricity prices are taken from 'Energy Prices and Taxes' (third quarter 2009 edition) published online by the International Energy Agency. The necessary data on electricity capacity and generation to compute the efficiency and control measures were taken from 'Electricity Information' (2009 edition), also by the International Energy Agency. GDP and the rate of urbanisation are both taken from the World Bank's 'World Development Indicators'. Both electricity prices and GDP are expressed in US dollars converted using purchasing power parities. Electricity prices are the net-of-tax prices to industrial users, since the share of generation costs in consumer prices is likely to be highest for industrial users, and reforms are expected to impact most on generation costs. A summary of the data on electricity prices, efficiency measures, and non-regulatory controls is shown in Table 6.4 (Annex 6).

The policy variables used in the analysis are defined as follows:

etpa Existence of regime for regulated or negotiated third party access to electricity transmission grid
0 = no third party access, 1= third party access

ewpp Existence of liberalised wholesale market for electricity (wholesale price pool)
0 = no wholesale price pool, 1= wholesale price pool

eunb Existence of vertical separation between the transmission and generation segments of the electricity market (whether accounting separation or separate companies)
0 = no vertical separation, 1= vertical separation

eown Ownership structure of the largest companies in the generation, transmission, distribution and supply segments of the electricity market
0 = public, 1 = mostly public, 2 = mixed, 3 = mostly private, 4 = private

Measures of these policy variables for all of the OECD economies in the sample except for the Republic of Korea and Mexico are available up until 2003 from OECD (2005). Measures for the remaining economies and time periods were constructed from information obtained online from the International Energy Regulation Network, the 'EIA Country Analysis Briefs' of the US Energy Information Administration, and the 'Trade Policy Reviews' of the WTO. Web addresses for these sources are shown at the bottom of Tables 6.2 and 6.3 (see Annex 6). A full listing of the values of these policy variables for all OECD economies and time periods in the sample is given in Table 6.6 (Annex 6).

As noted earlier, one difficulty in exercises like this is distinguishing the separate contributions of different steps in the reform process when the different steps are often taken together. This creates a technical problem of multicollinearity, which manifests itself in econometric estimation on panel data sets as instability or 'flip-flop' in the signs of the coefficients on the policy variables, while the magnitudes of the coefficients are often implausibly large, but apparently highly significant. As an initial reality check, it is therefore useful to look at the *simple* correlations between the policy variables and the resulting measures of performance, prior to correcting for the influence of other variables.

These simple correlations are shown in Table 6.7 (Annex 6; unfortunately, graphical presentation does not show the correlations clearly, because of the zero-one nature of the policy variables). The table shows the same pattern of policy changes on price as in Steiner – third party access, a wholesale market and unbundling all tend to reduce electricity prices, while private ownership can increase them. Third party access, unbundling and private ownership also tend to increase capacity utilisation, while a wholesale market can apparently reduce it, though the effect is small, as expected. Third party access, a wholesale market, unbundling and private ownership are all associated with reserve plant margins being closer to optimal (the distance from the optimal margin is reduced), though the effect of the wholesale market is again small, as expected.

The simple correlations do not show whether the strength of these effects is significantly different from zero. They also do not correct for the influence of other, non-regulatory factors. The results of econometric estimation shown in Tables 6.9 and 6.10 (Annex 6) overcome these limitations.

The econometric estimation also attempts to control for *unobservable* influences on electricity prices and efficiency that might vary over time or across economies. Unobservable differences over time are controlled using a deterministic time trend. In principle, unobservable differences across economies could also have been controlled using deterministic dummy variables. However, such dummies are relatively highly correlated with both the policy variables and with the degree of urbanisation (which does not vary much over time in many economies). Including such deterministic dummies, therefore, causes the 'flip-flop' problem noted earlier. Consequently, unobservable economy effects are controlled by assuming them to be random and using random effects estimation, even when Hausman tests show that these estimates differ significantly from fixed effects estimates (the fixed effects estimates are not regarded as robust, for the reasons just described).

The effects of the policy variables on electricity prices are qualitatively the same as indicated by simple correlations. Furthermore, the effects are shown to be significantly different from zero. So Steiner's results are again confirmed – third party access, a wholesale market and unbundling all tend to reduce electricity prices, while private ownership can increase them. The apparent insignificance of some of these factors found by other researchers, particularly

the presence of a wholesale market, has been overcome by using a dataset in which there is more reform 'action'.

The non-regulatory influences on electricity prices are generally also as expected. Prices tend to be higher when GDP is higher, while a higher hydro share in generation tends to reduce prices. A high nuclear share also appears to reduce prices, against expectations, but this effect is not significant. A higher rate of urbanisation tends to reduce prices, confirming that there are economies of density in the production and sale of electricity.

The policy variables have less significant effects on efficiency than on prices. The only result that comes close to being significant is that unbundling tends to increase capacity utilisation. Note that European Commission (2007) also identifies adequate unbundling as the key linchpin to promoting effective competition. Utilisation also increases significantly when there is a high nuclear share in generating capacity. No policy variable has a significant effect on the deviation of reserve plant margin from optimal. However, this estimation performs poorly on all fronts.

These results should not be taken to mean that structural reform of electricity markets has minimal effect on efficiency. It just means that it has little discernable effect on the particular efficiency measures chosen in this exercise. Reform could still have a large beneficial effect on other measures, such as labour productivity. Indeed, the reforms that are shown to reduce electricity prices could do so in one of two ways – perhaps by squeezing the excess profits of incumbent operators, or more likely by encouraging them to reduce inflated production costs. Anecdotal evidence from the reform experience in economies such as Australia suggests that reforms can dramatically boost labour productivity and, therefore, reduce production costs.

6.5.2 Analysis of gas markets

While there are many models of gas efficiency (e.g., Lee, Park & Kim 1999, Granderson 2000, Hawdon 2003, Jamasb, Pollitt & Triebs 2008, Farsi & Filippini 2009) there are fewer models of gas prices. Furthermore, many of the price models explain the extent of convergence of gas prices across different geographic markets (e.g., Walls 1994, Cuddington & Wang 2006) rather than the level of gas prices *per se*.

This may in part reflect the limitations imposed by the way that gas prices are set, especially in Europe. As explained in European Commission (2007), a large majority of gas consumed in the EU is bought by the incumbent wholesale players under long-term contracts from producers outside and inside the EU. The prices in European long-term gas contracts are mainly linked to the prices of oil and oil derivatives. Thus the contract prices paid by different producers to different suppliers move in an almost identical manner through time, and do not react smoothly (or at all) to changes in the supply and demand of gas markets. The UK gas market is a little different, with long-term gas prices from UK fields being determined partly by hub gas prices (i.e., the prices on more or less organised wholesale exchanges) and partly by general inflation indexes. But hub trading has been slow to develop. At the retail end a majority of EU members regulate prices to households and small businesses, while at least six members set a regulated price that is available to all customers (though the proportion of consumers that have stayed with the regulated tariff varies between member states).

Thus if EU structural reform is to be reflected in gas prices at all, it is likely to be reflected in the wholesale–retail margins on gas sold to industrial users. The approach here is, therefore,

to look for any discernable effect of regulatory reform on the net-of-tax price to industrial users. These prices are modelled as being determined by measures of regulatory policy, as well as a number of non-regulatory controls. The regulatory measures are the presence of a regulated or negotiated third party access regime, the percentage of the retail market for gas that is open to competition, the absence of national, state or provincial regulations that restrict the number of competitors, the existence of vertical unbundling between production/import and other segments, the existence of vertical unbundling between gas supply and other segments and the prevalence of private ownership. The non-regulatory controls are the level of GDP, the total gas pipeline length (to account for economies of scale) and the urban share of the population (to account for economies of density).

Ideally, the model of gas prices to industrial users should include the wholesale price of gas as a control. However, as was the case for electricity, the coverage of input prices from International Energy Agency sources is very patchy, and restricting the estimation to those economies and time periods for which it was available would severely restrict the range and extent of gas reform in the sample. But given the relative unresponsiveness of wholesale gas prices to supply and demand conditions, it was judged adequate to proxy wholesale gas prices by a non-linear time trend.

The current analysis also examines the effect of regulatory policy on gas capacity utilisation, as measured by annual gas consumption relative to total pipeline length. This is modelled as being determined in part by the same regulatory variables as for gas prices. It is also affected by non-regulatory controls, including the share of gas in electricity generation (which would be expected to increase the utilisation rate) and the degree of urbanisation. Urbanisation could have an ambiguous effect on the utilisation rate. Greater urbanisation could increase the utilisation rate by allowing economies of density. However, if there were industrial or other users with heavy and reliable gas demands (such as mining operators or electricity generators) located outside urban areas, this too could increase utilisation despite the degree of urbanisation.

The coverage of economies and time periods is the same as for the electricity analysis. Net-of-tax gas prices to industrial users are taken from ‘Energy Prices and Taxes’ (third quarter 2009 edition) published online by the International Energy Agency. The necessary data on gas consumption and the gas share of electricity capacity is taken from ‘Electricity Information’ (2009 edition) and ‘Natural Gas Information’ (2009 edition) by the International Energy Agency. Pipeline lengths are taken from various editions of the ‘CIA World Factbook’, available online. GDP and the rate of urbanisation are both taken from the World Bank’s ‘World Development Indicators’. Both gas prices and GDP are expressed in US dollars converted using purchasing power parities. A summary of the data on gas prices, the efficiency measure and non-regulatory controls is shown in Table 6.5 (Annex 6).

The policy variables used in the analysis are defined as follows:

gtpa Existence of regime for regulated or negotiated third party access to gas transmission grid
0 = no third party access, 1= third party access

gretc Percentage of the retail market for gas that is open to competition
0 = less than 10%, 1= 10% or more

gent Existence of national, state or provincial laws or other regulations that restrict the number of competitors allowed to operate a business in at least some markets in gas production/import
0 = restrictions in all markets, 1= free entry in all markets

gunb_p Existence of vertical separation between gas production/import and other segments of the gas market (whether accounting, legal or ownership separation)
0 = no vertical separation, 1= vertical separation

gunb_t Existence of vertical separation between gas supply and other segments of the gas market (whether accounting, legal or ownership separation)
0 = no vertical separation, 1= vertical separation

gown Percentage of shares in the largest firm in the gas production/import sector owned by government
0 = 100%, 1 = more than 50%, 2 = 50%, 3 = less than 50%, 4 = 0%

Measures of these policy variables for all of the OECD economies in the sample are available up until 2003 from OECD (2005). Measures for the remaining time periods were constructed from information obtained online from the International Energy Regulation Network, the 'EIA Country Analysis Briefs' of the US Energy Information Administration and the 'Trade Policy Reviews' of the WTO. Web addresses for these sources are shown at the bottom of Tables 6.2 and 6.3 (see Annex 6). A full listing of the values of these policy variables for all OECD economies and time periods in the sample is given in Table 6.6 (Annex 6).

As an initial reality check, it is useful to look at the *simple* correlations between the policy variables and the resulting measures of performance, prior to correcting for the influence of other variables. These simple correlations are shown in Table 6.8 (Annex 6; once again, graphical presentation does not show the correlations clearly, because of the zero-one nature of the policy variables). The table shows that removing regulatory restrictions on entry can have an apparently large downward effect on gas prices. Unbundling production/import and private ownership are also associated with lower gas prices. Third party access, retail competition and unbundling of gas supply appear to be associated with higher gas prices. But note that there is limited scope for customer prices to reflect the conditions of supply, demand and competition, especially in Europe.

In simple correlations the policy variables also appear to have mixed effects on the utilisation of gas pipelines. Retail competition and private ownership appear to be associated with higher utilisation rates. Third party access, removal of entry restrictions and any type of unbundling appear to be associated with lower utilisation rates. Note, however, that European Commission (2007) was particularly critical of the adequacy of unbundling and the effectiveness in practice of third party access regimes in European gas markets, even after the reforms, in part because of the prevalence of long-term contracts and the continued close vertical ownership links between incumbent operators. In addition, the methods by which the incumbents have been able to reserve storage capacity, whether or not they use it, have had serious deleterious effects on the ability of new entrants to provide adequate services.

The results of econometric estimations shown in Tables 6.11 and 6.12 (Annex 6) correct for the influence of other, non-regulatory factors and also show whether the strength of the policy effects are significantly different from zero.

As for electricity, the econometric estimation also attempts to control for *unobservable* influences on gas prices and efficiency that might vary over time or across economies. Unobservable differences over time are controlled using a deterministic, quadratic time trend. In particular, this trend is intended to capture the significant and accelerating upward trend in wholesale gas prices over the sample period. Unobservable differences across economies are controlled using random effects estimation, even when Hausman tests show that these estimates differ significantly from (perhaps flawed) fixed effects estimates.

When non-regulatory factors are controlled for, few of the policy variables have a significant effect on gas prices. The only variable that appears to be significantly associated with lower gas prices is the unbundling of production/import from other market segments. This result accords with the observations of European Commission (2007) that close ownership links (and long-term contracts) lock new entrants out of being able to secure their own primary gas supplies, creating a serious impediment to competition.

The non-regulatory factors have the expected impact on gas prices. Prices are higher when GDP is higher. Prices are lower when gas pipelines are longer, suggesting economies of scale in gas production. Higher rates of urbanisation tend to reduce gas prices, though this effect is not significant.

Few of the policy variables have a significant effect on the utilisation of gas pipelines. Third party access appears to reduce pipeline utilisation, but third party access in Europe has been effectively thwarted by a variety of other means. Retail competition increases pipeline utilisation. The presence of retail competition is the 'acid test' of whether unbundling and third party access regimes create effective competition, and the effect on pipeline utilisation is significant. Private ownership also has a significant positive effect on pipeline utilisation. Higher rates of urbanisation tend to reduce pipeline utilisation, though the effect is not quite significant at conventional testing levels and, in any event, the effect is ambiguous *a priori*.

6.6 IMPLICATIONS FOR APEC ECONOMIES

The econometric results of the previous section can be used to project the effects that further structural reforms in APEC electricity and gas markets may have on prices and efficiency.

As noted earlier, such out-of-sample projections need to be interpreted cautiously. The econometric results are conditioned by local factors and details of policy design and implementation that are peculiar to OECD members in general and European economies in particular. To the extent that these local factors are adequately captured by the policy and control variables used in the regressions, they can also be taken into account in out-of-sample projections. But many of them will not be adequately captured by these variables. For example, the above policy variables do not distinguish between regulated and negotiated third party access, and this distinction was seen as crucial to the effectiveness of European reform efforts. Nevertheless, while caution is needed in interpreting numerical out-of-sample projections, the general lessons from Section 6.3 also provide some guidance about the prerequisites for successful reform.

Tables 6.2 and 6.3 (Annex 6) provide a great deal of detail about the current state of play in APEC electricity and gas markets, and can be used as the basis for deriving values for the policy variables currently appropriate to each APEC economy. Combined with the coefficient estimates from Tables 6.9–6.12 (Annex 6), this information can then be used to project by how much prices or efficiency measures would change if further reforms were undertaken (and, hence, the values of each of the policy variables were to change). To simplify the process, however, projections can be made for each type of reform, assuming a starting point for prices or efficiency that was the same as the OECD average (as shown in Tables 6.4 and 6.5 [Annex 6]). Thus a rough guide to the effects of individual reforms can be obtained as follows.

In electricity markets, the introduction of a third party access regime would be associated with about 4.7% lower electricity prices than otherwise, on an indicative basis and holding all

other factors constant (where 0.0032/0.067587 = 4.7%). The introduction of a wholesale electricity market would be associated with about 7.2% lower electricity prices, while the unbundling of generation from transmission would be associated with 11.1% lower electricity prices. In reality, the allocation of separate effects to separate reform initiatives is unlikely to be as precise as the combined effect of all initiatives, since the separate initiatives tend to go together. The combined effect of all three initiatives would be electricity prices estimated to be 23% lower than otherwise. This is a similar order of magnitude to the effects implicit in Steiner's projections.

Note that the econometric results also suggest that wholly private ownership of electricity operators would be associated with prices that were 23.1% *higher* than if ownership were wholly public (where 4*0.0039/0.067587 = 23.1%). Pollitt (2007) also notes that private ownership can make it difficult to get reforms under way. However, this is an effect of initial conditions that is unlikely to persist over time. Doove et al. (2007) also note that ownership is unlikely to be independent of market structure, as the econometrics implies. Any positive relationship between price and private ownership is likely to be strongest when there is a monopoly provider – private sector monopolists might be more likely to pursue higher profits than government monopolists and, hence, to raise electricity prices by exploiting their market power. This effect is also unlikely to persist over time as reform efforts continue.

The econometric results also suggest that unbundling of generation from transmission would be associated with 2.1% higher utilisation of generating capacity on an indicative basis (where 0.0944/4.428908 = 2.1%). No other reform initiatives were shown to have a significant effect on efficiency.

In gas markets the introduction of retail competition would be associated with gas prices being about 15.0% lower than otherwise, on an indicative basis and holding all other factors constant (where 30.446/203.2362 = 15.0%). The unbundling of gas production/import from other segments of the market would be associated with about 23.4% lower gas prices. Both these percentages would be lower if initial gas prices were higher than the average in the OECD sample, as they are currently.

The econometric results also suggest that the introduction of retail competition would be associated with 24.3% higher utilisation of pipeline capacity than otherwise on an indicative basis (where 1.4587/6.013908 = 24.3%). Third party access was projected to reduce capacity utilisation, but this reflects the difficulty of instituting an effective third party access regime in European gas markets. Private ownership is projected to about double capacity utilisation, probably reflecting that private gas operations tend to serve dedicated industrial users.

As noted, these results are indicative only and are not fine tuned to the individual circumstances of each APEC economy. However, they do suggest that the slow, incremental approach to reform of APEC energy markets is worth reviving or continuing, despite the considerable burdens imposed on regulatory capacity. APEC economies learn from the general lessons of reform in other economies, and they can learn from close interaction and cooperation among industry regulators. APEC processes are well tuned to providing the sort of experience sharing and capacity building that can make the regulatory burden easier. They can also learn from doing. The results of this paper suggest that the gains to industrial users and, by inference, to households would be considerable.

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ANNEX 6: TABLES 6.2–6.12

Table 6.2: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Australia	Partially privatised	Ownership of generation remains concentrated, with significant state regulation	Partially privatised	Interconnected national grid operated by 8 TSOs	13 DSOs operate distribution networks under state TPA regimes. Australian Energy Regulator to take over regulation by 2010	National Electricity Market is a compulsory wholesale pool operated by National Electricity Market Management Company. Wholesale prices are market-based.	Partially privatised	Retail competition has been introduced since 2003	IERN
Canada	Most generation companies are Crown corporations, but generation in Alberta is mostly private.	18 generators, but 85–90% of the market is served by the provincial majors (BC Hydro, Hydro Quebec etc.)	Partially privatised, vertically integrated	Some vertically integrated (BC Hydro). Some functionally unbundled (Quebec, Saskatchewan, Manitoba, Nova Scotia, Ontario). IERN also describes the situation as 'mostly' vertically integrated.	*Several provinces have adopted the Open Access Transmission Tariff which allows IPPs to bid on new generation development and use the transmission system to gain access to wholesale markets (see also retail access details).*	BC, Saskatchewan, Quebec, Manitoba, New Brunswick and Alberta have a competitive wholesale pool. It is mandatory in Alberta.	Partially privatised	Ontario: retail access since 2002. Alberta: Retail access since 2001. BC, NB: Industrial open access.	IERN
Chile	Fully privatised	31 power generation companies, very often vertically integrated along the supply chain	Fully privatised	Yes - most transmission facilities were owned by TRANSELEC, majority owned by Hydro Quebec.	Free access to transmission services for generators; regulated third party access regime.	Wholesale prices are market based for sales to eligible customers and to Centros de Despcho Economico de Carga. Sales to distributors (which mainly supply non eligible customers) are regulated.	Fully privatised	34 distribution companies. Eligibility levels set at 2000KW (and 500-2000KW under certain circumstances).	IERN

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
China	Dominated by state-owned enterprises. Even the new generation and grid companies created in accordance with 2002 reform plans are under the direct ownership and control of State-owned Asser Supervision and Administration Commission	90% of electricity produced by state-owned or state-controlled enterprises, despite a number of small power plants. The government determines the output that each generator is to produce, and approves selling prices.	Dominated by state-owned enterprises. Six state-owned regional networks in charge of transmission and distribution.	The separation of transmission and distribution has not yet taken place. However, in the reform experiments in the North East and East, there are separate grid operating companies.	The North East China and East China regional electricity markets are described as being power exchange markets with a single buyer – hence no third party access because there is no retail choice.	*Trading activity low, mostly between generators and provincial electricity companies, which act as single buyers. Two pilot projects to develop regional trading markets (one in North East, one in East) were launched in 2007*	Dominated by state-owned enterprises	Under each of the regional grid companies, there are provincial grid companies that have monopolies over distribution and sales within a specified area in accordance with the Electricity Law 1995.	TPR, Ni (2005).
Hong Kong, China	Two vertically integrated private companies with regional monopolies, operating under agreements that expire in 2018. Duopoly appears natural, as neither has exclusivity.	None	Two vertically integrated private companies with regional monopolies, operating under agreements that expire in 2018. Each owns its exclusive transmission grid	None	None	None	Two vertically integrated private companies with regional monopolies, operating under agreements that expire in 2018. An earlier government consultation document on post-2008 arrangements proposed continued regulation with more flexibility (shorter duration of agreement, lower permitted rate of return). This has now been accepted.	No competition, but rates of return regulated, and high by global standards for regulated private companies	TPR

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Indonesia	State-owned electricity utility PT PLN (Persero) owns two-thirds of generating capacity. IPPs provide the rest under Power Purchase Agreements. Under new government regulation 3/2005 IPPs must be in joint venture (maximum 95% foreign ownership).	Retail prices were controlled, often at less than cost of production, so incumbent operated at a loss. This deterred investment in IPPs. There have also been disputes over payments by PT PLN to IPPs. There were take-or-pay contracts at high prices, to favour IPP owners who had political connections. Under new regulation 3/2005, there will generally be competitive bidding for new capacity	State-owned electricity utility PT PLN (Persero) dominates, and presumably owns the transmission capacity.	None	None	No - IPPs sell to PT PLN on long-term contract.	PT PLN has monopoly on retail sales.	Electricity Law of 2002 anticipated retail competition by 2008, but the law was annulled by the Constitutional Court. A new government regulation has been drafted (3/2005) but PT PLN retains the sole right to distribute and sell electricity. However, regulated retail price has been raised - now about production cost. New law was finally passed in September 2009 - will allow private investors and local authorities to generate, transmit, distribute and sell electricity without working through PLN. Authorities to retain some control over prices.	TPR, Nikomborirak and Manachotphong (2007).

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Japan	Privatised	10 regional private utilities responsible for generation, transmission, distribution and supply in their respective service areas. Only a small percentage provided by IPPs.	Private	None	The regional utilities own and operate transmission and distribution grids under a TPA regime.	*The Japan Electricity Power Exchange is a voluntary market where both spot and forward trading takes place. It was established in November 2003 and started operation in April 2005*	Private	*Eligibility levels set at 50 KW since 2005. Full market opening (including residential customers) to be introduced in 2007*	IERN
Korea	Majority state-owned KEPCO generates 94% of all power. A few IPPs supply to KEPCO under long-term contract. KEPCO generating capacity split into 6 separate Gencos, but these are still subsidiaries of KEPCO - privatisation not attempted since liberalisation was suspended in 2004.	*KEPCO generates 94% of all power and handles distribution and transmission. A few IPPs supply to KEPCO under long-term contract. KEPCO's monopoly on non-nuclear power generation abolished in 1999, and its generation capacity was split in 2001. These gencos compete with each other in a generation pool.*	KEPCO manages transmission and distribution, its wholly owned subsidiaries manage generation.	*KEPCO generating capacity split into 6 separate Gencos, but these are still subsidiaries of KEPCO - privatisation not attempted since liberalisation was suspended in 2004, based on the two-thirds recommendation of a joint study team, who thought the benefits of an integrated regulated monopoly outweighed the benefits of competition.*	*A regulated third party access system for transmission was introduced to facilitate trade between generators and large customers, using rate of return on assets to determine the transmission fee.*	*Gencos compete in a wholesale power pool (one-way bidding).*	KEPCO manages transmission and distribution, and is majority state-owned.	None. Eligible customers can buy electricity directly from Gencos, but distribution services (billing etc) are still a KEPCO monopoly.	TPR, Cho, Gulen and Foss (2007).

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Malaysia	Tenaga is majority state-owned, and owns about 60% of generating assets. The IPP sector owns 40%. The first 5 IPP licences (in early 1990s) went to the politically well-connected, and Tenaga became minority shareholder in all but one of the first IPPs.	The IPPs signed long-term contracts with Tenaga, which were overseen by the government. These included take or pay provisions or fixed capacity charges, very beneficial to the IPPs. Since the Asian financial crisis IPPs have signed contracts on less beneficial terms.	Tenaga holds a monopoly over transmission and distribution in all of Peninsula Malaysia. Two smaller companies provide power in Sabah and Sarawak.	None	Described as being very limited.	None. Plans for a power pooling system were put on hold in the wake of the Californian power crisis, but there were moves to inject more competition into the process of bidding for power plant construction.	Tenaga holds a monopoly over transmission and distribution in all of Peninsula Malaysia. Two smaller companies provide power in Sabah and Sarawak.	None.	Rector (2005)
Mexico	Under Article 27 of the Constitution, the State has exclusive responsibility for generating, transporting, transforming, distributing and supplying electricity as a public service. The public electricity system is dominated by CFE, a decentralised state-owned entity that operates most of the electricity plants, and all of the transmission and distribution network jointly with LFC.	In 2006 CFE bought 26% of its energy from IPPs. IPP (small scale production), cogeneration, self-supply, import and export are not deemed a public service.	Under Article 27 of the Constitution, the State has exclusive responsibility for generating, transporting, transforming, distributing and supplying electricity as a public service. The public electricity system is dominated by CFE, a decentralised state-owned entity that operates most of the electricity plants, and all of the transmission and distribution network jointly with LFC.	None. The system operator, the State-owned National Energy Control Centre, is part of CFE.	None. IPPs can sell only to CFE. In 2002 there was a proposal by the Executive to, among other things, convert the National Energy Control Centre into a decentralised entity responsible for dispatch and capable of guaranteeing non-discriminatory access to distribution networks. This was not adopted by Congress.	Apparently none.	Under Article 27 of the Constitution, the State has exclusive responsibility for generating, transporting, transforming, distributing and supplying electricity as a public service. The public electricity system is dominated by CFE, a decentralised state-owned entity that operates most of the electricity plants, and all of the transmission and distribution network jointly with LFC.	Private generators are not allowed to sell to end users. End-user prices are subsidised.	IERN, TPR

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
New Zealand	Partially privatised	5 companies produce 95% of the electricity generation	Transmission is publicly owned, while distribution is partially privatised.	Transmission is owned and operated by Transpower.	Yes (see also retail competition)	Yes.	Transmission is publicly owned, while distribution is partially privatised.	There are 28 distribution companies that sell mainly to retailers. Retailers include the big 5 generation companies, plus at least 4 others. All end users can choose between retailers.	IERN
Peru	Partially privatised	State-owned Electroperu SA is the dominant player. Other IPPs are Edegel SAA and Egenor Duke Energy Internacional SAC. The private sector produces four-fifths of the energy and competes for non-regulated customers.	Partially privatised	Yes. The majority of the transmission system is controlled by ISA Group.	Yes - generators compete for customers.	No. The wholesale market relies on bilateral medium or long-term contracts for non-regulated customers.	Partially privatised, mainly private.	Two big private companies, plus the rest operated by the State. Eligibility is set at 1 MW.	IERN

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Philip-pines	Partially privatised	State-owned PSALM took over operation of generation assets of the vertically integrated National Power Corporation when it was broken up in 2001. These assets are to be privatised. The Electric Power Industry Reform Act of 2001 (EPIRA) states that 70% must be sold before open access and retail competition. As of May 2008, privatisation was still not complete. There are also IPPs.	Transmission is publicly owned, while distribution is partially privatised.	*Yes. State-owned National Transmission Company operates the national grid.*	No. See also retail competition.	No. Wholesale prices regulated by the Energy Regulatory Commission. IPPs had long-term contracts with NPC prior to EPIRA. Immediately after EPIRA, lack of contracts may have thwarted privatisation. EPIRA now allows short-term transition contracts until one year after open access. But still a 'chicken and egg' problem.	Partially privatised. Distribution: 17 privately owned companies and 119 cooperatives. Accounting separation between regulated and non-regulated assets for DSOs was promulgated in 2003 and is due for amendment in 2006.	The implementation of retail competition and open access was tentatively set up on 1 July 2006, but it is totally dependent on the realisation of NPC's generation asset privatisation plan.	IERN, Mira and Singson (2007), Philippine Daily Inquirer
Russia	*System was dominated by vertically integrated Unified Energy System of Russia (RAO UESR), 52% government owned with 10% Gazprom stake. Foreign investors have taken stakes in the wholesale generation companies and territorial generation companies that were split off since 2006.*	RAO UESR has 70% installed capacity. A RAO UESR subsidiary owns the wholesale market. Mandatory bilateral contracts were at government fixed prices in transition to Target Market Model.	RAO UESR is sole owner of Federal Grid Company. It owns about 96% of transmission and 77% of distribution systems.	*Not really initially. Vertically integrated RAO UESR was sole owner of Federal Grid Company. But since 2006 six wholesale generation companies and 14 territorial generation companies have been split off, though RAO UESR retains shareholdings in these.*	*Not initially (customers were serviced by regional monopolies). But by 2008, competitive supply companies and retail competition were in place.*	*Not initially. But now a competitive wholesale market accounts for about 20% of generation.*	*Customers were served by regional monopolies. But by 2008, competitive supply companies and retail competition were in place. Supply companies privately owned.*	*As at 2008, simplified provisions in place for transition of consumers from one seller to another. Extent of real retail competition not clear. Aiming for full competition (ie phasing out of regulated prices) at both wholesale and retail level by 2011.*	IERN (from March 2006), RAO UESR present-ations.

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Singapore	Generation dominated by 3 government-linked companies. Temasek announced in 2007 that they will be divested by 2008–09.	To curtail market power, the Energy Market Authority imposed vesting contracts in 2004, which oblige generators to produce a specified quantity of electricity and limit prices. Contracts to be rolled back from 2005.	One transmission company, SP PowerAssets Ltd, is a subsidiary of Singapore Power, a Temasek company.	Yes	*Yes (see also retail competition)*	Yes. Wholesale market run by Energy Market Company Pty Ltd. Singapore electricity pool introduced in 1998.	SP Services, another subsidiary of Singapore Power, administers billing, meter reading and customer databases.	*Retail competition being introduced in stages. By mid-2004, the 10 000 biggest customers (75% of total demand) could buy from the wholesale pool or from retailers. The Energy Market Authority is studying how to retail to households efficiently.*	TPR
Chinese Taipei	TPC is a vertically integrated state-owned monopoly, with monopoly rights until 2008. IPPs provided around 16% of power in 2004, and sell through power purchase agreements to TPC. TPC privatisation is on hold indefinitely.	IPPs provided around 16% of power in 2004, and sell through power purchase agreements to TPC.	TPC is a vertically integrated state-owned monopoly, with monopoly rights until 2008. TPC privatisation is on hold indefinitely.	None	None	None	TPC is a vertically integrated state-owned monopoly, with monopoly rights until 2008. TPC privatisation is on hold indefinitely.	TPC is a vertically integrated state-owned monopoly, with monopoly rights until 2008. TPC privatisation is on hold indefinitely.	TPR, Wang (2006)

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
Thailand	As at 2007, State-owned generator and distributor (EGAT) had 56.8% of production. Rest was from private suppliers and imports (from Myanmar, Lao PDR and China). Domestic generation was 96.4% of domestic consumption. EGAT was corporatised in June 2005, but a planned IPO was called off.	As at 2007, State-owned generator and distributor (EGAT) had 56.8% of production. Rest was from private suppliers and imports.	EGAT has a monopoly in transmission.	No – EGAT is vertically integrated, but there is accounting separation.	No. In December 2003 the government approved the Enhanced Single Buyer model, which establishes EGAT as the sole electricity buyer, transmitter and wholesaler.	In 2000 there were plans to unbundle transmission and distribution, to create an independent regulator and create a wholesale power pool. Plans were thwarted by EGAT objections and by election of Thaksin, which converted reform plans into plan to create a 'national champion'. Enhanced single buyer model looks like it uses (retains?) PPAs, but 'new capacity allocation' based on competitive bidding. However, no independent regulator (cf Republic of Korea) so claimed to favour incumbent.	EGAT sells to the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA).	None. In 2005 regulated retail tariffs were only about 0.6% higher than marginal cost. Different categories of customers receive different degrees of cross-subsidy.	TPR, Greacen and Greacen (2004), Sira-soontorn (2008).

Table 6.2 continued: Electricity regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling	Third party access	Wholesale pool	Downstream ownership	Downstream competition	Source*
United States	Mixed, mostly private.	IPPs have flourished.	Mixed, mostly private.	Transmission segment is now undergoing unbundling. Distribution segment is changing more slowly. Companies are operated on a vertically integrated, cost-plus business model.	Starting from 2000, retail customers in some states have been given the choice of electricity suppliers. This suggests third party access.	In 2001 the California Power Exchange went out of business. Internet-based B2B markets have emerged, using a pay-as-bid model (essentially bilateral contracts).	Mixed, mostly private.	Starting from 2000, retail customers in some states have been given the choice of electricity suppliers.	IERN, Finance-Tech.
Viet Nam	State-owned EVN dominates generation, transmission, distribution and sales of electricity in Viet Nam. Foreign and private participation has been permitted since 2002, but lack of a regulatory regime has inhibited investment.	IPPs provide 19% of generating capacity	State-owned EVN dominates generation, transmission, distribution and sales of electricity in Viet Nam. Foreign and private participation has been permitted since 2002, but lack of a regulatory regime has inhibited investment.	No	No	No	State-owned EVN dominates generation, transmission, distribution and sales of electricity in Viet Nam. Foreign and private participation has been permitted since 2002, but lack of a regulatory regime has inhibited investment.	No	EIA Country Analysis Brief

* IERN is the International Energy Regulation Network website (http://www.iern.net/portal/page/portal/IERN_HOME/IERN_ARCHIV/Country_Factsheets). APEC IAP is the APEC Individual Action Plan website (http://www.apec-iap.org/). EIA Country Analysis Briefs come from the US Energy Information Administration website (http://www.eia.doe.gov/emeu/cabs/contents.html). TPR is the Trade Policy Reviews of the WTO (http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm).
Sources: See last column.

Table 6.3: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Australia	Private	Many private companies involved in exploration and production.	Private	Many major gas pipeline companies	National Gas Code regulates the gas distribution and transmission access regime.	Some companies vertically integrated in this way, but some separate retailers.	Private	Most States and Territories committed to implement full retail competition. Actual eligibility varies. Key reform dates are 1999 for NSW (partial) and SA, 2002 for NSW, ACT and Vic.	IERN
Canada	Private	At least 4 big companies	Partially privatised	Yes. Privately owned TransCanada Pipelines is the largest operator	Regulated third party access (according to OECD).	Yes (according to OECD). Natural gas distribution companies have been given franchise areas to serve customers (generally by local municipalities).	Private	Yes - fully liberalised since 1987.	IERN, OECD regulatory scorecard.
Chile	Partially privatised	State-owned ENAP is the main licensee for exploration and production. LNG terminal is owned by GASCO. Chile heavily dependent on imports from Argentina. Only one of four disjoint markets (the Magellan market) is supplied in part by ENAP.	Transmission partially privatised and distribution fully privatised.	Mostly. GASCO (LNG owner) has part ownership in one of 2 transmission pipelines to central area. ENAP owns the pipeline from its production fields to the Magellan basin. Other pipelines owned by third parties or end user (Methanex, a methanol producer in the Magellan region).	Unclear.	Apparently not.	Distributors are two GASCO subsidiaries plus two other private companies	More than one distribution company, but unclear whether there is competition or whether these are regional monopolies. OECD describes the natural gas market as a monopoly. Little prospect for sources other than Argentina, and it has cut supplies at various times.	IERN, Galetovic and de Mello (2005).

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
China	Dominated by the 3 large state-owned oil and gas holding companies - CNPC, Sinopec and CNOOC. All 3 have numerous local subsidiaries, which are listed on stock exchanges. CNPC and Sinopec are vertically integrated but their mandates are geographically separated.	CNPC dominates in gas production and sales, with 75.6% market share in 2006. LNG imports began in 2006. CNPC also involved in LNG imports. CNOOC provides offshore gas by pipeline to Hong Kong, China and Shanghai, and is the leading player in LNG. Some small size producers becoming active, mainly private or owned by local governments, to supply local markets.	One West to East pipeline became operational in 2004, and another has been approved. CNPC now owns about 80% of pipeline network.	One West to East pipeline became operational in 2004, and another has been approved. CNPC now owns about 80% of pipeline network.	Probably not. There is no specific law to regulate the natural gas industry. The existing legislation on pipelines concerns safety. Nevertheless, with growing interconnectedness, sharing of pipeline capacity apparently occurs.	Apparently. In 2002, the city gas business was opened to private and foreign companies, and more than 60 companies are now distributing in several cities.	Most distribution companies owned and managed by local governments. Natural gas delivered to some major industrial users directly by producers. In 2002, the city gas business was opened to private and foreign companies, and more than 60 companies are now distributing in several cities. LNG receiving terminals owned by joint ventures of local governments, has users and importing companies such as CNOOC and CNPC.	*Up until 2005, the price was tightly controlled, and not linked to production costs. This distorted use. In August 2007, the government issued a directive on which activities can use natural gas. Household fuel and combined cycle seems preferred, while its use to produce methanol is forbidden. Since 2005, controlled prices are adjusted annually in accordance with the price of other fuels, and producers can increase prices up to a limit, usually of 8%.*	TPR, Higashi (2009)

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Hong Kong, China	Town gas is distributed by HKCG. LPG is supplied by six oil companies. Natural gas is supplied by pipe from the South China Sea and used solely by CLP for power generation. CLP plans for an LNG terminal recently scrapped after HK and Chinese governments signed MOU renewing 20 year supply agreements for natural gas and electricity.	Excluding natural gas, HKCG had about 80% of the market in the mid 2000s.	HKCG owns the pipes that service most households.	No.	No. Common carrier provisions investigated in late 1990s but there were deemed to be too few gas sources to make this worthwhile.	No.	Town gas is distributed by HKCG. LPG is supplied by six oil companies. Natural gas is supplied by pipe from the South China Sea and used solely by CLP for power generation.	Excluding natural gas, HKCG had about 80% of the market in the mid 2000s.	APEC IAP and other documents, CLP documents available from web.
Indonesia	Prior to 2001, Pertamina was both the oil and gas company and regulator. Under the 2001 deregulation and reform, upstream regulation is now under BP Migas. PT Pertamina is now limited liability and 100% government owned.	PT Pertamina and six major international companies dominate the natural gas industry. According to EIA, the six majors had about 80% market share in the mid 2000s. Just over 50% of gas was exported in the mid 2000s, but this is shrinking.	PT PGN has 87% share of transmission business and 93% share of distribution. It is 55% government owned. Listed on the Stock Exchange.	Apparently.	Yes. Gas transmission contracts are long-term, with minimum ship-or-pay volumes, with tariffs in USD. Access regulated by BPH Migas (downstream regulatory agency).	Apparently not.	PT PGN has 87% share of transmission business and 93% share of distribution. It is 55% government owned.	PT PGN has 87% share of transmission business and 93% share of distribution. It is 55% government owned. 98.7% of its customers are industrial.	EIA Country Analysis Briefs, PT PGN documents.

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Japan	Partly privatised.	Domestic production negligible – 97% of demand met by LNG imports. Most import contracts in 1980–90s were long-term, tied to price of crude oil and not flexible. From 2001 the three major vertically integrated private companies (Tokyo Gas, Osaka Gas and Toho Gas) started to sign or renew on more flexible terms.	Partly privatised.	No. The three largest gas companies own and operate their transmission and distribution networks under a regulated third party access for large volume supply since 1999.	Yes. Regulated third party access for large volume supply since 1999.	No.	Partly privatised.	Most imports go to power generation or petrochemical feedstock - only about 1/3 to domestic consumption. Private companies have 97% of the market. Eligibility levels were at 0.5 Mcm by 2004, lowered to 0.1 Mcm by 2007. The price for non-eligible customers is regulated.	IERN
Korea	KOGAS is the main importer and distributor of natural gas and the largest purchaser of LNG in the world. KOGAS is 27% owned by government, 25% owned by (majority govt owned) KEPCO, and the rest split among local govt and institutional investors. State-owned KNOC is involved in domestic production, but this is a small fraction of consumption.	Not much. In 2005 POSCO and Mitsubishi started a fourth LNG import terminal, with about 7% of total import capacity.	KOGAS operates 3 LNG import terminals as well as the pipeline system. In 2005, POSCO and Mitsubishi started a fourth LNG import terminal, with about 7% of total import capacity.	No	KOGAS has a monopoly over wholesale trade, transmission and wholesale distribution.	KOGAS is the sole distributor to private city gas companies that have territorial monopolies and supply retail users through their distribution pipelines.	Partly privatised.	KOGAS is the sole distributor to private city gas companies that have territorial monopolies and supply retail users through their distribution pipelines. Wholesale gas tariffs must be approved by MOCIE, and retail gas prices by local governments. Essentially rate of return regulation.	TPR, EIA Country Analysis Briefs.

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics)

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Malaysia	Wholly state-owned Petronas has a monopoly on all upstream natural gas developments. It also plays a leading role in downstream activities and LNG trade. Most natural gas production occurs from production sharing contracts operated by foreign companies in conjunction with Petronas.	No.	Through its listed subsidiary, Petronas Gas Bhd, Petronas has since 1984 been implementing the three-phase Peninsular Gas Utilisation (PGU) project. The entire PGU system now spans over 1,700km, comprising main gas transmission pipelines, supply pipelines and laterals. Also planning a Sabah-Sarawak pipeline.	No	No	Yes.	Gas Malaysia is sole provider of gas to non-power sector. It is 55% owned by MMC, 25% Tokyo Gas - Mitsui Holdings, and 20% Petronas Gas.	No	EIA Country Analysis Briefs, MMC website.
Mexico	Partially privatised. Government-owned PEMEX is licensed for production and first hand sale of gas on the wholesale market, while import, export and commercialisation have been liberalised and no authorisation is required.	No. However, as at mid 2007, the Regulatory Commission for Energy had granted private consortia, with domestic and foreign participation, 22 permits for distribution, 5 storage permits and 21 transport permits for serving the public.	Partly privatised. The Mexican natural gas transport system is composed of different unconnected pipelines operated by different TSOs under a third party access regime. The main pipeline is run by PEMEX. Several local DSOs operate the distribution pipelines under a regulated TPA/negotiated TPA.	No. However, transmission, storage and distribution rates and quality of services are regulated by the ERC.	Yes.	No. But ERC controls prices when DSOs act as supplier in their licensed area. Also, vertical separation (corporate unbundling) is required one step back – between distribution and transmission activities when the two systems are integrated.	Partly privatised.	Yes. The market is fully opened since 1995. End-user prices are market-based. ERC controls PEMEX's first hand sales prices as well as when DSOs act as supplier in their licensed area.	IERN, TPR.

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
New Zealand	Privatised.	81% of natural gas production comes from 2 fields - Maui (Shell, OMV NZ Ltd and Todd Petroleum) and Kapuni (Shell, Todd Petroleum). The rest comes from a number of fields.	Mainly private. NGC has one main network in the North Island - NGC has been acquired by Vector, which is majority private owned. The Maui pipeline is owned by a subsidiary of the Maui field owners. Other pipelines are privately owned.	Mostly.	Yes. *A regulated TPA regime has been in place for the Maui pipeline since 2005.* The NGC/Vector pipeline had open access arrangements before this.	Partly. 4 distributors, with NGC/Vector the main player. 9 gas retailers, including NGC/Vector, but also other players not involved in distribution.	Partly privatised.	9 gas retailers. Domestic prices are regulated by the Ministry of Economic Development.	IERN
Peru	Four main areas being exploited by domestic and foreign private companies. Also an LNG gas export terminal operated by a consortium led by Hunt Oil.	Yes.	One transmission pipeline operated under a regulated TPA regime by a consortium led by Techint based in Argentina.	Yes.	Yes.	No.	A company majority owned by Suez Group is the licensee distributor supplying Lima. Other major cities yet to be connected.	No	IERN
Philip-pines	Small but rapidly growing sector. 3 main areas of gas associated with oil. Main one is offshore. Domestic production used for power generation.	No. Imports under consideration.		No.	No.	NA	NA	NA	IERN

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Russia	Gazprom is the 38% government-owned natural gas monopolist that dominates the sector. It accounts for 90% of production (2006). Three other private companies expected to be major contributors in the future.	Not much.	Gazprom controls the pipeline network.	No.	No.	Gazprom has the duty to supply gas to the domestic market at government-regulated prices.	Gazprom.	No	IERN
Singa-pore	Partially privatised. After 2002 reforms, two companies import gas: SembGas and Gas Supply, the latter being a wholly owned subsidiary of government-owned Temasek Holdings. Senoko Power (owned by Temasek) also imports, but solely for its own power generation.	Duopoly.	Government-owned Power Gas is involved only in the transport of gas. It remains the only licensed gas transporter and gas system operator.	Yes.	*Yes. The Gas Code of 2005 details the terms and conditions for gas transportation on an equitable and non-discriminatory basis.*	No.	SembGas, Gas Supply and City Gas (also a wholly owned subsidiary of Temasek) are involved in gas retailing. City Gas also manufactures gas.	Three players.	TPR

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
Chinese Taipei	Natural gas is supplied mainly by the state-owned CPC. It is the sole provider of gas, wholesale and transportation services to local distribution companies, power generators and industrial firms. There are private LNG terminals.	No. But wholesale prices are set by a Natural Gas Pricing Formula based on full cost recovery principle.	Natural gas is supplied mainly by the state-owned CPC. It is the sole provider of gas, wholesale and transportation services to local distribution companies, power generators and industrial firms. There are private LNG terminals.	No.	No.	No.	Local distribution companies.	No. But retail gas prices are also regulated by the ministry and local government, also based on the full cost recovery principle.	TPR
Thailand	Chevron Texaco is the largest natural gas producer, with about 2/3 of production. Three other companies also produce. PTTEP has about 28% of market. It is a subsidiary of PTT, the partly privatised oil giant.	Yes.	PTT Pipeline Co, 100% owned by PTT, which is just over 50% government owned.	Yes.	*Yes. Unclear when this came into force, but may have been after 2004.*	No.	Only one distribution licence had been issued to PTT by the newly formed Energy Regulatory Commission in 2009.	No	TPR, ERC website, Dept of Mineral Resources website, Skeer (2004).

Table 6.3 continued: Gas regulation in APEC economies, 2009 (reforms since 2004 in italics).

	Upstream ownership	Upstream competition	Transmission ownership	Unbundling of transmission and production	Third party access	Unbundling of distribution and supply	Downstream ownership	Downstream competition	Source*
United States	More than 500 natural gas processing plants. Following reform in 1990s, the companies owning these shifted from primarily oil/gas producers to 'midstream' companies, which now dominate.	Yes.	Competition encouraged by FERC letting pipelines unbundle their gathering, transportation and storage services - can price these separately. FERC also revised transportation rate structures.	Yes.	Regulated TPA.	Yes	Since the late 1980s public utility commissions have encouraged local gas distribution companies to unbundle their services and allow customers to choose their gas supplier.	Only about 50% of states have actively pursued deregulation of gas distribution. One problem is special obligations (e.g., USOs).	IERN
Viet Nam	State-owned Petrovietnam dominates the natural gas sector. It has foreign partners such as BP, Chevron, Petronas etc in production and development. Most gas is sent directly to industrial and power sector end users, such as the Phu My power complex.	No	Presumably Petrovietnam	No	No	No	Presumably Petrovietnam	No	EIA Country Analysis Brief.

* IERN is the International Energy Regulation Network website (http://www.iern.net/portal/page/portal/IERN_HOME/IERN_ARCHIV/Country_Factsheets). APEC IAP is the APEC Individual Action Plan website (http://www.apec-iap.org/). EIA Country Analysis Briefs come from the US Energy Information Administration website (http://www.eia.doe.gov/emeu/cabs/contents.html). TPR is the Trade Policy Reviews of the WTO (http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm).
Sources: See last column.

Table 6.4: Economic and technological data for electricity, OECD economies, 1990–2008.

Variable	Variable name	Number of observations	Mean	Standard deviation	Minimum	Maximum
Electricity end-user price to industry, net of taxes, USD PPP/kWh	entpr	349	0.067587	0.028455	0.016	0.187
GDP, PPP (current international $, trillions)	gdp_ppp_s	399	1.190218	2.09913	0.046	14.204
Nuclear share in gross production (ratio)	nucshr	399	0.189979	0.2158379	0	0.783681
Hydro share in gross production (ratio)	hydroshr	399	0.2009344	0.2536616	0.0003546	0.9962215
Urban share of population (%)	urban	399	75.3015	10.94613	47.9	97.4
Utilisation rate = gross production (GWh)/net capacity (MWe)	eutil	374	4.428908	0.562455	2.715238	5.852232
Deviation of reserve margin from optimal = abs[(capacity – peak)/peak – 0.15]	eres	332	0.304555	0.1984277	0.0004457	0.9926048
Nuclear share in capacity (ratio)	nuccapshr	374	0.1209503	0.1447605	0	0.5509456
Hydro share in capacity (ratio)	hydcapshr	374	0.2659052	0.2393256	0.0006915	0.9907865
Coal share in capacity (ratio)	coalcapshr	332	0.1543606	0.1766962	0	0.6428536

Sources: See text.

Table 6.5: Economic and technological data for gas, OECD economies, 1990–2008.

	Variable name	Number of observations	Mean	Standard deviation	Minimum	Maximum
Gas end-user price to industry, net of taxes, USD PPP/10e+7kcal	gntpr	260	203.2362	118.1389	74.21	644.418
GDP, PPP (current international $, billions)	gdp_ppp	399	1190.218	2099.13	46	14204
Pipeline length (,000km)	gpipe_s	399	29.32738	87.17871	0	548.665
Urban share of population (%)	urban	399	75.3015	10.94613	47.9	97.4
Utilisation rate = gas consumption (million m^3)/pipeline length (kms)	gutil	391	6.013908	8.047427	0.023514	47.62
Gas share in electricity generation capacity (ratio)	gascapshr	327	0.1019645	0.1029867	0	0.5691414

Sources: See text.

Table 6.6: Policy data for electricity and gas, OECD economies, 1990–2008.

Economy	Year	ETPA	EWPP	EUNB	EOWN	GTPA	GRETC	GENT	GUNB_P	GUNB_T	GOWN
Australia	1990	0	0	0	1	0	0	1	1	0	4
	1991	0	0	0	1	0	0	1	1	0	4
	1992	0	0	0	1	0	0	1	1	0	4
	1993	0	0	1	1	0	0	1	1	0	4
	1994	0	0	1	2	0	0	1	1	0	4
	1995	0	0	1	2	0	0	1	1	0	4
	1996	0	0	1	2	0	0	1	1	0	4
	1997	0	0	1	2	0	0	1	1	0	4
	1998	1	0	1	2	1	0	1	1	0	4
	1999	1	1	1	2	1	1	1	1	0	4
	2000	1	1	1	2	1	1	1	1	0	4
	2001	1	1	1	2	1	1	1	1	0	4
	2002	1	1	1	2	1	1	1	1	0	4
	2003	1	1	1	2	1	1	1	1	0	4
	2004	1	1	1	2	1	1	1	1	0	4
	2005	1	1	1	2	1	1	1	1	0	4
	2006	1	1	1	2	1	1	1	1	0	4
	2007	1	1	1	2	1	1	1	1	0	4
	2008	1	1	1	2	1	1	1	1	0	4
Belgium	1990	0	0	0	3	0	0	1	0	0	0
	1991	0	0	0	3	0	0	1	0	0	0
	1992	0	0	0	3	0	0	1	0	0	0
	1993	0	0	0	3	0	0	1	0	0	0
	1994	0	0	0	3	0	0	1	0	0	0
	1995	0	0	0	3	0	0	1	0	0	4
	1996	0	0	0	3	0	0	1	0	0	4
	1997	0	0	0	3	0	0	1	0	0	4
	1998	0	0	0	3	0	0	1	0	0	4
	1999	0	0	0	3	0	0	1	0	0	4
	2000	1	0	1	3	1	1	1	0	0	4
	2001	1	0	1	3	1	1	1	0	1	4
	2002	1	0	1	3	1	1	1	0	1	4
	2003	1	0	1	3	1	1	1	0	1	4
	2004	1	0	1	3	1	1	1	0	1	4
	2005	1	0	1	3	1	1	1	0	1	4
	2006	1	1	1	3	1	1	1	0	1	4
	2007	1	1	1	3	1	1	1	0	1	4
	2008	1	1	1	3	1	1	1	0	1	4
Canada	1990	0	0	0	1	1	1	1	1	1	4
	1991	0	0	0	1	1	1	1	1	1	4
	1992	0	0	0	2	1	1	1	1	1	4
	1993	0	0	0	2	1	1	1	1	1	4
	1994	0	0	0	2	1	1	1	1	1	4

	1995	0	0	0	2	1	1	1	1	1	4
	1996	0	0	0	2	1	1	1	1	1	4
	1997	0	0	0	2	1	1	1	1	1	4
	1998	0	0	0	2	1	1	1	1	1	4
	1999	1	0	0	2	1	1	1	1	1	4
	2000	1	0	0	2	1	1	1	1	1	4
	2001	1	0	0	2	1	1	1	1	1	4
	2002	1	1	0	2	1	1	1	1	1	4
	2003	1	1	0	2	1	1	1	1	1	4
	2004	1	1	0	2	1	1	1	1	1	4
	2005	1	1	0	2	1	1	1	1	1	4
	2006	1	1	0	2	1	1	1	1	1	4
	2007	1	1	0	2	1	1	1	1	1	4
	2008	1	1	0	2	1	1	1	1	1	4
Denmark	1990	0	0	0	1	0	0	0	1	0	0
	1991	0	0	0	1	0	0	0	1	0	0
	1992	0	0	0	1	0	0	0	1	0	0
	1993	0	0	0	1	0	0	0	1	0	0
	1994	0	0	0	1	0	0	1	1	0	0
	1995	0	0	0	1	0	0	1	1	0	0
	1996	0	1	0	1	0	0	1	1	0	0
	1997	0	1	0	1	0	0	1	1	0	0
	1998	0	1	0	1	0	0	1	1	0	0
	1999	1	1	0	2	0	0	1	1	0	0
	2000	1	1	0	2	0	1	1	1	0	0
	2001	1	1	1	2	1	1	1	1	1	0
	2002	1	1	1	2	1	1	1	1	1	0
	2003	1	1	1	2	1	1	1	1	1	0
	2004	1	1	1	2	1	1	1	1	1	0
	2005	1	1	1	2	1	1	1	1	1	0
	2006	1	1	1	2	1	1	1	1	1	0
	2007	1	1	1	2	1	1	1	1	1	1
	2008	1	1	1	2	1	1	1	1	1	1
Finland	1990	0	0	0	1	0	0	1	0	0	3
	1991	0	0	0	1	0	0	1	0	0	3
	1992	0	0	0	1	0	0	1	0	0	3
	1993	0	0	0	1	0	0	1	0	0	3
	1994	0	0	0	1	0	0	1	0	0	3
	1995	1	0	1	1	0	0	1	0	0	3
	1996	1	1	1	1	0	0	1	0	0	3
	1997	1	1	1	1	0	0	1	0	0	3
	1998	1	1	1	1	0	0	1	0	0	3
	1999	1	1	1	2	0	0	1	0	0	3
	2000	1	1	1	2	0	0	1	0	0	3
	2001	1	1	1	2	0	0	1	0	0	3
	2002	1	1	1	2	0	0	1	0	0	3

	2003	1	1	1	2	0	0	1	0	0	3
	2004	1	1	1	2	0	0	1	0	0	3
	2005	1	1	1	2	0	0	1	0	0	3
	2006	1	1	1	2	0	0	1	0	0	3
	2007	1	1	1	2	0	0	1	0	0	3
	2008	1	1	1	2	0	0	1	0	0	3
France	1990	0	0	0	0	0	0	0	0	0	0
	1991	0	0	0	0	0	0	0	0	0	0
	1992	0	0	0	0	0	0	0	0	0	0
	1993	0	0	0	0	0	0	0	0	0	0
	1994	0	0	0	0	0	0	0	0	0	0
	1995	0	0	0	0	0	0	0	0	0	0
	1996	0	0	0	0	0	0	0	0	0	0
	1997	0	0	0	0	0	0	0	0	0	0
	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	1	0	1	0	0	0	0	0	0	0
	2001	1	0	1	0	0	0	0	0	0	0
	2002	1	1	1	0	0	0	0	0	0	0
	2003	1	1	1	0	1	1	1	0	1	0
	2004	1	1	1	0	1	1	1	0	1	0
	2005	1	1	1	1	1	1	1	0	1	1
	2006	1	1	1	1	1	1	1	0	1	1
	2007	1	1	1	1	1	1	1	0	1	1
	2008	1	1	1	1	1	1	1	0	1	1
Germany	1990	1	0	0	2	0	0	1	1	0	4
	1991	1	0	0	2	0	0	1	1	0	4
	1992	1	0	0	2	0	0	1	1	0	4
	1993	1	0	0	2	0	0	1	1	0	4
	1994	1	0	0	2	0	0	1	1	0	4
	1995	1	0	0	2	0	0	1	1	0	4
	1996	1	0	0	2	0	0	1	1	0	4
	1997	1	0	0	2	0	0	1	1	0	4
	1998	1	0	1	2	0	1	1	1	0	4
	1999	1	0	1	2	1	1	1	1	0	4
	2000	1	1	1	2	1	1	1	1	0	4
	2001	1	1	1	2	1	1	1	1	0	4
	2002	1	1	1	2	1	1	1	1	0	4
	2003	1	1	1	2	1	1	1	1	0	4
	2004	1	1	1	2	1	1	1	1	0	4
	2005	1	1	1	2	1	1	1	1	0	4
	2006	1	1	1	2	1	1	1	1	0	4
	2007	1	1	1	2	1	1	1	1	0	4
	2008	1	1	1	2	1	1	1	1	0	4

Greece	1990	0	0	0	0	0	0	0	0	0	0
	1991	0	0	0	0	0	0	0	0	0	0
	1992	0	0	0	0	0	0	0	0	0	0
	1993	0	0	0	0	0	0	0	0	0	0
	1994	0	0	0	0	0	0	0	0	0	0
	1995	0	0	0	0	0	0	0	0	0	0
	1996	0	0	0	0	0	0	0	0	0	0
	1997	0	0	0	0	0	0	0	0	0	0
	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	1	0	0	0	0	0	0	0
	2000	0	0	1	0	0	0	0	0	0	0
	2001	1	0	1	0	0	0	0	0	1	0
	2002	1	0	1	0	0	0	0	0	1	0
	2003	1	0	1	0	0	0	0	0	1	0
	2004	1	0	1	0	0	0	0	0	1	0
	2005	1	1	1	0	0	1	1	0	1	0
	2006	1	1	1	0	1	1	1	0	1	1
	2007	1	1	1	0	1	1	1	0	1	1
	2008	1	1	1	0	1	1	1	0	1	1
Ireland	1990	0	0	0	0	0	0	0	0	0	0
	1991	0	0	0	0	0	0	0	0	0	0
	1992	0	0	0	0	0	0	0	0	0	0
	1993	0	0	1	0	0	0	0	0	0	0
	1994	0	0	1	0	0	0	0	0	0	0
	1995	0	0	1	0	1	1	0	0	0	0
	1996	0	0	1	0	1	1	0	0	0	0
	1997	0	0	1	0	1	1	0	0	0	0
	1998	0	0	1	0	1	1	0	0	0	0
	1999		0	1	0	1	1	0	0	0	0
	2000		0	1	0	1	1	0	0	0	0
	2001	1	0	1	0	1	1	0	0	0	0
	2002	1	0	1	0	1	1	0	0	0	0
	2003	1	0	1	0	1	1	0	0	1	0
	2004	1	0	1	0	1	1	0	0	1	0
	2005	1	0	1	0	1	1	0	0	1	0
	2006	1	0	1	0	1	1	0	0	1	0
	2007	1	1	1	0	1	1	0	0	1	0
	2008	1	1	1	0	1	1	0	0	1	0
Italy	1990	0	0	0	0	0	0	0	0	0	0
	1991	0	0	0	0	0	0	0	0	0	0
	1992	0	0	0	0	0	0	0	0	0	0
	1993	0	0	0	0	0	0	0	0	0	0
	1994	0	0	0	0	0	0	0	0	0	0
	1995	0	0	0	0	0	0	0	0	0	1
	1996	0	0	0	0	0	0	0	0	0	1
	1997	0	0	0	0	0	0	0	0	0	2

	1998	0	0	0	0	0	0	0	0	0	3
	1999	1	0	1	0	0	0	0	0	0	3
	2000	1	0	1	2	0	0	0	0	0	3
	2001	1	0	1	2	1	1	0	1	0	3
	2002	1	1	1	2	1	1	1	1	0	3
	2003	1	1	1	2	1	1	1	1	1	3
	2004	1	1	1	2	1	1	1	1	1	3
	2005	1	1	1	2	1	1	1	1	1	3
	2006	1	1	1	2	1	1	1	1	1	3
	2007	1	1	1	3	1	1	1	1	1	3
	2008	1	1	1	3	1	1	1	1	1	3
Japan	1990	0	0	0	4	0	0	0	0	0	4
	1991	0	0	0	4	0	0	0	0	0	4
	1992	0	0	0	4	0	0	0	0	0	4
	1993	0	0	0	4	0	0	0	0	0	4
	1994	0	0	0	4	0	0	0	0	0	4
	1995	0	0	0	4	0	1	0	0	0	4
	1996	0	0	0	4	0	1	0	0	0	4
	1997	0	0	0	4	0	1	0	0	0	4
	1998	1	0	0	4	0	1	0	0	0	4
	1999	1	0	0	4	0	1	0	0	0	4
	2000	1	0	0	4	1	1	0	0	0	4
	2001	1	1	0	4	1	1	0	0	0	4
	2002	1	1	0	4	1	1	0	0	0	4
	2003	1	1	0	4	1	1	0	0	0	4
	2004	1	1	0	4	1	1	0	0	0	4
	2005	1	1	0	4	1	1	0	0	0	4
	2006	1	1	0	4	1	1	0	0	0	4
	2007	1	1	0	4	1	1	0	0	0	4
	2008	1	1	0	4	1	1	0	0	0	4
Korea	1990	0	0	0	0	0	0	0	0	0	0
	1991	0	0	0	0	0	0	0	0	0	0
	1992	0	0	0	0	0	0	0	0	0	0
	1993	0	0	0	0	0	0	0	0	0	0
	1994	0	0	0	0	0	0	0	0	0	0
	1995	0	0	0	0	0	0	0	0	0	0
	1996	0	0	0	0	0	0	0	0	0	0
	1997	0	0	0	0	0	0	0	0	0	0
	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	1
	2001	0	1	1	0	0	0	0	0	0	1
	2002	1	1	1	0	0	0	0	0	0	3
	2003	1	1	1	0	0	0	0	0	0	3
	2004	1	1	1	0	0	0	0	0	0	3
	2005	1	1	1	0	0	0	0	0	0	3

	2006	1	1	1	0	0	0	0	0	0	3
	2007	1	1	1	0	0	0	0	0	0	3
	2008	1	1	1	0	0	0	0	0	0	3
Mexico	1990	0	0	0	0	0	0	0	1	0	0
	1991	0	0	0	0	0	0	0	1	0	0
	1992	0	0	0	0	0	0	0	1	0	0
	1993	0	0	0	0	0	0	0	1	0	0
	1994	0	0	0	0	0	0	0	1	0	0
	1995	0	0	0	0	0	0	0	1	0	0
	1996	0	0	0	0	1	0	0	1	0	0
	1997	0	0	0	0	1	0	0	1	0	0
	1998	0	0	0	0	1	0	0	1	0	0
	1999	0	0	0	0	1	0	0	1	0	0
	2000	0	0	0	0	1	0	0	1	0	0
	2001	0	0	0	0	1	0	0	1	0	0
	2002	0	0	0	0	1	0	0	1	0	0
	2003	0	0	0	0	1	0	0	1	0	0
	2004	0	0	0	0	1	0	0	1	0	0
	2005	0	0	0	0	1	0	0	1	0	0
	2006	0	0	0	0	1	0	0	1	0	0
	2007	0	0	0	0	1	0	0	1	0	0
	2008	0	0	0	0	1	0	0	1	0	0
Netherlands	1990	0	0	0	0	0	0	0	0	0	4
	1991	0	0	0	0	0	0	0	0	0	4
	1992	0	0	0	0	0	0	0	0	0	4
	1993	0	0	0	0	0	0	0	0	0	4
	1994	0	0	0	0	0	0	0	0	0	4
	1995	0	0	0	0	0	0	0	0	0	4
	1996	0	0	0	0	0	0	0	0	0	4
	1997	0	0	0	0	0	0	0	0	0	4
	1998	0	0	0	0	0	0	0	0	0	4
	1999	1	1	1	0	1	0	0	0	0	4
	2000	1	1	1	4	1	1	1	0	1	4
	2001	1	1	1	4	1	1	1	0	1	4
	2002	1	1	1	4	1	1	1	0	1	4
	2003	1	1	1	4	1	1	1	0	1	4
	2004	1	1	1	4	1	1	1	0	1	4
	2005	1	1	1	4	1	1	1	0	1	4
	2006	1	1	1	4	1	1	1	0	1	4
	2007	1	1	1	4	1	1	1	0	1	4
	2008	1	1	1	4	1	1	1	0	1	4
New Zealand	1990	0	0	1	0	0	0	1	0	0	4
	1991	0	0	1	0	0	0	1	0	0	4
	1992	1	0	1	0	0	0	1	0	0	4
	1993	1	0	1	0	0	0	1	0	0	4

	1994	1	0	1	0	0	0	1	0	0	4
	1995	1	0	1	0	0	0	1	0	0	4
	1996	1	1	1	0	0	0	1	0	0	4
	1997	1	1	1	0	0	0	1	0	0	4
	1998	1	1	1	0	0	0	1	0	0	4
	1999	1	1	1	2	1	0	1		0	4
	2000	1	1	1	2	1	0	1		0	4
	2001	1	1	1	2	1	0	1		0	4
	2002	1	1	1	2	1	0	1		0	4
	2003	1	1	1	2	1	0	1	1	0	4
	2004	1	1	1	2	1	0	1	1	0	4
	2005	1	1	1	2	1	0	1	1	0	4
	2006	1	1	1	2	1	0	1	1	0	4
	2007	1	1	1	2	1	0	1	1	0	4
	2008	1	1	1	2	1	0	1	1	0	4
Norway	1990	0	0	0	1	0	0	0	0	0	1
	1991	1	1	1	1	0	0	0	0	0	1
	1992	1	1	1	1	0	0	0	0	0	1
	1993	1	1	1	1	0	0	0	0	0	1
	1994	1	1	1	1	0	0	0	0	0	1
	1995	1	1	1	1	0	0	0	0	0	1
	1996	1	1	1	1	0	0	0	0	0	1
	1997	1	1	1	1	0	0	0	0	0	1
	1998	1	1	1	1	0	0	0	0	0	1
	1999	1	1	1	1	0	0	0	0	0	1
	2000	1	1	1	1	0	0	0	0	0	1
	2001	1	1	1	1	0	0	0	0	0	1
	2002	1	1	1	1	1	0	1	0	0	1
	2003	1	1	1	1	1	0	1	0	0	1
	2004	1	1	1	1	1	0	1	0	0	1
	2005	1	1	1	1	1	0	1	0	0	1
	2006	1	1	1	1	1	0	1	0	0	1
	2007	1	1	1	1	1	0	1	0	0	1
	2008	1	1	1	1	1	0	1	0	0	1
Portugal	1990	0	0	0	1	0	0	0	0	0	0
	1991	0	0	0	1	0	0	0	0	0	0
	1992	0	0	0	1	0	0	0	0	0	0
	1993	0	0	0	1	0	0	0	0	0	0
	1994	0	0	1	1	0	0	0	0	0	0
	1995	0	0	1	1	0	0	0	0	0	0
	1996	0	0	1	1	0	0	0	0	0	0
	1997	0	0	1	1	0	0	0	0	0	0
	1998	0	0	1	1	0	0	0	0	0	0
	1999	0	0	1	2	0	0	0	0	0	0
	2000	1	0	1	2	0	0	0	0	0	1
	2001	1	0	1	2	0	0	0	0	0	1

	2002	1	1	1	2	0	0	0	0	0	1
	2003	1	1	1	2	0	0	0	1	1	1
	2004	1	1	1	2	0	0	0	1	1	1
	2005	1	1	1	2	0	0	0	1	1	1
	2006	1	1	1	2	0	0	0	1	1	1
	2007	1	1	1	2	1	0	0	1	1	1
	2008	1	1	1	2	1	0	0	1	1	1
Spain	1990	0	0	0	2	0	0	0	0	0	4
	1991	0	0	0	2	0	0	0	0	0	4
	1992	0	0	0	2	0	0	0	0	0	4
	1993	0	0	0	2	0	0	0	0	0	4
	1994	1	0	1	2	0	0	0	0	0	4
	1995	1	0	1	2	0	0	0	0	0	4
	1996	1	0	1	2	0	0	0	0	0	4
	1997	1	0	1	3	0	1	0	0	0	4
	1998	1	0	1	3	0	1	0	0	1	4
	1999	1	1	1	3	0	1	0	0	1	4
	2000	1	1	1	3	0	1	0	0	1	4
	2001	1	1	1	3	0	1	0	0	1	4
	2002	1	1	1	3	1	1	0	0	1	4
	2003	1	1	1	3	1	1	0	0	1	4
	2004	1	1	1	3	1	1	0	0	1	4
	2005	1	1	1	3	1	1	0	0	1	4
	2006	1	1	1	3	1	1	0	0	1	4
	2007	1	1	1	3	1	1	0	0	1	4
	2008	1	1	1	3	1	1	0	0	1	4
Sweden	1990	0	0	0	2	0	0	1	0	0	4
	1991	1	0	0	2	0	0	1	0	0	4
	1992	1	0	1	2	0	0	1	0	0	4
	1993	1	0	1	2	0	0	1	0	0	4
	1994	1	0	1	2	0	0	1	0	0	4
	1995	1	0	1	2	0	0	1	0	0	4
	1996	1	1	1	2	0	0	1	0	0	4
	1997	1	1	1	2	0	0	1	0	0	4
	1998	1	1	1	2	0	0	1	0	0	4
	1999	1	1	1	2	1	0	1	0	0	4
	2000	1	1	1	2	1	1	1	0	1	4
	2001	1	1	1	2	1	1	1	0	1	4
	2002	1	1	1	2	1	1	1	0	1	4
	2003	1	1	1	2	1	1	1	0	1	4
	2004	1	1	1	2	1	1	1	0	1	4
	2005	1	1	1	2	1	1	1	0	1	4
	2006	1	1	1	2	1	1	1	0	1	4
	2007	1	1	1	2	1	1	1	0	1	4
	2008	1	1	1	2	1	1	1	0	1	4

United Kingdom	1990	1	1	1	3	1	0	1	0	0	4
	1991	1	1	1	3	1	0	1	0	0	4
	1992	1	1	1	3	1	0	1	0	0	4
	1993	1	1	1	3	1	0	1	0	0	4
	1994	1	1	1	3	1	0	1	0	0	4
	1995	1	1	1	4	1	0	1	0	1	4
	1996	1	1	1	4	1	0	1	0	1	4
	1997	1	1	1	4	1	0	1	1	1	4
	1998	1	1	1	4	1	1	1	1	1	4
	1999	1	1	1	4	1	1	1	1	1	4
	2000	1	1	1	4	1	1	1	1	1	4
	2001	1	1	1	4	1	1	1	1	1	4
	2002	1	1	1	4	1	1	1	1	1	4
	2003	1	1	1	4	1	1	1	1	1	4
	2004	1	1	1	4	1	1	1	1	1	4
	2005	1	1	1	4	1	1	1	1	1	4
	2006	1	1	1	4	1	1	1	1	1	4
	2007	1	1	1	4	1	1	1	1	1	4
	2008	1	1	1	4	1	1	1	1	1	4
United States	1990	0	0	0	3	1	0	1	1	1	4
	1991	0	0	0	3	1	0	1	1	1	4
	1992	1	0	0	3	1	0	1	1	1	4
	1993	1	0	0	3	1	0	1	1	1	4
	1994	1	0	0	3	1	0	1	1	1	4
	1995	1	0	0	3	1	0	1	1	1	4
	1996	1	0	1	3	1	0	1	1	1	4
	1997	1	0	1	3	1	0	1	1	1	4
	1998	1	1	1	3	1	1	1	1	1	4
	1999	1	1	1	3	1	1	1	1	1	4
	2000	1	1	1	3	1	1	1	1	1	4
	2001	1	1	1	3	1	1	1	1	1	4
	2002	1	1	1	3	1	1	1	1	1	4
	2003	1	1	1	3	1	1	1	1	1	4
	2004	1	1	1	3	1	1	1	1	1	4
	2005	1	1	1	3	1	1	1	1	1	4
	2006	1	1	1	3	1	1	1	1	1	4
	2007	1	1	1	3	1	1	1	1	1	4
	2008	1	1	1	3	1	1	1	1	1	4

Sources: See text.

Table 6.7: Simple correlations between policy and performance in electricity.

	Performance measures		
Policy variables	entpr	**eutil**	**eres**
etpa	-0.09	0.05	-0.16
ewpp	-0.06	-0.03	-0.04
eunb	-0.04	0.06	-0.17
eown	0.05	0.02	-0.14

Source: Own calculations.

Table 6.8: Simple correlations between policy and performance in gas.

	Performance measures	
Policy variables	gntpr	**gutil**
gtpa	0.20	-0.05
gretc	0.20	0.20
gent	-0.40	-0.28
gunb_p	-0.06	-0.29
gunb_t	0.16	-0.18
gown	-0.26	0.22

Source: Own calculations.

Table 6.9: Results of random effects panel regression for electricity prices.*

Dependent variable	**Industry price**
Constant	0.1571
	[0.000]
Third party access (etpa)	-0.0032
	[0.270]
Wholesale price pool (ewpp)	-0.0049
	[0.072]
Unbundling (eunb)	-0.0075
	[0.008]
Private ownership (eown)	0.0039
	[0.011]
Hydro share in generation (hydroshr)	-0.0276
	[0.047]
Nuclear share in generation (nucshr)	-0.0033
	[0.847]
Urbanisation (urban)	-0.0013
	[0.000]
GDP in PPP (gdp_ppp_s)	0.0010
	[0.352]
Time trend	0.0018
	[0.000]
Number of observations	347
Number of time periods	19
Number of OECD economies	21
Wald test that coefficients not significantly different from zero	100.06
	[0.000]
Breusch-Pagan chi-squared test that random effects equal zero	838.65
	[0.000]
Hausman test of no difference between random and fixed effects estimates	4.34
	[0.888]

* Numbers in parentheses after the coefficient estimates are Prob>lzl.
Numbers in parentheses after the Wald, Breusch-Pagan and Hausman tests are Prob>chi^2.

Table 6.10: Results of random effects panel regression for electricity efficiency.*

Dependent variable	**Utilisation rate**	**Reserve margin deviation**
Constant	3.9804	0.5256
	[0.000]	[0.034]
Third party access (etpa)	-0.0638	-0.0023
	[0.289]	[0.919]
Unbundling (eunb)	0.0944	-0.0317
	[0.111]	[0.152]
Private ownership (eown)	0.0077	-0.0019
	[0.780]	[0.871]
Hydro share in capacity (hydcapshr)	0.6381	-0.0126
	[0.152]	[0.939]
Nuclear share in capacity (nuccapshr)	2.3007	-0.2038
	[0.003]	[0.481]
Coal share in capacity (coalcapshr)	0.4208	-0.0126
	[0.284]	[0.939]
Urbanisation (urban)	-0.0028	-0.0031
	[0.760]	[0.355]
Time trend	0.0133	0.0036
	[0.014]	[0.078]
Number of observations	330	302
Number of time periods	19	19
Number of OECD economies	21	21
Wald test that coefficients not significantly different from zero	24.30	6.46
	[0.002]	[0.596]
Breusch-Pagan chi-squared test that random effects equal zero	811.45	869.64
	[0.000]	[0.000]
Hausman test of no difference between random and fixed effects estimates	17.49	6.90
	[0.025]	[0.547]

* Numbers in parentheses after the coefficient estimates are Prob>lzl. Numbers in parentheses after the Wald, Breusch-Pagan and Hausman tests are Prob>chi^2.

Table 6.11: Results of random effects panel regression for gas prices.*

Dependent variable	**Industry price**
Constant	320.5354
	[0.000]
Third party access (gtpa)	-4.75449
	[0.682]
Retail competition (gretc)	-30.4460
	[0.026]
Absence of entry restrictions (gent)	13.3761
	[0.474]
Unbundling of gas production/import (gunb_p)	-47.5065
	[0.002]
Unbundling of gas supply (gunb_t)	3.8747
	[0.780]
Private ownership (gown)	-2.9226
	[0.595]
Pipeline length (gpipe_s)	-0.3071
	[0.078]
Urbanisation (urban)	-1.7877
	[0.124]
GDP in PPP (gdp_ppp)	0.0183
	[0.018]
Time	-11.9693
	[0.000]
Time squared	1.4067
	[0.000]
Number of observations	256
Number of time periods	19
Number of OECD economies	21
Wald test that coefficients not significantly different from zero	531.42
	[0.000]
Breusch-Pagan chi-squared test that random effects equal zero	63.95
	[0.000]
Hausman test of no difference between random and fixed effects estimates	40.10
	[0.000]

* Numbers in parentheses after the coefficient estimates are Prob>lzl. Numbers in parentheses after the Wald, Breusch-Pagan and Hausman tests are Prob>chi^2.

Table 6.12: Results of random effects panel regression for gas efficiency.*

Dependent variable	**Pipeline utilisation rate**
Constant	15.8143
	[0.080]
Third party access (gtpa)	-1.1931
	[0.046]
Retail competition (gretc)	1.4587
	[0.015]
Absence of entry restrictions (gent)	0.6199
	[0.427]
Unbundling of gas production/import (gunb_p)	-0.7744
	[0.319]
Unbundling of gas supply (gunb_t)	-0.7000
	[0.271]
Private ownership (gown)	1.4720
	[0.000]
Gas share in electricity capacity (gascapshr)	2.2703
	[0.444]
Urbanisation (urban)	-0.1827
	[0.132]
Time	0.0089
	[0.872]
Number of observations	315
Number of time periods	19
Number of OECD economies	21
Wald test that coefficients not significantly different from zero	49.31
	[0.000]
Breusch-Pagan chi-squared test that random effects equal zero	1320.69
	[0.000]
Hausman test of no difference between random and fixed effects estimates	43.26
	[0.000]

* Numbers in parentheses after the coefficient estimates are Prob>lzl. Numbers in parentheses after the Wald, Breusch-Pagan and Hausman tests are Prob>chi^2.

Chapter 7

QUANTIFYING THE IMPACTS OF STRUCTURAL REFORMS IN TELECOMMUNICATIONS MARKETS IN APEC ECONOMIES

Roy Chun Lee[1], John Ure and Hsin Chin Lee

- All APEC member economies have implemented a market liberalisation policy in the telecommunications sector for over a decade: reforms are important, principally because of the network effects.
- Competition has produced benefits in terms of lower prices, innovation in networks and services (economic growth) and in the efficiency of the use of spectrum.
- For some APEC members, the availability of telecommunications network infrastructure to all citizens remains an issue, and a universal service regime is a valuable part of a reform program.

7.1 INTRODUCTION

The telecommunications sector stands out from all other networked industries for two reasons. Firstly, it is a mode of communications and therefore enters into every activity: cultural, which is a sensitive area that inevitably raises issues of morality, privacy, security etc.; economic, which involves wealth-generating activities; social, which has direct welfare implications; scientific and technological, which involves innovations that disrupt the existing *status quo*; and political, because better communications open the door to information and empowerment. No other networked industry can claim such ubiquitous influence over people's lives and livelihoods.

Secondly, no other networked industries, for example banks or airlines, have been subject to such transformative technological developments as telecommunications. When analogue networks gave way to digital networks in the 1980s, the beginnings of convergence between telecommunications and information technology (IT; computers) began. When Internet Protocol (IP) came along in the 1990s, convergence between telecommunications and web-based media services (TV, video, web downloads, etc.) began. When mobile cellular phones spread, especially pre-paid in low income societies, telecommunications became globally ubiquitous for the first time. When broadband came along in the 2000s convergence was raised to a higher level as networks grew in bandwidth capacity (higher speeds) and the phenomenon of social networking began. When smart phones, and especially Apple's iPhone, came along, convergence over mobile devices began, offering low-income societies their first real chance of widespread broadband access to the Internet. And the Internet itself offers a means to bypass many of the traditional revenue gateways of carriers and service providers, causing a major transformation of the business models that drive and sustain the industry.

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At the same time the sector has been highly regulated, because of the risks of significant barriers to entry and the consequences for competition of network externalities. Those regulatory systems are being reformed, and the primary objectives of this chapter are to quantify the benefits of telecommunications structural reform and to review the impact of telecommunications reforms on performance in APEC member economies. This requires an assessment of the current state of policy.

In a liberalised telecommunications market where entry restrictions are removed, new entrants often face a situation where a vertically integrated incumbent controls a ubiquitous network infrastructure. In addition, the incumbent often enjoys a significantly larger subscription base. Both network coverage and subscription lead to market dominance.

In generic competition policy, dominance itself is not of policy concern, as long as the potential threat of competition is able to discipline the dominant operator. Nevertheless, for the telecommunications sector, though entry restrictions are removed in light of market liberalisation, economies of scale and high sunk costs in the telecommunications networks, in particular in the local access network (in other words, the 'last mile'), create high entry barriers.

While sunk costs make potential entrants more sensitive to the level of post-entry profitability than the incumbent, economies of scale inherent in pre-established switching facilities enable the incumbent to take advantage of the low marginal cost to further degrade the prospect for post-entry profitability through strategies such as posing a high likelihood of price wars post-entry (Armstrong et al. 1995).

But potential entrants wishing to self-supply network infrastructure also face a more stringent environment. The pre-existing monopoly status enables the incumbent to establish an ubiquitous network infrastructure with ease. For most economies, the universal network coverage has often been funded through cross-subsidisation or direct public budget expenditure. Also, incumbents in most APEC economies were once part of the government and thus had little difficulty in obtaining right-of-way for infrastructure deployment. In a competitive context, not only does the technical issue of right-of-way become increasingly difficult for new private entrants to acquire but the removal of cross-subsidies and lack of market share often increases their hurdles in network construction.

For these reasons, even if facility based entry is allowed at the policy level – and in practice new entrants are willing to do so – entry is unlikely to reach a scale necessary to produce effective competition (Hausman & Sidak 1999). Regulation cannot change the commercial costs of network deployment but it can facilitate entry by enhancing the certainty of post-entry business viability and by providing a safeguard against the potential anti-competitive conduct of the incumbent.

Network externalities represent another impediment to entry. One of the major effects of network externalities is that networks with a larger subscriber size are more attractive to potential subscribers than smaller ones. This peculiar feature creates a constant competitive advantage for existing networks with an established subscriber base when different networks are not interconnected. Further, in a competitive environment both the incumbent and the new entrant have the incentive to interconnect. As failing to provide any-to-any connectivity might deter potential subscribers, the incumbent operator is still in a position to undermine a new entrant by setting high interconnection charges. Commercially agreed interconnection charges between networks of equal size are also likely to be above cost, due to the termination monopoly issue.

Section 7.2 reviews the state of play of the telecommunications sector in the APEC region, including some indicators of performance. The next step is to identify the key features of the regulatory regime. These regulatory features are then related to performance, both at the sectoral level and at the economy level.

7.2 STATE OF PLAY IN THE APEC TELECOMMUNICATIONS SECTOR

7.2.1 Overview

Raw data used throughout this report is supplied mainly by the ITU Telecom Database. Although every effort has been made to ensure that the data is up-to-date, the researchers understand that information for some member economies has not been updated. Given the speed of information and communications technology (ICT) development, some assessments made in this report might underestimate actual situations in some economies, especially in the broadband, Internet and mobile sectors. This nonetheless does not affect the report's ability to reflect the overall and general trend of development and performance in the region.

The accessibility of telecommunications infrastructure in APEC economies has improved significantly in recent years. The most remarkable development is the enormous expansion in mobile and Internet accessibility, particularly in economies with low penetration rates in the past. Table 7.1 reports a series of indicators.

In 2008 the average penetration for fixed-line PSTN network per 100 inhabitants in the APEC region exceeded 30%, which is well above the world average of 19%. Mobile penetration exceeded 90%, which is again significantly higher than the world average of 60%.

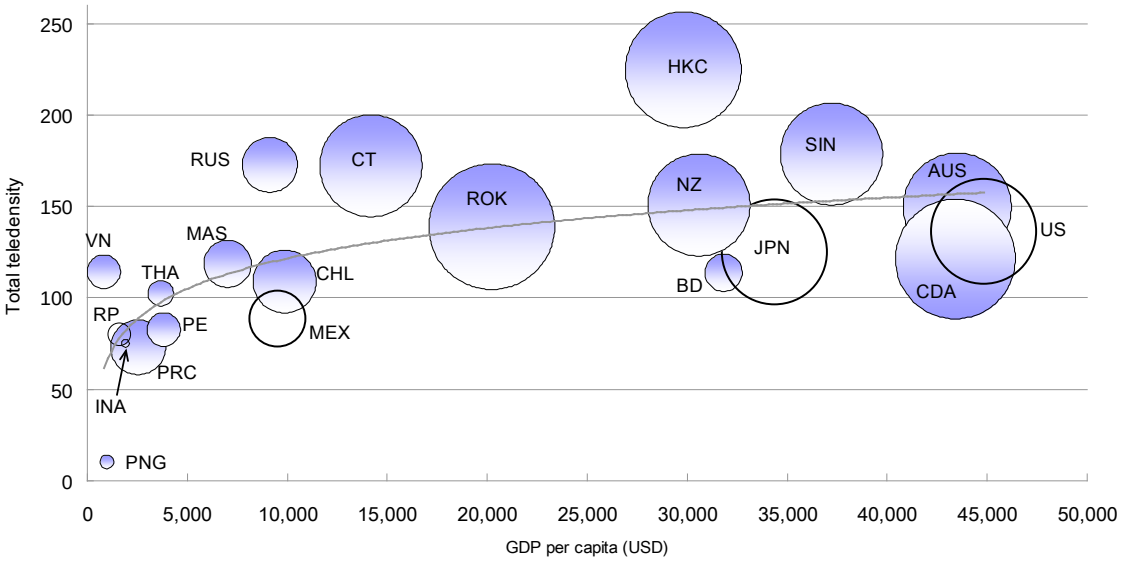
Table 7.1: Key telecommunications indicators of APEC member economies.

APEC member	Population (millions)	GDP capita (million; 2008)	Main telephone lines/100 inhabitants	Mobile phone subscribers/100 inhabitants	Fixed broadband subscribers/100 inhabitants
Australia	21.07	46,824.1	44.46	105.00	24.4
Brunei Darussalam	0.39	37,053	19.53	95.85	3.56
Canada	33.26	45,085.3	54.87	66.42	29.6
Chile	16.80	10,117	20.99	88.05	8.49
China	1337.41	3,259.46	25.48	47.95	6.23
Hong Kong, China	6.98	30,725.9	58.72	165.9	28.1
Indonesia	227.35	2,238.93	13.36	61.83	0.18
Japan	127.29	4,910.69	38.04	86.73	23.7
Korea	48.15	38,457.2	44.29	94.71	32.1
Malaysia	27.01	8,118.21	15.89	102.6	4.93
Mexico	108.56	10,199.6	19.04	69.37	7.00
New Zealand	4.23	30,030.1	41.37	109.2	21.6
Papua New Guinea	6.58	1,306.01	0.912	9.123	0.00
Peru	28.84	4,447.81	9.981	72.66	2.52
Philippines	90.35	1,845.17	4.512	75.39	1.16
Russia	141.39	11,806.9	31.75	141.1	6.56
Singapore	4.62	38,972.1	40.24	138.1	21.7
Chinese Taipei	23.04	1,6987.9	61.96	110.3	21.8
Thailand	67.39	4,116.32	10.42	92.01	1.41
United States	311.67	47,439.9	49.62	86.79	23.5
Viet Nam	87.10	1,042.39	33.98	80.37	2.35
APEC average	–	18,808.8	30.45	90.45	12.9

Source: ITU, 2009b; IMF, 2009.

Broadband is another area of growth: the fixed broadband subscription rate is also significantly higher than the rest of world.

Figure 7.1 presents the more specific relationship between total teledensity and the broadband penetration with GDP *per capita* of APEC economies as at 2008. Total teledensity is calculated by adding fixed telephone lines penetration rate and mobile penetration rate. Penetration rate used throughout this chapter, unless specified otherwise, refers to subscribers per 100 inhabitants as defined in ITU.[2]



Note: The size of the bubbles represents broadband penetration.

Figure 7.1: Teledensity, broadband penetration and GDP *per capita* as at 2008. (Source: ITU 2009b)

As a rule of thumb, APEC economies with higher income levels and teledensity tend to have a better broadband penetration rate, reliability underpinned by market demand and the availability of telecommunications infrastructure. Nonetheless, economies with relatively limited telecommunications resources are also catching up rapidly in terms of next generation broadband infrastructure development. Hong Kong, China; Korea; and Chinese Taipei are not only regional but also world leaders in broadband performance, and China; Chile; Malaysia; and Mexico are also performing well. Several factors might contribute to this outcome. Firstly, developed economies usually have a higher market demand for communications services. Secondly, lack of financial as well as technical support might result in delaying infrastructure developments in developing economies. Finally, the lacking of a predictable policy/regulatory environment affects investments in the telecommunications sector. The third factor underpins the importance of structural reform efforts.

7.2.2 Performance of the fixed-line telecommunications network

Although communications traffic has been shifting from voice to data and the fibre-optical network is phasing in as the broadband Next Generation Networks (NGN), traditional fixed-line Public Switched Telephone Network (PSTN) networks remain one of the most essential telecommunications infrastructures for the majority of APEC economies for the foreseeable

[2] For detailed discussions on the definition of telecommunications statistics, see ITU 2009, Technical Notes on World Telecom/ICT Indicators, available at http://www.itu.int/ITU-D/ICTEYE/Indicators/WTI_Technotes.pdf (23 October 2009).

future. The performance of fixed-line telecommunications network development, measured in penetration rate (accessibility) and price (affordability), affects not only the provision of traditional voice services such as local and long distance telephony but also other value-added services it supports.

With the advancement of broadband technologies such as Digital Subscribers Line (DSL) that have evolved based on PSTN configurations, the fixed-line telecommunications network plays a central role in the building of broadband infrastructure. This is equally relevant in the deployment of NGN. Despite the fact that the fibre-optical based and Internet-Protocol (IP) switched NGN is technologically different from the traditional PSTN, the diffusion of the latter requires the sharing of many critical network as well as ICT elements, including conduits, power supply units and users' information, with the existing telecommunications network.

Significant variations in access to fixed-line infrastructure still exist across the APEC region on a per capita basis. Performance in fixed-line telecommunications network accessibility among APEC economies is in general a function of the level of economic development (Figure 7.2). Accessibility conditions in some economies, in particular China; the Russian Federation; and Viet Nam, have been significantly improved over the last decade, and the gap in accessibility between developing and developed economies is rapidly reducing.

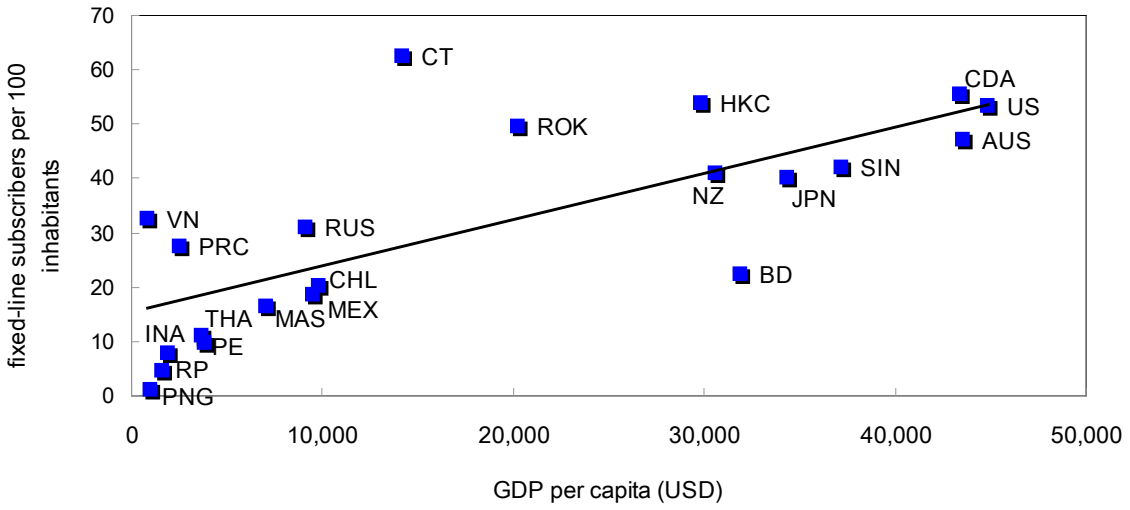


Figure 7.2 APEC economies' fixed-line penetration rate in 2008. (Source: ITU 2009b)

Figure 7.3 demonstrates the change of fixed-line accessibility in the APEC region between 2002 and 2008. Fixed-line networks in most developed APEC economies have reached saturation point. Competition from alternative networks – notably mobile telecommunications services and NGN – means the fixed-line penetration rate in many economies is actually declining rapidly. The penetration rate in Japan, for example, has reduced 28.6% between 2002 and 2008 and a 17.8% reduction is also recorded for the USA. A remarkable performance in Viet Nam is recorded where network penetration grew from a modest 5% to 34% over the review period, reaching close to the level of Japan.

The fixed-line penetration performance is most likely the result of technological advancement, competition and structural reform. For economies with declining fixed-line penetration, the likely explanations include the liberalisation of the mobile sector, the cost and technological

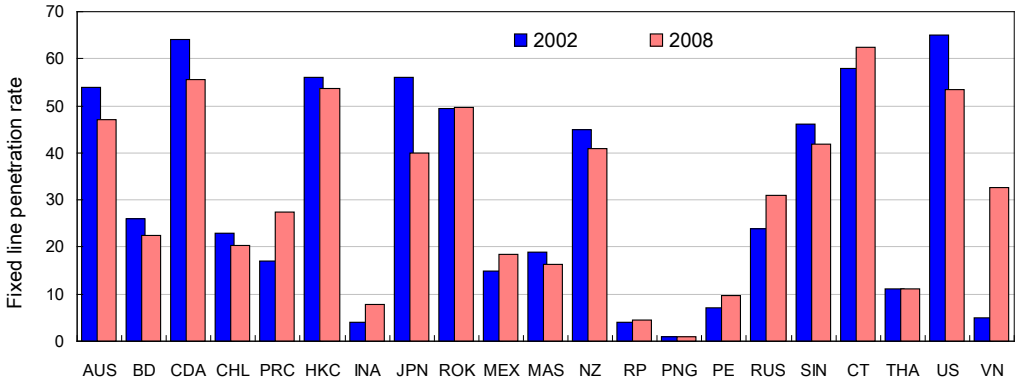


Figure 7.3: Comparison of fixed-line penetration rates between 2002 and 2008. (Source: ITU 2009b)

advantages of mobile network deployment, and in particular the development of fixed-mobile convergence (FMC). These developments underpin the shifting of consumers from traditional fixed-line subscription to mobile services. This development will be further analysed in the next section. The effect of cross-network competition is most evident in economies already enjoying a high level of fixed-line penetration.

Structural reform, at the same time, underpins the remarkable growth rate in developing economies. As already mentioned, penetration in Viet Nam grew rapidly over the last 6 years. This is also the period when Viet Nam was negotiating with trading partners for its WTO membership and had hence introduced substantial structural reform initiatives in light of its WTO accession process in both market access liberalisation and regulatory reform as set out in the case study focusing on telecommunications in Viet Nam. Viet Nam officially joined the WTO in 2008.

The most critical policy issue with fixed-line accessibility is perhaps the uneven distribution of infrastructure resources between urban and rural areas. In most circumstances, development is centred on metropolitan areas with a significantly higher than average penetration rate (World Bank 2003). PECC (2005) reports that Indonesia's fixed-line penetration rate was only 3 per 100 inhabitants at the end of 2001; but the penetration rate in the capital (also largest) city Jakarta is around 8.7 times higher than the national average, reaching 26 phone lines per 100 inhabitants. Several policy considerations are required to tackle the issue, the centrepiece of which is a well defined and effectively implemented universal service regime to bring forth a more balanced distribution of telecommunications infrastructure resources.

7.2.3 Performance in the mobile sector

The APEC region leads the world in mobile sector performance. Contributing factors include relatively low network deployment costs, less policy constraints, high market demand and an increasing variety of services (ITU 2006). With the launch of the 3G mobile service that promises an access speed of up to 3 Mbps, mobile services are fast shifting from voice to Internet access and multimedia applications.

Unlike fixed-line networks, the relationship between economic development and network accessibility performance in mobile network is less apparent. As shown in Figure 7.4, a large number of developing APEC economies enjoy an equal if not higher level of mobile

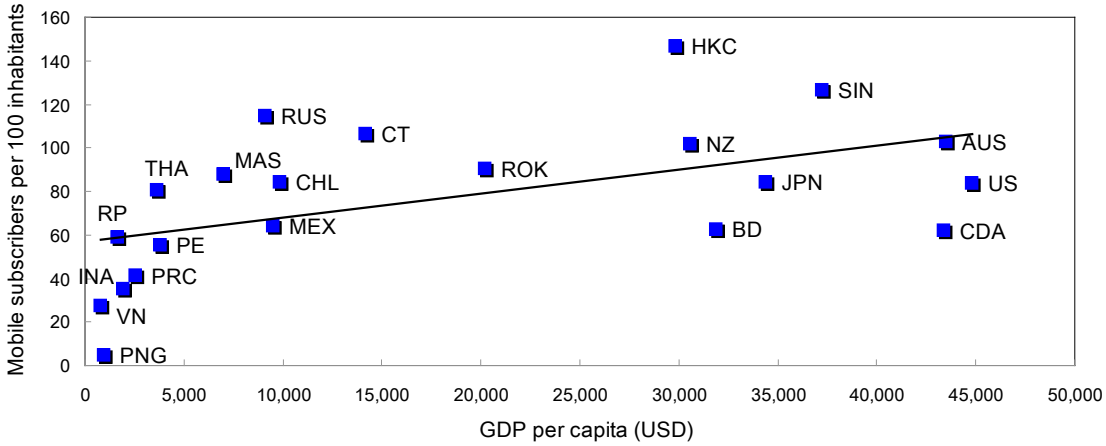


Figure 7.4: Mobile penetration rate and GDP *per capita* (2008). (Source: ITU 2009b)

penetration performance *vis-à-vis* their developed peers. As a matter of fact, the majority of APEC economies enjoy a mobile penetration rate of between 60% and 120% regardless of their respective levels of economic development.

The high growth rate in the mobile sector is occurring in both developed and developing APEC economies. This is particularly evident on a cross-year comparison approach. Figure 7.5 shows the change of mobile network accessibility in the APEC region between 2002 and 2008. It is evident that the mobile sector is expanding rapidly for all APEC economies without exception. Even Hong Kong, China, where the penetration rate was already reaching 100% in 2002, has a 50% increase in penetration over the 6-year period. The Russian Federation took off in 2002 from a penetration of less than 10% to reach 110% in 2008. This reflects the speed at which the mobile network is emerging as the most widely available telecommunications infrastructure in the region.

Table 7.2 shows that growth of penetration is 27% between 2003 and 2008, which is significantly higher than that of the fixed-line network (3%). All economies except Chinese Taipei enjoy a positive growth rate. Papua New Guinea (PNG) stands out with an average growth rate of 102.8%, and Indonesia reports 50%.

Unsurprisingly, extensive network and subscription roll-outs in the mobile sector have led to the mobile network becoming the most popular telecommunications infrastructure in the

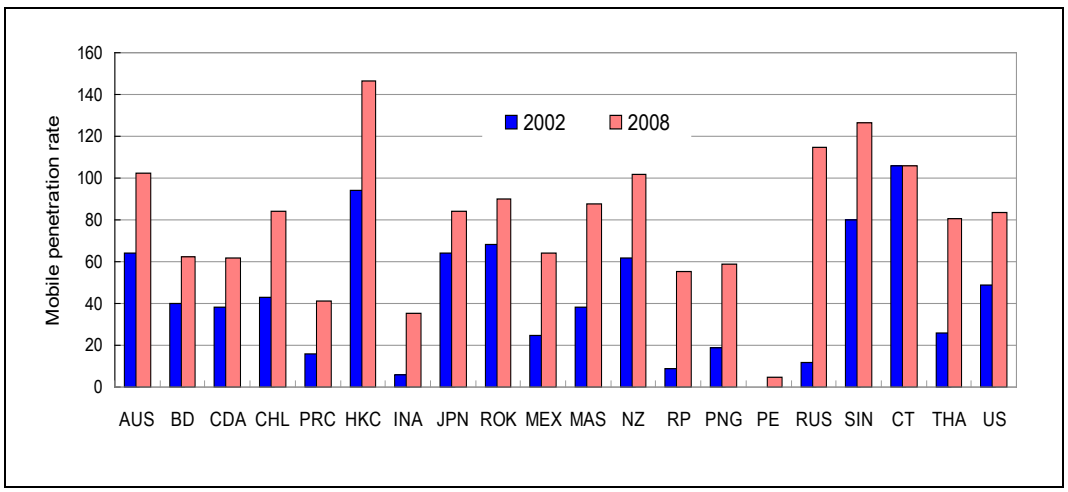


Figure 7.5: Comparison of change in APEC economies' mobile penetration rate. (Source: ITU 2009b)

Table 7.2: Growth rate for APEC economies' mobile sector.

APEC member	Mobile penetration rate, 2008	Compound Annual Rate Growth(%; 2003-2008)	Percentage of total telecommunications subscribers
Australia	105	9.0	70.2
Brunei Darussalam	96	16.2	83.1
Canada	66	10.7	54.8
Chile	88	15.3	80.8
China	48	18.6	65.0
Hong Kong, China	166	9.5	73.9
Indonesia	62	50.0	82.2
Japan	87	5.0	69.5
Korea	95	4.92	68.4
Malaysia	103	20.1	86.6
Mexico	69	20.1	78.5
New Zealand	109	12.2	72.5
Papua New Guinea	9	102.8	90.9
Peru	73	48.2	87.9
Philippines	75	24.8	94.4
Russia	141	40.7	81.6
Singapore	138	12.3	77.4
Chinese Taipei	110	-0.3	64.0
Thailand	92	23.2	89.8
United States	87	11.0	63.6
Viet Nam	80	91.2	70.3
APEC Average	90.43	27	76.9

Source: ITU 2009b.

APEC region. As illustrated in Table 7.2, at 2008 the number of mobile subscribers in the majority of APEC economies has overtaken that of fixed-line subscribers to become the most commonly used infrastructure. An average of 76.9% of telecommunications subscribers subscribed to mobile services. In PNG and the Philippines, the very high share of mobile subscribers in total subscribers has led to the observation that the mobile network appears to be the only telecommunications infrastructure available to the public.

7.3 DEVELOPMENT IN BROADBAND ACCESSIBILITY

Technically speaking, the Internet is an inter-networking system connecting more than 50 000 sub-networks worldwide. By virtue of this character, and with the rapid expansion of Internet-based applications and cloud computing architecture, the Internet has emerged undoubtedly as one of the core telecommunications infrastructures.

A growing number of Internet-based applications require a flexible bandwidth which cannot be provided through the traditional dial-up access service with its maximum speed of 56 Kbps. Not surprisingly, demand for broadband Internet access has been extremely robust in recent years and it is rapidly becoming the mainstream Internet access method: assessments and surveys on Internet accessibility are not complete without the inclusion of broadband accessibility. Specific attention will be given to the analysis of broadband performance in the following sections. (There are various definitions on the minimum speed of the qualification for broadband services. Commonly quoted are ITU's 128 Kbps, FCC's definition of 200 Kbps, OECD's 256 Kbps downstream. Due to the fact that the ITU database is used in this document and the fact that 128 Kbps will be able to support the minimum bandwidth requirement for many applications, broadband is thus defined in this report as any access speed above 128 Kbps.)

Internet accessibility performance will be measured in two dimensions. The first is Internet user penetration rate (i.e., Internet user per 100 inhabitants) and the second is Internet subscription penetration rate. The Internet is accessible through various channels, many of which require no prior subscription arrangements. In addition to Internet access provided in work places and public institutions such as public libraries and schools, free Internet hot spots are also widely available in many economies. Internet kiosks that are popular in many APEC economies also require no subscription between user and access provider. Yet the user penetration rate reflects the on-the-ground accessibility of Internet services that are also part of the outcome of structural reforms in the telecommunications sector.

7.3.1 User penetration performance

Figure 7.6 shows the total penetration of Internet users at 2008 across APEC economies. Economies with higher economic development tend to have a higher penetration rate. Korea; New Zealand; Malaysia; and Chile performed well above the average of their GDP level. This outcome is linked with the accessibility of other telecommunications infrastructures discussed previously. Policy, however, also plays an important role in promoting Internet accessibility. Thus economies with a similar level of economic development varied substantially in terms of Internet accessibility. For example, Internet user penetration in Malaysia significantly outperformed its peers with similar levels of economic development. Viet Nam is another good example of above average performance within its counterparts.

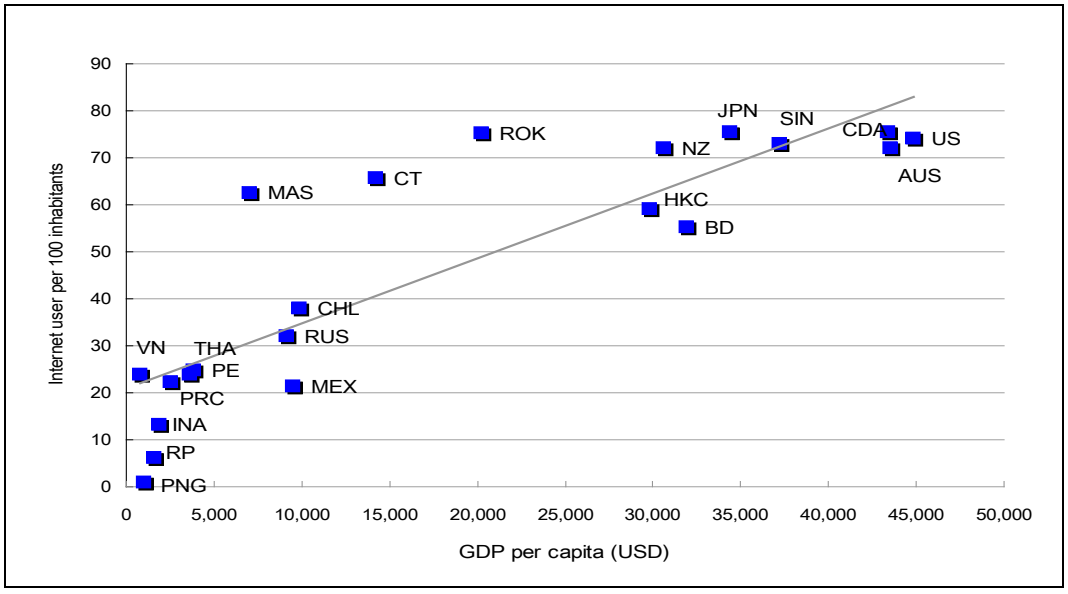
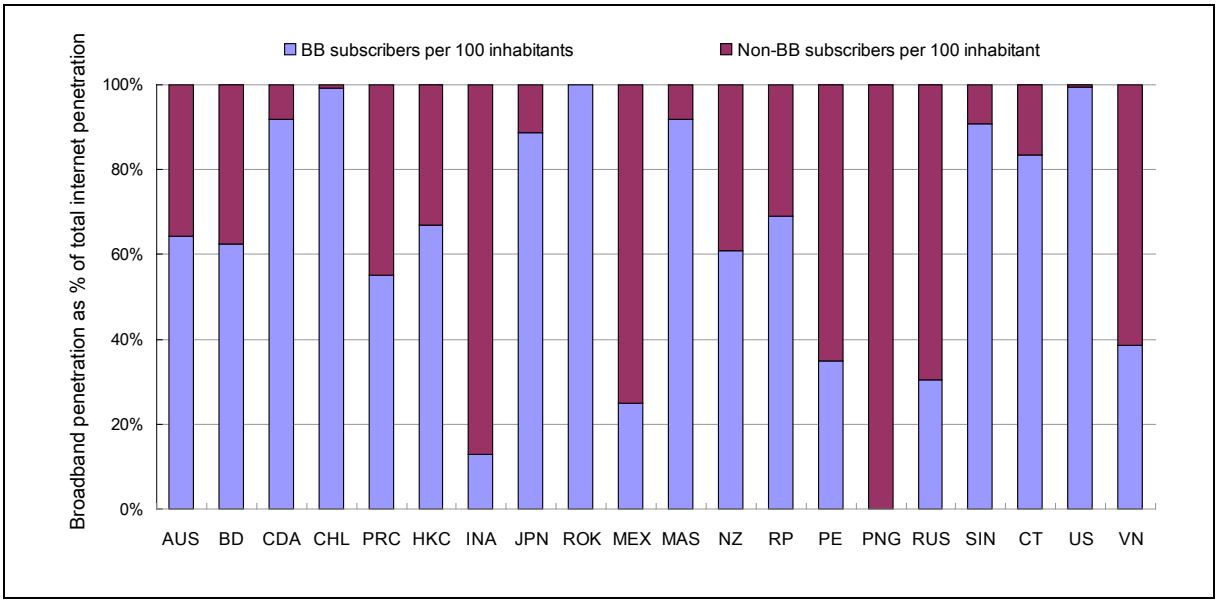


Figure 7.6: Internet user penetration rate and GDP *per capita* (2008). (Source: ITU 2009b)

7.3.2 Subscriber penetration performance

The subscriber penetration rate is not directly connected to the level of economic development. As illustrated in Figure 7.6, a large group of APEC economies shares a close level of Internet subscriber penetration with varying levels of GDP per capita. Malaysia and the Russian Federation are two good examples: they share a similar level of subscriber penetration rate to the USA and Singapore. Korea; Hong Kong, China; and New Zealand are also out-performing some of the more advanced economies.

With respect to the diffusion of broadband access, dial-up has been phased out and broadband has became the only Internet access technology in Korea and Japan in 2008 (Figure 7.7).

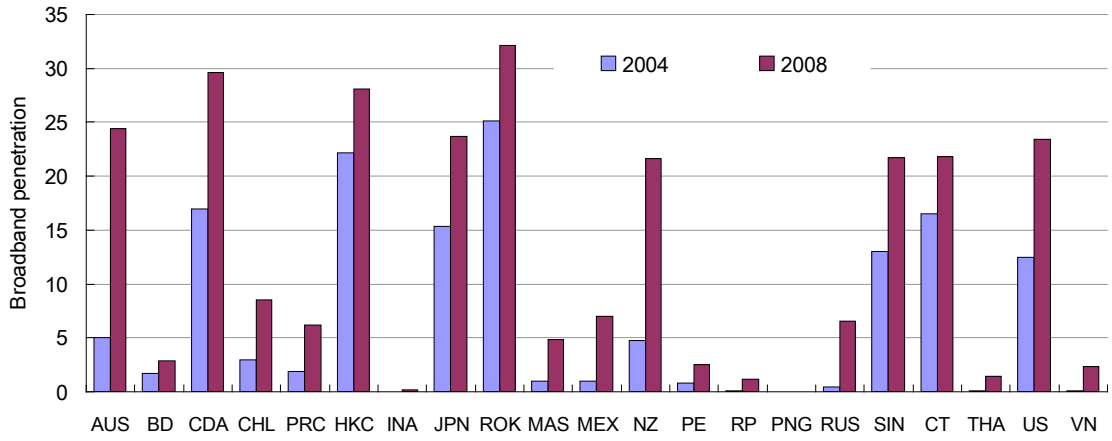


Note: data not available for Thailand

Figure 7.7: Broadband subscribers as a percentage of total Internet subscribers (2008). (Source: ITU 2009b)

Other economies with mass conversion include Canada; Chile; Hong Kong, China; Mexico; Singapore; Chinese Taipei; and the USA. Dial-up remains the primary access service for Indonesia; Malaysia; the Philippines; the Russian Federation; and Viet Nam.

As broadband access is a recent development, we use the year 2004 as the basis to observe the change of broadband penetration rate. As shown in Figure 7.8, it is evident that access among APEC economies is one of the areas where significant development has taken place. Australia; Canada; and New Zealand, for example, are catching up rapidly over the period with leading broadband APEC economies. To a lesser degree, broadband expansion in other economies such as Chile; China; Malaysia; and Mexico, is also a major development.



Note: Broadband is not available in PNG as at 2008.

Figure 7.8: Comparison of change in APEC economies' broadband penetration (Source: ITU 2009b)

Nonetheless, it is equally notable that the gap between economies with advanced broadband access and those with the limited access is increasing. Status in access for Indonesia; the Philippines; and PNG was virtually at a standstill over the period. While less market demand might be partly responsible for this, it is also likely that there exist structural impediments that prevent broadband access development.

7.4 MARKET STRUCTURE AND ACCESS CONDITIONS

7.4.1 The fixed-line telecommunications sector

Entry restrictions have been removed by the majority of APEC member economies as the preferred structural reform tool to attract infrastructure investment and to achieve better performance in fixed line services. The main measures taken are the opening of market entry and the privatisation of the state-owned incumbents. Yet it is a common practice among APEC economies to liberalise the fixed-line sector in a much-delayed sequence compared to mobile and Internet services.

With the introduction of liberalisation policies since the late 1980s, the market structure (i.e., the number of operators) has been moving from monopoly to competition in the APEC region. Considerable improvements are observed, especially since the WTO–GATS agreement on basic telecommunications service came into effect in 1998. Since 2000 a large number of economies started to adopt a market opening policy (Figure 7.9). Compared to market access conditions in 2003, when China; Indonesia; Russia; and Thailand were restricting entry under a duopoly structure, a competitive structure was dominant in 2009, with only Brunei and PNG maintaining a monopoly market structure and Indonesia a duopoly structure.

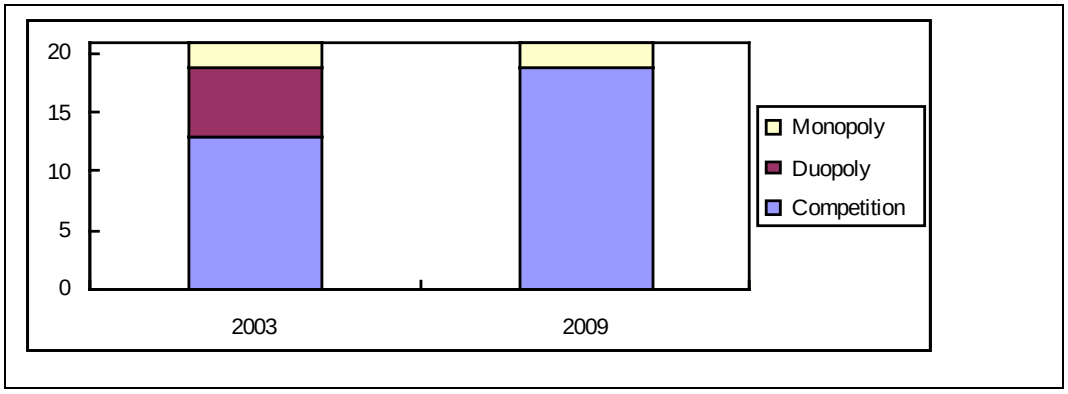


Figure 7.9: Fixed network market structures in the APEC region, 2003–09.

In many circumstances market structure does not always reflect actual market access conditions. The number of operators is affected by many non-policy considerations, including market size, services maturity and state of competition. Thus, there might be, as in the case of Singapore, a duopoly structure yet market access restrictions are completely liberalised. In contrast, multiple existing players do not indicate that future entry is possible, as in the case of Thailand. In Viet Nam only state-owned enterprises are allowed to apply for new licences.

Different forms of market access restrictions are applied across the APEC region. Aside from the licensing regime, some economies such as Thailand and Russia adopted BOT-style concession arrangements that often require new entrants to establish revenue sharing schemes with the incumbent. As of 2009, all APEC economies except Brunei and PNG have adopted full market entry liberalisation, with no predetermined numeric restrictions. Actual market entry conditions among APEC economies are summarised in Table 7.3.

Due to the nature of telecommunications infrastructure, establishing a commercial presence is the most common and feasible mode of supply. Foreign suppliers can set up a commercial outlet, with or without domestic partners, only through foreign investment. Hence, restrictions on foreign investment are also a major market access barrier. There are two major

categories of restriction on foreign investment. The first is the limitations on the percentage of foreign ownership and the second is the requirement to adopt particular legal forms.

As of 2009, there are eight APEC economies that allow 100% foreign ownership for fixed-line operators: Australia; Chile; Hong Kong, China; Japan; New Zealand; Peru; Singapore; and the USA. These economies impose no restrictions on legal forms. Australia; Japan; and New Zealand, together with Korea and Chinese Taipei, have retained foreign investment restrictions on existing operators. The Philippines offers higher ownership allowances for fellow ASEAN member economies. Brunei; PNG; the Russian Federation; and Viet Nam do not allow foreign investment in the fixed-line networks at all. Most APEC economies limit foreign investment from gaining dominant positions in fixed-line operations. Restrictions on foreign investment among APEC economies are summarised in Table 7.4.

Table 7.3: Market access conditions of fixed-line networks in APEC economies (2009).

Economies	Market structure	No. of new entrants	Access conditions
Australia	C	3^	Full liberalisation; entry based on merits of application
Brunei Darussalam	M	0	Entry prohibited. Review policy 10 years after privatisation of incumbent JBT. Timetable for privatisation unclear
Canada	C	3^	Full liberalisation; new entrants do not need to be licensed
Chile	C	3^	Full liberalization; entry based on merits of application
China	C	3^	Short-term policy: two major and two minor operators Long-term policy: unclear
Hong Kong, China	C	3^	Full-liberalisation; entry based on merits of application
Indonesia	C	3	Early 2008 the government awarded the third International Operators which is expected to offer services before end of the year. Current government has announced tender for the third operator for domestic long distance services, as well as additional local and long distance services.
Japan	C	3^	Full liberalisation; entry based on merits of application
Korea	C	3^	Full liberalisation; entry based on merits of application
Malaysia	C	3^	Market-oriented approach; entry based on necessity test and merits of application
Mexico	C	3^	Market-oriented approach; entry based on necessity test and merits of application
New Zealand	C	3^	Full liberalisation; entry based on merits of application
PNG	M	0	Entry prohibited. Future policy: unclear
Peru	C	3^	Market-oriented approach; entry based on necessity test and merits of application
Philippines	C	3^	Based on granting of legislative franchise from Congress and Certificate of Public Convenience and Necessity from regulator
Russia	C	2	Concession with incumbent. Short-term policy: duopoly. Long-term policy: unclear
Singapore	C	2	Full liberalisation; entry based on merits of application
Chinese Taipei	C	3^	Full liberalisation; entry based on merits of application
Thailand	C	3^	Full liberalisation; entry based on merits of application
United States	C	3^	Full liberalisation; entry based on merits of application
Viet Nam	C	3^	Limited: based on necessity test. Only state-owned enterprises allowed.

Notes: C = competition; D= duopoly; M= monopoly. 3^ denotes more than 3 operators.
Sources*:* APEC Telecom Regulatory Updates and other sources.

Table 7.4: Restrictions on fixed-line network foreign investment in APEC economies (2009).

APEC member	Direct investment ceiling	Legal form required
Australia	100% except: ▪ 35% of Telstra's shares ▪ Majority Australian ownership of Vodafone	None
Brunei Darussalam	Not allowed	Not allowed
Canada	Facilities based telecommunications service suppliers: 46%	None
Chile	100%	None
China	49%	Joint venture only
Hong Kong, China	100%	None
Indonesia	30% (40% for ASEAN member)	Joint venture only
Japan	None except no more than 33% is allowed for NTT	
Korea	General: 49%; Incumbent (KT): 33%	None
Malaysia	49%	Only through acquisition of shares of existing operators
Mexico	49%	None
New Zealand	100% except 49.9% for Telecom NZ	None
Papua New Guinea	Not allowed	Not allowed
Peru	100%	None
Philippines	40%	None
Russia	Not allowed	Not allowed
Singapore	100%	None
Chinese Taipei	General: 60%; existing operator: 49%	None
Thailand	49%	Joint venture
United States	None after passing public interest test	None
Viet Nam	Not allowed	Not allowed

7.4.2 The mobile telecommunications sector

As of 2009, all APEC economies have liberalised, albeit to different degrees, their mobile sector. Multiple new entrants are allowed to compete with incumbent operators in APEC economies, except in Brunei with its duopoly structure. All new licences are granted based on market-oriented approaches unless limited by the availability of spectrum. Brunei; PNG; and China are the exceptions: there the number of operators is regulated in line with their telecommunications development master plans underpinned by phased-in liberalisation policies. This reflects a significant refinement in market access policy across the APEC region. In 2003 mobile sectors in Brunei and PNG where still monopolised by state-owned incumbents, and China was maintaining a duopoly structure. Market entry conditions among APEC economies are summarised in Table 7.5.

Restrictions on foreign investment in the mobile sector in the APEC region are in general governed by the same regime that applies to the fixed-line sector. The exceptions are Mexico and the USA (Table 7.6), but Mexico allows 100% foreign ownership for mobile operators while the USA applies a 20% foreign ownership ceiling for mobile operators (PSC licensees) unless the FCC approves otherwise, based on case-by-case evaluations.

A major issue remaining in mobile market accessibility is the assignment of radio spectrum. In accordance with the WTO Reference Paper on Basic Telecommunications, which all APEC members have undertaken as their respective GATS commitments, the allocation process should be carried out in an objective, timely, transparent and non-discriminatory manner. The spectrum allocation among APEC members can be assessed when more data becomes available. But some general comments drawn from a background paper prepared for this project (Ure 2010) are worthwhile.

Table 7.5: Market access conditions of mobile networks in APEC economies (2009).

APEC member	Market structure	No. of operators	Access conditions
Australia	C	3^	Market-oriented approach; evaluate applications based on merits and availability of spectrum
Brunei Darussalam	D	2	Second mobile operator (Bmobile) began in 2006
Canada	C	3^	Market-oriented approach; evaluate applications based on merits and availability of spectrum
Chile	C	3^	
China	C	3^	Three licences were issued for 3G operations
Hong Kong, China	C	3^	Market-oriented approach; evaluate applications based on merits and availability of spectrum
Indonesia	C	3^	
Japan	C	3^	
Korea	C	3^	
Malaysia	C	3^	
Mexico	C	3^	
New Zealand	C	3^	
Papua New Guinea	C	3	Two mobile carrier licences were issued on 27 March 2007. The licences have a validity of 10 years.
Peru	C	3^	Market-oriented approach; evaluate applications based on merits and availability of spectrum
Philippines	C	3^	
Russia	C	2	
Singapore	C	2	
Chinese Taipei	C	3^	
Thailand	C	2	Market-oriented approach; evaluate applications based on merits and availability of spectrum. Concessions with incumbent operator
United States	C	3^	Market-oriented approach; evaluate applications based on merits and availability of spectrum
Viet Nam	C	3^	Limited based on necessity test and availability of spectrum. Only state-owned enterprises allowed

Notes: C = competition; D= duopoly; M= monopoly. 3^ denotes more than 3 operators.

Table 7.6: Restrictions on mobile network foreign ownership in Mexico and the USA.

Economy	Investment ceiling	Legal form	Fixed-line ceiling
Mexico	100%	None	49
United States	20% unless otherwise approved	None	100

The allocation of radio spectrum by national regulatory authorities for different categories of use such as broadcasting, mobile phones, satellite etc. usually follows the recommendations of the ITU-organised World Radio Conference. This ensures the harmonisation of frequencies across regions of the world, permitting services such as mobile roaming, and preventing cross-border radio interference. Once allocated, the frequency bands are subdivided into frequency bandwidths for assignment to individual users, either by administrative means (‘command and control’) or by a market mechanism, such as auctions. In cases where spectrum is in plentiful supply and demand for it is unlikely to cause interference between users, it is usually available unlicensed. For example, no-one needs a licence for a microwave oven. But where demand is competitive, spectrum is a valuable scarce resource.

Reforms therefore straddle both licensed and unlicensed spectrum: the former to improve the efficient use of a scarce resource by placing a price on frequencies; and the latter to increase welfare by facilitating the use of the resource, for example, making it easier for populations in remote areas to access wireless networks and the Internet. Reforms in spectrum management can be seen as falling into three categories:

- Transparency – including conforming with the WTO's Basic Agreement on Telecom regulatory guidelines, by making spectrum management a more open process, by providing national spectrum plans for investors to estimate the risks and opportunities, by providing databases for the public to check spectrum usage and licences, by engaging the industry and the public in the consultation process behind proposed changes to spectrum policies, by speeding up response times and reducing administrative processes and by maintaining easy-to-navigate websites.
- Licensing – including making clear distinctions between property rights, with appropriate constraints such as limits on the power of emissions, on spectrum sharing, on the right to transfer ownership, on the right to trade spectrum and on the rights to change spectrum usage ('refarm' etc.) and spectrum availability for common usage – which may or may not require a licence or the registration of usage – and spectrum reserved for use by government; by speeding up the licensing process (see 'Transparency' above) and by the introduction of market mechanisms or shadow price mechanisms (where prices are based on opportunity cost) to assist in a more efficient use of the scarce resource. Market mechanisms and shadow mechanisms can include, *inter alia*, spectrum usage fees (SUFs) where demand is competitive, auction prices and administrative incentive pricing schemes where assignments are non-competitive (e.g., to government agencies etc.).
- Convergence – including an adaptation of existing policies, rules and regulations to take account of convergence between telecommunications, IT (e.g., the Internet) and new media (e.g., web-server based services), measures to enable and encourage investment and innovation in converged services, and increasingly a trend to merge the regulatory agencies responsible for telecommunications and broadcasting, thereby providing the industry and the public with a single point of contact.

7.4.3 Summary

This section reports the latest progress of APEC member economies in refining market access conditions. As far as market entry policy is concerned, most APEC members which had not adopted a liberalisation policy in 2003–04 have now aligned with more liberal policy considerations. While advances in liberalisation policy for the mobile sector is more encouraging than that for the fixed-line sector, structure reform through market opening has became the primary policy setting in the APEC region.

Despite the emergence of new technologies and communications convergence, the telecommunications sector is expected to remain highly regulated. Thus, the results surveyed in this section indicate that in order to deepen the benefits of market liberalisation and, consequently, structure reform efforts, regulatory reform that adheres to world best practices is necessary. Given the complexity and dynamic advancement of the telecommunications sector, regulatory reform will be a challenge that requires regional cooperation and capacity-building initiatives.

7.5 REGULATORY REFORM UNDERPINNING STRUCTURAL REFORM

Regulation is a double-edged sword. Market access and the treatment of foreign operators were discussed in Section 7.4. Regulation in this section refers to regulatory measures other than market entry and foreign investment restrictions. Often regulation is required to preserve the outcome of liberalisation. Firstly, due to both historical and technical reasons, to prevent an incumbent operator from misusing its market dominance. Secondly, to ensure that public interest objectives (e.g., sector development, any-to-any connectivity, service quality, pricing

and universal service) are accomplished. But without proper design it can also be the major source of restrictions, especially in a sector where the dynamics of improving technologies and innovation produce rapid change.

The greatest challenge of designing and implementing a pro-competitive regulatory framework is that it must be flexible enough to allow national consideration and at the same time be not so abstract that it fails to provide meaningful guidelines for pro-competitive regulatory approaches. Based on this understanding, 18 APEC economies reached a consensus in the APEC Leader's Los Cabos Statement to Implement APEC Policies on Trade and the Digital Economy (2002) to adopt the regulatory principles inscribed in the WTO Reference Paper as the underlying guideline for implementing a pro-competitive regulatory regime in the APEC region (Box 7.1).

That said, the state of APEC economies' implementation of the aforementioned core regulatory principles is summarised in Table 7.7.

7.6 QUANTIFYING THE IMPACT OF REFORM

The impact of reform is assessed at two levels: in the sector itself, where the performance indicators are penetration rates, and on the economy as a whole.

7.6.1 Impact at the sectoral level

Following the work of Warren (2000), performance in penetration for fixed, mobile and broadband services are modelled as being affected by a set of structural reform initiatives, with additional non-policy variables such as housing or population density and income level (GDP per capita).

Policy initiatives concerning telecommunications structural reform can be divided into two primary categories:

- *Market access policies*
  Market access policies represent restrictions on market entry by either domestic or foreign new entrants.
- *Pro-competition regulatory regimes*
  Telecommunications services are particularly sensitive to the regulatory environment. The WTO Telecom Reference Paper, which all APEC WTO members undertook as part of their Los Cabos commitment, provides a set of multilaterally agreed regulatory principles to guard against the potential manipulation of a dominant operator and to ensure that *de facto* competition can take place. These include, *inter alia*, safeguards to prevent major operator(s) from engaging in or continuing anti-competitive practices, cost-based pricing rules for access to essential infrastructure, an independent regulator and a number portability regime.

Based on this understanding, a composite set index that captures both market entry and regulatory undertakings has been developed. The index has been split into two categories: 'market entry and non-discrimination' and 'pro-competition regulations'. The market entry category reflects market entry and investment conditions, with the assumption that competition through competitive entry by both foreign and domestic new entrants impact on performance. The pro-competition regulations category captures measures that are the prerequisite elements for a competitive market. Policy measures included in the calculation of the index have been split into five components, according to their primary impact.

Box 7.1 Regulatory principles included in the WTO Reference Paper.

- **Non-discrimination**
  Non-discrimination is to ensure that domestic regulation does not discriminate between foreign services (most-favoured nation treatment) and between foreign and national services and service suppliers (national treatment).
- **Good governance**
  The aim of good regulatory governance is to ensure that domestic regulation is administered in a transparent and fair manner for all parties involved. This concerns the notification and publication of regulatory rules and procedures, as well as the independence of the regulator.
- **Competitive safeguards**
  Appropriate measures are to be maintained for the purpose of preventing suppliers, who, alone or together are a major supplier, from engaging in or continuing anti-competitive practices. Besides state rules and regulations, anti-competitive practices carried out by suppliers, in particular the incumbent who has market power, pose a major barrier to competition. For example, the practice of cross-subsidisation, by offering services below cost in competitive markets and making up for the loss from another service where competition is absent, can foreclose competition. The problem is particularly acute in the telecommunications sector, where there are bottleneck facilities, giving rise to monopolies. In this regard, the economy should have a competition regime in place to ensure that competition in the telecommunications market is 'fair' for all suppliers.
- **The establishment of an interconnection regime**
  While a mandatory non-discriminatory interconnection regime is established in many economies, it is not necessarily cost based, and a dispute settlement mechanism is often absent. A sound interconnection regime ensures that interconnection and access to bottleneck facilities are provided in a fair and transparent fashion.
- **Access to essential facilities**
  As provided in the WTO Reference Paper, access to essential facilities controlled by a major supplier will be ensured at any technically feasible point in the network. It should also be provided under non-discriminatory terms and conditions, in a timely fashion and subject to charges that are cost based. To ensure transparency of the access regime, the procedures for interconnection to a major supplier should be made publicly available, and major suppliers should make publicly available either their access agreements or a reference access offer. Service suppliers requesting access with a major supplier should have recourse to an independent body to resolve disputes.
- **Universal service obligations**
  Each member economy should have the right to define the kind of universal service obligations it wishes to maintain. These obligations will not be regarded as anti-competitive *per se*, provided they are administered in a transparent, non-discriminatory and competitively neutral manner and are not more burdensome than necessary for the kind of universal service defined by the particular economy. Universal service requirements can have anti-competitive effects. Many economies in the past allow the incumbent to use a cross-subsidy to finance universal service. For example, profits from long distance are used to compensate for losses in local fixed line services. In such a situation, competition in the long distance would have to be restricted in order to sustain the high profits for the incumbent. In many economies the state operator alone undertakes the obligation to provide universal services. But the actual cost of providing the service is rarely available, and as a result, the state operator may be over or under compensated for shouldering the responsibility. Over compensation would provide the state operator with unfair financial advantage. Under compensation, however, may undermine the universal service goals, since the state operator would be unwilling to carry out loss-making activities.

Table 7.7: Summary of APEC economies' implementation of the WTO regulatory principles.

Regulatory Elements	APEC Performance
1. Competitive safeguards 1.1 Preventing major supplier from engaging in anti-competitive cross-subsidisation; 1.2 Preventing major supplier from using information obtained from competitors with anti-competitive results; 1.3 Preventing major supplier from not making available to other service suppliers on a timely basis technical information about essential facilities and commercially relevant information which are necessary for them to provide services.	***Interconnection regime*** ▪ Implemented: 14 economies ▪ Not yet implemented: 4 economies ▪ Regulatory proposals under consideration: 3 economies ***Access to essential facilities*** ▪ Implemented: 13 economies ▪ Not yet implemented: 7 economies
2. Interconnection 2.1 Interconnection with a major supplier is under non-discriminatory terms and conditions (including technical standards and specifications) and rates and of a quality no less favourable than that provided for its own like services or for like services of non-affiliated service suppliers or for its subsidiaries or other affiliates; 2.2 Interconnection with a major supplier is provided in a timely fashion, on terms, conditions (including technical standards and specifications) and cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided; 2.3 Interconnection with a major supplier is provided on request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of necessary additional facilities; 2.4 The procedures applicable for interconnection to a major supplier are made publicly available; 2.5 It is ensured that a major supplier will make publicly available either its interconnection agreements or a reference interconnection offer; 2.6 Dispute settlement.	▪ Implemented: 12 economies ▪ Not yet implemented: 4 economy ▪ Regulatory proposals under consideration: 3 economies ▪ Partial implementation (e.g. non cost-based rules and/or no dispute settlement): 2
3. Public availability of licensing criteria Where a licence is required, the following is made publicly available: 3.1 All the licensing criteria and the period of time normally required to reach a decision concerning the application; 3.2 The terms and conditions of individual licences. The reasons for the denial of a licence will be made known to the applicant upon request.	▪ Implemented: 13 economies ▪ Partial implementation: 8 economies (failure to provide timeline for licensing and reasons for denial)
4. Independent regulators 4.1 The regulatory body is separate from, and not accountable to, any supplier of basic telecommunications services; 4.2 The decisions of and the procedures used by regulators shall be impartial with respect to all market participants.	▪ Implemented: all APEC economies
5. Allocation and use of scarce resources 5.1 The procedures for the allocation and use of frequencies are carried out in an objective, timely, transparent and non-discriminatory manner; 5.2 The procedures for the allocation and use of numbers are carried out in an objective, timely, transparent and non-discriminatory manner; 5.3 The procedures for the allocation and use of rights of way are carried out in an objective, timely, transparent and non-discriminatory manner; 5.4 The current state of allocated frequency bands is made publicly available.	▪ Implemented: 20 economies ▪ Not implemented: 1 economy

Source: ITU, *World Telecommunication Regulatory Database*; APEC Tel, *Regulatory Updates*, 2007 and 2008. USTR, *2009 Section 1377 Review of Telecommunications Trade Agreements*.

7.6.1.1 Market entry and non-discrimination category

The market entry and non-discrimination category captures measures affecting the ability of a telecommunications operator to establish a physical operation. Four index variables are included in this category:

- licensing of new fixed-line local service licences;
- licensing of new mobile operation licences;
- direct foreign investment regime;
- foreign investment, which includes the following sub-items:
    - general: the maximum direct foreign equity participation in any licence; and
    - incumbents: the maximum direct foreign equity participation allowable for incumbent operators.

'New licensee' means a licensed operator other than the incumbent. Given the fact that most APEC economies allow fixed-line service operators to provide a basket of integrated fixed-line services (i.e., the bundling of provision of local, domestic and international long distance and broadband access services), we therefore do not further distinguish separate licensing regimes that might be available for individual services.

7.6.1.2 Pro-competition regulation category

The pro-competition regulation category measures policies that are deemed essential for the establishment of a pro-competition regulatory regime after market opening. Index components included under this category are:

- *Competitive safeguard*
  After market opening it is also essential to ensure that all anti-competitive activities undertaken by the major operator in the telecommunications sector are regulated and prevented.
- *Interconnection rules*
  For networked industries such as the telecommunications sector, the security of interconnection with other networks, in particular, interconnection with the major operator's network, is a prerequisite for service provision.
- *Independent regulator*
  In many economies the legacy of state-owned monopolist PTOs has led to a structure where the incumbent PTO is also the sector regulator. This referee–player structure affects the creation of a level playing field in a competitive market place.
- *Access to essential facilities*
  Based on WTO Reference Paper on Basic Telecommunications, essential facilities are defined as 'facilities of a public telecommunications transport network or service that (a) are exclusively or predominantly provided by a single or limited number of suppliers; and (b) cannot feasibly be economically or technically substituted in order to provide a service'. This element captures rules that enable new entrants access to essential facilities managed by the major operators.
- *Number portability*
  Number portability (NP) is an additional policy indicator. When subscribers decide to change their existing telecommunications operators to another, they face switching costs. High switching costs often prevent subscribers from changing operators and therefore deter competition. NP is identified as an effective measure to address non-pecuniary switching costs. In general, an NP regime allows subscribers to retain the same telephone numbers when they switch between operators.

A weighting and scoring methodology is developed to give scores to each of the policy variables to produce an aggregated index, with a zero given to an economy that maintains no restrictions on entry and investment and has implemented the full set of regulatory measures included in the index. Partial liberalisation and/or implementation of regulations will be scored accordingly, with a score of one for restrictive regimes. Weighting of each variable is based on the judgment of the importance of each policy variable to maximise the correlation between the individual components and their weighted averages (Sidorenko 2001). The index system and the results of the index measurement are provided in the Annex of this chapter. Only current policy information is included in this index and the models are estimated for only one point of time (2009).

Information on market access and regulatory measures are collected mainly from the ITU World Telecom Regulatory Database, with additional inputs from the individual economy's Regulatory Updates reported to the APEC Telecommunications and Information Working Group (TEL) meetings.

In the following part we examine the impact of the policies included in the index on the performance of network development (fixed and broadband penetration) and mobile penetration. Drawing from Warren (2000), the estimated equations also include non-policy explanatory variables, such as GDP, housing density (population density in the case of mobile penetration) and the two policy index categories. It could be expected that an economy with limitations on the introduction of the policy regimes defined (resulting in higher index scores) will show a lower penetration rate, allowing for the influence of the other non-policy variables.

Tables 7.8 and 7.9 show the results of the analysis for fixed-line and mobile penetration in APEC economies. Contrary to the findings of Warren (2000), none of the models found a significant relationship between the two policy index categories and penetration rates, controlling for GDP and density. There are several possible explanations behind this. Firstly, fixed-line and mobile liberalisation policies have been implemented for an extended period of time. For the fixed-line market, that process started around 1997 when the WTO telecommunications commitments came into effect for most APEC economies, and mobile sector liberalisation in most economies was even earlier than that. In addition, despite varying levels of implementation, all APEC economies have agreed to adopt the WTO regulatory principles.

As such, the establishment of a pro-competition regulatory regime plays a much less critical role in refining market performance by 2009. Instead, technology advancements, innovative services and growing market demand for communications services perhaps are the main reasons underpinning the considerable performance that is observed. The reduction in costs for both service provision and consumer devices, and the advancement in wireless technologies, might be more important factors affecting development in the telecommunications sector. This is not to say that the traditional regulatory policy is without influence; rather it suggests a shift in policy directions and priorities. Policy initiatives that facilitate technology development, innovation and the development of intellectual property protection (and harmonisation) will play an increasingly important role. Regulations ensuring the quality of services are also important in light of the diversified and innovative modes of services provisions.

For the relatively new development of broadband, the impact of policy is more direct and obvious. Table 7.10 shows the result of the regression analysis on fixed-line broadband penetration for APEC economies. With strong explanatory power, all regression models

Table 7.8: Results of fixed-line penetration models.

Variable	Mode1-1 (Policy1)	Mode1-2 (Policy2)	Mode1-3 (average)
Policy1	-10.62762 (12.02183)	–	–
Policy2	–	-18.75779 (10.92538)	–
Policy average	–	–	-16.10337 (11.9413)
Y	0.0015399 (0.000917)	0.0014696 (0.0008631)	0.0015143 (0.0008896)
Y^2	-0.0000000196 (0.000000019)	-0.0000000202 (0.0000000179)	-0.0000000201 (0.0000000184)
HD	0.0037694 (0.0064281)	0.003167 (0.0059265)	0.0031934 (0.0061874)
Constant	16.29225** (7.454765)	19.98039** (7.216838)	18.57443** (7.444616)
R-squared	0.5596	0.6100	0.5852

Notes: Reported figures are coefficient estimates; figures in parentheses represent standard errors;*= coefficient estimates are significant at the 90% level; **= coefficient estimates are significant at the 95% level.

Table 7.9: Results of mobile penetration models.

Variable	Mode2-1 (Policy1)	Mode2-2 (Policy2)	Mode2-3 (average)
Policy1	-9.81373 (22.09086)	–	–
Policy2	–	-0.0350171 (21.94072)	–
Policy average	–	–	-5.224837 (22.86316)
Y	0.0064254** (0.0018034)	0.0064998** (0.0018107)	0.006467** (0.0018099)
Y^2	-0.000000123** (0.0000000376)	-0.000000123** (0.0000000378)	-0.000000123** (0.0000000377)
Population	0.0615315 (0.081313)	0.0632053 (0.0822061)	0.0637684 (0.0816567)
Constant	47.84828** (17.81047)	44.06617** (17.58578)	45.99976** (17.86413)
R-squared	0.5166	0.5103	0.5120

Notes: Reported figures are coefficient estimates; figures in parentheses represent standard errors;*= coefficient estimates are significant at the 90% level; **= coefficient estimates are significant at the 95% level.

Table 7.10: Results of broadband penetration models.

Variable	Mode3-1 (Policy 1)	Mode3-2 (Policy 2)	Mode3-3 (aggregate)
Policy1	-13.4699(5.9441)**	--	--
Policy2	--	-18.00711** (4.822528)	--
Policy aggregate	--	--	-17.17051** (5.519789)
Y	0.0008281** (0.0004534)	0.0007531* (0.000381)	0.0007959* (0.0004112)
Y^2	-0.00000000864 (0.0000000094)	-0.00000000877 (0.00000000789)	-0.00000000889 (0.00000000852)
Household Density	0.0010802 (0.0031783)	0.0010242 (0.002616)	0.0008078 (0.0028601)
Constant	6.470009* (3.68595)	8.860321** (3.185556)	8.150823** (3.441227)
R-squared	0.7219	0.8037	0.7711

Notes: Reported figures are coefficient estimates; figures in parentheses represent standard errors;*= coefficient estimates are significant at the 90% level; **= coefficient estimates are significant at the 95% level.

establish a significant and negative relationship between the policy index categories and the broadband penetration rate, controlling for GDP and household density. This outcome supports our expectation that limitations on market entry, investment and shortcomings in pro-competition policy regimes hinder broadband development.

There are still uncertainties in the market demand for fixed-line broadband, and competition from wireless broadband technologies (e.g., 3.5G, LTE and Wimax) worsens the investment risk. Given the fact that fixed-line broadband requires significantly higher investment that is sunk, these investment uncertainties make it particularly sensitive to policy environment. Among the models, the relatively high coefficient for the aggregate index model (Model 3-3) highlights the significance of developing a holistic approach for structural reform.

7.6.2 Economy-wide effects

The research literature on the impact that investment in telecommunications has upon economic growth is extensive, pioneered by studies such as Hardy (1980) and reviewed by Negash and Patala (2006). These have been followed by numerous studies on the importance of market reforms in opening the sector to greater investment – see Sridhar and Sridhar (2004) for an analysis and overview; for case studies see Petrazzini (1995) and for an overview of reforms across the Asia–Pacific see Ure (1995, 2008). Some general comments are drawn from a background paper prepared for this project (Ure 2010).

The economic gains from the spread of access to telecommunications networks are generated mostly through the network effects ('externalities') of linking hundreds of thousands of businesses and residential subscribers, and through reduced transactions costs, including reduced costs of market information, reduced travelling times, faster responses to changing markets etc. The growth of the telecommunications sector itself adds to GDP but the initial impact of liberalisation or competitive market entry is often a contraction of the workforce – see review by Ure and Vivorakij (1997). This is partly a response to competitive pressures by the incumbents becoming more efficient; and more important over time, it is a response by the incumbents to accelerate the adoption of new digital technologies which are far less labour intensive. New technologies are associated with innovation in services through more effective delivery channels, such as digital subscriber line (DSL) and IP-based mobile cellular etc., and through new services such as converged services like IPTV and mobile TV. As new entrants make their mark and users become more aware of the benefits and availability of telecommunications, the elasticity of demand tends to rise (i.e. demand becomes less responsive to price changes). For this reason, it was common in the 1990s in many low income economies immediately following liberalisation for waiting lists to grow rather than shrink, as potential subscribers realised there was, for the first time, a realistic opportunity to register for a telephone line. And as new services create new markets, so employment in the sector grows again.

The evidence from econometric studies on the impact of investment in fixed line telephony growth has varied according to the methods employed. Hardy (1980) found that investment in telecommunications had a higher impact on developing rather than developed economies, while the ITU studies referred to above tended to imply quasi-linear relationships between teledensity and *per capita* GDP. In 1996 an influential study by Roller and Waverman challenged these results by finding that across the OECD economies the impact of investment in telecommunications on GDP growth was higher at higher levels of *per capita* GDP.[3]

[3] For other studies see, for example, http://www.nipfp.org.in/working_paper/wp04_nipfp_014.pdf.

The approach of Roller and Waverman is to be preferred because it tackles several estimation problems not handled by earlier studies.[4] When these are accounted for, most of the growth attributed to investment in telecommunications in previous studies disappears. Having revised the earlier view, they then test for network effects or network externalities by a regression of economic growth not simply on each economy's teledensity but also its teledensity squared to reflect network effects.[5] Their findings show clearly that as teledensities, and therefore the network effects, rise, so the impact of investment in telecommunications rises. This finding is also intuitively appealing. Table 7.11 summarises the results.

Table 7.11: Teledensity and the impact of telecommunications investment – developed economies.

OECD economies	Teledensity	Impact of 10% investment
OECD average	30%	2.8% increase in GDP
USA	40%	7.8% increase in GDP

Independent estimates for GDP elasticity with respect to investment in telecommunications were made for Hong Kong, China by Ure (1997) in a study for PECC which found a much lower impact of investment on GDP. This might be expected of a small open economy such as Hong Kong, China, where many of the benefits of the multiplier effects of investment will be leaked overseas through the import of equipment.

The findings of Roller and Waverman (1996) have implications for developing economies because they suggest that the economic return on investment in telecommunications in lower income economies will be less than in their more developed counterparts, although for individual telecommunications companies the financial returns may, of course, be high. However, the findings also suggest that in developing economies there should be increasing returns to telecommunications investment as the network effects become progressively more widespread, and therefore policies and regulations should be tailored to promote the spread of network effects in developing economies. This objective would be consistent with APEC's concept of inclusive growth. While these results only relate to fixed-line telephones, the network effects of mobile are increasingly strong, and by 2010 the substitution of mobile for fixed lines is well established in almost all economies, as already noted.

Research into the impact of investment in the mobile cellular sector on economic growth has given important insights into the way in which the lives and livelihoods of people in developing economies have improved due to access to wireless networks. The research cited here is academic in nature and some of it is sponsored by a vendor, Vodafone. Table 7.12 summarises the findings of three studies, each of which uses econometrics to derive results: Waverman et al. (2005) appeared separately as a Vodafone research paper, and there is a similar study to that of Sridhar and Sridhar (2004) on the impact of mobile phones in India (Kathuria, Uppal & Mamta 2009).

Table 7.12: Teledensity and the impact of telecommunications investment in mobile.

Developing economies	Teledensity	Impact of 10% investment
Torero et al. (2002)	5–15%	0.3% increase in GDP
Waverman et al. (2005)	10%	5.9% increase in GDP
Sridhar & Sridhar(2004)	<20%	7% increase in GDP

[4] The first is the problem of simultaneity, i.e., a growth in telecommunications can cause economic growth and economic growth can cause a growth in telecommunications. Secondly, economic growth can be caused by the accumulation of fixed assets, such as R&D, to which telecommunications investment is closely correlated.

[5] The number of possible connections in a network is n(n-1) or n2-n.

Two notable features emerge from these studies. Firstly, the elasticity of GDP growth is mostly higher when teledensities are higher, replicating the findings of Roller and Waverman (1996). Secondly, the impact mobile network investment has on economic growth of developing economies is higher at lower levels of teledensity than for comparable levels of investment in fixed lines in developed economies. There is intuitive appeal in this result. The mobile function offers 'anytime, anywhere' networking opportunities, and the opportunity cost measured in terms of the cost and duration of travelling times and the loss of business and social opportunities arising from difficulties in accessing information make the mobile phone an ideal communications and networking tool. The implication is that policies and regulations should be designed to encourage further investment in, and wider usage of, mobile networks (e.g., by encouraging the spread of services such as mobile banking, mobile payments, mobile search, location-based services etc.).

The latest wave of technology to engulf the telecommunications sector is broadband. Because it is rather new, research into the impact of broadband remains nascent. Work includes studies by Atkinson, Castro and Ezell (2009) and Crandall, Lehr and Litian (2007) which find significant effects on employment and productivity. Although these studies are for the USA, the impact of broadband is likely to be very high in other developed economies and strategically important in the main metropolitan centres of developing economies to attract foreign investment. The competitive advantage of 'world cities' will be influenced by their level of broadband access, but equally important is the growing phenomenon of social networking in developing economies. For example, Indonesia is the world's fourth largest market for Facebook. For most people in developing economies their first use of broadband will most likely be through wireless access.

There are, therefore, three aspects to policy making and regulation with respect to broadband: enabling the demand side, promoting the supply side and providing sufficient radio spectrum. On all three issues it is worth noting the conclusions of Crandall, Lehr and Litian (2007):

- *Demand side*
  '[G]iven that the demand for broadband is price elastic, the most effective policies are likely to be those that contribute to lower prices. The surest route to lower prices is provided by increasing competition in the delivery of broadband services'.
- *Supply side*
  '[G]overnments should actively seek to remove barriers to new infrastructure investment by incumbents and new entrants. The growth of Internet traffic, especially video traffic associated with such services as YouTube and file sharing traffic associated with a variety of P2P sharing applications, is straining current infrastructure. Providers will need to continue to invest substantially to meet this growing demand without quality-reducing congestion occurring … more investment in facilities risks being derailed if the firms investing in such infrastructure cannot reasonably expect to recover their economic costs, including earning a fair, risk-adjusted return on investment. Regulatory rules which unduly restrain provider pricing and service offerings threaten carriers' ability to recover their costs and hence the viability of on-going investment in infrastructure'.
- *Spectrum management*
  'Finally, there is one important way in which federal policy makers can and should expand both demand and supply of broadband services. That is to continue the process of increasing the amount of radio spectrum available for commercial uses and subject to flexible market allocation'.

Spectrum trading refers to the right to trade ownership of part or all of spectrum assigned to a user, or to lease part or all of spectrum. For example, in the USA utility companies often sit on under-utilised radio spectrum assigned to them in past years, and they can lease part of it to other users, which generates revenue for them and provides a scarce resource to others who can use it productively. Liberalisation is a more radical measure. It means giving the owners of spectrum the right to change its usage, in effect using a market mechanism to change spectrum allocation. This can threaten regional harmonisation of usage, so its application is usually reserved for cases not requiring strong harmonisation measures. An intermediate step is refarming of spectrum, where frequencies assigned to support a service such as a 2G mobile network are re-assigned to support a 3G or a 4G network

There have been various studies on the likely economic benefits or impact of spectrum liberalisation and trading (see Ure 2010). One example is from the UK regulator Ofcom, who commissioned a study by Europe Economics (2006). The survey did not report on consumer price responsiveness for 2006 but based its assumptions upon a survey carried out in 2002, using four different methods of extrapolation. However, it found that most of the benefits of trading spectrum will arise in the provision of public mobile services (51% in 2006 in the UK report) and broadcasting (29% in 2006). Eighty-seven per cent of the benefits from public mobile services accrued as consumer surplus rather than producer surplus, and 82% of the benefits from broadcasting services. These findings are not surprising given the value users place on public mobile phone and broadcasting services, and these results are very much in line with similar studies from other regions such as Analysys et al. (2004) for the European Union.

Trading, however, is still limited. The following economies, together with dates of introduction, have categories of licences that may be traded: New Zealand (1989), Australia (1992), El Salvador (1996), Guatemala (1996), the USA (1997), Norway (2003) and the UK (2003, 2006). The evidence from El Salvador and Guatemala is not overwhelming but a study by Hazlett, Ibarguen and Leighton (2006) does show that trading is consistent with higher than average radio spectrum deployment *per capita* GDP across 16 South American economies, and for minutes of usage per GDP *per capita*. In other words, whether due to spectrum trading or not, both economies compared well with their neighbours.

Successful trading requires transparency and low transactions costs. Where auctions have already assigned frequencies efficiently, trading tends to be low in volume. The most commonly traded frequencies in Australia, the UK and the USA are those supporting personal communications services (PCS) and broadband fixed wireless access services (BFEA). In other economies publicly available information is insufficient to make an analysis, which is a future issue for data availability and research yet to come.
At regional level, however, one potential drawback that might undermine the development of mobile services (and possibly the 2000 Brunei Goal and regional economic integration) is the issue of international roaming charges. It became apparent that international roaming charges for both voice and data services are in many if not all cases unreasonably high globally. The European Commission has found, for example, that international mobile roaming prices were on average 4 times higher than national mobile calls in the EU region (ITU 2008). OECD (2009) also reported that in some extreme cases in the OECD region, it can be 20 times more expensive to make a call back to the home economy whilst roaming in the host economy than for users in the host economy to make an international call to the roamer's home economy.

Recent studies undertaken by ITU (2008) and OECD (2009 and 2010) recommended that, as the high roaming charges could not be explained by the underlying costs, there exists significant market failure in this area. Regulatory interventions are therefore required as a

primary measure to resolve the issue. As international roaming involve at least one foreign partner, this implies that regulatory cooperation and coordination at regional (or even international) level is required because price regulation by national regulator can only manage half of the roaming loop; the rest is beyond the jurisdiction of a single economy. APEC initiatives therefore are needed to examine this issue from a regional perspective and to explore the possible regional framework for regulatory cooperation.[6]

7.7 CONCLUSION

The considerable development of the telecommunications sector in the APEC region in recent years reflects the structural reform efforts by APEC economies. While some of the APEC economies are taking a world leadership role in telecommunications development, more recent starters are also catching up rapidly and reducing the gap.

This chapter reviewed the quantitative impact of telecommunications structural reform in the APEC region. It found that, as all APEC economies have already implemented a market liberalisation policy for over a decade, structural reform and pro-competition regulations played a less critical role in refining market performance in 2009. The results of the quantitative analysis on broadband penetration, however, also suggest that structure and regulatory reform still have a direct impact on new investment. For new investment such as broadband access, while each of the policy components has its own unique value and purpose, the implementation of a full set of rules appears to be the most desired policy.

In addition, the results also suggest that, as far as the telecommunications sector is concerned, policy initiatives to promote technology development and innovation will play an increasingly critical role in the future. Still, for some APEC economies, the availability of telecommunications network infrastructure to all citizens remains a critical issue. To achieve this goal, a good universal service regime is a prerequisite as market failure restricts the size of network. Yet the effective implementation of the universal service regime also requires political commitment to encourage investment and a sound regulatory environment that removes policy uncertainties.

This chapter also reviewed some of the evidence of recent research on the impact of reforms in terms of more open policies and regulations that spur greater competition, access and innovation in telecommunications service markets. Chronologically, reforms have taken place in the fixed line, cellular mobile wireless and broadband markets, and concomitantly in spectrum management. In all cases the evidence indicates what intuitively sounds right, namely, that competition produces benefits in terms of lower prices, innovation in networks and services (economic growth) and in the efficiency of the use of spectrum. Reforms are important in telecommunications, principally because of the network effects. The benefits are spread throughout the economy because telecommunications is a major productive input into just about every sector of industry and commerce. Potential shortcomings, such as the international roaming pricing issue, warrant that further regional regulatory cooperation is required.

[6] APEC Telecommunications Working Group (APEC TEL) recently held the first workshop on international roaming charges during APEC TEL 41 (2010) meeting. Member economies shared their experiences in consumer information provisions as a measure to address the issue.

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ANNEX 7 POLICY INDEX

Table A7.1: Policy index.

Category weight	Score	Categories
Market entry and non-discrimination (total score=1 for least performing economy)		
0.30		**Licensing of new fixed network operation licences**
	1.00	Issues no new licences
	0.75	Issues 1 new licence
	0.50	Issues up to 3 new licences
	0.25	Issues more than 3 new licences
	0.00	No limitation on the number of new licences
0.30		**Licensing of new mobile network operation licences**
	1.00	Issues no new licences
	0.75	Issues 1 new licence
	0.50	Issues up to 3 new licences
	0.25	Issues more than 3 new licences
	0.00	No limitation on the number of new licences except for technical reasons
0.40		**Direct investments**
0.20		General
		The score is inversely proportional to the maximum direct equity participation permitted in an existing domestic telecommunications operator. Issues no new licences. For example, equity participation to a maximum of 75% would be given a score of 0.25.
0.20		Incumbents
		The score is inversely proportional to the maximum direct equity participation permitted in a specific domestic telecommunications operator.
Pro-competition regulations (total score=1 for least performing economy)		
0.20		**Anti-competition rules against major operators** [c]
	1.00	No anti-competition rules
	0.50	Proposals for anti-competition rules are developed and/or under consideration
	0.00	Existence of anti-competition rules
0.20		**Interconnection rules**
	1.00	No interconnection rules
	0.50	Partial application and/or proposals for interconnection rules are developed and/or under consideration
	0.25	Existence of interconnection rules that are not consistence with WTO
	0.00	Existence of WTO-consistent interconnection rules
0.20		**Independent regulator**
	1.00	Regulators is not separated from services provisions
	0.00	Regulator is separate from services provisions
0.20		**Access to incumbent's facilities**
	1.00	No regulatory regime available
	0.50	Partial application and/or proposals for access rules are developed and/or under consideration
	0.00	Regulatory regime available for competitors to seek access
0.20		**NP**
	1.00	No NP regime
	0.50	Partial application and/or proposals for interconnection rules are developed and/or under consideration
	0.00	NP regime implemented

Table A7.2 Policy index values.

Category 1: Establishment and non-discrimination																					
Policy component	**AUS**	**BD**	**CDA**	**CHL**	**PRC**	**HKC**	**INA**	**JPN**	**ROK**	**MAS**	**MEX**	**NZ**	**PNG**	**PE**	**RP**	**RUS**	**SIN**	**CT**	**THA**	**US**	**VN**
Licensing of new fixed-line licences	0	1	0	0	0.5	0	0.5	0	0	0	0	0	1	0	0	0.5	0	0	0.5	0	0.25
Licensing of new mobile licences	0	0.75	0	0	0.5	0	0.25	0	0	0	0	0	0.25	0	0	0	0	0	0.25	0	0.25
Inv-General	0	1	0.54	0	0.51	0	0.7	0	0.51	0.51	0.51	0	1	0	0.6	1	0	0.4	0.51	0	0.51
Inv-Incumbents	0	1	0.54	0	0.51	0	0.7	0.67	0.67	0.51	0.51	0.501	1	0	0.6	1	0	0.51	0.51	0	0.51
Total-policy 1	0	0.925	0.216	0	0.504	0	0.505	0.134	0	0.204	0.204	0.1002	0.775	0	0.24	0.55	0	0.182	0.429	0	0.354
Category 2: Pro-competition regulation																					
Policy component	**AUS**	**BD**	**CDA**	**CHL**	**PRC**	**HKC**	**INA**	**JPN**	**ROK**	**MAS**	**MEX**	**NZ**	**PNG**	**PE**	**RP**	**RUS**	**SIN**	**CT**	**THA**	**US**	**VN**
Anti-competition rules	0	1	0	1	0	0	0.5	0	0	0	0.5	0	1	0.5	0.5	1	0	0	0.5	0	0.5
Interconnection rules	0	1	0	1	0.5	0	0.5	0	0	0	1	0	1	0.5	0.25	1	0	0	0.5	0	0.25
Independent regulator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Access to incumbent's facilities	0	1	0	0	1	0	1	0	0	0	0.5	0	1	0	0.5	1	0	0	1	0	1
NP	0	1	0	0.5	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0.5	0	0.5
Total--policy 2	0	0.8	0	0.5	0.5	0	0.6	0	0	0	0.4	0	0.8	0.2	0.25	0.8	0	0	0.5	0	0.45
Aggregate (P1+P2)	0	1.725	0.216	0.5	1.004	0	1.105	0.134	0	0.204	0.604	0.1002	1.575	0.2	0.49	1.35	0	0.182	0.929	0	0.804

Chapter 8

QUANTIFYING THE IMPACTS OF REGULATORY REFORM IN INFRASTRUCTURE ON ECONOMIC PERFORMANCE IN APEC ECONOMIES

Marn-Heong Wong[1]

- Foreign direct investment inflows at the aggregate level are influenced by the general regulatory environment in an economy rather than by regulation which is specific to infrastructure.
- There is some evidence of the positive influence of infrastructure regulatory quality when examining flows at the sectoral level, at least for telecommunications.
- Quality of regulation includes aspects other than just the independence of the regulator.

8.1 INTRODUCTION

Policy debate on the impact of structural reform often makes use of a series of indicators of institutional quality and of the characteristics of an economy's regulatory system. Such indicators are often produced by agencies such as the World Bank. APEC also uses similar indicators in its work programs on structural reform. In this chapter, indicators of this type are tested for their influence on indicators of economic performance. The focus is the link between regulatory quality and performance in relation to the infrastructure sector from two perspectives. The first explores how the quality of regulations, including infrastructure regulation, may affect foreign direct investment (FDI) in infrastructure industries. The second assesses how the regulatory environment may affect total FDI inflows.

The review finds that FDI inflows aggregated across infrastructure industries are influenced by the general regulatory environment in an economy, such as the legal framework and the cost of compliance with administrative requirements. This effect is more important than that of the quality of regulation. However, there is some evidence of a positive link between regulatory quality in a specific infrastructure sector and investments in that particular sector, such as in telecommunications.

For economy-wide total FDI inflows, more important are the opportunities for foreign investors to acquire a controlling share in domestic companies and the degree of openness to trade. Ease of access to finance also appears to be connected to the total FDI inflows.

APEC membership since 2004, when the structural reform agenda was launched, does not seem to be significantly associated with a higher rate of FDI inflows, after accounting for the regulatory environment, as well as other economy characteristics.

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These results focus only on one performance indicator but they suggest the value of further work using a longer time frame and testing a wider range of indicators of regulatory quality as they apply to infrastructure sectors. At the same time, they stress the importance of the general regulatory environment, at least for FDI.

8.2 MODELLING AND DATA

The paper estimates two models using panel data. The first relates regulation with FDI in infrastructure and is adapted from the specification in Kirkpatrick et al. (2006):

$$InfraFDI_{it} = \beta_0 + \beta_1 REG_{it} + \beta_2 X_{it} + \beta_3 apect_{it} + \nu_i + u_t + \varepsilon_{it} \quad [1]$$

where *i* denotes economy, *t* denotes year. The dependent variable, InfraFDI, is private foreign investment in infrastructure projects and measured in logarithm. REG refers to general regulatory and infrastructure policy variables and X represents the control variables, which will be elaborated below. *apect* is an interaction term to assess whether an economy that is an APEC member would receive higher private investments in infrastructure industries after 2004, as APEC members implement structural economic reforms that would fit within the APEC Leader's Agenda to Implement Structural Reform (LAISR). ν_i absorbs the time-invariant economy-specific effects, while u_t is a set of year dummies to control for macroeconomic shocks; ε is the idiosyncratic error term.

The second model estimates the relationship between the regulatory environment and quality of infrastructure on aggregate FDI inflows to an economy:

$$FDI_{it} = \beta_0 + \beta_1 REG_{it} + \beta_2 X_{it} + \beta_3 apect_{it} + \nu_i + u_t + \varepsilon_{it} \quad [2]$$

FDI is measured as foreign direct investment inflow as a percentage of GDP. The right hand variables are the same as defined for Equation (1).

The data on FDI in infrastructure projects is obtained from the Private Participation in Infrastructure (PPI) Project Database compiled by the World Bank. The PPI data records infrastructure projects with private participation in the energy, telecommunications, transport, and water and sewerage sectors in low- and middle-income economies. Thus, the equation is estimated for a set of developing economies only, of which 11 are APEC member economies.

Detailed project information is examined to calculate private investors' share of investment commitments in infrastructure projects with private participation. State-owned enterprises or their subsidiaries are considered private investors in projects located offshore. Kirkpatrick et al. (2006) notes that about 80% of private contribution in infrastructure projects comes from foreign investors. Thus, the values of private investment can be regarded as comprising mainly values of private foreign investment and will reflect the influences of FDI determinants.

Regulatory quality variables are the focus of research interest in this chapter. Alternative sets of regulatory indicators are used, which comprise a mix of indicators of various aspects of the general regulatory environment as well as measures of infrastructure policy. General regulatory indicators are obtained from the alternative sources of the World Bank's Worldwide Governance Indicators (WGI) database produced by Kaufmann et al. (2009), IMD Business School's *World Competitiveness Yearbook* (WCY), and the World Economic Forum's *Global Competitiveness Report* (GCR). These regulatory indicators are based on survey responses and thus are subjective measures. They are also open to the criticism that they only give an idea of relative regulatory quality across economies in broad aspects but do

not provide information on the policy measures that might have contributed to an economy's ranking or changes in its relative position. Nevertheless, information from these sources has the advantage of containing annually updated data for a large number of economies and thus is suited for use in multiple-year, cross-economy regressions.

Where possible, a set of indicators is chosen to proxy for the five priority areas of the LAISR, namely: regulatory reform, strengthening economic legal infrastructure, competition policy, corporate governance and public sector management. However, it is noted that some of these indicators may be highly correlated as they reflect the common underlying governance and policy environment of an economy. Thus, the final set of regulatory indicators included in any estimation is selected after checking their degree of correlation and also using the best fitting specification based on a model selection criterion (this is called the Akaike Information Criterion).

The effective regulation of privatised infrastructure sectors requires a policy environment that sustains market incentives and investor confidence, and a key condition towards this end is independence of the regulators from political interference. Following Kirkpatrick et al. (2006), this study constructs a dummy variable that takes a value of 1 if an economy has independent regulators in both the telecommunications and electric power industries in any year, to proxy for the quality of its infrastructure regulation. 'Independence' here refers to organisational independence of the regulatory bodies – where the regulator is not integrated as a section of a government ministry – rather than their actual autonomy from government interference. This information is obtained from the International Energy Regulation Network and the International Telecommunications Union. A second measure used in the estimations that proxies for infrastructure policy is the survey response to the question of whether 'maintenance and development of infrastructure are adequately planned and financed' from WCY.

The scope of the set of variables measuring economy characteristics (called control variables) is based on the specification in Kirkpatrick et al. (2006) and data obtained from the World Bank's World Development Indicators database. These variables are:

- real GDP *per capita* as a measure of the level of income and demand in an economy;
- inflation, domestic credit, exchange rate and taxation variables to capture macroeconomic stability;
- trade openness; and
- domestic financial development and skills level of the labour force as indicators of structural characteristics of the host economy.

Not all the control variables in Kirkpatrick are used in the final estimations, as the inclusion of all the variables significantly reduces the sample size and the excluded variables are found in preliminary estimations to be statistically insignificant. The final set of control variables included are lagged variables of income *per capita*, inflation and openness to allow for statistical problems (including potential endogeneity bias and adjustment lags).

The apec-time (*apect*) interaction term is constructed as $a_{it} \times tr_t$, where a_{it} is a dummy that is 1 if an economy is an APEC member in year *t* and 0 otherwise, and tr_t is a trend term with 0 values before 2004.

The main regression technique applied in the estimations is fixed effects panel regression, which controls for time-invariant, economy-specific effects. However, since the dataset is a relatively short panel that covers 2000 to 2008 (or shorter depending on the set of regulatory

indicators used), the equation is also estimated using pooled OLS with cluster-robust standard errors, on the assumption that the errors are correlated over time for each economy but not across economies.

8.3 RESULTS AND ANALYSIS

Table 8.1 presents the results for the pooled OLS and fixed effects regressions with FDI in infrastructure projects as the dependent variable. The results apply to a set of developing economies for which data are available and include the APEC economies of Chile; China; Indonesia; Malaysia; Mexico; Peru; the Philippines; the Russian Federation; Thailand; and Viet Nam.

Of the regulatory and infrastructure policy variables there is evidence of a statistically significant and positive relationship between the quality of a general regulatory environment and foreign private investment in infrastructure across the different sets of regulatory indicators used.[2] Coefficient estimates that are significant include those on the WGI-government effectiveness index, the WCY indicator on whether a 'legal and regulatory framework encourages the competitiveness of enterprises' and the GCR indicator on whether 'complying with administrative requirements is burdensome'.

The correlation between infrastructure policy and quality and FDI in infrastructure is generally insignificant. In particular, the dummy of regulatory independence is not significant across all specifications. The apec-time interaction term intended to capture the differential effects of regulatory changes since 2004 in APEC economies is only sometimes significant.

Table 8.2 reports the results of pooled OLS and fixed effects regressions with economy-level FDI inflows as the dependent variable. The sample used for the aggregate FDI equations includes a much larger number of economies than the sample for the FDI in infrastructure equations. These economies are spread across different income levels and comprise all APEC economies except Brunei; Papua New Guinea; and Chinese Taipei where not all the data included in the regressions are available. The regulatory and infrastructure policy variables are largely insignificant regardless of the sets of regulatory indicators and econometric methods used. The only exception is the WCY variable on whether 'foreign investors can acquire control in domestic companies', which is significant and positive. The variable that is consistent in being strongly and positively correlated with FDI across regressions is trade as a percentage of GDP. The last two findings indicate that FDI is encouraged by economies that are more open to trade and that foreign investors respond to lower restrictions on FDI. There is also evidence that an increase in credit extended to the private sector, which proxies for ease of access to finance, is associated with higher FDI. The apec-time interaction term is significant only in pooled OLS regressions and is negatively signed across specifications.

The dummy variable that measures regulatory independence in infrastructure (precisely, in both telecommunications and electricity industries) is found to be insignificant across the board, regardless of whether the dependent variable is infrastructure investments or aggregate FDI inflows. This is unlike the findings in Kirkpatrick et al. (2006), where the variable is weakly significant (at the 10% level) and positively correlated with infrastructure investment in selected specifications. As mentioned in Kirkpatrick et al. (2006), when both general regulatory indicators and an infrastructure regulatory independence dummy are included in

[2] All mentions of 'significance' in this section refer to statistical significance.

Table 8.1: Results for the pooled OLS and fixed effects regressions with FDI in infrastructure projects as the dependent variable.

Dependent variable: Ln FDI in Infrastructure	(1)	(2)	(3)	(4)	(5)	(6)
Economy fixed effects	No	Yes	No	Yes	No	Yes
Regulatory environment						
WGI						
Government effectiveness index	0.064 (0.885)	1.850 (0.462)***				
WCY						
Control by foreign investors			-0.236 (0.128)*	0.102 (0.085)		
Legal and regulatory framework			0.301 (0.134)**	0.388 (0.100)***		
Shareholders' rights			-0.120 (0.238)	-0.089 (0.127)		
GCR						
Business impact of rules on FDI					-0.374 (0.323)	0.329 (0.202)
Burden of government regulation					-0.070 (0.271)	0.370 (0.187)**
Effectiveness of anti-monopoly policy					1.237 (0.420)***	0.027 (0.244)
Protection of minority shareholders' interests					-0.202 (0.358)	-0.338 (0.213)
Infrastructure policy						
Independence of regulators in electric power and telecommunications sectors (dummy variable)	-0.405 (0.260)	-0.017 (0.222)	0.197 (0.376)	-0.112 (0.290)	0.129 (0.440)	-0.159 (0.311)
Maintenance and Development of infrastructure (WCY)			-0.089 (0.139)	-0.270 (0.124)**		
Control variables						
Ln GDP per capita (lagged)	0.604 (0.235)**	-1.174 (1.046)	0.129 (0.228)	1.977 (1.126)*	0.175 (0.250)	-1.304 (1.618)
Annual change of inflation (lagged)	0.002 (0.007)	-0.014 (0.005)***	-0.028 (0.015)*	-0.018 (0.010)*	0.015 (0.020)	-0.014 (0.014)
Export and import/GDP (lagged)	-0.021 (0.005)***	-0.001 (0.007)	-0.013 (0.005)**	-0.020 (0.009)**	-0.018 (0.006)***	0.007 (0.010)
Domestic credit to private sector/GDP	0.017 (0.006)***	0.016 (0.006)**	-0.002 (0.004)	0.015 (0.005)***	0.005 (0.007)	0.014 (0.007)*
apec-time interaction term	0.305 (0.108)***	-0.181 (0.064)***	0.112 (0.094)	-0.155 (0.089)*	0.405 (0.113)***	-0.038 (0.089)
Joint significance of year dummies (p-value)	0.002	0.000	0.008	0.121	0.260	0.006
Adjusted R2	0.365	0.813	0.253	0.776	0.376	0.844
No. of observations	440	440	150	150	243	243
No. of economies	62	62	23	23	54	54

Standard errors in parentheses.

****, **, * - indicates significance at the 1, 5 and 10% levels*

the same regression, results of significant coefficients on the former and insignificant coefficient on the latter could indicate that investors, whether in infrastructure or more generally, are more strongly influenced by the overall governance environment, and infrastructure regulation does not exert an independent influence from the quality of overall governance.

Table 8.2: Results for the pooled OLS and fixed effects regressions with economy-level FDI inflows as the dependent variable.

Dependent variable: FDI	(1)	(2)	(3)	(4)	(5)	(6)
Economy fixed effects	No	Yes	No	Yes	No	Yes
Regulatory environment						
WGI						
Government effectiveness index	0.674 (0.491)	1.398 (1.321)				
WCY						
Control by foreign investors			1.015 (0.270)***	0.743 (0.443)*		
Legal and regulatory framework			0.369 (0.306)	-0.134 (0.411)		
Shareholders' rights			-0.498 (0.376)	-0.429 (0.561)		
GCR						
Business impact of rules on FDI					0.499 (0.845)	0.052 (0.915)
Burden of government regulation					0.321 (0.711)	0.222 (0.682)
Effectiveness of anti-monopoly policy					0.168 (0.637)	-0.110 (0.918)
Protection of minority shareholders' interests					-0.872 (0.707)	-0.894 (0.917)
Infrastructure policy and quality						
Independence of regulators in electric power and telecommunications sectors (dummy variable)	-0.253 (0.495)	0.269 (0.700)	-0.330 (0.551)	-0.356 (1.265)	-0.518 (0.865)	-0.699 (1.374)
Maintenance and Development of infrastructure (WCY)			-0.058 (0.273)	0.540 (0.532)		
Control variables						
Ln GDP per capita (lagged)	-0.247 (0.307)	2.814 (3.316)	-0.503 (0.388)	-2.323 (5.325)	-0.091 (0.263)	-6.497 (7.031)
Annual change of inflation (lagged)	0.031 (0.019)*	0.048 (0.018)***	-0.031 (0.028)	-0.022 (0.061)	0.025 (0.040)	0.031 (0.064)
Export and import/GDP (lagged)	0.044 (0.006)***	0.088 (0.017)***	0.037 (0.006)***	0.107 (0.022)***	0.045 (0.008)***	0.062 (0.032)*
Domestic credit to private sector/GDP	-0.005 (0.008)	0.027 (0.014)*	-0.007 (0.008)	-0.021 (0.023)	0.004 (0.011)	0.085 (0.026)***
apec-time interaction term	-0.525 (0.254)**	-0.187 (0.242)	-0.354 (0.268)	-0.179 (0.326)	-0.634 (0.281)**	-0.339 (0.408)
Joint significance of year dummies (p-value)	0.0006	0.7321	0.0015	0.3097	0.0026	0.0865
Adjusted R2	0.318	0.472	0.419	0.541	0.317	0.632
No. of observations	660	660	323	323	331	331
No. of economies	99	99	51	51	89	89

Standard errors in parentheses.

****, **, * - indicates significance at the 1, 5 and 10% levels*

Some studies (e.g., Cubbin & Stern 2006; Zhang et al. 2008) have found a significant and positive link between the quality of regulation of the electricity industry, which included regulatory independence, and a positive outcome as measured by generation capacity. So it may be the case that independence of the regulator in an infrastructure sector might be more specifically linked to outcomes in that sector. To test this premise, two additional regressions

are conducted in this paper. The first relates private investment in telecommunications infrastructure projects (which accounts for over half the amount of infrastructure investments) to independence of telecom regulators only. The other relates private investment in energy infrastructure projects (which accounts for 28% of total investments) to independence of electricity regulators only. The other variables remain as specified in Equation (1).

The results are reported in Tables 8.3 and 8.4. It is observed that the regulatory dummy variable is now significant in a number of regressions although not always with the expected signage. Independence of telecom regulators is strongly and positively related to FDI in telecoms infrastructure projects in developing economies when fixed effects regression is run on the sample that includes GCR indicators. However, the variable is weakly significant and negative in the sample using WCY indicators. Coefficient estimates on the electricity regulatory independence variable are significant in the sample with the WGI variable but they are negative.

8.4 CONCLUSION

The paper finds that FDI flows, whether aggregated across infrastructure industries or at the economy-wide level, are influenced by the general regulatory environment in an economy rather than regulation which is specific to infrastructure. There is no conclusive evidence that APEC membership since 2004 is significantly associated with a higher rate of FDI inflows. There is some evidence of the positive influence of infrastructure regulatory quality when examining flows at the sectoral level, at least for telecommunications. Further investigations could be carried out by constructing a regulatory indicator that takes into account more dimensions of infrastructure regulatory quality than the independence of regulators and using a longer time series. Overall the results, although mixed, serve to highlight that the quality of infrastructure regulations should be taken into consideration in any statistical analysis of infrastructure sector performance.

Table 8.3: Relating private investment in telecommunications infrastructure projects to independence of telecom regulators.

Dependent variable: Ln FDI in Telecom Infrastructure	(1)	(2)	(3)	(4)	(5)	(6)
Economy fixed effects	No	Yes	No	Yes	No	Yes
Regulatory environment						
WGI						
Government effectiveness index	-0.142 (0.361)	0.353 (0.370)				
WCY						
Control by foreign investors			-0.176 (0.168)	0.122 (0.082)		
Legal and regulatory framework			0.215 (0.125)*	0.344 (0.095)***		
Shareholders' rights			-0.147 (0.280)	-0.116 (0.132)		
GCR						
Business impact of rules on FDI					-0.291 (0.283)	-0.001 (0.186)
Burden of government regulation					-0.376 (0.249)	0.116 (0.162)
Effectiveness of anti-monopoly policy					1.328 (0.342)***	0.198 (0.214)
Protection of minority shareholders' interests					-0.276 (0.343)	0.170 (0.196)
Infrastructure policy						
Independence of regulators in telecommunications sector (dummy variable)	0.426 (0.404)	-0.005 (0.291)	0.123 (0.492)	-0.576 (0.343)*	0.148 (0.553)	1.822 (0.667)***
Maintenance and Development of infrastructure (WCY)			-0.218 (0.154)	-0.293 (0.128)**		
Control variables						
Ln GDP per capita (lagged)	0.683 (0.171)***	-0.584 (0.790)	0.144 (0.241)	2.638 (1.264)**	0.166 (0.188)	-1.449 (1.538)**
Annual change of inflation (lagged)	0.010 (0.005)**	-0.013 (0.004)***	-0.031 (0.014)*	-0.032 (0.010)***	0.031 (0.021)	-0.008 (0.013)
Export and import/GDP (lagged)	-0.021 (0.004)***	0.004 (0.005)	-0.011 (0.007)	-0.010 (0.008)	-0.016 (0.006)***	0.003 (0.009)
Domestic credit to private sector/GDP	0.016 (0.006)***	0.002 (0.005)	-0.002 (0.005)	0.004 (0.005)**	0.006 (0.007)	0.002 (0.007)
apec-time interaction term	0.418 (0.109)***	-0.164 (0.067)**	0.136 (0.091)	-0.020 (0.063)*	0.375 (0.102)***	-0.036 (0.089)
Joint significance of year dummies (p-value)	0.000	0.000	0.4885	0.3666	0.1143	0.025
R2	0.376	0.8260	0.237	0.811	0.394	0.846
No. of observations	559	559	145	145	272	272
No. of economies	92	92	23	23	64	64

Standard errors in parentheses.

****, **, * - indicates significance at the 1, 5 and 10% levels*

Table 8.4: Relating private investment in energy infrastructure projects to independence of electricity regulators.

Dependent variable: Ln FDI in Energy Infrastructure	(1)	(2)	(3)	(4)	(5)	(6)
Economy fixed effects	No	Yes	No	Yes	No	Yes
Regulatory environment						
WGI						
Government effectiveness index	0.090 (0.614)	0.651 (1.019)				
WCY						
Control by foreign investors			-0.407 (0.184)**	-0.405 (0.299)		
Legal and regulatory framework			0.227 (0.321)	0.359 (0.283)		
Shareholders' rights			0.061 (0.404)	0.262 (0.393)		
GCR						
Business impact of rules on FDI					-0.603 (0.459)	-0.684 (0.549)
Burden of government regulation					0.081 (0.436)	0.258 (0.486)
Effectiveness of anti-monopoly policy					0.950 (0.550)*	0.957 (0.637)
Protection of minority shareholders' interests					0.115 (0.526)	-0.655 (0.674))
Infrastructure policy						
Independence of regulators in electric power sector (dummy variable)	-0.828 (0.376)**	-1.219 (0.532)**	0.120 (0.556)	-1.344 (0.860)	0.347 (0.552)	1.034 (1.077)
Maintenance and Development of infrastructure (WCY)			-0.042 (0.340)	-0.079 (0.377)		
Control variables						
Ln GDP per capita (lagged)	0.234 (0.340)	3.271 (2.096)	-0.033 (0.365)	6.305 (3.274)*	-0.054 (0.290)	4.779 (4.606)
Annual change of inflation (lagged)	0.002 (0.011)	0.011 (0.017)	-0.005 (0.029)	0.027 (0.029)	0.005 (0.020)	-0.028 (0.057)
Export and import/GDP (lagged)	-0.007 (0.007)	-0.024 (0.017)	-0.003 (0.008)	-0.011 (0.027)	-0.001 (0.008)	-0.053 (0.033)
Domestic credit to private sector/GDP	0.007 (0.010)	0.009 (0.015)	-0.008 (0.017)	0.020 (0.021)	-0.009 (0.015)	0.044 (0.026)*
apec-time interaction term	0.187 (0.138)	-0.024 (0.124)	0.100 (0.145)	0.158 (0.180)	0.291 (0.123)**	0.248 (0.213)
Joint significance of year dummies (p-value)	0.0066	0.0875	0.2315	0.1583	0.0036	0.4298
Adjusted R2	0.115	0.454	0.050	0.448	0.134	0.498
No. of observations	237	237	119	119	137	137
No. of economies	58	58	22	22	43	43

Standard errors in parentheses.
****, **, * - indicates significance at the 1, 5 and 10% levels.*

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Chapter 9

AIR TRANSPORT IN KOREA AND NORTHEAST ASIA

Yeon Myung Kim and Sean Seungho Lee[1]

- Competition on domestic routes in Korea by low cost carriers has led to much lower fares.
- The negotiation of an Open Skies agreement led to lower fares and more flights and, therefore, greater convenience and higher traffic levels on routes to Shandong province in China: this experience could be extended to other international routes.
- There are some lessons in the experiences of the European Union and the USA on how this might be done; and the expected competitive pressure that spills over from the agreement between the EU and the USA is another driver for change in North-East Asia.

9.1 INTRODUCTION

Korean civil aviation has shown remarkable development in recent years. Korea has recorded one of the highest air traffic growth rates in Asia, averaging over 10% annual growth for international passengers and 7% for cargo from 2005 to 2007. Incheon International Airport has grown into one of Northeast Asia's largest hub airports since its inauguration in March 2001. It now ranks as the world's second airport in international cargo transported and the tenth airport in passenger volume in 2009. Meanwhile, domestic traffic has slumped from a peak of 23.5 million trips in 1996 to less than 17 million in 2007. There was a large drop in 2004 which coincided with the opening of Korea's Bullet Train. This led to a response in airline strategy, which is discussed in this case study.

In international markets, a new program of 'Open Skies' negotiations has begun. These developments and their consequences are reviewed in this case study. The main interest is developments on international routes but also included is a brief review of the experience of the entry of low cost carriers (LCCs) to the domestic market in Korea.

9.2 DOMESTIC MARKETS

A series of regulatory reforms in 2009 changed the entry conditions into the Korean air transport market, including reductions in the value of the capital required for new entrants and in the number of aircraft in the fleet. However, even prior to the regulatory and policy reform, private entities had already been operating airline services as new start-up carriers. The LCCs began to enter domestic routes in 2006. Kim and Lee (2010) review the LCC sector in Korea and Zhang et al. (2008) review the experience in Thailand and China. They link the growth of the sector to the growth of domestic tourism in 2005. Another pressure on the full service carriers (FSCs) that previously dominated the market was the competition

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from high-speed trains which began in 2004. The use of the LCC model was a competitive response. Another driver was the interest of regional governments willing to invest and to develop their local airports.

Table 9.1 shows the status of Korea's start-up operations. Six have set up and four remain in operation. There are reports that Hansung Airlines may resume this year (*Korea Herald* 2010). Most charge fares of about 70% (one charges 80%) of the fares of the FSCs or the fare prior to their entry. Two of the airlines are not subsidiaries of the established carriers. The LCC share is now 25% (Jin Air 8% Jeju Air 7%, Air Busan 7%, Eastar Jet 3%) of the domestic market, with Korean Air having 48% and Asiana Airlines 27%. The LCC share is close to 30% on some routes (e.g., Gimpo-Jeju).

Clearly, the established FSCs see the LCCs as a threat. Recently, the Korean competition authority, the Korea Fair Trade Commission (KFTC), ruled as anti-competitive some practices of the FSCs, including offering loyalty rebates to travel agents. The KFCT also warned against FSCs asking agents to restrain sales of tickets on LCCs by threatening access to fewer seats on FSCs at peak times or on certain routes.

Table 9.1: Status of Korean low cost carriers.

Carrier/ Operations	Seju Air	Hansung Airlines	Yeongnam Air	Jinair	Air Busan	Eastar Jet
Licence issued	August 2005	March 2005	July 2008	April 2008	June 2008	August 2008
Inauguration	June 2006	August 2005–April 2009	July 2008–December 2008	July 2008	October 2008	June 2009
Airport base	Jeju International Airport	Cheongju International Airport	Kimhae International Airport	Gimpo International Airport	Kimhae International Airport	Gimpo International Airport
Licence type	Scheduled	Non-scheduled	Non-scheduled	Scheduled	Scheduled	Non-scheduled
Route	Jeju–Gimpo Jeju–Kimhae Gimpo–Kimhae	Cheongju–Jeju Gimpo–Jeju	Kimbae–Jeju, Gimpo, Daegu	Gimpo–Jeju	Kimhae–Gimpo Kimbae–Jeju Kimbae–Gunsan	Gimpo–Jeju Gunsan–Jeju Cheongju–Jeju
Air fare	70% of current fare	70% of current fare	70% of current fare	80% of current fare	70% of current fare	70% of current fare
Capital investment	Aekyung Group KRW15 billion; Jeju Province KRW5 billion	Private fund KRW5 billion	na	Korean Air subsidiary	Asiana Airlines subsidiary	na
Operational	Yes	Ceased	Ceased	Yes	Yes	Yes

Note: na = not applicable

9.3 INTEGRATED INTERNATIONAL AIR TRANSPORT MARKETS

The international policy of the three Northeast Asian (NEA) economies is reviewed in this section. All are working towards more liberal arrangements. Before turning to the detail it is important to note that events in transport across the North Atlantic Ocean are a driver of this change. In May 2008 routes to any destination within the European Union (EU) and the United States of America (USA) were opened to carriers of either continent. Two giant markets have been consolidated with the aim of expanding market share in the global air transport industry, and the increased competitiveness of these carriers may be expected to spill over to other markets. The North Atlantic market is well known for its profitability and the EU–Far East market remains one of the biggest premium travel markets (accounting for 15.2% of total premium revenues worldwide; Centre for Asia Pacific Aviation 2008). The EU

and USA carriers may target other routes in NEA and carriers in that region now also seek to remove the impediments to their own international competitiveness.

9.3.1 Policy in Korea

The Korean government's aim is to have Korean airlines operating in a hub and spoke structure in the international market, thereby adding to traffic growth to and within Korea. With more open agreements, air carriers will operate more effectively and efficiently and passengers will benefit as a result. To establish a more liberal hub and spoke air transport market, the Korean government has negotiated bilateral and multilateral agreements according to the principles of Open Skies. Table 9.2 summarises the state of these negotiations and Table 9.3 refers to features of all Korea's air services agreements (ASAs).

Table 9.2: Status of Open Skies in Korea, January 2010.

Deregulation of passenger and cargo traffic rights	Deregulation of cargo traffic rights	Open Skies
Maldives; China; Thailand; Chile; Myanmar; Peru; Cambodia; Japan; Viet Nam; Ukraine; Sri Lanka; Kenya; Azerbaijan; Mexico; Malaysia; Tunisia; Belarus	Australia; India; Austria; Sweden; Norway; Denmark; Macau; Germany; South Africa; Finland; Greece; Uzbekistan	USA; Canada

Source: KOTI.

Table 9.3: Status of Korean Air Services Agreements (ASAs).

Type of bilateral ASAs	Non-operational bilateral ASAs	Operational bilateral ASAs
Predetermined (TP)[1]		
Bermuda (B)[2]	Macau (pax); Brunei; Khuzestan; Gabon; Nigeria; Libya; Morocco; Algeria; Djibouti; Columbia; Rumania; Malta; Bulgaria; Iceland; Palau; Yugoslavia; Portugal; Bahrain; Saudi Arabia; Oman; Jordan; Iraq; Kuwait	France; Hong Kong, China; Chinese Taipei; Singapore; Indonesia; Netherlands; Belgium; Switzerland; Spain; Italy; Czechoslovakia; Poland; Finland; Hungary; UAE; Iran; Turkey; Egypt; Qatar; Israel; Fiji; Australia (pax); New Zealand
'Point to Point' Open Skies (POS)[3]	Maldives; Peru; Norway; Denmark; Sweden; Portugal; Qatar; Palau; Nigeria; Kenya; Mexico; Chile	Viet Nam; China; Japan; Malaysia; Myanmar; Cambodia; Thailand; Sri Lanka; Azerbaijan; Ukraine; UK (cargo); Australia (cargo); Germany; Austria
'Multiple Point' Open Skies (MOS)[4]	Canada	USA

[1] TP – Each economy designates a single company to operate on the route; limited number of points/routes operated by designated airlines; capacity and frequency to be agreed *ex ante*; few 5th freedoms are granted.

[2] B – Each economy designates one or several airlines on each route; limited number of points/routes operated by designated airlines; there is no *ex ante* capacity control on each route, capacity offered is often negotiated via commercial agreements between airlines; several 5th freedoms may be granted; total capacity must be proportional to the needs of the main bilateral route.

[3] POS – Multiple designation of airlines; free access to designated routes, between specific points, either departure or arrival points may be left open and unrestricted; no frequency or capacity control; extensive 5th freedom rights are granted.

[4] MOS – Multiple designation of airlines; airlines can fly on any route between two states; no frequency or capacity control; unrestricted 5th freedom rights.

This more open approach was reinforced in March 2008 when a new government sought to open the international air transport markets to and from Korea. The administration's intention was to promote and deregulate Korea's air transport industry, and to offer a broader range of

choices to the air passengers by allowing open market competition to air transport operators. However, the procedure was that airlines had to 'provide the basic requirements for domestic air transport operation before entering the international air transport market'. All 'start-up' carriers in Korea were required to serve 2 years of probation in order to stabilise their safety management systems, and also to complete 20 000 Aircraft Transport Movements (ATMs) in the domestic sector before they could launch their international operations. This meant, for example, that LCCs had to become established on domestic routes before being able to fly internationally, whereas some may have preferred otherwise.

In one case, an international LCC, Tiger Airways, attempted to enter the Korean market. The majority owner of Incheon Tiger was the Incheon municipal government (51%) and the balance was owned by Tiger. However, it was argued to the Ministry of Transport that the new airline was effectively controlled by Singapore Airlines, which has an ownership share in Tiger. This would have contradicted Korea's policy on the entry of foreign controlled carriers, and the application for a licence was withdrawn.

9.3.2 Policies in China and Japan

Instead of an immediate move to Open Skies, China has preferred a process of 'stepwise' market integration, with a focus on NEA. China's preference is to follow the example of the EU's 'Open Aviation Area' (OAA), which was set up in three packages from 1988 to 1997. Chinese researchers have proposed four stages of reform. As the first step, the target is to turn the separate ASAs of China; Korea; and Japan into a plurilateral ASA. At this stage, the difficulty is how to coordinate the differences among the ASAs. The other three steps would be followed in a package program similar to the OAA (Table 9.4). However, change of this sort would be significant. The partial open sky policy between Korea and China established in 2006 is discussed in detail below. In May 2007 they also initiated the Seoul Gimpo–Shanghai Hongqiao shuttle service.

In 2006, under the former Abe Administration, Japan began a reform called the Asian Gateway Initiative (AGI) that was to revitalise the Japanese economy and share prosperity with its neighbouring economies, China and Korea. In May 2007 the government of Japan proposed a comprehensive policy package for air transport which accelerated the promotion of an Open Skies policy in Japan. This brought about drastic changes in the Japanese air transport industry. In July 2007 Korea became the first partner of Japan to abolish the restrictions on entry points into both economies and, with the exception of flights to and from airports in metropolitan areas of Japan that have capacity constraints, to abolish limits on frequencies. The Japan Civil Aviation Bureau (JCAB) has now reached agreement with Thailand; Macau; Hong Kong, China; Viet Nam; Malaysia; and Singapore, with negotiations in progress with China and India.

A Japanese air transport specialist has suggested that Japan; China; and Korea should cooperate to approach an integrated air transport market. In the first stage of bilateral liberalisation, two economies could, as much as possible, reciprocally seek to liberalise both the routes and frequencies between any points within them and direct flights between them. The two economies may also reciprocally expand up to the rights of airlines to pick up traffic bound for destinations other than the airline's home base. In the second stage the expansion of traffic rights up to the full Open Skies could be initiated on a reciprocal basis. However, according to this analyst, prior to the formation of the integrated air transport market in NEA, the following issues would have to be resolved:

- proper capacity of infrastructure for the air transport industry;
- development of common safety, security and social rules and regulations;
- geographical scope of liberalisation; and
- security policy.

Table 9.4: The EU action package for the integration of the air transport market.

<table>
<tr><th></th><th colspan="3">1st (January 1988–)</th><th colspan="3">2nd (November 1990–)</th><th>3rd (January 1993–)</th></tr>
<tr><td rowspan="5">Fare*</td><td colspan="3">Percentage of full fare</td><td colspan="3">Percentage of full fare</td><td rowspan="5">Establish regulations for committee or government to implement
Inordinate discount fare
Continuous lowering of the fare</td></tr>
<tr><td>Fare type</td><td>Ref. fare</td><td>Approval</td><td>Fare type</td><td>Ref. fare</td><td>Approval</td></tr>
<tr><td rowspan="3">Discount or radically low fare</td><td rowspan="3">45–90</td><td rowspan="3">Permitted</td><td>Fully flexible</td><td>106</td><td>Not to be denied by either government</td></tr>
<tr><td>Economy</td><td>95–105</td><td>Permitted</td></tr>
<tr><td>Discount or radically low fare</td><td>30–94</td><td>Permitted</td></tr>
<tr><td>Approval of dual service</td><td colspan="3">Annually, > 250 000 passengers at each departure point (1988)
Annually, >200 000 passengers or >1200 aircraft frequencies at each departure point (1989)
Annually, >180 000 passengers or 1000 aircraft frequencies at each departure point (1990)</td><td colspan="3">Annually, >140 000 passengers or >800 aircraft frequencies at each departure point (1991)
Annually, >100 000 passengers or >600 aircraft frequencies at each departure point (1992)</td><td>Not applicable</td></tr>
<tr><td>Seat distribution per economy</td><td colspan="3">45/55% (Jan. 1988–)
40/60% (Oct. 1989–)</td><td colspan="3">Up to 60% capacity to be distribution
Up to 75% of yearly expansion</td><td>Unlimited</td></tr>
<tr><td>Route entrance</td><td colspan="3">3rd, 4th freedom for permitted hub routes
5th freedom up to 30% of capacity
5th freedom to Ireland and Portugal</td><td colspan="3">3rd, 4th freedom in all airports
5th freedom up to 50% of the capacity</td><td>All entrants on international and domestic routes
Cabotage since April 1997
Permitted cabotage in >50% of capacity† prior to April 1997</td></tr>
<tr><td>Exempt from fair competition</td><td colspan="3">Fare discussion
Slot allocation
CRS
Ground service for aircraft, freight, passenger and in-flight meals etc.</td><td colspan="3">Fare discussion
Slot allocation
CRS
Ground service for passenger, freight and in-flight meals etc.</td><td>Fare discussion
Slot allocation
CRS
Cooperate in low demand routes</td></tr>
<tr><td>Operator licence</td><td colspan="6">Not applicable in 1st and 2nd package.</td><td></td></tr>
</table>

Source: Kim 2004.

Note: *To the above exception, the bilateral agreement can be applied (up to 2nd package)
†Domestic flight operation by third economy flag carrier

9.4 IMPACT OF OPEN SKIES

A regional version of Open Skies was established between Korea and Shandong Province in China in 2006. The result was rapid growth in passenger numbers and aircraft movements (much faster than other routes to China), higher frequencies (and therefore greater convenience), a new network structure and lower fares by more than 8% on average. Tables 9.5 and 9.6 report the data for routes between Korea (ICN) and Shandong Province compared with other Chinese destinations. Both series show growth to record heights but with much higher growth on routes to Shandong.

Another way to assess the impact of Open Skies is to review the experience of the following destinations in Shandong from 2005 to 2007 and their links to Korea:

- Incheon–Weihai, Yantai, Qingdao, Jinan routes
- Busan–Weihai, Qingdao routes
- Daegu–Qingdao routes

Table 9.5: Aircraft movement after the Open Skies policy between Korea and China.

Classification		Aircraft movement		
		A	B	C
ICN–Shandong	Korean Carriers	3,756	5,330 (+41.9%)	5,645 (+50.3%)
	Chinese Carriers	4,208	8,361 (+98.7%)	8,732 (+107.5%)
ICN–Other Cities	Korean Carriers	19,897	26,667 (+34.0%)	25,361 (+27.5%)
	Chinese Carriers	18,229	27,976 (+53.5%)	24,493 (+34.4%)

Note: A = 12 months to 16 June 2006; B = 12 months from 16 June 2006; C = 12 months to June 2008.

Table 9.6: Passenger performance after the Open Skies policy between Korea and China.

Classification		Passengers			L/F		
		A	B	C	A	B	C
ICN–Shandong	Korean Carriers	495,259	549,836 (+11.0%)	563,109 (+13.7%)	62.3%	56.6%	57.9 %
	Chinese Carriers	376,234	653,388 (+73.7%)	774,869 (+106.0%)	60.1%	52.4%	59.6 %
ICN–Other Cities	Korean Carriers	3,303,690	3,893,738 (+17.9%)	3,236,856 (-2.0%)	71.0%	65.5%	61.2 %
	Chinese Carriers	2,671,634	3,473,055 (+30.0%)	2,876,549 (+7.7%)	66.5%	62.2%	65.4 %

Note: A = 12 months to 16 June 2006; B = 12 months from 16 June 2006; C = 12 months to June 2008.

The number of passengers using the Korea–Shandong route in 2006 was 1.02 million, showing an increase of 16.1% compared to the previous year (Table 9.7). In 2007 the number of passengers was 1.4 million, a much higher growth rate of 37.2%.

The number of passengers carried on all Korea–China routes in 2006 and 2007 were 6.57 million and 7.32 million respectively, each showing growth of 24.3% and 11.4% compared to the previous years (Table 9.8). In 2006 the increase on the Korea–Shandong route was 8.2%, which was lower than that on all routes, whereas it was higher by 25.8% after the initiation of Open Skies. The performance of Korea–Shandong Province passenger traffic has surpassed the rate of growth in the overall Korea–China market.

The aircraft movements on the Korea–Shandong route also grew rapidly (Table 9.9). This was the case even before the agreement but after 2006 the growth rate was even higher. More aircraft movements also meant higher frequencies and therefore a higher quality of service.

Airfares on the Korea–Shandong routes decreased by 8.4% on average.

The response to Open Skies differed among the airlines (Table 9.10). New airlines entered the Incheon–Weihai and Yantai, Busan–Weihai and Qingdao routes with Open Skies and they offered lower fares.

Table 9.7: Number of passengers on the Korea–Shandong route, 2005–07.

2005	2006	2007
880,390	1,021,806 (16.1%)	1,401,523 (37.2%)

Note: Unit = persons; (%) = growth rate compared to the previous year.

Table 9.8: Number of passengers on the Korea–China route, 2005–07.

2005	2006	2007
5,288,252	6,573,175 (24.3%)	7,321,391 (11.4%)

Note: Unit = persons; (%) = growth rate compared to the previous year.

Table 9.9: Aircraft movements on the Korea–Shandong route, 2005–07.

2005	2006	2007
9,907	13,954 (40.8%)	23,256 (66.7%)

Note: Unit = times; (%) = growth rate compared to the previous year.

Table 9.10: Airfare changes on the Korea–Shandong route.

Routes		Carriers	Airfare (June 2006)	Airfare (July 2007)	YoY (%)
Incheon	Jinan	KE	450	460	2.2
		SC	360	300	-16.7
		Average	405	380	-6.2
	Qingdao	KE	400	400	0.0
		OZ	370	400	8.1
		CA	450	300	-33.3
		MU	280	200	-28.6
		Average	375	325	-13.3
	Weihai	KE	350	390	11.4
		OZ	340	390	14.7
		CA	400	300	-25.0
		MU	–	150	–
		Average	363	308	-15.4
	Yantai	KE	–	390	–
		OZ	370	390	5.4
		MU	340	180	-47.1
		CA	–	300	–
		Average	355	315	-11.3
Busan	Weihai	OZ	–	390	–
		Average	–	390	–
	Qingdao	KE	410	410	0.0
		SC	340	–	–
		CA	–	340	–
		Average	375	375	0.0
Daegu	Qingdao	KE	370	–	–
		SC	340	–	–
		CA	–	340	–
		Average	355	340	-4.2
Overall					-8.4

Source: AirTimes, Economy Class

Note: Regular airfare, excludes fuel and airport taxes. Currency exchange hypothesised as USD1 = KRW1000.
KE = Korean Air; OZ = Asiana Airlines; SC = Shandong Airlines; CA = Air China; MU = China Eastern Airlines

Korean Air and Asiana Airlines, Korea's flag carriers, did not lower fares but Chinese airlines such as Shandong Airlines, Air China and China Eastern Airlines did. The network structure also changed. A new route Busan, Korea–Weihai, China was launched in 2007.

9.5 STEPS TOWARDS NEA MARKET INTEGRATION

The next question is how the experience between Korea and China might be made more general across NEA. There are several constraints:

Different interests
The Korea Transport Institute (KOTI) has pointed out that the most serious obstacles are the asymmetries between economies with diverse market sizes, different geographical locations and disparate economic interests based on the varying strengths of their airlines.

Bilateral agreements
Another constraint is the set of terms of existing bilateral agreements. KOTI found that the bilateral ASAs between Japan, Korea and China are in certain respects even more restrictive than the Bermuda I agreement between EU economies, which was established at the point when a common European air transport policy began to emerge.

Legal issues
Zhang (2008) identified a legal issue as each economy's legal system is not in line with up-to-date transport and logistics practices. An updated Civil Aviation Act, Decree and Ordinance should be implemented or reinforced through regulation. Korean aviation authorities have begun to reconstruct the legal system that governs the air transport industry, bringing the issue to the National Assembly with the intention of presenting a better method of regulation.

People movement
With regard to eliminating administrative barriers, particularly in the movement of people, Korea and Japan agreed to implement a visa exemption program, which was initiated to comply with the opening of the 2004 Aichi Expo in Japan and the inauguration of the Central Japan International Airport in Nagoya.

More specific suggestions for the development of the air transport regulatory system in the region are the following:

Give first priority to air cargo liberalisation
The air cargo sector may be a good place to start in implementing liberalisation in NEA, rather than passenger operations. Korea has a special interest in this strategy because throughout the region air cargo traffic is growing rapidly. Table 9.11 shows the fastest growing airports in Asia. In terms of freight volume, airports in NEA mark the top five, and there are five Chinese and three Japanese airports within the top 30. Each of the three economies plans to construct more social infrastructure at airports to provide improved business and to support air cargo operations. Narita International Airport (Japan) Beijing-Tianjin International (China) and Incheon International Airport (Korea) are either already equipped with the necessary infrastructure or plan further expansion. These plans would be supported by a commitment to more liberal arrangements for cargo operations.

Table 9.11: Fast-growing cargo airports in Asia, 2007.

Rank	Airport	Cargo carried (ton)	YoY (%)	World rank
1	Beijing, China	1,220,001	15.8	20
2	Shanghai Pudong, China	2,494,808	15.5	5
3	Jakarta, Indonesia	384,050	11.5	46
4	Chengdu, China	328,429	11.1	56
5	Xiamen, China	193,625	10.6	89
5	Shenzhen, China	616,058	10.1	33
7	Incheon, Korea	2,555,582	9.4	4
8	Shanghai Hongqiao, China	388,815	6.9	47
9	Guangzhou, China	694,923	6.4	30
10	Kunming, China	232,647	6.1	78

Source: KOTI and Airport Council International.

Complementary measures

It will be important to deal with complementary issues in order to capture the benefits from a regional agreement. For example, issues to consider include traffic control, people movement and safety and security.

While NEA may not follow the EU model exactly, there are lessons to be learnt from that experience. In particular, the EU started EUROCONTROL for safe airspace control and the centralisation of the air traffic control system before proceeding into discussions on the integration and liberalisation of the air transport market. Similarly, EU's air transport passengers or citizens of EU members are not required to carry their passport within the EU boundaries. However, NEA economies demand authorisation stamps from economies to which one desires to travel, as well as travel documentation, which must be unnecessary in a truly integrated and liberated air transport market.

A regional agreement would also put emphasis on safety and security. Representatives from the three economies must discuss and cooperatively stipulate such measures. ICAO has set forth a complete series of common safety and security standards, by which the contracting states must abide. Aviation authorities in China and Japan established a cooperative mechanism at the ministerial level in May 2005, which covers the entire field of aviation issues except for air traffic rights. Furthermore, China and Korea could establish an identical cooperative mechanism. If the three economies shared identical safety and security obligations and adhered to the common standards, it would be easier to develop bilateral safety and security mechanisms into tripartite ones.

To capture these and other wider dimensions and non-aeronautical issues directly linked to the air transportation market, KOTI has proposed to use the term 'free sky policy' for the scope of regional strategy.

9.6 CONCLUSION

There are significant examples of reform to date within NEA. Within Korea (and other economies) the growth of the LCCs has been important. Fares are lower and traffic has grown. The negotiation of an Open Skies arrangement between Korea and China based on Shandong Province led to lower fares, more frequent flights, greater convenience and higher traffic levels. This has increased the interest in extending this experience to international routes. There are some lessons in the experiences of the EU and the USA on how this might be done but for a variety of reasons its applicability is limited. At the same time, the expected

competitive pressure that spills over from the agreement between the USA and the EU is a driver for change in NEA.

There are some specific issues to be addressed, including security and safety, air traffic control and the movement of people. However, the members of the region have common interests in pursuing this development. A place to start may be to seek more rapid liberalisation in the cargo sector, where traffic is growing rapidly. There are challenges to resolve and this case study concludes with some comments on the role of research, both in the experience to date and in formulating the next steps.

Further research will contribute to progress. For the integration of NEA's air transport market, a number of academic and government institutes have already conducted important studies on the regional air transport market (Oum, Zhang & Fu 2009). There have been many studies and proposals; aviation academic specialists have presented the requirements for the market integration process and suggested additional research ideas for the identification of winners and losers at the bilateral/trilateral air transportation liberalisation meetings. Whatever projects are designed, the goal must be to develop a new strategy. To carry such studies further, forming a joint research group among NEA's representatives might be the first step of the action plan. A methodology that supports the reform program but recognises issues in the distribution of its effects, as well as an analysis of safeguard measures, could be developed.

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Chapter 10

RAIL TRANSPORT IN NEW ZEALAND

Dave Heatley[1] and Margot Schwass[2]

- Privatisation of track and operations in New Zealand's rail system had significant effects, including lower prices and higher volumes, improved productivity and better financial performance.
- Despite reforms, profits did not cover the cost of capital and debt was increasing, while track maintenance was falling: these were consequences of the underlying economics of rail and of the constraints imposed by the government. Eventually the track was returned to the government.
- Successful structural reforms require a solid understanding of the economics of rail, and the specific circumstances and history of an economy's transport system.

10.1 INTRODUCTION

'The railways in New Zealand have never been regarded, or run, as a profit-making concern', wrote New Zealand's Minister of Railways, Gordon Coates, in 1923. Even the most unprofitable branch lines and services had an intangible value, he said: 'They have opened up the economy, increased production and consequently the wealth of the Dominion' (Atkinson 2007 p. 60). For much of the 20th century, rail was regarded not only as core government business but also as an iconic part of New Zealand's journey to prosperity. Notions that the railways should cover costs or provide a return on the capital invested were anathema to policy makers and the public alike. To Minister Coates, running a railway solely on commercial grounds 'would not be utilising the service in the true interests of [New Zealand]'.

Those traditional assumptions were swept aside in the 1980s. Corporatisation was followed by deregulation, privatisation and then the separation of infrastructure from rail operations. But in 2008 rail became a government activity once more, with both the tracks and rail services owned and managed by the New Zealand Rail Corporation through its business arms, ONTRACK and KiwiRail. After more than 25 years of policy shifts and U-turns, rail in New Zealand today is still far from 'a profit-making concern' and the need for significant government subsidies remains. There are conflicting views on rail's potential to contribute to New Zealand's economic development and environmental goals. Debate continues over how best to fund and run a railway 'in the true interests' of New Zealand.

This case study describes the arrangements under which rail has operated in New Zealand, and explores the policies and political imperatives that drove them. Figure 10.1 summarises

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the changes in policy. How has rail performed under the various models? And, given its ongoing economic performance problems, where might the future of rail in New Zealand lie?

The next section includes some detail of the history of the development of the rail network up to the creation of corporate structure for the government-owned system in 1982. Those more interested in regulatory changes since then should turn to section 10.3.

10.2 A SHORT HISTORY OF NEW ZEALAND RAIL TO THE 1990s

10.2.1 Building the railway, building the nation: 1860 to the 1920s

Rail has been described as New Zealand's 'engine of colonisation' (Atkinson 2007 p. 22). Railways helped open up the economy's interior, linking new European settlements to ports, from the 1860s. The first railways were short lines built by provincial governments at considerable and usually very high cost. By 1880, with the economy's population still only 500 000, New Zealand had more than 1900km of track. Trains carried nearly 3 million passengers and 830 000 tons of freight a year (ONTRACK 2010).

The government's enthusiasm for railways continued well into the 20th century. While some had dreamed of a national trunk line, it was also considered vital to establish branch lines connecting rural areas – with their farms, dairy factories, meat works, mills and mines – to export ports. Passenger services between major urban centres expanded too, and some extraordinary feats of engineering saw the North Island main trunk line finished in 1908 (its South Island counterpart was completed in 1945). Between 1870 and 1929 tens of millions of pounds were spent on rail construction, representing 48% of the economy's Public Works Fund (Atkinson 2007 p. 57). By 1920 New Zealand Rail was carrying 28 million passengers and more than 6 million tons of freight.

10.2.2 The end of the golden age: 1930 to the 1990s

The rail network continued to expand, reaching its peak in 1952 at 5695km. However, it was not until 1962 – when rail ferries began sailing between the North and South Islands – that New Zealand had a fully integrated national rail network.

For much of the first part of the 20th century, rail remained a protected icon of national progress. Money was poured into enhancements – the transition from steam to diesel, the electrification of suburban lines, the introduction of railcars, the promotion of rail tourism – without any expectation that the costs would be recouped. Rail was effectively a public service, with the Railways Department New Zealand's largest employer. Yet even as the network was expanding, rail was losing its pre-eminence and by the 1920s increasing competition from road transport saw the start of the steady deterioration in rail's financial performance that has continued ever since (see Figure 10.2).

New Zealanders embraced the automobile early and enthusiastically, with ownership of cars more than doubling from 71 403 to 150 571 in the second half of the 1920s, by which time there was one car for every nine New Zealanders – one of the highest rates of automobile ownership in the world at that time (Atkinson 2007 p. 100). Passenger rail travel began to fall almost immediately (Figure 10.3).

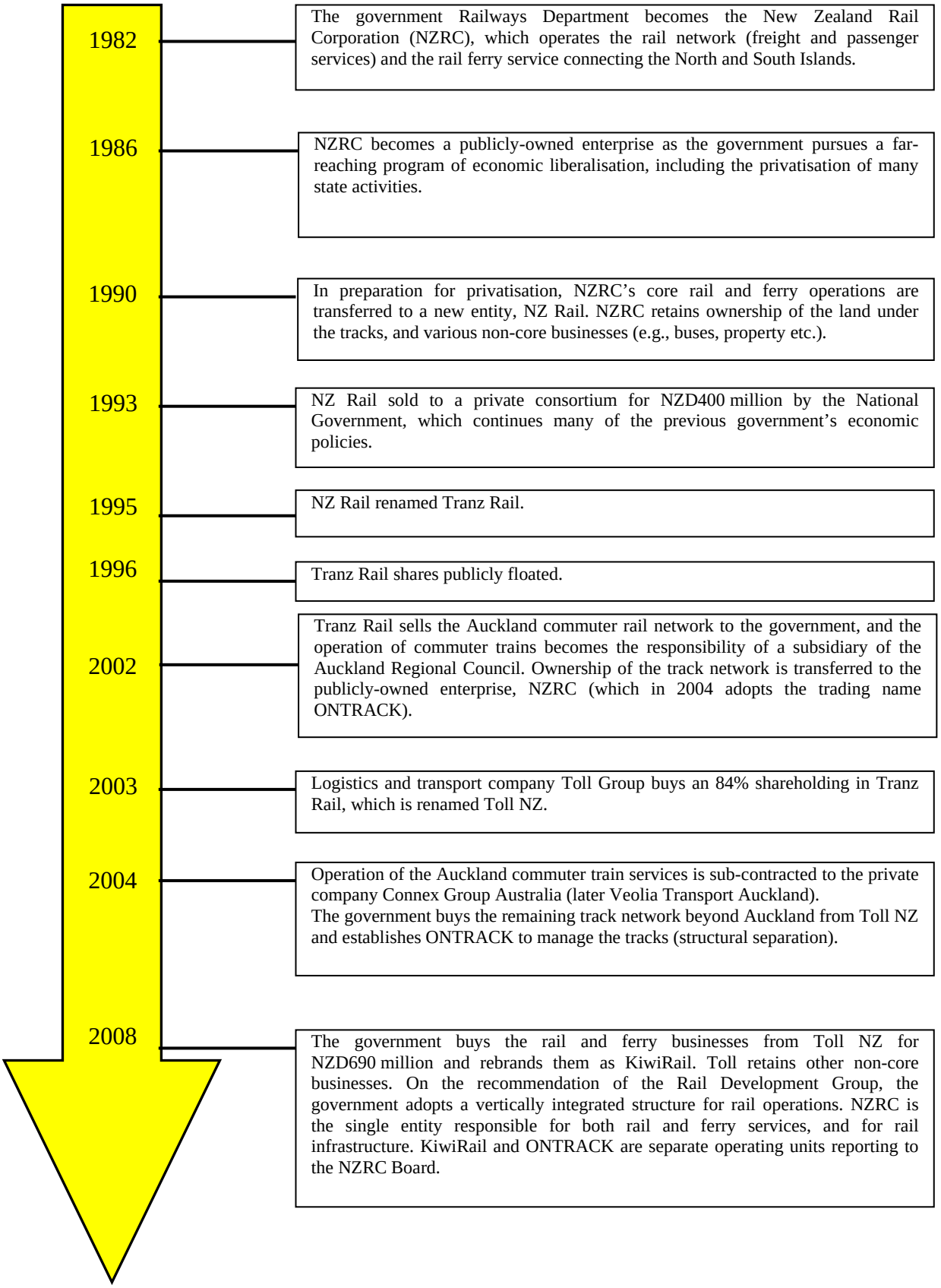

Figure 10.1: Milestones in the development of railways in New Zealand, 1982–2008.

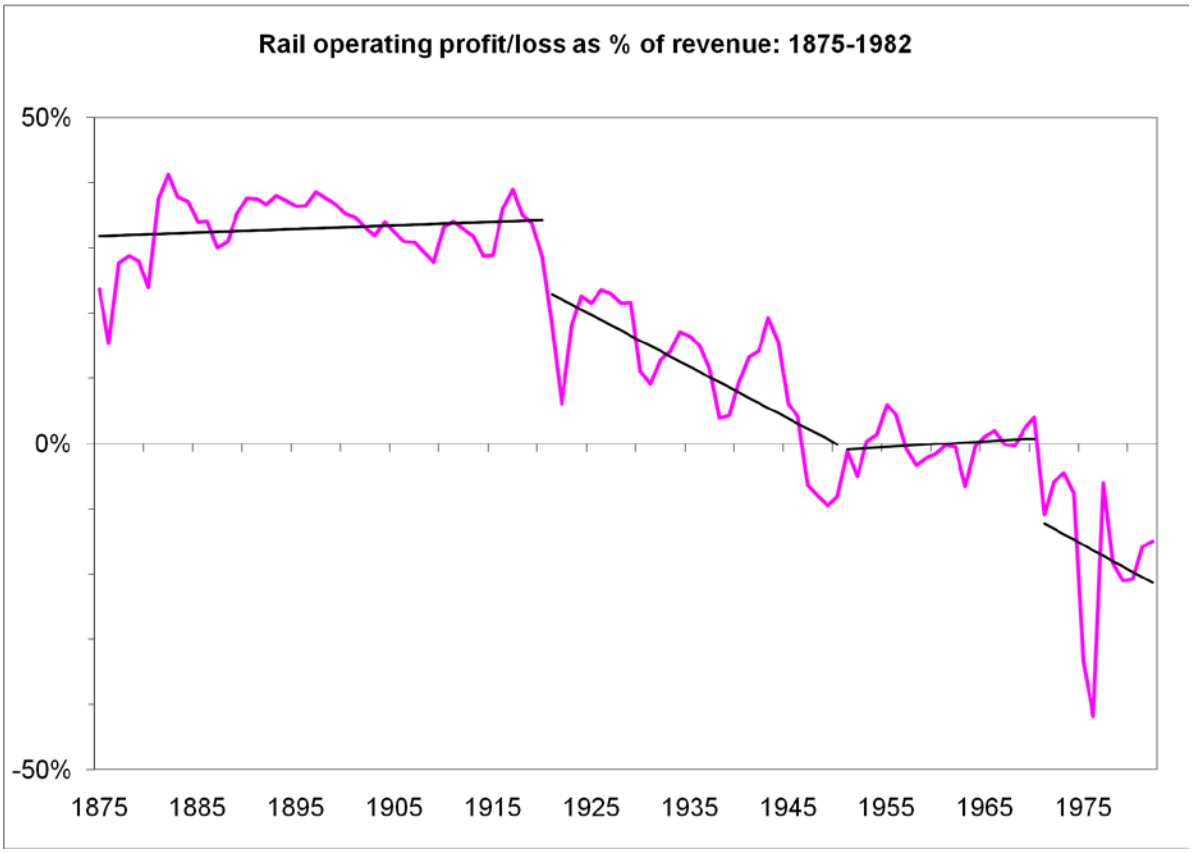

Figure 10.2: Rail operating profit/loss as a percentage of revenue, 1875–1982. (Source: Heatley 2009 p. 11)

For freight, the competition from trucks – whose greater flexibility and connectivity made them ideally suited to New Zealand's low freight volumes and sparse settlement patterns – represented a major threat. The government stepped in, offering generous freight concessions to ensure local producers used rail. Then, in 1936, legislation was introduced preventing trucks from carrying loads more than 30 miles (48km) and restricting new trucking operators to those that could prove a need for their services. The Railways Department expanded its Road Services Branch, which soon become one of the economy's largest bus operators (Atkinson 2007 p. 102).

Despite these interventions, rail's already poor financial performance continued to decline. After an upsurge due to fuel rationing during and after World War II (Dravitzki & Lester 2006 Fig. 3), passenger travel dropped dramatically, apart from some resurgence in urban commuter services for the new suburbs established post-war (see Figure 10.3). The option of travelling from Auckland to Wellington within an hour by air, rather than 10 hours by train, increasingly enticed long-distance travellers. Freight services continued to lose market share to road.

The Railways Department continued to struggle financially and its declining fortunes eventually prompted drastic measures. Closures of the least profitable branch lines and services, which had begun in the 1950s, accelerated. In 1982 the Railways Department was corporatised, becoming the New Zealand Railways Corporation. With a new focus on profit making, there were massive job losses – between 1982 and 1989 the workforce was cut by 54%. For a while rail's financial decline steadied. But like new technologies and regulatory protection previously, line closures and staff cuts were not enough to arrest the downward trend.

Figure 10.3: The decline in passenger rail travel. (Source: Atkinson 2007 pp. 101, 215)

In the 1980s the transport sector felt the full force of the Fourth Labour Government's deregulation program. The restriction on road freight movements (which had steadily increased from 48 to 150km) was phased out, and by 1986 road transport operators were no longer subject to the Ministry of Transport's qualitative licensing system. At the same time, the permitted size and weight of trucks were growing steadily. The combined impact was immediate and dramatic: rail lost one-third of its freight market share between 1980 and 1988 (ISCR 1999a p. 13), and greater competition saw freight haulage prices fall by 25% (McKinnon 1998 p. 213). If rail was to remain competitive, services and infrastructure (for both freight and passengers) needed modernising urgently.

All these factors, in conjunction with the reforming ideology of the times, drove the government's decision to sell rail to the private sector.

10.3 PRIVATISATION

Deregulation, privatisation, asset sales and subsidy removal were central planks of the radical economic program of the government which was elected in 1984. In its electoral term, a heavily-indebted, tightly-regulated economy that the new Prime Minister described as operating 'like a Polish shipyard' was transformed into a deregulated free market economy at a speed that astonished onlookers.

The privatisation mantra was continued by the new government that came to power in 1990. This new government saw selling government assets as a way to raise money while avoiding ongoing investment in them. In the case of rail, significant investment was urgently needed in both the track and rolling stock after years of cost cutting: who better to take on the task than the private sector? The same approach was applied to other areas previously seen as core government business. Telecommunications, electricity, the postal service and the national airline were all either privatised or became publicly-owned enterprises during this period. In New Zealand, a publicly-owned enterprise is a corporation whose shares are wholly owned by the government, and whose principal objective is to operate as a successful business. Each enterprise has an independent board and management, and their responsibilities (together with those of the shareholding Minister) are clearly delineated under the State Owned Enterprises Act 1986.

Preparations for selling New Zealand Rail began in 1990. In 1993 it was bought by a private consortium comprising Fay Richwhite and Company (local investment bankers), the Wisconsin Central Transportation Corporation and Berkshire Partners LLC. They paid NZD400 million, and renamed the business Tranz Rail.

A 'Core Lease' between the Crown and Tranz Rail gave the company an exclusive 40-year right (with a right of renewal for a further 40 years) to use the land under the current network for the purposes of running a railway. There was no access regime for potential competitors (excepting provisions for heritage operators). Presumably, by granting exclusive rights the government received a higher sale price at privatisation.

Following the decision to prepare rail for privatisation in 1989, a focused marketing effort led by non-rail staff brought in for that purpose segmented the freight market. This effort led to better understanding of customer needs and a customer-centric approach that recognised that Tranz Rail's freight business was dominated by a small number of customers transporting a very small number of commodities (ISCR 1999a pp. 32–4). Tranz Rail benefited from this market segmentation, improved understanding of customers and focus on marketing to their largest customers. Volumes for the bulk-goods segment increased by 5.5% per year over 1994–97 in response to price falls of 7% per year. The export-goods segment was more elastic, with volumes growing at 12% per year in response to price falls of 4.4% per year. The distribution (logistics) segment had small price and volume growth in response to an improved quality of service (ISCR 1999a p. 42).

It was not until 1996 that Tranz Rail sought to directly measure operational indicators that had been identified as important to service quality. The limited data available showed somewhat variable results through to 1997 (ISCR 1999a pp. 39–40). Significant improvements were reflected in customer satisfaction surveys conducted in 2000 and 2003, with positive responses to the question 'Would you recommend Tranz Rail to another potential customer?' increasing from just over 30% to nearly 80% (Tranz Rail Holdings Limited 2003).

Under private ownership Tranz Rail further improved productivity and returned the first operating profits for rail in many years. Costs were reduced, including by cutting uneconomic services. Freight volumes grew, peaking in 2000 (Figure 10.4), while rail's share of the land freight market peaked at 29% in 1998 (Richard Paling Consulting 2008 p. 4).

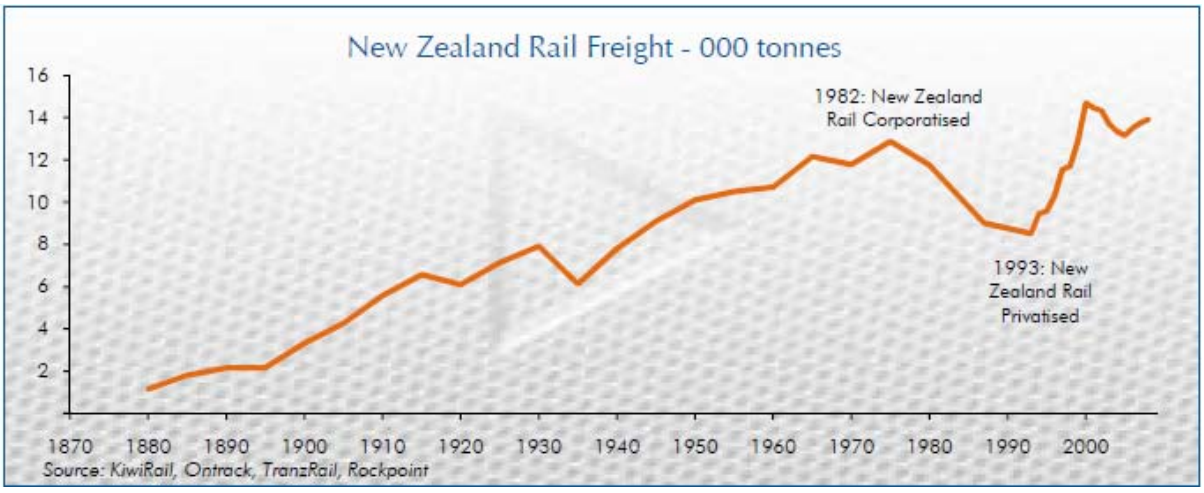

Figure 10.4: Rail freight in New Zealand from 1880. (Source: Rockpoint 2009 p. 103)

But Tranz Rail's debt levels were rising at the same time. Its profits were insufficient to cover the opportunity costs of capital (shown in Figure 10.5) and both the track and the rolling structure continued to suffer from insufficient investment in maintenance, renewal and upgrades (ONTRACK 2010; Heatley 2009 p. 35).

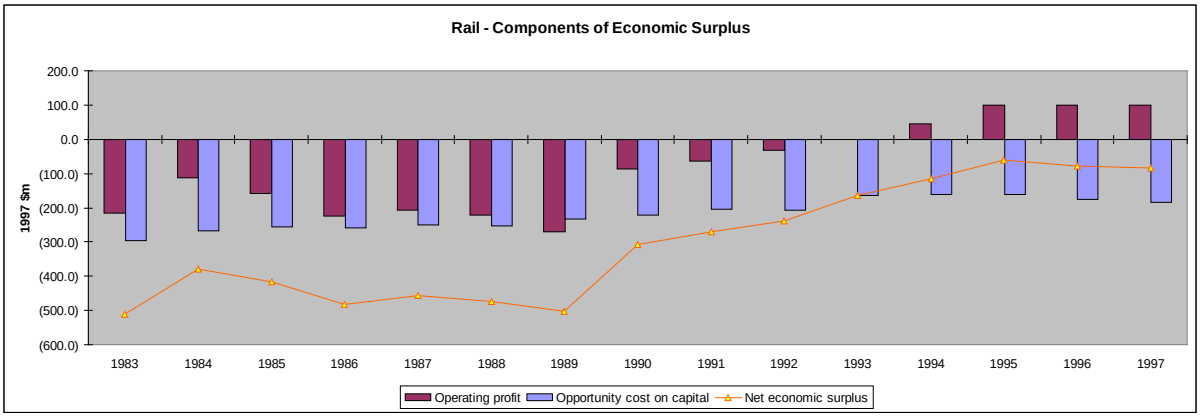

Figure 10.5: Tranz Rail's profit could not sustain its operations. (Source: Heatley 2009 p. 28)

Nor did Tranz Rail perform well for its shareholders. From a high point of NZD9/share in 1997, the value of Tranz Rail shares fell steeply to NZD0.39 in 2003. Those who had bought shares in the public float in 1996 and retained them through to 2003 got back only 28% of their original investment (although the original investors did very well indeed, realising a total of NZD470 million on their initial equity of NZD105 million when they sold their shares in 1997 – a transaction that subsequently became the focus of an insider-trading inquiry) (Gaynor 2008; Heatley 2009 p. 31).

At the time of privatisation, the government retained ownership of the land under the rail tracks, leasing it to Tranz Rail through the 'Core Lease'. Assuming that the initial objective of privatisation was greater economic efficiency, the Core Lease arrangement worked to undermine it. If a line was not economic, the rail operator was unable to make the economically rational decision to sell the land for a more productive use. This suggests that, although the government had at one level embraced the new era of privatisation, it was reluctant to abandon rail to market forces entirely. This became even clearer in 2002, when Tranz Rail indicated it wanted to close 41% of the lines, deeming them uneconomic (RDG 2008a; Heatley 2009 p. 46). Faced with this politically unpalatable prospect, and with real concerns about the impact of under-investment in the network, the government (Labour-led once more) sought a way to maintain a national railway that met its political, economic and social goals.

What went wrong with privatisation? One problem was the assumption that – despite rail's history – simply changing the ownership model would 'fix' the underlying economics of rail in New Zealand (Box 10.1). Secondly, the government's willingness to intervene when the owners sought to rationalise services and close unprofitable lines demonstrated that it still wanted substantial control over rail. Not only did this create difficulties at the time, but it is also likely to have long-term ramifications: any future government wishing to pursue privatisation may find it cannot credibly commit to non-interference (Heatley 2009 p. 46).

Box 10.1: Constrained by geography and population.

New Zealand – population 4.3 million[3] – is an economy comprising two narrow, mountainous main islands, whose nearest neighbour is 1500km away. These facts place certain inescapable limits on rail operations and have dictated some significant decisions. For example, the economy's challenging topography was instrumental in the early choice of narrow-gauge tracks, which were cheaper to build in mountainous terrain (Japan, Indonesia and Australia's Tasmania chose the same option for similar reasons). Unfortunately, this decision placed technological and commercial constraints on rail's development which took decades to overcome (Leitch & Stott p. 5).

More insurmountable have been the problems caused by New Zealand's low population density (16 people/km^2). This has made it impossible to achieve the 'economies of density' essential for successful rail services – in other words, there is insufficient population to justify running more trains on existing tracks (The Treasury 2009 p. 25). Frequent, high-speed passenger trains may be viable in similarly-sized island nations such as the United Kingdom and Japan, but those economies' population density is far greater, at 338 and 251 people/km^2 respectively.[4] New Zealand's low urban population density and a trend to dispersed employment have also contributed to the demise of commuter rail services in all but two cities, Auckland and Wellington. Thus, in New Zealand today, freight, and not passengers, is the lifeblood of rail.

The viability of freight services, too, is constrained by physical factors. The fact that the railways still follow routes mapped out more than 100 years ago, often through difficult terrain, means freight may have to travel more slowly and over longer distances to reach the same destinations served by roads. Rail's competitiveness is also constrained by the low volume of bulk freight and the short distances it is carried, relative to international standards. For the past 30 years, the average freight journey has been just under 300km, well below the distance at which rail is found to be competitive internationally for all but point-to-point transport of bulk commodities (Heatley 2009 p. 25). New Zealand's lack of borders, and the obvious inability to connect with other economies' rail networks, is an important factor here. In combination with the low population and other factors, it means New Zealand's rail freight density – calculated as the average number of tonnes of freight transported per kilometre of track – is very low by international standards (Figure 10.6).

Despite all these constraints and their impact on rail's economic performance, the size of New Zealand's rail network in 2010 (4000km) remains unchanged from 1991.

[3] As at 30 September 2009. (Source: Statistics New Zealand, http://www.stats.govt.nz.top-statistics.aspx).

[4] Population density statistics are based on 2007 data. (Source: United Nations Statistics Division, http://unstats.un.org/unsd/demographic/products/dyb/dyb2007.htm).

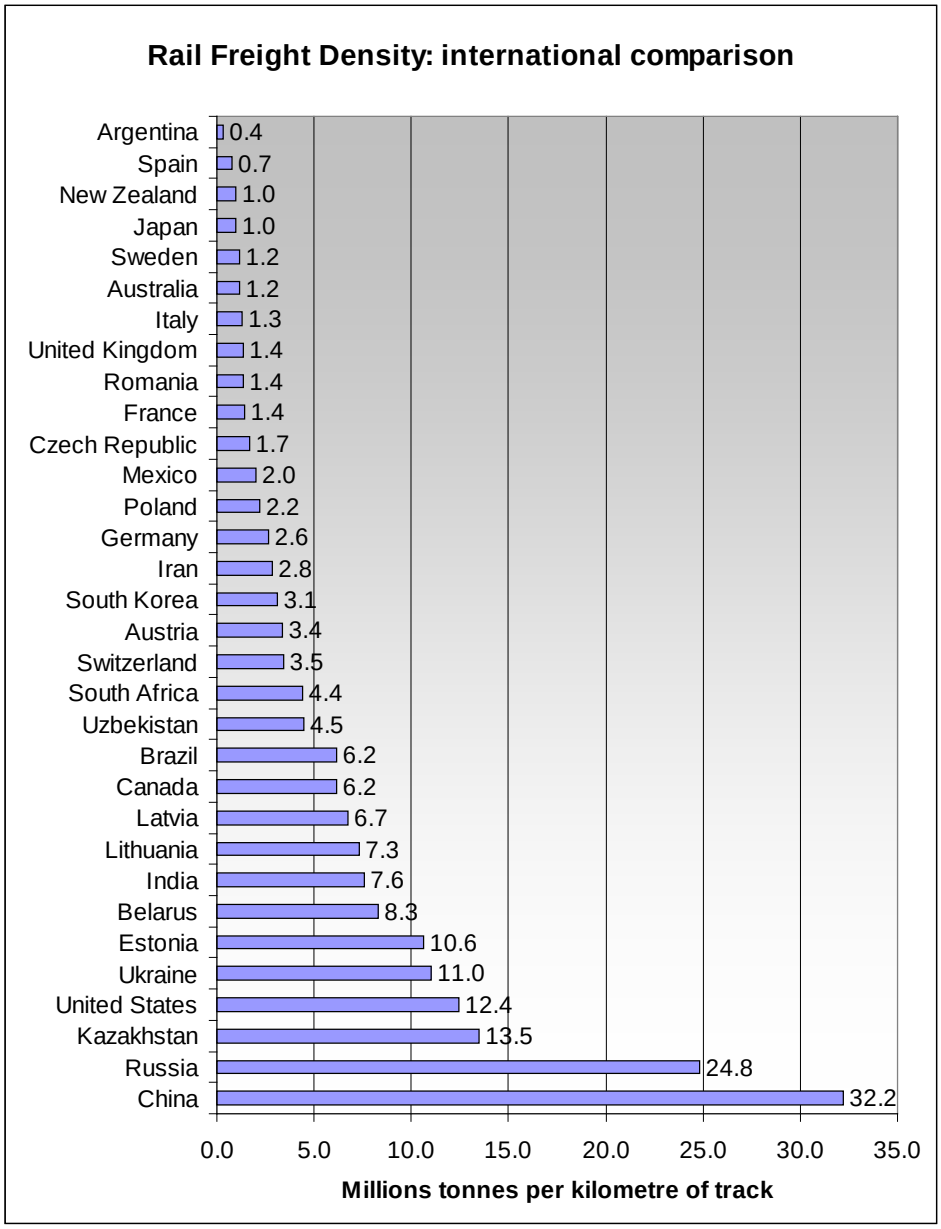

Figure 10.6: A comparison of rail freight density internationally. (Source: Heatley 2009 p. 21)

10.4 THE GOVERNMENT RETURNS TO RAIL

The government's return to the rail business began with its purchase of the Auckland suburban rail network from Tranz Rail in 2002. The Auckland Regional Council's transport agency, the Auckland Regional Transport Authority, became responsible for services (which were later contracted out to Veolia Transport: see Section 10.5.2). In 2003 the government began discussing the possibility of buying a stake in Tranz Rail, but this stalled when Australian transport and logistics company Toll Group moved to take over Tranz Rail.

Toll Group saw Tranz Rail as complementing its New Zealand activities, and considered that it could operate the business profitably (ONTRACK 2010; Toll Holdings Ltd 2004; Toll Group 2003). In 2003 it bought an 84% stake in Tranz Rail at NZD1.05/share (valuing Tranz Rail at NZD232 million) and renamed the business 'Toll NZ'. A year later the government struck a deal with Toll, buying the whole track network for NZD1. It was to be managed by ONTRACK, a business unit formed as part of the New Zealand Railways Corporation

(NZRC). It could be argued that Toll had thus secured itself an attractive deal: it had bought into rail relatively cheaply and retained the only part of the business that was ever likely to be profitable, while the intrinsically loss-making part (the track network) was now the government's responsibility.

This observation may seem counter-intuitive: a track network with its high fixed and sunk costs seems a promising candidate for a natural monopoly, and the opportunity to earn monopoly rents. However, the allocation of rents is only pertinent if there are rents to be allocated. As argued in this chapter, New Zealand rail (as a whole) is uneconomic relative to its competition; therefore there is no natural monopoly.

Under its agreement with Toll NZ, the government committed to spending NZD200 million on network upgrades and renewal. For its part, Toll NZ would spend NZD100 million on new rolling stock, and pay the government an annual track charge for exclusive access to the rail network. These access rights were subject to a 'use-it-or-lose-it' provision: if Toll NZ's traffic fell below 70% of average freight levels for 2002–04 on any line segment, it would no longer have exclusive rights to that segment (The Treasury 2004 p. 12). It must be considered very unlikely that this provision would have led to the appearance of a serious above-rail competitor to Toll, as the competitor's operations would have been restricted to those isolated line segments where there was declining demand for rail freight (Heatley 2009, p. 47). In any case there was no competitive entry between 2004 and 2008, when the agreement was effectively cancelled.

The access charge became a serious sticking point over the next few years. When the government sought to raise the charge to help fund upgrades, Toll NZ argued that this would lead to substantial losses unless freight prices were increased – and this would inevitably mean losing customers to road transport. Nonetheless, Toll NZ said in October 2007 that it remained 'absolutely committed to rail in New Zealand and freight was increasing on a number of its services' (*Sydney Morning Herald* 2007).

In the access charge negotiations between Toll and the government, both parties were in the position to 'hold up' the other and extract a 'profit' at the expense of a larger loss incurred by the other party.[5] Both the track (an exclusive sunk investment) and operations (with exclusive access conferred by contract) could be considered as 'bottleneck facilities', relative to each other. (But this does not make them bottleneck facilities in the economy as a whole – for that to be the case there would need to be a lack of close substitutes for the services offered by those facilities.)

The question was: 'Who had the greater bargaining power in the negotiations?'.

Toll had a credible threat: to withdraw selected services from rail and shift their operations to road and/or sea transport. This threat was credible because they had an existing road and sea transport business, and their shareholders would demand that Toll exit any business in which there was no reasonable prospect of earning an economic profit. Withdrawal of services would create a political cost for the government, which had made explicit policy commitments to invest in rail infrastructure and to move an increasing share of freight from road to rail.

[5] The 'hold up problem' in economics is that a party that has a relationship-specific investment is vulnerable to a threat by other parties to terminate that relationship. The threat enables these parties to obtain better terms than initially agreed (Milgrom & Roberts 1992).

But the government lacked any credible threats against Toll. They were contractually committed to maintain or improve the rail infrastructure (The Treasury 2004 p. 20). If Toll withdrew services, the contract allowed for a new rail operator to take over those services. While a lack of scale would mean that the new operator would likely face a higher cost structure than Toll, the contract meant that the terms for new entrants (including access charges) could be no more favourable than those faced by Toll (The Treasury 2004 p. 14). The putative entrant, with higher costs, would have little chance of earning a profit on a service that Toll decided to exit because it was uneconomic. Hence, there was no credible threat of entry.

Thus, the 2004 agreement had left Toll with substantially greater bargaining power. The government's frustration at Toll's exercising this power (combined with some unrealistic ideas about the potential of rail) led it to buy out the rail operator on terms very favourable to Toll. However, the costs of resolving this bargaining problem (to date over NZD1 billion) have exceeded the costs of living with it (perhaps an access charge subsidy of NZD70 million per year[6]).

In this instance, the contractual allocation of rights determined the locus of the bargaining power. With hindsight, other strategies may have been more successful in 2003–04, for example:

- encouraging the rail operator to withdraw from uneconomic services (in order to ensure the operator's ongoing viability);
- making an equity injection into the integrated rail operator (so that the government and private shareholders faced the same incentives);
- purchasing the distressed integrated rail operator at a bargain market price before (or in competition with) the takeover offer from Toll; and
- letting the rail operator fail, cancelling the exclusive access rights and introducing a new ownership and access model (e.g., one with sections of track owned by major users or port operators and cross-licensing arrangements for access).

In May 2008 the government moved to purchase the rail (and inter-island ferry) business from a reluctant Toll NZ, citing the impasse over the access charge. The change of ownership came into effect in July 2008, with the government rebranding the rail business 'KiwiRail'. Like ONTRACK, KiwiRail was a business arm of the New Zealand Railways Corporation and reported to the NZRC Board. In principle, there were still no barriers to competition within rail. Under the Railways Act 2005, any operator who met safety-related licence conditions could start running a rail service – providing they could negotiate access to the ONTRACK rail network. Toll NZ retained its road transport and logistics arm, Toll TranzLink, which became New Zealand's largest road freight operator.

Despite the public battles over the track access charge, the government's buy-back of rail was primarily driven by ideology. This expressed the government's belief that a strong rail network was essential to New Zealand's future economic and environmental performance. With freight volumes forecast to rise by 75% over the next 25 years, rail had a significant economic role to play. It was essential for regional development, and for New Zealand's vital export industries that benefited from rail's ability to carry large volumes of bulk commodities (such as coal and dairy products) comparatively cheaply (Cullen 2008a). The government also argued that the purchase was integral to the development of a more environmentally

[6] http://www.treasury.govt.nz/publications/informationreleases/rail/purchase/pdfs/rp-tsy-em-4dec06.pdf.

sustainable and integrated transport system. But even more fundamentally, the purchase confirmed the government's view that, if it was going to have to subsidise the rail network – which rail's performance under successive ownership structures had shown to be inevitable – it was preferable to subsidise a government-owned enterprise, rather than a foreign-owned private company. The Deputy Prime Minister of the time said that his government would not allow 'New Zealand taxpayers [to] indefinitely subsidise a private, foreign operation and then not make sure that the investment would deliver social and economic returns for New Zealand' (Cullen 2008b).

There was considerable criticism of the price that taxpayers paid for the railways. At NZD690 million, even the government admitted it had paid 'a premium price' (Young 2008). However, the government said that the price reflected the need to buy Toll out of its long-term monopoly rights (Bridgman 2008). It was also argued that the buy-out was preferable to the alternatives: 'continuing to subsidise a foreign-owned company failing to invest sufficiently in basic infrastructure, increased expenditure required on roading, increased accidents on the road, and increased greenhouse gas emissions at a direct cost to the taxpayer' (Young 2008).

The government made an immediate commitment to investment. In July 2008 it appointed a Rail Development Group (RDG) to make recommendations about rail's future. The RDG confirmed that deferred capital expenditure was a pressing issue, but said that remedying this would go only some way towards making rail commercially viable without government subsidy (RDG 2008b p. 6). It called for more than NZD1 billion to be spent over 5 years on replacing locomotives, rehabilitating key sections of the network, upgrading information technology and creating freight hubs. As a first step, in October 2008 the government announced an injection of NZD121 million for rail industry improvements in the current fiscal year, in addition to previously forecast spending (Cullen 2008c).

The next month, there was a change of government. The new government had already pledged not to sell any government assets in its first term, so government ownership of rail for the next 3 years at least was guaranteed. The government stressed there was now a strong expectation that the rail network should deliver 'a commercial rate of return. Any taxpayer subsidies to the freight side of the business should be provided transparently and should not be at the expense of other transport modes' (Joyce 2009a).

After its first year back in government ownership, rail's economic performance problems remain. KiwiRail made a loss of NZD187 million in 2008/09, largely due to depreciation expenses on network assets (KiwiRail 2009 p. 76). The total government funding of NZD425 million almost exceeded operating revenue of NZD518 million.

10.5 REGULATION, COMPETITION AND STRUCTURAL REFORM

10.5.1 Minimal regulation

The 1980s New Zealand model of structural reform has been labelled 'light-handed regulation' (Evans et al. 1996 p. 1885). It sought to minimise government and regulatory intervention and to place reliance on actual and potential competition for the regulation of prices and monopoly behaviour.

When the New Zealand Railways Corporation became a government-owned corporation in the 1980s and was subsequently privatised, a raft of regulations was discarded, including, most importantly, the regulatory restrictions on road transport first introduced in 1936 to

allow rail to remain competitive. As already noted, deregulation had a major impact on the business, with rail losing one-third of its share of the freight market between 1980 and 1988. Today there is only minimal regulation of the sector and it focuses almost entirely on safety. The sector regulator is the Rail Regulation Section of the New Zealand Transport Agency, the government agency responsible for planning and funding land transport. Its rail-related responsibilities are confined to administering the Railways Act 2005, monitoring accidents, and licensing organisations that control and use rail networks. Licences are granted to rail providers and operators that meet specified safety standards.

Rail is also affected by the provisions of the Resource Management Act 1991, the principal legislation dealing with the use of the natural environment and its resources. Under the Act, rail operators wanting to build or expand infrastructure need to embark on planning and resource consent processes that can be both costly and time consuming.

The largely 'hands-off' approach to rail regulation reflects the present government's thinking about infrastructure regulation in general. A recent Treasury paper described the objective of regulation as 'to ensure sufficient certainty and consistency for business to operate competitively and with confidence, and with minimum transaction costs'. It also expressed concern that the costs of compliance may be contributing to New Zealand's relatively low productivity performance: it ranks 22nd of 30 OECD economies (The Treasury 2009 p. 95).

10.5.2 No barriers to entry

As described above, under the Railways Act 2005 any operator who meets safety-related licence conditions can start a rail service when they negotiate access to the ONTRACK rail network. The real competition lies with those other transport modes that manage to respond to changes and challenges more rapidly than rail – with its high fixed costs and 'sunk' assets – has been able to. Most rail costs (e.g., the cost of providing tracks or signalling equipment) are fixed: they do not change depending on the volume of freight or passengers. In addition, rail infrastructure is a very long-lived asset that gets more expensive to maintain and renew as it ages. Most of New Zealand's fixed rail assets are sunk: the value of tunnels, bridges etc. cannot be recovered if they are no longer used for railways (Heatley 2009 p. 20).

In practice, KiwiRail has no competitors in either the rail freight or long-distance passenger rail markets. Nor is there much likelihood of competitors emerging, given rail's perennial lack of profitability and KiwiRail's ability to access government financial support. The only scenario a potential new entrant might consider would be to service a profitable subset of routes or customers. KiwiRail could be expected to oppose such competitive entry vigorously, as the company relies on its profitable routes to cross-subsidise its less profitable ones, and its integration with ONTRACK gives it substantial power to exclude rail competitors.

Recent overseas trends towards supply-chain integration have seen port operators taking control over their supply chains by purchasing the rail networks servicing their hinterlands (e.g., in Europe: Notteboom 2008). Similarly, some large exporters (such as Australian mining companies) own the railways that connect their operations to ports. Such arrangements are unlikely to arise in New Zealand, as both major political parties appear committed to a national rail network with a single owner.

Urban commuter rail is in a slightly different situation. In 2004 services in Auckland were contracted out via competitive tender. The successful tenderer was the French-owned multinational Veolia Environment (Box 10.2).

Box 10.2: Competition for Auckland Commuter Rail Services.

When the Auckland Regional Council (ARC) called for tenders for the operation of Auckland's commuter rail system in 2002, Tranz Rail chose not to tender. Instead, it sold the Auckland metropolitan rail network to the Crown for NZD81 million. In November 2003 the successful tenderer was announced: Connex Group Australia (now know as Veolia Transport Auckland, part of the French multinational Veolia Environment). Connex was one of three tenderers; the British firms Serco and Stagecoach were unsuccessful.[7] Connex took over operation of the trains from July 2004.

In parallel with these changes the ARC moved to consolidate passenger transport planning, asset management and service delivery in one organisation. ARC formed the Auckland Regional Transport Authority (ARTA) in 2004 to own stations and passenger trains and take responsibility for service planning. Under the contract terms, Veolia receives payment for its costs plus a management fee. All fare revenue goes directly to ARTA.

Ownership of the track network and responsibility for signals and corridor infrastructure was transferred to the publicly-owned enterprise NZRC, which adopted the trading name ONTRACK.

As a result of the new public–private partnership structure, substantial investment in new infrastructure and fare subsidies, train patronage in Auckland doubled between 2005 and 2010 (Figure 10.7).[8] ARTA attributes the increase in patronage to the following changes:

More trains, more often. With the double tracking of the Western Line almost complete, trains run every 15 minutes at peak times, and five to six trains an hour run at peak times on the Southern and Eastern lines. Services increased from 635 per week in 2005 to 1475 in 2009 with 49 carriages added to the network.

More punctual. In March 2005 only 76.6% of trains arrived on time. This figure steadied at over 85% for most of 2009.

Better stations, better trains. 21 of the 41 stations on the network have been upgraded over 5 years. Six train carriages have been fitted this year with new seating, carpet and upgraded air conditioning (Auckland Regional Transport Authority 2009 p. 1).

The doubling in passenger numbers, however, came from a very low base. While rail now services 12.5% of public transport trips in Auckland, passenger transport is still dominated by the use of private vehicles.

The fare subsidies required to reach this level of patronage are significant: rail requires a NZD7–8 operating subsidy/passenger trip (Auckland Regional Transport Authority 2006 p. 26). These subsidies do not include a contribution to capital costs. Fares have recently been raised after a significant period in which they were held constant in order to attract patronage.

The structural split between ONTRACK and ARTA has created integration issues (Mein 2008) and continuing disputes between central and local government about who pays for rail. Transport Minister Stephen Joyce recently summed up the situation neatly: 'everybody loves [rail], but nobody wants to pay'.[9]

Central government has committed to an NZD1.6 billion upgrade of Auckland's commuter rail system, including electrification of the network at a cost of NZD1 billion. ARTA expects these upgrades to enable it to provide fast, reliable journeys at 10-minute frequencies and attract 15.7 million passengers to rail by 2016. ARTA's modelling suggests that at this level of patronage the operating subsidy per passenger can be reduced to NZD4 per passenger trip (Auckland Regional Transport Authority 2006).

[7] http://tvnz.co.nz/content/238981.
[8] http://www.arta.co.nz/newsroom/media-releases.html?releaseid=dfdd9285-5056-a41f-9226-f3c70938762c.
[9] http://www.guide2.co.nz/politics/news/councils-need-to-pay-for-regional-rail-use-minister/11/15796.

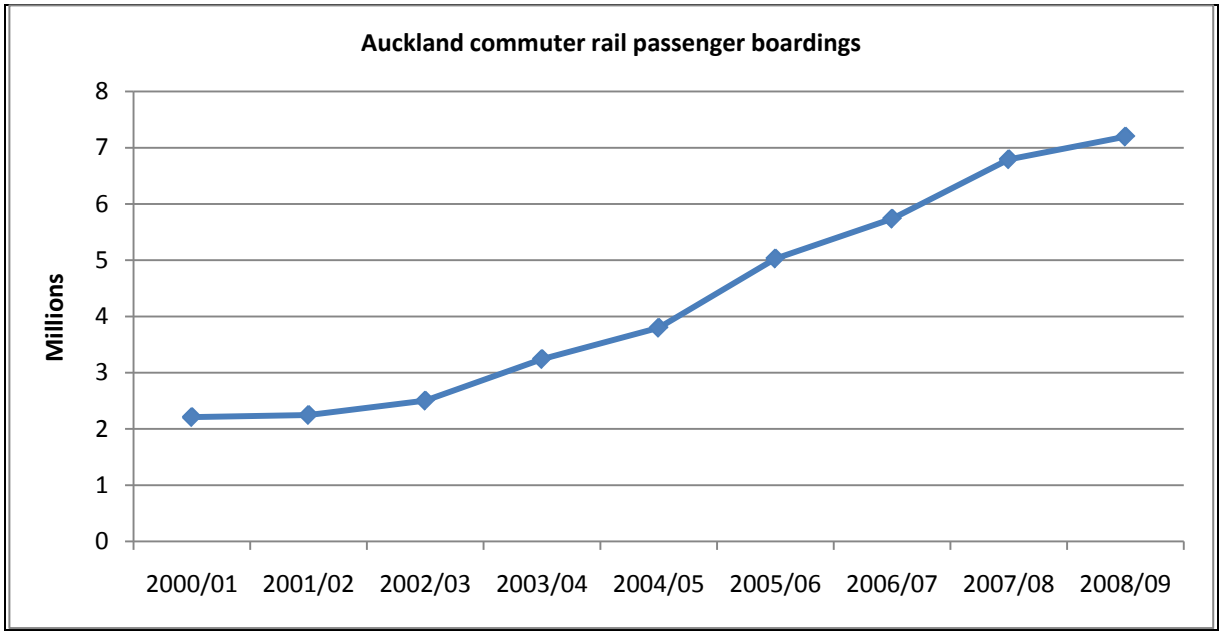

Figure 10.7: Growth in Auckland passenger rail. (Source: Ministry of Transport[10])

Commuter services in Wellington, currently owned and operated by KiwiRail under contract to the Wellington Regional Council, are expected to be similarly tendered out in 2016.[11] Assuming the successful tenderer is a new entrant to the market, the total number of significant rail operators will climb to four. The three current operators are KiwiRail, Veolia Transport and Taieri Gorge Railway Ltd. Taieri Gorge Railway is the largest of the economy's 60 heritage rail operators (the others are mainly small, non-profit organisations).

10.5.3 Structural integration favoured

For much of its history New Zealand rail has been structurally integrated, with a single organisation responsible for both infrastructure and rail services. There was, however, a period of structural separation from 2004 to 2008 when ONTRACK was responsible for below-rail infrastructure and Tranz Rail provided above-rail services. 'Below-rail' in this context means the non-moving parts of the rail network, including the rails themselves.

Elsewhere in the world, structural separation has often been introduced to enhance competition. However, results have been mixed, with some economies (such as the United States) reporting a reduction in efficiency (Heatley 2009 p. 46). But in New Zealand the case for structural separation was made for somewhat different reasons. It arose at a time when the private rail operator, Toll NZ, was seeking government subsidies in order to maintain the national network. Rather than continuing to make direct subsidies, the government elected instead to create ONTRACK as a separate entity with which Toll would negotiate a track access agreement. As Nick Wills-Johnson (2007 p. 2) has argued in relation to Australia, 'by investing in the below-rail infrastructure only, government can [ensure] that its investment is not affected by future inefficiencies elsewhere in the railway, or even by the railway operation becoming insolvent'. For the New Zealand government, then, structural separation was a less risky (and perhaps more politically acceptable) way of investing in rail.

[10] http://www.transport.govt.nz/ourwork/TMIF/Pages/TV020.aspx accessed 3 May 2010.
[11] http://www.transport.govt.nz/ourwork/rail/Documents/Metro%20rail%20Oct%2009.pdf.

In the event, information-sharing difficulties soon arose between ONTRACK and Toll. For example, the former needed accurate forecasts of future freight volumes in order to plan its capital works program. But was supplying such information in Toll's interests when ONTRACK might have used it to justify a higher track access charge? Impasses such as this contributed to the return to vertical integration in 2008.

10.6 THE GAP TO BEST PRACTICE IN STRUCTURAL REFORM

The current government favours minimal regulatory intervention, and has a review program in place to identify and remove 'unnecessary and superfluous regulation'.[12] Government ownership of transport infrastructure should be the exception rather than the norm, as evidenced by the following policy:

> All things being equal, the Government will favour the distributed decision-making power of a competitive market for the provision of infrastructure. This is because the commercial disciplines that come from investors risking their own money are difficult to replicate in the public sector. However, the Government does have a role providing goods and services where:
> - the goods and services have the characteristics of being 'public goods' in the technical sense;
> - the service is a monopoly and there are advantages in regulating through direct ownership rather than through the Commerce Act or other regulatory vehicle; or
> - distributional and equity objectives are better achieved through in-kind provision than through income support. (The Treasury 2010 p. 25)

It would be hard to argue that railway freight and long-distance passenger services meet these criteria. Urban passenger rail may meet the criteria insofar as it can deliver public goods such as reductions in urban road congestion. There is little doubt that the current government would prefer rail to be privately owned, but they are constrained by their own pre-election policy commitments and a general public distrust of privatisation. There is a substantial gap between the current situation and one that harnesses the 'distributed decision-making power of a competitive market'. The cost of this gap is difficult to establish. The direct costs of current policy to the taxpayer are measurable: they are the ongoing operational and capital subsidies to rail. Indirect costs include the opportunity costs of the land and other assets currently allocated to rail but potentially not being used for their most productive purpose in the economy. For example, the government is earning a zero financial return on the approximately NZD6 billion of land under the rail network.

As rail is generally a price taker in a competitive freight market, it is unlikely that the current policy has a significant impact on freight prices. However, ongoing public ownership and subsidy of rail is restraining private investment in other transport modes, particularly in coastal shipping (Rockpoint 2009 p. 219). Distorted investment signals can be expected to lead to the creation or maintenance of an economically inefficient freight transport network with higher average prices over time.

As noted, under present circumstances, competition within the rail sector is unlikely to emerge. Close substitutes exist for almost all of the freight products offered by New Zealand railways (Mackie, Baas & Manz 2006 p. 2). Rail faces substantial competition from both road and coastal shipping, and entry barriers in these sectors have been low in New Zealand since the 1980s (ISCR 1999a pp. 15, 28). Competition in rail's product markets (and threats of further entry there) should be sufficient to ameliorate monopoly power and drive efficiency gains.

[12].http://www.treasury.govt.nz/economy/regulation/statement/govt-stmt-reg.pdf.

While the current arrangements are technically an open-access regime, entry is unlikely: the rail operator is in government ownership, rail freight is unprofitable, the operator is subsidised and the government is unable to credibly commit to future non-interference in the sector. These problems would need to be overcome before access regime changes had any material effect in the sector. Moreover, reforms designed to foster competition within the rail sector (e.g., structural separation and improved access regimes) would lack credibility given the government-owned and funded incumbent, and likely involve significant costs for little benefit.

10.7 WHERE TO NOW FOR RAIL IN NEW ZEALAND?

10.7.1 Drivers for reform

From the government's perspective, the key drivers for change appear to be:

- a wish not to be seen as supporting rail over other transport modes, and hence unwillingness to continue subsidising unprofitable services;
- the need for significant investment in rail infrastructure;
- an expectation that further investment in KiwiRail will enable it to generate enough additional income to eventually meet its own renewal and capital development costs;
- a wish to be seen to be actively addressing road congestion in Auckland;
- a tight fiscal situation following the global financial crisis and recession in New Zealand; and
- competitive and political pressure from the road transport and coastal shipping sectors, requiring rail to be more narrowly focused on providing services only where it has a competitive advantage.

10.7.2 Barriers to reform

Major barriers to change include:

- a pre-election commitment to retaining KiwiRail in public ownership (at least for the current parliamentary term);
- a public perception that New Zealand went too far with structural reform in the 1980s and 1990s;
- ongoing operational and capital subsidies which reduce the incentives for efficiency improvements and structural change; and
- the risk of policy capture by the incumbent publicly-owned firm, which faces the weak market discipline inherent in a corporatised structure.

There is a strongly held public perception that the rail network was run down by its private owners and that this situation has been 'fixed' by re-nationalisation, regardless of the existence of evidence to the contrary. In fact, neither private nor public owners maintained rail infrastructure at anywhere near replacement levels from 1991 to 2008 (Heatley 2009 pp. 34–5). Advocates of structural reform will need to overcome this public perception.

A possible impediment to change is emphasis on over-detailed centralised transport network planning, under various labels including 'logistics' and 'integrated planning'. While the goals of such activities are laudable, the vast majority of transport supply and demand factors are outside the control of the planners. Treasury (2010 p. 88) recognises this when they state 'the parts of the [rail freight] network that thrive, and those that decline, will be determined to a large extent by the decisions of our major exporters and by the configuration of our ports'. There is a risk that integrated planning is used as a delaying tactic that supports the *status quo*, rather than as a true search for efficiency. Supply and demand uncertainties need to be

acknowledged as such, and not unduly delay decision making. Technical coordination – the efficient interchange of passengers and freight where transport modes interconnect – needs little central coordination; it will happen where demand is present and transport suppliers can profit from it.

10.7.3 Small steps to support reform

One useful reform would be to structurally separate the urban commuter services from the freight operator, with distinct branding and reporting. Advocates of the *status quo* frequently rely on confused arguments that ascribe commuter rail benefits to the freight network and *vice versa*. Functional and structural separation could allow for a more rational debate of these logically separate businesses.

The advocates of policy reform are at a substantial information disadvantage to the incumbent firm. The level of financial detail (in particular breakdowns by business unit) and frequency of reporting have declined under public ownership compared with the situation under private ownership. A small but useful step in enabling the effective advocacy of structural reform would be to improve the financial reporting to the public, permitting effective evaluation of the rail sector by competitors and independent commentators.

10.7.4 More questions than answers

In 2010 rail faces an uncertain future, and for policy makers there are more questions than answers. How best to address rail's long legacy of under investment and deferred maintenance (e.g., locomotives with an average age of 31 years, more than 550 bridges over 80 years old and dilapidated passenger services)? Much work is already in progress: major urban rail upgrades are underway in Wellington and Auckland, new locomotives and carriages are being purchased and some heavily used parts of the network are being upgraded. But the total cost of overcoming this legacy may be as much as NZD2 billion over the next 5 years (The Treasury 2009 p. 85). And quite apart from 'catch up' funding, there is also a need to invest in new technology and infrastructure that would allow KiwiRail to take advantage of emerging business opportunities. It cannot be assumed that competing transport modes will stay stagnant – KiwiRail's new infrastructure will be competing for customers against more efficient coastal shipping and larger trucks with improved fuel efficiency running on better roads.

The 2009 government-appointed RDG concluded that while KiwiRail's commercial revenue might be sufficient to fund its operating costs, it would be well short of the level required to provide a return on capital, or to fund asset renewals and new investment. Nor would it be sufficient to 'maintain ongoing operating capability at a level to achieve the government's desired policy outcomes' (RDG 2008b p. 6).

The clear need for ongoing government support was recognised when the government allocated NZD90 million in operating grants to KiwiRail for 2009/10. But is it prepared to keep on subsidising rail to this extent, and for how long? How can the government both deliver subsidies *and* incentivise good commercial decision making aimed at maximising financial returns? And should government subsidies be used to keep on supporting parts of the network that have long been non-commercial? An RDG report (2008c p. 2) noted that some routes had a good commercial rate of return (15–20%) while others were operating on negative returns.

The government expects 'that all investments in the national rail network provide a commercial rate of return. Taxpayer subsidies should be provided only as a last resort and

where there is clear evidence that it will improve service and provide a decent return on taxpayers' money' (Joyce 2009b). Although the government had not yet announced its rail policy at the time of writing, it appeared to be preparing to withdraw its NZD90 million operating subsidy to KiwiRail for 2011/12, while continuing to provide capital grants for infrastructure renewal and development without expecting any return on that investment.

Government support for commuter rail would remain and KiwiRail would continue to provide some passenger services, possibly in conjunction with private operators. But in terms of KiwiRail's core freight business, a clear message seemed to be emerging: the government expected the company to generate enough revenue to meet its own cash requirements – not necessarily to the point of providing the government (as owner) with a return on its investment, but sufficient to meet its own renewal and capital development costs. Exactly how KiwiRail was to achieve this turnaround in performance remained unclear, but it was likely to involve improvements in yield and productivity. The possibility of cutting unprofitable activities (such as long-distance passenger services) was still on the table.

The government does not wish to be seen as supporting rail over competing modes of transport, and this position moves it marginally closer to that goal. It is interesting to note that when the first National Infrastructure Plan was released in March 2010, rail was not among the government's eight key or emerging infrastructure priorities (The Treasury 2010 p. 15).

Other policy questions surround the extent to which rail can deliver other economic and environmental benefits – the 'positive externalities' which the previous government used to justify its buy back of the railway. Research by the New Zealand Institute for the Study of Competition and Regulation in both 1999 and 2009 suggested that the magnitude of these externalities had been overstated. In some cases the benefits sought – such as reducing greenhouse gas emissions or congestion – could best be achieved by other means, such as a carbon tax, emissions trading scheme, commuter rail subsidies or road user charging. The research found that while rail did have some positive effects on economic development and the quality of the environment, they were not enough to outweigh rail's negative contribution to New Zealand's overall economic performance (ISCR 1999b p. 85; Heatley 2009 p. 58).

Similar observations have been made by the Treasury. Its paper 'Infrastructure: Facts and Issues'– a discussion document intended to guide the preparation of the first National Infrastructure Plan – noted that economic benefits are likely to be realised only on heavily used parts of the network. Treasury offered the following analysis:

> The argument for ongoing public subsidisation of the network tends to rest on the premise that rail offers positive externalities (e.g., reduced congestion, emissions and accidents) and that road transport does not pay for its full social costs, reducing the ability of rail to compete. There is little current evidence to support this.
>
> Much of the New Zealand rail network is uneconomic, even when taking into account the environmental value of rail's greater fuel efficiency. While there may be a case for subsidising rail up to a certain point, based on its social and environmental contribution, it is an unresolved question about whether this would be sufficient to cover the full capital costs of the entire rail network. (The Treasury 2009 p. 29)

Environmental benefits respond to the same economies of density that drive railway economics. The fixed (economic) costs of rail incur environmental costs in parallel. The main inputs into railway construction and maintenance are earthmoving (diesel), transport (diesel), steel and concrete. All have significant environmental costs, including being substantial sources of greenhouse gas emissions. On the operational side, heavily used lines are more

likely to carry full trainloads, and these offer significantly better fuel efficiencies than partial trainloads. It follows that the most environmentally beneficial parts of the network are likely to be those in least need of government subsidy.

At the time of writing, the Ministry of Transport was undertaking more work to quantify the economic and environmental benefits of rail. In regard to the latter, there was a particular focus on determining the 'environmental footprint' costs to New Zealand if rail were not part of the overall transport mix.

In deciding how best to proceed, the government will negotiate a course between doing what is economically rational and what is politically feasible. It has been suggested that the most economically rational course would be to largely abandon rail (Malpass 2009). This view acknowledges that rail has placed an enormous burden on New Zealand taxpayers for decades, and the situation is unlikely to change. Without the loss-making railways, hundreds of millions of dollars could be diverted to more socially and economically beneficial uses.

A less extreme course would be to reduce the size of the network to only its most economic components (widely considered to comprise around 1500–2000km: see RDG 2008b p. 3; Heatley 2009 p. 69) and focus on rail's competitive advantages: the point-to-point transport of large volumes of bulk freight and carefully planned commuter rail. Under this scenario, line closures and land sales would fund the upgrade of the network to modern standards (Heatley 2009 pp. 70–2). However, the present government seems disinclined to move in this direction, seeing the retention of the national network as no more costly than having a disjointed smaller network (which could necessitate some duplication of rolling stock across its disparate parts).

The course that the previous government was advised to take by the RDG avoided any such potentially controversial steps as dismantling the national network. While the RDG recognised that, on a purely financial basis, 'rail is not commercially sustainable without a significant reduction in the size of the existing network' (RDG 2008c p. 2), its ultimate recommendation was to retain the network at its present size through ongoing government support.

The government today faces some difficult decisions. What role does it want rail to perform, and how much is it willing to spend on it? Is it prepared to wear the political consequences of making tough decisions about rail, with all the economic and social changes that may flow from them? Fundamentally, to echo the words of the Railways Minister more than 80 years ago, it needs to decide: what are 'the true interests' of New Zealand when it comes to rail?

10.8 SOME LESSONS FROM THE NEW ZEALAND EXPERIENCE

10.8.1 Rail-specific lessons

New Zealand's experience with rail may be different to that of other economies, but it is by no means unique. There are close parallels with the experiences of Victoria (2007) and Tasmania (2009) in Australia, where those governments purchased previously privatised rail networks following near-abandonment by their owners. Successful structural reform requires a solid understanding of the economics of rail in general, and how they play out given the specific circumstances and history of an economy's transport system. While applying lessons from one economy to another should be done cautiously, the following observations from New Zealand are pertinent:

- Rail assets are very long-lived, but the demand for specific types of rail services has changed over significantly shorter timeframes. When combined with the high costs

and sunk nature of rail infrastructure, this makes the problem of determining the optimum type and level of investment very difficult indeed.

- The long life of rail assets means that it is possible to boost short-term financial performance by deferring maintenance and upgrades, and incentives exist for both public and private owners to defer these costs. The inevitable long-term consequence is a dilapidated and uncompetitive rail system.
- The economic performance of rail in New Zealand has long been poor. Unable to cover its capital costs, it relies on taxpayer subsidies to cover its operating deficit. This performance can be attributed to the convergence of distinctive physical factors (low population density, topography and geographical isolation) with rail's underlying economic characteristics: high proportions of sunk fixed costs, expensive maintenance and renewals, and diminishing returns on infrastructure investment.
- Simply changing the ownership model – from public to private and back again – has not changed the fundamental economics of rail.
- A lack of competition within the rail sector does not give a rail operator a natural monopoly. KiwiRail competes with other transport modes – with trucks and coastal shipping for freight, and with aeroplanes, buses and private cars for passengers. It is thus unhelpful to consider rail in New Zealand in terms of a natural monopoly.
- Any given rail project may or may not have net environmental benefits – the existence and level of such benefits can only be determined once details of that specific project are known. The most environmentally beneficial projects are likely to be those in least need of government subsidy.
- New Zealand's experience suggests that increasing or maintaining the size of the network to achieve so-called economies of network size does not enhance economic performance. Railways are driven by the economies of density, which can be achieved by using a rail network more and better. Economies of density might be best achieved in New Zealand by focusing on a smaller, more heavily used subset of the current network – a scenario which would also allow rail's potential economic and environment benefits to be realised.

10.8.2 Structural reform lessons

Some more general lessons about structural reform also emerge from this case study:

- Structural reform needs to be very clear about its goals and how the reform will achieve those goals. All underlying assumptions should be clearly identified.
- The goals of structural reform will shift over time. It is more appropriate to compare the outcomes of reforms against their original goals than against newly defined ones.
- Intervention to reverse previous structural reforms is likely to have long-term ramifications: any future government wishing to pursue reform may find it cannot credibly commit to non-interference.
- New Zealand's experience points to an inherent conflict between financial and political goals for rail. Structural reform is unlikely to resolve such conflicts.
- Reforms designed to create competition within a sector may not be necessary (or even desirable) if the sector faces effective competition in its product markets.
- Some economic problems may be too large to be 'fixed' by structural reform. It may be necessary to recast the problem in a wider context.
- The mere existence of externalities is insufficient cause for specific government interventions. Externalities need to be quantified, and if material, a least-cost approach should be adopted for their mitigation. The least-cost approach identified may be cross-sectoral or even focused on other sectors entirely.

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Chapter 11

RAIL TRANSPORT IN CHILE

Raimundo Soto[1]

- Extensive reform was completed in the rail sector in Chile and different models were used, including full privatisation and concessions.
- Both types of reforms achieved significant efficiency and welfare gains and reforms have improved the industry operations, particularly in freight.
- Motivation for the reforms was to reduce subsidies: that issue remains, particularly in the passenger sector.

11.1 INTRODUCTION

Railways played a significant role in social life in Chile for almost a century. Between 1860 and 1950 railroads were an exemplar of modernisation, integration and economic development. By 1950, however, the industry had started to decline, unable to compete with more efficient means of transportation (buses and trucks). By the mid 1970s railroads were bankrupt, surviving through government subsidies. Two decades later, passenger services had almost disappeared (accounting for less than 1% of total traffic). Freight operations, on the contrary, had been privatised and revitalised, and concentrated on small profitable market niches usually in remote areas of the economy (Thompson & Angerstein 1997).

This paper reviews the Chilean case and analyzes the current standing and operations of the industry, focusing on the reforms, public sector involvement, regulation, market entry, vertical integration, externalities and political factors. The Chilean economy underwent a massive restructuring in the mid 1970s. This included opening to foreign trade, complete market deregulation, inflation control, macroeconomic stabilisation and, most importantly for our study, a complete reallocation of government subsidies. In this economic turnaround, despite the waste and inefficiency associated with the publicly-owned railroad monopoly, no specific reforms were devised for railroads. Fiscal reforms led to a substantial reduction in subsidies to the sector which, in turn, prompted managers to change operations, eliminate redundancies and inefficiencies, and divest assets to cut financial losses. The government did not consider a transition phase or compensation mechanisms for those negatively affected.

Perhaps uniquely, the Chilean reforms resulted in the coexistence of two different forms of private sector participation in freight operations: the privatisation of the entire Northern Railroad, including rolling stock and essential facilities (track, yards and terminals) without open-access clauses, and the contracting out or 'concessioning' of freight in the Southern Railroad to private carriers who pay a fee for the use of the track and terminals while sharing these essential facilities with the remains of the publicly-owned passenger-services company.

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Both systems have led to substantial increases in transportation volumes, rising labour productivity and declining tariffs. Consumers benefited from the reforms, which are now discussed in more detail. The first step, however, is a review of the circumstances in which the rail system operates.

11.2 CHILEAN GEOGRAPHY AND THE DEVELOPMENT OF RAILROADS

To a large extent, the development of railways depends on geography. Since their inception, entrepreneurs and government authorities looked at railroads as means to overcome isolation, improve connectivity, consolidate territorial integration and advance economic development. Historical and political events such as international conflicts have also shaped the development of railroads, not only in Chile but also in most economies (see Atack et al. 2009 and references therein for the United States of America, and Thompson & Angerstein 1997 for Chile). This section provides a brief summary of the geographical and historical events leading to the development of the Chilean railroad industry. Readers with more interest in the detail of the reform may move to Section 11.3.

Chile is a long and quite narrow economy (4300km from north to south; and an average width of 180km), sandwiched between the Pacific Ocean and the Andes Mountains. The northern half is dominated by the Atacama Desert, rich in minerals but sparsely populated. The southern half, in contrast, concentrates most of the population and economic activities (except mining).

In such a peculiar geographical environment, it would have been natural to expect railroads to play a crucial role in economic development and social life. Indeed, one longitudinal railroad track and a number of branches would service most of the population and economic enterprises, providing efficient and cheap transport services to the public and a reasonable profit for investors (Figure 11.1). That was the tenet of railroad managers and the Chilean governments for decades, but history proved otherwise.

Chile's first railroad track was laid in 1851 to transport silver from the mines in the north to the seaport of Caldera. Other tracks mushroomed in following years, but a railway system did not take shape until the 1870s (Alliende 2001). Private initiatives were initially supported with public funds, due to the insufficient development of Chilean financial markets and the lack of private capital. Dissatisfied with the slow pace of expansion, the government started to acquire private railroads in the 1880s and embarked on an ambitious investment program to connect all railways. From then on, the industry development was almost exclusively a public sector business.

Between 1870 and 1915 the government completed the Chilean railway system (Table 11.1). Massive investments in the northern railway were justified by the significant territorial expansion after the Nitrate War (1879–84) and were easily financed by taxes on nitrate exports. By 1915 some 3500km of tracks were laid and interconnected. These tracks were of metric gauge (1m). The southern railway expanded similarly, laying around 3800km of track, but of broad gauge (1.676m). By 1910 a publicly owned railroad linked Chile and Argentina (250km) using a cogged metric track and reaching altitudes of 3200m. Finally, by 1913, a publicly owned railroad linked Chile and North Bolivia (500km) and one private company linked Chile and South Bolivia (c. 1000km). These were the last investments in rail tracks until the 21st century.

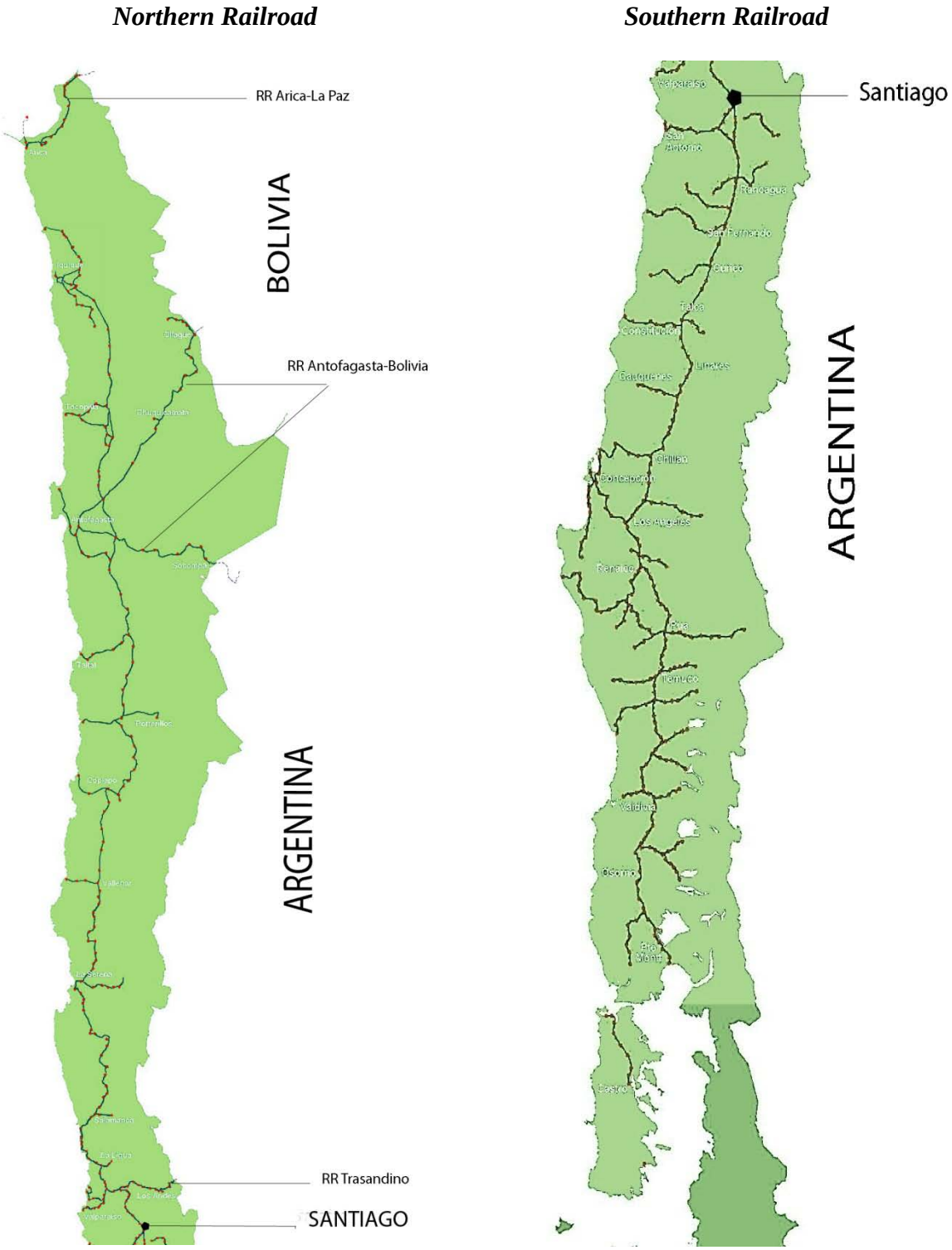

Figure 11.1: Main railroads in Chile.

By 1915 the main companies (Ferrocarril del Norte and Ferrocarril del Sur) were consolidated in one firm called EFE. It has been argued that there was never a railway system because the two railroads remained disconnected by their differences not only in track gauge but also in market and development strategies. Later, this tacit separation would play a decisive role in the shape of the reforms.

Table 11.1 Main railroads in Chile.

Name of company	Length (km)	Track gauge (m)	Completed	Current operational status
Ferrocarril del Sur	1254	1.676	1913	Passengers: operated by public firm Freight: private sector concessions
Ferrocarril del Norte	1867	1.000	1915	Passengers: discontinued in 1975 Freight: privatised in 1997
Ferrocarril Antofagasta-Bolivia	700	1.000	1888	Privately owned Transports freight and passengers
Ferrocarril Transandino	250	1.000	1910	Closed since 1984
Ferrocarril Arica-La Paz	204	1.435	1913	Privatised in 1996 Bankrupt and closed since 2005
Ferrocarril Potrerillos	155	1000	1928	Privately owned by mining operation (freight only)
Ferrocarril Tocopilla	124	1.067	1890	Privately owned by mining operation (freight only)
Ferrocarril de Huasco	100	1.000	1892	Privately owned by mining operation (freight only)
Ferrocarril de Romeral	38	1.000	1913	Privately owned by mining operation (freight only)

Source: Elaborated from work of Thompson & Angerstein (1997)

A report by the EFE directors notes the history of challenges of managing a publicly-owned firm, including political interference, financial mismanagement, lack of maintenance of tracks, buildings and rolling stock, the low quality human capital of its labour force and disregard for customer satisfaction (EFE, 2009). In contrast, the only private railroad with significant operations (Antofagasta–Bolivia) remained profitable and expanded its operations, despite continuous political turmoil between the two economies.

By the 1950s EFE began to feel the very strong competition from trucks and buses as a result of the extension of roads and paving. Continuous financial losses throughout the 1960s and to the mid 1970s led to a significant decline in quality service and massive injections of public funds to maintain operations. At the peak of its popularity in the 1950s EFE transported around 35% on average of the freight and passenger markets in which it operated. However, by the mid 1970s, the market share for both freight and passenger transport was in single digits. This declining market share contributed to the rising financial losses of the railway.

Table 11.2: Traffic operations by EFE.

	1960	1970	1980	1990	2000	2008
Passengers (millions)	26.4	21.1	9.4	8.8	9.5	10.0
Passenger*km (millions)	1,906	2,338	1,425	1,077	737	759
Freight (million tons)	13.0	19.0	16.7	19.1	22.0	27.2
Freight*km (millions)	1,952	2,532	1,942	2,804	3,134	4,292

Source: Based on *Anuarios de Transporte y Comunicaciones, Instituto Nacional de Estadísticas de Chile*

11.3 REFORMS IN CHILE'S RAILROAD INDUSTRY

As in most economies, the reforms to the Chilean railroad industry were not devised as a sector program but stemmed from macroeconomic and fiscal reforms initiated in the mid 1970s. As discussed in Thompson et al. (2001), a series of economic crises removed the government's ability to pay for losses in the railway. Railway reforms in Chile, however, predate those in Latin America, Africa and Europe by two decades. The economy-wide reform process included a vast array of measures aimed at deregulating the economy, achieving effective vertical and horizontal disintegration, opening all sectors to foreign

competition and foreign investment, allowing and encouraging private sector initiatives and restricting public sector activities to subsidiary initiatives (poverty alleviation, control of externalities, human capital formation and the like) (Larraín & Vergara 2000).

A significant goal of the Chilean reforms was the elimination of subsidies that could not be justified on social grounds. In this context the publicly-owned railroad monopoly was targeted for major restructuring. This did not include a transition phase or an adjustment plan. A second general goal of the reforms was to improve efficiency but in the case of the railroad, given the scale of the financial losses, efficiency was a secondary target (Thompson 2001).

As a result of the fiscal reforms, all direct subsidies were eliminated, leading to the closure of a substantial number of branch lines and layoffs of personnel (the rail labour force fell from 15 000 workers in 1978 to 7000 in 1981). Concurrently, the government deregulated the interurban passenger transport market and opened up imports of trucks and cars, thus increasing competition for EFE in both markets.

In order to cut subsidies, the government also required EFE to downsize operations. The Northern Railroad ceased all operations in 1975, its tracks as well as its rolling stock abandoned or sold to local private operators (see below). The Argentina–Chile Transandino Railroad ceased operations in 1984, the track was abandoned and covered by snow and mountain landslides. The publicly owned Chile–Bolivia Railroad remained in operation largely as a result of the provisions of the Peace Agreement after the Nitrate War, but it reduced activities to a minimum until it was privatised in 1997. By 2005 the Bolivian private company that acquired the railroad was bankrupt and its operations closed. The Southern Railroad continued to operate, but the government had to impose branch closures and layoffs and reduce frequencies to regain financial balance.

Despite the sizable government intervention, EFE did not become operationally profitable. The main longitudinal track of the Southern Railroad remained operative, yet financial and operative losses put continuous pressures on EFE and required further restructuring. More pressure came in the 1990s from the successful highway concession program that substantially improved the quality and availability of paved roads, thereby reducing costs for trucks and buses. Between 1988 and 1990 EFE sold the remains of the Northern Railroad that had been closed for around 15 years to a public holding that subsequently restructured the company and privatised it in 1996. Other EFE assets such as yards, buildings, crossings and even the ‘fiscal track’ (the land on which the railroad tracks are laid) were divested in order to raise funds for continuing operations. In spite of these adjustments, EFE still required major support: for example, in 1994 it transported around 9 million passengers (less than 10% of total interurban traffic) and 17 million tons of freight, earning around USD39 million. Total costs, however, reached around USD80 million of which the payroll amounted to USD42 million. The USD51 million deficit was subsidised by the government.

Studies undertaken by the government and EFE in the early 1990s concluded that a major legal restructuring of EFE was needed, that the freight business would be profitable if properly managed by private-sector carriers, and that passenger services were not profitable but could be provided as a social benefit by a restructured EFE.

The legal restructuring of EFE was required in order to increase its capabilities to undertake new business, reinforce internal control and professionalise its management. In 1993 the government passed a new legal charter for EFE allowing for vertical and horizontal disintegration. The separation of freight and passenger activities was completed when EFE

created a separate company – Ferrocarriles del Pacífico (FEPASA) – to handle its freight operations. In 1995 FEPASA was privatised through a joint venture of Chilean and foreign investors in which EFE retained a participation of 18%. According to the concession contract, FEPASA has the right to carry freight for 20 years, accessing and using EFE tracks for which it has to pay fixed and variable tolls. FEPASA, nevertheless, does not hold exclusivity in access to the tracks. A second private carrier – TRANSAP – also signed contracts with EFE and started freight operations in 2001. In 2009 these two private carriers transported around 11 million tons (equivalent to 3.6% of the total freight transport in southern Chile), in what has become a small yet profitable market. EFE had previously complained of unfair competition from trucks on the grounds that road tolls were too low to cover their marginal cost. The success of FEPASA and TRANSAP indicates the effect may be small.

The second major restructuring of EFE was the creation in 1995 of several subsidiaries to serve the passenger market according to those segments of the railroad system where it was deemed to be socially justified. Only one of these new companies succeeded financially, while the others required sizable subsidies to operate. EFE maintained passenger services at a loss as competition from buses dwarfed its market share: in 2008 only 9 million passengers were served by EFE, less than 1% of the total number of passengers transported in southern Chile.

The third change to EFE's structure was to allow its current operations to be managed as a private company while the government retained control of its major investment plans. In principle, EFE was to inform the government on current operations but was required to obtain approval for capital investments. In practice the company operated as an unregulated unit due to loopholes in the 1993 law, while negotiating directly with the presidency for capital appropriations. The management of the company improved steadily over time, but for political purposes constraints on providing services continued to be an issue.

Over 2005–08 EFE embarked on a USD1 billion investment project to restart passenger services in southern Chile with new and refurbished rolling stock, improved buildings and terminals and upgraded tracks. Contrary to Chile´s tradition, the government did not undertake the mandatory social evaluation of the project. The project did not succeed: no new services were implemented, the refurbished rolling stock did not operate, and new buildings and terminals await their opening. There are several ongoing legal inquiries to determine responsibilities.

EFE's financial position has deteriorated markedly. Operational losses in 2009 amounted to around USD65 million a year, or roughly USD3 per passenger. The losses are expected to increase to around USD100 million for years to come as a result of debt service. A World Bank study has found that EFE is losing money in every single business undertaking (World Bank 2007).

11.4 REGULATION AND PERFORMANCE OF CHILE'S RAILROAD INDUSTRY

This section reviews the rationale for government regulation in railroads and discusses the extent to which reforms and current regulations in Chile follow such rationale and how this, in turn, affects the performance of the Chilean industry.

11.4.1 The rationale for regulation in railroads

The fundamental rationale for government regulation in railroads is that infrastructure is almost inevitably a natural monopoly and is characterised by indivisibilities and economies of

scale and scope (ECMT 2005). Regulation becomes crucial when network industries are vertically separated and competition is introduced. There are, however, particular characteristics of railways in Chile that would affect regulation. Whilst there is a desire to promote competition – as a means of promoting cost-minimisation/productive efficiency and of fostering innovation and traffic growth – there is still a dominant publicly-owned operator and owner of the track, EFE. Therefore, the regulator's role in promoting competition is particularly important, not only in preventing exploitation of monopoly power but also in facilitating access to the infrastructure. In practice this means not only regulating charges and access conditions but also the process of timetabling and the allocation of paths for trains, and possibly access to other essential facilities such as depots and terminals.

A further crucial point about rail, that tends to make it different to most other regulated utilities, is that there is a *prima facie* case for subsidy in terms of economies of scale within the sector and in terms of the failure to charge appropriately on competing modes. For these and for other political reasons, European governments have typically intervened heavily in rail industry decisions, particularly in the passenger sector. However, there remain debates as to how much to subsidise the industry and whether to channel the subsidy into the infrastructure or the operations. In this situation, an essential role of the regulator may be to protect private entrants from arbitrary decisions by the government, for instance, in regard to the level of finance it will provide to the infrastructure manager and, therefore, the capacity and quality of the infrastructure over which the private operators run. This can create potential conflicts between the regulator and the government.

In considering the arguments for regulating the access charges of the rail industry, there are three roles that a regulator might perform: in preventing the monopoly infrastructure manager from exploiting its market power to the detriment of the public interest, in facilitating access to the infrastructure, in particular where the infrastructure manager is linked with one or more of the train operators, and in protecting the train operators from arbitrary decisions by the government regarding the level of finance it will provide to the infrastructure manager.

11.4.2 Railroad regulation in Chile

There is no railroad regulation in Chile beyond general security and environmental restrictions in the legal codes that apply to the transport sector (CITRA 2008). Until 1993 EFE – and implicitly the entire sector – operated under the 1931 Railway Transportation Law, even when most of its provisions only pertained to publicly-owned railways and were obsolete or in direct opposition to other more modern regulatory provisions. For example, the 1931 Law granted EFE the monopoly of railroad operations in Chile and restricted asset divestiture. In spite of this, EFE has privatised a substantial share of its activities, including all of the Northern Railroad. As mentioned, in 1993 EFE was given a new charter which changed it rights and obligations, but *de facto* the private and public sector continues to operate according to the 1931 Law, which is a slightly amended version of the 1925 Law. Among other unusual provisions, it requires free transporting of mail, free transporting of rolling stock from universities and the granting of free passes for authorities.

Likewise, there is no regulatory body in charge of railroad operations and no agency responsible for the strategic, long-term planning for the industry. Formally, the Ministry of Transport and Telecommunications is the industry authority (LIBRA 2007). But in practice it has never issued any significant regulation and its strategic planning activity comprises only a few, largely descriptive studies that do not relate directly to rail.

An historical explanation for the absence of regulation and regulatory agencies is the prevailing opinion that the publicly-owned monopoly would not require a regulatory body and that any regulation could be better channelled and implemented directly by EFE. In fact, over the years EFE has passed a series of internal regulations for its operations that became the norm for the few private-use railroads servicing mines and seaports in the north. However, this does not justify the lack of regulation after reforms and particularly after recent privatisations.

The 1993 Charter Act for EFE gave the company the capacity to undertake new businesses, divest assets, form joint ventures and disintegrate its operations vertically and horizontally. This, in practical terms, corresponds to a major change in regulation for the sector and certainly affected the operation of the entire industry.

The fact that this structural change was based in and affected mainly the public-sector indicates the nature of its limitations and the difficulties it poses for enacting much needed sector regulations (see below). In particular, the changes in the regulations channelled via the incumbent company used *ad hoc* procedures which increased regulatory risks and opened space for lobbying and capture.

11.4.3 Unregulated privatisation

Consider first the case of the Northern Railroad. In a competitive bid in 1995 FERRONOR acquired the complete railroad, i.e., tracks, rolling stock, fiscal land, buildings, terminals and other facilities. According to Chilean law, the bidding process did not discriminate between domestic and foreign firms, nor did it require licensing, quotas or any restriction on the participation of the private sector in the railroad industry. Nine companies participated in the auction of the Northern Railroad, including foreign companies (such as Spanish RENFE, American Railroad Development Corporation and British RAILTEX), large size Chilean companies (CAP and CSV) and consortiums formed for the sole purposes of participating in the auction. FERRONOR was owned initially by Chile's APCO (45%) and USA's Rail America (55%): APCO purchased Rail America's share in 2001.

As a result of the privatisation, the Northern Railroad now operates as an unregulated, vertically integrated enterprise. The privatisation process considered no provisions for preventing the infrastructure monopoly from exploiting their market power or for facilitating non-discriminatory access to essential facilities (i.e., the track), although the government required the winning company to undertake the maintenance of the entire track.

Since privatisation FERRONOR has concentrated its operations in a few segments of the market, eliminating small volume loads and general cargo and focusing on large operations (e.g., minerals and sulphuric acid) and long-term contracts. As noted by Thompson (1999), private-sector railway managers were not interested in carrying freight at rates equal to or below their marginal costs, and they expected all the traffic transported to at least help to finance fixed costs. Therefore, although the volumes transported have more than tripled with privatisation, some types of freight ceased to be transported by rail.

Table 11.3 provides information on the performance of FERRONOR after privatisation. There is evidence that the social benefits after privatisation may have been increased substantially. It can be seen that freight transport increased markedly for 2 years after privatisation, indicating that the privatised firm was able to restructure production towards more efficient use of resources. This is also indicated by the increase in physical labour

productivity: transport in tons*km per worker increased by around 200%. However, 4 years after privatisation physical labour productivity and transport volumes had not grown, while revenues continued to rise. This would indicate a restructuring of operations towards more profitable segments of the market, because tariff charges reduced after privatisation by around 36% (Thompson et al. 2001).

A key, but largely unexplored, issue is whether forcing FERRONOR to grant access to its essential facilities would change market conditions for entry and efficiency. A mostly descriptive study by LIBRA (2007) indicates that entry in the short run is unlikely for several reasons, even if full access were granted. Firstly, the market for large volumes and long-term contracts is restricted to current mining operations and is unlikely to expand significantly in the future. Secondly, competition from trucks in general freight is intense and benefits from the absence of tolls on roads and lax environmental regulations. Thirdly, the rail track beyond what is being used (17% total) is in poor condition and would require substantial investment to yield the high-quality/low-cost services required for trains to compete effectively with trucks.

Table 11.3: FERRONOR's operations after privatisation.

	1997	**1998**	**1999**	**2000**
Freight transported (,000 tons)	1,300	3,900	5,900	6,300
Total revenue (USD m)	7.9	15.3	21.0	23.7
Expenditures (USD m)	6.3	10.6	15.3	17.7
Productivity I (revenue per worker USD)	35,300	63,000	77,800	82,000
Productivity II (m ton*km/worker)	0.84	2.11	2.57	2.57

Source: Elaborated from The World Bank Railways Database

In addition, FERRONOR allows other carriers to use the track, charging an unregulated toll that is directly negotiated between the parties. In principle, the ownership of an essential facility such as the track would indicate that FERRONOR could exercise monopoly power. However, the consumers are large mining operations with substantial resources and the ability to present credible threats to the company. This may have counterbalanced the potential market power of FERRONOR, but certainly a regulated price could benefit small consumers unable to negotiate on equal footing with the company. But there have been no complaints to the Antitrust Commission against FERRONOR.

11.4.4 Regulated concessions

Consider, in contrast, the divestment of freight in the Southern Railroad. As indicated, EFE divested its freight operations by first creating a subsidiary FEPASA and then auctioning its concession to the private sector in 1995. Three companies bid for the 51% of FEPASA: Consorcio del Pacífico S.A., Compañía de Transportes Ferroviarios S.A. and Cruz Blanca S.A. The last named won with an offer of around USD30 million. The remaining 49% of the property was to remain in the hands of EFE (which expected annual dividends of around USD15 million), but it later sold an additional 30% of its participation to IFC and Latin American railway investors. A second private carrier – TRANSAP – entered the market in 2001. Concessions consist of non-exclusive 20-year contracts that allow free entry of carriers to facilities and require the payment of fixed and variable tariffs for the use of the infrastructure. The track remained in the hands of the government and, consequently, EFE is required to provide maintenance for the tracks and facilities, and to the path, and to schedule services.

Following the trend in railroad reforms elsewhere, EFE concessions provided some elements of vertical disintegration and attempted to generate competition among carriers. As noted by Pietrantonio and Pelkmans (2004), vertical separation helps identify the true cost of running the railway and the eventual subsidy needed to allow safe and reliable infrastructure. Removing and preventing cross-subsidisation, in turn, creates fair conditions for potential entrants. Ideally, too, vertical separation helps reduce the asymmetries of information in the railway business, which is traditionally prone to hide cost structures and discourage performance.

Thompson et al. (2001) have calculated that FEPASA tariffs are around 40% lower than those prevailing before privatisation, thus indicating a substantial benefit to consumers. Nevertheless, it should be acknowledged that both private carriers in the Southern Railroad have operated in the same manner as FERRONOR in the Northern Railroad (i.e., by exploiting market niches rather than providing a full range of services to the general public). They have concentrated their business on the transport of bulk commodities in large volumes (paper pulp, iron ore etc.) and not in general freight, where competition from trucks is intense. This would indicate that the freight operations have benefited mostly from better management, but not necessarily by improving efficiency to the point of being competitive with trucks beyond their current level.

Table 11.4 presents data on the performance of FEPASA. The effects of the change in management can be seen: although traffic volumes did not increase in the initial years after privatisation, revenue and traffic per worker increased markedly. This slow beginning was the result of problems relating to labour and line rehabilitation. It was only after a decade of operations that traffic and revenue per worker expanded markedly, indicating the long-run development of the market. Note FEPASA's relatively low profit levels.

Table 11.4: FEPASA's operations after concessioning.

	1995	**1997**	**1999**	**2001**	**2009**
Freight transported (,000 tons)	4,333	3,981	4,810	5,395	7,100
Total revenue (USD m)	29.9	28.9	29.7	32.4	56.5
Expenditures (USD m)	26.0	24.8	32.2	32.4	53.0
Productivity I (revenue per worker USD)	57,700	68,800	68,000	64,800	114,342
Productivity II (m ton*km/worker)	1.52	1.73	2.31	2.61	2.69

Source: Elaborated from The World Bank Railways Database and FEPASA

The contract signed by FEPASA included the payment of a fixed fee to EFE for track maintenance and path and scheduling services. The subsequent entry of TRANSAP to the market indicates that this fixed payment was relatively low and did not deter entry. TRANSAP's entry was motivated by a change in sanitary and environmental regulations that prohibited truck transport of sulphuric acid through urban areas, thus leading a major mining operation to transfer the service to the private railway. In time, TRANSAP operations began to diversify which suggests that long-term contracts may be an important requirement to start operations as they guarantee the amortisation and recovery of fixed costs (typically in rolling stock and reputation) and lower risk.

Determining the fixed and variable fees is controversial. As noted by Pietrantonio and Pelkmans (2004) for the OECD, the adoption of marginal cost pricing is problematic on economic grounds. The drawbacks include arbitrary cost allocation rules in the presence of large economies of scope and relatively large common costs, a non-optimal incentive system and, possibly, the anti-competitive effects of two-part tariffs. EFE has complained of unfair competition from trucks as road tolls are too low to cover their marginal social cost and that

this, in turn, artificially lowers the demand for rail transport of freight. It has asked for a permanent subsidy of around USD0.1 per ton*km transported.

Concession contracts are usually subject to renegotiation. In the Chilean case legal disputes arose with regards to EFE's inability to upgrade (and even maintain) the quality of tracks as required by the original contracts. There have been, however, no complaints about the fixed and variable tolls that private carriers must pay for the use of the essential facility (tracks and other facilities).

11.4.5 Remnants of the past

EFE continues operating passenger services despite incurring heavy losses (USD65 million in 2009 as noted above). The market share in interurban transport continues to shrink and the quality of services is low in terms of comfort and frequency. Accidents are relatively frequent (at a rate 10 times higher than that in the USA) and costly: the social cost of accidents is estimated at around USD16 million in 2007 only (LIBRA 2008).

The continuing losses of EFE indicate that the original purpose of the reforms, namely, to avoid fiscal costs, has not been met, that subsidies continue to drain public resources and that a lack of safety leads to an increased social cost. Moreover, such losses negatively affect EFE's ability to raise funds for other important tasks such as the maintenance of the track and facilities and the upgrading of several railway components that have become bottlenecks for the operation of the system. These include expanding single to double tracks to eliminate traffic bottlenecks, improving communication systems and so on.

EFE's board of directors have acknowledged that, from a social point of view, only two of its passenger services (Metrotren and Merval) are justifiable since their financial losses are less than the estimated social value of the positive externalities derived from their operations (EFE 2009). Passenger services should be closed if they are not socially justifiable. The government, however, has been reluctant to undertake these measures and to bear the likely later political cost of closing down services. Decisions have been made in the opposite direction. As noted above, in 2003 EFE embarked on a USD1 billion investment project to restart passenger services. Likewise, despite a negative social evaluation of the project, a suburban train system was launched in 2005 in Concepción with an implicit subsidy of USD0.41 per km/passenger.

This indicates the value of isolating the management of EFE from political pressures. Currently, the Chilean president directly appoints EFE's chairman and board, thus adding the appearance of political considerations to the nomination and encouraging interest groups (e.g., regional authorities) to press for subsidised services. Measures aimed at higher levels of transparency, accountability and independence from political contingencies are an indispensible component of any successful reform proposal.

In addition, it would be advisable to separate passenger services from track operations. EFE's board has proposed creating a separate company to manage the railroad infrastructure, probably as a first step for further privatisation (EFE 2009). Independent observers have also suggested that subsidiaries should be created for the existing passenger services in order to make costs and resource allocation transparent. Alternatively, separating costs would provide sufficient information to undertake appropriate policy reforms, avoiding the coordination problems of having separate companies. Asmild et al. (2005) found that in 23 OECD economies there was a clear positive effect on operating efficiencies of the cost transparency following from accounting separation. But whether there is an additional benefit through complete separation or whether the potential coordination problems outweigh the benefits remains unanswered.

11.5 CONCLUSION

For almost a century, railroads in Chile were an exemplar of modernisation, integration and economic development. By the 1970s railroads were bankrupt, surviving on government subsidies. Reforms initiated in the 1990s managed to revitalise freight transport by transferring operations to the private sector, but passenger services virtually disappeared.

The process of this reform of the freight industry provides examples of different types of reform: unregulated vertically integrated privatisation and a regulated, vertically disintegrated concession with public control of the essential facilities. Neither of these reforms was designed to optimise the working of the industry, nor do they fit in an integrated transport regulated system. They stem from the government´s desire to cut financial losses and to avoid political damage in running a bankrupt system. Reforms were made to a large extent on an *ad hoc* basis. Nevertheless, they complied with the standard Chilean norm of divesting publicly-held assets using competitive, non-discriminatory and largely transparent bidding processes.

Both reformed sectors achieved significant efficiency and welfare gains and, in this sense, reforms have improved the industry's operations. Nevertheless, as the starting point was quite low, it made it easier to achieve such gains. The question remains of whether alternative divestiture procedures would have achieved better results.

In particular, the privatisation of the vertically integrated Northern Railroad without provisions for open access to essential facilities, such as the track, yards and terminals, raises the question of potential market power on the part of the incumbent. Declining tariffs and the absence of complaints indicates that potential monopoly power may have been counterbalanced by the large economic size of the mining operations that are the main customers of the railroad.

In contrast, freight concessions in the Southern Railroad using long-term contracts seem to have bridged the open access issue successfully, but have not been able to provide an effective solution to managing the essential facility by the incumbent. While usage fees may provide for maintenance and system improvements, resources have been used to cover losses in passenger transport, a segment of the industry with no competitive advantages and apparently destined to disappear in the long run.

Reforms were dictated by fiscal balance reasons rather than aiming at improving the working of the railroad industry for consumers or with a strategic vision of the future needs of the transport sector. Consequently, reforms fell short of providing a more complete and efficient regulatory framework for the industry, in particular with regards to regulation in several areas. Four issues remain:

- Reforms reduced but did not stop the losses of the incumbent public firm in passenger transport. Subsidies continue to consume public resources.
- The losses negatively affect EFE's ability to undertake important tasks such as the maintenance of the track and facilities and the upgrading of those components that have become bottlenecks for the operation of the system.
- The reforms did not provide for an adequate institutional setting capable of isolating the management of EFE from political pressures. Likewise it did not increase transparency.
- The absence of a transport authority capable of integrating externalities, security considerations and environmental issues unnecessarily complicates the operation of the railroads.

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Chapter 12

ROAD TRANSPORT IN THAILAND

Narong Pomlaktong, Rattana Jongwilaiwan, Prakai Theerawattanakul and Rapee Pholpanich[1]

- Regulatory constraints on regular bus prices encouraged the entry of new competitors in a less regulated part of the market, offering more choice to consumers.
- Relaxation of quotas as well as infrastructure improvements led to lower prices and higher volumes of cross border road freight.
- Road transport reform raises significant issues of coordination across agencies.

12.1 INTRODUCTION

There are many challenges in road transport policy development in Thailand. Many of the important issues are related to the population in Bangkok. Its size has made it difficult to create a well-designed urban public transportation system that meets the needs of the entire population. Other current domestic road transport issues include too great a focus on mega-projects in urban areas and their associated infrastructure without considering the development of secondary roads, regulation in the market for passenger vans and price distortions such as lack of congestion and pollution charges. Thailand is also working with other economies in the South East Asian region to liberalise cross-border transport and to improve the transportation corridors which link their markets.

Transport policy in Thailand has developed in concert with urban development planning. The first four development plans by the National Economic and Social Development Board (NESDB plans) from 1963 to 1981 aimed at accelerating economic growth by emphasising utility infrastructure development, including electricity, water, transport, educational institutions and public health. Besides this, the plans focused on export-led and import-substitution industrialisation. The government, therefore, allocated a large amount of its budget to transport, energy and irrigation. The government invested highly in substantial projects such as the construction of dams, water-operated power plants and transport to connect the main provinces of the economy.

Beginning with an outline of the context of Bangkok, the current issues and recent developments in passenger transport, freight transport and cross-border movements are reviewed in this chapter.

12.2 THE ROLE OF BANGKOK

The Bangkok metropolitan population is almost 8 times as large as the second largest city in Thailand (Table 12.1). Bangkok has become not only the capital city but also the centre of political, financial and business activities. It is estimated that the population of Bangkok and its

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nearby provinces will reach 13.6 million (over 19% of Thailand's population) by 2017 (Table 12.2). There are two major consequences:

- Bangkok has become crowded due to the rising number of rural-urban migrants, leading to problems with housing shortages, a lack of basic infrastructure and impact on the public health service; and
- The land price in Bangkok has been soaring due to urban development and speculation.

Table 12.1: The population of Bangkok, Bangkok Metropolitan Area and Chiang Mai, 2003–08.

Provinces	2003	2004	2005	2006	2007	2008
Bangkok	5,844,607	5,634,132	5,658,953	5,695,956	5,716,248	5,710,883
Bangkok Metropolitan Area[1]	8,554,751	8,395,838	8,524,158	9,930,634	10,065,126	10,161,694
Chiang Mai	1,603,220	1,630,769	1,650,009	1,661,020	1,664,399	1,670,317

Source: Department of Provincial Administration 2010.
[1] Bangkok Metropolitan Area is primarily Bangkok, Samut Prakarn, Nontha Buri and Pathum Thani provinces.

Table 12.2: Forecast population growth in Bangkok and nearby provinces.

Area	Population (persons)		Growth rate (% per annum)
	2003	2017	
Bangkok (Bangkok Metropolitan Area)	6,502,000	8,066,000	1.6
Nearby provinces			
Samut Prakarn	1,025,000	1,347,000	2.0
Nontha Buri	906,000	1,346,000	2.9
Nakhon Pathom	800,000	1,007,000	1.7
Phatum Thani	702,000	1,211,000	4.0
Samut Sakhon	446,000	592,000	2.0
Bangkok Metropolitan Region	10,381,000	13,569,000	1.9
Thailand	63,665,000	70,016,000	0.7

Source: World Bank 2007.

As a result of the rising land price, rural migrants and the poor live in densely settled and run-down areas, which have turned into slum communities, and many people live in areas where the land price is lower than the urban area. This, in turn, creates pressure for public transport services. The residents have to commute from the suburbs to Bangkok, thus contributing to traffic congestion in Bangkok.

Accordingly, the government has implemented a passenger transport policy with the goal of universal service to keep the public transport between the city and outer Bangkok at a low cost. This has led to poor quality public transport. The middle class then prefer to use old cars or motorcycles. Cars and motorcycles are more prevalent than other vehicles in Bangkok: they account for approximately 75% of the total vehicles used (Table 12.3).

The increase in the use of passenger vehicles has led to more traffic congestion and to air and noise pollution problems. The development of roads has also brought extensive negative social impacts. For example, the deterioration of urban areas, the rise in slum areas, an increase in ineffective land use and environmental impacts (such as encroachment on forest areas, carbon dioxide emissions, massive energy consumption and water pollution). Furthermore, the increase in the number of roads and traffic has affected the rates of deaths and accidents from vehicles in Thailand.[2]

[2] The accident rate declined from 1997 as a result of road improvements (e.g., separated and wider road lanes). But the 1998–2007 death toll was about 127 296 people (average of 12 729 per year). In 2007 the economic and social cost of road accidents to the nation was THB232 855 million (USD7216 million). This was equivalent to 2.81% of the economy's GDP (DOH 2007). Some 1.5 million road crashes occur annually, resulting in about 9000 disabilities, 210 000 serious injuries and 750 000 slight injuries. The fatality rate on Thailand's roads is about six times that of Japan and Great Britain's (OECD database).

Table 12.3: The number of in-use vehicles in Bangkok, 1994–2010.

Type of vehicle	1994	2003	2010	Average annual growth (%)	2010	
					Share of fleet in Bangkok (BMA)	Bangkok fleet as % of Thailand's
Car	716,951	1,162704	1,203,764	3.77	36.14%	53.59%
Microbus & passenger van	241,120	149,613	104,703	-5.78	3.14%	50.35%
Van & pick up	245,942	583,045	522,511	5.53	15.69%	20.44%
Urban taxi	22,256	63,228	49,224	5.83	1.48%	98.90%
Motor tricycle taxi (Tuk Tuk)	3,645	7,394	4,876	2.10	0.15%	41.94%
Motorcycle	851,853	857,460	1,299,637	3.06	39.02%	14.46%
Truck	73,145	75,800	61,732	-1.20	1.85%	14.39%
Bus	17,457	26,225	18,831	0.54	0.57%	27.26%
Other	13,220	11,248	65,298	12.09	1.96%	27.30%
Total	2,185,229	2,936,717	3,330,616	3.06	100.00%	22.51%

Sources: World Bank 2007, Department of Land Transport, Land Transport Promotion Center 2010.

Due to the increased population and housing density in Bangkok (such as at the Bangkok port), the government launched an extended industrial estate policy, which has resulted in more extensive urbanisation and more sprawl. During three NESDB plans (1982–96), the government implemented a decentralisation policy and invested heavily in projects such as the Eastern Seaboard Project which consists of the Laem Chabang Deep Sea Port, Map Ta Phut Industrial Estate and the Northern Region Industrial Estate. Although the plans focused on investment in public infrastructure in Bangkok's outskirts, the development also extended to central and eastern regions; but Bangkok and its vicinity was still the centre of development.

With sound economic growth, a rising population and changing lifestyles resulting in increasing demand for goods and services, the urban areas attract the modern retailers, including the 'mega markets' (47 of Thailand's 166 – 28.3% – are located in Bangkok.). The entry of these modern businesses had a mixed effect on traffic issues. On the one hand there is greater traffic congestion due to their location within inner Bangkok and other large cities of Thailand. On the other hand they brought innovative urban freight logistics management. Regarding the urban logistics management, the foreign modern retail businesses use information and communications technologies to improve the flow of their supply chains and optimise them by reducing the number of warehouses, centralising inventories and consolidating deliveries through a distribution centre or so-called 'hub and spoke' transport. The freight consolidation approach will lessen the number of vehicles and their trips by using bigger and fewer trucks, reducing the traffic at loading areas, reducing the supply chain cost, optimising inventory management as well as contributing to the improvement in air and noise quality and pollution in the city centre.

12.3 CHARACTERISTICS OF THE ROAD TRANSPORT INDUSTRY

For the past 20 years the Thai government has been investing heavily in a road network system. Road transport has become the most significant sector of the economy, despite its inefficiency in terms of energy consumption. The government's policy is to encourage this development, since it may lead to the development of land use and its surrounding estates, which will finally bring about the economic growth needed for many regions. Not surprisingly, today Thailand's transport sector of passengers and freight is dominated by road. Thailand's Department of Land Transport (DLT), a government agency under the

Ministry of Transport, is the main regulator for bus and truck transport. Established on 11 September 1941 (BE2484), the DLT is responsible for the systematisation and regulation of land transport by conducting the monitoring and inspection, which ensures the smooth running of and conformity with the relevant land transport rules and regulations.

12.3.1 Passenger transport

Passenger transport in Thailand consists primarily of personal vehicles, including cars, personal pick-ups and motorcycles. For passenger public transport there are four categories of fixed route (Table 12.4) and there are two government agencies that operate bus transport: the Transport Company Ltd and the Bangkok Mass Transit Authority (BMTA), both of which are government enterprises that have the government as the primary shareholder with 51% while private shareholders have 49%.

- The Transport Company Ltd is permitted to operate the routes of categories 2 and 3;
- The BMTA is permitted to operate the routes of categories 1 and 4 in Bangkok; and
- Private companies are entitled to operate the routes of categories 1 and 4 in the provinces, categories 1 and 4 in Bangkok and category 3.

The DLT is the government agency authorising public bus regulations:

- To supervise and control fixed-route buses to run on a fixed route and on the condition of picking up the passengers at specific locations according to a timetable, to collect bus fares at government-regulated rates and to stop at regulated bus terminals;
- To stipulate, improve and revoke the bus route and to renew/withdraw bus operation licences;
- To stipulate and improve the condition of vehicle operations, and the number and category of vehicles;
- To give the information of fixing the fare rate to the Central Land Transport Control Board for approval;
- To stipulate bus standards, to supervise the quality of the transport operators' service to passengers, to control bus safety (speed, duration of parking and the age of the bus), and to control and examine the operation of the transport operators, crew and vehicles; and
- To encourage and develop a system of mass transit by bus.

Regulating the passenger transport market is done by licensing conditions and pricing.[3]

[3] Fixed-route bus regulation in Thailand is implemented under Land Transport Act 1979 (BE2522) by having the Land Transport Policy Committee, Central Land Transport Control Board and Provincial Land Transport Control Board that have the authority to approve fixed-route buses. The Central Land Transport Control Board has the authority as follows: To stipulate the category of fixed-route bus; Fix the routes, the number of bus operators and the number of vehicles for fixed routes in Bangkok, between provinces and between economies; Fix the rates of transport charges and other service charges; Designate the sites, arrange for or set up and regulate the bus terminal; Specify the types or conditions of vehicles not acceptable for registration; Prescribe the classes or categories of vehicles which must stop or park for picking up and setting down the passengers or for loading and unloading goods at the bus terminal; To stipulate places for parking to pick up passengers; Lay down measures for prescribing, permitting and controlling transport business; Carry on other actions as provided in the Act and according to the regulations of the Land Transport Policy Committee. The Provincial Land Transport Control Board has the authority to: Fix bus routes, the number of transport operators and the number of vehicles in the provincial area; Fix the rates of transport charge in the provincial area (the same criteria as prescribed by the Central Land Transport Control Board); Carry out other actions as provided in the land transport regulation according to the Land Transport Policy Committee and the Central Land Transport Control Board.

Table 12.4: The operations of passenger bus transport services by government and private sectors.

Bus route category	Government and private operations	Maximum private equity permitted
Category 1 in Bangkok Has contiguous routes in the perimeter area by running on the main road in the community area which is crowded by people, business centre, school and university, government agency etc.	The BMTA has 89% (321 route licences) and allows private sub-contractors. The Premier Metro Bus Company operates 10% (35 routes). The Thonburi Bus Service Company Ltd 1% (4 routes)	The BMTA has the government's share (51%); the private share is (49%). The other two firms are 100% private equity.
Category 1 in provincial areas	Many private firms operate in the market under the licensing system.	100% private equity is permitted.
Category 2 Routes link Bangkok and the provinces.	The Transport Company Ltd has all licences and allows private sub-contractors.	The Transport Company Ltd has the government's share (51%); the private share is (49%).
Category 3 Interprovincial routes which link one province with another and may pass through other provinces	Many private firms operate in the market under the licensing system.	100% private equity is permitted.
Category 4 in Bangkok Route mainly on subordinate roads and the feeder roads to the main road to link with Category 1 in Bangkok	The BMTA operates 76% (113 routes) and allows private sub-contractors. Private firms operate 24% (36 routes).	100% private equity is permitted.
Category 4 in provincial areas Services the community (village, district and city) in the provinces.	Many private firms operate in the market under the licensing system.	100% private equity is permitted.

Source: TDRI 2010b.

12.3.1.1 Route licensing

Bus Route Category 1 in the provincial area is open for private company operation. Generally, the licence for a fixed route is THB7000 (USD217) and is valid for 7 years; for a non-fixed route it is valid for 5 years.[4] There is a 'one licence per one route' policy. Thus, each route is monopolised in the sense that once the operator is licensed to operate a route for 7 years, the licence will be renewed as long as the firm complies with the DLT's conditions. However, there is considerable competition for new route licences through a tendering procedure; a firm is able to apply for a licence to provide service for a fixed term. The firm that receives a licence usually will not operate the whole fleet but will sub-contract some of its operations to other operators without competitive tendering. Routes compete with each other (and some licences have a duplicated route section), which reduces the incentive for dynamic efficiency, introducing new technology or improving services to increase profit.

The situation is different in Bangkok where only three companies have licences for the 360 routes of Bus Route Category 1. The BMTA is entitled to operate 321 routes, the Premier Metro Bus Company Ltd has 35 concessional routes and the Thonburi Bus Service Company Ltd is the airport express bus service provider with four downtown routes.

The Transport Company Ltd, a government-owned enterprise, is entitled to provide services for all Category 2 routes, and private companies are allowed to be sub-contract operators of the Transport Company. BMTA can also sub-contract its routes to private operators. The

[4] A non-fixed route bus is a 'for hire' vehicle such as a taxi. The DLT only regulates the licence of drivers and vehicle standards. There is no regulation on entry to the taxi market.

companies collect a royalty fee which can be used to subsidise their loss-making routes. The royalty fee collected by the Transport Company is sufficient to subsidise its loss-making routes, which enables the government to maintain universal services. The royalty fee collected by the BMTA is inadequate for its loss-making operations: the sub-contractor pays the BMTA THB200–300/vehicle/day (USD6.2–9.2) and THB100–150/vehicle/day (USD3.06–4.60) for air-conditioned buses and non air-conditioned buses respectively. Therefore, the government has to subsidise the BMTA by loan guarantees (Table 12.5).

Table 12.5: Characteristics of the passenger transport industry.

Bus route category	Characteristics of competition
Category 1 in Bangkok	Concessions are granted to three operators. The government-owned BMTA is entitled to grant sub-contracts to private companies and collect the royalty fee. The passenger van is the new mode which serves the niche market.
Category 1 in provincial areas	'One licence per one route' policy is implemented. The firms which receive the licence are able to sub-contract to small-scale operators. The market is highly competitive between overlapping route operators.
Category 2	Only the government-owned Transport Company Ltd is entitled to provide services for all routes, to sub-contract to private companies and to collect the royalty fee. The passenger van is the new mode which serves the niche market.
Category 3	'One licence per one route' policy is implemented, which is a monopoly. The firms which receive the licence are able to sub-contract to small-scale operators. The market is highly competitive between overlapping route operators. The passenger van is the new competitor in this category.
Category 4 in Bangkok	'One licence per one route' policy is implemented, which is a monopoly. The firms which receive the licence are able to sub-contract to small-scale operators. The market is highly competitive between overlapping route operators.
Category 4 in provincial areas	'One licence per one route' policy is implemented. The firms which receive the licence are able to sub-contract to small-scale operators. The market is highly competitive between overlapping route operators. The passenger van is the new mode which serves the niche market.

Under this licensing and sub-contracting system, there are approximately 1256 companies (all but the BMTA and the Transport Company are private companies). The majority of the bus companies are small and family-owned firms: only 0.1% of the private companies have more than 50 buses, around 8% have between 2 and 48 buses, and around 92% own only 1 bus (National Statistical Office and TDRI survey). The BMTA and the Transport Company have the biggest market shares (21.02% and 13.77% respectively) followed by four private firms (Cherd Chai Motor 5.06%, Nakornchai Air 2.11%, Thep Sombat 1.74% and Bangkok Transport Company 1.29%). The market share of these six operators accounts for 45% of the sector. Other companies shared the rest of the market (Table 12.6).

12.3.1.2 Bus fare regulation

The public bus fare is regulated by the Land Transport Committee, the Land Transport Policy Committee, the Central Land Transport Control Board and the Provincial Land Transport Control Board (Table 12.7). Prices are based on a cost-plus formula, including a target rate of return and an allowance for an expected load factor. The fare rate (baht/km) is adjusted according to a change in the diesel price with 25 steps ranging between THB10.07 and THB40.57: for example, if the diesel price increases from THB28/L to THB30/L, the 17th fare rate (THB0.56/km) is used to multiply the actual operating vehicle kilometres to provide a new fare for travelling on that section. However, any increase in bus fares is a sensitive political issue in which the final decision is made by the Cabinet (Meakin 2005).

Table 12.6: Characteristics of the largest passenger transport firms in terms of revenue, 2007.

Firm	Year established	Government equity (%)	Domestic private equity (%)	Foreign equity (%)	Market share of total revenue (%)
Bangkok Mass Transit Authority[1]	1976	51	49	–	21.02
Transport Company Ltd	1930	51	49	–	13.77
Cherd Chai Motors Sales Company Ltd	1980	–	100	–	5.06
Nakornchai Air Company Ltd	1986	–	100	–	2.11
Thep Sombat Company Ltd	1978	–	100	–	1.74
Bangkok Transport Company Ltd	1984	–	100	–	1.29
Others (1250 registered firms)					55

Source: Based on Department of Business Development 2010 and survey data by TDRI (accessed on 2 March 2010).

[1] The Bangkok Mass Transit Authority was established by Royal Decree BE2519 in August 1976.

Table 12.7: Public bus pricing.

Bus route category	Pricing
Category 1 in Bangkok **Category 4 in Bangkok**	The Central Land Transport Control Board regulates the price based on the calculation of the cost/person/trip plus a 15% margin (excluding labour and fuel costs) and fluctuates according to the oil price.
Category 1 in provincial areas **Category 4 in provincial areas**	The Provincial Land Transport Control Board regulates the price based on the guidelines set by the Central Land Transport Control Board. The price differentiation depends on the cost of operation in each province. The calculation of margin is based on Minimum Retail Rate (MRR) plus 5% (i.e., MRR =13 +5, margin =18%). Price adjustment is used to cope with the oil price fluctuation and is tabulated in 25 steps. Yet the real price adjustment is subject to negotiation between the DLT and bus operators rather than being adjusted automatically.
Category 2 **Category 3**	The Central Land Transport Control Board regulates the price adjustment according to the fuel price. The price differentiation depends on the cost of operation in each province. The calculation of margin is based on MRR plus 5% (i.e., MRR =13 +5, margin =18%). Price adjustment is used to cope with the oil price fluctuation and is tabulated in 25 steps. Yet the real price adjustment is subject to negotiation between the DLT and bus operators rather than being adjusted automatically.

Source: TDRI 2010b.

The bus fare calculation is based on the assumptions of a maximum of 7 years of vehicle use and a 70–90% load factor depending on the bus standard. In fact, this cost plus pricing does not take into account the addition to capacity and changes in load factor due to the issuing of new licences and the entry of passenger vans (see below). Therefore, regulated bus operations generally have a lower load factor and thus a lower margin of profit than the DLT's assumptions. The bus operators, therefore, have less incentive to invest in their services and the fare regulation process contributes to falling quality. Not only does quality suffer, but maintenance and replacement do also. Nor can prices respond to demand shifts in the market: as the population increases, the gap between the quantity supplied and that demanded at the regulated price widens. This provides an incentive for the growth of an unregulated or 'illegal' sector (see below).

12.3.1.3 Van transport

Public bus provision was unable to meet the demand for bus services in suburban residential areas. The BMTA could not provide adequate convenient and comfortable services for those commuters who travelled from suburbs to work in the city. Leopairojna and Hanaoka (2006) explain that passenger van services were started by investors who saw benefits in responding to the needs of commuters in suburban Bangkok. The number of vans grew steadily from the mid 1980s to 1996. However, these vans operated outside the regulatory system and were technically illegal. In 1984 the DLT promulgated that operating vans as bus-like services was illegal, and the Ministry of Transport had a policy to eliminate the van services in 1986.

Van operators can charge fares that cover their costs. These fares are usually higher than those of the regulated companies (see below). They also offer a different service quality (Table 12.8). Illegal vans provide alternative services on the profit-making routes. They offer shorter, faster routes with guaranteed seats and a door-to-door service. They are supposed to operate between passenger van terminals (in housing estates, markets or community centres) and they are not supposed to pick up passengers at bus stops (although in practice they do so). Although passenger van operations cause lower revenues for the normal bus services and the drivers were often criticised as reckless and undisciplined, they can bridge the gap between the lack of public air-conditioned buses and the increasing demands of Bangkok-vicinity commuters. Leopairojna and Hanaoka (2006) found that passengers who travelled by van valued the shorter travel times and comfort from a guaranteed seat. The downsides according to those who travelled by bus were the narrower space and the higher fares.

Table 12.8: Advantages of vans over buses by category.

Bus route category	Advantages of vans over buses
Category 1 in Bangkok Has contiguous routes in the perimeter area by running on the main road in the community area which is crowded by people, business centre, school and university, government agency etc.	Passenger vans have to pick up passengers only at origins and drop off them at bus stops along routes or at destinations. In fact, they undercut the bus operators since they operate on more profitable route (cutting routes), pick up and drop off passenger at the bus stops, residential areas, markets, community (more like a door-to-door service).
Category 2 Routes link Bangkok and the provinces. **Category 3** Interprovincial routes which link one province with another and may pass through other provinces.	Buses of the Transport Company Ltd and its sub-contractors are required to pick up passengers at official bus terminals (only one or few terminals in a province). However, passenger van terminals are usually located in residential areas (in housing estates, markets or community centres) which are not proclaimed officially. They also provide door-to-door service by charging extra, which is actually prohibited.

Leopairojna and Hanaoka (2006) also report average trip lengths for the vans were less than for buses. They say that the gap between van fares and bus fares increased with trip length. Bus fares tend to be flatter over long distances, so competition from vans on shorter routes undermined the ability of buses to cross-subsidise longer routes (to cater for low-income households living further from the city centre) from shorter ones. The study reports that the incumbent operators such as BMTA and its sub-contractors complained to the DLT. They identify research that showed a link between these complaints and the new policy on vans introduced in 1999. At that time, only BMTA was granted licences to operate passenger van services, but it was able to sub-contract this work to van drivers. The licences were allocated on the existing routes of the vans between important locations in the city and suburbs with distances of 8–56km. The services had to comply with DLT standards, have insurance for

passengers and pay fees to BMTA. Maximum fares were also regulated. The quota of legal vans was set according to the number of van drivers who applied for a BMTA sub-contract and then was adjusted according to passenger demand. The van service was established originally by investors who constructed the van terminals and set up the services. Establishing the terminals required the 'support from influential figures (who were) paid … in return' (Leopairojna & Hanaoka 2006, p. 6). According to some passenger van operators, the drivers made an unofficial payment to the police who enforce the transport laws. The van drivers also had to be 'members' of the terminals for which they paid a membership fee. They report that in 1998 these fees were THB100 000 for entry and THB4000/month. After the vans were legalised the fees rose to THB250 000 and THB5000/month. This may reflect the expectation that the legalisation process might actually make it more difficult to enter the market.

Although the van fare in the Bangkok Metropolitan Region is more expensive than for the air-conditioned buses (Table 12.9), the number of legal vans has increased from a few hundred in 1995 to 5555 in 2004 and 6582 in 2008 (Table 12.10). However, illegal vans continue to operate. They do not have to comply with the DLT's conditions and can operate on disallowed (profit-making) routes in peak hour, for example. Furthermore, they can charge more for offering extra services such as door-to-door and dropping passengers off in small Soi (lanes). Economies in vehicle size in passenger transport are also argued to be not significant (Gwilliam 2008). Leopairojna and Hanaoka (2006) report that a Senatorial Subcommittee found there were 8000–9000 vans in Bangkok in 2001.

Table 12.9: Characteristics of urban public transport modes in the Bangkok Metropolitan Region (Bus Route Category 1), September 2008.

Transport mode	Fare (THB/ride)
1. Non air-conditioned bus	7
2. Air-conditioned bus	Regular Bus: 11–19 Euro I and Euro II: 12–24
3. Micro bus	20–40
4. Mini bus (Non air-conditioned)	6.50
5. Van (legal)	10–45

Source: Department of Land Transport, Land Transport Promotion Center 2010.

Table 12.10: The number of passenger vans in the Bangkok Metropolitan Region (Bus Route Category 1).

	Before legalisation	After legalisation		
Year	**1995**	**1999–2002**	**2004**	**2008**[3]
Quota Limit	n.a.	4,789–8,505 (115 routes)	3,964–5,574 (144 routes)	6,950 (127 routes)
Legal Vans[1]	Approx. 300	5,566	5,555	6,582
Illegal Vans[2]		unknown	3,690	unknown

Source: [1]Leopairojna & Hanaoka 2006; [2]APEIS 2004; [3]Bangkok Mass Transit Authority 2010.

In 2009 the DLT legalised another 6400 passenger vans to provide services on 60 routes from Bangkok to other provinces (Bus Route Category 2). According to the DLT regulation, Van Route Categories 2 and 3 offer the same price as normal air-conditioned buses for the same section. However, passengers are willing to pay extra because the vans' smaller size means they can provide a door-to-door service. Vans have pick up/drop off points in city centres while the large buses (Bus Route Categories 2 and 3) must stop at the regulated bus terminals.

The legalisation of passenger vans is a good lesson in basing regulatory reform on market-driven demand. Since the existing regulation did not meet the demand of the market, there was a gap between the demand and the legal bus services (supply). This gap has been filled by the

entry of illegal vans to the market. The DLT, therefore, has a policy to legalise illegal vans' operation. However, a large number of vans apparently continue to operate illegally which affects the number of passengers on a legal route, particularly air-conditioned bus routes, and the ability of the bus system to meet its service obligations.

12.3.2 Freight transport

Truck transport dominates the freight transport industry in Thailand. More than 80% of freight is transported by trucks, with 2% of cargo moved by rail (427.5 and 11.5 million tonnes out of the total freight quantity of 507.7 million tonnes respectively). The rest is split among inland waterway, coastal and air transport (Figures 12.1–2). At present Thailand's freight transport services exhibit some undue inefficiencies, including aged fleets of trucks with low load limits and low fuel efficiency, low penetration of multi-modal logistics providers, limited capital for new investment by small firms and limited use of Electronic Data Interchange for facilitating shipment and delivery and supply chain management (World Bank and NESDB 2009).

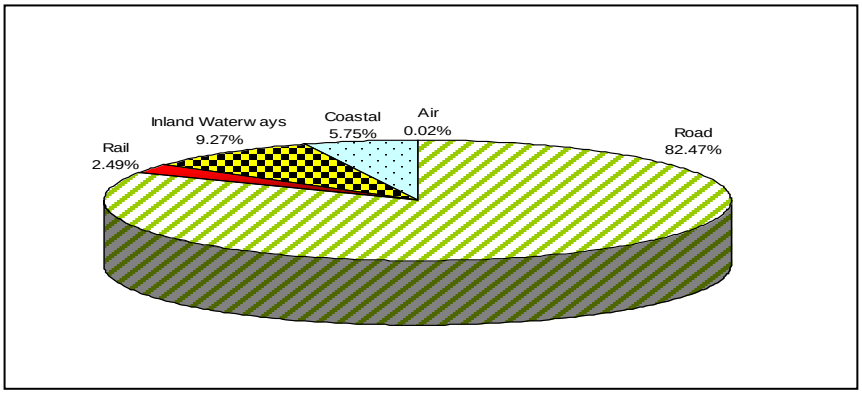


Figure 12.1: The modal share in freight transport in 2008 (tonne). (Source: Ministry of Transport 2010)

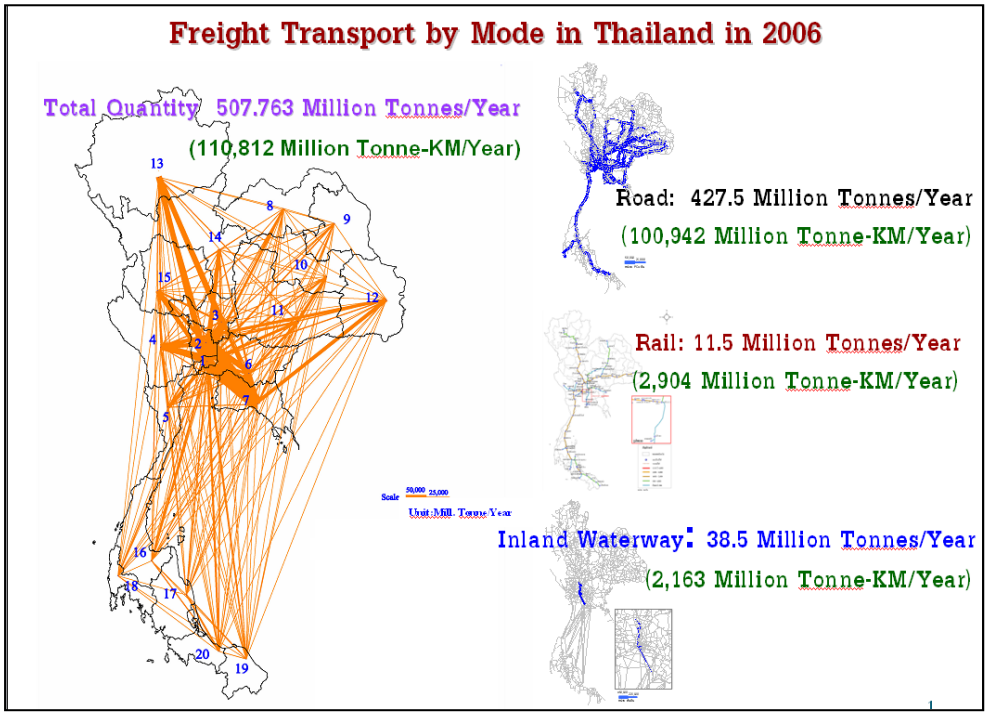


Figure 12.2: Freight transport split by mode, 2006. (Source: Ministry of Transport 2010)

Freight transport is a free competitive market without price regulation. The DLT only regulates vehicle standards through licensing conditions, with very simple requirements. The licence for a fixed route costs THB2500 (USD77.4) and is valid for 5 years. A new domestic entrant must present the Contract of Carriage and vehicles must comply with the DLT standard.

In the past the Express Transportation Organization of Thailand (ETO), a government enterprise, was the largest freight firm with the largest transport network and the most extensive route coverage. Private firms used the ETO price as the reference and adjusted their price according to the ETO price fluctuation. However, the ETO was closed down in 2006 due to its inefficient operation and the financial burden it created.

Private ownership in the provision of services is allowed for 100% of private equity. Foreign firms are allowed up to 49% of equity for passenger transport firms but must be registered under Thai laws according to the Foreign Business Act AD 1999.

In terms of the market share, SCG Logistics and Thai Beverage Recycle, who are own account operators, are now top of the freight transport market share. The former is ranked in the high revenue group while the latter is in the upper middle revenue group. In the lower middle revenue group are NYK Logistics, SSO Transport Company, Hatyai Kor-Chaisang and Linfox Transport. The majority of truck companies are small to medium firms which are in the low revenue group (Table 12.11).

Table 12.11: Characteristics of the six largest freight transport firms in terms of revenue, 2007.

Firm	Year established	Government equity (%)	Domestic private equity (%)	Foreign equity (%)	Market size of total revenue (%)
SCG Logistics Management Company Ltd	1990	–	100	–	High revenue
Thai Beverage Recycle Company Ltd	1986	–	100	–	Upper middle revenue
NYK Logistics Thailand Company Ltd	1969	–	61.84	38.16	Lower middle revenue
S.S.O. Transport Company Ltd	1989	–	100	–	
Hatyai Kor-Chaisang Partnership Ltd	1984	–	100	–	
Linfox Transport (Thailand) Company Ltd	1993	–	100	–	
Other 3807 operators					Low revenue

Source: Calculated on Department of Business Development 2010 and survey data by TDRI (accessed on 2 March 2010).

Note: Due to data limitations, the market size of truck operators cannot be calculated exactly. However, we grouped the truck operators with respect to the revenue into four intervals based on the Bank of Thailand exchange rate of 2007: low revenue, < USD57.8 million; lower middle revenue, USD57.8–115.7 million; upper middle revenue, USD115.7–173.5 million; high revenue, > USD231.4 million.

Based on DLT data, there were 3668 truck transport operators and truck rental operators in 2007. The total number of trucks then registered for transport companies was 135 996 while the number of privately owned trucks was 611 739 (DLT 2009). Besides, there were 3813 registered road freight transport operators based on Department of Business Development (2010) data. The majority of the truck operations are not cost-efficient since there is a high cost per kilometre and economy of scale is lacking.

The freight transport industry in Thailand has also been affected by the liberalisation of retail trade services in 1997. The modern trade businesses have dominated the domestic consumer goods freight by using efficient supply chain management and sub-contracting the transport function to a local haulage company. Being transport operators only, Thai freight firms gain a small profit margin and cannot develop their capacity to compete in the logistics and supply chain management market.

The road freight transport market by truck is highly competitive among small operators. Competition forces operators to carry overweight loads and, without incentives to do otherwise, use older and polluting truck fleets. This leads to the abrasion of roads, air pollution and a high accident rate. One response has been for the DLT and police to enforce the regulations on vehicle standards strictly. It is also important that road pricing reflect the externalities involved in road transport. Without that pricing, road transport would be greater and freight would be diverted from rail and inland waterways (when for some types of cargo those options would be more productive in terms of the use of fuel).

Road pricing is also debated in the context of the liberalisation of cross-border road transport. The absence of charges for access and externalities allows foreign vehicles to use the national road infrastructure free of charge while the cost is subsidised by taxpayers.

12.3.3. International road transport

Apart from the development of the domestic road transport network, globalisation has brought a demand for goods and services that requires improved infrastructure and more efficient transport systems as a precondition for economic development. Thailand, which has paid attention to the inter-city road transport linkages with neighbouring economies and sub-regional groups, recently has signed several agreements to facilitate cooperation in the road transport sector.

Currently, international road transport service is not open to competition. Cross-border transport between Thailand and neighbouring economies is allowed only between border cities (i.e., up to 7km from the borders). Cross-border transport must be operated under a bilateral agreement; for example, Thailand–Malaysia and Thailand–Lao (Box 12.1) or multilateral agreements such as the ASEAN Economic Cooperation Agreement and the ADB-Greater Mekong Sub-region Economic Cooperation Program (see below). The government regulates the international haulage by having an international haulage licence quota (except the cross-border transport between Thailand–Lao PDR; see Section 12.4.2). The operators are selected and approved by DLT: under section 25 of the Land Transport Act AD 1979 the operators carry out the transport under the bilateral and multilateral international road transport agreements between Thailand and neighbouring economies.

Under these agreements an international road transport operator must be a Thai juristic person, whose head office must be located in Thai territory,. Foreigners are allowed to have equity participation of no more than 49%. International road transport under the Land Transport Act BE2522 (1979) is categorised as:

- Fixed Route and Non-Fixed Route International Road Transport Services – the providers must be either a limited company, a limited public company or a Thai government organisation; and
- Private International Road Transport Services (Commercial) – the providers must be either a registered ordinary partnership, a limited company or a limited public company.

The international road transport service providers must have been domestic road transport service providers beforehand. The licence fee of THB2500 (USD77.4) is for a 5-year period.

Box 12.1: Bilateral agreements on road freight transport services.

- *Thailand–Malaysia*: Memorandum of Understanding (MoU) between Thailand and Malaysia on the Movement in Transit of Perishable Goods by Road from Thailand through Malaysia to Singapore 1979. Under this bilateral agreement cross-border transport is allowed only for perishable goods from Thailand to Singapore, travelling through Malaysia**.** It also has an annual quantitative limitation of goods as well as a specific transport route. The cross-border road transport service between Thailand and Malaysia is an oligopoly in which there are currently three transport operators under this agreement.
- *Thailand–Lao PDR*: MoU between the Government of the Kingdom of Thailand and the Government of Malaysia, Agreement Between the Government of the Kingdom Thailand and the Government of the Lao People's Democratic Republic on Road Transport, 1999 and Subsidiary Agreement Specifying Road Transport Arrangement between the Government of Thailand and the Government of the Lao PDR, 2001.

This bilateral agreement is the first liberalisation of international road transport services. The background of the liberalisation is:

1978–90: cross-border transport between Thailand and Lao PDR was a monopoly under the ETO.

1991: The ETO had its licences terminated because Lao PDR appealed its expensive service fee. Cabinet approved the joint venture firm of Thailand and Lao PDR, named T.L. Enterprise, and it became the monopoly transport operator.

1992: Ministry of Transport opened the market for competition since there were many complaints about the monopoly of T.L. Enterprise. In this year, there were five transport operators.

2004: Lao PDR and Thailand agree to open the free market of cross-border transport of both passengers (non-fixed route) and freight without quota limitation since previously the transport costs were very high.

Source: Department of Land Transport, Land Transport Promotion Center 2010.

12.3.3.1 Thailand–Lao PDR

Cross-border transport between Thailand and Lao PDR was liberalised under a bilateral agreement. After liberalisation in 2004 the number of international freight transport operators increased from two (only Thailand–Malaysia transport operators) to 123 (including Thailand–Lao PDR transport operators) (Table 12.12).

Table 12.12: The number of international transport operating licences issued per year, 2000–07.

	Year							
International Licence	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Bus	–	–	–	–	13	25	7	15
Truck	3	2	2	2	123	63	51	75

Source: Department of Land Transport, Land Transport Promotion Center 2010.

Cross-border transport between Thailand and Lao PDR is highly competitive among domestic operators (226 international truck licences and 57 international non-fixed route bus licences have been issued) (Table 12.13). In comparison, international freight transport between Thailand and Malaysia is an oligopoly as it has a quota limitation and only allows the transport of perishable goods from Thailand to Singapore through Malaysia. Banomyong (n.d.) reports that as a result of the agreement, freight rates fell by 20–30% between Vientiane and Thai ports. Banomyong points out some logistical constraints on the agreement's impact on routes other than between the major points. One of these is the report by Thai operators that Lao authorities continue to insist that some Thai trucks be reloaded on to Lao trucks at the border. Also, partnership operators may have difficulty in meeting the legal requirements of the agreement (which refers to 'juristic persons').

Table 12.13: The number of international transport operating licences for 2007.

International licence	Total no. of licences	Total no. of vehicles
Non-Fixed Route Bus	57	177
Fixed Route Bus	2	–
Non-Fixed Route Truck (Transport Operators)	229	8,979
Thailand–Malaysia (only perishable goods)	3	79
Thailand–Lao PDR	226	8,900
Private Transport (Own Account)		
Truck (Thailand–Lao PDR)	84	861

Source: Department of Land Transport, Land Transport Promotion Center 2010.

The operation of a cross-border non-fixed or chartered route bus was also liberalised between Thailand and Lao PDR. However, the fixed route international bus between Thailand and Lao PDR is a monopoly run by Transport Company Ltd (Thailand), a government-owned enterprise of Thailand, and the government-owned Bus Enterprise of Laos. Currently, there are five fixed routes of international transport between Thailand and Lao PDR: Nongkhai–Vientiane, Udonthani–Nongkhai–Vientiane, Ubonratchathaini–Pak se, Vientiane–Khon Kaen and Savannakhet–Mukdahan. Fares are difficult to compare between bus routes because of the differences in service quality, but the entry of chartered buses provides consumers with more options.

12.4 MULTILATERAL AGREEMENTS

Multilateral agreements are also important for the structure of the road transport markets.

12.4.1 ASEAN Framework Agreement on Services

ASEAN started its services liberalisation project with the ASEAN Framework Agreement on Services (AFAS). The liberalisation of international road freight transport service is expected to be achieved by 2015. ASEAN nationals will be allowed an equity participation of no less than 49% by 2008, 51% by 2010 and 70% by 2013. AFAS also includes customs facilitation for transit goods which will be exempt from customs formalities procedures. The transport facilitation will allow 500 vehicles in each member economy to operate cross-border transport[5], develop multimodal transport and facilitate trade to allow the door-to-door delivery of goods. This will reduce logistics, time and cost, harmonise road transport laws to facilitate movement across land borders and support the regional supply chain and logistics network.

12.4.2 ADB–Greater Mekong Sub-region Economic Cooperation Program

The Greater Mekong Sub-region (GMS) regional economic cooperation framework was formulated in 1992 and funded by the ADB with the aim of facilitating efficient freight and passenger cross border transport, which will improve intra-regional market access for GMS products and trade competitiveness. The GMS program covers nine sectors – agriculture, energy, environment, telecommunications, human resource development, investment, tourism, trade and private sector development, with the priority being on the transport sector (JICA 2007). The coverage is on international road transport, specifically the multimodal transport related to the roads covering six member economies, namely Cambodia; southern China; Lao PDR;

[5] In January 2009 the Thai Parliament approved the ASEAN Framework Agreement on Facilitation of Inter-State Transport. (Source: Office of Transport and Traffic Policy and Planning)

Myanmar; Thailand; and Viet Nam. Each member economy is entitled to 500 GMS transport permits for cargo transport and non-scheduled passenger transport: the permit quota is divided into 400 for commercial trucks and 100 for buses. Member economies will allow foreign vehicles granted the 'GMS transport permit' by the contracting economy to enter the economy on designated routes. GMS members will also consider the transition from quota limitations to a free market system in the future.

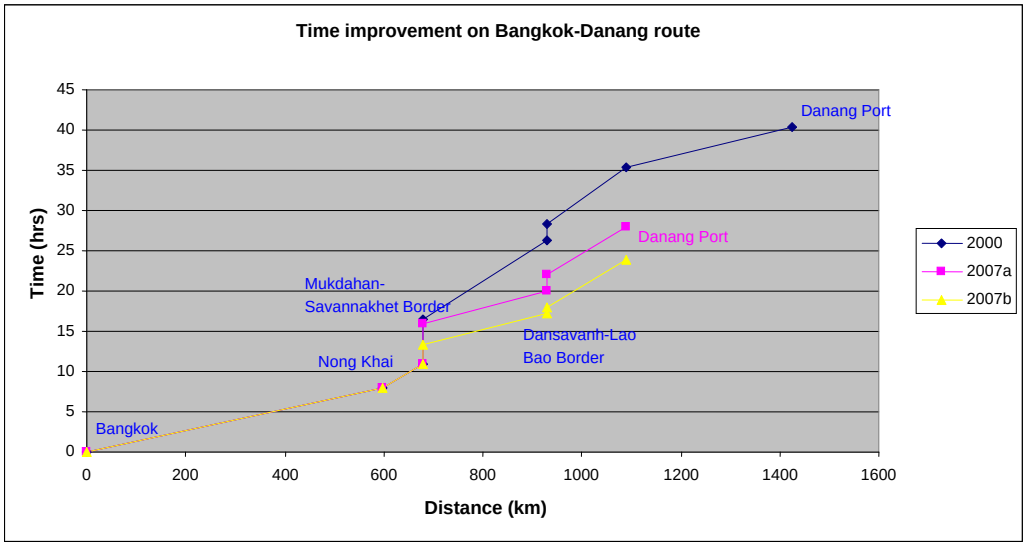
Several flagship infrastructure projects were identified, and three 'Economic Corridors' – the North–South Economic Corridor (NSEC; covering southern China–Lao PDR–Myanmar–Thailand), the East–West Economic Corridor (EWEC; covering Myanmar–Thailand–Lao PDR–Viet Nam), and the Southern Economic Corridor (SEC; covering Thailand–Cambodia–Viet Nam) were prioritised in the GMS transport sector development plan. Other corridors identified in the initial framework were: Western (Tamu–Mawlamyine); Eastern (Kunming–Ho Chi Minh City and Nanning–Bangkok/Laem Chabang), Central (Kunming–Sihanoukville/Satthaip) and Southern Coastal (Bangkok–Namcan).

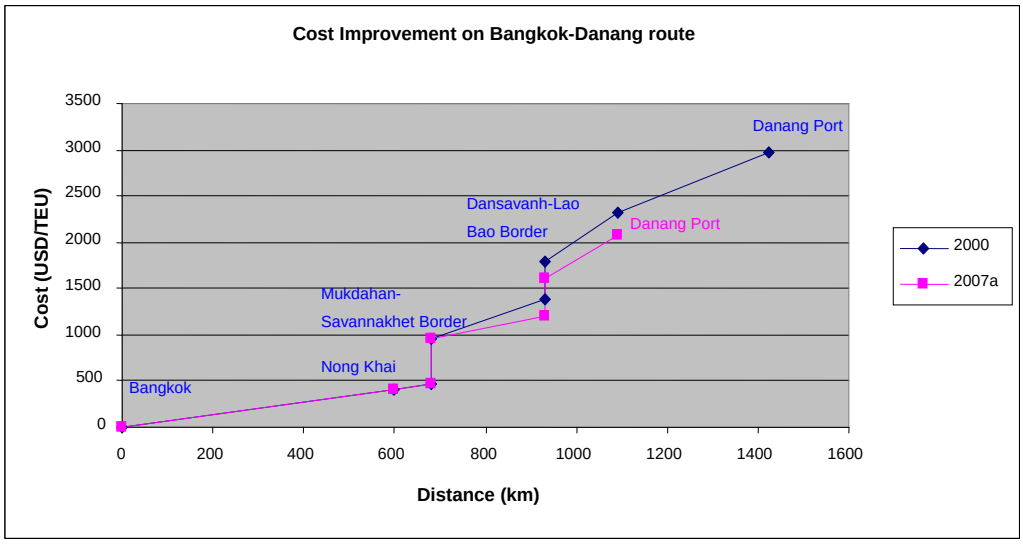
The time and cost reduction on transport from Bangkok–Danang Port demonstrates the Economic Corridors' performance. There has been a significant improvement through the infrastructure investment, particularly the Second Mekong International Bridge and cross border formalities facilitation agreement. These initiatives led to drastic reductions in the logistics cost and time (Figure 12.3). The overall transport cost fell from approximately USD3000 to USD2070 and the transport time improved by almost 13 hours (from 40 hours 40 minutes in 2000 to 28 hours in 2007).

The prospective significant reduction in logistics time and costs in these economic corridors will benefit the transport of perishable goods in particular, as 'time' is the most crucial factor for the traders' ability to ensure quality control. The GMS economic corridor development will enable Thailand to export fruit to China within 4 days. This will leave more days to distribute fresher and higher quality fruit in that nation (Box 12.2).

Furthermore, a GMS infrastructure improvement project, the Second Mekong International Bridge as the link of EWEC, has had a considerable impact on the increase in trade value between Thailand and Lao PDR (Box 12.3).

The GMS agreement also covers the removal of non-physical barriers to the cross-border movement of people, vehicles and goods such as facilitating border crossing formalities and exchange of traffic rights through a GMS Cross-Border Transport Agreement. There are 17 Annexes and 3 Protocols which allow flexibility for ratification by economies: all member economies have ratified the Annexes and Protocols except Thailand, which has not ratified Annexes 1, 4, 6, 7, 8, 9, 10 and 14 and Protocol 3, and Myanmar which has not ratified any of the Annexes and Protocols. In liberalising international road transport, the agreement allows the admission of foreign vehicles registered in member economies for those who satisfy the technical requirements (e.g., weight limit and vehicle length). The implementation is divided into two phases. The first phase is committed to the reciprocal recognition of foreign vehicles by the quota limitation: the 500 permits that can be issued are subject to limits on frequency, capacity and the number of transport operators. The second phase will open a free market system without any restrictions. The governments of the contracting parties are authorised to regulate the safety and weight limit of vehicles while the pricing of cross-border transport will be determined by market forces. The government is entitled to regulate the market domination under the supervision of the Joint Committee.





Sources: JICA (2007), MOU IICBTA between Lao PDR and Thailand (2007), JETRO (2008), ADB (2009)

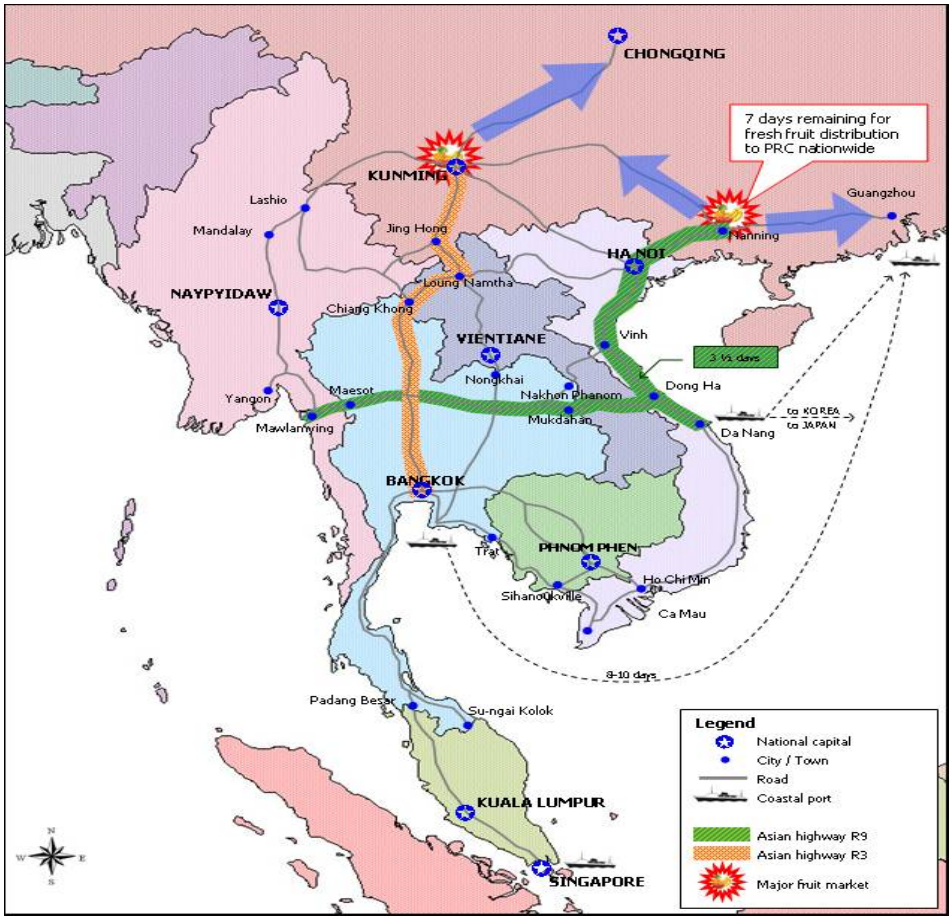
Notes: Year 2000 – the transport on the Bangkok–Danang route goes via Nong Khai and crosses the First Mekong International Bridge to Vientiane, Lao PDR, and then goes to Savannakhet.
Year 2007a – the transport on Bangkok–Danang route goes via Mukdahan and crosses the Second Mekong International Bridge to Savannakhet, Lao PDR, and then to Lao Bao, Viet Nam.
Year 2007b –May 2007, the Step I of Single Stop Inspection (SSI) and Single Window Inspection (SWI) was implemented at Lao Bao–Dansavanh border. Besides, as of June 2007, minimal inspection was implemented at Mukdahan–Savannakhet border.
Cost is for chartering a 20-foot container for land transport.
The estimated logistics cost in 2009 is slightly higher than the cost in 2007 due to the increase in the fuel price (from approximately USD2070 to USD2282).

Figure 12.3: Time and cost improvement on the Bangkok–Danang route.

One major breakthrough is the trial of the Customs Transit System and Exchange of Traffic Rights among Thailand, Lao PDR and Viet Nam which allows registered trucks in these economies to go through foreign territory on the R9 route from Mukdahan Province in Thailand to Savannakhet (Lao PDR), and then to Lao Bao, Dong Ha and Danang Port in Viet Nam. The trial of the 'go-through' trucks was initiated on 11 June 2009 and 400 trucks of 12 Thai truck operators were issued GMS road transport permits by the Board of Trade of Thailand. Despite this trial, the cross-border transport under the Initial Implementation of the Cross-Border Transport Agreement has not genuinely taken place: there were problems relating to the Customs Transit System with the guaranteeing organisation and the transit fee

Box 12.2: Benefits from the GMS Economic Corridors development.

Under GMS economic cooperation, Thailand can exploit the benefit from routes R3 and R12 which are the effective and efficient transport routes from Thailand to China. These routes will reduce logistics cost and time and allow more days to distribute the goods within China. The transport from Thailand to China normally uses sea freight from Laem Chabang Port to Guang Zhou Port, which takes around 8–10 days and leaves only a few days to distribute the goods. However, with R3 routes on the NSEC, it will take only 3 days to transport fresh fruit from plantation areas through northern Thailand and Lao PDR to arrive in Kunming, Sichuan and Chongqing. More importantly, it will then have 7 days to distribute the goods in China. Additionally, routes R9 and R12 on the EWEC will shorten the period to transport fresh fruit from plantation areas in Thailand to Nanning in China via Lao PDR and Viet Nam to 3-4 days.



that needed agreement among member economies. Cross-border transport from Thailand to southern China (NSEC) and from Thailand to Viet Nam through Lao PDR (EWEC), still requires cargo transshipment at the Lao PDR border since Thai trucks are only allowed to enter into Lao territory and not beyond.

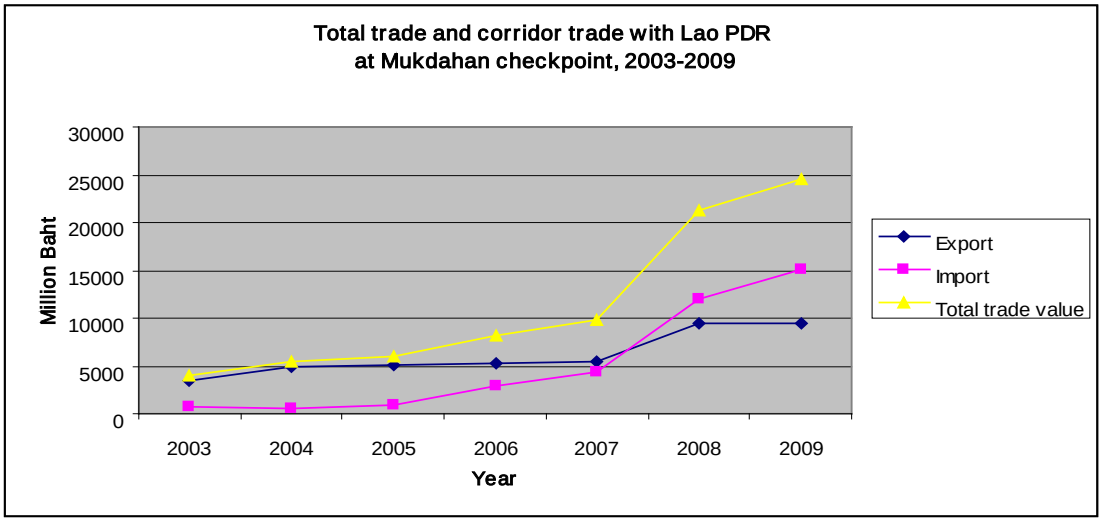
There are other barriers along the GMS Economic Corridors that hamper the efficient utilisation of the transport infrastructure. These constraints could derive from customs procedures, lack of supporting policy frameworks as well as human and institutional capacities which add to the stopping time at the borders. The price distortion as a result of unofficial payments also leads to the current high logistics cost.[6]

[6] Based on an interview with a Thai operator, the freight cost on route R3A (Bangkok–Yunnan) is much higher than the actual cost. The operator has to pay THB60 000 (USD1860) for actual transport costs plus another THB120 000 (USD3721) for unidentified costs along the route.

Box 12.3 Impacts from the GMS East-West Economic Corridor, Mukdahan checkpoint.

The major consequence of infrastructure development project, a Second Mekong International Bridge, is the increase in trade value between Thailand and Lao PDR. The total trade value between Thailand and Lao PDR at the Mukdahan checkpoint has grown rapidly from THB4 billion in 2003 to THB24 billion in 2009. The export value has increased from THB3 billion in 2003 to THB9 billion in 2009 while the import value has significantly increased from THB665 million to THB15 billion. The average annual growth rate for the past 7 years of import value is 68.1% and of export value is 18.7%.

Notably, the Second Mekong International Bridge has resulted in a significant increase in the import of copper, wooden products and metal from Lao PDR. The bridge allowed the transport of heavy goods like wood and metal products through the Mukdahan checkpoint since it could not be transported by ferry.

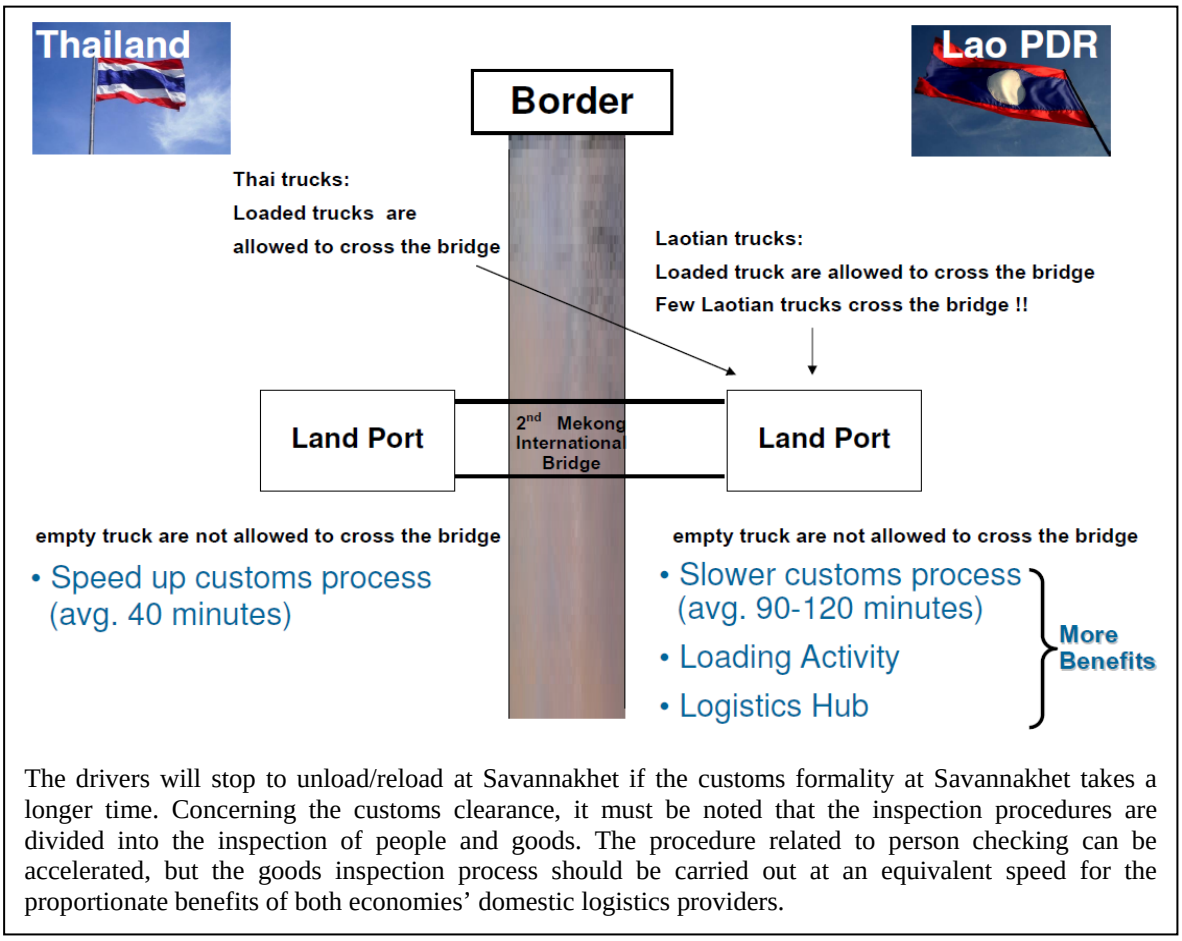


Source: TDRI 2010a.

More importantly, the major problem of GMS is the unequal sharing of costs and benefits among member economies. In the case of transit economies like Lao PDR, the facilitation of cross-border transport means that the benefit goes to other economies while leaving the costs of road maintenance, infrastructure investment, and social and environmental impacts to the transit economy. To counteract such circumstances, Lao PDR might resort to the strategy of assembling the traffic in its territory with little incentive to expedite customs, immigration and quarantine inspection processes. If this is the case, unfortunately it will be counterproductive. Given that there is more time taken for customs formalities in Lao PDR at the Mukdahan–Savannakhet border, compared to Thailand, Lao PDR logistics providers will obtain more than the road usage fee (Figure 12.4).[7] This, in turn, would hinder rather than facilitate trade flow (of both passengers and freight) among the member economies. Furthermore, neighbouring economies could also give financial aid for infrastructure investment and maintenance cost to Lao PDR by allowing transit fee collection to relieve the burdens of transit economy.

Although the regional transport agreement results in reduced transport cost along the corridors, there are informal stakeholders who must be included as crucial participants who could hamper the development of corridor efficiency. Corruption and informal payments are common along some of the borders. By harmonising the necessary requirements for engaging in cross-border trade, it will be more difficult for local government officials, customs workers

[7] Based on the Time Release Study (2007), the Customs import procedure is: Mukdahan, 40 minutes and Savannakhet, 120 minutes; and the export procedure is Mukdahan 46 minutes and Savannakhet 90 minutes.



The drivers will stop to unload/reload at Savannakhet if the customs formality at Savannakhet takes a longer time. Concerning the customs clearance, it must be noted that the inspection procedures are divided into the inspection of people and goods. The procedure related to person checking can be accelerated, but the goods inspection process should be carried out at an equivalent speed for the proportionate benefits of both economies' domestic logistics providers.

Figure 12.4: The problem of possible cross-border truck flow at Mukdahan–Savannakhet.

and others with authority to act corruptly. Meanwhile, the resistance to fully implementing the agreement is continuing. The practice of corruption leads to an unreasonably high transport cost, resulting in the imperfect competition of international transport and hampering new entrants into the market.

The regional liberalisation of road transport is the forthcoming scenario, namely 500 interstate transport permits for each member economy under the GMS agreement and another 500 permits under AFAS.[8] These agreements will lead to further reductions in transport cost along the corridors. However, the cross-border transport requires mutual agreement among member economies on the clear definition of international haulage permission regarding service duration, frequency, periodicity and continuity. Otherwise it could result in disputes over cabotage transport which has a large impact on domestic providers. There is also a concern about negative impacts such as an increase in smuggling goods and illegal substances.

The liberalisation will allow foreign firms to invest in domestic transport businesses in the economies. However, foreign firms will have to offer some differentiated service, particularly with the use of standards and information and communications technology, if they are to compete. There are many competitors in the market already and foreign firms might not be able to compete with local firms which have advantages of geography (they are more familiar with the towns), rules, regulation familiarity and the requirements of the customers, especially local

[8] In January 2009 Parliament approved this action under AFAS according to the Constitutional Law of Thailand, Article 190, Paragraph 2.

businesses). However, domestic operators could be affected by the entry of 'brand name' manufacturing firms which only hire local transport firms to operate their transport.

12.5 VALUE OF COORDINATION

Institutional barriers can arise through the agencies involved, as each has their own objectives and jurisdiction. The past implementation of road transport and land-use plans was carried out by five committees and 14 agencies under two ministries, the Ministry of Interior (MOI) and the Ministry of Transport (MOT) (Table 12.14). A review of institutional problems by the Office of the National Economic and Social Development Board, (NESDB 1991) noted the following issues:

- Conflicting mega-projects: As demonstrated by the intersections between elevated structures.
- Duplication of capacity: Enormous duplication of capacity is evident in the mega-projects, but there are other instances: for example, the Public Works Department and ETO that both appear to be planning a north–south road in Thonburi west of Middle Ring Road, on alignments close to each other.
- Unbalanced road hierarchy: An enormous expansion of main road capacity into the city centre is being planned, but there are no corresponding plans to expand the collection/distribution network.

A key problem in overlapping agencies is the lack of effective coordination, consultation and control. Sometimes this is due to differences in the cultures of the agencies. The allocation of the budget is also important, since each agency expects to maintain its share of 'the cake'.

It has been recognised since the Sixth Plan (1986–91) that there is an imbalance where the investment for road improvement occurs. There is a bias towards substantial projects, at the expense of needed supporting investment in secondary roads, including distributor and local roads. The absence of sufficient distributor and local roads had led to the development of 'superblocks' which are large tracts of uncoordinated urban development and vacant land parcels within, and following, the primary road corridors within which discontinuous narrow local roads provide access to individual housing developments. The problems of this form of development include:

Table 12.14: Implementing and planning agencies.

	Agency or committee	Reporting to
1.	Department of Land Transport	MOT
2.	Department of Highways	MOT
3.	Bangkok Mass Transit Authority	MOT
4.	The Transport Company Ltd	MOT
5.	Express Transportation Organization of Thailand	MOT
6.	Harbour Department	MOT
7.	Public Works Department	MOI
8.	Department of Town and Country Planning	MOI
9.	Accelerated Rural Development Department	MOI
10.	Expressway Authority of Thailand	MOI
11.	Office of the Committee for the Management of Road Traffic	MOI
12.	Bangkok Metropolitan Administration	MOI
13.	Traffic Police Division	MOI
14.	Department of Local Administration	MOI
15.	Bangkok Metropolitan Region Development Committee	Independent Agency
16.	Committee to Consider Construction of Elevated Roads over Canals	
17.	Committee for the Management of Road Traffic	MOI
18.	Land Transport Policy Committee	MOT
19.	Land Transport Control Board	MOT

- Excessive congestion on primary roads – in the absence of a good secondary (i.e., distributor) road network the primary roads must be used for local and long distance trips;
- Inconvenient and circuitous travel for private and public modes of transport attempting to access or egress developments within the superblock; and
- Large parcels of underutilised land with poor accessibility and high servicing costs (World Bank 2007).

However, policy reform began in 2002 through the Office of Transport and Traffic Policy and Planning (OTP) and the Ministry of Transport, with oversight by the Commission for the Management of Land Traffic. There are still problems of overlapping agencies; for example, the Departments of Highways and of Rural Roads are the two main agencies in the provision of roads, with responsibility for major highway and rural roads construction, respectively. Another overlapping operation is the expressway network systems that are operated by the Expressway Authority of Thailand with private sector participation. Finally, there is no single regulator that can set all transport-related prices and taxes so as to maximise social welfare throughout the system (Rietveld & Stough 2004).

12.6 CONCLUSION

The Thai case highlights a number of topical and widespread issues in road transport policy. In urban bus markets, for example, attempts to provide a universal service in a regulated environment have created incentives for entry in substitute but unregulated markets. Passengers have benefited from the wider options available. But this entry has challenged the capacity of the incumbents in the regulated markets to meet their service obligations. The response has been to widen the scope of regulation; however, a significant unregulated set of operators continues to exist. The significance of the impact of the growth of the unregulated sector is exaggerated in the absence of both pricing for traffic congestion and measures to capture other externalities associated with urban passenger transport systems.

The road transport industry involves externalities that may justify a certain degree of government intervention. A regulatory framework in road freight can contribute to public safety and reduce environmental impacts. An appropriate road pricing and vehicle taxation system to reflect the actual cost of the road freight industry is valuable. The value of including the costs of externalities will be even more significant once the cross-border transport market has been liberalised.

The liberalisation of cross-border transport facilitates intra-regional trade. Several agreements on cross-border transport facilitation allowing foreign vehicles to enter the economy will reduce logistics costs. But new issues will emerge, including the treatment of cabotage. Managing the infrastructure at border crossing points will be important for preventing the gains from lower transport costs being captured by the providers of those critical infrastructure services.

This study also highlights the value of coordinating policies for operations and for infrastructure with those for the environment. This coordination at government level will be difficult to obtain, not only because of the amount of information that has to be shared but also because of the nature of the agencies involved. The Thai government has begun a process of reorganisation to resolve these issues, but challenges remain.

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Chapter 13

MARITIME TRANSPORT IN AUSTRALIA

Fabien Bertho[1]

- International shipping markets are becoming more competitive, though restrictions on operations remain in some high income economies. Lower income economies are more likely to have restrictions on foreign investment.
- The Australian experience of a more liberal application of rules on cabotage is associated with lower freight rates and higher productivity in the remaining domestic fleet.
- Becoming more important are the terms of access to port services and their performance.

13.1 INTRODUCTION

This paper is an analysis of the Australian maritime transport sector and addresses maritime transport in the widest sense, while focusing strictly on shipping (international and domestic) and on port infrastructures and related services.

The Australian regulatory framework is, overall, one of the most open and liberal in the world. This analysis examines the sectors that have been reformed in the last few years, those where reforms are still being debated and others where regulatory reform is still obviously necessary for reasons such as poor performance, congestion and bottlenecks. It explains the drivers of past and potential reforms, highlights the consequences of these reforms and provides recommendations, as appropriate, to show room for progress.

More particularly, it focuses on three themes: coastal shipping, competition rules in liner shipping, and cargo handling and related infrastructures. In the first, it explains in what way the Australian coastal shipping regulation is very liberal in comparison with other economies, in the second, why the exemption of carrier agreements from competition law is a non-issue in Australia and in the third why, despite there being no restrictions in the cargo handling sector, some problems remain.

Although geography makes maritime transport of crucial importance for Australia, at first sight this does not show up from data on worldwide maritime transport. The Australian flag registered fleet represents just a tiny share of the world fleet – 0.18% (UNCTAD 2009). Moreover, in 2008 Australia's merchandise trade represented only 1.2% of world merchandise trade in value (UNCTAD 2009). By volume, however, the picture is quite

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different. Despite Australia being a modest trader of general and containerised cargoes, it is a huge exporter of bulk cargoes. Indeed, in 2004 Australia's seaborne export volume of coal and of iron ore represented one-third of the world's coal and iron ore seaborne trade (ISL 2006). Port traffic shows a similar picture. In 2005 the two leading Australian ports in terms of the volume of cargo handled were Dampier and Port Hedland in Western Australia, ranked between 20th and 30th in world terms. Both ports handle only bulk exports and a single commodity at that – iron ore. On the other side of the continent, Newcastle in New South Wales is the world's largest coal port. In terms of container traffic, however, the busiest Australian port is Melbourne, which in 2008 ranked 56th with 2.11 million 20-foot equivalent container units (TEUs) handled.

13.2 CURRENT REGULATORY FRAMEWORK

This section is divided in two parts: shipping, and port infrastructures and related services. Shipping, port and auxiliary services focus on the restrictions on market access and national treatment (and most particularly on barriers to entry), on discrimination between domestic and foreign providers and on competition rules. Port infrastructure addresses the regulatory regime and the roles and status of the regulators.

Broadly speaking, Australia is one of the most liberal economies in a sector which is relatively open worldwide. Table 13.1 identifies key features of the Australian regulatory framework and compares Australia with its APEC partners.

Table 13.1: Regulatory framework in maritime transport in APEC economies.

	Quotas	Exemption of carrier agreements from competition law	Form of the ownership	% of ownership	Acquisition domestic entity	Cabotage	Cargo Handling	Regulatory authority independent
Australia								
Canada								
Chile								
China								
Hong Kong, China						n.r.		
Indonesia								
Japan								
Korea								
Malaysia								
Mexico								
New Zealand								
Peru								
Philippines								
Russian Federation								
Singapore						n.r.		
Chinese Taipei								
Thailand								
United States								
Vietnam								

Source: World Bank Survey, 2008
Note: Darker shading corresponds to a less restrictive implementation of the measure; n.r. = not relevant.

9.2.1 Shipping

International shipping involves no barriers to entry for domestic providers by way of licensing requirements or restriction on the number of providers. There are also few barriers to entry for foreign providers. In regard to cross-border trade (mode 1), a liner shipping operator providing transport services to or from Australia must be represented in Australia by an Australian resident. In regard to commercial presence (mode 3), international activities carried out in Australia must for reasons of tax and legal liability be conducted by a legally

registered Australian firm. This is a restriction on the form of commercial presence. Although, technically, both measures are considered by the General Agreement of Trade in Services (GATS) to be impediments to trade, their main objectives are not protectionist but fiscal, safety and juridical: they establish practical Australian jurisdiction over maritime incidents in Australian waters and ensure that ships do not leave port without paying their bills. Additionally, there is no discrimination between domestic and foreign providers: no tax exemption, no preferential subsidy, and no discrimination in access to port facilities and related services. The one exception is in liner shipping, with the Bass Strait Freight Equalisation Scheme. According to this program, in order to avoid transport cost disadvantages for Tasmanians, the Australian government subsidises shippers transporting certain types of cargo between Tasmania and mainland Australia.

Australia still maintains an exemption from domestic competition laws on international liner shipping agreements (Box 13.1). However, if the agreement contains any anti-competitive provisions, it must be registered under Part X of the Trade Practices Act in order to qualify for the exemption. Carriers of registered agreements must publish specified details in a public register and the parties to them are also required to negotiate with, and provide information to, representative shipper bodies. In general all types of agreements are liable to be registered.

Box 13.1: A typology of agreements in liner shipping.

Historically, economies exempt liner shipping carriers agreements from the competition rules. The objectives of this measure are to:
- make the service more reliable;
- make the market more stable; and
- take advantage of economies of scale.

Various types of agreements have different aims and different competitive outcomes. These agreements are classified into three categories:

Conferences are route-specific agreements between carriers on conditions for the carriage of cargo. The main characteristics of conferences are the regulation of capacity and the application of uniform or common freight rates. They can be seen as a kind of *entente* between carriers that restrict competition.

Operational agreements provide for cooperation by means of technical, operational or commercial coordination. They take various forms: vessel-sharing agreements, managing port installations and managing marketing activities. They do not affect competition directly and may improve the efficiency of market outcomes.

Discussion agreements are non-binding agreements between conferences or between conference and non-conference members servicing a particular route. They are a forum to discuss and share commercial information relevant to a specific route (e.g., forecasting the introduction of a new capacity)

Source: Productivity Commission 2005.

Table 13.1 shows Australia to be one of the more liberal economies in relation to coastal shipping. The Australian regulatory framework is considered as such because many economies still reserve domestic shipping for vessels flying their own flag. Although these requirements are burdensome, they are restrictions on foreign ownership and on the employment of foreign crews. Australia does not reserve domestic shipping for Australian-flag vessels. The least open case is that of the United States of America (USA): under the well-known Jones Act, it reserves cabotage for vessels built in the USA.

According to the Australian regulatory framework, two systems co-exist in coastal shipping: a general scheme (the licence system) and a special scheme (the permit system) (Australian

Parliament, House of Representatives 2008). To be licensed, carriers must comply with two main requirements. Firstly, the vessel's crew must be paid at Australian wages while it trades on the Australian coast, and secondly, the vessel must not have been subsidised in the previous 12 months. Permits to transport coastal trade are issued without these licence requirements but under certain conditions: if there are no suitable licensed ships available and if the issuing of the permit is considered desirable in the public interest.

13.2.2 Port infrastructure and related services

Under the Australian Constitution, the responsibility for ports and harbours is decentralised, so that regulation is a matter for the states and territories. Port regulators are therefore state government agencies and most of them are not institutionally independent (Annex Table A13.1). At the main container ports the infrastructure (e.g., piers, berths and quays) is publicly owned through the port corporations under a landlord system, whereby private terminal operators lease terminals from the public authority and operate them as private businesses. At bulk-loading ports various schemes apply. For example, at the coal port of Hay Point the infrastructure is owned and operated by a private company, at Gladstone the infrastructure is managed and operated by the publicly owned port corporation, at the coal port of Dalrymple Bay the infrastructure is managed by a private firm under lease from the port authority and the port of Newcastle has both public and private terminals under a state-owned port corporation.

Commercial regulation of port and auxiliary services involves no barriers to entry for either domestic or foreign providers, except in sectors where there are market failures. Indeed, in ports generally, the number of some services providers – cargo handling, storage and warehousing and pilotage – is limited by economies of scale or because of a scarcity of port space. On the one hand, companies seeking to provide cargo handling, storage and warehousing services must obtain concessions from port authorities through auctions or tenders (in the absence of competition in some markets, the port authorities may even introduce competition) while on the other hand, pilotage services are regulated monopolies.

Port services can be defined as activities related solely to the management of ships in port, such as pilotage, berthing, anchorage, whereas auxiliary services are defined as activities related to cargo manipulation in and on ships, such as cargo handling, storage and warehousing and customs clearance.

13.3 FORCES FOR POLICY CHANGE

This section deals with sectors which have been subject to recent policy changes or which face policy and regulatory challenges, with an initial focus on coastal shipping that has undergone various reforms since 2008. For details about recent policy changes see Table A13.2 in the Annex. The section then explains why the exemption of shipping agreements from competition rules can be considered a non-issue, and finally it reveals how inefficient regulatory regimes and poor management of infrastructure has led to problems such as a lack of competition in container handling, and congestion and bottlenecks at bulk port terminals.

13.3.1 Coastal shipping

The core legislation that regulates Australian coastal shipping is the Australian government's Navigation Act 1912. The Act is supported by the Ministerial Guidelines for Granting

Licences and Permits to Engage in Australia's Domestic Shipping (the Ministerial Guidelines) which provide guidance for administering the coastal trade provisions of the Act. Although the Australian coastal shipping legislation has not changed much over several decades, its interpretation and application by the government has changed a good deal.

Until the early 1990s coastal shipping permits were issued to foreign-flag vessels in exceptional circumstances only and the share of coastal trade transported under the permit system was small (Figures 13.1–2).

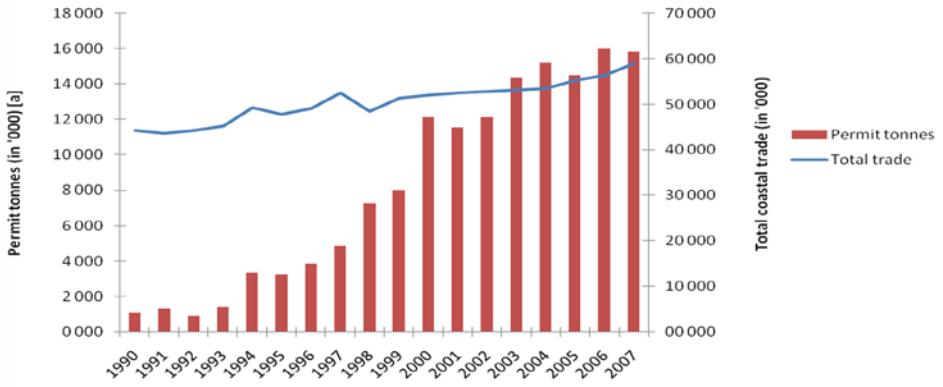


Figure 13.1: Total coastal trade and permit tonnage issued by the government. (Source: Department of Infrastructure, Transport, Regional Development and Local Government [2009])

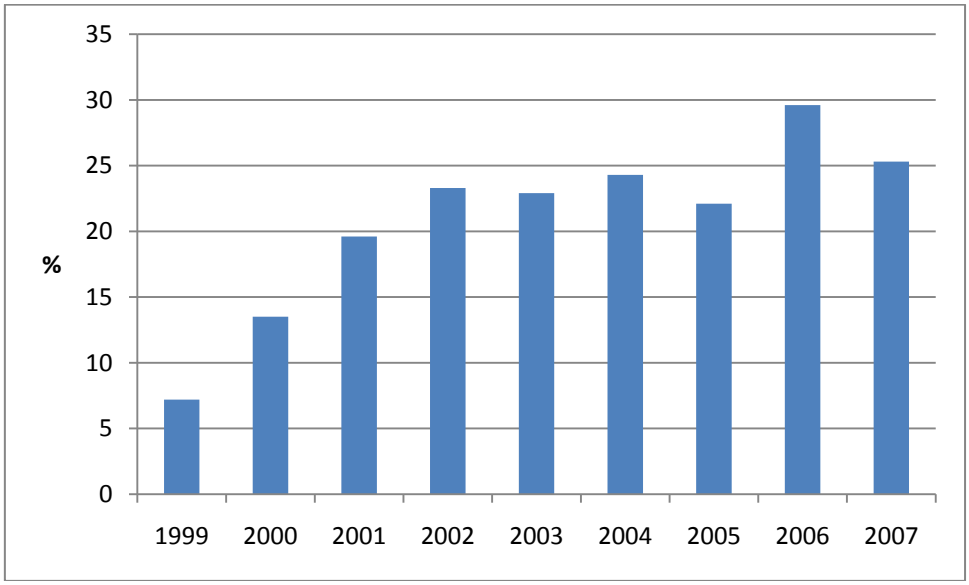
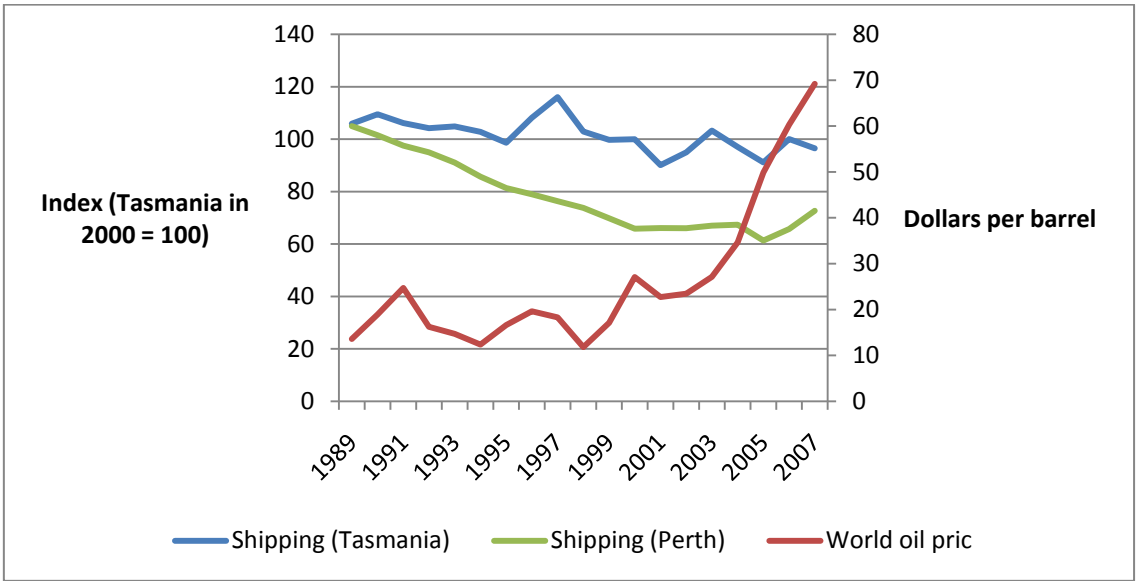


Figure 13.2: Share of coastal trade transported under permits (%). (Source: Department of Infrastructure, Transport, Regional Development and Local Government [2009])

In the early 1990s the small number of permits issued combined with the licensing requirements and high Australian labour costs allowed the Australian-flag vessels to remain competitive. In other words, government policy supported the national fleet. Since the mid 1990s the government's decision to take a more liberal approach was justified as a way of reducing the cost of coastal shipping. Indeed, a parliamentary report on Australian coastal shipping stated that the gap between operating a foreign and an Australian crew ranged from AUD1 million to AUD3 million per year, depending on the size of the vessel (Australian Parliament, House of Representatives 2008).

The relaxation of cabotage in the 1990s had two effects. At first, due to technological factors and the rationalisation of manning scales introduced by the Australian government, it sustained a downward trend that had been observable in real interstate non-bulk freight rates from the early 1980s. The impact of the change in coastal shipping policy was clear from the mid 1990s, however, as the decrease in freight rates for journeys to and from Perth accelerated despite rising fuel prices (Figure 13.3).[2]



Notes: Shipping rates on the left scale (2000–01 = 100) and oil price on the right scale. The basis of the shipping freight rates is full container load (FCL) wharf-to-wharf (that is, excludes local pickup and delivery). Rates for Tasmanian non-bulk shipping are weighted by route. (a) Annual average of weekly all economies spot price fob weighted by estimated export volume, in AUD/barrel.

Figure 13.3: Real interstate non-bulk freight rates and world oil price. (Sources: BITRE 2008, Energy Administration 2010)

The second effect was more obvious. The Australian fleet decreased in deadweight tonnage (dwt; carrying capacity) by almost half between 1999 and 2007, with the much larger decrease in the coastal fleet (Table 13.2). This is a direct effect of the market share loss of Australian-flag vessels in favour of foreign permit vessels (Australian Parliament, House of Representatives 2008). From 1994 the permit tonnage has increased much faster than the total coastal trade. Hence, the share of coastal trade transported under permits increased steeply from around 7% in 1999 to around 25% in 2007 (Figures 13.1–2). However, the decrease of the Australian-flag coastal shipping fleet had been accompanied by an increase in the productivity of the fleet. Indeed, in 1999, the ratio of costal trade transported by the Australian-flag fleet (in tonnes) divided by the capacity of the Australian-flag fleet dedicated to coastal shipping (in dwt) was 27.7; in 2007 the ratio was 66.9 (computed from BTE [2000], BITRE [2009a] and Department of Infrastructure, Transport, Regional Development and Local Government [2009]).

In 2007 a Labor Government replaced the long-serving conservative coalition. The new government held the view that it was in the national interest to maintain a strong Australian fleet, for strategic reasons that included security of trade and to provide a training ground for

[2] There are two reasons for using Perth freight rates as the example. Firstly, the increase in the number of permits did not affect freight rates on the Tasmanian route because of the support of the Australian government through the Bass Straight Freight Equalisation Scheme. Secondly, coastal shipping to and from Perth represents more than 50% of the total interstate coastal shipping activity (in billion tonne kilometres) and the majority of this is transported in permit vessels. The port of Perth is Fremantle.

Table 13.2: Summary of the Australian registered trading fleet, 1999 and 2007.

	Number of vessels		Dwt		
	1999	2007	1999	2007	Change in %
Coastal trade	41	28	1 562 588	644 807	-59
Overseas trade	10	10	673 467	543 808	-19
Total	51	38	2236055	1188615	-47

Source: BTE 2000, BITRE 2009a
Note: Vessels have a capacity greater than 2000 dwt.

the maritime expertise necessary to an island economy.[3] This has led the government to encourage Australian vessels to provide coastal shipping services but not to give preference to Australian-flag vessels in international trade.

The new policy was implemented through two reforms of the Ministerial Guidelines in 2008 and 2009. According to a new preamble to the guidelines in 2008, the government's intention was 'to enhance the competitiveness and sustainability of the Australian coastal shipping sector'. In 2009 some terms of the guidelines were clarified in the interests of transparency and accountability. For example, one condition for the issuing of a permit is that there is 'no suitable licensed ship available'. A new guideline now defines what are an 'available licensed ship' and a 'suitable licensed ship'.

Nevertheless, the main policy change has been wrought through the coverage of licensed and permit vessels in the Fair Work Act (FWA), the legislation that governs employment terms and conditions in Australia. The Seagoing Industry Award 2010 is the regulation that among other things applies the FWA to the coastal shipping sector. According to the new regulation, since 2010 licensed vessels are now subject to scrutiny (licensed vessels were required to offer Australian crew wages and conditions before the coverage by the FWA, but there was no formal inspection regime). According to the Seagoing Industry Award 2010, from 2011 permit vessels will also have to comply with requirements in terms of minimum wages, hours of work and rest periods. These requirements are high and, in fact, very close to prevailing Australian domestic conditions.

13.3.2 Shipping agreements

In 2005, following a review of Part X of the Trade Practices Act by the Productivity Commission, the government reformed the legislation on the exemption of liner shipping agreements from the Act. The main changes consisted in the introduction of new provisions on contract confidentiality. Even before the reform, the majority of cargo was carried under individually negotiated service contracts between carriers and shippers and thus at freight rates differing from, and usually below, listed conference rates. As in the airline industry, this trend reflected competition between carriers in a situation of rapidly increasing capacity. This Australian reform has strengthened market forces, just as reforms in other economies have had a direct impact on their liner shipping sectors. Since 1998, when the USA took similar measures to Australia concerning confidentiality, conferences have less and less influence on the routes between the USA and Australia. Finally, in 2008, the European Community (EC) decided to repeal the exemption on shipping agreements and as a result, conferences are now prohibited on the routes to and from Australia and the EC.

A review of all Australian shipping agreements registered since 2000 shows 112 active agreements (Australian Department of Infrastructure, Transport, Regional Development and

[3] Of 38 Australian flagged vessels in 2007, four were tankers (two each for crude oil and petroleum product) and four were LNG tankers (BITRE 2008).

Local Government pers. comm.). Most of these agreements are operational (Table 13.3), yet only four still active conferences serve the following routes:

- eastern and southern Australia to Japan and Korea;
- Australia; Papua New Guinea; and the Pacific Islands;
- ports in the Philippines; Borneo; Hong Kong, China; Chinese Taipei; China; Japan; and Korea to ports in Australia; and
- Australia northbound to ports in the Philippines; Hong Kong, China; China; Japan; and Korea.

Table 13.3: Active shipping agreements by type as at February 2010.

Operational agreements	Conferences	Discussion agreements	Others	Total
71	4	17	20	112

Source: Australian Department of Transport 2010.

Thus, conferences appear to serve less and less routes to or from Australia. Furthermore, according to most experts, conference rates are seldom applied. It may therefore be concluded that Australia's liner shipping market is competitive. Considering the now minor importance of conferences, it may be said that the relevant section of the Trade Practices Act about conferences is now almost redundant and that shipping agreements are a non-issue in Australia. This situation is unlikely to change until demand for liner shipping catches up with the overcapacity that existed even before the global financial crisis.

13.3.3 Infrastructure and related services

In Australia, as for most developed economies, the regulatory problems involved in international shipping deal with port infrastructures and related services. Australia faces several challenges in this area: to ensure competition and contestability in regulated services (most particularly in the container handling sector), to provide a consistent regulatory framework for the funding of infrastructure and to promote coordination between the different parts of the supply chain. This section addresses container terminals and bulk terminals.

13.3.3.1 Container terminals

This section focuses on the five main Australian container ports: Melbourne, Sydney, Brisbane, Fremantle and Adelaide, each a main port of one of the mainland Australian states. In 2008 they represented 35%, 29%, 15%, 9% and 4% respectively of the total TEUs handled in Australia (Ports Australia 2010). In 2008 the port of Melbourne handled more than 2 million TEUs.

Comparison of performance between Australian and overseas ports can be made in terms of three indexes: the crane rate, TEUs throughput per berth metre and TEUs throughput per gross hectare. The crane rate is computed by dividing the containers handled by the total allocated crane hours and is expressed in containers per hour. The TEU throughput per berth metre is computed by dividing the TEU throughput by the total length of container terminals berths. Finally, TEU throughput per gross hectare is a measure of container yard productivity with respect to the transfer of containers to and from the ships. All these data come from a report led by the Bureau of Infrastructure, Transport and Regional Economics (BITRE 2009b).

As cranes are big investments for terminal operators, the crane rate could be seen as an index of capital productivity. The crane rate in the five Australian ports is lower than leading international ports like Hong Kong, China, Shanghai and Long Beach (Figure 13.4).

Nevertheless, the crane rate in Australian ports is higher than in smaller ports like Hamburg or Gothenburg. Interestingly, the crane rates of Australian ports are very close to each other.

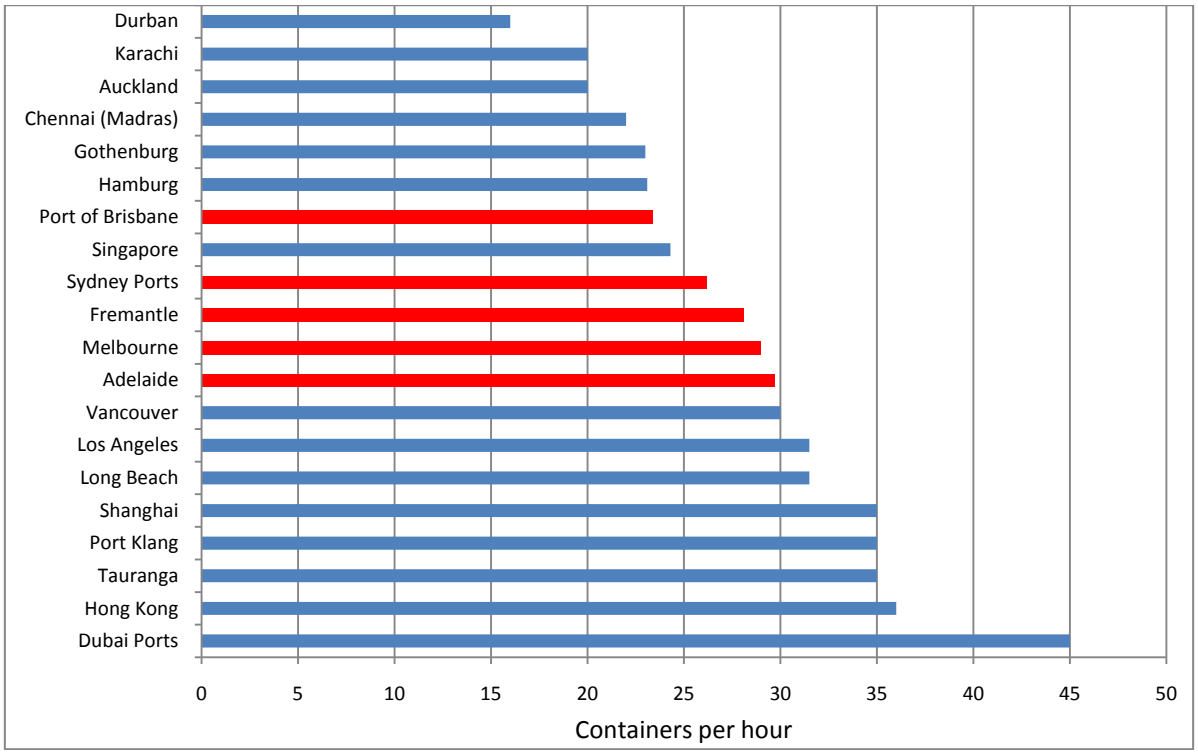


Figure 13.4: Crane rate at selected ports, 2005–07. (Source: BITRE 2009b)

As regards the TEU throughput per berth metre index, the picture is even worse than the crane rate, except in Melbourne and to a lesser extent in Sydney (Figure 13.5).

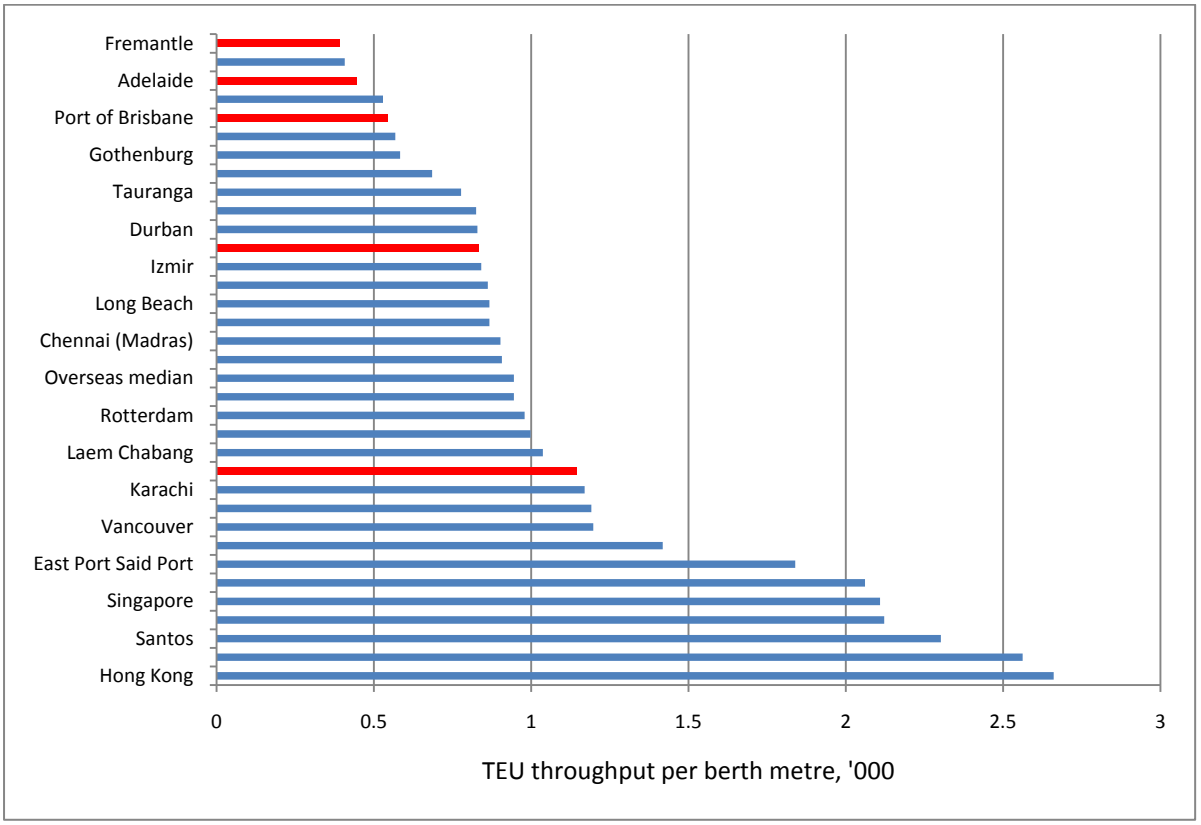


Figure 13.5: TEU throughput per berth metre, 2006–07. (Source: BITRE 2009b)

Not surprisingly, both TEU throughput per berth metre performances and yard utilisation measured as TEU throughput per gross hectare are very close (Figure 13.6).

Overall, we can say that the performance of all five main Australian ports is quite low in terms of international comparisons. In order to explain this poor performance, we suggest two arguments: a lack of exploitation of economies of scale and a lack of inter- and intra-port competition.

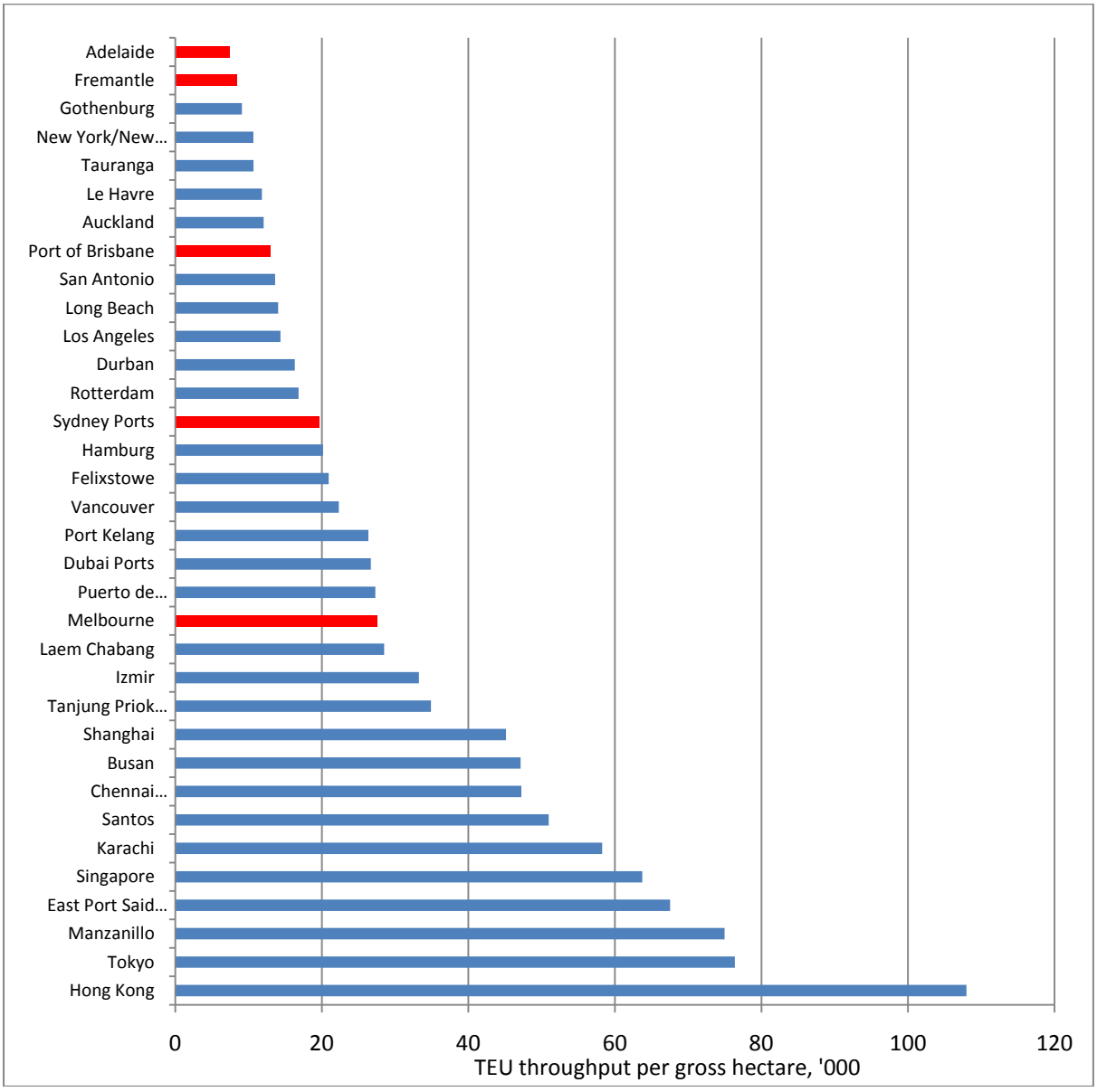


Figure 13.6: Yard utilisation measured as TEU throughput per gross hectare, 2006–07. (Source: BITRE 2009b)

In regard to economies of scale, the number of TEUs handled in Australia is quite small in comparison with most overseas ports in the sample (Figure 13.7). This is due to the logistics of international shipping and ports in Australia. Indeed, most container vessels serving Australia call at least three and often four or five main ports, being the main port in each state. Australian ports are organised as hinterland ports (i.e., they only serve their own hinterland unlike a hub and spokes system).

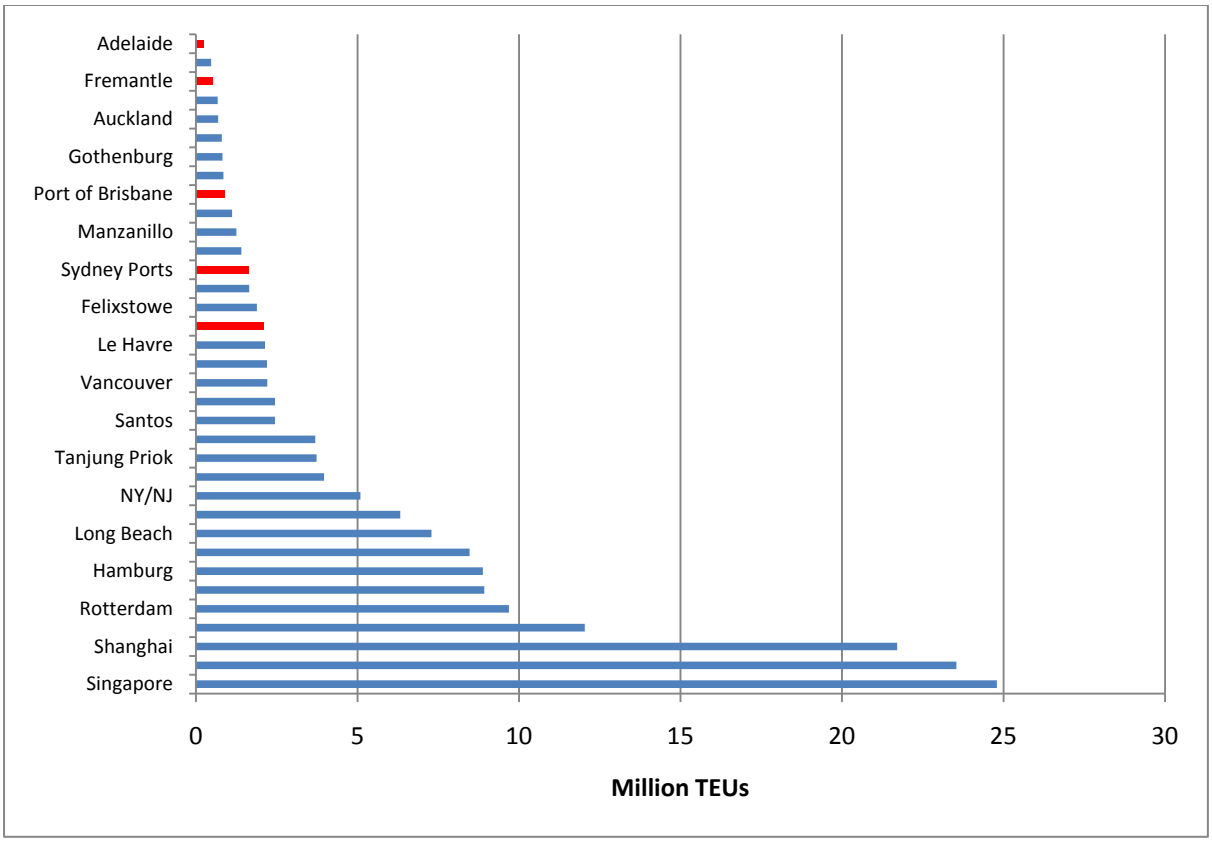


Figure 13.7: TEUs handled in overseas ports, 2006-07. (Source: BITRE 2009b)

This system of fragmented logistics has a direct impact on the number of containers handled in each port and makes it very hard for Australian ports to take advantage of economies of scale. This presumption is reinforced by simple correlations computed between the number of TEUs handled and port performance indexes: see Figure 13.8.[4]

A second explanation for the poor performance of Australian ports could be the lack of competition in stevedoring. In the four largest ports the market is characterised by a duopoly with the same duopolists present; and one of them is the monopolist in Adelaide (Table 13.4). More importantly, each provider has almost the same capacity in each port – measured in terms of berth length and in cranes. This situation can lead to inefficiencies in the sector.[5] The small number of providers in each port harks back to the lack of economies of scale, that is to say the traffic in each port would not justify the entry of a new terminal operator if 0.5–1.0 million TEU per annum is taken as a minimum efficient scale. The modest growth in container traffic also means that a new entrant would need to attract a substantial amount of custom from existing terminals.

[4] These are simple correlations and many factors could explain port performances. Nevertheless, it is interesting to see the positive correlation between the volume of TEUs handled and the indexes of performance.

[5] Moreover, assuming symmetric costs and competition *a la Cournot* (i.e., on quantity), firms make over profits.

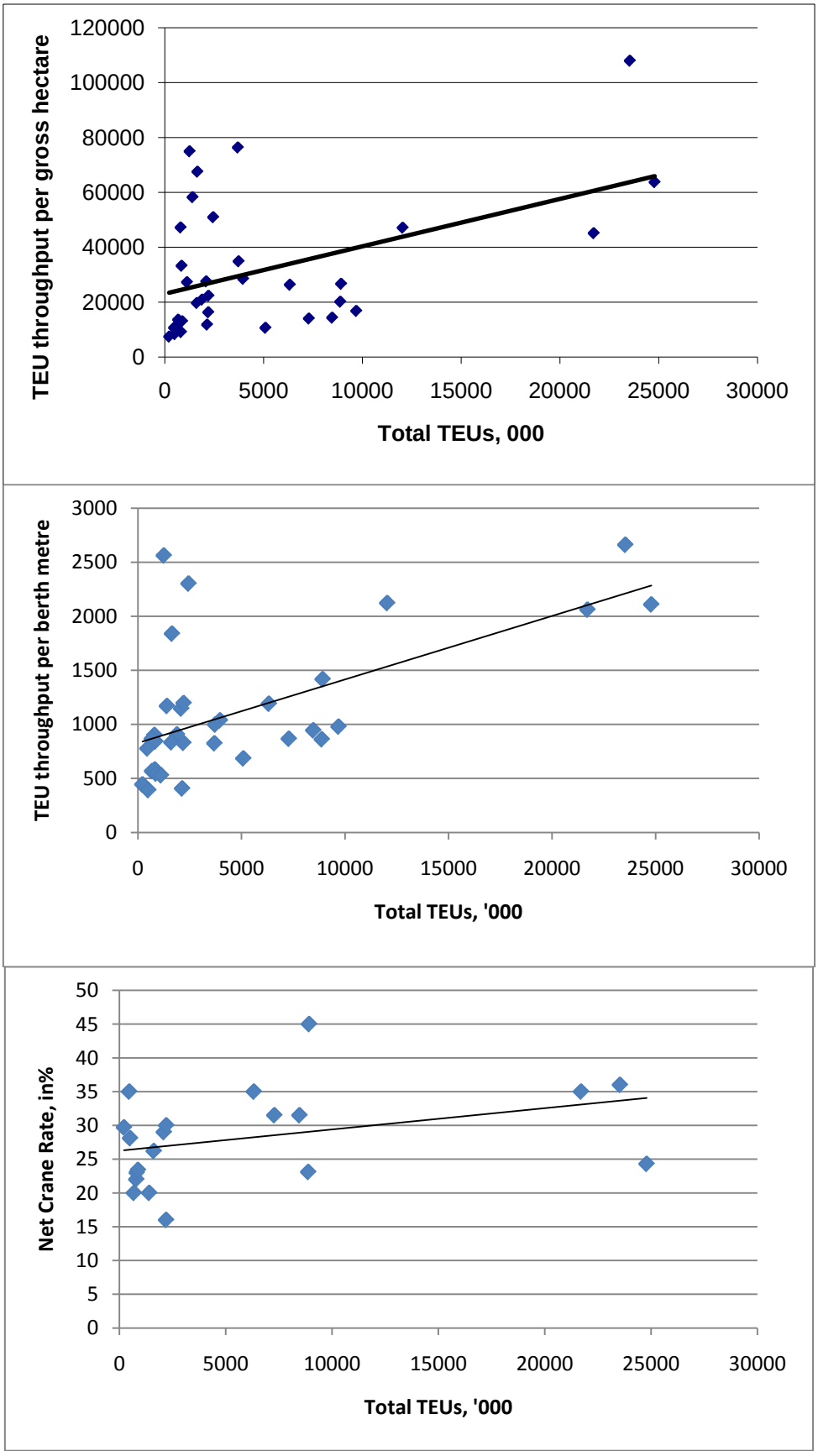


Figure 13.8: Simple correlations – TEUs handled and port performances, 2006-07. (Source: Computed from data from BITRE 2009)

Table 13.4: **Market structure and capacities at the main Australian ports, early 2010.**

Port	Operators	Berths length [a]	Portainers [b]
Melbourne [c]	Patrick	885	8 (3)
	DP World	944	8 (3)
Sydney - Port Botany [d]	Patrick	1006	8 (n.a.)
	DP World	936	7 (n.a.)
Brisbane [e]	Patrick	900	5 (2)
	DP World	900	6 (4)
Fremantle - Inner Harbour	Patrick	726	3 (3)
	DP World	526	3 (0)
Adelaide - Outer Harbor	DP World Adelaide Pty Ltd	660	4 (0)

Source: Ports Australia 2010.
Notes: (a) Metres; (b) In brackets, the number of Post Panamax Cranes; (c) The Port Corporation of Melbourne announced it will host a third container stevedore by 2013; (d) The NSW government announced in December 2009 that Hutchinson Port Handling (HPH) will be the operator of the new third container terminal at Port Botany from 2012; (e) HPH signed a 42-year lease agreement in January 2008 to operate a third container terminal, commencing in 2012.

Since 2003 the Australian Consumer and Competition Commission (ACCC; the government agency in charge of monitoring competition in Australia) has drawn attention to the lack of intra-port competition with statistical evidence. In its Container Stevedoring Monitoring Report the ACCC (2003) stated: 'The existence of monopoly or duopoly suppliers immediately raises questions about the extent of competitive pressures within the markets. The evidence available to the ACCC in that regard is mixed but does raise some concerns about the contestability of the market'. Then the ACCC (2007) stated: 'The amount paid for [the takeover of] Patrick reflects expectations of profits that are available when a small number of firms operate in an industry where price competition is less effective'. The ACCC (2008) said: 'It is clear that some of the planned expansion in terminal capacity creates the possibility of new entry to at least some ports. Thus potentially, the number of competitors could rise from two to three'. The global financial crisis in 2009 increased the presumption of a lack of competition within Australian ports: 'The ability of the stevedores to sustain price levels despite reduced demand and short-term increases in unit costs while also making strong positive returns reinforce the ACCC's concerns about the intensity of competition' (ACCC 2009).

The lack of intra-port competition along with the concerns of shippers has led to some policy response. In 2006 the Council of Australian Governments (COAG), being the Federal and state and territory governments, came to an agreement concerning infrastructure competition. The Competition and Infrastructure Reform Agreement (CIRA) sought to achieve a simpler and more consistent national approach to economic regulation in significant infrastructure. It also asked state governments to review their regulations to ensure that ports are managed efficiently, to allow for competition in the provision of port and related infrastructure and to maximise the opportunity for competition. The main objective of the CIRA was to promote competition, as this would lead to efficiency gains that would finally benefit all consumers.

One important impact of the agreement has been to trigger the entry of new container handling providers in the ports of Brisbane and Sydney and soon also in the port of Melbourne (Table 13.4, notes). However, there have been almost no changes to state government regulations (the relevant level of decision making for port regulations). The only change occurred in New South Wales where the state government has issued a new framework for infrastructure leases which provides incentives for the stevedore to meet performance benchmarks in return for discounts on rental leases. It also threatens to scrap a lease agreement if the terminal operator fails to follow through on investment commitments.

13.3.3.2 Bulk port terminals

Because of the importance of raw materials exports for the Australian economy, efficient bulk port terminals are crucial. Yet in recent years, with the rapid and unanticipated growth in demand, there has been under capacity and congestion in many ports, especially at coal terminals. Table 13.5 shows the dramatic situation in coal terminals: as at May 2009 the waiting time for loading coal at the port of Newcastle and the Dalrymple Bay terminal at Hay Point could be 14 days. No other overseas coal ports suffer from this level of congestion.

Table 13.5: Waiting time for vessels at major coal terminals as at 21 May 2009 (days).

Economy	Pacific Ports	Days		Economy	Atlantic Ports	Days
Australia	Newcastle (Kooragang Terminal)	10–14		Colombia	Puerto Bolivar	0–3
Australia	Newcastle (Dyke Terminal)	8–12		Colombia	Cartagena (Colclinker)	0–1
Australia	Hay Point (Dalrymple Bay Terminal)	7–14		Colombia	Prodeco (Santa Marta)	0–1
India	Haldia	1–6		Colombia	Puerto Drummond	0–1
Australia	Hay Point (Hay Point Coal Terminal)	1–5		Netherlands	Rotterdam (EECV)	0–1
Australia	Gladstone	1–4		Netherlands	Rotterdam (St Laurenshaven Terminal)	0–1
India	Chennai (Madras)	1–4		Netherlands	Amsterdam (OBA Terminal/Rietlanden)	0–1
India	Paradip	0–7		Netherlands	Rotterdam (EMO)	0–1
Australia	Port Kembla	0–5		Netherlands	Ijmuiden (Outer Quay No.2–Corus)	0–1
China	Xingang (Tianjin)	0–2		USA (EC)	Norfolk (Norfolk Southern Coal Pier)	0
Chinese Taipei	Kaohsiung (TPC Terminal)	0–2		USA (EC)	Norfolk (Dominion Coal Terminal)	0
Australia	Abbot Point	0		USA (EC)	Norfolk (Pier IX Terminal)	0
Australia	Brisbane	0		USA (EC)	Baltimore (Consol CMTI Terminal)	0
China	Qingdao	0		South Africa	RBCT	0
China	Rizhao	0		Brazil	Praia Mole Coal Terminal	0
China	Lianyungang	0		Brazil	Itaguai (Sepetiba)	0
China	Qinhuangdao	0		Brazil	Vila do Conde	0
China	Huangpu	0				
India	Tuticorin	0				
India	Pipavav	0				
Canada (WC)	Ridley Island Coal Terminal	0				
Canada (WC)	Roberts Bank (Westshore Terminal)	0				
Canada (WC)	Vancouver (Neptune Terminal)	0				
Chinese Taipei	Kaohsiung (CSC Terminal)	0				

Source: Global Port 2010.

At iron ore terminals the situation is less acute but waiting times for the loading of vessels are also significant (Table 13.6). Congestion and bottlenecks in coal port terminals leads to loss of sales and reduced profits and taxes, which leads to export revenue losses for Australia.

Because of differences in regulatory regimes between states and because of differences in the schemes of exploitation of terminals within states (see Section 13.2) it is difficult to provide a common analysis. Because coal is one of Australia's leading exports, the main focus is on these terminals, specifically the ports of Newcastle and Hay Point (Dalrymple Bay and Hay Point Coal Terminals), where the waiting times are longest. In January 2010 the *Financial Times* reported that 'Ships are queuing for an average of 27 days to collect coal at Dalrymple Bay in Queensland, Australia'. As at midnight 3 March 2010, 48 vessels were anchored off Newcastle waiting to load coal (Hunter Valley Coal Chain Coordinator 2010).

There are various reasons for the now notorious congestion at Australian coal terminals, including periodic bad weather and interruptions to shipments on the landward side. Another is the shipowners' habit of placing their ships in the queue to improve their prospects of charter. This market imperfection is being addressed by the introduction of an advance booking system that requires a vessel to be fixed for a specific cargo. Nevertheless, long vessel waiting times are primarily the result of lags in investments in port capacities.

Table 13.6: Waiting time for vessels at major iron ore terminals as at 21 May 2009 (days).

Economy	Port	Days		Economy	Port	Days
China	Rizhao	3-10		China	Lianyungang	0
China	Beilun (Ningbo)	3-4		Australia	Esperance	0
China	Caofeidian	2-16		Australia	Whyalla	0
China	Qingdao	2-9		China	Qinhuangdao	0
India	Chennai (Madras)	2-3		Australia	Port Latta	0
Australia	Port Hedland	1-7		Australia	Port Kembla	0
Australia	Port Walcott	1-6		Chinese Taipei	Kaohsiung (CSC Terminal)	0
India	Mangalore	1-4		China	Huangpu	0
Australia	Dampier	1-2		Australia	Geraldton	0
China	Baoshan (Baosteel)	1-2		Brazil	Itaguai - CPBS-CVRD (Sepetiba)	1-2
China	Xingang (Tianjin)	0-19		Brazil	Tubarao (North Pier 1)	0-5
India	Haldia	0-5		Brazil	Tubarao (Pier 2)	0-4
China	Fangcheng	0-4		Brazil	Itaguai - CSN Terminal (Sepetiba)	0-3
China	Nantong (Yaogang Terminal)	0-3		Brazil	Ponta da Madeira (Pier 2)	0-2
China	Lanshan	0-3		Brazil	Ponta da Madeira (Pier 3)	0-2
China	Yantai	0-2		Netherlands	Ijmuiden (Outer Quay No.2-Corus)	0-1
India	Paradip	0-2		Netherlands	Rotterdam (EMO)	0-1
China	Dalian	0-2		Brazil	Guaiba Island	0-1
China	Shanghai (Luojin Terminal)	0-1		Brazil	Ponta da Madeira (Pier 1)	0-1
China	Shanghai (Luhuashan Terminal)	0-1		Brazil	Ponta Ubu	0-1
China	Bayuquan	0-1		Brazil	Tubarao (South Pier 1)	0
China	Baoshan (Majishan)	0-1		Brazil	Salvador	0

Source: Global Port 2010.

Although the lack of port capacity was identified at Newcastle and Hay Point in 2003, the first investment was not committed until 2005 and did not come on stream until 2007 (Table 13.7). Investors have argued that these lags were attributable to the inefficient regulatory framework, which also differs between states (Annex Table A13.1). The complexity of the regulation and long decision times within and between government agencies leads to delays in project design, approval and implementation. On average, approval by state government regulators takes more than a year (Exports and Infrastructure Taskforce 2005).

Waiting times are not just a problem of terminal loading capacity, there are also bottlenecks in the supply chain, most notably in rail freight infrastructure. Lack of coordination in investment in port and rail infrastructure is especially a problem in the port of Newcastle, where 99% of coal is transported from mines to the port by rail. In 2005 the Australia Export's Infrastructure Report stated 'In early 2000, in the Hunter Valley, the throughput increased 20% without any significant capital investment in rail infrastructure for the movement of coal from the mine to the port' (Exports and Infrastructure Taskforce 2005). In

Table 13.7: New infrastructure projects – coal.

	Project	Company	Capacity	Phase	Timing	Capital exp.
Newcastle	NCIG export terminal (Newcastle Coal Infrastructure Group)	NCIG	New capacity of 30 Mtpa	Feasibility study Government approval Under construction Expected Startup	2nd semester 2006 2nd semester 2007 1st semester 2008 2010	US$1.1b (A$1.3b
	Kooragang Island coal terminal expansion - Phase 1	Port Waratah Coal Services	Capacity increase from 89 to 102 Mtpa	Feasibility study Under construction Startup	2nd semester 2005 1st semester 2006 2007	$170m
	Kooragang Island coal terminal expansion - Phase 2	Port Waratah Coal Services	Capacity increase of 11 Mtpa	Commitment Under construction Expected Startup	1st semester 2007 1st semester 2008 2010	$456m
	Kooragang Island coal terminal expansion - Phase 3	Port Waratah Coal Services	Capacity increase of 27 Mt	Feasibility study Expected Startup	2nd semester 2006 n.a.	$1b
Hay Point	Dalrymple Bay Coal Terminal 7X expansion project - Phase 1	Babcock & Brown Infrastructure	Capacity increase from 60 to 68 Mtpa	Commitment Under construction Startup	2nd semester 2005 2nd semester 2006 2008	$600m
	Dalrymple Bay Coal Terminal 7X expansion project - Phase 2 and 3	Babcock & Brown Infrastructure	Capacity increase from 68 to 85 Mtpa	Commitment under construction Expected Startup	2nd semester 2006 2nd semester 2007 2009	$679m
	Hay Point Coal Terminal - Phase 2	BHP Billiton Mitsubishi Alliance (BMA)	Capacity increase from 40 Mtpa to 44 Mtpa	Under construction Startup	1st semester 2006 2007	$70m
	Hay Point Coal Terminal - Phase 3	BHP Billiton Mitsubishi Alliance (BMA)	Capacity increase from 44 Mtpa to 55 Mtpa	feasibility study Expected Startup	1nd semester 2006 2014	$500m

Source: ABARE various years.

the Hunter Valley, activities along the supply chain are vertically separated, so bottlenecks might be explained by a problem of coordination between the various players of the logistic chain. The Australian Rail Track Corporation (ARTC) manages 311km of coal rail infrastructure in the Hunter Valley and Pacific National, a private operator, transports most of the coal transported by rail. There are three terminal operators – two in operation and one being commissioned.

The Australian government has taken some steps to address congestion and bottlenecks. In 2008 it passed the Infrastructure Australia Act, creating a new government body called Infrastructure Australia (IA) with a charter to take an intermodal approach. The IA's role is to advise Australian governments on policy and regulatory reforms and on barriers or disincentives to investment. Its operational mission is to define infrastructure priorities to be financed by the Building Australia Fund. A major achievement of IA so far is the publication of the National Public Private Partnership Policy and Guidelines (the PPP Guidelines), which provide a clear, consistent and predictable framework for awarding contracts through a more rigorous process and following more streamlined procedures. The PPP Guidelines have been endorsed by all state governments.

Concerning the Hunter Valley coordination issue, some improvements have also been achieved. In 2004 an agreement was taken to lease the Hunter Valley coal railways to ARTC (Table 13.8). The lease agreement began to have effect from 2005. The rail capacity in Newcastle was increased to 60Mtpa in 2006. Nevertheless, because of the lags involved, it took some time for the necessary investments to be designed and contracted out. Furthermore, problems of coordination persist in the Hunter Valley. Indeed, many rail projects are under way but they have been at the first stage of development for a long time. This is due to the functioning of the rail network access regime. Actually, in the Hunter Valley the rail track is 'open access' and the principle of non-discrimination is applied (i.e., the rail operator cannot refuse to supply the service). According to this system, in the current situation of congestion an increase of demand of one unit leads to an equivalent decrease in the supply for the other consumers. The capacity constraint is managed by the quantity, and as a result consumers face the average cost and not the marginal cost if the outcome is not efficient. The price of the service is too low and does not cover the cost of the necessary investments. This explains the lack of investment in rail in the Hunter Valley. By contrast, in Dalrymple Bay, coal transport is provided on a fully commercial basis, with contracts between miners and transport service providers. There is no problem of vertical coordination in investment between the quayside and the landside operators.

Table 13.8: ARTC coal infrastructure expansion projects in New South Wales.

Project	Location	Phase	Timing	Expected Startup	New Capacity	Capital Expend. [a]
Minimbah Bank third rail line - stage 1	Minimbah to Whittingham (10km)	Under construction	Since second semester 2009	2010	n.a.	$134m
Scone - Parkville duplication	Scone - Parkville	Feasibility study under way	Since second semester 2009	2013	n.a.	$60m
Koolbury - Aberdeen duplication	Koolbury - Aberdeen	Feasibility study under way	Since second semester 2009	2013	n.a.	$60m
Export terminal arrival tracks	Newcastle	Feasibility study under way	Since second semester 2009	2011	n.a.	$50m
Drayton Junction rail upgrade	13 km S of Muswellbrook	Feasibility study under way	Since second semester 2008	2010	n.a.	$270m
Minimbah - Maitland third road rail	Minimbah to Maitland (30km)	Feasibility study under way	Since first semester 2008	2012	n.a.	$270m
Minimbah - Bank third road rail	10km S of Singleton	Feasibility study under way	Since second semester 2008	2010	n.a.	$100m
Muswellbrook - Koolbury duplication	Muswellbrook to Koolbury (5km)	Feasibility study under way	Since first semester 2008	2011	n.a.	$35m
Liverpool Range rail project	Willow Tree to Murrurundi (30 km)	Feasibility study under way	Since second semester 2007	2012	Capacity increase of 12.5 Mtpa	$290m
Sandgate rail grade separation	Sandgate, between Newcastle and Maitland	In operation	Since 2006	-	Capacity increase of 60 Mtpa	$68m

Source: ABARE various years.
Note: (a) Includes cost of development, plant and equipment.

13.3.4 Consequences of changes and scope for further reform

13.3.4.1 Coastal shipping

The recent changes introduced by the government do not change the regulatory regime of coastal shipping but they will affect its implementation. The reforms of the Ministerial Guidelines and, most particularly, the extension of the Fair Work Act to licensed and permit vessels will increase the labour operating costs for foreign-flag vessels. At the same time it will make the Australian-flag fleet more competitive with foreign-flag vessels. The higher operating costs of foreign-flag vessels are likely to lead to some increase in freight rates over the next few years, depending on how strictly the Act is applied. It remains to be seen how willing foreign owners will be to meet Australian labour standards and how interested Australian investors will be to place Australian-flagships in coastal trades.

Finally, it is important to note the argument that there is a substantial benefit to Australia as an island economy in maintaining a viable maritime industry of its own, with the supply of skills to all ancillary areas that this entails.

13.3.4.2 Shipping agreements

Within the area of competition, Part X of the Trade Practices Act may now validly be regarded as a non-issue. Nevertheless, the current system is burdensome for carriers and expensive to manage for the government. Some adjustments to the regulations could improve this situation.

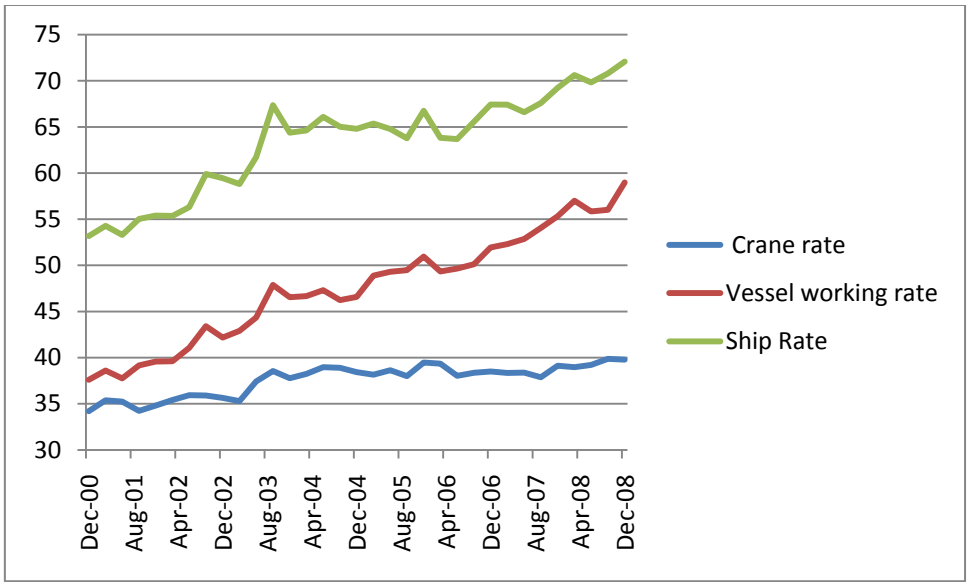
Actually, we can imagine a system which would be similar to the EC regime. The conference element of the regulations, which is outdated, could be repealed and substituted by a new and softer regulation that would cover only operational agreements that have market outcomes.

13.3.5 Infrastructure and related services

13.3.5.1 Container port terminals

The lack of exploitation of economies of scale in the container handling sector can be seen as part of a more general problem, one of either competition or coordination between ports. The absence of port rationalisation raises not only the question of lack of economies of scale but also of the duplication of costs for port authorities, notably the cost of dredging because of the increasing size of container ships. Nevertheless, in the absence of massive investments in rail and road infrastructure, a hub and spokes system is not sustainable in Australia. Given Australia's geography and infrastructure, a hinterland system is more efficient for carriers and route patterns are adjusted accordingly. For example, on the busy Singapore–Australia–Singapore route it is more efficient for carriers to take the western route and use the favourable ocean currents than to sail around Australia from Fremantle, on to Adelaide, Melbourne, Sydney and Brisbane and then back to Singapore. In other words, Australian ports are complementary and not substitutable.

Regarding competition in the container-handling sector, port productivity increased substantially in the early 2000s but has stagnated since 2003 (Figure 13.9). The entry of new providers in the main three ports will increase competition and may lead to improved performance in the next few years.



Notes: The vessel working rate as a measure of labour productivity is computed as the total containers handled divided by the elapsed labour time. The ship rate measures the combined stevedoring productivity of capital and labour. Both indicators and the crane rate are expressed in containers per hour.

Figure 13.9: Port performance indicators, average of the five main ports, in TEUs per hour. (Source: BITRE website 2010)

Nevertheless, the entry of new terminal operators will not of itself lead to better productivity and pricing outcomes. State governments, through their port corporations, still own the channels, land and immobile port infrastructure, and regulate the entry of new providers. There is a clear conflict of interest between these responsibilities. State governments have little incentive to reduce returns on their assets when port revenues represent a significant share of state revenues (McInerney et al. 2007).

There may be scope for an independent regulator (at federal or state level) whose role would be to ensure competition and contestability in the market. Although ACCC might have the regulatory power to mandate the entry of a new service provider to port corporations it only nominally plays this role, as it is in fact just a monitor and an adviser. So another solution might consist in enhancing shipper pressure through the ACCC.

13.3.5.2 Bulk port terminals

The new terminal and landside capacities coming on stream will relieve the immediate problems of port congestion (see Table 13.7). The implementation of the new booking system will also help to coordinate the arrival of vessels in ports and limit the number of vessels queuing.

The PPP Guidelines do not cover direct private investment in infrastructure such as bulk terminals. While public-private partnership is a sensible mode of funding port infrastructures, especially in ports where there are only a few main users, more care by state governments in the design of the PPP Guidelines would reduce uncertainty and improve the investment climate. The pernicious pressure from state treasuries to require up-front payments creates an unbalanced structure of debt and an excessive burden of debt service. This is another reason why there is much to be gained from improvements to the PPP Guidelines, for instance, in coordinating the regulatory framework between states, the issuing of new guidelines and limiting the time for project approval.

Over the longer term, Infrastructure Australia (IA) should help to overcome delays in scheduling and financing further necessary investments. Prioritisation of public investments in infrastructure would give clarity to investors and allow long term strategic planning (PricewaterhouseCoopers 2009). It would also decrease the uncertainty for private investment in infrastructure.

IA should also help to overcome the lack of coordination in infrastructure investments, especially by way of integration across the national freight network – a lack of coordination in investment that is also true for other infrastructures and other parts of Australia, An example is the bottleneck in Sydney between the port and the southbound road. But IA will not help to address the persistent problem of coordination between ports and rail users in the Hunter Valley. One solution could consist of shifting from the open access system to access by auction, a system that would reveal the real price of the service and make funds available for investment in new capacities.

13.4 CONCLUSION

In Australia the maritime transport industry is characterised by fairly open markets under liberal commercial regulations. Indeed, for most maritime services there are neither artificial barriers to entry nor restrictions to trade.

Coastal shipping is the best example of the openness of Australia in comparison with many overseas regimes. This remains the case despite the Australian government's decision to re-introduce Australian wages and conditions to the manning of foreign-flag ships engaged under permit in coastal trade. While this may be viewed as a step towards the reintroduction of cabotage, in fact it removes an exceptional loophole in Australian labour regulations. The reform does not discriminate between ownership and flag of operation. There is a further objective of strengthening the Australian-flag fleet, which is justified by the strategic need of an island nation to sustain a maritime capability. A tonnage tax is presently under consideration.

The exemption of liner shipping agreements from the competition rules has become a non-issue because the liner shipping market is now highly competitive and conference agreements no longer have binding force. Nevertheless, the registration system could be simplified to maintain transparency but reduce the cost and burden of administration.

In Australia, as indeed for most of economies, the balance between light-handed and heavy-handed regulation is difficult to find. Australia provides good examples of these difficulties. Thus, in the container-handling sector, regulation needs to be firmer in order to ensure competition and contestability, while by contrast, in Newcastle's coal terminals, regulation is heavy-handed, even though market driven mechanisms would lead to better outcomes.

The other big challenge concerns the ability of the government to adopt an intermodal approach that takes into account the logistics revolution of recent decades. The big task is now to facilitate coordination between the different modes, both in the harmonisation of regulation between the states and in the prioritisation and financing of large components of infrastructure.

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ANNEX 13

Table A13.1: Port regulatory regimes in various Australian states.

	Agencies and regulators	Status	Mission
Victoria	DoT	Not independent	Strategy and safety
	Essential Services Commission	independent	Price monitoring for shipping channels, berths and short term storage and cargo marshalling facilities
	Department of Planning and Community Development	Not independent	Planning and project approval
New South Wales	NSW Maritime	Not independent	Providing strategic advice to the three NSW Ports Corporations, coordination of maritime security arrangements across NSW, development of advice on shipping and safety matters at NSW ports, oversight of the implementation of the NSW Ports Growth Plan
	Department of Planning	Not independent	Planning and project approval
	independent Pricing And Regulatory Tribunal (IPART)	independent	Oversees regulation in the electricity, gas, water and transport industries and undertakes other tasks referred to it by the NSW Government.
Queensland	Queensland Competition Authority [c]	independent	Assess and approve access undertakings for ports declared for Third Party Access, arbitrate access disputes, enforce breaches of access obligations, investigate and monitor prices for ports declared for monopoly prices oversight and assess competitive neutrality
	Maritime Safety Queensland	Not independent	Maritime safety, delivering essential maritime services such as pilotage
	Department of Transport and Main Roads	Not independent	Policy and strategic advice on the planning, funding and performance of Queensland's port, overseeing the operation of the state's port authorities, provides policy and procedural advice about government-owned corporations
	Department of Infrastructure and Planning	Not independent	The Coordinator-General is responsible for deciding if Queensland's most important and complex private and public projects require whole-of-government management as significant projects, and coordinates an environmental assessment process on behalf of the state government
Western Australia	DoT	Not independent	Security and safety, formulating and implementing suitable policies relative to ports, funding for the WA Port Operation Taskforce
	Department of Planning	Not independent	Planning and project approval
	WA Port Operation Taskforce	Not independent	Identify operational impediments to passage of goods and vessels through Western Australian ports, determine practical measures to overcome those impediments
	Economic Regulation Authority	independent	Maintain a competitive, efficient and fair commercial environment, particularly where businesses operate as natural monopolies, for the benefit of the Western Australian community.
South Australia	Department for Transport, Energy, Infrastructure	Not independent	Safety, security, environment, Policy and Planning, identifying infrastructure priorities for South Australia (SA), coordinating infrastructure planning and development and facilitating the timely delivery of key projects.

Sources: State government websites 2010.

Table A13.2: Recent policy changes in maritime transport.

Sector	Area of policy change	Associated regulation	Year of change	Description of change
Coastal shipping	Regulation	Review of the Ministerial Guidelines	2008	Introduction of a preamble setting new objectives of the government
			2009	Clarification of key terms in a concern of transparency and accountability
				Coverage of licensed and permit vessels by legislation that governs workplace relations
Liner shipping	Competition rules	Review of Part X of the Trade Practice Act	2005	Introduction of new provisions on contracts' confidentiality
Infrastructures [a]	Regulation and competition	The Competition and Infrastructure Reform Agreement (CIRA)	2006	Objective to achieve a simpler and consistent national approach. State Governments have to review their regulations to ensure competition
Infrastructures	Creation of a new governmental body	Infrastructure Australia Act	2008	IA Provides advices to Australian governments about policy and regulatory reforms, it define infrastructure priorities, it issued PPP Guidelines. IA is the only Australian institution with an intermodal view
Port infrastructures [b]	Lease framework	Port and Maritime Administration Amendment	2008	Provides incentives for the stevedore to meet performance benchmarks in return for discounts on rental leases. Carries threats if the terminal operator fail to follows investment commitments

Notes: (a) Agreement between the members of the Council of Australian Governments (COAG); (b) In New South Wales.

Chapter 14

MARITIME TRANSPORT IN THE UNITED STATES

Fabien Bertho[1]

- The USA retains a restrictive cabotage regime because it has decided to prioritise strategic factors. The high cost of maritime domestic freight has led to a substitution by other modes and the volume of domestic freight by sea has fallen, as has the size of the US fleet: the shipbuilding sector has also declined.
- Businesses which consign freight have been lobbying against the regulation but have not been effective in comparison with the concentrated influence of the remaining shipping companies (now a duopoly in the domestic container transport sector); the complexity of the policy package and the lack of transparency make its assessment more difficult.
- Container handling is characterised by open and competitive markets and regulation is efficient and in line with good practices: the main challenge is the expected increase in traffic and the risk of congestion, both inside and outside ports: coordination across modes in future will be valuable.

14.1 INTRODUCTION

This chapter analyses the maritime transport sector in the United States of America (USA). It addresses maritime transport in the widest sense possible with a focus on international and domestic shipping, and port infrastructure and related services, particularly container and intermodal facilities. It deals with commercial and competition regulations. Measures of the impact of these policies on the maritime sector in particular and on the USA's economy in general are examined. The US pursues a policy of explicit support to the maritime industry, which means to both the fleet and the shipyards. The cornerstone of this policy is security of supply. The aim is to ensure that the fleet is sufficient to carry US domestic water-borne foreign trade and is capable of serving as a naval military auxiliary in times of emergency. This study identifies some economic consequences of the policy, contrasts the treatment of the shipping sector with that of the port sector and identifies emerging issues.

The US's focus on security follows from the significance of maritime transport in US trade. In 2008, 48% of the value of international trade was transported by sea and in 2007 12% of domestic trade was transported by water (US Department of Transportation 2009). Maritime transport also represents an important part of the US economy, accounting for USD30.9 billion of gross output and employing over a quarter of a million workers (in 2008, of whom about a quarter were in transportation, a third in port services and the balance (40%) in the shipbuilding and repair sector). The US accounts for a large share of world sea-borne trade (17%), mostly petroleum products (44% of the total volume) and containers (in 2008

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US container traffic represented 10% of world traffic). While it has some large ports, only one (Los Angeles) is ranked in the top 20 in the world.

14.2 THE CURRENT REGULATORY FRAMEWORK

The first part of this section deals with international shipping and the second part focuses on port infrastructures and related services, most particularly on container and intermodal facilities.

14.2.1 Shipping

14.2.1.1 International shipping

There are no barriers to entry in the market for domestic providers in the maritime transport sector; however, there are significant barriers to entry for foreign providers. In cross-border trade the US maintains some cargo preferences (also called cargo reservations). According to the General Agreement on Trade in Services (GATS), cargo preferences are a restriction to market access under mode 1. (GATS splits supply of services into four modes. Mode 1 is cross-border supply, and it applies when service suppliers resident in one economy provide services in another economy, without either the supplier or the buyer/consumer moving to the physical location of the other. [Francois & Hoekman 2009]). According to this restriction, some types of cargo (e.g., government-generated, strategic, military or that financed by certain government programs) can only be transported by vessels that fly the flag of the economy. At the same time, requirements to fly the US flag are quite restrictive. In order to fly the flag the vessel must be owned by a US entity (but may be owned up to 100% by non-citizen interests), the vessel must be crewed by US citizens or lawful permanent residents, all licensed officers must be US citizens and the vessel must be certified by the US Coast Guard. Foreign seafarers are allowed to work on US-flag vessels in the domestic and international trades if they hold a green card but are limited to only 25% of the licensed crew members.

Cargo reservation is a precedent which in the past has widely applied in the maritime transport industry across nations. Nevertheless, although since the 1970s and 1980s most economies have repealed this type of restriction, the US is one of the OECD economies that still applies it. Moreover, as can be seen in Table 14.1, cargo preference laws in the US cover many types of cargoes. Furthermore, considering cross-border trade restrictions, the US is party to a bilateral maritime agreement with Brazil. This agreement includes a cargo sharing clause; that is, it establishes a system of 'cargo reservation' between partners based on shares of bilateral or international trade transported by sea. The agreement signed with Brazil states that 'National-flag carriers of each party shall have equal and *discriminatory* access to the government-controlled cargo of the other party'. Nevertheless, according to the Brazilian Maritime Transport Agency (Agência Nacional de Transportes Aquaviários), the reservation is not applied (Brazilian Maritime Transport Agency e-mail 2009).

Table 14.1: US cargo reservation schemes.

Types of cargo reserved	Regulation associated	Share reserved to US-flagged vessels
Military cargo [a]	Military Cargo Preference Act (1904)	100%
Government generated cargo [b]	Cargo Preference Act (1954)	At least 50% of the GT
Petroleum	Cargo Preference Act (1954)	
Agricultural cargoes under some foreign assistance programs [c]	Food Security Act (1985)	At least 75%
Exports for which a government agency makes export loan or credit [d]	Public resolution 17 (1934)	100%

Sources: MARAD website 2010.

Notes: (a) Includes military contract cargo, commercial contractor cargo, personal property cargo, POV shipments; (b) Includes Congressional supplementary for Iraq reconstruction, Federal Transit Administration, AID loans and grants, etc. (c) Includes programs PL480 (Title I to III), Food for Progress, Section 416(b) and Food for Education; and (d) Ex-Im Bank.

There are almost no restrictions concerning the establishment of a commercial presence for a foreign provider, for example, restrictions on foreign ownership. Nevertheless, there is a measure considered by GATS as an impediment to trade under mode 3, namely, that international activities carried out in the US cannot be conducted by a branch. The requirement enables the US to have jurisdiction over the companies, in case of shipwreck for instance. It is also a means for the government to ensure that ships do not clear port without paying their bills.

Concerning discrimination between domestic and foreign providers, there is an important scheme in place with the aim of supporting the US maritime industry as a whole, which means the US-flag fleet, the vessels' owners and operators and also US shipyards. These support programs are described in Table 14.2. The support can be applied to both international and domestic trade vessels and takes various forms: subsidies, credit guarantees and tax deferrals.

Table 14.2: Support programs to the US maritime transport industry.

Programs	Support	Mechanism
The Maritime Security Program (MSP)	US flag merchant marine - operators	Fixed payment to US-flag vessel operators
Voluntary Intermodal Sealift Agreement Program (VISA) [a]	US flag merchant marine - operators	Participants obtain priority consideration in the award of Department of Defence peacetime ocean freight contracts
Title XI - Federal Ship Financing Program	US merchant marine and shipyard	Credit guarantee to private entity seeking to finance the construction or modernization of vessels in US shipyards and for US shipyards seeking to invest in technology
Capital Construction Fund (CCF)	US flag merchant marine - owners and operators	Deferment of Federal income taxes on certain deposits of money or other property placed into a CCF
Small Shipyard Grant Program	Smaller shipyards	Grants for capital and related infrastructure improvements
Technical Assistance Program	Shipbuilding	Various programs to aid the development of more advanced technologies

Source: Source: Global Insight 2009, MARAD website 2010.
Note: (a) VISA is not really a subsidy. Nevertheless, the effect of the program is similar as it ensures a given level of resources for the carriers involved.

With only two exceptions, there is no discrimination in access to port infrastructure and related services for foreign vessels. First, national security measures may deny access to US ports to vessels from some economies. The second exception deals with the maintenance and repair of vessels. The US applies the principle of reciprocity, that is, it assesses tariffs when those services are rendered on US vessels in foreign ports.

Finally, the US applies an exemption on shipping agreements (conferences, consortia, discussion agreements) from US competition laws. Agreements among liner operators and marine terminal operators to discuss, fix, or regulate transportation rates and other conditions of service or cooperate on operational matters must be filed with the Federal Maritime Commission (FMC). The FMC reviews them to avoid anti-competitive behaviour.[2]

14.2.1.2 Domestic shipping: cabotage

In general, economies reserve domestic shipping for vessels that fly their own flag, but the requirements in order to provide cabotage service are more demanding in the US. According to the Merchant Marine Act of 1920 (the 'Jones Act'), vessels must be registered under the

[2] Given the evolution of US regulations (with OSRA in 1998) and that of other economies (the repeal of the exemption in the European Union, for instance) the number of conferences calling at US ports is negligible. The market share of conferences on these routes is also negligible. In other words, in the US, liner shipping is a competitive market. Thus, the exemption of carriers' agreements from competition law is considered a non-issue.

US flag and also be owned by a US corporation, of which the maximum amount of foreign equity is 25% and at least 75% of its employees must be US citizens.

More importantly, under the Jones Act, cabotage is reserved for ships built in the US. This building requirement has the effect of providing support for US shipyards. The US defines cabotage as 'cargo services between two points in the US, including its territories and possession either directly or via a foreign port'. According to the cabotage regulations, any domestic leg of an international journey is also considered cabotage. This is an important restriction and more inclusive than that used by some other economies, even if, in practice, many waivers are issued (as reported by experts in 2009).

There are exemptions from the Jones Act. For instance, there is no building requirement for the transport of crude oil from Alaska. Also, with the exception of activities reserved for the US government, the US territories of American Samoa, Virgin Islands and Northern Mariana Islands are also exempt.

These restrictions stem in part from the long decline in the size of the US maritime industry prior to World War I. In 1913 the US fleet was very small in comparison to the US's engagement in international trade. From the beginning of World War I foreign-flag ships were diverted away from US routes. In order to satisfy the demand for shipping for commercial and military purposes, the US government subsidised the shipbuilding industry. As a result, the shipbuilding industry obtained not only substantial financial resources and but also experience of interaction with policymaking, adding to its capacity to influence the content of the Jones Act.

14.2.2 Port infrastructure and related services

This section focuses on port services (pilotage, towing and tug assistance, provisioning, fuelling and watering, garbage collection and disposal, port captain's services, navigation aids, shore-based operational services and emergency repair facilities) and auxiliary services (cargo handling, storage and warehousing, customs clearance, container station and depot, maritime agency and maritime freight forwarding).

It is the task of the Maritime Administration (MARAD) to provide expertise on port financing and port infrastructure, ensure port and cargo security, and license deepwater liquefied natural gas ports. Meanwhile, the Federal Maritime Commission (FMC), which is an independent regulatory agency, regulates certain port activities and is responsible for the registration of Marine Terminal Operators (MTOs). These two entities are both port authorities and private terminal operators. All MTOs are obliged to file a notice with the FMC that they will provide regulated marine terminal services. The FMC reviews agreements, monitors the concerted activities of ocean common carriers and MTOs and produces a market analysis with a focus on activities that are substantially anti-competitive.

The US system is decentralised. Most commercial regulations dealing with ports are issued by local governments and the state governments are responsible for environmental regulation. In the main US container ports, a public port authority owns and maintains the docks and other facilities and is responsible for the overall administration of the property, terminals and other facilities. In these ports, the port authority acts as a landlord; that is, it leases terminals to private operators.

Ocean Transport Intermediaries (OTIs; freight forwarders or 'non-vessel operating common carriers') must obtain a licence in order to enter into the market. The FMC issues the licences after the submission of a form, the payment of a fee and a proof of financial responsibility has been provided. Moreover, a company officer has to provide proof of his or her experience.

There are restrictions on the number of port and auxiliary service providers. In general the number of service providers in some areas (e.g., cargo handling, storage and warehousing and pilotage) is limited in ports because of the existence of economies of scale and the scarcity of port space. Thus, it is not uncommon that companies that want to provide these types of services must obtain concessions from port authorities through auction or tender. Major US ports are landlords, so they are responsible for the introduction of new providers when necessary. The right to operate port facilities then is driven by the operators' financial capacity and willingness to meet safety and security requirements. Various schemes apply to pilotage services in ports: they might be operated by private monopolies (e.g., Long Beach), by pilotage associations (e.g., New York/New Jersey and Houston) or by port authorities (e.g., Los Angeles).

14.3 FORCES FOR POLICY CHANGE

This section deals with the main policies that have been put in place to support shipping in the maritime transport industry; that is, the cargo preferences system, various subsidy programs and the Jones Act. It also includes reference to container and intermodal facilities because of their importance in US freight transport.

14.3.1 Cargo preferences

The US government grants preference to US-flag vessels for transporting various types of cargo. From 2005 to 2007 the volume of cargo transported under preference schemes represented a very small share of the total US foreign trade (1.4–1.6% of total US seaborne trade depending on the year). Nevertheless, the revenue generated by cargo preferences transportation was sizable (Table 14.3). For each of the fiscal years between 2005 and 2007 it represented more than USD1.3 billion. Thus, it represents an important share of the total revenues of carriers operating US-flag vessels.

Table 14.1: Importance of various cargo preference schemes, since fiscal year 2005.

	FY2005			FY2006			FY2007			FY2008		
	Total tonnage (1000)	Share really reserved	US revenue (1000)	Total tonnage (1000)	Share really reserved	US revenue (1000)	Total tonnage (1000)	Share really reserved	US revenue (1000)	Total tonnage (1000)	Share really reserved	US revenue (1000)
Military cargoes	17 225	92.0	853 086	15 349	88.2	784 848 [a]	19 086	74.0	919 363	n.a.	n.a.	n.a.
Agricultural cargoes	3 779	67.7	379 396	3 655	72.8	414 403	2 554	83.1	319 760	2 796	79.3	430 788
Civilian agencies	859	92.0	80 434	900	93.2	122 951	822	93.2	88 719	841	94.0	95 659
Ex-Im Bank	30	55.7	10 939	27	70.9	16 657	67	42.3	24 724	8	65.7	4 659
Total	**21 893**	**87.7**	**1 323 855**	**19 931**	**85.6**	**1 338 859 [b]**	**22 528**	**75.6**	**1 352 566**	**3 644**	**82.6**	**531105 [c]**

Source: MARAD website (2010)

Note: Data not available for petroleum reservation scheme. 'Share really reserved' is expressed in percent of the total tonnage. (a) Does not include revenue for petroleum.

Military cargo preference is the most important scheme in volume and in value. In 2007 the scheme represented 84.7% of the volume of cargo reserved and 68% of the revenue generated. The share generated by military cargo over the last number of years has undoubtedly been inflated by the conflicts in Iraq and Afghanistan. Nevertheless, the share of cargo that should be reserved according to the law and the share of cargo actually reserved are noticeably different.

This discrepancy is most likely due to the limited shipping capacity of the US-flag fleet. Because the general fleet is relatively small in size, the first issue is gross capacity. There is also the issue of the Department of Defense's need for specialised carriers, such as Roll-on/Roll-off (Ro/Ro) ships, which are insufficient in the US-flag fleet. Moreover, the share reserved to US-flag vessels comes with the condition 'to the extent that such vessels are available at fair and reasonable rates', which means that the various agencies are allowed to contract for foreign-flag vessels if there is a documented lack of availability of US-flag vessels.

From a commercial policy point of view, cargo reservation works much like a quota, by protecting the vessels registered under the American flag. Contrary to the situation in most other economies, there are no restrictions on foreign ownership in order to fly the flag. However, the cost of operating a foreign-flag vessel is lower than the cost of operating a US-flag vessel. Therefore, the operating cost differential comes, above all, from the American crew requirement, which makes for higher labour costs (Table 14.4). This crew-related expenses differential is responsible for more than 75% of the total operating expenses differential for a tanker and 80% for a container ship. Protection of the domestic fleet leads to an increase in the price of shipping services, which results in an opportunity cost for the reserved cargoes' shippers – to transport the cargo on a US-flag ship rather than on a cheaper foreign ship. Most reserved cargoes are consumed by US government departments (e.g., Defense, Agriculture and Transport) so that it is the taxpayers who bear the cost.

Table 14.2: Daily operating expenses for US-flag vs foreign-flag vessels, in 2005 (USD).

	Tanker [a]		Containership [b]	
	US-Flagged	**Foreign-Flagged**	**US-Flagged**	**Foreign-Flagged**
Expense Category				
Crew	11 000	2 300	12 705	2 940
Fuel	2 600	1 100	4 410	3 045
Maintenance and Repair Costs	1 200	700	2 310	1 470
Insurance	11 000	11 000	13 335	13 335
Other [c]	2 100	1 500	1 500	1 400
Total	27 900	16 600	34 260	22 190

Source: MARAD 2006 (replicated from USITC 2007)
Notes: (a) These costs are estimated for 40-50 000 dwt tankers that are less than 10 years old; (b) These costs are estimated for a container ship with a volume of 4000 20-foot equivalent units (TEUs) that are less than 10 years old; and (c) includes food, supplies and other vessel expenses.

There is little information in terms of impact assessments relating to cargo preferences, as there has not been regular analysis allowing for the monitoring of this policy. Furthermore, there is only one analysis dealing with all schemes in combination, as most studies focus on one particular type of reservation scheme only. Table 14.5 shows the results from various studies.

Table 14.3: Results of various assessments.

Study	Period of Assessment	Schemes Assessed	Estimation	Main conclusion
White (1988)	1984	Agricultural commodities (P.L. 480), Strategic Petroleum Reserve, other shipments	-	Cost for the Federal government are respectively of 130, 43 and 93 MUSD
GAO (1990)	1986-1988	Food Aid (P.L. 480)	Based on ocean freight differentials	The cost differential is in average 128.1MUSD per year - i.e. 9.5% of total program expenditures
GAO (1994)	1989-1993	All schemes	Comparison with charges to carry cargo on foreign vessels	Federal agencies' transportation costs are increased by 578MUSD per year
Department of Defense (1994) [a]	-	Military cargo scheme	-	Additional costs of 476 MUSD on a total bill of 1.15 BUSD for the DoD
Barrett and Maxwell (2005)	1999-2000	Section 416(b) and Food for Progress		A premium of 78% is paid for ocean freight due to cargo preference

Sources: Various reports, for details see references.
Note: (a) Not available, information reported from OECD (2001).

The highest estimated cost is associated with military cargo – with estimates ranging from USD352 million to USD969 million according to the year and the study. The difference between assessments can be explained by the different methodologies used to compute the cost of the measure as well as the variation of the quantity of cargo transported under the various schemes. This is particularly true for military cargo, where the difference between cargo transported in peacetime and in wartime is important.

Finally, the various impact assessments do not focus solely on the pecuniary costs of the measures; e.g., the 1990 assessment by the GAO highlights the impact of cargo preferences on the quality of services provided. According to the report, because of the schemes a sizable share of cargoes are loaded late (GAO 1990).

For all these reasons it is very difficult to draw general conclusions from this work beyond the assessment that cargo preferences are costly for the American economy.

If the main objective of cargo preferences is to support the US-flag fleet involved in international trade. Figure 14.1 shows that this objective has not been reached. Indeed, the US-flag fleet decreased substantially over the last two decades. Cargo preferences have not prevented the decline in the size of the US-flag fleet. It may also isolate carriers operating US-flag vessels from international competitive standards and reinforce the fleet's inefficiency.

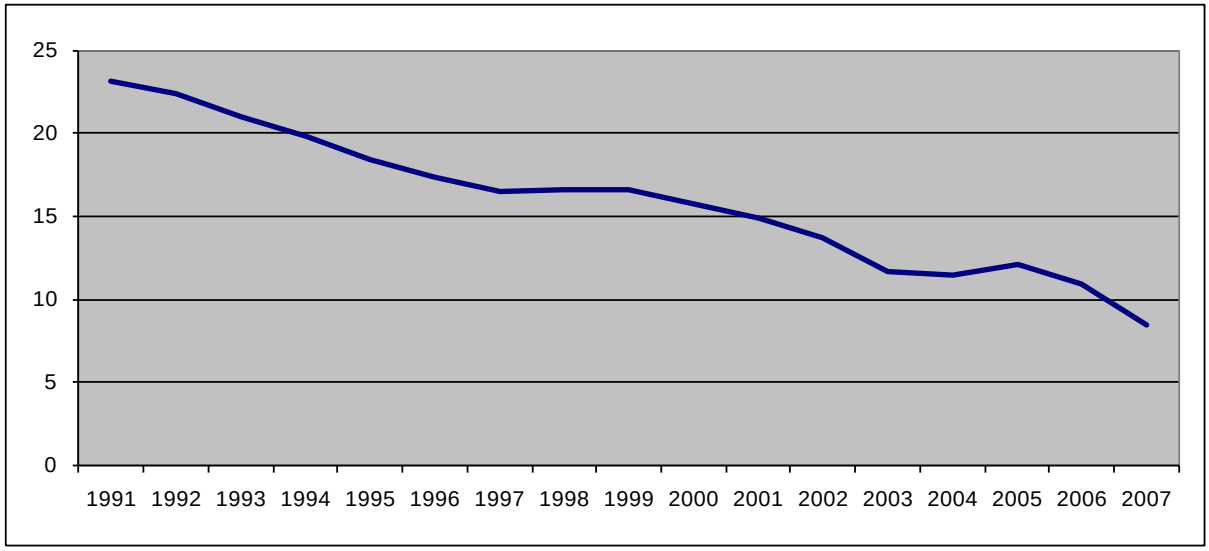


Figure 14.1: Size of the US-flag merchant fleet, ocean-going ships of ≥1000 gross tons (in million dwt). (Source: BTS 2010)

14.3.2 Subsidy programs and the Jones Act

This section examines the MSP and VISA programs and also focuses on Title XI and the Capital Construction Fund (CCF) programs (Table 14.6). The objective of these programs is to support the fleet involved in international trade, whereas the aim of the MSP and VISA programs is more precise. The MARAD website states that 'These programs are designed to assure the availability of sufficient US commercial sealift capability and the US intermodal system to sustain US military operations overseas in an emergency'. The MSP establishes a fleet of privately-owned, militarily useful vessels and the operators involved in the MSP have to make their ships and commercial transportation resources available on the request of the Secretary of Defense. With the VISA program participants commit to capacity in exchange for priority consideration in the award of Department of Defense peacetime ocean freight contracts. The MSP was created in 1996 because cargo preferences were not able to support the fleet and to achieve the national security objective.

Table 14.4: Importance of each subsidy scheme, various years.

Programs	Budget	Associated fleet
The Maritime Security Program (MSP)	156 MUSD authorized annually for 2006-2008 and 174 MUSD for 2009-2011	59 vessels - of which 38 containership. 2.5M of dwt - of which 2M of dwt for containership
Voluntary Intermodal Sealift Agreement Program (VISA) [a]	-	49 Companies, 133 Ocean Going Ships, 178 Tugs, barges and other vessels (More than 90% of the militarily useful vessels in the U.S.-flag fleet are committed to the VISA program)
Title XI - Federal Ship Financing Program [b]	Commitement of 178 MUSD in 2005, no new commitment in 2006-2008, 351 MUSD for 2009	In 2009, for 5 articulated tug or barges (185000 bbl), 9 asphalt tank barges and 30 open hopper barges
Capital Construction Fund (CCF) [b]	n.a	-
Small Shipyard Grant Program	10 MUSD in 2008	-
Technical Assistance Program	n.a	n.a.

Sources: MARAD website 2010.
Notes: (a) VISA is not strictly a subsidy. Nevertheless, the program's effects is similar as it ensures a given level of resources for carriers involved. (b) These programs are linked directly to the Jones Act.

The MSP and VISA programs as a consequence work in conjunction, so that more than 90% of the militarily useful vessels in the US-flag fleet are committed to the VISA program and over 77% of that capacity comes from MSP vessels.[3] Carriers can legally be engaged in either or both of the MSP and VISA programs and at the same time transport reserved cargo, which means they can benefit from multiple support schemes. For instance, since military cargo is reserved for US-flag vessels and consequently is highly lucrative for carriers, the Department of Defense pays them to commit to capacity in the VISA program. Clearly, because of this 'double dipping', this type of support is more costly for the taxpayer but without any corresponding enhancement of benefits. As shown in Figure 14.1, the creation of the MSP in 1996 may have prevented the decline of the fleet's size for a few years, however, after only 3 years the MSP was already insufficient and the decline began again. Furthermore, the complexity of the system leads to a lack of transparency, which further complicates the effective monitoring of these programs.

Finally, the MSP subsidises the operators of US-flag vessels even though maritime regulation does not require national ownership in order to fly the flag. Hence, an important share of the US-flag fleet is operated by foreign carriers. This leads to the situation where the US government, in supporting its fleet by allowing preferences, is directly subsidising foreign carriers. For instance, as of 1 July 2009 the container ship fleet in the MSP program represented 2 million dwt and more than 80% of the capacity of the entire MSP fleet. Among this fleet, 98% of the deadweight tonnage was operated by three foreign-owned carriers.[4]

The Jones Act in effect works like a cargo preference system, reserving domestic maritime transport for US built and operated vessels. This adds to the costs of providing the services, due to the higher building costs and crew costs compared to ships from the rest of the work. There are, however, subsidies to offset this cost increase for the shipyards (Title XI – see Table 14.6) and for companies that want to buy a Jones Act vessel (the CCF).

[3] Carriers with vessels enrolled in the MSP agree to make their ships available to the Department if VISA is activated. In Stage III of VISA, those ships which receive the MSP subsidy must devote 100% of their capacity to Defense cargo; but those ships which opt into VISA but do not receive the MSP subsidy must devote only 50% of their capacity to Department of Defense cargo.

[4] They are APL Marine Services (subsidiaries of Neptune Orient Line, Singaporean ownership), Maersk Line Ltd and Farrell Lines (subsidiaries of AP Moller-Maersk Group, Danish ownership) and Happag Lloyd (German ownership). The fourth carrier, Waterman Steamship Corporation, is US owned.

Table 14.7 lists impact assessments that have computed the cost of the Jones Act system. The first conclusion is that the Jones Act is much more costly than other support programs. This is, above all, due to the huge differential in construction cost. The difference is presented in Table 14.8. The price of a vessel built in an American shipyard was two, three or even four times higher than the representative new construction price reported by UNCTAD for an equivalent, or a larger, vessel of the same category in the same period. The additional operating and construction costs are supported by taxpayers via subsidies and by the consumers of the services, that is, first the shippers, but ultimately the final consumers of the goods.

Table 14.5: Results of various Jones Act impact assessments.

Authors	Methodology	Period assessed	Cost estimation
White (1988) [a]	Based on government transfers	1984	Higher cost of $2 billions to transport goods in the coastal trade
Congressional Budget Office (1994) [a]	Based on government transfers	1983	Cost of $1.3 billion for the US economy
Hufbauer and Elliot (1993)	Partial equilibrium model	1990	Net cost of $1.1 billion for the economy
ITC (1995)		1992	Net welfare gain of 2.8 billions USD in case of repeal of the Jones Act
ITC (1999)	Computable General Equilibrium - Operating and capital costs [b]	1996	Net welfare gain of 1.3 billion USD in case of repeal of the Jones Act. Gain of 380 MUSD for the build liberalization only
ITC (2002)		1999	Net welfare gain of 656 millions of USD in case of repeal of the Jones Act. Gain of 261 MUSD for the build liberalization only
ITC (2004 and 2007)	No quantitative assessment		

Sources: Various reports, see references.
Notes: (a) The report is not available; information comes from Papavizas & Gardner 2009; (b) Partial equilibrium for assessing the removal of the domestic build requirement of the Jones Act.

Table 14.6: Major US commercial shipbuilding programs and representative new building prices, selected years (USD million).

Original Name	Builder	Capacity	Delivery	Price	Representative newbuilding price	Price differential in %
Crude Carriers						
Polar Endeavour	NGSS Avondale	140,000dwt	2001	166	41 [a]	405
Alaskan Explorer	GD/NASSCO	193,000dwt	2005	210	58 [b]	362
Alaskan Adventurer	GD/NASSCO	193,000dwt	2005	210	58 [b]	362
Alaskan Legend	GD/NASSCO	193,000dwt	2006	210	81 [c]	259
Containerships						
Manulani	Aker Philadelphia	2502 TEU	2005	145	42 [d]	345
Maunalei	Aker Philadelphia	2503 TEU	2006	145	46 [e]	315

Sources: Shipbuilding history website 2010, UNCATD 2009.
Notes: In this table are presented prices for buyers. Hence, data includes subsidies directly paid to shipyards. (a) For tanker of 110 000 dwt, 2000. (b) For tanker of 1100 00 dwt, 2005. (c) For tanker of 110 000 dwt, 2006. (d) For full container ship of 2500 TEU, 2005. (e) For full container ship of 2500 TEU, 2006.

The various methodologies explain the variability of the results presented in Table 14.7. Nevertheless, contrary to the assessments of cargo preferences, the studies of the Jones Act are more interesting for the purposes of this case. Of particular interest will be the most recent of the periodically released United States International Trade Commission (USITC) assessments because, as they use a similar methodology, they will allow a comparison with the Jones Act's cost over time. According to various USITC studies since 1995, the cost of the Jones Act to the US economy has decreased. The USITC computed that if the Jones Act had been repealed in 1992 there would have been a welfare gain of USD2.8 billion; for 1996 the welfare gain of the repeal had decreased to USD1.3 billion; and to USD656 million for a repeal in 1999. Interestingly, the reduction in the cost of the Jones Act could potentially be explained by the decrease in the volume of domestic shipping as shown in Figure 14.2 (USITC 2002).

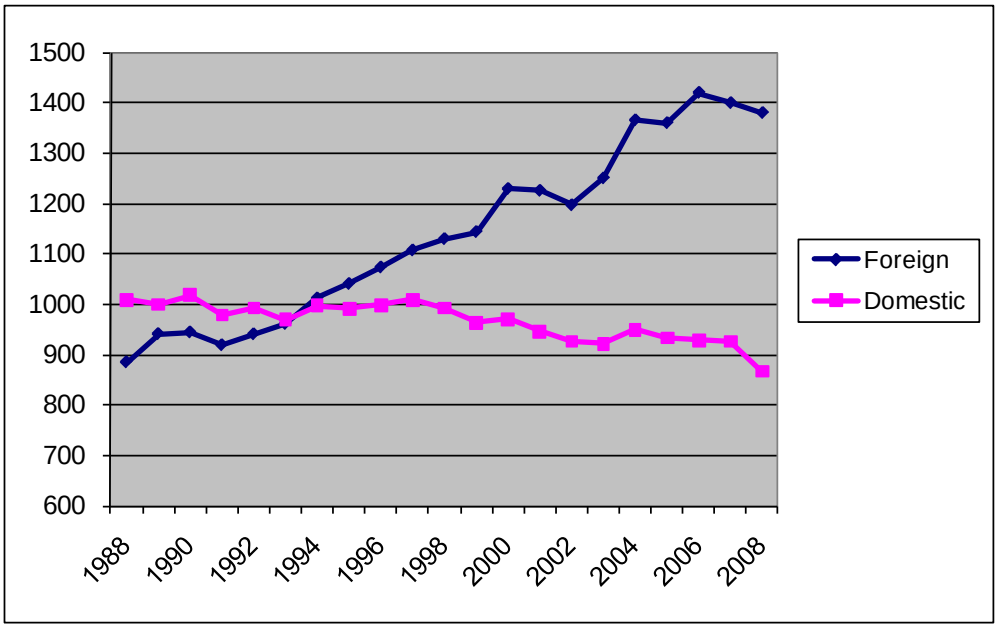


Figure 14.2: Volume of foreign and domestic shipping, in millions of tonnes. (Source: BTS 2010)

During the same period the operating cost differential had increased – for example, between 2003 and 2005, from USD8700 to USD11 300 for a tanker and from USD11 500 to USD12 070 for a containership. The building cost differential is presumed to have increased as well. Thus, the decrease in cost could be explained by a volume effect and not a price effect.

Furthermore, the Jones Act results in a high cabotage service price. Moreover, between 2003 and 2008 the producer price of coastal shipping increased much more than the freight trucking rate. The producer price for rail transport increased at the same rate (US Department of Labor, Bureau of Labor Statistics 2010). Hence, consumers substituted other modes of transport for coastal shipping (Figure 14.3). This in turn has reduced the volume of domestic shipping and thus raised the cost of the Jones Act. The reduction in volume can also be explained by reductions in domestic production and the shipment of crude oil. Additionally, substituting rail and road transport for domestic shipping leads to congestion on land.

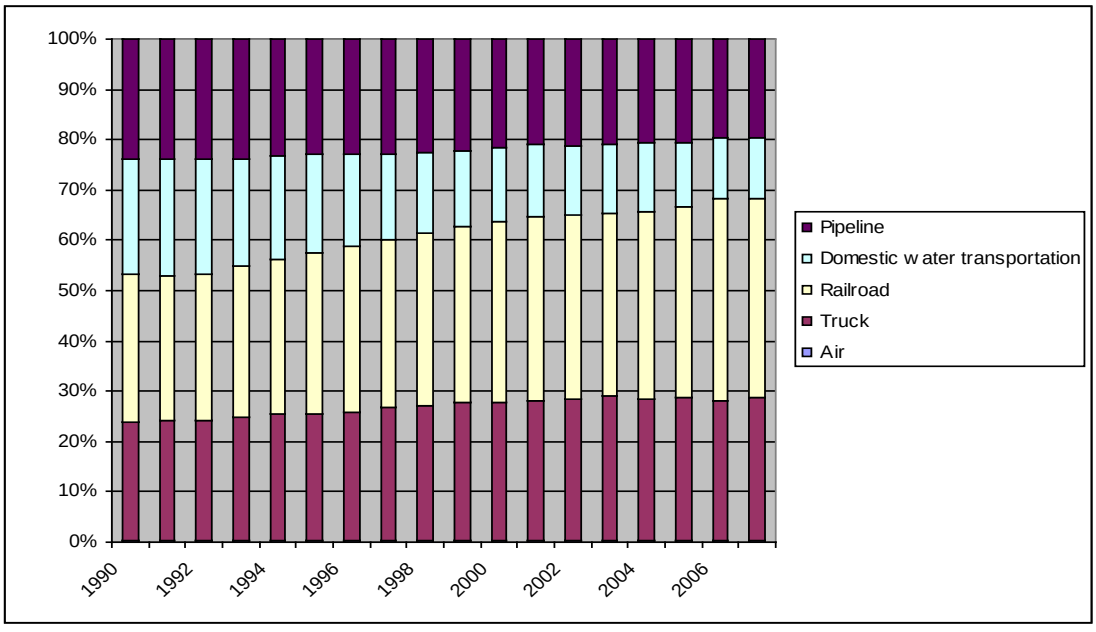


Figure 14.3: US domestic transport share by modes (ton/miles of freight). (Source: BTS 2010)

The combination of cargo preferences (on various types of international trade and on domestic shipping) and the various subsidy programs could not prevent the decline of the US-flag fleet (Figure 14.1). Additionally, since the mid 1980s, the Jones Act and related subsidies have not prevented the decline of the shipbuilding sector. There has been a strong decrease in the number of shipyards and in employment in the shipbuilding and repair sector (Figures 14.4–5).

In conclusion, cabotage regulation has had an important impact on the cost of domestic shipping but it has also had implications for international shipping. The definition of cabotage used by the US considers the domestic part of an international journey as cabotage. In theory, foreign carriers providing international shipping services cannot call at multiple US ports without employing a 'Jones Act vessel'. Thus, the law prevents carriers involved in international shipping from rationalising the use of their vessels. It leads to higher costs for providers and higher prices for consumers. Even if waivers are issued, according to experts the system is burdensome and inefficient.

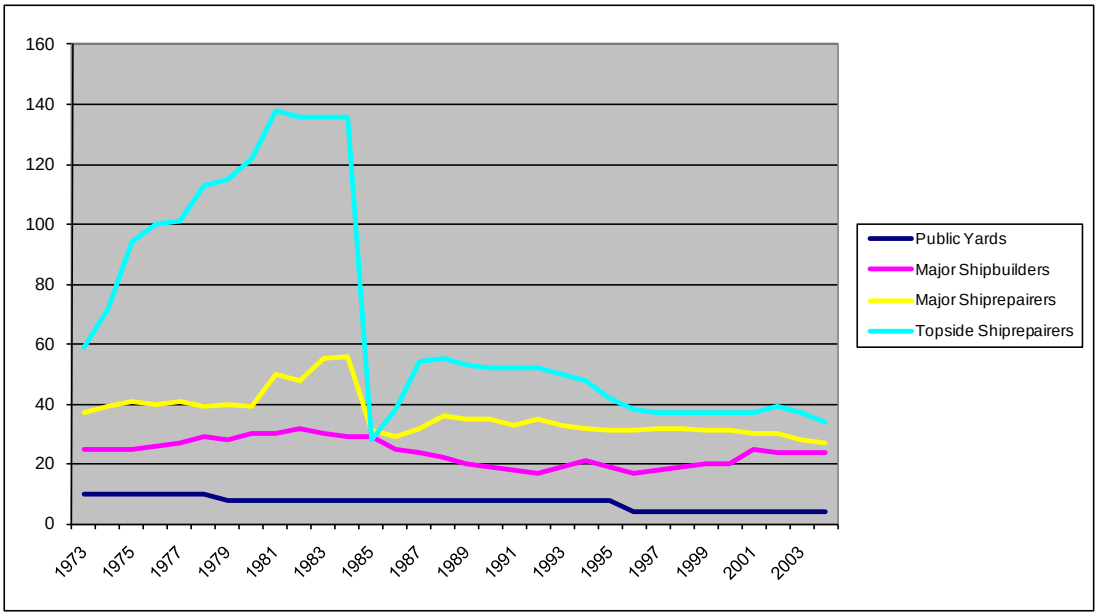


Figure 14.4: The number of shipyards in the US. (Source: Shipbuilding history website 2010)

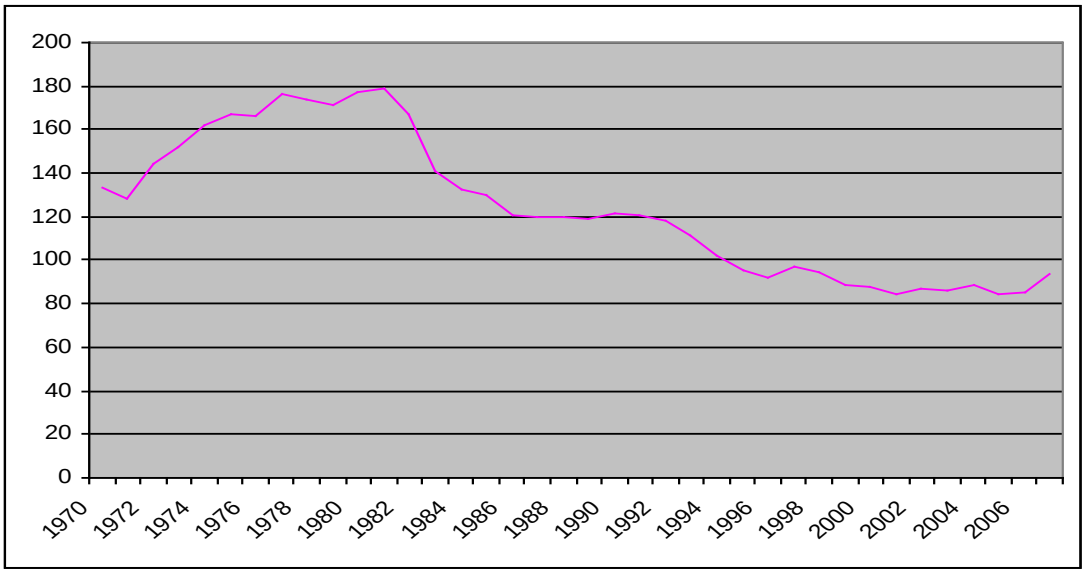


Figure 14.5: Employment in the shipbuilding and repairing sector (,000). (Source: Shipbuilding history website 2010)

14.3.3 Port infrastructure and related services

This section examines the challenges faced by US ports, focusing on capacity constraints and congestion risks, including congestion within ports and rail and road bottlenecks in and around ports.

14.3.3.1 Congestion in ports

During the 2000–07 period container throughput more than doubled (Table 14.9). Despite a decrease in 2008 and 2009 because of the global financial crisis, container traffic is expected to increase again in the coming years. This is particularly true for West Coast ports because of trade growth in manufactured goods from East Asia (Figure 14.6). Thus, in 2020 port capacity would need to have increased by 107% in major Pacific ports and by 59% in major Atlantic ports in order to satisfy future demand.

Table 14.7: Evolution of container throughput in the first 10 US ports (in TEUs).

		2000	2007	Evolution 2000-2007
1	Los Angeles (13) [a]	3 227 743	8 355 039	159
2	Long Beach (15) [a]	3 203 555	7 312 465	128
3	New York/New Jersey (19)	2 200 343	5 299 105	141
4	Savannah (40)	720 231	2 604 509	262
5	Oakland (45) [a]	988 773	2 387 911	142
6	Norfolk (52)	850 400	2 128 366	150
7	Seattle (57) [a]	959 883	1 973 504	106
8	Tacoma (59) [a]	647 017	1 924 934	198
9	Houston (65)	733 134	1 768 687	141
10	Charleston (66) [b]	1 246 181	1 750 000	40

Source: Containerisation International 2010, US Department of Transportation 2009

Notes: In brackets is the world rank of the port in terms of container throughput; (a) West Coast. (b) Reported from July to June.

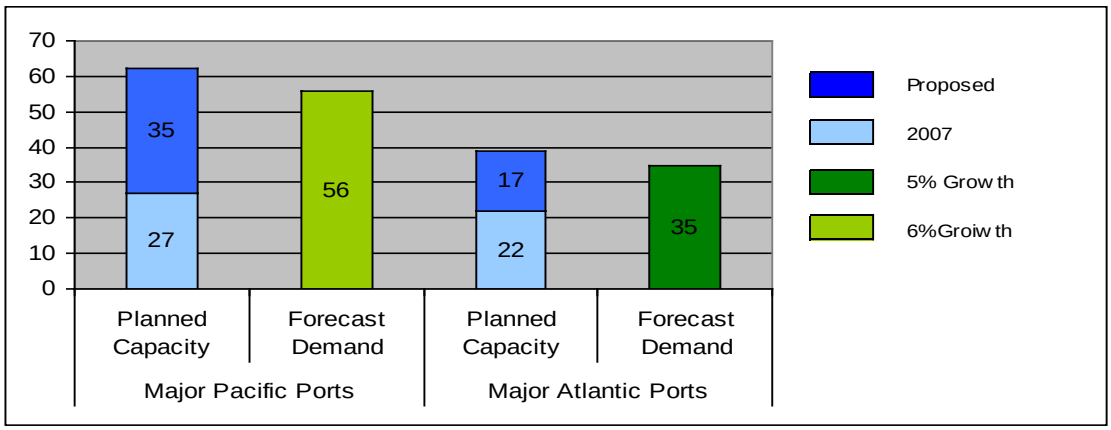
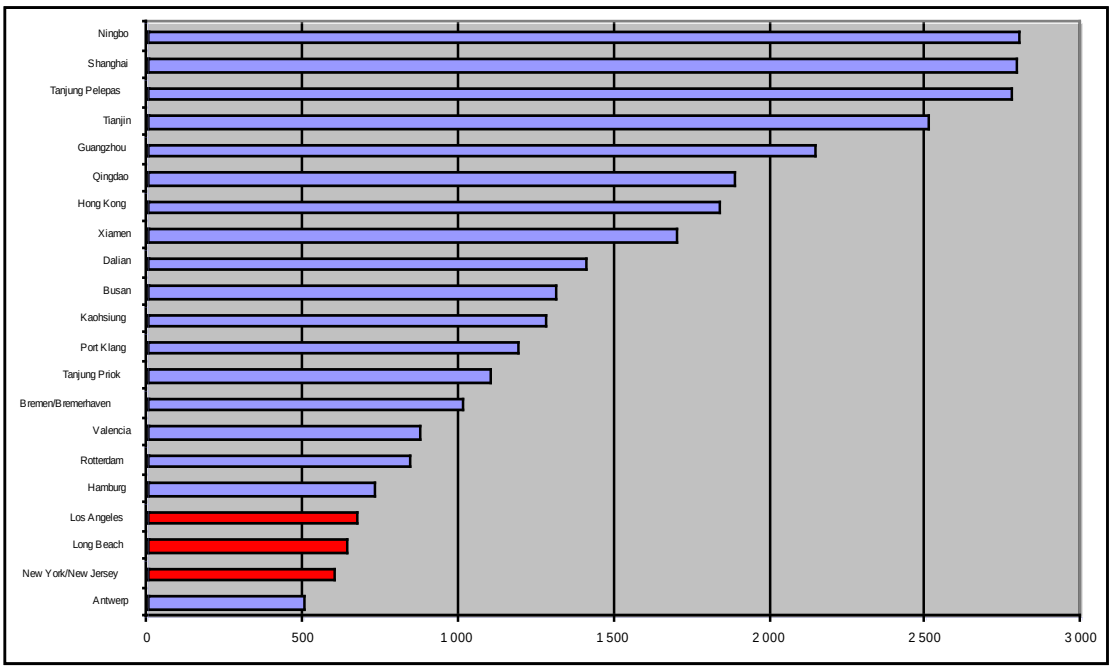


Figure 14.6: Capacity and demand by 2020 by major ports (million TEU). (Source: MARAD 2009)

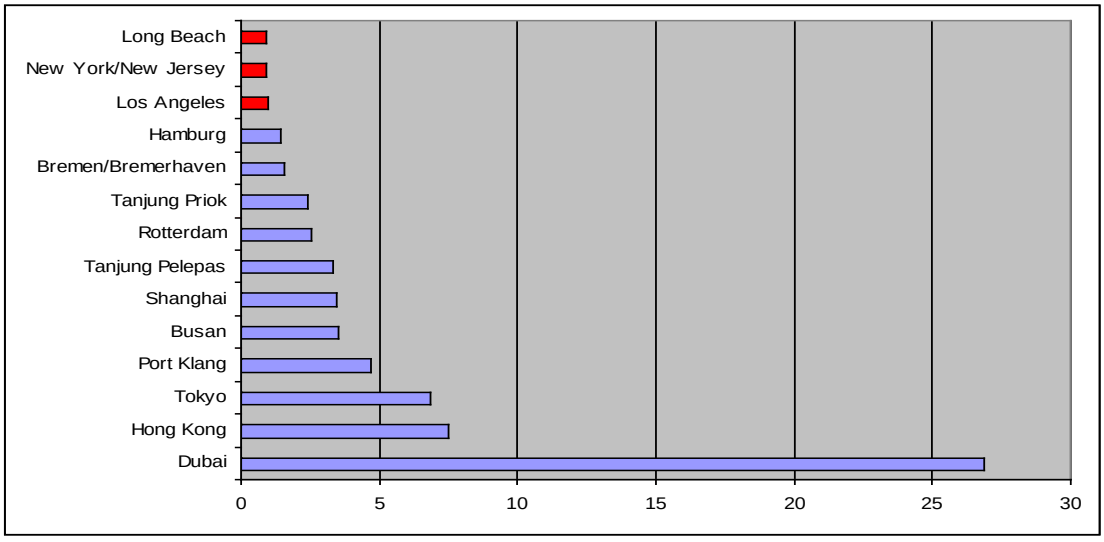
Such a huge increase in port traffic could lead to congestion, which would increase costs for shippers and consumers. It also gives incentives for shippers to shift from US ports to less congested ports in Canada or Mexico (MARAD 2009a). This issue can be seen in two different ways: as a problem of investment in new infrastructure and as a problem of full and efficient use of existing capacities. Indeed, the performance of ports in the US measured by two different indexes is low by comparison with other international ports (Figures 14.7–8). Given the main international ports' performance, US ports have room for progress to attain

the full potential of berths and of port surfaces. Therefore, it would seem that, before investing in new capacity, US ports could rationalise existing ones. This would allow ports to handle increased numbers of containers with the same level of infrastructure.



Note: Computed as the total TEUs throughput divided by the length of container berths.

Figure 14.7: Port productivity in international ports, 2009. (Source: Data from Containerisation Online 2010)



Note: Computed as total TEU throughput divided by total container terminal surface in squared metres.

Figure 14.8: Port productivity in international ports, 2009. (Source: Data from Container International 2010 and related port authority websites)

14.3.3.2 Rail and road bottlenecks in port surroundings

As noted in Section 14.3.3.1, ports have witnessed a strong increase in container traffic in the last decade. Whereas the cargo throughput increased in ports, too few investments have been made in other modes of transport. This leads to rail and road bottlenecks, notably in the ports' surroundings. Bottlenecks slow access to ports and increase delays within ports because of

the waiting time to unload cargoes, which in turn decreases the efficiency of the entire logistics chain. In this respect bottlenecks are partly responsible for poor port performance.

Table 14.10 gives an indication of the congestion of land transport in port surroundings. For instance, in 2005 in the areas of Long Beach and Los Angeles, the annual delay per container was 72 hours on average. Again we can note that congestion is particularly prevalent on the West Coast.

Other data gives us some indication of bottlenecks around ports. For instance, in 2007 the area where the average truck speed was the lowest was close to ports (US Department of Transportation, Federal Highway Administration 2008). All this data highlights the importance of building new infrastructure and improving the efficiency of existing ones.

Table 14.8: Landside annual traffic delay per container in surrounding urban areas, 2005.

Port	Container traffic rank	Delay	
		Hours	Rank
Los Angeles/Long Beach [a]	1-2	72	1
New York	3	46	16
Savannah	4	n.a.	n.a.
San Francisco Bay Area ports [a] [b]	5	60	2
Virginia ports [c]	6	30	42
Seattle [a]	7	45	19
Tacoma [a]	8	45	19
Houston	9	56	7
Charleston	10	31	40

Source: US Department of Transportation, 2009
Notes: (a) West Coast ports; (b) San Francisco Bay Area ports: Oakland, Redwood City, Richmond, San Francisco and Stockton; and (c) Virginia ports: Norfolk, Richmond and Newport News.

14.4 SCOPE FOR FURTHER REFORM

The last policy change in shipping was the Ocean Shipping Reform Act (OSRA) in 1998. It dealt with the exemption from competition law of liner carriers' agreements. In spite of many proposals to reform the maritime regulatory framework, in particular the Jones Act and cargo preferences, nothing has been done since that time. This section considers why those changes have not occurred and discusses the most recent changes that have occurred in container and intermodal infrastructures.

14.4.1 Shipping

US policy is motivated by concerns about the security of supply. It involves the use of cargo preferences and cabotage regulation. However these are costly for consumers and taxpayers with significant effects on the allocation of resources within the economy. Some of the consequences of the policy are apparently inconsistent with its purpose, since even the legislation which was designed to support US-flag vessels could not prevent the decline of the US fleet. In these respects, it might be expected that the policy package would come under pressure for change. There are, however, several sources of countervailing pressure.

The first difficulty for policymakers comes from the likely impact of reforms on employment. The maritime transport sector employs hundreds of thousands of people (Table 14.11, Figure 14.5). Repealing the cargo preferences measure would directly affect the shipboard jobs of 6000 Americans (GOA 1994). According to the USITC report (2002), abolition of the Jones

Act would affect about 7700 maritime workers (full time equivalent; FTE) and about 3100 FTE workers in the shipbuilding sector. These changes would be associated with responses through the political system.

Table 14.9: US employment in water transport and related industries, 2003–08 (,000).

	2003	2004	2005	2006	2007	2008
Transportation	54.5	56.4	60.6	62.7	65.5	65.2
Port Services	93.8	91.5	93.9	99.3	100.1	97
Cargo Handling	*40.8*	*40.8*	*42.8*	*45.6*	*46.2*	*44.9*
Handling	*53*	*50.7*	*51.1*	*53.7*	*53.9*	*52.1*
Shipbuilding and Repair	92.6	90.8	92.2	95.1	101	104.5
Total	240.9	238.7	246.7	257.1	266.6	266.7

Source: US Department of Transportation 2009

Another difficulty in reforming the maritime transport policy comes from the fact that the 'losers' are diffuse and not easily organised whereas the 'winners' are few and very well organised. Government support to the maritime industry represents an important share of the revenue of some carriers. In relation to cargo preferences, 118 US-flag vessels participated in moving preferential cargo in 2006. At the same time, more than 50% of the revenue of some operators was derived from this trade in preferential cargo (Global Insight 2009). Whereas the aim of the system was to support the fleet, in fact it only subsidises a very few companies. In relation to the Jones Act, at the end of 2008 only two carriers operated Jones Act container vessels – Horizon Lines Inc. and Matson Navigation Inc.: 67% and 87% of the fleets of these carriers, respectively, were involved in the cabotage market. At the end of 2008 the domestic container transport was a duopoly, with Horizon Lines operating 55% of the fleet and Matson Navigation 45%. Experiences from various studies of regulation indicate that the more concentrated is a market, the easier it is to organise and defend a favourable regulation.

There are groups in the US which oppose the Jones Act. In 1995 an initiative called the Jones Act Reform Coalition, mostly comprised of shippers, was formed with the objective to repeal, or at least to reform, the regulations on cabotage. The Coalition relied on the economic arguments surrounding the inefficiency of the present system. In the same year, by way of reply, some carriers, shipyards and other maritime interests involved in the domestic shipping market formed the Maritime Cabotage Taskforce. Despite the evidence provided, the efforts of the Coalition were not seriously considered by Congress (Papavizas & Gardner 2009).

14.4.2 Port infrastructure and related services

Over recent years, most of the port and related regulation reforms have concerned security issues (see Annex Table A14.1), the one exception being the creation of the Office of Port Infrastructure Development and Congestion Mitigation (OPIDCM) in May 2009. The objectives of the OPIDCM are manifold: coordinating port infrastructure projects for a variety of entities, coordinating and directing studies of port and intermodal facilities and leading national efforts to reduce congestion, including highways and railways.

In relation to port congestion, during fiscal years 2007–10 the projected annual capital expenditures in public ports were on average more than USD2.3 billion, representing an increase of 125% in comparison with 2006 (Table 14.12). The most prominent expenditures were to be on container facilities. Despite the fact that the West Coast represents a market share of 55% of the containers entering the US (vs 40% for the East Coast and 5% for the Gulf ports), only 30% of the investments were allocated to West Coast ports (vs 50% for the East Coast and 20% for the Gulf ports).

Table 14.10: US public port capital expenditures by region, historical and projected (USD,000).

		Type of facility								
		General cargo - Ro/Ro	Container	Bulk	Passenger	Other [a]	Infrastructure [b]	Dredging	Security	Total
2 006	Atlantic	95 715	157 431	2 550	27 507	30 718	10 896	78 228	21 418	424 463
	Gulf	26 660	110 996	28 449	26 960	63 578	45 086	40 309	17 464	359 502
	Pacific	36 409	72 212	2 383	2 158	92 757	16 921	25 529	8 559	256 928
	Total	158 784	340 639	33 382	56 625	187 053	72 903	144 066	47 441	1 040 893
Annual average (2007-2011)	Atlantic	178 691	328 101	20 484	63 410	214 890	56 388	201 952	17 350	1 081 266
	Gulf	163 764	141 834	59 851	5 804	65 063	58 920	26 728	26 834	548 797
	Pacific	14 250	204 883	21 080	62 718	252 621	124 740	12 527	23 270	716 089
	Total	356 704	674 817	101 416	131 932	532 573	240 048	241 207	67 454	2 346 152
Evolution Total, in %		125	98	204	133	185	229	67	42	125

Source: MARAD, 2009

Notes: (a) Equipment (computer, maintenance etc.), buildings/improvements (maintenance, fire stations, administration etc.), real estate development, crane electrification conversion, customer facilities, terminal development, maintenance, administration, property/infrastructure, land, new accounting systems, HVAC systems, new roof on administration buildings, feasibility studies, marinas, moorage, fireboats, environmental, recreation, information technology and boat launches; (b) Rail, road and utilities inside or outside of terminals.

As can be seen in Figure 14.6, most of the demand for TEU capacity in ports will be covered by proposed investments. An important question concerns the placement of these investments. Because main ports are located close to megalopolises where land is scarce and expensive, they are close to their maximum sizes. This points to a need for the development of secondary ports, which means an extensive development of US ports. In this respect the OPIDCM would help to coordinate investments in various ports, thereby helping to make the US port network coherent and avoiding duplication of investments.

Yet bearing in mind the bad performances of US ports, the question is whether investing in new capacities is the most efficient way to address the congestion issue. As already noted, congestion could be addressed by the intensive development of facilities. The poor performance of the three main US ports cannot be explained by a lack of competition between terminals within ports – which is the norm in the US (Table 14.13). In these ports the container handling market is competitive.

Table 14.13: Container handling operators in the three main US ports.

Port	Operators	Berths length [a]	Portainers [b]
Los Angeles	West Basin Container Terminal LLC [a]	1200'	4SPP
	West Basin Container Terminal LLC [a]	3500'	5PP - 3P
	Trans Pacific Container Service Corporation [b]	4050'	11PP
	Port of Los Angeles Container Terminal [c]	2180'	3 (50') - 1 (34')
	Yusen Terminal [d]	5800'	4SPP - 4PP - 2P
	Seaside Transportation Services LLC [e]	4700'	8PP
	APL Terminal - Global Gateway South	4000'	12SPP
	APM Terminal	7190'	14SPP
Long Beach	California United Terminals [f]	2100'	5 (50')
	Total Terminals International [g]	5000'	14 (100')
	International Transportation Service, Inc. [h]	6379'	17 (50 and 100')
	Long Beach Container Terminal, Inc.	2750'	7 (100')
	Pacific Maritime Services	5900'	15 (100')
	SSAT Long Beach LLC	3600'	10 (100')
	SSA Terminals	1800'	3 (100')
New York/New Jersey	American Stevedoring - ASI Terminals	2080'	2 (80') - 1 (90) - 1 (100')
	Global Marine Terminal	1800'	6PP
	Port Newark Container Terminal	4400'	3 (170') - 6 (220')
	Maher Terminal	10128'	9 (120') - 7 (100') -
	APM Terminal	6001'	4SPP - 8PP - 1 (85')
	New York Container Terminal	3012'	3 (80') - 6 (120')

Sources: Port corporations' websites 2010

Notes: (a) Feet; (b) Number of container cranes with height in feet in brackets – SPP=Super Post Panamax, PP=Post Panamax, P=Panamax.

Various reports by the MARAD or by independent bodies highlight ways to improve US port performances. One proposal concerns investment in new technology to improve the organisation of arrivals and the management of containers in terminals. Indeed, this is the objective of various OPIDCM programs: Agile Port Systems, the Centre for the Commercial Deployment of Transportation Technology (CCDoTT) and the Cargo Handling Cooperative Programme (CHCP). Another requires changes in labour regulations to allow extended hours of work in ports, such as the opening of truck gates and access to warehousing. Other reports advise procedural changes that would allow port authorities to offer proper incentives to limit the time containers stay in the port, for instance through higher demurrage costs.

With respect to bottlenecks in port surroundings, the most dramatic increase in capital expenditure for the next few years concerns infrastructure – rail, road and utilities inside or outside terminals (Table 14.12). The increase of 239% is encouraging. Moreover, it is to be hoped that this effort will be sustained by the OPIDCM, whose role is to coordinate investments between different transport modes. But it will have to focus on investment in new capacities and in improved infrastructures such as high speed trains.

14.5 CONCLUSION

While governments pursue non-economic objectives, there are often available a variety of policy tools for those purposes. Some are more costly than others, and may also be less effective. Regular processes for making transparent and then assessing policy in quantitative terms relative to its objectives can contribute to effective structural reform. The case of shipping policy in the US highlights the value of establishing these processes and also linking them to policy-making processes.

US policy is designed to support a US-flag fleet and American shipyards. The policy which applies to both international and domestic shipping entails costs for the American economy, according to a series of assessments. One objective of the policy is to have a strong fleet that will help to maintain maritime skills within the workforce. Another is for security reasons. These objectives are laudable. Nevertheless, the policy package has incurred significant costs.

Furthermore, measures to curb the costs did not reach their goals. In order to cut major sources of inefficiency, and to be in line with the OECD's maritime regulation, the US would have to repeal cargo preferences and abandon its building requirement in cabotage. The cargo preference system represents only a tiny share of the economy's waterborne international trade and this would be a symbolic reform. The building requirement of the Jones Act would lead to much higher gains. Yet despite the economic analysis, the government maintains all these policies in place at a cost to consumers and taxpayers and to the benefit of a limited number of carriers (and even foreign carriers). The difficulties of reform can be explained in part by the operations of well-organised interest groups and the effectiveness of their efforts compared to those who are in favour of reform.

The decision to implement reform is difficult, considering the cost for those who now gain from the policy and in loss of employment. In addition, the regulatory framework relating to shipping is complex, with overlaps between supporting measures that lead to a lack of transparency that makes the assessment of the various policies difficult. Regular work on the assessment of the policy is likely to assist the development of lower cost options for the same policy objectives.

In contrast to shipping, the auxiliary services, and in particular container handling, are characterised by open and competitive markets. Regulation is efficient and in line with good practices in the major US ports. The main challenge is the expected increase in traffic and the risk of congestion inside and outside ports. In order to cope with congestion, a balance will be sought between extensive and intensive development of the major ports, which entails the development of secondary ports, and the improvement of performances at them. An effort towards coordination and a harmonious development between modes would be valuable.

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ANNEX 14

Table A14.1: Recent policy changes in maritime transport.

Sector	Area of policy change	Associated regulation	Year of change	Description of change
Liner shipping	Regulation and competition	Ocean Shipping Reform Act	1998	Abolition of the obligation for carriers to publish publicly freight rates and service contracts. Shippers and carriers are allowed to engage in confidential agreements
Port and infrastructures	Security	Maritime Transportation Security Act	2002	Plan to coordinate action between federal, state, and local governments to respond to security incidents involving maritime assets and infrastructure Šand various measures.
Port and infrastructures	Security	Critical Infrastructure Information Act	2002	Framework for the submission of information regarding critical infrastructures
Port and infrastructures	Security	Container Security Initiative	2002	The "24-hours rule" requires detailed description to be reported on cargoes travelling to the US 24 hours prior being loaded onto vessels.
Port and infrastructures	Security	Security and Accountability for Every Port Act	2006	Required the development of the National Strategy for Transportation Security. The objective is to secure the national transportation system and to prepare to respond to terrorist threats or attacks to transportation infrastructure
Port and infrastructures	Creation of a new agency	Office of Port Infrastructure Development and Congestion Mitigation	2009	Objectives are to coordinate port infrastructure projects for a variety of entities, to coordinate and to direct studies of port and intermodal facilities and leading national efforts to reduce congestion (including highways and rails).
Port and infrastructures	Security	Security and Accountability for Every Port Act	2009	Develop and implement a strategic plan to enhance the security of the international supply chain

Sources: MARAD website 2010, MARAD 2009a

Chapter 15

ELECTRICITY IN KOREA

Seung-Hoon Lee[1]

- Korea's electricity reform has been partially implemented.
- There is some evidence of improved performance in the generation of electricity.
- Further reform is valuable to remove remaining distortions to price and the use of electricity.

15.1 INTRODUCTION

Stable power supply in a sufficient amount was, and still is, the most important condition for a developing economy in undertaking ambitious industrialisation projects. The Korea Electric Power Corporation (KEPCO), which supplies electricity to the entire economy as a state monopolist, was created in 1961 by consolidating three state-owned and operated electricity supply companies in Korea: one generation–transmission company and two distribution–sales companies. KEPCO supported the rapid industrialisation of Korea by supplying sufficient power at low tariffs without outside subsidies, and by successful expansion of the capacity for generation and the transmission–distribution grid in a timely manner.

The growth of KEPCO was paralleled by the rapid industrialisation of the Korean economy. In the 1980s it became the largest company by asset value and the second largest by the number of employees, behind Korea Telecommunications. The Korean government then decided to sell 49% of its stock in KEPCO to the general public in an attempt to invite private capital to the power sector. The government still holds over 50% of the total stocks in KEPCO. Also, a small portion of new investment was allowed to private generators in the form of independent power plants under long-term power purchase agreements with KEPCO.

The operation of the Korean economy depended upon public sector investment to a substantial extent, since the Korean government made extensive use of public enterprises during the process of economic development, not only in basic infrastructure but also in energy and material industries such as oil refining, gas, electricity, steel and petrochemicals. In other economies the petrochemical and steel industries are usually under private, not public, control. The Korean petrochemical and steel industries, however, began through state initiative in the early stages of economic development when private capital was not able to invest in these capital-intensive industries. The Korean government established many public enterprises in those sectors, aiming at the import substitution of basic materials. The major market for their outputs was Korea's manufacturing sector, which was rapidly growing as a successful export industry under the vigorous export drive policy of the Korean government. The public enterprises had once produced as much as 15% of the total value added of the entire economy.

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With the accelerated growth of the private sector, the Korean government initiated privatisation of many public enterprises. Though there were no objections to privatising material industries, public opinion was divided over privatising network industries such as telecommunications and electricity. A substantial portion of the population maintained the idea that there must be proper mechanisms for the provision of these universal services, and the regulated operation under public ownership was essential for this purpose.

At the same time, other economies shifted towards competition by restructuring network industries. Research institutes and academics advised the Korean government to initiate restructuring in line with this trend. Meanwhile, the industries and their labour unions opposed what they referred to as an 'untested' experiment.

There are differences and similarities between sectors. Consider the trends of change in electricity and telecommunications. Due to technological change and after only slight institutional re-arrangement, it is now possible for a new entrant to compete in the telecommunications industry. More extensive change is required for electricity, in particular, to unbundle generation from grid operation in order to guarantee fair open access of energy traders to the grid. Third party access under functional unbundling prevailed in systems where traditional grid operators were private utilities under regulation who objected to attempts to intrude upon their property rights. But open access under structural unbundling seems more likely in systems where traditional monopolies were state enterprises. Examples of the former are the USA, Germany and Japan, and examples of the latter are the UK and Nord Pool economies. However, resistance to change from the incumbent could still be expected in those cases.

In the case of Korea, the size of KEPCO was a matter for consideration in the design of reform. KEPCO had not only monopolised the supply of electricity, but also now comprised many associated businesses. In particular, it had undertaken all the construction works of its own generation plants: other construction and engineering companies could join in projects only as subcontractors. This approach added to its size but also invited criticism of its corporate governance structure, which contributed to the pressure for reform.

The proposal for restructuring the electricity industry to accommodate competition attained political support, and the Korean government finally decided to initiate restructuring. The National Assembly passed the relevant legislation in 2000, and restructuring began in April 2001.

15.2 RESTRUCTURING AND REACTION

The original restructuring plan comprised three stages:

- divesting the generation sector from KEPCO to initiate the creation of a competitive wholesale market;
- divesting the distribution sector from KEPCO to complete the wholesale market; and
- creating a competitive retail market.

Stage 3 was planned to be completed by 2009.

To begin Stage 1 the Korean government created six generation companies (one nuclear-hydro and five thermal). It also established the Korea Power Exchange (KPX) which was to take charge of the system's operation and to mediate the wholesale trading of power between generators and retail suppliers, including other buyers such as large-scale customers. Thus the

function of KEPCO was to be limited to being a grid company and a retailer, without engaging in generation. Though KEPCO would become the only buyer, the wholesale price was to be determined by the KPX.

The Korean Electricity Commission (KOREC) was established under the Ministry of Commerce, Industry and Energy (MOCIE). KOREC was headed by a chairman and eight commissioners, all part-time members except for one full-time commissioner who would be the chief energy policy maker of MOCIE, whose role was also to take care of the remaining tasks of restructuring the industry.

KOREC was not an independent body, since it was designed to report to the Minister of Commerce, Industry and Energy. This structure was due to the fact that KOREC was also in charge of the implementation of further restructuring, for which the Minister had to be responsible. It was understood that KOREC would be made independent as soon as the task of restructuring was completed.

KOREC was to approve electricity tariffs and oversee the quality of electricity and security of the system. It also was to review the fundamental qualifications of the applicants for business in the electricity industry, such as generation, transmission, distribution and retail. All applications were to be approved unless they violated conditions stipulated in the law, and without discriminating against foreign entrants. Approval was permanent as long as applicants abided by the regulations and there were no licence fees. Since the transmission business was to be monopolised by KEPCO for the time being, and the distribution–supply business would be made open in later stages, all the applications were expected to be, and were, concentrated in generation.

Long-term power purchase agreements (PPAs) under pre-existing contracts with private generators who had obtained approval before restructuring were honoured. New private power plants, however, were no longer eligible for PPAs. They had to sell their power only through the KPX at market prices, and could only sell it directly to consumers when trading was made feasible.

There was no explicit legal restriction on foreign ownership: there had been, and are still, several generators under full or partial foreign ownership. Most of them sold off their shares and withdrew their investment from Korea during the past decade. The withdrawals, however, were not due to the government's restriction on foreign ownership but were a voluntary choice. As for portfolio investment, about 25% of the total outstanding KEPCO shares were in the hands of foreign investors in September 2008, and a similar level has been maintained.

15.2.1 Basic nature of the Korean model

The KPX operated a cost-based pool (CBP) to determine real time wholesale equilibrium prices, which equate electricity supply and demand on an hourly basis. Demand was determined by the amount of power consumption and supply by marginal cost, reflecting the merit order of the generators adjusted for the real time availability. So the equilibrium price was determined by the marginal cost of the marginal generator, called the system marginal price (SMP).

Since the pricing by SMP may not recover fixed costs, for the marginal generator in particular, a fixed amount of compensation was allowed under the title of a 'capacity payment'. So the final payment to the generators was composed of the SMP, which represents the level of the

marginal cost for generation, a capacity payment and compensation for ancillary services. This system was essentially similar to the old UK system – the England-Wales pool.

The Korean wholesale market, however, differed from that in the UK in its dual structure. The KPX priced wholesale power in two ways, with generators divided into two groups: nuclear and coal-fired (baseload group) and oil-fired and gas-fired (general group). Each group had its own marginal price and capacity payment. The marginal cost of the 'marginal' baseload generator, usually a coal-fired one, was called the baseload marginal price (BLMP), while that of the real marginal generator maintained its original name of SMP. The BLMP is much lower than the SMP. Baseload generators are paid for their energy by BLMP and the general group is paid by SMP. Since the baseload generator is more costly to build, its capacity payment is set higher than that of a general generator. A baseload generator that incurred losses through the BLMP recovered them through the higher capacity payment.

This feature of the Korean CBP was introduced to comply with ongoing retail tariff regulation. If the same SMP were paid to all the baseload generators, KEPCO would encounter a substantial rise in cost for its acquisition of wholesale power. This would drive KEPCO to a deficit under the fixed retail tariff. The government had to either repeal the tariff regulation or adopt dual wholesale pricing. As a transitory measure, the government adopted the dual pricing system.

The new law allowed large-scale customers direct purchase of power from generators. However, this measure was delayed until the transmission tariffs could be established and retail tariffs liberalised. Direct purchase was not likely to take place then. All the large-scale customers, most of whom were industrial consumers, were enjoying subsidised low tariffs. Also, the big residential complexes which paid high tariffs to subsidise industrial consumers were not ready to form collective units to bargain.

This model was only supposed to last until deregulation of the retail tariff and the start-up of retail market operations in subsequent stages. The CBP market was to be replaced by an elaborate price-bidding pool, which would have involved the following measures:

- the generating companies (Gencos) were to be privatised individually;
- genuine open access to the grid was to be implemented;
- trading by bilateral contracts between customers and generators was to be introduced;
- retail tariffs were to be liberalised in order to accommodate the market determination of energy prices; and
- retail supply market was to be made fully open.

The initial mechanism was designed only to cover the transitory initial phase.

The divestiture of the generation sector was incomplete in the sense that it was designed to let KEPCO own the entire share of stocks of each generation company. This was also just a transitory feature, since the Korean government planned to privatise all the thermal Gencos according to the original plan. Privatisation, however, would not be possible unless all the future conditions surrounding the electricity market became clear and reliable. Apparently, the uncertainty about future restructuring had the effect of discouraging potential buyers in the early stage of restructuring and none of the Gencos were sold.

15.2.2 Reform put on hold

In 2002 the Gencos' unions undertook a month-long strike against the restructuring when the government attempted to privatise a Genco. However, the restructuring proceeded on schedule

under the support of the president who had initiated the restructuring. This support continued while he was in office but things began to change in 2003. Although the new president of that year belonged to the same political party as the outgoing president, there was evidence that he was sceptical about privatising the power industry. The labour unions continued to demand a repeal of the entire restructuring plan.[2] The issue at hand was the divestiture of the distribution sector, scheduled as part of Stage 2. The unions threatened another strike if the government proceeded according to the original restructuring plan.

The new president then decided not to push restructuring any further but to maintain it in its present status. There was no further restructuring but there was no return to the previous system either. The consequence was a higher level of uncertainty among private investors. Private investment in the generation sector was limited only to capacity expansion of pre-existing generators, and no new private generator entered the market. Though the total installed capacity expanded from 55GW to 75GW during the past decade, the expansion was mainly driven by the six Gencos owned by KEPCO. Exceptions to this are the renewable generators of 803.64MW capacity, which are subsidised by a scheme independent of the market, and the district suppliers with approved capacity of 1.5GW (see below).

15.2.3 Retail tariffs and cross-subsidisation

The retail rates of electricity in Korea are set by the standard principle of rate of return regulation. Although the figures vary over time, it is generally accepted that the rates for agricultural and industrial users are set below cost, while those for other users are above cost. There is a special discounted rate for late night consumption, which is set just to cover the marginal cost of nuclear generation and intended to encourage the consumption of residual midnight power from nuclear plants.

Table 15.1 summarises trends in electricity prices for each usage and total. Retail tariffs are set by the rate of return regulation modified by some progressive schemes. So the figures in the table are not the market prices but the average of regulated tariffs, and they do not directly reveal any effect of restructuring. The prices have been rising consistently, reflecting the rising costs. In 2008 KEPCO incurred a loss of KRW1 trillion due to the substantial increase in fuel prices.

This rate structure generated cross-subsidisation in Korean electricity consumption. Firstly, residential and commercial consumers paid higher tariffs for power in order to subsidise agricultural and industrial consumers. Industrial consumers represent up to half of Korea's total power consumption. Such cross-subsidisation provided incentives for Korean industry to rely heavily upon high electricity consumption, while other economies are endeavouring to conserve energy. This is a legacy of an export-driven policy, which provided the manufacturing industry with a wide range of subsidies. While cheap power helped the export-led growth of the Korean economy significantly, at the same time it nurtured an industry structure which consumes too much power and which cannot survive with a price that would recover costs.

Secondly, urban consumers paid much higher tariffs than the incurred costs. This was done in order to subsidise consumers residing in remote mountain regions and isolated islands who pay the same rates as the urban consumers. It is interesting to note that the tariffs for tap

[2] During the campaign, the president maintained it was desirable that network utility industries be under public control, except telecommunication which had already been privatised.

water, which is as essential as electricity, differ across regions. Perhaps this is because water is supplied by separate municipal governments while electricity is supplied by a monopoly.

Thirdly, the midnight discount rate is only for power consumed by approved heating and air conditioning equipment. This program is intended to encourage consumption of midnight power that is left over from nuclear generation. It has proven very effective. Load factors have improved so much that costly liquefied natural gas (LNG) must be burned now in order to meet increased midnight demand for power. At the same time, the program generated a strong interest group, led by the equipment producers, who strongly opposed its repeal, even though the need for the program is no longer present.

Table 15.1: Trends in average prices per kWh (KRW).

Year	Residential	Industrial	Agricultural	Total
1994	85.95	46.14	34.59	59.39
1995	86.47	47.14	36.17	61.28
1996	88.95	48.37	37.11	62.99
1997	92.05	49.86	38.96	65.26
1998	96.60	55.01	44.31	72.08
1999	96.41	54.78	44.04	71.59
2000	94.72	58.30	43.04	74.65
2001	91.57	61.56	43.51	77.06
2002	87.01	59.02	42.37	73.88
2003	88.00	60.30	43.45	74.68
2004	90.94	60.23	41.95	74.58
2005	91.07	60.25	41.67	74.46
2006	93.70	61.92	42.96	76.43
2007	94.78	64.56	42.45	77.85
2008	97.58	66.24	42.38	78.76

Source: KEPCO statistics 2010.

15.2.4 Emergence of district suppliers

As the electricity rates for residential consumers were set high, there was strong demand from the private sector to enter the power market for large residential complexes. They built gas turbine generators in urban residential complexes, mostly doing cogeneration, and sold power to the complexes at rates slightly lower than KEPCO's. Furthermore, they were allowed to sell power in excess to KEPCO at reasonable rates. This emergence of district suppliers prompted KEPCO and KOREX to set the transmission tariff, opening the door for direct trading by bilateral contract between generators and large-scale customers.

District suppliers sell their power to their customers at prices which are similar to the retail tariffs of KEPCO. They may obtain back-up power from KEPCO at industrial or general rates, which are lower than the residential rate, or directly from the wholesale market. Their leftover power may be sold back to KEPCO at the real time SMP. However, rising oil prices have discouraged their activities.

In total, 22 district suppliers were approved across 28 districts from October 2004 to July 2008, and the total capacity approval reached 1512.25MW. Operations started in four districts and suppliers withdrew from two districts. The initial enthusiasm cooled down, because the soaring oil price substantially eroded its profitability. The cross-subsidising rate structure removes the incentive for large-scale customers to trade directly with generators, even though the transmission tariffs are set clearly.

15.3 PRESENT STATUS

The lack of continued restructuring has had a number of consequences. No new private generator has entered the market except for the renewable generators and the district suppliers. Also the tightly controlled retail tariff has caused a serious financial unbalance between KEPCO and the Gencos. Every spot price then became subject to a ceiling to try to solve this problem and the wholesale market shifted to serving the role of allocating earnings artificially between KEPCO and the Gencos.

A new president belonging to a different party was elected in 2008 and to date the new president has not announced further reforms in the electricity industry. Meanwhile the labour unions continue to encourage the government not to pursue further restructuring actions. The Minister of Commerce, Industry and Energy, in his nomination hearing at the National Assembly, then said he would subject the restructuring of the power industry to a thorough review by the Korea Development Institute (KDI), a national think tank. KDI has recently released its final report, which proposes to resume restructuring by divesting the retail sector from KEPCO to begin retail competition. The Minister, however, announced that it is not yet the right time to begin retail competition. Instead he decided that all the Gencos will be controlled not by KEPCO but by government, in contrast to the demand to repeal all the restructuring and go back to the old system. He also promised to introduce an electricity rate system chained to oil prices.

15.4 STATISTICAL FEATURES OF KOREA'S ELECTRICITY INDUSTRY

15.4.1 Price trends

KEPCO attained a good reputation for its supply of electricity at a low price to support the industrialisation of Korea. Figure 15.1 shows the trend of average prices from 1994 to 2008.

The trend does not indicate any direct effect of restructuring. The price of KRW78.76/kWh (USD0.066) in 2008 is much cheaper than the price of USD0.0974 in the USA in the same year. Except for the recent years of soaring oil prices, KEPCO managed its operations without requiring fiscal support from the government.

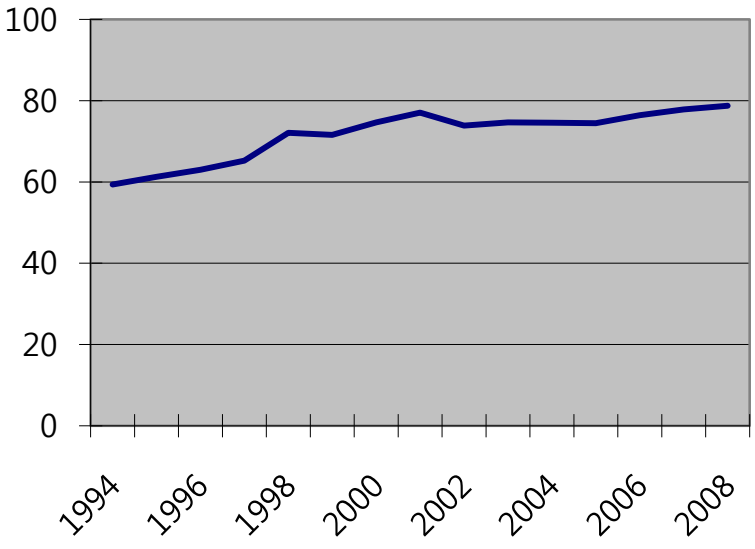

Figure 15.1: Trend of average power prices in KRW/kWh, 1994–2008.

15.4.2 Trend of total power losses

Transmission–distribution loss has reduced over time to 4.01% in 2008 (Figure 15.2). Improvement was evident well before the restructuring, and the trend was not interrupted by restructuring (though the trends in Figure 15.2 do not reflect the effect of restructuring).

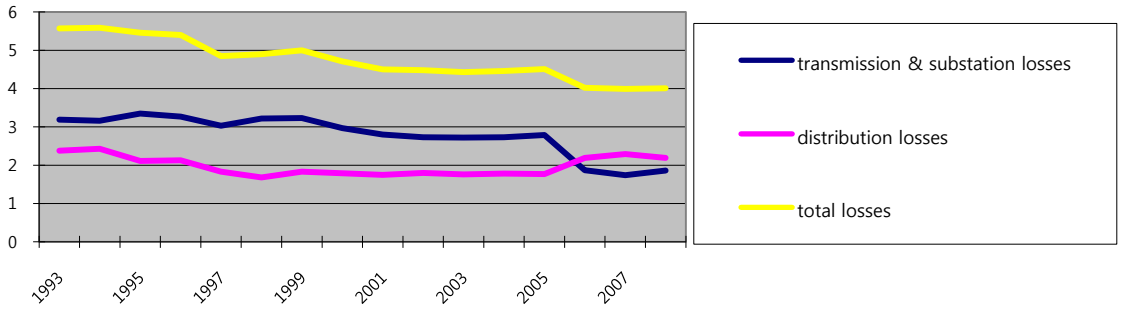

Figure 15.2: Trends of power losses (%), 1993–2008.

The loss rate of 4.01% is remarkable in comparison with the USA's 6.5% in 2007. While Korea cannot be compared with the USA in terms of area, it appears that KEPCO has managed the grid operation extremely well.

15.4.3 Efficiency gains from restructuring?

Although the future of restructuring is quite uncertain, several studies have examined if any efficiency gains were made through restructuring. The restructuring is incomplete and the relevant data are insufficient so, as yet, there are no convincing conclusions.

Since there has not been market competition in earnest, any gains would appear to arise from improved management after the divestiture. The planned outage, which in 2000 required 25.0 days across 109 units of generators, dropped following restructuring to be 19.4 days across 117 units in 2003 (Samil Consultant 2003). The heat efficiency of the generation facilities and the maintenance of frequency and voltage also seem to have improved after restructuring (Tables 15.2 and 15.3, respectively; The Korean Society for Electricity Industry Study, 2007).

Table 15.2: Trend of heat efficiency of generators (%), 1998–2004. Restructuring started in 2001.

Year	1998	1999	2000	2001	2002	2003	2004
Heat efficiency	39.45	39.51	39.45	39.57	39.96	39.94	40.66

Table 15.3: Maintenance of frequency and voltage (%). Restructuring started in 2001.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Frequency	99.17	99.28	99.33	99.41	99.45	99.70	99.74	99.70
Voltage	99.35	99.57	99.79	99.84	99.88	99.94	99.96	99.96

There was a substantial rise in the capacity utilisation rate of coal-fired plants and a subsequent reduction in generation cost of the Gencos after the divestiture (The Korean Society for Electricity Industry Study 2005). The rate rose from 74.8% in 1999 to 89.0% in 2003, and the cumulative cost savings were estimated as KRW602 billion for 2001–03. Kim, Knittel and Cho (2006) and Kim and Kim (2008) reported similar results. It is important to note, however, that Lee and Kim (2008) criticise the models used, claiming that they give rise to conflicting conclusions about the efficiency gains of restructuring.

In terms of financial performance, the recent hike in oil and coal prices drove up the wholesale price of power. As a result, KEPCO was pushed into deficit under the fixed retail tariff. This resulted in price ceilings on the wholesale price and substantially reduced the Gencos' profits. At the same time KEPCO has observed that the Gencos have paid higher prices for the coal they import, since each Genco was not able to command the same strong market power that KEPCO did before the restructure. However, this point can be debated, since even KEPCO is not likely to have substantial buying power in the world coal market.

15.5 POLITICS OF REFORM

All reform encounters political resistance as well as support. When the Korean electricity industry reform was begun, this author's observation was that the bureaucracy, following the president's instruction, pushed the reform very aggressively. The management of KEPCO also complied with the government's direction. The labour unions objected to the reform explicitly, although their month-long strike was in vain. The general public was not sure of the reform, since the idea of a competitive power market was novel. However, the move to reform was firm and steady while the political leader was clearly fully convinced of its merits.

The situation changed substantially when a new president signalled that he was not convinced about the value of reform. This author's assessment and observation was that bureaucrats lost their enthusiasm; KEPCO managers began to express their opposition publicly. For example, the present chief executive officer of KEPCO said before the National Assembly that he believes that the electricity industry must go back to its original form, that is, a KEPCO monopoly. The labour unions started systematic campaigns involving opponents from academia and industry. People generally appeared to become more sceptical, and the negative impact of the Californian electricity situation contributed to this.

Some recent experience provides an example of how competition might work and therefore could help reinvigorate the progress of reform. This involves the use of smart grids in line with a green power policy. To improve the efficiency of energy consumption, the Korean government promoted the introduction of the smart grid into the electricity system. Jeju Island was selected for testing a smart grid and an extensive experiment is underway. A smart grid will inform each consumer of the real time cost and price of power if the competitive market is at work. A display panel will provide the information so the consumer can decide then whether to use power or not. Consumers are unlikely to respond to the real time cost if it does not reduce their power bill, but many certainly will respond to the real time price in order to save money.

This experience could deliver the message that a competitive market is more appropriate for the system based on the smart grid than the traditional regulated monopoly. The large telecommunications companies KT and SK are aggressive with respect to the smart grid. There is the prospect of competition between the traditional giant of the electricity sector and two giants of telecommunications.

The patterns of electricity consumption in Korea remain an issue, and may also contribute to the momentum for further reform. Consumption data indicates that the Korean electricity industry is characterised by 'too much consumption', which is encouraged by the low tariffs. *Per capita* power consumption of Korea was very close to Japan's in the same year but Korea's *per capita* income was only half that of Japan. Korea consumed 497kWh of electricity in order to produce USD1000 of GDP, while Japan, the USA and the UK each consumed only 30–60% as much.

15.6 CONCLUSION

As explained in this case study, an extensive program of reform was proposed in Korea but a change in circumstances and apparently in the evaluation of the reform by political leaders has altered the process of its implementation. The main reform to date has been the separation of the generation companies, although without a change of ownership. There is some evidence of an effect on various dimensions of efficiency, though its significance is debated. Competition has not been introduced. Drivers of further reform may not be fiscal constraints, since KEPCO has performed well in financial terms. However, there is evidence of the benefits of competition emerging in new models of systems of supply and an apparent interest from the telecommunications companies in the electricity market. Prices have risen closer to world market benchmarks but remain below them. This approach to pricing, and the cross subsidies to industry, led to higher levels of consumption which remains an issue.

What might be the next steps in reform? In 2007 a research group proposed that KEPCO divest its retail sector so that each Genco could take over the retail business and start competing in the retail market, without divesting its distribution sector (The Korean Society for Electricity Industry Study 2007). The idea was motivated in part by the experience in Texas, where fierce retail competition was used to drive retail prices down. However, it also resulted in certain retailers becoming insolvent so that customers who had signed contracts with insolvent retailers were stranded without a supply of electricity. However, if a retailer is backed by its own generation business, this acts as a 'physical' hedge against fluctuations in the wholesale electricity price. As a result, the retailer is less likely to fall bankrupt easily and the customers are less likely to be left stranded. Such an approach is common amongst electricity generators/retailers in Australia. This proposal, while opposed by those against further restructuring, deserves attention.

Further restructuring could also involve:

- divesting the construction and retail businesses from KEPCO;
- bringing the Gencos into the retail business; and
- creating an energy market by abandoning regulation of the retail rate.

There would be resistance from interest groups who gain from the current structure of cross-subsidisation. Their position seems to be supported by political leaders as well as the general public, based on the perception that KEPCO is an excellent utility that supplies electricity at low prices without state subsidy. In many efficiency measures KEPCO is indeed an excellent utility. But it is not desirable for the present system to continue to encourage high electricity consumption in Korea. More extensive and convincing analysis and presentation of information is valuable for successful further restructuring of the Korean electricity industry.

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Chapter 16

ELECTRICITY IN RUSSIA

Alexandra Sidorenko[1]

- There has been a transformation of the system to separation and a wholesale market. The motivation was the urgency to mobilise investment in capacity.
- The steps include restructuring and private ownership (2003–08); price deregulation according to a schedule and full competition in generation (by 2011); and competition by ensuring third party access to network infrastructure. Price regulation remains to 2015 for retail consumers.
- The consequence was significant increases in capacity. The 2010 Russian budget commits to further electricity tariff increases to reduce the extent of the subsidies.

16.1 INTRODUCTION

The Russian Federation has embarked on, and achieved, significant progress on what seems to be the 'textbook version' of the comprehensive electricity sector privatisation, restructuring, competition and regulatory reform program (Joskow 2008), following the lead of the United Kingdom and applying the market design of the Pennsylvania–New Jersey–Maryland (PJM) model from the United States of America (USA).

As Pollitt (2007) remarks, 'what seems to be the case is that the pursuit of electricity reform through to its logical conclusion is only likely to happen in jurisdictions where there is strong ideological commitment to competition in energy markets. This will partly be driven by resource conditions … but significantly by whether there is a fundamental belief that electricity prices should be left to the market'.

In the case of the Russian Federation, the progress to date demonstrates that strong commitment to market reform and leadership has been the key condition for keeping the reform on track despite its unpopularity. It looks like the Russian reform has successfully passed the point of no return and the only way is forward, fine-tuning the wholesale market mechanism, aligning price signals and incentives, enforcing competition policy, increasing energy efficiency and fostering investment in modern technology, both public and private.

This case study outlines the scope and progress of the reform and some of its effects to date.

16.2 ELECTRICITY SYSTEM IN RUSSIA

The Russian Federation is one of the top electricity generating economies in the world:

- it is the fourth largest generator after the USA; China; and Japan, producing 5% of the world's electricity (IEA 2009);

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- in 2009 there were more than 700 generating plants in Russia with a total installed capacity of 211 846 MW;
- domestic electricity generation was 957.1 million MWh, domestic consumption 942.8 million MWh (SO 2010b);
- Russia is a net exporter of electricity (exports account for 2% of domestic supply, imports 0.3%) (FSS 2010);
- the composition of the installed generating capacity in Russia by type of fuel is 68% thermal, 11% nuclear and 21% hydro;
- the regional composition varies, with Siberia relying on hydropower stations (47% of capacity), the North-East on nuclear generation (27%) and the Urals almost exclusively on thermal generation (94% of installed capacity) (SO 2010b).

Russia's unified electric energy system was created during the Soviet times as the backbone for the economic growth in an industry-oriented planned economy. Following the Soviet Union's collapse, in 1992 the Russian Federation government transferred most of the electricity assets to the open joint stock company 'United Energy Systems of Russia' (RAO-UES).

At the onset of the reform, RAO-UES owned 72% of the economy's installed generating capacity and 95% of its transmission grid.[2] It had 72 regional vertically integrated subsidiaries called AO-Energos. The dispatch and system operation services also belonged to RAO-UES.

In 1998 Anatoly Chubais became the president of RAO-UES. His team was behind the concept of electricity reform and its implementation in Russia. Chubais' background as one of the architects of voucher privatisation and major market-oriented reforms of the early 1990s shaped his approach to the task of reforming the electricity sector. Chubais was responding to a number of challenges faced by RAO-UES.

Chubais faced a number of issues. Payment arrears were plaguing RAO-UES's bottom line during the transition years and there were no funds to maintain, even less to expand, the infrastructure.[3] A related motivation for the reform of the electricity sector came from the so-called 'Chubais cross', a diagram based on the existing and projected installed capacity, with the intersection in 2008 (Chubais 2007). Chubais observed that in 1990 electricity consumption was 1074 billion kWh. This fell to 809 billion kWh in 1998 and then steadily increased. By 2006 it had reached the 1992 level and Chubais estimated that at the rate of growth at that time the historic high of 1990 would be reached again in 2008. He went on to forecast consumption of 1198 billion KWh in 2010. He then estimated it would be necessary for Russia to build a substantial amount of capacity over the 2006–10 period to meet this growth in demand.[4]

The observations by Chubais were the basis of a case for reform in order to finance the construction of the new capacity. In retrospect, the timing of the capacity exhaustion could

[2] http://www.rao-ees.ru/ru/info/history/show.cgi?prof.htm.

[3] In 1998 salaries and wages of RAO-UES staff were on average 3 months in arrears, cash payments for electricity supply were less than 17% of the total owing, and more than 20 RAO-UES companies were on the verge of bankruptcy. Corporate debts of RAO-UES had reached about USD10 billion at the beginning of 1998. http://www.rao-ees.ru/en/invest/reporting/reports/report2007/4.htm

[4] Chubais' estimate was that Russia would require 40.9GW of capacity over the period 2006–10 and the context was that Russia had built only 23GW over the previous 15 years. Cook (2005) had produced a similar forecast of the growth of consumption, although meeting the 1990 level by 2010, rather than 2008. Cook argued that the majority of the investment would be required after 2010.

have been delayed by the current financial and economic crisis: as noted above, consumption in 2009 was actually only 943 billion kWh and capacity in 2009 was about the same level as it was in 1991. But at the time, the perception was that the value of the reform was acute.

Reform was conceived around the idea of maintaining government regulation over the natural monopoly components of the sector, while introducing competition and private investment in the generating segment. The large-scale reform of the electric power sector was launched in 2001.[5] The stated goals of the reform included:

- private ownership (2003–08);
- price liberalisation and full competition in generation (by 2011); and
- third party access to network infrastructure.

Pricing mechanisms for electricity tariffs were to be changed to stimulate investment, which had been inadequate for many years:

- The average annual input of new generating capacity over 1991–2000 was just 600–1500MW compared to 6000–7000MW over 1976–85 (Palamarchuk & Voropai 2006).
- In 2007 about two-thirds of all installed capacity had been commissioned at least 25 years earlier (Abdurafikov 2009 and Figure 16.1).
- With the accepted power infrastructure lifetime values, the depreciation of transmission lines had reached 50% in 2009, thermal generation 60–70% and hydroelectric power generation 80%.[6]
- The August 2009 accident at Sayano-Shushenskaya hydropower station highlighted the need for urgent investment in replacing aging and failing infrastructure.
- By the estimates of KPMG, the Russian electric energy sector would require investment of USD550 billion by 2020,[7] which exceeded the official figure of USD420 billion over 2008–20. The Russian Federation government's Energy Strategy 2030 estimates investment needs in the electricity sector between USD572–888 billion over 2009–30.[8]

Manufacturing and mining are among the largest users of the electric power (Figure 16.2), and a competitive modern electricity sector is essential for their performance. Energy saving measures are also becoming more important and are recognised in the recent legislation. Main elements of the policy to increase efficiency in the electricity energy sector using renewable sources were adopted by the Russian Federation government on 8 January 2009. The share of renewable energy (excluding hydropower generators with installed capacity greater than 25 MW) in total generation is scheduled to increase from 1.5% in 2010 to 4.5% in 2020.[9]

16.3 POLICY REFORM

Table 16.A1 summarises the current industry structure. Reform of the electric energy sector has been discussed since 1997, with the draft resolution 'The main directions of the State

[5] Reform began with the signing of Resolution #526 'On the Restructuring of the Electric Power Industry of the Russian Federation'.
[6] http://www.gazeta.ru/business/2010/01/25/3316190.shtml.
[7] http://www.gazeta.ru/business/2010/01/25/3316190.shtml.
[8] http://minenergo.gov.ru/activity/energostrategy/pr_4.php.
[9] http://minenergo.gov.ru/activity/plan/2010-2012_3/1.php.

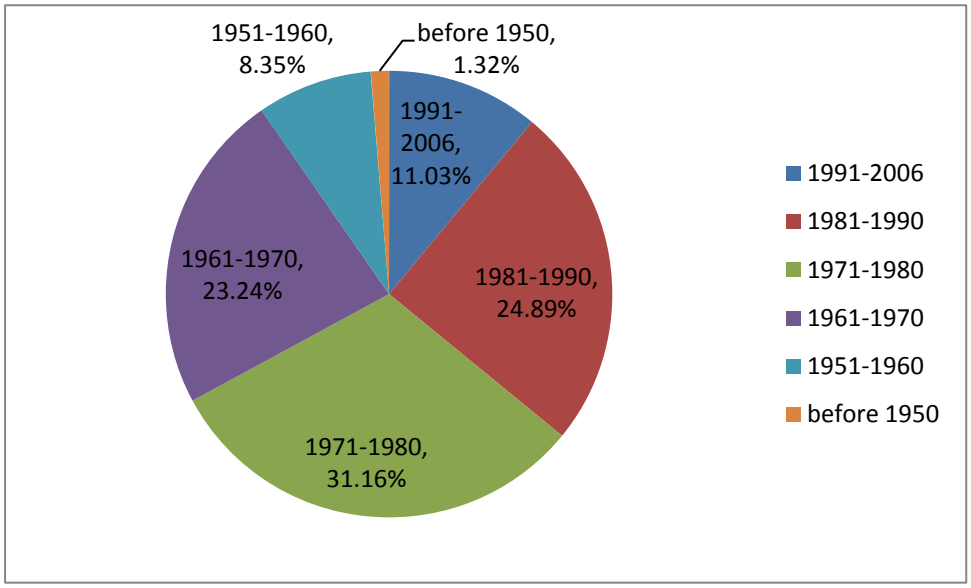

Figure 16.1: Distribution of installed capacity by commissioning year, 2007. (Source: Abdurafikov 2009)

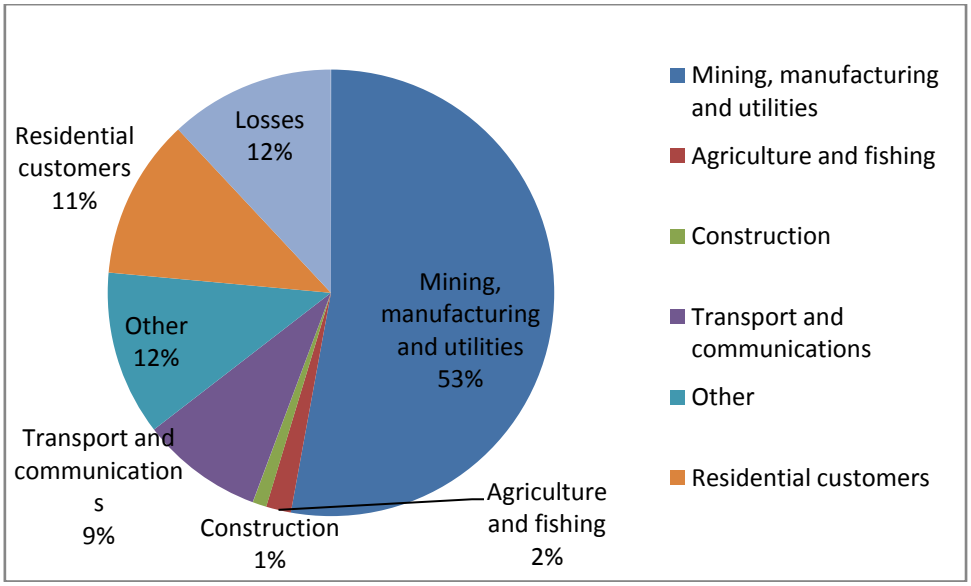

Figure 16.2: Electricity consumption by final use, 2007.

Table 16.1: Market concentration.

Name of firm	Service provided: Generation Transmission Retail	Year the firm first offered services	Market share	Owners of capital and their respective shares (domestic/foreign/ government)
FGC	Transmission	2002/1992	100%	25%-1 private/ 75%+1 gov
MRSK	Transmission (regional)	2003	90-100%	
System Operator	Network technical supervision	2002	100%	100% govt
RusHydro	Generation (hydro)	2004	13%	40 %/60% govt
Rosenergoatom	Generation (nuclear)	1992	12%	100% govt
Distribution/retail companies	More than 540	Various (reorganised during reform)	Some regions are highly concentrated	Various (public/private with different level of local governments share)
Generating companies: see below	More than 700	Various (reorganised during reform)	HHI=601 on the national level, but concentrated on regional level analysis	Mostly private, with foreign equity participation in three large WGCs (control about 11% of generating capacity).

Policy on Restructuring the Electric Power Industry in the Russian Federation' adopted by the government in 2000. The Arthur Andersen consulting company was chosen to assist in the development of the restructuring model. The large-scale reform of the electric power sector was launched in 2001 with the signing of Resolution #526 'On the Restructuring of the Electric Power Industry of the Russian Federation'. As of 1 July 2008 RAO-UES ceased to exist as a company, having completed both horizontal and vertical separation.

16.3.1 Ownership

The proposed industry structure and market design was based on international best practice in electricity sector restructuring. There was political will to implement liberalisation of the generation sector and to introduce third party access to the transmission and distribution infrastructure, which was to remain under majority government control. Incumbent hydroelectric power stations (previously part of RAO-UES) were transferred to the RusHydro company, with mandatory majority government ownership. Nuclear generation remained under full government ownership and supervision through the RusEnergoAtom Company.

In 2007, 48.5% of companies in the electricity, gas and water sector were private, contributing 54% to the total sector revenue and 34.5% employment. There were 1469 companies with (joint) foreign ownership – 3.8% of the total number of companies in the sector – producing 13.5% of the total sector revenue and employing 5.2% of the sector's workforce (Industry of Russia 2008). A Federal Law had imposed a 25% limit on foreign participation in the assets of the corporatised incumbent UES.[10] This restriction has been removed in the course of the reform.

The first foreign entry into electricity assets was by portfolio investors and private funds who bought shares in RAO-UES and then its spin-offs. In 2007–08 strategic investors entered. Currently, E.ON (Germany), Enel (Italy) and Fortum (Finland) are the three largest foreign investors in Russian generation assets. Newspapers report the following experiences of foreign investors in the Russian electricity sector. The Director-General of Italian Enel, the owner of WGC-5, comments that current electricity tariffs in Russia are four to five times lower than in the EU. Enel invests RUB20 billion per year in the generating capacity of its Russian company. The current level of tariffs is too low to support the investment activity. There are various social obligations attached to the balance sheets of the privatised entities which the private investor has to support. Low payment discipline creates another problem, with chronic payment arrears (Baumgartner 2009).

16.3.1.1 Generation

Restructuring of AO-Energos was launched at the end of 2001, starting with Belgorod-energo. In parallel with this, a wholesale market for electricity (and capacity) was set up to enable trading in electricity at unregulated prices. The active divestment of RAO-UES's generating assets has been underway. Foreign investors have gained control over 17 300MW capacity (30% of capacity privatised in 2007; 8% of total national stock (UniCredit 2008).[11]

[10] № 74-FZ of 7 May 1998 'On managing common stock of the Russian joint-stock energy and electricity company 'United Energy System of Russia' and stock of other joint-stock electric energy companies in Federal ownership'.

[11] In 2007 eight large generating companies (WGC-2,3,4,5 and TGC-1,3,5,8) were sold by RAO UES for USD20 billion (installed capacity 57 400 MW, about 27% of the national installed capacity). WGC-4 was bought by foreign investor Enel (Italy) and WGC-5 by E.ON (Germany).

16.3.1.2 Transmission

The Federal Grid Company (FGC, or FSK in the Russian acronym) was established in June 2002 as an open joint stock company fully owned by RAO-UES. The transmission assets of its regional subsidiary AO-Energos were brought under FGC control in March 2003. There is mandatory majority government ownership of the national transmission grid incumbents FGC (75% + 1 share) and System Operator (100%).

The network assets of FCG are spread over 73 regions of the Russian Federation, covering an area of 13.6 million km^2. They include 118 000km of trunk transmission lines and 757 transformer stations with a total capacity of over 286 000MVA (voltage 35–1150kV).[12]
FGC requires significant investment in modernisation and in the extension of the national high-voltage grid. According to FGC data, in 2010 the average depreciation of the network's physical assets is 41%, including 65% depreciation of transformer and other auxiliary equipment, 35% depreciation of transmission lines and 23% depreciation of buildings and facilities.[13]

Special rules apply to the new transmission assets built by other operators. Article 10.2 of the Federal Law 'On Electric Power Industry' stipulates that any entity can construct a transmission grid subject to building approvals (Article 42). Once connected to the national grid, transmission assets with a rated capacity greater than or equal to 330 kV, and other transmission assets with a rated capacity 220–330 kV providing a critical connection between significant generation and load centres, become part of the national grid. The owners cannot exit without the approval of FGC, which collects transmission charges on their behalf based on the established tariffs and reimburses the owners.[14]

16.3.1.3 Distribution

Before the reform 72 vertically integrated regional energy companies (AO-Energos) controlled most of the distribution lines in Russia. Subsidiary companies of RAO-UES hold 85% of distribution lines, with the rest belonging to four independent AO-Energos and municipal utility companies (Standard & Poor's 2008).

RAO-UES coordinated the reform of its regional subsidiaries with regional authorities:

- In August 2002 procedures for establishing the wholesale and territory generation companies (WGCs and TGCs), distribution grid companies and interregional grid companies were approved by the RAO-UES Board.
- As part of the restructuring process, 66 AO-Energos belonging to RAO-UES were unbundled and their distribution assets transferred to separate companies. Seven interregional grid companies were established in December 2003.
- In April 2004 the configuration of interregional distribution grid companies (IDGC, or MRSK in the Russian acronym) was approved[15] and 12 interregional distribution

[12] http://www.fsk-ees.ru/investors_about.html.
[13] http://www.fsk-ees.ru/evolution_strategy.html.
[14] Article 7.2 of Federal Law 'On Electric Power Industry' and Russian Federation Government Decree № 41 of 26 January 2006 'On Criteria for the Assignment of Electric Grid Facilities to the Unified National (All-Russian) Power Grid'.
[15] The first four IDGCs were established in October 2004: MRSK-1 UES of Centre and Northern Caucasus, MRSK-2 UES of North-West, MRSK-3 UES of Urals and MRSK-4 UES of Siberia.

companies (IDGCs) spin-offs had been formed.[16] IDGCs are publicly listed and majority government-owned (53%), with more than 300 000 shareholders.

16.3.2 Regulation

The basic model of WGCs was approved in September 2003. Discussion of mergers between AO-Energos to form a single TGC started in December 2003. A lease-based model was used. The first WGC (#5) and the first two TGCs (#9 and #14) were established in September 2004. Hydroelectric power assets were consolidated in a separate WGC, RusHydro, in October 2004.

Mandatory unbundling provisions in force from 1 April 2006 mean that a company is forbidden to own or lease assets in the transmission/dispatch of electricity and in its generation and/or distribution. Since 1 January 2008 the same measures apply to a company's affiliates operating in the same price zone of the wholesale market (currently there are two price zones – Europe/Urals and Siberia).

Exemptions include Guaranteeing Suppliers (the Suppliers of Last Resort) – that is, designated distribution companies with universal service obligations to residential and other consumers; isolated systems where there is no competition, and where electricity is generated for the provider's own use. Most of the regions in the Russian Federation have companies which are exempt from the unbundling requirement.

The types of economic entities allowed bundled operations are:

- supplying network companies – activities in transmission and distribution;
- supplying companies with subscribers – transmission and distribution to connected customers as part of the operations but not the main economic activity;
- energy-industrial conglomerates – combined transmission and distribution; not the main activity but a secondary function (e.g., large production facilities in metallurgy, the paper industry, oil refineries, the petrochemical industry etc.);
- nuclear power facilities; and
- suppliers to military and other strategic entities.

Unbundling was performed in several ways, including the transfer of network assets to a different owner or the transfer of customer supply contracts to another distribution company or guaranteeing supplier.

16.3.2.1 Independent power producers

The entry of independent power producers was facilitated by the development of the wholesale electricity market and the setting of rules for third party access to transmission lines (see below). Independent generators with a total generating capacity of at least 25MW and 5MW minimum at each connection node can become participants in the wholesale market.

It was envisaged that the development of new generation capacity would be largely funded by private investors but until recently regulated electricity tariffs in Russia had failed to reward investment in new capacity (Table 16.2).

[16] http://www.holding-mrsk.ru/about/facts/spravka/. The grid network of 10 voltage categories (0.4–220kV) under MRSK-Holding is 2 million km; 637 million MWh were transferred through the grid in 2008.

Some features of the electricity markets include a long lag between committing to new capacity and the ability to supply it, the high cost of new energy compared to 'old'/installed energy, the lack of certainty of future electricity prices and the presence of generating plants with different cost structures (competition with hydro and nuclear generating facilities) (Belyaev 2005).

In 2004 electricity tariffs were US1.5 cent/kWh in the European part of Russia. Belyaev (2005) explains such low tariffs as a failure to account for capital costs as a result of 'gratis' privatisation of electric power industry assets in the early 1990s which led to the creation of the RAO-UES monopoly and its regional electricity monopolies AO-Energos. Prices for natural gas, a major fuel for thermal power generators, were regulated and the level was low. There was virtually no investment activity in replacement and new assets, hence there was no investment component included in the electricity tariffs.

Based on the analysis of cost structure for new and installed generation capacity (Table 16.3), Belyaev concludes that the deregulated electricity market will be characterised by a permanent capacity shortage. A similar argument recognises that the investment in new

Table 16.2: Selected comparisons of international electricity prices, 2007 (US cent/kWh).

Economy	Industrial	Households
Austria	15.41	25.72
Czech Republic	15.12	19.15
Denmark	–	39.60
Finland	9.69	17.24
France	5.95	16.90
Hungary	16.97	22.34
Ireland	18.59	26.72
Italy	28.98	30.53
Korea	6.02	8.86
Mexico	12.60	9.61
Netherlands	–	24.26
New Zealand	7.14	16.44
Norway	6.36	16.39
Poland	11.93	19.30
Portugal	13.13	21.97
Slovak Republic	17.39	21.96
Spain	12.52	21.80
Switzerland	9.38	15.43
Chinese Taipei	6.72	8.56
Turkey	13.88	16.48
UK	14.59	23.13
USA	7.02	11.35
Russia*	4.50	4.50

Source: IEA 2009, *data for Russia MED 2007.

Table 16.3: Cost components of old and new generation plants, 2005 (US cent/kWh).

OLD						NEW				
Type	**Depreciation**	**O&M**	**Fuel**	**Cost of capital**	**Total**	**Depreciation**	**O&M**	**Fuel**	**ROI**	**Total**
CFP	0.54	0.69	1.19	-	2.42	0.54	0.53	1.19	3.68	5.94
GFP	0.40	0.44	1.84	-	2.68	0.40	0.34	1.34	2.05	4.13
NPP	0.44	0.53	0.40	-	1.37	0.44	0.41	0.40	3.76	5.01

Source: Belyaev (2005). CFP = coal-fired plant, GFP = gas-fired plant, NPP = nuclear power plant; ROI = return on investment, O&M = operation and maintenance

generation capacity should be rewarded either through higher tariffs or through capacity payments. Recent changes to the Regulated Asset Base (RAB) should help to attract new entry by independent power providers (see Box 16.1 below).

16.3.2.2 Third party access

The 2003 legislation stipulated the rules for gaining non-discriminatory access to transmission and distribution networks. Transmission tariffs and technological connection fees are regulated by the Federal Tariff Service (FTS). In 2008 there were 120 companies with direct connection to FGC, including distribution network companies (56% of connections), independent network companies (9%), retail distributors (17%) and large consumers of energy (18%).

The formula for transmission tariffs changed in 2006 from the actual amount transmitted (in MWh) to a declared capacity (in MW per month). Base transmission tariffs increased from USD1478/MW per month in 2006 to USD2236/MW per month in 2008, with additional payments for transmission losses differentiated by region.[17]

Distribution tariffs are also set by the FTS (FTS Order № 20-e/2 6 August 2004, as amended on 31 December 2009, 'On approval of instructional guidelines for the calculation of regulated tariffs and prices for electric (thermal) power in the retail (consumer) market').

16.3.2.3 Wholesale electricity (capacity) market

The Administrator of Trading System (ATS) was founded by 28 bodies representing market participants (generators and consumers) and regulators.[18] ATSis a not-for-profit organisation whose responsibilities include managing trading and settlement in the wholesale electricity market (maintaining a registry of participants, registering contracts, data collection, development of rules and methodologies, dispute resolution etc.). A Market Council oversees operations of the wholesale electricity (capacity) market.[19]

The 'System Operator - Central Dispatch Administration of the Unified Energy System' (SO-CDA) was established in July 2002 to provide paid dispatch services. On 1 April 2003 the dispatch functions of AO-Energos were transferred to regional dispatch administrators – subsidiaries of SO-CDA – increasing the number of SO dispatch branches from 20 in 2003 to

[17] Transmission tariff is differentiated by voltage of the lines required to supply the energy. Four categories are specified: high voltage (110kV and above); medium first (35kV), medium second (20kV down to 1kV) and low (0.4kV and below). The higher the voltage, the less transformation losses are associated with electricity delivery to the customer, hence the lower the tariff. Distribution surcharge is included in the final tariff and is also regulated by the FTS.

[18] The wholesale market for electric energy and capacity was first tested in Russia in the late 1990s. The earlier model, FOREM, was based on Federal Law № 41-FZ of 14 April 1995 'On State Regulation of Tariffs for Electric and Thermal Power in the Russian Federation', and the Decree # 793 'On Federal (national) wholesale electricity power (capacity) market' (12 July 1996). The rules and structure of the new wholesale market, NOREM, are based on Federal Law № 35-FZ, 'On the Electric Power Industry (26 March 2003); #36-FZ, 'On Specific Features of Functioning of Electric Power Industry During the Transitional Period and on Introduction of Amendments into Certain Legislative Acts of the Russian Federation and on Recognizing Certain Legislative Acts of the Russian Federation to Have Lost Their Force in Connection with Adoption' (26 March 2003) and Russian Federation Government Resolution № 576 'On Federal Bodies of Executive Power Authorized to Provide State Control over Activities Performed by the Administrator of Trading System of the Wholesale Power (Capacity) Market' (16 September 2003).

[19] http://www.np-ats.ru/.

60 by 2004. SO is a technical body responsible for the technical security/uninterrupted supply of the national electrical grid.[20]

- Simulation trading at the new wholesale market started in September 2002.
- Originally there were 87 wholesale market participants. During 2002 wholesale market rules were developed, including payments for the ATS and SO services.
- The wholesale market model during the transitional phase was approved in March 2003.
- In October 2003 wholesale market regulations were adopted. Template contracts for joining the wholesale market were approved and the dispute settling mechanism established.
- The first trading in the competitive power sector ('5–15% total') was on 1 November 2003, with 6 registered buyers and 7 sellers and 13 000MWh traded at average weighted price RUB260/MWh.
- By the end of the first year of operation, the Russian wholesale electricity market became the 5th in Europe and the 9th in the world in terms of the volume traded.
- Out of 128 participants of the wholesale market in the first year, 54 were independent from the incumbent.[21]

The current design of the wholesale market has been influenced by the Pennsylvania–New Jersey–Maryland (PJM) interconnection model, including its nodal pricing approach and Financial Transmission Rights (FTR) mechanism to hedge price differences between the nodes. The role of the latter is fulfilled by Free Bilateral Contracts (Oksanen et al. 2009).

The Russian national electricity system is comprised of six united energy systems: Centre, Middle Volga, Urals, North-West, South and Siberia. The energy system of the East operates as a separate synchronous zone, with manual control over the 220kV connection with the Siberian system.

The national wholesale market is divided into two price zones for geographic reasons – European Russia/Urals and Siberia. The transmission links between the zones are weak. The third large region, Russia's Far East, is not part of the wholesale market due to its remoteness and lack of connections (Palamarchuk & Voropai 2009). There are also non-price zones/islands with limited connections to the wholesale market. Transmission capacity even within the same price zones is often congested, including the links between the Urals and the Middle Volga/Centre, and the North-West to and from the Centre (SO 2010a).

At the end of 2009, 82% of the technological reserve capacity was used in the Central subdivision of the market, signalling the need for additional capacity and facilitation of flows between the zones. Newly installed or modernised generating capacity comprised 1377MW, or 0.7% of the existing stock at the beginning of 2009.

The major suppliers to the wholesale market are six WGCs with cross-territorial operations, 14 TGCs and the government-owned nuclear energy consortium 'RusEnergoAtom', importers and independent generators (with total generating capacity of at least 25MW and 5MW minimum at each connection node). Buyers are distribution companies, including

[20] http://www.so-ups.ru/.

[21] The balancing market was launched in October 2005 (Government Decree № 620 of 17 October 2005 'On Amending the Russian Government Decree on the Deviations Sector of the Transitional Wholesale Power [Capacity] Market').

guaranteeing suppliers, exporters and large industrial consumers (with connected demand capacities of at least 20MVA and a minimum 2MVA at each connection node. For direct consumers and local distribution companies the latter limit was reduced to 1 MVA from 1 August 2007, and then to 750 kVA from 1 February 2008). In 2009 there were 7913 nodes and 12 151 branches in the wholesale electricity (capacity) market trading model (SO 2010a).

Until the introduction of the wholesale market, most of the electricity was supplied at regulated prices through long-term (usually 5-year) vested contracts. These regulated 'take-or-pay' contracts defined both the volume and prices of the electricity (capacity), and customers were required to make the full agreed payments regardless of actual consumption. The phasing out of regulated (vested) take-or-pay contracts has allowed for a gradual transition to market liberalisation.

As part of the liberalisation process, the share of electricity which can be traded on the wholesale market at unregulated prices is being increased gradually. The share of the regulated sector has been reduced as follows:

1 January 2007 to 30 June 2007	90–95%
1 July 2007 to 31 December 2007	85–90%
1 January 2008 to 30 June 2008	80–85%
1 July 2008 to 31 December 2008	70–75%
1 January 2009 to 30 June 2009	65–70%
1 July 2009 to 31 December 2009	45–50%
1 January 2010 to 30 June 2010	35–40%
1 July 2010 to 31 December 2010	15–20%.

Full liberalisation of the wholesale market is envisaged for 1 January 2011, with all electricity sold at free (competitive) prices. The regulated sector covers generators registered with FTS in 2007. All new generators and new capacity will be able to supply electricity at competitive prices.

The capacity market was launched on 1 August 2008, with buyers making payments to the generators for having a declared installed capacity ready to be employed at request.

The difference between the FTS regulated tariffs and the equilibrium wholesale market price is significant. In the European Russia/Urals price zone in 2008 the average market price was RUB708/MWh compared with the FTS price of RUB425/MWh (or US2.8 cent/kWh vs US1.7 cent/kWh). In the Siberian zone it was RUB500/MWh compared to RUB219/MWh (or US2.0 cent/kWh vs US0.9 cent/kWh), respectively (ATS 2010). The highest prices were observed in the South (due to high transmission losses), and the lowest in the Urals (low generation costs and large proportion of price-taking suppliers).

There are two major forms of electricity (capacity) trading in the 'unregulated' wholesale market – bilateral contracts and on a day-ahead market.[22] Bilateral contracts allow the parties to supply electricity directly to buyers (wholesale market participants) at contractual prices. The day-ahead market is composed of bids from suppliers and buyers for next day consumption. Buyers with excess capacity purchased through bilateral contract can sell their spare electricity on a day ahead-market. Similarly, a generator who needs additional capacity to fulfil contractual obligations can purchase additional amounts on a day-ahead market. The bids are processed by the ATS and the equilibrium price is determined using the nodal pricing model. As a result, an hourly supply schedule is designed with dispatch instructions

[22] http://www.rao-ees.ru/en/reforming/market/show.cgi?market.htm.

sent to the suppliers and buyers for the day ahead. The balancing market ensures that deviations from the scheduled supply/demand are met in real time (here, the participants are unsuccessful bidders from the day-ahead market who are offered to supply electricity, and buyers with controlled loads). Prices are calculated for more than 6000 nodes in European Russia/Urals and more than 600 nodes in Siberia, taking into account generation costs, transmission losses and congestion charges (Oksanen et al 2009)

16.3.2.4 Trade and interconnections

Electricity grids of several neighbouring economies work in parallel with the Russian grid: Belarus, Estonia, Latvia, Lithuania, Georgia, Azerbaijan, Kazakhstan, Ukraine, Moldova and Mongolia. Electricity grids of Uzbekistan, Kyrgyz Republic and (until the end 2009) Tajikistan are also connected via the Kazakhstan grid (SO 2010b). Direct transformation links exist with the grids of Finland (through Vyborg), Norway (several generators in the Kolsk system are supplying directly), and connection from the Far East to China (SO 2010b). The operating system frequency of the Russian national grid is 50Hz. Peak loads occur in the winter months, with historic demand maximums reached or exceeded during 17–21 December 2009 in all regional energy sub-systems of the national grid (SO 2010b).

Power failures can occur when the grid frequency falls outside the normal range, which is 50Hz+- 0.05Hz. This can happen during peak demand when there are insufficient spinning reserves to ensure normal frequency. The Moscow blackout of 25 May 2005 was caused by the failure of local distribution lines (110kV), raising concern about the classification of network lines as ‘transmission’ or ‘distribution’ in terms of government supervision (Renaissance Capital 2005). Figure 16.3 illustrates deviations from optimal frequency over 2004–09. Note that there is no clear trend in terms of changes in system reliability following the structural reform.

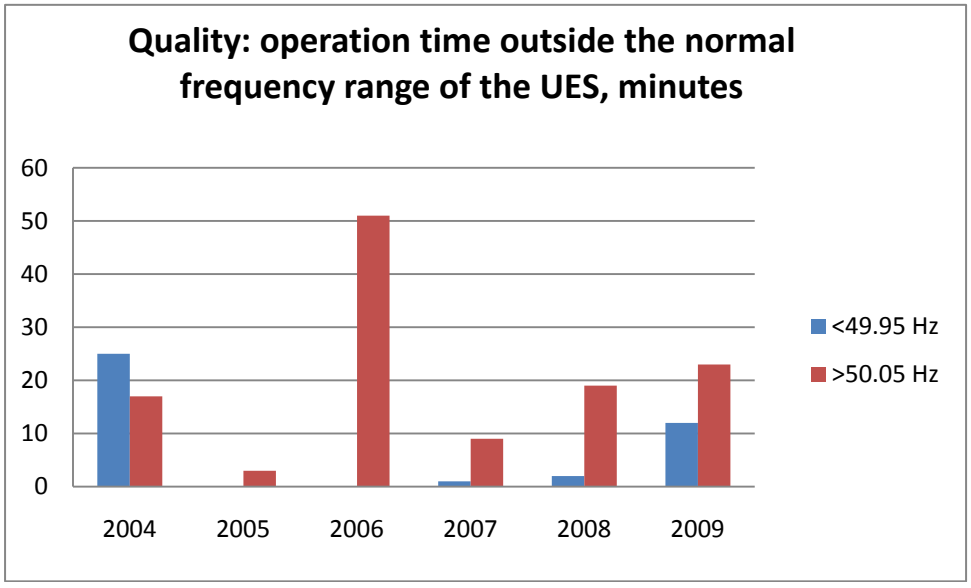

Figure 16.3: Technical reliability of RAO-UES operations, 2004–09. (Source: SO 2010a)

Russia imports electricity from Kazakhstan (Northern regions) and Kyrgyzstan (transit)/Central Asia, Ukraine and Lithuania; and exports to Finland/Nord Pool, Belarus, Kazakhstan (Western regions), and Georgia, Armenia, Mongolia and China (Inter RAO 2008).

The electricity system of Russia's Far East is independent from the European and Siberian markets and accounts for less than 10% of national total generation and consumption (Palamarchuk & Voropai 2006). Growing demand from neighbouring China creates an opportunity for developing this regional system. China has approved plans to construct 5000km of 500kV transmission lines along the Russia–China border. Since 2005 about 492 000 MWh of electricity has been exported annually to China, with the planned increase to 3.8 million MWh/year by 2015 (Drugov 2008). Various interconnection projects have been proposed and discussed (e.g., Belyaev et al. 2005; Yoon et al. 2006; Lee et al. 2007).

16.3.2.5 Industrial users choice

Large industrial users (with connected demand capacity of at least 20MVA, and a minimum of 2MVA in each connection node) can purchase electricity (capacity) directly from the wholesale market. For direct consumers and local distribution companies the required capacity limit was reduced to 1MVA from 1 August 2007, and then to 750kVA from 1 February 2008. This move facilitated further entry into the wholesale market by potential buyers.

16.3.2.6 Residential choice

There is limited competition in retail distribution to date. Section 16.3.10 contains examples of Federal Antimonopoly Service (FAS) investigations into the state of competition in the distribution sector. It is worth noting that the introduction of retail competition has been slow in many economies undertaking reform (Joskow 2008), and Russia does not appear to be an exception.

16.3.2.7 Consumer tariffs

The guaranteeing supplier receiving electricity through vested (regulated) contracts is obliged to sell the full amount at regulated retail tariffs. Residential customers are supplied exclusively at regulated tariffs. Any amount of electricity purchased at free wholesale market prices can be supplied at prices above the regulated tariffs. Independent distribution companies – participants in the wholesale market – can supply to any customer at unregulated prices. While the free bilateral contracts allow wholesale market participants to hedge their risks for future increases in the wholesale price, similar contracts do not exist for retail market participants.

Previously the rules for setting wholesale electricity tariffs were based on cost-plus reimbursement (Russian Federation Government Resolution № 109 of 26 February 2004 'On Formation of Prices for Electric and Thermal Power in the Russian Federation'). The allowable rate of return on invested capital was set to be between the government bond rate and the refinancing rate of the Central Bank of RF (13–14% in 2004 and 8.5–9% in 2009[23]). A similar approach was followed in the methodology for setting transmission charges.[24]

The allowable rate of return in the cost-plus formula often underestimated risk premiums associated with the economic activity of the regulated utilities, did not stimulate necessary investments and did not promote efficiency.[25] An Investment Guarantee Mechanism was

[23] http://www.cbr.ru/eng/print.asp?file=/eng/statistics/credit_statistics/refinancing_rates_e.htm.

[24] Federal Tariff Service Resolution № 56-e/1 of 21 March 2006 'On approval of methodology for calculation of tariffs for transmission services in the unified national (all-Russian) electricity grid'.

[25] Tariff levels for 2004–06 were set in the Russian Federation Government Decree № 1754-r of December 1, 2003 'On Approval of the Program for Changing State Regulated Prices (Tariffs) in Electric Power Industry'.

briefly introduced to compensate for investment in new capacity by levying a surcharge on the SO's tariff.

In the distribution/retail sector, residential tariffs were price-cap adjusted for CPI. One of the criticisms was that the expected inflation was lower than realised over 2002–05, and the prospective adjustor failed to compensate for an actual increase in costs. The real revenues of the sector were stagnant in 2002–05: the average profitability dropped from 15.7% in 2002 to below 10% by 2005, with half of all enterprises making losses (Milov 2005).

The deficiency of cost-plus pricing was recognised, and a new RAB formula for distribution tariffs was introduced in July 2008. The new formula was implemented in five regional pilot projects, with the consequent roll-out to other regions in 2009–10. Challenges include the determination of the asset base for RAB regulatory purposes: all new investments are included in the RAB calculations for the next accounting period. Hence there is a delay between the outlay of funds and the opportunity to recoup them through higher tariffs.

16.3.2.8 Regulators

The Federal Energy Commission (FEC) was established in 1995.[26] In 2001 the FEC assumed other anti-monopoly control functions in infrastructure sectors (transport etc.) and government regulation of tariffs. Regional Energy Commissions were formed to support the FEC activities with the role of regulating local tariffs for electricity and heat. In 2004 the FTS was formed to take over the FEC's functions. Responsibilities of the FTS include developing pricing and tariff methodologies and setting maximum and minimum price caps and tariffs (Box 16.1). Regional tariffs are set jointly with the Regional Energy Commissions (RECs).

Other regulators include:

- Federal Antimonopoly Service: competition supervision, including approval of mergers and acquisitions, regulation of market conduct and consumer protection. Oversees non-discriminatory third-party access to the transmission grid. Regulates the activities of the Administrator of Trading System.
- Administrator of Trading System – NOREM (wholesale electricity/capacity market operator) is a not-for-profit organisation with government involvement. Responsibilities of ATS include managing trading and settlement in the wholesale electricity market (maintaining a registry of participants, registering contracts, data collection, development of rules and methodologies, dispute resolution etc.).
- Rostekhnadzor (Russian Technical Supervision Agency) regulates technical protocols and norms in the construction and operation of the components of the electricity sector.
- System Operator – the technical body responsible for the technical security/uninterrupted supply of the national electricity grid.

Market competition and abuse of monopoly power in the electric energy sector is under the direct supervision of the FAS, a government agency in the Russian Federation. For the purposes of market definition, there is a single market for electric energy and capacity in

[26] Presidential Decree № 1194 'On Federal Energy Commission of Russian Federation' to regulate natural monopoly in the energy sector (based on the Federal Law № 41-FZ of 14 April 1995 'On State Regulation of Tariffs for Electric and Thermal Power in the Russian Federation', and Federal Law № 147-FZ of 17 August 1995 'On Natural Monopolies'). The FTS was formed based on the Russian Federation Government Decree № 204 'On Federal Tariff Service' (9 April 2004).

Box 16.1: RAB formula for distribution of tariffs.

The cost-plus formula was superseded with the Regulated Asset Base (RAB) methodology (Russian Federation Government Resolution N 459 of 18 June 2008 'On changes to the RF Government Resolution N 109 of 26 February 2004 *On Formation of Prices for Electric and Thermal Power in the Russian Federation*', with technical details provided in Annex to the Federal Tariff Service Resolution N 231-e of 26 June 2008 'Methodology for regulation of tariffs using the return on invested capital approach'). The new methodology formulated the rules for calculating regulatory capital value, reporting requirements for new investments and a formula for an allowable rate of return. Tariffs set for longer term (3–5 year) contracts are adjusted on an annual basis. Operating costs are adjusted for CPI, anticipated changes in business assets and an efficiency parameter (currently 1%, but possibly up to 2.5% reduction in operating costs pa). Any efficiency gains due to the reduction of transmission/distribution losses and to the reduction of operating costs remain with the company and are not taken into account in the annual review of tariffs (do not affect the allowable total revenue figure). The allowable return on capital (both equity and debt) is set once for the whole regulation period using the WACC formula. Return on debt is set to the average of return on corporate bonds issued by the regulated industries. Return on equity is set equal to the return on government bonds (4–6 year duration) plus risk premium for the regulated companies. Investment plans of the regulated company are coordinated with the FTS and, with the regulator's approval, earn the rate of return including the regional adjustor (higher allowable return in the areas of shortage). The investment activities are a separate item for accounting purposes and separated by geographic region (a Federal subject of the Russian Federation). Calculation of the initial regulatory capital value is performed by an independent expert. Transmission assets which are being fully funded by connecting charges are not included in the calculation of invested capital. The regulator receives an annual update on implementation of the agreed investment program and adjusts the values of the RAB and the return on RAB, and tariffs accordingly. In the distribution sector, RAB regulation has been in place for eight MRSK regional branches and the Tomsk distribution company since 1 January 2010, with an additional 22 branches switching to RAB by 1 July 2010. All the remaining regions will be on the RAB tariff formula by 1 January 2011. The regulators (FTS and Regional Energy Commissions) approve RAB parameters for each of the MRSKs. There is a perceived problem of regulatory valuations of the capital base being lower than accepted market valuation (ATON 2010).

Russia. Distribution companies supply electricity to the retail markets through retailers and guaranteeing suppliers. In 2008 both regulated and free (wholesale market determined) tariffs were in place. Supply to residential customers and other customers classified as such, including municipal utility companies, was conducted using regulated tariffs. The regions/territories outside the boundaries of the wholesale market were supplied using regulated tariffs (FAS 2009a).

The FAS registry in 2008 included 540 distribution companies, including 260 guaranteeing suppliers in 82 regions of the Russian Federation. Most of the regions have several distribution companies, usually coinciding with municipal divisions. At this level of geographic disaggregation, many sub-regional distribution markets appear highly concentrated.

Distribution companies belong to one of the following categories:

- Distributors – spin-offs from RAO-UES AO-Energos ('AO-energosbyt'). There are 70 such distributors on the FAS registry, all of them participants in the wholesale market. Some of these distributors were active in more than one region: 'Far East energy company' operates in several regions of the Russian Far East; Mosenergosbyt in both Moscow city and Moscow oblast (region); Petersburg energosbyt company in St Petersburg city and Leningradskaya oblast;
- Independent distribution companies – participants in the wholesale electricity (capacity) market and serving primarily large industrial customers. Some of these were also present in more than one geographic subdivision of the retail market: Rusenergosbyt (Moscow) is active in trading and supply of electric energy in 45 regions, serving the needs of the Russian Railways; Mezhregionenergosbyt (Moscow)

is active in 39 regions; Siburenergomanagement (Voronezh) is active in 13 regions; RN-Energo (Moscow) is in 6 regions; Energoservice Trading House (Moscow) is in 7 regions; Transneftservice (Moscow) is in 34 regions; and Mechel-Energo is in 4 regions;

- Other retailers, including municipal companies and non-members of the wholesale market. These distributors purchase energy from guaranteeing suppliers, other distributors or directly from generators, some of whom are second-tier guaranteeing suppliers.

According to FAS (2009b), the share of type (1) distributors in most of their geographic markets exceeds 75%; in some regions they are the monopolistic suppliers. All of these distributors have the guaranteeing supplier status. In the regions with multiple distributors, often only AO-Energos can purchase electricity on the wholesale market and re-sell it to other guaranteeing suppliers. At the same time, there is increased competition between retail distributors.

Since 1 April 2006 a company has been forbidden to own or lease assets in the transmission/dispatch of electricity or in its generation or distribution. Since 1 January 2008 these measures have applied also to a company's affiliates operating in the same price zone of the wholesale market (currently European Russia/Urals and Siberia).

Challenges facing FAS in enforcing this law include enforcement mechanisms which are not clearly specified and the difficulty of keeping track of the owners of affiliated entities. Breaches of the law on the separation of natural monopoly and competitive activities in the electric energy sector are brought by FAS to courts on a case-by-case basis. Uniform practices in solving such cases are not yet established.

Some third-tier distribution companies attempting to purchase electricity for further distribution from large distributors/guaranteeing suppliers complain about anti-competitive requests, such as pre-payment for the electricity or other arbitrary conditions.

Overall, FAS estimates that the level of competition in distribution and retail remains low and that most markets appear highly concentrated. In 2008 there were almost 3000 complaints to FAS regarding anti-competitive behaviour in the electricity sector. About one-third of these cases were investigated, with 60% of them resulting in orders by FAS to stop the offending action. Most of the complaints pertained to the refusal of guaranteeing suppliers to grant connections to the independent distributors, unreasonable conditions of supply, disconnection of services etc. Box 16.2 outlines some of the barriers to entry in distribution.

16.3.2.9 Universal service obligations and cross-subsidisation

Guaranteeing Suppliers (Suppliers of Last Resort) are designated distribution companies with universal service obligations to residential and other consumers. The guaranteeing supplier receiving electricity through vested (regulated) contracts is obliged to sell the full amount at regulated retail tariffs. Residential customers are supplied exclusively at regulated tariffs. The situation is to be preserved until 2015. Residential customers account for 11% of total electricity consumption (data for 2007).

Box 16.2: Barriers to market entry by new distributing companies.

1) Administrative barriers, such as:
- postponement of tendering for the status of guaranteeing supplier within the established geographic market to 2010;
- failure by the Ministry of Energy to approve rules and develop sample documents for the earlier tender to provide guaranteeing supplier services, in breach of the May 2008 deadline;
- control over retail tariffs for guaranteeing suppliers;
- lack of consistency in the application of tariff policy (e.g., approval of one-part tariffs for transmission charges by local tariff regulators while the two-part tariffs were still contractually in place)

2) Economic barriers, such as:
- requirements to reimburse the guaranteeing supplier when switching to an alternative supplier if breaking the contract within its duration (normally one year);
- high cost of installing metering equipment to connect to the wholesale market;
- customer receipts arrears;
- unauthorised or unaccounted for electricity consumption;
- cross-subsidies;
- arrears of payments for supply to communal utilities;
- investment needs to maintain infrastructure;
- inefficiencies in transmission and distribution networks, including technical dilapidation, disputed ownership of distribution lines, large distances from the point of connection to wholesale purchasers to final consumers; and
- abuse of market power by guaranteeing suppliers, barriers to entry by independent distributors by refusing them on the grounds that they are not final consumers.

3) Technological barriers:
- lack of automatic metering and accounting systems to participate in the wholesale electricity market.

Source: FAS 2009a.

The need to bring electricity tariffs in line with economic costs has long been publicly recognised in Russia.[27] Residential electricity tariffs were often used as a policy instrument in election campaigns at sub-federal level, with tariffs kept artificially low in pre-election years (Yudashkina & Pobochy 2007).

By 2004 the residential tariffs reached the level of industrial tariffs and in 2005 exceeded them at 1 RUB/kWh (or US3.4 cent/kWh) (Kurronen 2006).

The government provided USD90 million in direct subsidies for electricity tariffs in the Far East in 2004, in addition to USD280 million fuel subsidies in the Far North.[28] Cross-subsidisation takes different forms in Russia between industrial and residential users, heat and electricity tariffs, geographic regions, implicit subsidies from regulated natural gas prices and electricity tariff discounts for special categories of customers (e.g., veterans, pensioners, low income). The full extent of cross-subsidies is difficult to estimate. The range is USD4.5–12 billion per year (Milov 2005, Renaissance Capital 2006). RAO-UES estimated electricity cross-subsidies in 2007 to amount to RUB115 billion (USD4.5 billion), a 34% annual increase over USD3.3 billion subsidies in 2006.[29]

Major steps in the elimination of cross-subsidy between residential and industrial customers occurred over 2003–04, with the gap between residential and industrial tariffs closing by 2004. Retail tariffs still remained below the full economic costs but were expected to rise to reflect the full costs of distribution and retailing. The efficiency of electricity use remained low, and the need for energy-saving measures became apparent.

[27] The Government Decree № 1231 'On gradual elimination of cross-subsidies in electric power industry and on bringing residential electricity tariffs in line with actual costs of generation, transmission and distribution' of 26 September 1997 has set the elimination in action.
[28] http://budgetrf.info/?tag=dotacia.
[29] http://www.rao-ees.ru/en/invest/reporting/reports/report2007/8_3.htm.

The 2010 Budget of the Russian Federation's assumptions of average electricity tariffs include:[30]

- an increase in average electricity tariffs for all users from US4.5 cent/kWh in 2007 to US7 cent/kWh in 2011 and US10.5 cent/kWh in 2020;
- residential tariffs to increase more steeply from US4.5 cent/kWh in 2007 to US7.1 cent/kWh in 2011 and US15.3 cent/kWh in 2020 (Table 16.4);
- residential tariffs to be subject to government regulation at least until 2015;
- 60% of all electricity will be purchased at the unregulated wholesale market from 1 January 2010 but residential customers will continue to be supplied at regulated tariffs (tariffs in the regulated segment of the electricity market are set annually);
- full elimination of cross-subsidies in residential electricity tariffs in 2015;
- domestic prices for natural gas to be brought in line with the world price by 2020; and
- residential electricity tariffs increasing 1.35–2-fold over 2011–15.

Following the budget announcement there were public protests across Russia against the forthcoming increases in electricity, transport and residential utility tariffs.

16.3.3 Review of the implementation of reform

The changes in policy since 2003 are summarised in Table 16.5. Implementation of a reform of such depth and magnitude in a relatively short time (one decade) has presented multiple challenges. The population in general resisted the reform, unimpressed by the idea of higher retail electricity tariffs. Keeping the residential segment shielded from free market prices was a trade-off to liberalising other segments of the electricity sector.

During 2002–05 there were delays in passing the necessary legislation and starting the reform. The Duma (2007) and Presidential (2008) elections added to the uncertainty as to the future progress of the reform. The Renaissance Capital (2005) report highlighted the industry's disappointment with the discrepancy between the announced reform milestones and their implementation.

Note that there are essentially two wholesale electricity markets in Russia – capacity and electricity. Wholesale electricity prices at a day-ahead market are based on marginal (variable) costs, covering mostly the fuel component. Fixed costs of generation are covered through capacity payments, with an annual competitive selection of future capacity suppliers (to supply starting year of selection +4). The amount of capacity payment is differentiated by new/old energy, between type of fuel (nuclear, hydro, gas and coal) and is calculated for each generator based on the rate of return formula. Clarifications of the capacity payment rules and mechanisms and liberalisation of tariffs would help to resolve the uncertainty that has stifled investment in the generation sector.[31]

Tightly regulated by regional energy commissions, consumer tariffs often did not leave any room for regulated distributors' required capital expenditure. The shortfall between the usage fees and costs was often covered through connection fees introduced in 2006. For 2008–12 the connection fees for new customers and for existing users requiring additional capacity are expected to cover the capital costs and investment. Reliance on connection fees has the

[30] http://budgetrf.info/?tag=dotacia

[31] Russian Federation Government Decree № 238 of 13 April 2010 'On pricing parameters of capacity traded in wholesale electricity/capacity market during transition period' and Russian Federation Government Decree № 89 of 24 February 2010 'On issues of competitive tendering of long-term capacity in the wholesale electricity/capacity market'.

Table 16.4: Electricity tariffs for 2006, and projected for 2007–20.

Electricity tariffs ***(US c/kWh)***	**Scenario**	**2006**	**2007 estimate**	**Forecast**												
				2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
All users	**1**	*3.9*	*4.5*	*5.4*	*6.1*	*6.6*	*6.8*	*6.5*	*6.0*	*6.3*	*6.4*	*6.6*	*6.7*	*6.9*	*7.0*	*7.2*
	2	*3.9*	*4.5*	*5.4*	*6.1*	*6.8*	*7.0*	*7.1*	*7.2*	*7.5*	*8.0*	*8.4*	*9.1*	*9.6*	*10.1*	*10.5*
	3	*3.9*	*4.5*	*5.4*	*6.1*	*6.8*	*7.0*	*7.2*	*7.3*	*7.6*	*7.9*	*8.2*	*8.5*	*8.9*	*9.2*	*9.5*
Residential	**1**	*4.0*	*4.5*	*5.0*	*5.6*	*6.4*	*6.8*	*6.9*	*6.7*	*7.4*	*8.0*	*8.6*	*9.2*	*9.7*	*10.2*	*10.7*
	2	*4.0*	*4.5*	*5.0*	*5.7*	*6.5*	*7.0*	*7.5*	*8.1*	*8.9*	*9.8*	*10.8*	*12.1*	*13.3*	*14.3*	*15.3*
	3	*4.0*	*4.5*	*5.0*	*5.6*	*6.5*	*7.1*	*7.7*	*8.2*	*8.9*	*9.7*	*10.6*	*11.4*	*12.4*	*13.2*	*13.9*

Source: http://budgetrf.info/?tag=dotacia

Table 16.5: Recent changes in policy.

Area of policy change	Year of change	Description of change
Structure	2003–08	Restructuring of incumbent operator RA-UES based on: •vertical unbundling of contestable activities from network services and system operation; first accounting and then structural separation; and •horizontal unbundling of contestable components of the value chain, to facilitate competition in generation, retail and repair/maintenance services.
Ownership, structure	2003–08	All assets owned or controlled by RAO-UES, all existing assets of regional energos and any other public utility enterprises owning or operating electricity infrastructure were subject to restructuring. Restructuring of RAO-UES resulted in the creation of 6 wholesale generating companies, 14 territory generation companies and an international trading/generating company (Inter RAO). All hydro-electric power assets were transferred to RusHydro. Nuclear generation assets are under Rosenergoatom. All high-voltage transmission grid assets were transferred to the Federal Grid Company, and regional distribution networks to an Inter-regional Transmission Company. Technical supervision of the electricity network is performed by the System Operator. Privatisation of generating assets.
Market access, competition	2003	Third party access to the grid for independent generators and reorganised wholesale and regional generating companies. Horizontal unbundling of retailing functions, including the creation of guaranteeing suppliers to serve regulated consumers and to operate as a retailer of last resort.
Regulation, market access	2003	Wholesale electricity and capacity market has allowed competitive supply in the market not covered by vesting (regulated) contracts. Creation of an Administrator of Trading System. Next-day market, balancing market, financial transfer rights market and market for derivatives.
Regulation	2003	Elimination of licensing requirement for economic activity 'generation, transmission and distribution of electric energy'. Technical standards and norms (Rosteckhnadzor).
Market access	2003–08	Entry of foreign utilities/strategic investors in electricity infrastructure. Currently, E.ON (Germany), Enel (Italy) and Fortum (Finland).
Regulation	2008–	Move from cost-plus to RAB tariff formula for regulated activities.

drawback of increased volatility of MRSK's revenues. In an economic downturn, the demand for new connections and additional capacity falls, so funding for investment projects dries up (Standard & Poor's 2008).

The incentive for distribution companies to recoup shortfalls of tariff revenues over the cost of investment and maintenance through connection charges created a significant barrier to small and medium enterprises (SMEs) seeking a new connection. In response, the Russian Federation Government mandated a simplified procedure for technical connections.[32]

It is important to recognise that the original investment program, formulated in the economic boom years, has been halted by the financial and economic crisis of 2008–09. As noted

[32] By Resolution № 334 of 21 April 2009, since 5 May 2009 the connection fee for the maximum capacity of 15kW should not exceed RUB550 (USD18). Customers requiring connection of 15–100kW are given the option to pay the connection charge in instalments within 3 years from the connection date. Information disclosure requirements were imposed on distribution companies to facilitate transparency of their connection fee decisions (FAS 2009b). The decision has led to a 30% increase in connection applications from SMEs over 2008–09 (for <15kW connections), and a 50–60% increase in the requested total capacity (MED 2010a).

above, electricity consumption failed to grow at the rate that Chubais has expected and in hindsight the growth in capacity was not required as urgently as he had predicted.

The data from the Ministry of Economic Development and Trade demonstrates that, despite the recession, the electricity, water and gas sector fell by only 5.2% in physical output, and actually increased 2.4-fold in revenue over 2008–09 to RUB200 billion (USD8 billion) (MED 2010b). Improved financial performance of the sector was definitely attributed to the increase in tariffs as part of the reform implementation. Processing and manufacturing industries in energy-using sectors were hit particularly hard by both falling demand for their goods and rising electricity costs. This is a (rather painful) example of when price signals generate incentives to increase efficiency – both technical efficiency, through energy-saving measures, and allocative efficiency, by considering the longer term viability of the energy-using sector – given the true economic cost of electricity and other energy sources. These efficiency gains, and the reductions they make possible in the energy intensity of the economy, have been an important benefit of the reforms to date and of the further stages of its implementation which are planned.

Investment targets for 2008 and thereafter were not fully met, however.[33] Russian Prime Minister Vladimir Putin recently criticised private owners of generating assets for lagging behind with their investment programs. The industry response was that recent changes in economic conditions forced the postponement.

16.4 CONCLUSION

The electricity sector in Russia has experienced significant reform since 2003, in terms of ownership, pricing and access to new competitors. The commitment to price reform has led to the scope for efficiency gains in energy use. The transition of pricing to world market levels has been an important contributor to support for the implementation of reform, but the commitment remains to reach the global benchmarks.

One of the prime motivations for the reform was to create incentives for new investment. Foreign investors have been attracted to the sector. However, the slower than expected growth in electricity consumption, including the impact of the global financial crisis, has allowed a delay in those investments. The maintenance of an investment program remains an issue, and some uncertainties related to the design of the reforms are yet to be resolved.

The progress of reform and its significance in Russia can be put into context by consideration of the lessons from the experience in California in 2001. Several issues underpinned the electricity crisis there at that time: the lack of investment in new generating capacity during the reform period when market rules were being developed; the strategic behaviour of the generators to withhold capacity and bid up wholesale prices, and the inability of retailers to pass the increased wholesale costs to consumers due to retail price caps.

The following observations not only highlight the new stages of the reform but also illustrate the ways in which the reform program in Russia has learnt from the experience in California:

[33] In 2008 the national energy system received an addition of 11 000km of transmission/distribution lines (76% of the planned facilities), transformation stations with total capacity 22 570MVA (90% of planned capacity) and 2004MW of generating capacity (68% of the planned) http://minenergo.gov.ru/activity/plan/2010-2012_3/1.php.

- *Investment in new capacity*
  It appears that investment in new capacity has been postponed until the rules of the wholesale market become clear and tested. Owners of the privatised RAO-UES generating assets have had their investment programs approved but much of the investment concentrates in replacing dilapidated assets and upgrading existing assets. There have been virtually no green-field investments until recently. The latest clarifications of the capacity payment mechanisms have created the conditions that would allow them to recoup fixed investments in the new projects.

- *Strategic behaviour of generators and market power*
  The new rules for capacity payments impose heavy penalties on generators withholding declared capacity or using a different mix of capacity from that approved by the System Operator. Generators operating in the markets with limited interconnection are subject to price-cap regulation by FTS and FAS. Base-load nuclear and hydro-generating assets remain fully/majority publicly owned, with the majority of private suppliers operating thermal plants with comparable cost structure. All of the above make the occurrence of California-type changes to the market design less likely.

- *Retail price caps and inability to pass costs to final users*
  With the scheduled liberalisation of the wholesale market to 2011, most customers will be supplied at unregulated wholesale market tariffs. Residential customers will be supplied at regulated tariffs until 2014, with the level of residential tariffs gradually brought in line with the full economic cost. Industrial and other users will be supplied at market prices. Voluntary bilateral contracts between suppliers and buyers of electricity/capacity allow retail distribution companies to hedge their price risks and purchase contractual amounts at mutually agreed prices. Any price increase at wholesale markets can be passed on to industrial and other non-residential customers, who are not subject to price caps.

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Chapter 17

GAS IN CHINA

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- A significant reform to gas pricing began in 2005 when pricing was changed from cost-plus to a system based on links to world energy prices.
- The hooking mechanism did begin to correct a problem of pricing gas too low which, in 2009, led to gas shortages in some cities: prices remain low relative to world levels.
- Growing demand, environmental pressures and rising world or LNG prices are not likely to permit this situation to continue, and further pressure for price rises is expected. The mechanism for arranging those changes has been established.

17.1 INTRODUCTION

China is the second largest gas consumer in Asia and its consumption of gas is growing faster than production. The volume of its gas consumption is high in absolute terms: in 2008 it was 80.7 billion m^3 while the production was only 70.08 billion m^3, leading to imports of 10.62 billion m^3 (Figure 17.1). However, the share of gas in total energy consumption in China remains low, at about 3% in 2006 and slightly higher at 3.5% in 2007 (Figure 17.2) as compared to a global average of 20%. The rising levels of urbanisation with its growing demand for energy and rising expectations of response to environmental pressures all lead to greater attention to the use of gas which, in turn, is driving policy reform.

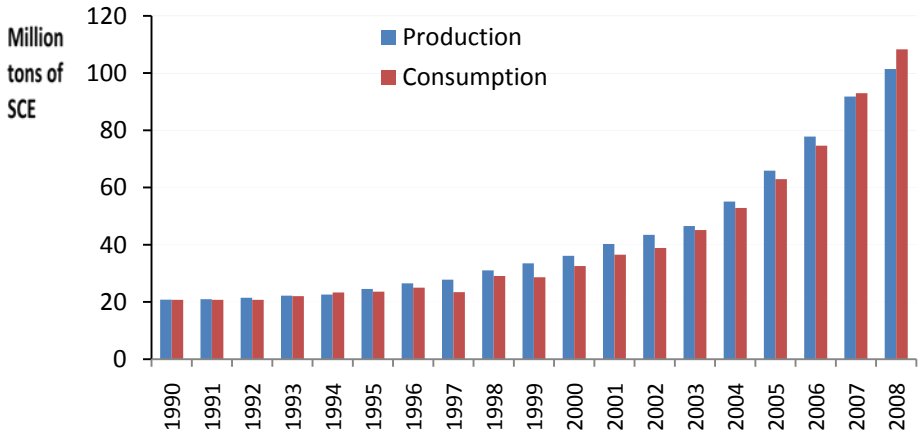

Figure 17.1: China's natural gas production and consumption, 1990–2008. (Source: National Bureau of Statistics of China 2010)

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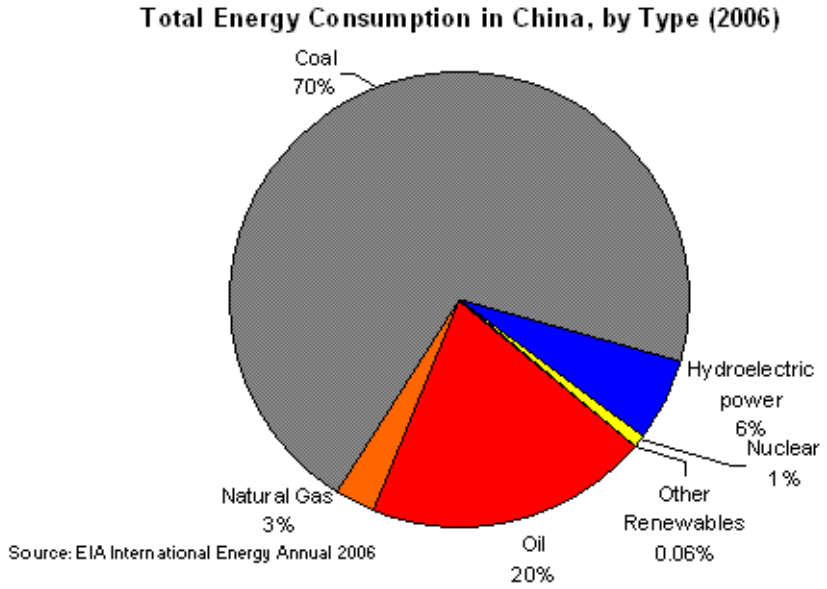

Figure 17.2: Energy consumption in China, by type, 2006. (Source: US Energy Information Administration 2008)

In 2008 gas for industrial fuels accounted for 30.5% of total use, gas for the chemical industry accounted for 31.5%, gas for electricity generation accounted for 10% and 28% was for civil natural gas. The share of gas used in electricity consumption is relatively low, and in some major coal production areas its use is restricted.

Since 1998 the Chinese government has sped up the pace of regulatory reform in the oil and gas industry and those changes are reviewed in this paper. One major issue has been the lack of an institution to guide policy. Following the abolition of the Department of Energy in 1998, there had been no single central government department responsible for energy policy and management matters. This situation has led to questioning whether the goals of regulation and the economic principles that are guiding prices are sufficiently clear and consistent (Liu 2004). In addition, no integrated natural gas legal system had been built, so government regulations could not seek effective legal support. More recent changes, including the establishment of the National Energy Administration in March 2008 and the State Energy Resources Commission in January 2010, are discussed below.

The time is now critical for regulatory reform in China. As explained by Wong (2010):

> ... without a suitable modern regulatory system, economic reform of China's city-gas industry will not overcome the pricing reform threshold necessary for future expansion and the creation of a level playing field for all stakeholders, including upstream gas producers, midstream long-haul pipeline operators, and downstream city-gas companies. In other words, market forces would better determine progress rather than reliance on central planning for investment, procurement and pricing decisions given the [economy] has to increasingly look to the international market to meet its (natural gas) needs.

This paper covers the scope of operations of the three main companies in the gas sector in China and other regional groups. It also provides details of the systems for pricing gas, including the recent changes, and reviews the restrictions on entry to various parts of the natural gas sector, including the trends in imports and the regulation of gas prices.

17.2 RESTRICTIONS ON ENTRY

Until recently, the China National Petroleum Corporation (CNPC), China Petrochemical Corporation (Sinopec group) and China National Offshore Oil Corporation (CNOOC), all state-owned enterprises (SOEs) which were active in the production and distribution stages of the industry, were the dominant firms in the gas market (Zhibin 2008). Table 17.1 shows the equity structure of these major SOEs.

Table 17.1: The equity distribution in three state-owned enterprises.

Corporations	Year of offering services	Government equity	Private equity	Foreign equity
China National Petroleum Corporation	1988	86.42%	11.38%	2.00%
China Petrochemical Corporation	1983	75.84%	19.24%	4.92%
China National Offshore Oil Corporation	1982	54.74%	34.06%	11.20%

Source: National Bureau of Statistics of China 2010

According to the Chinese Oil and Gas Industry Annual Report (2009), CNPC is still the biggest gas producer in China, accounting for almost 80% of total production. But the Sinopec group has found the Pu Guang oil field in Sichuan, and its output will increase.

Until now, the city gas companies have been the sole purchasers of natural gas from the three SOEs, which they then resold to consumers (Liu, D 2009). However, following city gas market-oriented reforms, foreign and private capital is also entering the city gas business (Liu, D 2009). City gas supply is now franchised: companies with franchise rights have the monopoly on all the business of purchasing and selling gas in their area.

Because the SOEs' businesses were separated by region, there was no intense competition among them. They were also highly integrated, and the driver for this was the need to provide security for the large investments that are required in each link of a gas chain as it develops. Contracts to buy and provide gas are valuable to secure gas field development and to ensure the financing of new transmission facilities and the construction of the large consuming units, such as power plants, that will 'anchor' the gas demand (IESM 2002).

Table 17.2 shows details of all major companies in China in this sector up to 1999, including those with foreign investment, particularly in transmission and distribution where the restrictions on foreign investment were lighter. Overall, the number of gas-related enterprises in China then amounted to 8560.[2]

17.2.1 Production

In exploration the three major SOEs operated according to their territorial allocations and had exclusive cooperation with overseas partners, which made it hard for other forms of capital to enter the market. According to The Mineral Resources Law of the People's Republic of China Implementation Rules, all mineral resources within a territory are owned by the state; any firm that wants to exploit a mineral resource must first apply to the relevant government department for registration in accordance with law to obtain a mining licence and consequent mining rights (State Council [SC) 1994).

[2] See http://china.exactdw.com/zhongguotianranqi.html.

Table 17.2: The characteristics of all major facilities-based operating companies providing gas services.

Company	Service provided: production/import transmission distribution (LNG noted)	Year services first offered	Market share	Owners of capital and their government, domestic, foreign shares
China National Petroleum Corporation	Production/import transmission distribution LNG	1988.9	c. 70% in production	Government 86.42% Foreign (H stock) 11.38% Domestic 2.00%
China Petrochemical Corporation	Production/import transmission distribution LNG	1983.7	c. 11.7% in production	Government 75.84% Foreign (H stock) 19.24% Domestic 4.92%
China National Offshore Oil Corporation	Production/import transmission distribution LNG	1982.2	NA	Government 54.74 % Foreign (H stock) 34.06% Domestic 11.2%
Beijing Gas Group Co. Ltd	Transmission distribution	1999.9	Monopoly in Beijing Market	Government 100% Not listed
Shaanxi Provincial Natural Gas Co. Ltd	Transmission distribution	1995.1	The only pipeline operator in Shan Xi Province	Government 62.19% Foreign and domestic 37.81%
Sichuan Datong Gas Development Co. Ltd	Production city pipeline distribution	1994	Operates in Chengdu Dalian ShangRao Mudanjiang	Domestic 100%
Changchun Gas Co. Ltd	Production and distribution	1993	Operates in Changchun and Yanji	Domestic 100%
Shenergy Company Ltd	Production city pipeline distribution LNG	1993	Operates in Shanghai	Government 50.56% Domestic 49.44%
Xinjiang Guanghui Industry Co. Ltd	LNG	1999	Operates in Xinjiang province	Domestic and foreign
XinAo Gas Holdings Ltd	City pipeline distribution LNG	1992	Operates gas distribution business in over 60 cities	Foreign and domestic (H stock) 100%
Wuxi China Resources Gas Co. Ltd	City pipeline distribution	2004	Operates gas distribution business in over 30 cities	Foreign and domestic (H stock) 100%
China Gas Holdings Ltd	City gas pipeline distribution LNG	1995	Doing business in c. 20 provinces	Government, foreign and domestic

Until recently only the three SOEs were authorised by the State Council to exploit oil and gas resources throughout the economy (NDRC 2007, SC 2001, SC 2007b). In 2009 CNPC accounted for 80% of the domestic market share in natural gas production and Sinopec about 13%. The state allowed foreign firms, other economic organisations and individuals to explore and exploit mineral resources in accordance with the relevant laws and administrative regulation. However, a foreign firm's involvement in natural gas exploration and development was limited to joint ventures (JVs) and cooperation with one of the SOEs. Then on 23 December 2009 the first private enterprise to invest in a natural gas production project obtained the permission of the National Development and Reform Commission (NDRC). From that time onwards, 100% private equity would be allowed in natural gas production.

In recent years the use of liquefied natural gas (LNG) has developed rapidly in China. The construction of LNG facilities requires sophisticated technology and high investment, so most LNG projects have been conducted in JVs between foreign firms and local stated-owned energy firms. In May 2007 the Ministry of Commerce cancelled the automatic import licence administration of natural gas and LNG, which means stricter supervision of gas imports. CNPC, Sinopec and CNOOC are also the three largest gas importers of China.

17.2.2 Transmission

Natural gas pipelines are listed in the 'encouraged' category, meaning that they need not be controlled by Chinese companies (NDRC 2007). However, the government has not established a corresponding access system and regulatory measures, so the implementation of investment projects continues to follow miscellaneous examination and approval systems. Transmission refers primarily to natural gas long-distance pipeline transportation, the intermediate link between manufacturing enterprises and the city gas companies. At present, China's natural gas transmission pipelines basically belong to CNPC and Sinopec, including the China Petroleum Pipeline Bureau that is owned by CNPC, and the Sinopec Pipeline Storage and Transportation Company, the gas pipeline agency that is owned by Sichuan Petroleum Bureau. There is no regime that provides access to these pipelines to third parties (Yang, J 2005). Most of CNOOC's gas supplies are imported from offshore oil and gas installations, transported either by offshore pipeline or by transport ship.

LNG is imported from abroad, then stored, re-gasified, compressed and distributed to special customers through long gas pipelines, and also sold through truck loading stations. LNG receiving terminals and short-distance pipelines have been constructed in coastal areas. There are no long-distance pipelines in mainland China.

Since February 2004 independent operators have been allowed to enter the LNG import market. Then the Guangdong Dapeng LNG Company Ltd, a Sino-foreign JV energy company that is the construction and operation entity of the Guangdong LNG Terminal Project, began its pilot operations for the importation of LNG into China. The project comprised fourteen separate but interrelated projects run by independent legal entities.

Each independent operator of an LNG project must undertake the purchase (import), transport, storage and re-gasification of the LNG. They sell and transport the natural gas and its by-products to the Pearl River Delta and other areas, construct and manage the LNG reception terminals, gas pipelines and other additional extended facilities, charter, lease and operate LNG carriers, and purchase and sell LNG and do other relevant business inside or outside the economy.

Legally, foreign gas companies are not required to establish in JVs. In the past gas companies had to seek the co-operation of local companies but an amendment to the Industrial Catalogue for Foreign Investment in 2007 ruled that foreign investment in the construction and operation of oil (gas) pipelines and oil (gas) storage is to be 'encouraged' (NDRC 2007).

17.2.3 Distribution

Because of limited pipeline route resources, cities cannot accommodate several natural gas pipeline networks belonging to different companies. Generally, to avoid duplicate construction and the waste of resources, local governments would monopolise the construction and the management of the local natural gas pipeline. On 27 December 2002 the Ministry of Construction issued 'Opinions on Speeding up Marketization Process of Municipal and Public Sectors'. Article 1 of which ruled that private and foreign capital were to be encouraged to participate in the construction of municipal public facilities. This could occur in single proprietorship, JV, cooperation and other forms. Construction projects of water supply, gas supply, heat supply, sewage treatment, garbage treatment and other municipal public facilities should choose main investors by a system of competition through open tendering (MOC 2002). Bid-winning enterprises would be franchises authorised by the government.

Regionally, the natural gas distribution business is monopolised by several large state-owned companies, overseas-funded gas companies and JVs. Examples of two of these companies are presented below. Retail customers must deal with the local franchised provider.

- China Gas Holdings Limited is a Sino-foreign JV. It engages principally in the investment, operation and management of city gas pipeline infrastructure, the distribution of natural gas to residential, commercial and industrial users, the construction and operation of gas stations and the development and application of natural gas related technologies in China. Its business scope has already been involved in 20 provinces. Its main shareholders are The Centre of Strait Economy & Science-Technology Cooperation, China Petroleum & Chemical Corporation, Oman Oil Company, Gail (India) Ltd, SK Group and Asian Development Bank.
- Xinao Gas Holdings Ltd was the first private enterprise to operate a natural gas transmission and distribution business in China. Its main business portfolio consists of clean energy distribution, including city pipeline natural gas (LPG), vehicle refuelling gas (CNG and LPG) and DME (dimethyl ether), non-pipeline energy delivery and other value added services on the basis of energy distribution. Now Xinao has businesses in 60 cities in China (Xinao Gas Holdings Ltd 2008).

Wong (2010) refers to a current issue in distribution:

> As the project owner of the second West–East Gas Pipeline project (WEGP2), which runs across thirteen provinces from Xinjiang in the west to the Yangtze River Delta in the east and Pearl River Delta in the south, CNPC will … control the vast amounts of NG imported from Turkmenistan. Recently, CNPC is thought to have begun talks with the provincial governments of Hebei, Gangsu and other provinces along WEGP 2 for an exclusive franchise to operate city-gas businesses in these regions. This is causing some disquiet as it would be easy for such a large organization as CNPC, with its upstream and midstream domination, to forward integrate into city NG projects to the detriment of the long-term development of China's city-gas industry. An enhancement to the regulatory system contiguously covering downstream, midstream and upstream operators would avoid such a monopolistic situation from occurring.

The right to operate a city gas business can only be obtained through tendering, and of course CNPC has the opportunity to bid. There is, however, some advantage in establishing rules on separation between production/transmission and distribution, because it could bring in more competition and thus add to efficiency compared to the situation in which outside bidders were constrained.

17.3 IMPORTS OF GAS

China's imports of LNG and natural gas showed considerable changes in volume between 2003 and 2008. From 2003 to 2005 the annual imports of LNG were less than 500 tonnes. China began to import large quantities of LNG in 2006, more than 100 times as much as in the past. In 2008 the LNG import volume rose 14.5% and its import value rose 55% (Table 17.3).

Table 17.3: China's imports of LNG.

Year	Imports (tonnes)	Value (USD million)	Average unit price of imports (USD/tonne)
2003	0	1	
2004	400	14	350.00
2005	483	18	372.67
2006	687,543	11,543	167.89
2007	2,913,122	60,058	206.16
2008	3,336,000	93,084	279.02

Source: Liang 2009

Natural gas demand in 2010 is expected to reach 110 billion m^3, while domestic natural gas production will be able to provide only 90 billion m^3 and the gap will be 20 billion m^3. China's natural gas demand for 2020 is expected to be 250 billion m^3, and its natural gas consumption in 2030 is expected to reach 320 billion m^3. Of that 320 billion m^3 domestic output is expected to be 250 billion m^3 with 70 billion m^3 imported from abroad (which according to some estimates will be made up of 30 billion m^3 from Turkmenistan, 10 billion m^3 from Myanmar and 18 billion m^3 from LNG, leaving more that 10 billion m^3 to be determined).

The growth in China's gas demand will lead to a radical change in its energy policy, which up until now has been dominated by the search for self-sufficiency. From 2003 to February 2008 China had not imported any natural gas products through pipelines. But building a transmission pipeline network linked to neighbouring economies will soon be essential for the economy's energy security. The Central Asia Gas Pipeline (with a length of 1801km) will transport about 300 billion m^3 of natural gas from Central Asia to China each year. The West–East Gas Second-line Project referred to above is linked to the Central Asian pipeline, on which construction began in 2008; this pipeline will transport natural gas to the Pearl River Delta and the Yangtze River Delta. China and Russia are negotiating gas contracts in which Russia may supply to China 68 billion m^3 of natural gas a year from 2014 or 2015. The China–Myanmar pipeline will also be built to increase domestic gas supplies (Table 17.4).

Another option is to import gas in the form of LNG. In 2008 China imported 4.44 billion m^3 of LNG, from Australia (81%), Egypt (5.6%), Nigeria (5.4%), Algeria (3.8%) and Equatorial Guinea (3.6%). Several major oil companies in China have further accelerated the pace of signing long-term LNG purchase contracts with international sellers. Purchase agreements

were signed with QATARGAS and Shell International Gas Ltd in 2008, and CNOOC also signed a framework agreement to buy LNG with QATARGAS and Total Petrochemicals of France. Table 17.5 summarises LNG projects under development. Higashi (2009) reports that 'most' LNG is used in electricity production with the rest going to city gas.

Table 17.4: The planned international gas pipeline.

Natural gas pipeline	Length (km)	Capacity	Remarks
Russia's eastern line	n.a.	30–40 b m^3/year	Expected to run through 2010
Russia's western line ('Altai')	n.a.	30–40 b m^3/year	Expected to run through 2010
Myanmar–China	2380	n.a.	March 2009 signed
Turkmenistan–China (Xinjiang)	1818	30–40 b m^3/year	Expected to run through end of 2009

Source: Liang 2009

Table 17.5: China's operating and under construction LNG projects.

LNG terminal	Province	Status	Start year	Capacity (million tonnes/year)
Dapeng	Guangdong	Production	2006	3.9
Xiuyu	Fujian	Production	2009	2.6
Zhongximentang	Zhejiang	Under construction	2009	4.0
Dalian	Liaoning	Under construction	2012	3.7
Rudong	Guangdong	Plan	2011	3.5
Hainan	Hainan	Feasibility study	2012	2.5
Qingdao	Shandong	Feasibility study	2010	3.7
Tianjian	Tianjin	Feasibility study	2013	2.0
Gaofeidian	Tangshan	Feasibility study	2013	4.3
Qinzhou	Guangxi	Feasibility study	2012	3.7
Macao	Guangdong	Feasibility study	2013	3.7
Rizhao	Shandong	Feasibility study	2012	1.8
Taizhou	Jiangsu	Feasibility study	2013	3.7
Weihai	Shandong	Feasibility study	2013	3.7
Ninpo	Zhejian	Feasibility study	2010	4.0

Source: Liang 2009

17.4 PRICE REGULATION

The NDRC decides price policy. It determines a 'guiding price' at the factory level (Zheng, Luo & Yang 2006). The consumer retail price is determined by the local price bureau and also by the big SOEs, based on the government-guided factory price plus the transmission and city distribution costs and a profit in each link of the industry chain, which differs across areas. The government's pricing policy, which divides natural gas users into fertiliser, industrial, civil and commercial users according to the direction of natural gas, also provides for different prices.

The State Council has identified some problems in this process, since it does not reflect the degree of scarcity of gas, supply and demand or the price's relationship to alternate resources (SC 2007a). The direction of reform of this price mechanism should be market-oriented. Higher consumption, the inequities between regions and the inability to pay for rising imports have all created pressure for change in the price of gas. Recent pricing reforms are discussed in more detail below.

As explained above, since the abolition of the Energy Industry Ministry in 1993 there has not been a unified energy regulatory administration. The National Energy Bureau established in 2008 did not unify China's energy management functions. In March 2010 the State Energy

Resources Commission was established by the State Council with the Premier as director, the Vice Premier as deputy director and a committee consisting of the heads of 21 central and national ministries such as the NDRC, the Ministry of Commerce, the Ministry of Foreign Affairs and the Industry and Information Ministry. There had previously been a Department of Energy and an Energy Commission but these had not formed any effective management processes, in our view, because of a division of interests. As a result, the final authority had been redistributed to the various departments listed above. In 2008, during the super-ministry reform period, the failure to re-create the Department of Energy may also have been related to the difficulty of reconciling the different interests involved. Therefore, whether the new structure will be able to solve the existing problems in the energy sector remains to be seen.

17.5 UNIVERSAL SERVICE

'Universal service' is defined as having natural gas replace oil in status by becoming the major energy source for urban residents. The policy instruments used to pursue this objective include improvement of the relevant laws and regulations, consumer subsidies to encourage urban consumption and improved supply provided by the incumbent operator; expansion of the range of uses of natural gas, and lowering the tariff on gas imports in order to increase the volume of gas imported.

China's natural gas consumption is at present mainly concentrated on the chemical industry. But it is expected that the direction of natural gas utilisation will change in the future to more urban consumption and gas-based power generation.

By the end of the '11th Five-year Plan' period, China will have built the backbone of the economy's natural gas pipeline network, which will inevitably bring about the development of the terminal sales market. The number of cities supplied with natural gas is expected to increase to 270 in 2010 (compared to 140 in 2005); 70% of Chinese cities are expected to have a supply of natural gas by the middle of this century. To achieve these objectives, the Chinese government plans to take the following measures:

- establish and improve the relevant laws and regulations relating to natural gas;
- encourage and develop new ways to use natural gas through the initiation of new gas projects, the reduction of appropriate income tax and the offer of preferential low-interest loans to gas users;
- expand the government's own use of natural gas, such as by using it to generate electricity and smelt steel and by the development of gas-fired air-conditioning;
- reduce the expense of using natural gas for some low-income families by providing subsidies and by trying to reduce gas supplier's charges.
- lower the import tariff on natural gas.

17.6 RECENT CHANGES IN POLICY

Major changes in policy since 2004 presented so far are summarised in Table 17.6. In this section we concentrate on the 2005 changes in pricing policy.

As noted earlier, the gas pricing policy is decided by the NDRC and there are two associated prices: the factory price and the consumer retail price. Before 2005 the factory price was determined by a cost-based fixed-price formula of production cost plus a reasonable profit. Higashi (2009) reported an internal rate of return of 12%. This pricing mechanism did not take into account the scarcity of gas, the imbalance of supply and demand, the fluctuation of

Table 17.6: Major changes in market access policies, ownership rules and regulations since 2004.

Area of policy change	Year of change	Description of change
Regulation	2005	Reformed the gas pricing mechanism and increased the factory price appropriately: (i) divided gas factory price into two levels; (ii) changed the form of price; and (iii) rationalised the price structure and set up the price hooking mechanism.
Regulation	2006	In 2006 applied universally acknowledged two-part pricing system (i.e., 'pipe capacity fees' and 'pipe utilization fees') to the Zhong Wu pipeline.
Regulation	2007	NDRC issued 'The Policy of Gas Usage' which would guide and regulate the downstream of gas usage. Wong (2010) says that: '[e]ffectively the Directive requires local governments to regulate growth of (natural gas) markets giving priority to residential cooking and water heating, with less encouragement to space heating and industrial applications, and positive discouragement to gas power and petrochemical production projects.'
Regulation market access and ownership	2007	'The Energy Law of the People's Republic of China' (Exposure Draft) was issued. This is the basic law which would reflect China's future overall energy strategy and involve much of the important and sensitive issues such as the framework of energy administration, pricing mechanism and strategic reserves. 'The Gas Law of the People's Republic of China' was under preparation.
Regulation	2008	'The Energy Conservation Law of the People's Republic of China' was issued. This law applied to all kinds of energy resources, including coal, oil, gas, biomass energy, electricity, heating power and other resources obtainable through processing and transformation.
Regulation	2010	The State Council declaration to set up the National Energy Commission was issued.

natural gas prices in the international market or comparisons with the market prices of competitive fuels.

Compared with prices of natural gas abroad and of alternative sources of energy, China's natural gas prices were too low and far lower than the world gas price. This caused many problems. The low price of natural gas led to a rise in the quantity demanded and contributed to inefficient gas usage. This exacerbated supply-side challenges. In some cases, industrial prices were also lower than residential prices. Take the first West–East pipeline for example, where the city gas price was CNY1.16–1.46/m^3 while the industrial gas price was lower, at CNY1.12–1.3/m^3. This 'dual-track' pricing system led some gas-using companies to rely excessively on the low-price policies, which then also added to the difficulty of reform (Li & Wang 2006).

The process of reform began in 2005, when NDRC reformed the gas pricing mechanism and increased the gas factory price appropriately (NDRC 2005). The main content is as follows:

- *Use a benchmark to set prices*
  In order to increase the flexibility of pricing and to reflect the market supply of and demand for gas, the gas factory price was changed to a government guiding price. Based on the benchmark price decided by the government, the gas factory price could either be negotiated between suppliers and buyers within a 10% range around the benchmark for some gas fields or at most be 10% above the benchmark but without limit below it for other gas fields.

- *Hook the benchmark to the prices of substitute forms of energy*
  The hooking mechanism means that the benchmark gas factory price would link to the substitute forms of energy and it would be adjusted once a year. The adjustment coefficient is determined with regard to the recent 5-year moving average change of the crude oil price, the LPG price and the coal price. The weights are 40%, 20% and 40% respectively and the successive yearly adjustment cannot be more than 8%. The crude oil price is decided by the arithmetic mean of MOPS WTI, Brent and Minas FOB prices, the LPG price is the Singapore FOB price and the coal price is the arithmetic mean price of Datong quality mix, Shanxi quality mix and Shanxi large mix coal at the QinHuangdao station. Figure 17.3 shows this hooking mechanism. LNG prices are decided according to the imported gas price and are different from the factory price determination systems.
- *Increase the factory price appropriately*
  The consequence was an increase of CNY50–150/1000 m^3 for industrial and urban gas use and CNY50–100 for fertiliser gas use (the range reflects the different systems for level 1 and level 2 gas). NDRC argued that the effect of this price increase was limited. If measured by the maximum increase of CNY150/1000 m^3 for a single family who consume 20 m3 gas/month, the monthly expense would only increase by CNY3 (which is less than USD0.50). If measured by the maximum increase of CNY100/1000 m^3 and consumption of 800–900 m^3/tonne of fertiliser production, the per tonne production cost would only increase CNY80–90 (or about USD12).

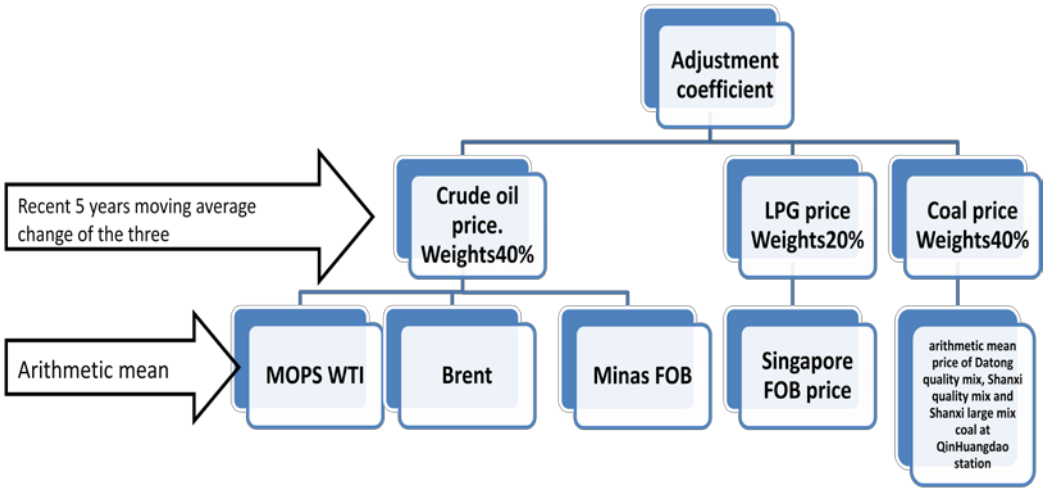

Figure 17.3: The price hooking mechanism.

The consumer retail price is then determined by the gas factory price plus the pipeline transport charge and the city distribution charge. The first two components are controlled by NDRC and the third is decided by local government. The consumer price differs at different cities because of the distances to gas fields and sources of gas (Table 17.7). The price of gas in cities such as Wulumuqi, Chengdu and Chongqing, which are close to a gas field, are relatively low. Gas prices in cities such as Beijing and Shanghai, which are in the downstream of a long-distance pipeline, are higher. The highest price is in cities whose gas is imported from abroad, either by pipeline or as LNG (e.g., Quanzhou).

Despite the initial round of reform, natural gas prices remained low relative to world prices. In November 2007 the average price for the industrial sector rose by 50% but remained less

Table 17.7: Urban gas prices, August 2008 (CNY/m^3).

City	Price	City	Price	City	Price
Beijing	2.05	Nanjing	2.20	Taian	2.00
Tianjin	2.20	Suzhou	2.20	Heze	1.70
Shijiazhuang	2.20	Yangzhou	2.20	Zhengzhou	1.60
Tangshan	2.50	Hangzhou	2.40	Luoyang	2.60
Qinhuangdao	3.38	Taiyuan	2.10	Xinxiang	1.75
Xingtai	2.20	Wenzhou	3.50	Wuhan	2.30
Datong	2.00	Jiaxing	2.90	Huangshi	2.10
Changzhi	1.70	Shaoxing	2.80	Yichang	2.20
Huhehaote	1.57	Quzhou	2.90	Xiangfan	2.20
Baotou	1.57	Hefei	2.10	Jinmen	2.10
Shenyang	2.40	Huainan	2.10	Changsha	2.36
Anshan	2.20	Anqing	2.30	Changde	2.53
Jinzhou	2.40	Chuzhou	1.97	Shaoguan	3.95
Changchun	2.00	Quanzhou	3.80	Shantou	4.10
Jilin	2.20	Jiujiang	3.45	Jiangmen	3.80
Yanbian	2.70	Ganzhou	3.90	Ganjiang	3.50
Haerbin	2.00	Jinan	2.40	Nanning	4.35
Daqing	1.65	Qingdao	2.40	Liuzhou	5.93
Jiamusi	2.00	Zaozhuang	2.00	Beihai	3.65
Shanghai	2.10	Yantai	2.40	Guigang	3.65
Wulumuqi	1.37	Hami	2.00	Bayinguoleng	1.30
Haikou	2.60	Leshan	1.54	Yulin	1.35
Sanya	2.40	Dazhou	1.52	Lanzhou	1.45
Chongqing	1.40	Shaotong	3.60	Xining	1.25
Chengdu	1.43	Xian	1.75	Geermu	1.20
Zigong	1.38	Baoji	1.75	Yinchuan	1.40
Panzhihua	1.43	Weinan	1.75	Shizuishan	1.50
Mianyang	1.52	Yanan	1.50	Wuzhong	1.40

Source: http://oil.chem99.com/channel/Naturalgas/

than half world prices.[3] Gas shortages re-emerged in 2009 in a number of cities. In Chong Qing taxis had to wait for a long time before filling with gas and passengers had to pay a CNY2 cover charge because of the increased price. In Hang Zhou the gas supply for 44 industrial enterprises was cut and a similar phenomenon appeared in other cities. The severely cold winter in China had caused a surge of heating gas usage. Supply-side factors were also important. CNPC said that it had already reached the maximum per day supply, which meant that the company did not have enough gas storage to meet the unexpected increase in gas demand. The separation of transmission pipelines among the giants also made it more difficult to allocate gas to areas that needed it. The relatively low gas price remains a key factor in the overall gas shortage, because it leads to the overuse of gas and reduced incentives for domestic suppliers to increase production.

17.7 CONCLUSION

China has undertaken substantial reform in the gas sector, including the participation of a wider range of investors, at least in transmission and distribution. A clear separation remains between production and transmission and its distribution. Major users are unable to 'buy direct' from producers but have to buy from local distributors who, since 2002, win a franchise through a bidding process. A major reform was also undertaken in pricing from 2005, with the introduction of the influence of world prices and substitute fuels.

[3] Prices rose from CNY800/1000 m^3 (USD3.04/MBtu) to CNY1200/1000 m^3 (USD 4.57/MBtu) (Higashi 2009; CNY1 = USD0.14404). International prices peaked at around USD13/MBtu in 2008.

Despite this significant progress, differences remain between prices on average in China and world prices, between cities for the same types of users and between users in the same cities. The low gas price tends to bring about overuse and adds to the risk of gas shortages in China.

Declining self-sufficiency and the price gaps will likely force further price changes. Aligning the now low domestic price with the higher international price would no doubt be the trend of further gas reform, however, at present there is a lot of argument about the reform policy. Among the options, the use of a weighted average of domestic and international prices seems to be more acceptable in the short term.

A further reform policy document is likely be issued later in 2010.

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Chapter 18

GAS IN THAILAND

Deunden Nikomborirak[1]

- A comprehensive plan for gas reform in Thailand was designed but only partially completed.
- The privatisation stage that has been completed is associated with increases in supply.
- Subsidies for some forms of consumption are rising and in the longer term provide new forces for further change.

18.1 INTRODUCTION

In 2009 Thailand ranked 27th in terms of natural gas production (28.7 million m^3) and 40th in terms of proven natural gas reserves (317 100 million m^3) according to the US Central Intelligence Agency (2009). Thailand has a vast natural gas supply in the Gulf of Siam and the Andaman Sea. However, domestic supply was not able to keep up with the surge in demand prompted by escalating global petroleum prices and government subsidies of the use of natural gas for vehicles (NGV) and home cooking (liquefied natural gas; LNG). During 2004–09 demand for natural gas increased on average 5.26% per year compared with 0.4% for petroleum. Thailand has been an importer of natural gas since 1998 (Figure 18.1).

The bulk of the demand for natural gas in Thailand comes from the power generation sector which relies heavily on natural gas. In 2009 more than 70% of consumption went to electricity generating plants, with the remaining 17% going to gas separation plants and 11% to industrial use (Figure 18.2). Thailand relies heavily on natural gas for power generation.

Note: MMSCFD = millions of standard cubic feet per day

Figure 18.1: Thailand's natural gas supply, 1986–2009. (Source: Energy Policy and Planning Office)

[1] Research Director at Thailand Development Research Institute (deunden@tdri.org.th) and Secretary to the Minister of Finance, Finance Ministry (2007–08).

A reform plan for the gas sector was developed in the late 1990s. This plan included extensive change. However in 2001 a new government adopted a policy of support of national champions which focused on privatisation and corporate development rather than market reform and the introduction of competition. This study case explains how the reform plan was adjusted in the light of the adoption of that policy and identifies some of the economic consequences of doing so. The first step is to provide some background information on the gas industry.

18.2 THE CURRENT STRUCTURE OF THE GAS INDUSTRY IN THAILAND

18.2.1 Domestic competition

The gas industry in Thailand is dominated by two players – the Petroleum Authority of Thailand (PTT) on the supply side and the Electricity Generating Authority of Thailand (EGAT) on the demand side. Both entities are majority government owned, although PTT is now a listed company with 49% of its equity share floated on the stock market and the remainder held by the Ministry of Finance.

PTT, with few minor exceptions, acts as the sole purchaser, transporter and distributor of natural gas in Thailand. PTT purchases all indigenous gas from the producers, including its subsidiary PTT Exploration and Production (PTTEP), and transmits this through its pipeline system to consumers. Its network of pipelines in Thailand currently stretches 3100km, linking all commercial offshore gas fields to EGAT's power plants, its own five gas separation plants (GSPs) as well as some 200 industrial users. Many of the industrial users are petrochemical companies and gas distribution companies in which PTT owns a controlling share.

In the petroleum sector, the company holds a majority equity share in several refineries whose production capacity contribute to more than 80% of the economy's total refinery capacity. It is also the largest player in retail distribution (petrol stations), international trading activities and the downstream petrochemical industry.

Limited private participation in pipeline construction (at the distribution level) has been introduced with the establishment of PTT Natural Gas Distribution Company (PTTNGD), a joint venture pipeline owned 49% by PTT and the balance by private investors. However, there is no mandatory third party access to PTT's gas transmission pipelines network, and so there is no competition in the distribution market. Certain power plants construct their own pipelines to connect to PTT's.

On the demand side, EGAT is by far the largest consumer of natural gas in Thailand. Although Figure 18.2 shows its gas consumption share is only 32%, the government-owned electricity generating enterprise holds a major equity share in many of the independent power producers (IPPs). As a result, sales to EGAT's group of electricity generating plants accounts for roughly half of Thailand's total natural gas supply.

The second largest group of customers is the gas separation plants, all of which belong to PTT. The third largest group are the small independent power producers (SPPs). These power producers supply electricity to EGAT's grid at a predetermined price. As for industrial customers, whose number totalled roughly 240 in 2009, many are downstream petrochemical companies affiliated with the PTT. All PTT contracts, whether with suppliers or consumers, are on a long-term (25–30 years) take or pay basis.

To conclude, there is little market competition in the vertical structure of the natural gas industry. Exploration and production where foreign players maintain a majority share in the market may be an exception. Although PTTEP's market share in exploration is roughly 25% in terms of sales, the company also holds equity shares that range from 5% to 40% in many of the exploration projects undertaken by its main competitor, Chevron.

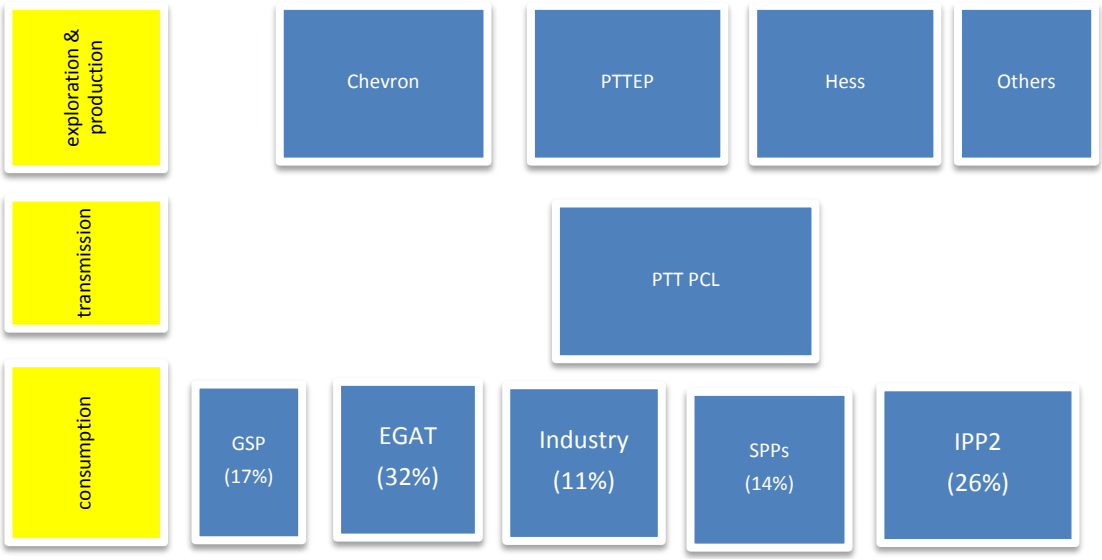

Figure 18.2: The current structure of the Thai gas industry.

18.2.2 Foreign commercial presence

The presence of foreign operators in the Thai gas industry has been confined to the exploration and production of natural gas. The Petroleum Act 1971 and the Energy Industry Act 2007 are the two main laws governing the gas industry. However, foreign investment issues are dealt with by the Foreign Business Act 1999. The foreign equity share is not restricted for businesses related to the production of tangible products. But foreign equity is limited to a minority portion for service businesses. Hence, foreign companies that seek to operate gas transmission, trading and distribution services are required to seek a joint venture with a local partner.

The employment of foreigners in Thailand is governed by an Act entitled the Working of Aliens Act BE2521 (1978). Generally, when considering whether to allow a foreign worker to enter the economy to work, the Department of Employment will consider whether the opening can be filled by a Thai, whether the foreign worker is qualified and whether the job fits the need of Thailand. Moreover, all foreign and Thai companies are required at all times to observe the 4:1 ratio of the number of Thai to foreign employees according to the Order of Immigration Office No. 110/2546 (2003). This may pose a problem for companies that require highly specialised staff to undertake work before production that will require local workers. The Board of Investment is able to waive this restriction. Promoted companies are allowed to bring in skilled workers and professionals. Gas exploration and production businesses are not among the list of promoted companies, unlike their downstream gas transmission and petrochemical counterparts.

18.2.3 Cross-border competition

While there is cross-border supply of natural gas both through pipelines and in the form of LNG, cross-border competition in natural gas is not established. Presently, there are several

joint development gas exploration and production projects between PTT and its counterparts in neighbouring economies such as Myanmar, Malaysia and Cambodia (Figure 18.3).

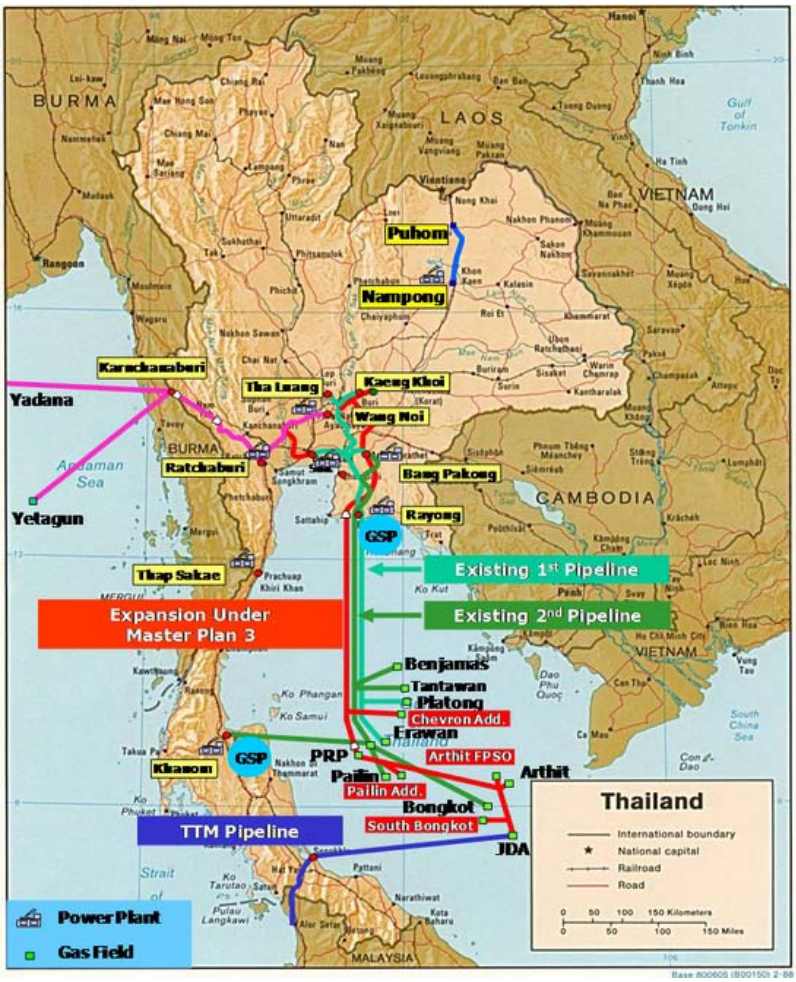

Figure 18.3: Thailand's regional natural gas pipeline network and its neighbours. (Source: PTT)

Pipelines connect offshore gas fields to electricity generation plants or gas liquefaction, condensation or separation plants mainly to serve Thailand's domestic demand.

The cross-border pipeline network between Burma and Thailand includes the Yadana–Ratchaburi pipeline (completed 1999) and the Yetagun–Ratchaburi pipeline (completed September 2000). On the horizon are projects to deliver gas to Malaysia and Thailand from the Malaysia–Thailand Joint Development Area.

Work to develop a regional natural gas market has been in progress for over a decade. ASEAN's proposal for a 'Trans-ASEAN Gas Pipeline' and APEC's concept of an 'Asian Gas Grid' both recognise natural gas' superior fuel qualities and the logic of linking ASEAN's natural gas production centres with markets in neighbouring economies. Both concepts are designed to catalyse cross-border linkages connecting national gas grids. According to Sovacool (2009), the establishment of national gas grids faces three challenges. Firstly, Lao PDR, Myanmar and Cambodia are poorer economies with vast reserves of natural resources relative to Thailand, which is perceived to be a much more advanced economy with a large demand for energy. Thus, the flow of energy within the region is likely to be one way. Secondly, the energy business in the region remains dominated by government enterprises – PTT (Thailand), Petronas (Malaysia) and Pertamina (Indonesia). Competition

that would undermine the status of each of these enterprises may be resisted by their government owners in order to protect national assets. Thirdly, the planned integrated natural gas pipeline is estimated to require an investment totalling USD16 billion to construct the additional 5600km of pipeline needed to connect centres of demand in the region. It is unlikely that private investors would be willing to inject capital into a project of such a scale, given that there is a lack of certainty concerning the pricing, that regulatory regimes are yet to be harmonized across borders and that gas market structures may continue to accommodate single-buyer regimes.

Competition from compressed LNG is conceivable, especially since Indonesia and Malaysia are among the five largest worldwide exporters of LNG. Indeed, to secure its gas supply, besides developing new gas fields in joint cooperation with neighbouring economies, Thailand has come to rely increasingly on imported LNG. PTT has undertaken to construct Thailand's first LNG terminal (in Rayong in the northern industrial zone on the eastern coast). The facility includes a tank terminal, a jetty and a 5 million ton storage facility that will be enlarged to accommodate 10 million tons in a second phase. The terminal is scheduled to start operating in 2011. However, in the absence of third party access to PTT's pipeline, there is unlikely to be any competition in the import of LNG.

18.3 GOVERNMENT POLICY

Greacen (2005) categorises the Thai government's policy towards the development of the domestic energy market into three distinct periods – the 'Nationalist Era' (1950–90), the 'Neo-liberal Era' (1990–2000) and the 'National Champion Era' (2001–05), the time of his presentation.

The Nationalist Era saw the establishment of government-owned utilities that were self-regulating monopolies based on the cost-plus price regulatory scheme. PTT was established in 1978.

The Neo-liberal Era was a period during which the government was dominated by technocrats whose concerns were focused mainly on introducing greater competition into utility markets monopolised by government enterprises. During the period, some EGAT power plants were spun off to become listed companies on the stock market. IPPs and SPPs were introduced to foster private competition in the power generation market. The National Energy Policy Office (NEPO)[2] floated the idea of creating a 'power pool' in 2000. A draft law on the rules governing the power pool was also proposed in the following year.

Although no reform took place in the gas industry during this era, the Ministry of Finance introduced a comprehensive plan for government enterprise reform. It proposed restructuring, liberalisation and regulation of the markets in which government enterprises dominated – telecommunications, transport and energy (gas, oil and power). This 'Master Plan for State Enterprise Reform 1998' offered a clear direction for developing the gas industry (Figure 18.4).

The competitive market model described in the plan contained two key reforms: the separation of the transmission network from production and trade functions and third party access. The separation of PTT's gas transmission pipeline function, either by accounting or legal methods, from its gas trading business was a pre-condition to promoting competition.

[2] The office is currently known as the Energy Policy and Planning (EPPO), Ministry of Energy.

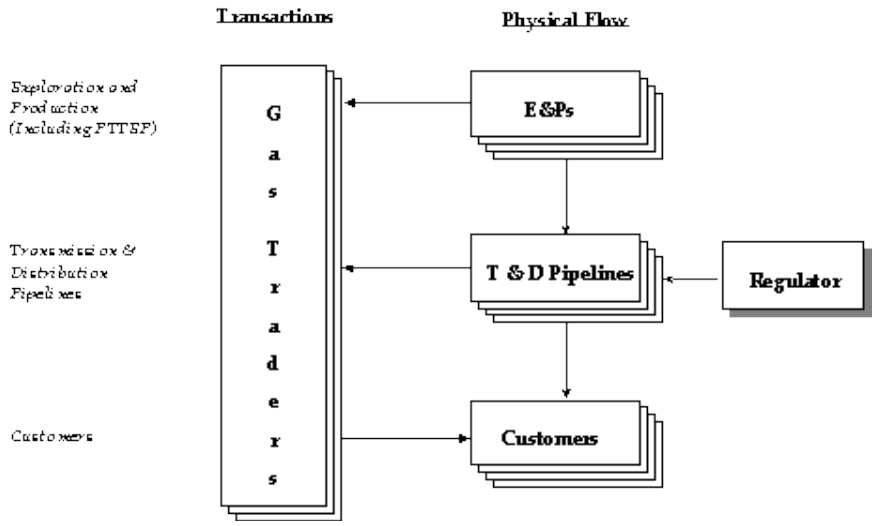

Figure 18.4: Future gas industry structure as perceived in 1998. (Source: Master Plan for State Enterprise Reform 1998, http://www.mof.go.th/sepc/sepcfn2.htm)

Full legal separation by a corporatised entity would not only facilitate competition in the production, trade and distribution of gas but would also allow more transparent and efficient regulation of the industry.

The establishment of third party access to gas transmission pipelines is a means of facilitating the development of competition in gas supply. The provision of access to these facilities by third parties on fair terms and conditions would allow consumers to purchase gas from upstream producers or continue to purchase the bundled service of gas transmission and supply from the pipeline owner.

'Special Purpose Pipelines' were proposed in the plan of 1998. Developers of new pipelines were to be granted a franchise under terms that would have allowed them to negotiate use of the pipeline with a limited number of customers. Under this approach, the broad framework for access would be well defined but the actual terms and conditions (such as tariffs) would be set by negotiation. This would have allowed a level of commercial control on the part of the owner, which may have led to an abuse of this position in terms of monopolistic pricing of the transmission service. To balance these matters, a dispute resolution process would have been necessary to address disputes arising from the negotiation process, with recourse to a predefined means of arbitration.

The Neo-liberal Era ended in 2000 and was replaced, under a new government, by the 'national champion model'. PTT was listed on the stock market in 2001 so that public funding could be mobilised to facilitate the planned expansion of the enterprise. However, the government retained a majority equity share: only 49% of the equity was floated.

Under the national champion strategy, privatisation took place without any of the market reform envisioned in the 1998 master plan. There was no separation of the monopolistic gas transmission business from the potentially competitive trading and distribution businesses and an independent energy regulatory body was not immediately established. Privatised operations conferred some benefits on the company, but without the introduction of competition these were not likely to be passed to consumers. As a listed company, for example, it was able to mobilise private capital to finance its expansion while its commitments to shareholders provided it with a framework to respond to community or government expectations about the services it might provide.

PTT shares sold out in 77 seconds. The price of the share went from THB35 at its IPO in November 2001 to THB183 at the end of 2003. The share price went up 70% in a single month when the government approved the proposed THB100 billion gas transmission pipeline plan with a guaranteed rate of return at 16% (Greacen & Greacen 2004). PTT now contributes 48.7% of the Thai Stock Exchange's total value (Nikomborirak & Sirikarn 2009).

A landmark court case decision in which the Supreme Court ruled against the privatisation of EGAT prompted the same group of NGOs to try to revisit the case of PTT. In August 2006 the Federation of Consumers and its affiliated organisations filed lawsuits, petitioning for the two Royal Decrees pertinent to the privatisation to be revoked and the company re-nationalised. In December 2007 the Administrative Court delivered a verdict that fell short of delisting the company, but required it to transfer all land acquired through expropriation and all assets (i.e., gas pipelines) attached therewith to the Ministry of Finance (PTT website, 2007). In practice, PTT continues to operate these pipelines as if they were its own but it does not have legal ownership of these particular pipelines and it has to pay the Ministry of Finance an annual access fee calculated as a fixed percentage of its total transmission revenue (this is 10–30% depending on the size of the revenue).

Corporate governance in the government-owned enterprises remains an issue. The National Anti-Corruption Commission is proposing a ban on government officials becoming directors in government-owned enterprises due to the conflict of roles. Members of Parliament and Senators raised concerns in Parliament about this conflict of roles among directors of government-owned enterprises. These issues may also limit the scope for further reform.

The National Champion Era came to an end in 2006 when the government originally elected in 2001 was replaced. During the period from September 2006 to February 2008 the Neo-liberal Era was revived. The Energy Industry Act, which established a fully fledged energy regulatory body, was passed in 2007. But the time span of that government was too short to implement the reform. A new government was elected in 2008 but there has been no further policy change since that time.

18.4 THE REGULATORY REGIME

18.4.1 The institution

The gas industry in Thailand is governed by two major laws; the Petroleum Act 1971 stipulates rules concerning the extraction and production of natural gas and the Energy Industry Act 2007 prescribes rules on the transmission of natural gas, compression of gas into liquid form, distribution of gas and wholesale and retail sale of gas. The Petroleum Act assigns the regulatory power to the Electricity Policy and Planning Office (EPPO) in the Ministry of Energy, which also oversees energy policy work. The Energy Industry Act established a regulatory body, the Electricity Regulatory Commission (ERC), for the gas and electricity generation industry. Regulations governing the petroleum industry and the exploration for and production of fossil fuel (including gas) were not included in this law. This was to preserve the Ministry of Energy's regulatory role, set out in the Petroleum Act.

Section 9 (6) of the Energy Industry Act stipulates that the Minister of Energy is responsible for setting the quality and standard of energy services. Section 64 similarly grants the Minister (with approval from the National Energy Policy Commission) the authority to set policy and guidelines with regard to the pricing of energy services. As a result the ERC applies the form of regulation (rate of return regulation or price cap) chosen by EPPO, but

decides on the actual tariff within that method. The ERC was granted the power of whether to allow the service provider to pass on certain costs to consumers. For example, it refused to allow PTT to pass on costs incurred from the destruction of its offshore gas exploration platform near the Oceania Islands.

It is interesting to compare the ERC's regulatory power with that of its telecommunications counterpart, the National Telecommunication Commission (NTC), which was established by the Telecommunications Act in 2001. The NTC's broad regulatory power and financial independence guarantee its autonomy. This is partly due to the fact that, unlike the NTC, the independence of the energy regulator was not mandated in the constitution. However, issues of accountability and transparency of the NTC remain, and need to be balanced with independence (Nikomborirak & Cheevasittiyanon 2009).

18.4.2 Regulatory rules

The key features of the existing regulatory regime governing the structure of the natural gas market, the access to the market and the tariff regulation are discussed below.

There are no legal restrictions on the structure of gas undertakings (no vertical separation requirement). PTT and its subsidiaries are engaged in the entire gas supply chain from exploration, production and transmission through to trade, import and distribution to retail.

There are no legal restrictions on new entries into any of the natural gas business subsectors, including the importation of LNG. However, PTT's monopoly in transmission, and hence the buying and selling of gas, amount to barriers to entry. As there is not yet third party access to PTT's proprietary transmission network and no third party access to its gas terminal facilities, entry is practically impossible.

While the market oriented reforms have not been adopted, there is an extensive system of price regulation, at least for natural gas. While some of its parameters could be debated (for example, the rates of return on investment built into the formulas), the regulatory system covers the key areas where there is a risk of the application of monopoly power over prices.

The wholesale gas price comprises the wellhead gas price, a marketing margin, the transmission tariff and the distribution tariff. These components are determined as follows:

- The wellhead gas price is specified in the gas purchase contract signed between the producer and PTT. It is normally indexed with the price of fuel oil, the exchange rate, and the consumer and producer price index. The price for natural gas produced from the Gulf of Thailand is roughly USD2 per million BTU, one-half the price of that in the USA and one-third of that in Japan where it is in the ranges of USD5–6 (Energy website n.d.). Gas procured from joint development with neighbouring Malaysia and Myanmar is slightly more expensive at USD2.3–2.75. Significantly lower wellhead gas prices are common for less mature gas fields.
- The marketing margin is regulated by the EPPO. The current rate of the pooled gas price (the weighted average price of gas purchased from various production sources) is 1.75% for sales to IPPs and EGAT and 9.33% for SPPs. The higher margin reflects the higher risks that PTT has to bear as SPP contracts are shorter (5 years vs 20–25 years) and allow an SPP to switch from one source of energy to another, depending on the price level. For example, an SPP may choose to use LPG instead of natural gas. However, the rate is currently being revised downward as statistics show that SPPs

rarely exercise the option. Hence, the risk involved with the contract may have been overestimated. But since 1999 a cap of THB2.15 (which translates into less than 1% considering the current price of natural gas) has been imposed.

- The transmission tariff is set by EPPO with approval from the Minister of Energy. The tariff is uniform for all gas customers. The current tariff is made up of the demand charge (TD) component to cover fixed costs and CPI - X for the commodity charge (TC) to cover variable costs. The rate of return on capital used for the demand charge is 18% for older pipelines and 12% for new pipelines (pipelines installed after 2007). The x value used in the price cap has always been 2%; the cap is revised every 5 years or when a new investment qualifies for a revision of the capital allowance.
- The distribution tariff is unregulated. PTT negotiates a price with its customers.

In contrast to the cost-based approach to pricing natural gas, the wholesale price of LPG has been capped since 2006 at USD330 per ton compared with USD550–700 per ton for imported LPG. The government pays the difference between the import price and the capped price: this gap has increased since 2004 when those prices were about the same and the gap is now around THB9/kg. This system also discourages PTT from manufacturing LPG as the government only subsidises imported LPG. The production of domestic LPG is 350 000 tons per month, which is not enough for the likely increase in demand, resulting at present in 74 000 tons of LPG being imported monthly. The additional 1-year extension of the LPG price cap will be a burden for the Oil Fund since it will require a subsidy of THB740 million per month (USD22.42 million) for imported LPG (EPPO n.d.)

Similarly, the price of NGV has been capped since January 2007 at USD258 per ton, while the global price is roughly USD424 per ton. Originally, the regulated price was to be adjusted upward gradually under a laddering model so that it would reflect actual costs by 2014. Governments have chosen to postpone these increases.[3]

Unlike the case of domestic production of LPG, however, PTT is promptly compensated for the NGV it produces. Thus, there is no shortage of domestic supply as in the case of LPG. EPPO estimated that maintaining a price cap on NGV will cost taxpayers roughly USD9 million per month. LPG demand has been increasing so the cost of the subsidy may increase.[4] Another issue in meeting this demand is that the controlled price leaves no room for a distribution margin which reduces the incentive to open new stations.

18.5 THE PERFORMANCE OF THE THAI GAS INDUSTRY AND PTT

How has this regulatory model performed in terms of the development of the gas market and the players involved? Broadly, the results of this assessment show a strong growth in the capacity of the distribution system, but questions remain about the level of gas prices compared to those in the rest of the world.

18.5.1 The Thai gas industry

The demand for and supply of natural gas in Thailand expanded at a very high rate from 1986 to 1999 when large reserves of natural gas were discovered in the Gulf of Siam (Table 18.1).

[3] For example, http://www.siamdailynews.com/2009/09/29/govt-to-pin-prices-of-lpg-ngv-ft-until-aug-2010/.
[4] http://www.bangkokpost.com/breakingnews/156365/ptt-ngv-usage-soars.

Table 18.1: Gas supply and demand growth, 1986–2009 as calculated from data provided by EPPO.

Average per period	Supply	Demand
1986–94	15.23	15.23
1995–99	12.54	12.55
2000–04	3.06	14.2
2005–09	6.55	5.77

Domestic supply was able to keep up with demand until the end of the 20th century. During 2000–04 demand outpaced supply as there was no new investment in new transmission pipeline capacity. However, when the ownership issues were clarified, in 2006–07 PTT was able to mobilise capital from the equity market to expand its transmission pipeline network by connecting new offshore gas fields to its onshore gas separation plants and its onshore gas fields to various power plants (Figure 18.5). As a result, the growth in domestic gas supply during 2005–09 exceeded that of demand such that the volume of imported gas fell (Figure 18.1).

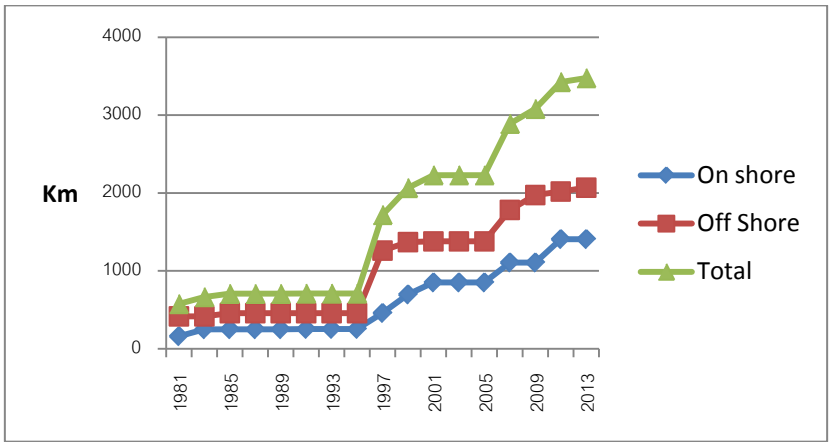

Figure 18.5: The length of natural gas pipeline, 1981–2012. (Source: PTT Annual Report 2009. History of Gas Transmission. *www.pttplc.com/Files/Document/Pdf/Gas/Gas_en2.pdf*, pipelines investment plan).

The natural gas industry, therefore, has undergone relatively healthy growth in terms of supply. PTT has been effective in seeking and developing new sources of natural gas supply overseas and investing in transmission capacity. The relatively high allowable rate of return on investment (internal rate of return on equity of 18%) is above the risk-adjusted rate for capital borrowing in the market place. These conditions have provided the incentives for PTT to expand its transmission pipeline network to facilitate growth in domestic gas supply. Earnings before interest and tax (EBIT) as a proportion of net sales for the gas operation has been higher than that in the petroleum and petrochemical businesses, which operate in more competitive markets (Figure 18.6).

PTT has performed well to meet the rapid growth of domestic demand for gas. The enterprise has also been one of the most efficient among its government-owned peers. A study by Hunt and Mantajit (2005) found that the pre-privatisation PTT was relatively efficient when compared with its counterparts in Japan, UK and Malaysia. The company was therefore able to take good advantage of access to direct financing once it became a listed company.

18.5.2 Gas prices

The price of natural gas depends on the wellhead prices plus the various margins. As noted above, the wellhead price is relatively low in Thailand. Lower wellhead gas prices due to lower cost of production and proximity of gas supply to demand also allowed the retail price of

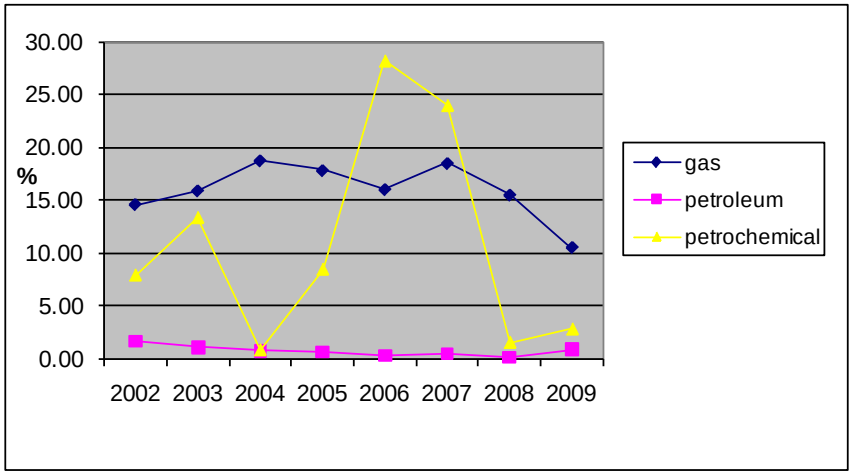

Figure 18.6: PTT's EBIT/net sales ratio, 2002–09. (Source: PTT annual reports)

natural gas to be lower than that prevailing in other economies that do not have their own gas supplies, while also allowing PTT to retain its margins. According to the study by Asia Pacific Energy Research Centre (2003), retail natural gas prices in Thailand have always been well below those of Chinese Taipei, Korea or Japan. Meanwhile NGV users enjoy subsidised retail tariffs.

18.5.3 Gas quality

According to Laoonual et al (2007), Thailand did not have a quality standard of natural gas like that established by the California Air Resource Board (CARB), the 'clean air agency' of California. The quality of NGV produced varied widely depending on the particular gas field. Natural gas from onshore fields in northeastern Thailand on average contains 76% methane and 13% carbon dioxide, while that from offshore fields in Myanmar contains 72.4% methane, 6.2% carbon dioxide and 16% nitrogen. According to the CARB, natural gas traded must have a combined carbon dioxide and nitrogen component not exceeding 1.4% and a methane number not less than 80 (except in some locations which have a minimum of 73). In standards found in other economies, the carbon dioxide component is usually required to remain below 3%. Hence, the quality of natural gas in Thailand, in particular that from the onshore fields in the eastern region, is below the international standard. NGV in Thailand may not be cleaner than LPG or gasoline in the absence of proper separation of carbon dioxide from the raw gas supply. In July 2009 the Department of Energy Business established a standard for natural gas to be used for NGV, but these standards are still inferior to the international ones.

18.6 CONCLUSION

The case of gas in Thailand illustrates a number of aspects of structural reform. These include the forces which cause an extensive reform strategy to shift and evolve in the process of implementation. At the same time, this case illustrates that a reform plan which is less extensive than originally conceived can have significant effects. Thailand's gas sector also illustrates a situation common in the region of energy prices below world market levels – substantial energy subsidies. As energy prices rise, this policy, however, may not be sustainable for fiscal reasons, and the forces which might emerge in Thailand may also be important in other economies.

The sequence of events was that a 1998 master plan laid out the reform of the gas sector in Thailand. This included the separation of production and transmission and the introduction of competition at all stages. The government entity, PTT, would be corporatised and privatised. An independent regulator would be established. This plan was overtaken, however, by a change of government in 2001 and its adoption of a strategy of focusing on the promotion of national champions, which involved more emphasis on development of some key enterprises to contribute to a wider set of policy goals than on competition in the marketplace. A minority share of PTT was sold to private owners but other elements of market reform were not adopted. More recently, and following another change of government in 2006, a regulatory agency has been established with extensive systems of cost-based regulation at least for natural gas. Other elements of the market reform agenda have still not been implemented.

One of the significant consequences of this reform package has been rapid growth in the capacity of the gas system. Since its listing in 2001, PTT has grown rapidly and performed well to meet the rapid growth in domestic demand for natural gas by its constant search for and development of new sources of gas in neighbouring economies and expansion of transmission capacity accordingly. Its rapid infrastructure roll out was a response to the relatively generous allowable rate of return for its transmission tariff.

Meanwhile, because of a large domestic and regional gas supply and a government subsidy at the wellhead level gas prices have remained relatively low. This approach to pricing involves distortions in consumption decisions. The low prices are not a reflection of competition in distribution and transmission, which remains absent.

The two current issues are therefore pricing and the lack of competition in distribution and transmission. Competition could be introduced, and the steps to doing so include:

- requiring PTT to divest its equity share in many of upstream and downstream gas businesses and to allow third party access to the transmission pipelines; and
- enforcing the competition law, which is important in a market that is so highly concentrated – PTT's current immunity from the Trade Competition Act 1999 would be abolished in that case.

On the other main issue of pricing, there are no significant forces for further reform either from within the sector or from its customers. PTT's main customers are power plants and its own gas separation plants. Although fewer than 300 customers are industrial users, many of them are petrochemical plants and natural gas distribution companies also affiliated with PTT. PTT's integrated operations and its control of the critical infrastructure reduce the incentives for it to maximise throughput in order to earn its target rate of return. Meanwhile, the retail price of NGV and the wholesale price of LPG are controlled at a rate well below cost. Thus, consumers enjoy low gas prices and have less interest in reforms of gas policy.

However, because of the fiscal consequences of the current policy package this situation may not be sustainable. A source of pressure for reform may be that the local gas supply is running out and PTT will have to import an increasing volume of more expensive LNG from distant places. For now, government import subsidies have sheltered consumers from rising costs but the pressure for reform could mount if fiscal pressures cause these subsidies to be abolished. But because LPG is used in many households for cooking, a change of policy involves political risks, despite the fiscal implications of the lack of reform.

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Chapter 19

TELECOMMUNICATIONS IN CHINESE TAIPEI

Roy Chun Lee[1]

- A liberalisation program began in Chinese Taipei in 1997, first in mobile then in fixed-line services. The subsequent change in performance was remarkable in comparison with other APEC member economies.
- Fixed-line, mobile and broadband service penetration significantly improved over the last two decades, while price has been decreasing rapidly over the same period.
- Some access charges for mobile services fell to zero in 2004, after the introduction of 3G mobile services: this pricing model facilitates access to services, while suppliers recoup costs through use charges.

19.1 INTRODUCTION

The structural reform of Chinese Taipei's telecommunications sector is a recent development. Entry was prohibited prior to 1996. The integrated and monopolist incumbent was an administrative branch of the government, which was at the same time the regulator.

Until 1987 the Directorate General of Telecommunications (DGT) of the Ministry of Communications and Transport enjoyed a statutory monopoly under the Telecommunications Act of 1978 on all telecommunications services and equipment supplies in Chinese Taipei. Any party other than the DGT that provided services or apparatus faced administrative penalties enforced by the DGT.

While paging and other value-added services had been liberalised earlier, in 1996 the government passed three major pieces of legislation – the Telecommunications Act, the Organization Act of Directorate of Telecommunications and the Organization Act of the Chung-Hwa Telecom (CHT) Co. Through this legislation, structural reform began in the telecommunications sector. The legislation underpinned the introduction of structural reform through the separation of service provision from the public sector and the creation of licensing regimes that allowed the entry of private telecommunications operators.

Specifically, the Telecommunications Act mandated that service provision be separated from the DGT and transferred to the newly established CHT. In the lead up to market liberalisation, the Act created a licensing regime by defining the legal relationship between the regulator and operators in the new multi-player context. A pro-competition regulatory regime, consistent with the WTO Reference Paper on Basic Telecommunications, (hereinafter WTO Reference Paper) was also created to promote competition post market opening.[2]

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[2] Chinese Taipei undertook the obligations contained in the reference paper as an additional commitment in its WTO Schedule of Commitments (GATS/SC/136/Rev.1, July 2002).

According to the government's Liberalization Policy White Paper (1997), the objectives of the structural reform effort were to 'promote fair competition', 'remove barriers to new technologies' and 'improve operational efficiency'. The White Paper also specified a timetable for subsequent liberalisation initiatives, beginning with second-generation (2G) mobile services open to competition in 1997 and fixed-line operation in 2001. The sequence of liberalisation will be discussed in Section 19.2.

The timetable was influenced by external pressures and considerations. Chinese Taipei was at that time negotiating its WTO accession with major trading partners, including the USA and the European Union, who requested a clear market opening time schedule.

According to Chinese Taipei's privatisation law, the incumbent operator CHT was considered a privatised company (i.e., with the government's shares below 50%) in 2005 – 4 years after the liberalisation of the fixed-line market. The privatisation process faced little resistance from unions, as market competition was sufficient for CHT to be free from the constraints applicable to public sector institutions. The government, however, remained the single largest share holder of the company (around 34% of total equity), with controlling power over the appointment of the directors and senior management positions. This makes the CHT essentially still a government-controlled operator.

Recent developments include the creation of a new and independent regulator, the National Communications Commission (NCC), in 2006. The NCC is responsible for regulating both the telecommunications and broadcasting sectors. Table 19.1 provides a chronicle snapshot of major policy milestones in Chinese Taipei's telecommunications structural reform process.

Table 19.1: Sequence of telecommunications reforms in Chinese Taipei, pre-1996–2008.

Reform initiative	Pre 1996	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Paging service liberalised														
Basic telecommunications legislation														
2G mobile market licensed														
Fixed-line market liberalised														
3G mobile market liberalised														
Acceded to the WTO														
Incumbent operator privatised														
Converged regulator (telecommunications + broadcasting) established														
Wireless broadband access (Wimax) licensed														

Source: NCC 2009.

Note: The basic legislation, the Telecommunications Act, established the pro-competition regulatory regime; the Organizational Act, the independent regulator; and the Incorporation Act, the incumbent operator.

19.2 LICENSING REGIME AND MARKET STRUCTURE

19.2.1 Licensing regime

In accordance with the Act, every telecommunications operator in Chinese Taipei, regardless of the nature of the service it provides, must be licensed. Apart from defining the rights and obligations of service providers, this gives the regulator the opportunity to use the licensing regime as an instrument to 'manage' a desired market structure by controlling the sequence and number of licences to be issued.

The licensing approach for fixed-line Type I operations in Chinese Taipei best demonstrates how the licensing regime was used to assist a smooth transition to competition (DGT 1997). From 1997 Type II operations in Chinese Taipei were authorised through a general licensing system, that is, a licence would be issued to all qualified applicants who met a general set of technical and consumer protection requirements, with no limitation on the number of licences (except 'special' Type II services, which were liberalised in 2001) (Table 19.2).

Table 19.2: Comparison of the market opening timetable and restrictions.

Licensing category	Opening timetable	Type of licensing	Numerical restrictions
Type I – full-service fixed-line operation	1st round: 1999 2nd round: 2004 Since 2008: application is open throughout the year.	Franchise	1st round: Yes 2nd round: No Since 2008: No
Type I – individual services fixed-line operation	2004 Since 2008: no restriction	Franchise	1st round: Yes 2nd round: No Since 2008: No
Type I mobile operation	GSM: 1997 3G: 2003	Franchise	No: based on spectrum availability
Type I Wireless broadband access (Wimax) operation	2008	Franchise	No: based on spectrum availability
Type II operation	1997	General authorisation	No
Type II 'special' operation (e.g., VoIP that requires number allocation)	2001	General authorisation	No

Source: NCC 2009.

The Type I mobile service was liberalised in 1997 with the issuing of four nationwide and two regional GSM (2G) mobile licences. However, mergers and acquisitions led to only three GSM operators being left bt the end of 2008, all of them declared Significant Market Players (SMPs). In 2002 3G operations were licensed with the issuing of five licences. Entry was now limited only by the availability of radio spectrum assigned to mobile operations.

The issuing of fixed-line Type I licences did not take place until 2001, when three full-service fixed-line licences were granted. In the initial stage there were seven consortia competing for this pre-determined limited number of new licences. As a result, an assessment based on technical innovation, financial capacity and past experience had to be held. The numerical restriction on fixed-line licences was removed from 2008.

Type I licences are issued by the regulator in conjunction with a concession franchise, a privilege granted by the government as opposed to a *de jure* right that Type II applicants are entitled to.

The Telecommunications Act specifies two categories of telecommunications operations, namely, Type I telecommunications enterprises (Type I) and Type II telecommunications enterprises (Type II) (Table 2.3). Type I operations are network-based operators that install telecommunications network facilities in order to provide telecommunications services. Type II operations are telecommunications enterprises other than Type I telecommunications enterprises (Telecommunications Act, ss. 1 and 2 and §11), that is, those that do not own physical network facilities. Another feature of this facility and non-facility dichotomy is the integration of voice telephony services with facility-based operations.

Table 19.3: Telecommunications service classification systems in Chinese Taipei.

Carrier categories	Designated service provisions	Types of licensing
Type I (facility-based)	Voice telephony and data transmission	Full service licence Individual service licence[a] Mobile licence
Type II (service-based)	None except Special Type II services	Type II Special Type II: voice resale, Internet telephony and mobile voice resale

Note: [a] individual service licensees can only operate through the provision of either local, domestic long distance or international services.

The service categories reserved exclusively for Type I fixed-line businesses are, in addition to their network leasing service, voice telephony connections between local, domestic, long distance and international destinations. These service categories are set out in the Regulations Governing Fixed Network Telecommunications Businesses (the Fixed Network Regulations), which is an administrative rule authorised by the Act. Operations in each of these telephony service categories, except for the holder of a full-service licence, require separate licences. For Type I mobile operations, the service provision includes both nationwide mobile telephony and data services.

In contrast, Type II operations do not have a pre-determined set of service categories other than voice-related operations. Voice service operators that do not own network facilities, including simple voice resale, VoIP, international telephony through leased international circuit and virtual mobile network operations (VMNO), are classified as Special Type II operators and they must apply for Special Type II licences.

In accordance with the Fixed Network Regulations, the regulator has the discretion to add other services to the list of Special Type II services as it deems appropriate. VMNO is the provision of a mobile voice telephony service by purchasing spare spectrum and network facility capacity from Type I mobile operators. It is the mobile analogue of voice resale.

It should be noted that no additional licence is required in order for Type I operators to provide Type II services.

In addition, Chinese Taipei adopts an asymmetric regulatory approach, whereby a Type I licensee classified as a SMP incurs additional burdens, especially with regard to price setting, interconnection and facility-sharing obligations. The qualification of SMP, as stipulated in the Administrative Regulation Governing Tariffs of Type I Telecom Enterprises, is judged by three criteria:

- a market share threshold measured in terms of either sale value or subscription rate that exceeds 25% of the relevant service market;
- dominant power over the market price; and
- the control of essential telecommunications facilities.

Currently the regulator has declared the incumbent CHT as the SMP in both Type I fixed-line and mobile operations. Interestingly, two new entrants in the mobile service market, Taiwan Mobile and FarEast Tone (FET), were also declared as SMPs for Type I mobile operations from 2007, making all 2G mobile operators SMPs. The consequence is that if all operators in a particular market are SMPs, the original intention of the Telecom Act to apply regulations asymmetrically to SMPs and non-SMPs becomes meaningless. The loosely defined qualification for SMP has been criticised for this peculiar outcome (Lee 2010).

19.2.2 Market structure

The full market entry liberalisation policy facilitated the issuing of a total of 109 Type I (facility-based) and 495 Type II (service-based) licences at the end of 2009. Yet Chinese Taipei's fixed-line and mobile markets remain concentrated. As at 2009, there were four integrated fixed-line service operators in Chinese Taipei: CHT, Taiwan Fixed Line Communications, Asia Pacific Telecom and Sparq Telecom. Nonetheless, as reflected in Chinese Taipei's experience, regulating market dominance to foster competition is not an easy task. Notwithstanding the introduction of pro-competition regulatory measures discussed below, the incumbent operator CHT still dominates the fixed-line market (Figure 19.1). It is especially worth noting that CHT enjoys a market share exceeding 97% for local telephony services. Further, dominance in a local telephony market often provides the operator with an advantage in the provision of broadband access services such as ADSL and fibre-based access services, and this is the case for Chinese Taipei, where CHT accounts for 83.8% of market share for the fixed broadband (including cable modem) market (CHT 2008). Evidence suggests that the policy enabling access to local loops is not delivering its intended objective, and is hindering the broadband development (see discussion in Section 19.4).

The mobile market is more competitive where the market shares of operators are less unequal compared to those in fixed-line services, with CHT sharing a similar market share with two primary competitors (Taiwan Mobile and FET) for both 2G and 3G markets (Figure 19.2). Reasons for this development are most likely related to the network deployment cost, network scalability, market demand for a mobile network vis-à-vis fixed-line and a relative lack of 'bottlenecks'.

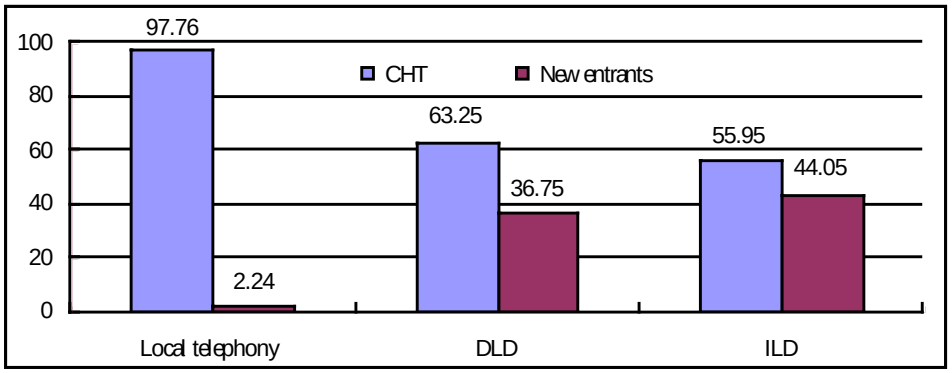

Figure 19.1: Market share in Chinese Taipei's fixed-line market, 2009 (% of total subscribers). (Source: NCC 2009)

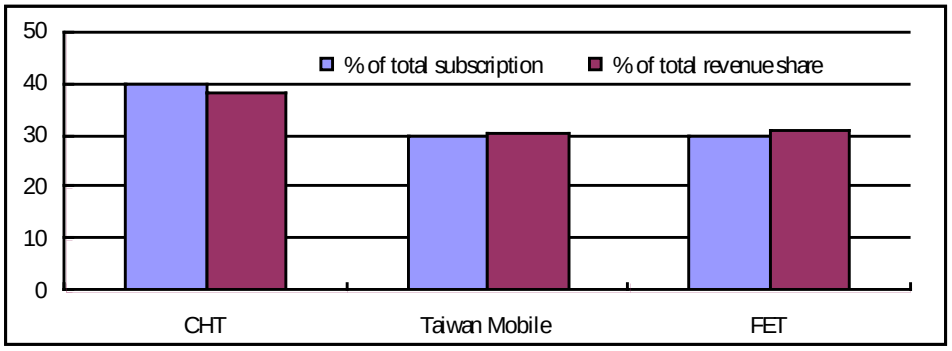

Figure 19.2: Market share in Chinese Taipei's mobile market, 2009 (% of total subscribers). (Source: NCC 2009)

19.3 PRO-COMPETITION REGULATIONS

19.3.1 Interconnection regime

As prescribed in the Telecommunications Act and the Regulations Governing Network Interconnection among Telecommunications Enterprises (hereinafter called the Interconnection Rules), the interconnection and access regulations in Chinese Taipei follow the principle of transparency, reasonableness and non-discrimination. All facility-based Type I operators are mandated, upon request, to interconnect with each other, either directly or indirectly through transit arrangements with third parties (Telecommunications Act, §16, para. 1). The regime also adopts an asymmetric approach that places additional requirements on the SMP to unbundle its network elements, adopt cost-based pricing and share certain essential network facilities with competitors.

In all cases, an interconnection agreement is deemed to be a commercial contract. All terms and conditions, including the point of interconnection (POI) and tariff, are subject to bilateral negotiation (the Interconnection Rules, §7 and §14). The regulator is not in a position to intervene for mediation and arbitration unless operators fail to reach agreement within 3 months from the date of the initial request. Even if the agreement is treated as a private contract, it is still required to observe certain provisions. These include requirements that agreement on the terms and quality of an interconnection should be non-discriminatory and that information exchanged between carriers to facilitate the interconnection of networks should be considered proprietary, and thus confidential. In the draft amendment of the Interconnection Rules published by the DGT in mid 2005, interconnection tariffs between non-dominating operators are also required to follow a cost-based and non-discriminatory approach.

Regulations for an interconnection agreement involving a SMP are different, and the POI is not the subject of negotiation. The Interconnection Rules prescribe a list of POIs where a dominating operator is obliged to offer interconnection with competitors upon request. The dominating operator is mandated to unbundle its network into trunk, local and switching components. The interconnection tariff must be calculated separately based on a Total Element Long Run Incremental Cost (TELRIC) pricing formula set forth by the regulator. In accordance with the Interconnection Rules (§2), TELRIC refers to the long run forward-looking cost added to telecommunications enterprises for making use of equipment; its functions are related, directly or indirectly, to unbundled network elements in order to offer network interconnections.

The final tariff is subject to approval by the regulator. The dominating operator must disclose the formula and method used in calculating the tariff. Also, the interconnection agreements between a dominating operator and other operators must be made publicly available as a reference for subsequent negotiations (articles 16 and 26 of the Interconnection rules).

Prior to 2003, the interconnection regime in Chinese Taipei did not extend to Type II operators. Interconnection between Type I and Type II operators is viewed as a private issue and arranged by commercial negotiation. A series of disputes have arisen since the liberalisation of voice-based Type II service provisions in 2001. These prompted the regulator to amend the Telecommunications Act and the Interconnection Rules in 2003 to include voice-based Special Type II operations under the interconnection regime.

The application of the interconnection regulations between Type I and Type II interconnections is rather limited; it only imposes the duty to provide interconnection with a regulatory arbitration when parties fail to reach consent within 3 months. As there is no requirement for cost-based pricing for interconnection between Type I and Type II operators, the regulatory arbitration mechanism will not be able to set the interconnection tariff for any interconnection disputes. This feature consequently constrains the capacity of the regulatory arbitration to settle interconnection disputes.[3]

Current regulation on interconnection tariffs (i.e., termination charges) in Chinese Taipei has been focused on its role in facilitating competition. Only the interconnection tariff set by the SMP is required to be cost-based and subject to regulatory approval. The application of the regulated tariff must also be non-discriminatory, so that it is applicable to all interconnection seekers.

The DGT amended the Interconnection Rules in 2005 to introduce cost-based and non-discriminatory rules for the calculation of interconnection tariffs across all operator categories. Yet given the bilateral contract nature of interconnection agreements between non-dominating operators, non-discriminatory rules would only be 'on paper' where there is a dispute and parties seek regulatory arbitration. This is because current rules do not require non-dominating operators to disclose their individual interconnection agreements and thus new negotiations cannot draw reference from the tariffs as well as terms and conditions agreed previously. Without this basis for comparison, it would be difficult for the negotiating party and regulator to assess if price and non-price conditions in a later agreement were non-discriminatory. Still, between 2006 and 2008 the regulator intervened to assist the establishment of 48 co-location sites.

Another unique feature of the interconnection tariff regulation in Chinese Taipei is that the access charge between mobile and fixed-line networks are decided by the mobile operator, regardless of which network originates the call. This arrangement departs from a common observation made by other regulators and the literature (Armstrong 2002; Albon & York 2004); they point out that, due to the lack of substitutes, a mobile operator enjoys a termination monopoly over calls made to its subscribers. This provides the opportunity and incentive for a mobile operator to set an access price that is above the competitive level. As such, there are several likely anti-competitive effects in Chinese Taipei's approach to regulating the fixed-line to mobile access charges. Firstly, pricing is not cost-based because interconnection tariffs are determined unilaterally by the mobile operators instead of bilaterally negotiated: this means, at the least, that the cost of the fixed-line partner in an interconnection relationship is not taken into consideration. In practice, all mobile operators in Chinese Taipei have set fixed-line to mobile access charges almost identical to each other through regulator-assisted group negotiations.[4] Secondly, this structure encourages the mobile operators to set the access charge above the competitive level without the need to worry about losing subscribers. Overall, this structure virtually implies that the fixed-line operator is subsidising mobile operators. With mobile market already out-performing the fixed-line market in recent years, this structure is increasingly unsustainable.

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[3] In addition to the interconnection agreement, fixed-line SMP (i.e., CHT) is offering other whole services (e.g., leased line) to other Type I and II operators at tariffs regulated by the NCC.

[4] See the regulator-approved fixed-to-mobile tariff at http://www.cht.com.tw/PersonalCat.php?Module=Fee, Describe&CatID=113&PageID=1694 (accessed on 17 August 2010).

For these reasons, the NCC announced in 2008 its plan to cease this arrangement in 2011. While retail tariff for a fixed-to-mobile call is still set by mobile operators, the NCC has introduced a 'make-up' component in the NCC-approved fixed-to-mobile access charge formula to minimise the subsidising effect.

19.3.2 Access to essential facilities

The regulatory survey undertaken in this report finds that 13 of the 21 APEC members have, in varying forms, mandatory third-party access provisions (i.e., regulations that mandate a major supplier to offer access to essential facilities).

One of Chinese Taipei's third party access regulations assists new entrants to build their own networks by providing access to right-of-way. The regulator has declared a range of physical locations that are considered 'right-of-way bottlenecks', and the holder of right-of-way (i.e., the incumbent) is required to share these locations with competitors. These include public bridges, public tunnels, main access pipelines, distribution frame rooms as well as telecommunications pipelines in multi-complex buildings.

A 'Local Loop Unbundling' (LLU) rule has emerged as a popular arrangement to foster both competition and broadband development (OECD 2003a). Specifically, an LLU rule consists of two requirements: a dominating and vertically integrated operator is required to unbundle formerly integrated network components in local access into separate elements, and the dominant operator has to render access to its unbundled network elements to access seekers at a reasonable and non-discriminatory price and non-price terms and conditions.

In ensuring this is achieved, an access provider's individual or reference access undertakings are subject to regulatory approval in some economies (e.g., Australia), while others (e.g., Chinese Taipei) adopt a regulatory arbitration approach so that the regulator only intervenes when a commercial leasing negotiation has failed to reach agreement. In essence, an LLU rule offers two categories of open access to the local loop.

The open access regime in Chinese Taipei in essence imposes a duty on a SMP to share certain network elements in the local loop with rivals. These network elements have to be unbundled so that an access seeker can lease only the elements that are required. The Telecommunications Act stipulates that a SMP cannot refuse a request for leasing a network component by other Type I telecommunications enterprises without due cause. In addition, the Interconnection Rules in Chinese Taipei require that the local loop be further unbundled between the subscriber lines, local switching facilities and trunk network between local switching offices.

The Telecommunications Act does not, however, provide authorisation for the regulator to determine access tariffs and the pricing model. The only exceptions are in a limited list of network facilities that were declared to be 'bottlenecks' (§37) for which leasing tariffs had to be cost based. In 2006 the twisted-pair local loop was added to the list and in 2009 other elements were added: public bridges, public tunnels and main access pipelines, distribution frame rooms, in-building telecommunications pipelines in multi-complex buildings and local access networks. Of note is that all bottleneck facilities are related to fixed-line operations, as there have been no bottleneck facilities declared for mobile operations.

Despite frequent requests from access seekers since the LLU policy was introduced in 2006, it is not functioning as expected. This appears to be mainly because parties have failed to agree on the level of unbundling, the services that can be provided over the unbundled local

loop and, most importantly, the tariffs for leasing network elements. New entrants have reported that, as of 2009, little more than 200 lines have been leased by new entrants.[5]

19.3.3 Universal service obligations

Teledensity in Chinese Taipei reached 171% per household at the end of 2008 (CHT 2009), which reflects the fact that network coverage is almost universal. This is perhaps the result of past policy before market liberalisation which demanded that the state-owned incumbent provide voice services upon request to all citizens at a uniform and affordable price. Traditionally, any deficit incurred by the incumbent in implementing this policy was compensated by a direct state budget or cross-subsidy from long distance and international services (DGT 1997).

The prohibition of cross-subsidies, in tandem with the increased level of competition in the subsidising service markets post liberalisation, significantly limited the incumbent's ability to recover losses in undertaking the universal service obligation. It was in this capacity that the then current USA regime emerged to establish an industry-wide universal service funding scheme levied on all eligible telecommunications operators.

The Regulation on Telecommunication Universal Services (hereinafter called the Universal Service Rules) in Chinese Taipei defines 'universal services' as the provision of 'indispensable telecommunications services with a reasonable level of quality provided fairly and at reasonable rates for all citizens'. Currently services considered 'indispensable' include voice telephony and data communications. Specifically, the scope of services set out in the Universal Service Rules (USR) include both uneconomic public payphone services, telephone services in uneconomical areas provided via a fixed-line PSTN and broadband Internet access to public schools and libraries at a subsidised price. The term 'uneconomic area' is defined as an area where the avoidable costs of the service provided to it by a local exchange office exceeds the amount of its revenue foregone.

The USR designate the fixed-line incumbent CHT to be the mandatory provider of universal local telephony services. The reason for this designation is straightforward: it is because CHT has the most extensive network coverage. Still, the USR provides the procedures for other local network to become a universal service provider. The amount of subsidy for providing voice telephony under the universal regime is determined by the difference between avoidable costs and the amount of revenues foregone. That is, the subsidy is estimated based on the costs the universal service provider can avoid, and what revenues it would consequently forego, if it were not required to provide services in areas that are deemed uneconomical.

The costs for providing universal services are then distributed and levied across all Type I and Special Type II operators in proportion to their respective annual turnovers. The Universal Service Rules, however, also adopt a threshold of financial eligibility based on market assessment, with only those operators having revenues in excess of TWD200 million required to make a contribution. According to the NCC's latest survey, in 2008 contributions levied from eligible operators in the USA based on that monetary threshold account for 98.4% of that economy's total costs for that year. Inevitably, larger operators have to bear the costs of the levies avoided by small and exempt operators. This is a common practice to

[5] In 2009 the NCC approved the monthly rental price per pair at TWD126, which is 10% lower than the 2007 price of TWD140. This is to encourage new entrant operators to rent LLU owned by SMP and to enhance the competition of ADSL in the fixed-line market. The effect is yet to be observed.

reduce both the possible financial impact on low turnover and new entrants and the cost of managing (by minimising auditing and verifying costs) the funding mechanism without substantially affecting the level of equity and competitive neutrality.

19.4 ASSESSMENT OF PERFORMANCE

19.4.1 Accessibility and price

The recent performance of Chinese Taipei's telecommunications sector has been remarkable in comparison with other APEC member economies. Measurements for major performance indicators, including fixed-line, mobile and broadband service penetration (defined as subscribers per 100 inhabitants), have been significantly refined over the last two decades, while price has been decreasing rapidly over the same period. The lack of competition in the fixed-line market, however, is likely to be responsible for undermining Chinese Taipei's broadband development.

In terms of accessibility performance, fixed-line penetration in Chinese Taipei exceeded that of Australia and Japan in 1998 and of the USA in 2003 (all economies with much higher *per capita* GDPs: see Figure 19.3a). Broadband performance appears to be performing well vis-à-vis these comparator economies (Figure 19.3b). Mobile sector's performance is equally consistent that of fixed-line and broadband. As demonstrated in Figure 19.3c, a sharp increase in mobile penetration took place around 1998 when competitive 2G operators began, surpassing many pioneer economies in the region, such as the USA; Australia; and Japan. This trend of rapid development continued until it reached its saturation point in 2004. The entry of 3G mobile operators in 2003 is likely to be the reason for this rebound in penetration since 2005.

While mobile penetration in Chinese Taipei represents a direct link between structural reform and performance, the relationship between fixed-line and broadband performances in Chinese Taipei and structural reform is less straightforward. The steady upward improvement in fixed-line penetration occurred before the introduction of structural reform in 1996, and no significant change has occurred since the fixed-line market was liberalised in 2001. On other hand, Chinese Taipei, once an APEC forerunner in broadband accessibility, has been lagging behind in broadband access since 2004. As demonstrated in Figure 19.4, the relative level of refinement for broadband penetration in Chinese Taipei between 2004 and 2008 is significantly lower than that in some other developed APEC economies.

Lack of competition due to the dominance of the incumbent CHT in broadband access offers a possible explanation. In fact, the CHT has other potentially anti-competitive conducts that would reflect its strategy to deter competition. One of the recent examples was the bandwidth degradation incident between CHT and other Internet Service Providers (ISPs) in 2009. A dispute over internet interconnection charges took place between CHT and other major ISPs in mid 2009, with the latter requesting regulator's arbitration. It was reported that while the arbitration process was still on-going, CHT unilaterally degraded the interconnection bandwidth with other ISPs to 75% of its normal speed when other ISPs refused to provide deposits before the conclusion of the arbitration.[6] As CHT hosts the majority of Chinese Taipei's prime websites, the impact of bandwidth degradation was felt in essence only by CHT's competitors.[7]

[6] Report on United Daily News (21 May 2009) available at www.mag.udn.com/mag/digital/storypage.
[7] The bandwidth was eventually resumed a week later after the regulator's intervention.

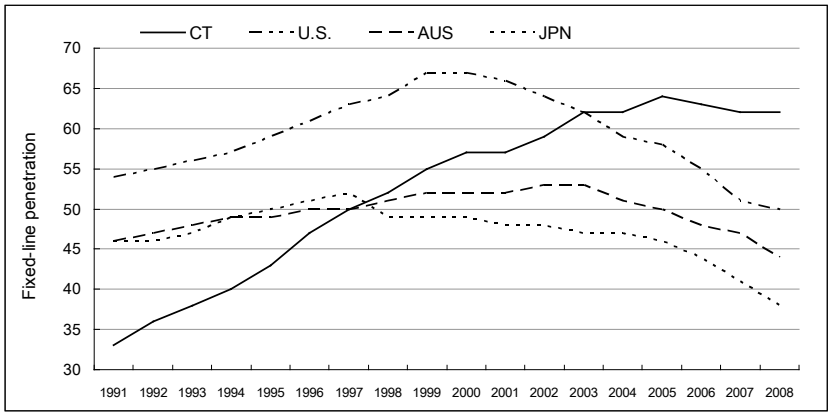

Figure 19.3a: Fixed-line penetration rates in Chinese Taipei; the USA; Australia; and Japan, 1991–2008. (Source: ITU 2009).

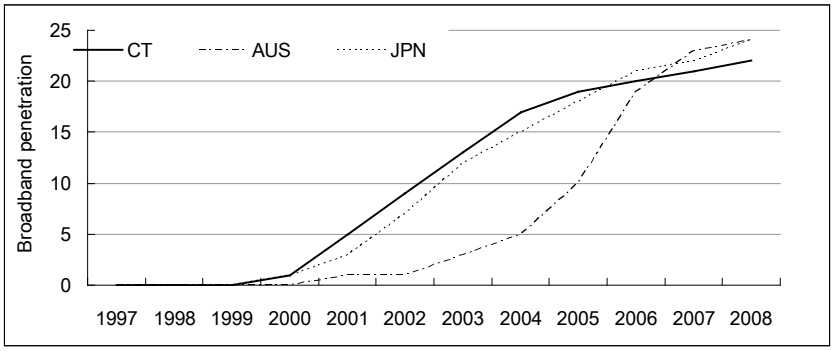

Figure 19.3b: Broadband penetration rates in Chinese Taipei; Australia; and Japan, 1997–2008. (Source: ITU 2009).

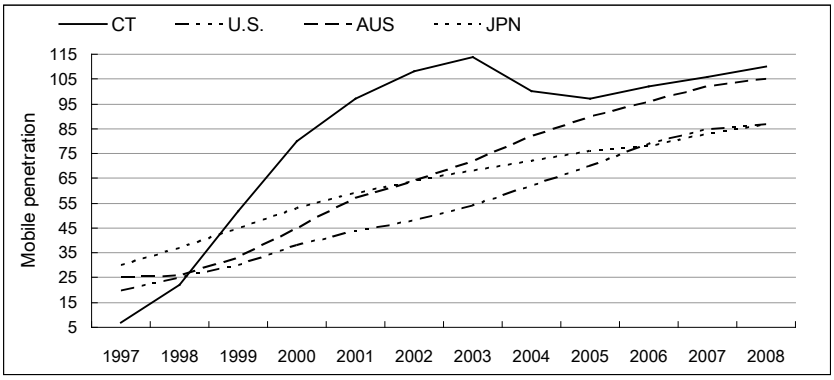

Figure 19.3c: Mobile penetration rates in Chinese Taipei; the USA; Australia; and Japan, 1997–2008. (Source: ITU 2009).

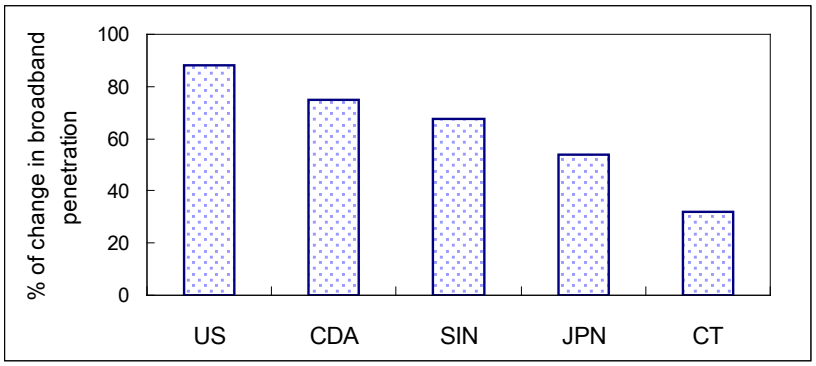

Figure 19.4: Percentage of change in broadband penetration between 2004 and 2008 for five APEC members – the USA; Canada; Singapore; Japan; and Chinese Taipei. (Source: ITU 2009)

Crémer et al. (2000) and Malueg and Schwartz (2001) have argued that bandwidth degradation can achieve the same anti-competitive outcome as pricing-based strategy. Chinese Taipei's competition law authority – the Fair Trade Commission (FTC), also issued a statement to express its concerns on the likelihood of CHT's degradation decision as abuse of market power.[8] Despite the swift resolution of the incident, it would possibly produce a chilling effect at least on future internet interconnection negotiations.

In relation to the change in price, performance in Chinese Taipei also demonstrates a positive relationship between structural reform and performance. A significant reduction for mobile service connection and monthly subscription charges, as well as the connection charge for fixed-line services, took place around the beginning of the structural reform. Of note is that, according to ITU (2009) data, the average connection and monthly subscription charges for mobile services reduced to zero since 2004 after the introduction of 3G mobile services (Figures 19.5a and b). Yet contrary to the ITU data, charging monthly subscription fees is still commonly practised in Chinese Taipei.[9]

Similar to the situation in Viet Nam (Chapter 20) mobile operators in Chinese Taipei waive connection fees with the view of achieving economies of scale. In addition, the level of competition was significantly increased after the entry of new 3G mobile operators, and new entrants often offer free subscription/connection fees, bundled plan with free handset and possibly free on-net calls to lure subscribers to switch operators. This strategy often prompts existing operators to follow suit.

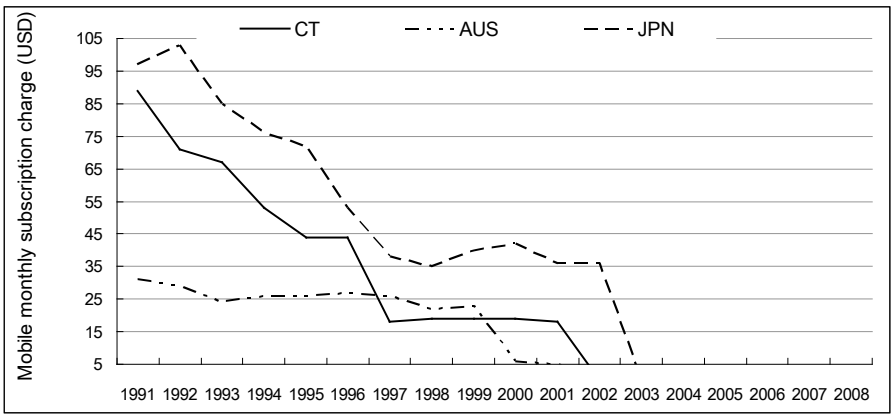

Figure 19.5a: Mobile service monthly subscription charge (USD). (Source: ITU 2009)

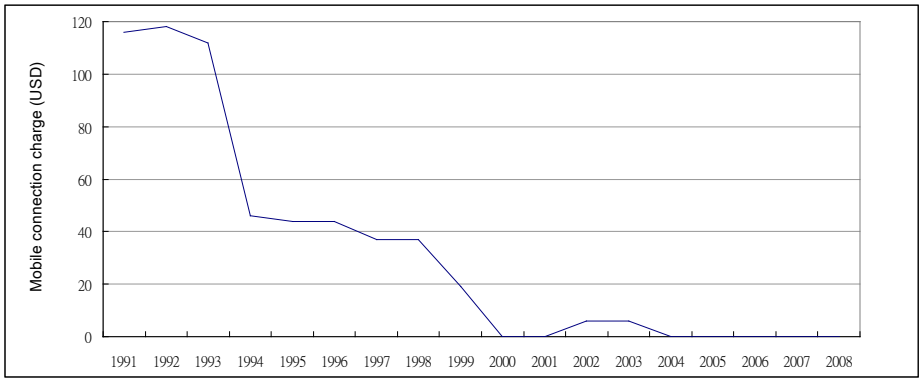

Figure 19.5b: Mobile service connection charge (USD). (Source: ITU 2009)

[8] http://mag.udn.com/mag/digital/storypage.jsp?f_MAIN_ID=314&f_SUB_ID=2922&f_ART_ID=195391

[9] This observation comes from visiting mobile operator's websites (e.g., CHT's at www.cht.com.tw).

19.4.2 Quantitative assessment

In this section, we report on the results of independent research commissioned by Chinese Taipei's telecommunications regulator (which was still the DGT at the time of commissioning) on the impact of liberalisation on efficiency. The report (CIER 2003) aimed to explore efficiency gains at both macro and micro levels.

At a micro level the research examined production efficiency and the total consumer surplus due to price reduction. Using the Data Envelopment Analysis (DEA) methodology in measuring production efficiency, the research found that four out of a total of six mobile services operators in Chinese Taipei enjoyed a technical efficiency value at 1, representing 100% utilisation of input. But most mobile operators failed to reach scale efficiency. On the consumer surplus estimation, the report concluded that between 1998 and 2003 the total consumer surplus reached TWD222.4 billion (USD71.1 billion at the 2010 exchange rate) due to a reduction in the mobile retail price. For the international long distance service, the consumer surplus stemming from the price reduction was TWD23.69 billion (USD0.76 million) (CIER 2003).

At the same time, the report found that the spillover benefit of telecommunications liberalisation in Chinese Taipei also went to the telecommunications system and terminal equipment manufacturing sector and the computer and information system management sector, as well as to the advertising and distribution services.

For macroeconomic impact, the report estimated the impact of the telecommunications liberalisation policy with the Computable General Equilibrium model. It found that, on the assumption that efficiency would be improved through competition, telecommunications liberalisation policy in Chinese Taipei would increase 0.31% of the GDP (equivalent to TWD30.8 million) and TWD19.7 billion in consumer equivalent variation. That is, for every 1% improvement in efficiency, there would be TWD2 billion and TWD1.25 billion increases in GDP and consumer equivalent variations respectively. At the same time, the report observed that there was room for improvement in telecommunications service quality and tariffs through international benchmarking (CIER 2003).

19.5 FUTURE CHALLENGES

Despite the remarkable performances discussed above, the telecommunications structural reform experiences in the APEC region and in Chinese Taipei suggest that policy challenges remain to be addressed. These challenges are likely to be common to most APEC economies.

19.5.1 Market dominance

Market dominance plays a dual role in the characterisation and specification of regulatory treatment. The first role is dominance in the local loop. The local loop is considered to be a bottleneck for competition in a downstream market with a SMP, where the SMP has the ability and incentive to deter competition when it is itself competing in the same downstream market (Economides 2004). Although facility-based competition is allowed at policy level, ensuring third party access to an incumbent-dominated local access network is viewed as the preferred way to encourage entry, by lowering the risks and entry barriers at the initial stage of a market's opening.

Nonetheless, as reflected in Chinese Taipei's experience, regulating market dominance to foster competition is not an easy task. Despite the introduction of pro-competition regulatory

measures as discussed above, CHT still dominates the fixed-line market. Further, as demonstrated in the bandwidth degradation case discussed above, dominance in the local telephony market gives CHT the opportunity to leverage its dominance to the provision of broadband access services such as ADSL and fibre-based access services.

19.5.2 Convergence

Convergence refers to the development that, due to digitalisation and IP-based technologies, traditional market boundaries have been removed and both broadcasting and telecommunications are coming together. Convergence becomes a policy issue when regulatory regimes are not updated with technological and market development, thus becoming barriers instead of facilitators. It is becoming increasingly evident that new IP-enabled services that are, in most respects, 'like' services to their traditional counterparts, are not receiving non-discriminatory treatment.

For example, when CHT launched its IPTV service over the broadband telecommunications network in 2006, it could not apply for a cable TV system licence. This is because each cable TV system licensee in Chinese Taipei can only offer service in one specific 'servicing area';[10] there is thus no licensing category that meets the profile of CHT's nation-wide network coverage.[11]

Another example is the debate over the legal basis for the issuance of mobile TV licences. If mobile TV is defined as a digital free-to-air TV on a hand-held device, the Broadcasting Act would be applicable. Nevertheless, Chinese Taipei's Broadcasting Act prohibits foreign investment, and this would disqualify all existing mobile operators from participating as they all have foreign equity holding).[12]

19.5.3 Competitive safeguards

The WTO Reference Paper stipulates that appropriate measures shall be maintained to prevent major operators, alone or together, engaging in or continuing anti-competitive practices. Anti-competitive practices carried out by operators, in particular operators with market power, pose a major barrier to competition and trade. Regulating operators with market power in the telecommunications market has been widely discussed.

In light of communications convergence, issues of cross-sector anti-competition practices are surfacing that require further attention. For example, it has been reported that TV program distributors owned by cable TV operators in Chinese Taipei have refused to supply TV programs (or in some cases supply only inferior quality programs) to IPTV services offered by telecommunications operators. While most of the refusals are based on disagreement over price and non-price terms and conditions, some of the refusals have been argued by some to be with the intention to distort competition.[13] This indicates that the concept of 'bottleneck facilities' in communications convergence needs to be redefined to address both hardware and 'software' bottlenecks (ITU 2008).

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[10] There are 52 'servicing areas' defined by Chinese Taipei's Cable TV Act.

[11] To resolve the issue, the regulator amended the 'Regulations Governing Fixed Network Telecommunications Business' and defined IPTV over telecommunications networks as 'telecom multimedia platform service' instead of a cable TV system service.

[12] This issue is still pending as at August 2010.

[13] Information collected through field interviews at file with the author.

Unfortunately, while competitive safeguard rules are included in the Telecommunications Act in Chinese Taipei, there is no similar regulation available for the cable TV or other broadcasting sectors. While there is a generic competition law to address possible anti-competition measures, its ex-post nature makes it less effective in regulating anti-competition measures in the broader communications sectors.

19.5.4 Interconnection

As discussed above, major issues in interconnection regulation in Chinese Taipei include non-disclosure interconnection agreements between non-dominating operators and the fixed-line to mobile termination charges. At the same time, with the development of next generation broadband networks, issues of interconnection arrangements for IP-based traffic have come to light. There are issues relating to costing methodologies. Also, Quality of Services (QoS) assurance across networks with differentiated transmission technologies and speed, for example, would be a challenge for regulators to avoid QoS 'Balkanisation' situations (where either an individual or each of a group of networks unilaterally adopts a set of QoS standards that apply only to 'on-net' services).

Three aspects of interconnection QoS in the IP-based environment are involved: standards and indicators of QoS; the technical performance required of a network to ensure that end-to-end performance standards are met; and the division of responsibility in meeting performance goals between interconnecting parties.

19.5.5 Access to essential facilities

As discussed, access to essential facilities, in particular the LLU policy, is not delivering its promised objective in fostering competition and broadband diffusion in Chinese Taipei. As at 2009 only a few more than 200 lines had been leased by new entrants and competition in the fixed-line market was limited by comparison with the mobile sector.

In light of the development in Chinese Taipei of a next generation broadband network, recent discussions have focused on mandatory infrastructure sharing as a new regulatory issue. Technically, as traditional copper wires are replace by fibre-optical cable, substantial physical space will be freed from existing conduits and trenches that will enable sharing by competing operators who are in the process of next generation broadband network deployment. ITU (2008) categorises this type of infrastructure sharing as 'passive sharing' (which includes the sharing of non-electrical 'civil engineering' elements of the network and rights of way). ITU (2008) recognises that passive sharing is a critical approach in encouraging the development of next generation broadband network.

The scope of essential facilities needs to be revisited because of convergence. The provision of cross-sector communication services warrants that the essential aspects, in particular the availability of alternative elements that are able to carry out a similar set of services, need to be assessed from a much broader perspective beyond traditional sector boundaries.

19.5.6 Universal service obligations

Each WTO member should have the right to define the kind of universal service obligations it wishes to maintain. These obligations will not be regarded as anti-competitive *per se*, provided that they are administered in a transparent, non-discriminatory and competitively neutral manner and are not more burdensome than necessary for the kind of universal service defined by the particular economy.

Traditional definitions of universal service focus on the provision of a set of pre-defined services, the most notable of which are voice telephony and data access. Communications convergence has significantly altered the pre-conditions of this traditional approach. As the scope of technologies to be included or omitted in a universal service scheme affects the cost, convergence indicates that what is required is technological neutrality that takes into account the viability of similar cross-networking services. The delivery modes for carrying out universal service obligations (however these are assigned) should not be confined by pre-determined technologies.

Such an approach would also help to identify the qualifications required to entitle operators to share the cost of providing universal service. Many economies tend to impose the universal service contribution onto a narrowly defined group of telecommunications operators, more specifically levying contributions from operators who provide voice telephony services via fixed-line or mobile networks. As an alternative, Sicker and Mindel (2002) and the OECD (2006) discussed the possibility of a contribution scheme based on telephony number assignment to ensure a more technology-neutral funding arrangement.

19.5.7 Allocation and use of spectrum and scarce resources

Any procedures for the allocation and use of scarce resources, including radio spectrum, numbers and rights of way, are important factors determining market accessing. The WTO Reference Paper requires that these procedures should be objective, timely, transparent and non-discriminatory and that the current state of allocated frequency bands should be made publicly available.

Emerging issues in this regard include the re-allocation and re-assignment of additional spectrums that are released after the digital terrestrial TV (DTV) switch over and the allocation and assignment of numbers to IP-based telephony services.

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Chapter 20

TELECOMMUNICATIONS IN VIET NAM

Roy Chun Lee[1]

- Vietnam adopted a transparent and predictable regulatory environment to foster competition, particularly in Internet-based services, and network investment.
- Prices and charges fell and penetration rose rapidly, exceeding that in peer economies.
- The establishment of the universal service fund made an important contribution to access to services.

20.1 INTRODUCTION

The telecommunications sector in Viet Nam has been considered an important element in the 'Doi Moi' economic reforms that started in 1986, and the economy has achieved a remarkable result through structural reform initiatives that depart from the traditional state monopoly mould.

Similar to many of its fellow APEC members, Viet Nam's market liberalisation policy is based on a progressive approach. Domestic entry is allowed to provide non-facility based/value-added services at the initial stage, while facility-based telecommunications services are to date still dominated by state-owned telecommunications operators, despite the fact that intense competition is taking place among them. The incumbent operator is the Viet Nam Posts and Telecommunications Corporation (VNPT), which spun off from the Department General of Posts and Telecommunications (DGPT) after the separation of regulatory and commercial functions of the latter in 1990. Following the creation of a separate regulatory entity, market segments were opened to competition, starting with mobile services in 1995. The international services market, considered the most lucrative, was opened to other providers in 2000.

This case study reviews the process of the introduction of these reforms and their consequences. A key interest is the treatment of Internet services. The next section reviews the licensing regime, regulation and market structure.

20.2 REGULATION AND MARKET STRUCTURE

20.2.1 Private and foreign entry conditions

Competition in all market segments in telecommunications in Viet Nam except value-added services is limited to state-owned operators that are under the supervision of different ministries. This policy appears to reflect the government's philosophy that telecommunications is a public service that the state should control to ensure equal and affordable access to its citizens.[2] However, a government decree issued in 2001 exempts Internet services from the

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[2] Liberalising ASEAN Telecom, 02-009.

state-dominating policy.[3] This regulation opens up ISP business to the private sector and foreign investors but reserves the provision of Internet exchange to state-owned operators or operators where the state holds majority shares. Internet exchange operators supply local Internet Service Providers (ISPs) with access to the World Wide Web via their international gateways.

Foreign investment in Viet Nam's telecommunications sector was first introduced in the form of a Business Cooperation Contract (BCC) scheme. A BCC scheme enables foreign partners to provide infrastructure deployment and financing while the local state-owned partner provides services, with the revenue shared among the partners (USAID 2005). However, the foreign partner does not have an equity claim in the assets and does not have any managerial control on the project. The first BCC scheme was established in 1988. As at 2009 there were still a number of BCCs in operation (Table 20.1). Possibly some of these will become joint venture-based equity participation entities when Viet Nam's Law on Telecommunications comes into force, a direction that is in line with Viet Nam's WTO commitments.

Table 20.1: Examples of Business Cooperation Contracts (BCCs) in Viet Nam.

BCC partners	Began (years)	Areas of cooperation
VNPT-Telstra	1988 (6)	Fixed-line services
VNPT-Sapura (Malaysia)	1993 (8)	Public phone services
VNPT-Comvik (Sweden)	1995 (10)	GSM service through Viet Nam Mobile Service
VNPT-Voice International (Australia)	1995 (9)	Paging services
VNPT-Korea Telecom	1996 (10)	Fixed-line services
VNPT-NTT	1997 (15)	Fixed-line services
France Telecom and VNPT	1997 (15)	Fixed-line services
VNPT-Cable and Wireless	1997 (15)	Fixed-line services
SPTS-SK Telecom	2003 (*)	Mobile services
Hanoi Telecom-Hutchison Telecom (Hong Kong, China)	2005 (15)	Mobile services

Source: USAID, 2005

* Built-in clause to convert into equity participation when Viet Nam passes the Law on Telecommunications.

Relaxation of foreign participation took a significant step forward when Viet Nam ratified a Bilateral Trade Agreement (BTA) with the United States of America (USA) in November 2001 in light of Viet Nam's application to join the WTO. The USA–Viet Nam BTA includes not only Viet Nam's commitments and obligations in the telecommunications sector but also a roadmap and blueprints for future reform. The BTA requires Viet Nam, amongst other things, to adopt the regulatory principles set out in the WTO Reference Paper on Basic Telecommunications, (hereinafter WTO Reference Paper) in order to establish a transparent and pro-competitive regulatory regime, with the regime maintaining an arm's length relationship with operators.

In terms of market access, the BTA binds Viet Nam to relax its restrictions on foreign investment with respect to US firms and specifically allows the formation of joint ventures, where the US partner can have an equity share of up to 49%. Viet Nam's main commitments in the BTA include:

- Value-added telecommunications – US companies have been allowed to form joint ventures from 2 years after implementation of the Agreement (i.e., 2003);

[3] Decree No. 55/2001/ND-CP, 23 August 2001.

- Basic telecommunications, including mobile cellular and satellite – Viet Nam has allowed US companies to form joint ventures since 4 years after implementation of the Agreement (i.e., 2005); and
- Voice telephone services – US companies have been allowed to form joint ventures since 6 years after implementation of the Agreement (i.e., 2007).

The joint ventures are not allowed to build a backbone network or gateway facilities but must lease these from VNPT.

An Ordinance on Posts and Telecommunications, Ordinance 43-2002-PL-UBTVQH10, was issued in May 2002 to implement many of Viet Nam's obligations under the BTA. As agreed in the BTA, the Ordinance includes many of the regulatory principles adopted by the WTO Reference Paper to create a pro-competitive regulatory framework for the telecommunications sector. In particular, the Ordinance adopts an 'asymmetric' regulatory approach, which subjects only service providers with market power to certain regulations on pricing, quality and other market behaviour. An operator covered by regulation is also required to maintain separate cost accounting systems for each type of service where it has at least 30% market share, and is expressly prohibited from carrying out anti-competitive practices. The Ordinance enabled new entrants to increase their market shares as they are permitted to launch promotions to attract new customers, while the incumbent is prohibited from doing the same. Since the Ordinance mandates lower interconnection rates to non-dominant firms, it allows new entrants to gain cost advantages. In addition, the Ordinance's implementing decree established a separate Ministry of Posts and Telematics to regulate the industry.[4]

A second reform milestone was Viet Nam's WTO accession in 2007. As part of its accession commitments, Viet Nam in essence offered to all WTO members, on a most-favoured nation basis, more favourable market access conditions than those offered to US companies in the BTA. This allowed joint ventures with foreign partners to provide telecommunications services related to network infrastructure such as telephone services, packet-switched data transmission services, circuit-switched data transmission services, telex services, telegraph services, facsimile services and private leased circuit services. Viet Nam's specific commitments are:

(1) *Basic telecommunications services*

- Non facilities-based services: The foreign capital contribution must not exceed 51% of the joint venture's capital; this limit rose to 65% 3 years after the accession (i.e., 2010), and without limitation on the choice of partner. For Virtual Private Networks, the foreign capital contribution must not exceed 70% of the legal capital of the joint ventures.
- Facilities-based services: On accession, joint ventures with telecommunications service suppliers duly licensed in Viet Nam became allowable. The foreign capital contribution must not exceed 49% of the legal capital of the joint ventures. For Virtual Private Network, the foreign capital contribution must not exceed 50%.

(2) *Value-added telecommunications services*

- Non facilities-based services: The foreign capital contribution must not exceed 51% of the joint venture's capital; this limit to rose to 65% 3 years after the accession (i.e., 2010), and without limitation on the choice of partner.
- Facilities-based services: On accession, joint ventures with telecommunications service suppliers duly licensed in Viet Nam became

[4] Decree 90-2002-ND-CP on Establishing Functions, Tasks, Mandates and Organisation of the Ministry of Post and Telecom (11 November 2002).

allowable. The foreign capital contribution must not exceed 50% of legal capital of the joint ventures.

(3) *BCC conversion*

- For both basic and value-added telecommunications services, foreign investors in BCCs have the opportunity to renew current arrangements or to convert them into another form of establishment with conditions no less favourable than those they currently enjoy.

20.2.2 The Law on Telecommunications

In light of Viet Nam's WTO commitments, at the end of 2009 it formally passed a Law on Telecommunications to replace the existing Ordinance from July 2010.[5] The Law on Telecommunications in essence establishes a framework for telecommunications regulations, with many specific regulatory items to be developed by implementation rules and regulations in the future (Informed Counsel 2010). For example, the Law divides telecommunications services into two categories – basic and value-added – without defining the scope of each category.

Further, the Law offers a legal basis for foreign and domestic investors to participate in the telecommunications sector. Specifically, Article 18 stipulates that the forms and conditions for investment in telecommunications services applicable to foreign investors must comply with Vietnamese laws and Viet Nam's WTO commitments, without further specifying the maximum foreign investment ceilings for each of the service categories. In this regard, the Law needs to be read in conjunction with Viet Nam's WTO commitments. However, the Law formalises the procedures for participation through the introduction of the 'Telecom Business Service Licensing' regime, which requires foreign operators to obtain an additional Investment Certificate. With particular respect to structural reform, the Law also includes provisions for a pro-competition regulatory regime, covering aspects such as abuse of market power regulation, interconnection rules and access to essential facilities.

The government retains control over fixed telephone service charges but operators will have the freedom to determine retail tariffs for other services. Yet for 'important' services, such as mobile services and the Internet, operators need to pre-register their proposed tariffs with the Ministry of Information and Communication (MIC) before applying the charges.

Finally, a regulatory authority to be established under the Law will be in charge of regulating competition issues in the telecommunications sector and will act as a dispute settlement body for interconnection and infrastructure sharing disputes. The Law does not specify the independence of this authority; it is positioned as an 'assisting' body to the MIC.

The major policy milestones in Viet Nam's telecommunications structural reform process are summarised in Table 20.2.

20.2.3 Licensing regime

Prior to 2002 there was a lack of a transparent and clearly defined licensing regime in Viet Nam. As all new operators were established by different government departments (e.g., Viettel by the military and EVN by the electricity monopoly), local governments, state-owned

[5] http://www.lookatViet Nam.com/2009/12/telecommunication-law-to-take-effect-next-july.html.

Table 20.2: Sequence of telecommunications reform in Viet Nam.

Reform initiatives	1988	1993	1996	1998	2000	2002	2003	2004	2005	2006	2007	2008	2009
Foreign participation through BCC													
Separation of VPNT from the regulator (DGPT)													
Second operator (Saigon P&T) entered market													
Signing of US-Viet Nam BTA													
Creation of Ministry of Posts and Telematics													
Post and Telecommunications Ordinance of 2002													
Acceded to the WTO													
Creation of Ministry of Information and Communications													
Licensing of 3G mobile market													
Passage of Law on Telecommunications, 2009													

enterprises and VNPT itself (such as VNPT's share-holding in SPT and MobiFone), licensing of new operators was more a matter of the government's internal coordination.

The first move towards modernising the licensing regime came with the introduction of the Ordinance on Post and Telecommunications in 2002. Specifically, Article 38 of the Ordinance provides for two types of licences: one for network infrastructure providers (Facility-based Operators [FBOs]) and one for telecommunications service providers (Services-based Operators [SBOs]). The FBO licence is exclusively reserved for state-owned or state-controlled enterprises and has a maximum term of 15 years. The SBO licence can be awarded to the private sector and has a maximum term of 10 years. Nonetheless, as the Ordinance does not contain provisions concerning administrative transparency and due process, there are no requirements for the disclosure of licensing conditions or background information on decisions made with respect to an application for a telecommunications licence.[6]

Of note is that the Law on Telecommunications creates licensing regimes for basic and value-added services. As mentioned, however, the Law does not provide definitions for either the scope of services under each category or the licensing procedures. At this time a lack of information means it is not clear how licensing each service category is to be carried out.

20.2.4 Market structure

Since the issuing of the first set of fixed-line licences to Viettel (100% owned by Viet Nam's military) and Saigon Postal and Telecom (SPT; a joint venture between the incumbent VNPT and other state-owned enterprises) in 1995, there are now eight licensed fixed-line and seven mobile FBO operators in Viet Nam (Table 20.3), all of whom are owned by other government departments and/or state-owned enterprises. The latest example is the Ministry of Public Security which controls G-Tel: it was awarded 3G (2009) and FBO licences (2010).

[6] Liberalising ASEAN Telecom, economy report.

Table 20.3: History of market opening in Viet Nam.

Services		Year second operator entered market	No. of licenses issued
Fixed-line service	Local and DLD services	1995 (Viettel, SPT)	9 (VNPT, Viettel, SPT, HT(Hanoi Telecom), EVN, GTel, FPT, VTC* and CMC.
	International services	2000 (Viettel, SPT,)	
Mobile service		1998 (GSM) 2009 (3G)	▪ GSM and CDMA: 6 (VinaPhone, Viettel, Mobifone, EVN, SPT, HT) ▪ 3G: 4 (MobiFone , VinaPhone, Viettel, GTel)
Mobile Virtual Network Operator (MVNO)		2009	1(Indochina Telecom)**
Internet service		1997	13 ISPs; 6 IXPs; 10 IOSPs

Sources: Various
* License revoked on February 2010 due to failure to complete network construction requirements.
** Leased capacity from Viettel.

It is noted that, for fixed-line services, some of the new entrants are competing with VNPT at specific geographical areas. For instance, SPT operates its fixed-line local services in Ho Chi Minh City, while HT Telecom's local service is confined to Hanoi City.

Despite the good number of new entrants, the fixed-line FBO services market remains concentrated, with the incumbent VNPT dominating about 65% of total fixed-line subscriptions, and Viettel and EVN having 18.1% and 16.3% shares of the remaining market respectively (Figure 20.1). Yet this development should be considered as an encouraging sign, given the fact that Viettel's market share was reported at a nominal 0.5% in 2002 (REPSF 2004). It is also a positive performance when compared with that of Chinese Taipei, where the incumbent's domination in the local market is close to 98%.

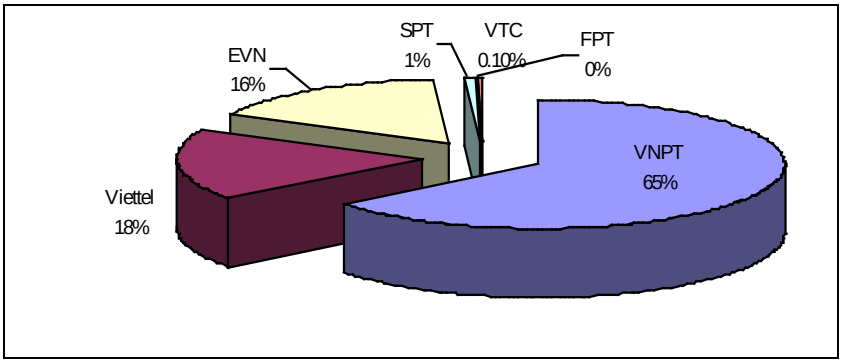


Figure 20.1: Market share in Viet Nam's fixed-line market, 2009 (% of total subscribers). (Source: MIC 2009)

The mobile market is significantly more competitive in Viet Nam. As of 2009, Viet Nam's mobile market is divided in principle between three major operators, namely VinaPhone, Viettel and MobiFone. Viettel accounts for 31.6% market share with around 8 million subscribers; MobiFone accounts for 25.4% market share with 6.5 million subscribers and VinaPhone accounts for 31.6% market share with 5.8 million subscribers (Figure 20.2). In addition, Viet Nam issued four third-generation (3G) mobile licences in early 2009, to the three major mobile operators (i.e., MobiFone, VinaPhone and Viettel) and to one new entrant (GTel). In the same year, Indochina Telecom received the first Mobile Virtual Network Operator (MVNO) licence. An MVNO operator is not required to build its own network infrastructure but to lease capacities from other FBOs.

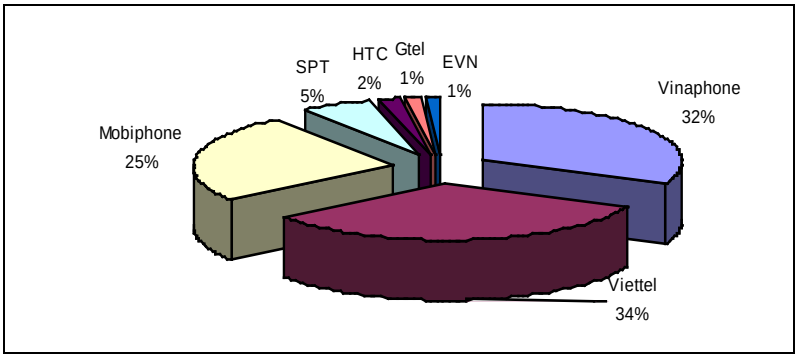


Figure 20.2: Market share in Viet Nam's mobile market, 2009 (% of total subscribers). (Source: MIC 2009)

It is noted, however, that while VinaPhone – the second largest operator – is a direct subsidiary of the incumbent, VNPT also enjoys a cross-ownership in MobiFone through its BCC contract with Sweden's Comvik. This structure indicates how VNPT remains dominant in the mobile market.

20.3 PRO-COMPETITION REGULATIONS

20.3.1 Overview and regulation of operators with significant market power

Before the promulgation of the Ordinance on Posts and Telecommunications in 2002 there was no clear regulatory framework: it was perhaps less urgent then, when the telecommunications sector was exclusively provided by state enterprises. But with the increased level of competition in all market segments, in tandem with private participation in the value-added/services-based services, came the need to define the conditions for private participation in the sector. The current Law lacks important provisions with respect to transparency and dispute resolution, and it has also not defined the regulatory objectives. Nonetheless, it does have laudable provisions that promote new entry and ensure fair competition by restraining abusive conduct by dominant players, as well as ensuring universal access to basic services.

Competition regulation in Viet Nam moved a step forward when the Law on Competition came into force in 2004. In particular, this Law prohibited enterprises with Significant Market Power (SMP) from taking any of the following abusive actions:

- selling goods, or providing services at prices lower than the aggregate costs, in order to eliminate competitors;
- imposing irrational buying or selling prices on goods or services or fixing minimum re-selling prices, causing damage to customers;
- restricting production or the distribution of goods or services, limiting markets, or preventing technical and technological development, causing damage to customers;
- imposing dissimilar commercial conditions in similar transactions, in order to create inequality in competition;
- imposing conditions on other enterprises to conclude goods or services purchase or sale contracts or forcing other enterprises to accept obligations which have no direct connection with the subject of their contracts; and
- preventing new competitors from entering the market.

Under the Law on Competition, the definition of SMP is based on single-firm dominance and joint dominance. For single-firm dominance, enterprises are considered to hold the dominant position if they have market shares of 30% or more on the relevant market or are capable of restricting competition considerably. For joint dominance, a specific group of enterprises are

considered to hold the dominant position if they, as a group, take concerted action to restrict competition and fall into one of the following classes:

- two enterprises having a total market share of 50% or more in the relevant market;
- three enterprises having a total market share of 65% or more in the relevant market; and
- four enterprises having a total market share of 75% or more in the relevant market.

In accordance with the Implementation Decree (Decree 116/2005/ND-CP), the Law on Competition is applicable to the telecommunications sector. As a result, in 2008 the MIC published a list of business services and telecommunications enterprises with SMP (Decision 1622; Table 20.4). Telecommunications enterprises included in the list are subject to the MIC's regulation on the retail tariff: they must submit any proposal to change the retail tariff to the MIC before issuing the tariff, and 'basic' and 'important' interconnection charges that would greatly affect the telecommunications market are also decided by the MIC.

Table 20.4: SMP telecommunications enterprises, 2008.

Services market	SMP operator	Single or Group SMP
International voice	VNPT	Single
DLD Voice	VNPT	Single
International and Domestic leased line	VNPT, Viettel, EVN Telecom	Group
Mobile services	Viettel, MobiFone, VinaPhone	Group
Wireless local voice	EVN Telecom	Single
Internet (leased line and ADSL)	VNPT, FPT, Viettel	Group

Source: MIC 2009

The anti-competition rules in the Law on Competition were incorporated into the Law on Telecommunications. The new provision on competition in the telecommunications business is Article 19 of the Law on Telecommunications. Specifically, telecommunications enterprises are prohibited from implementing practices that restrain competition and may not engage in unfair competitive practices. The Law also includes telecommunications-specific SMP regulations which control essential telecommunications facilities. Those regulations prohibit SMP telecommunications enterprises from:

- improperly intermingling different telecommunications services for an unfair competitive purpose;
- using their priority on telecommunications networks and essential facilities to impede market penetration, or limiting or creating obstacles for other telecommunications enterprises in providing telecommunications services;
- using information about other telecommunications enterprises for unfair competitive purposes; and
- providing other telecommunications enterprises with technical information on essential facilities and related trade information for providing telecommunications services in a timely manner.

At this stage, however, it is not clear about the division of jurisdiction between MIC and other competition authorities (the Viet Nam Competition Administration Department [VCAD] and the Viet Nam Competition Council [VCC]) over the regulation of anti-competitive practices in the telecommunications sector.

20.3.2 Interconnection regime

Article 43 of the Ordinance stipulates that all telecommunications enterprises have the right to 'link their own network to those of other telecommunications enterprises and shall be

obliged to allow those other telecommunications enterprises to link and access their own networks or services subject to fair and reasonable conditions'. Access and interconnection at every technically and economically feasible point is mandatory for service providers that hold 'essential equipment and facilities'. However, the Ordinance does not define the meaning of essential equipment and facilities, and unbundling of interconnection services is not required. Interconnection agreements are to be negotiated between operators, and where an agreement cannot be concluded within the time limit (45 days according to MIC regulations), the MIC will resolve the dispute. The MIC's decision is final, unless the affected party appeals the case to the Administrative Court. Interconnection charges are still regulated by the MIC.

Co-location is also envisioned in the Ordinance. Article 43(2) provides for 'shared use of linking points and technical infrastructure facilities via linking agreement between two signed parties'. Despite this provision, the sharing of facilities is one of the contentious issues in forging interconnection agreements.

The basis for setting an interconnection fee is *ad hoc*, although it is said to approximate cost plus a contribution to universal service (called a Community Service Obligation [CSO]). As required by Article 39 of the Ordinance, a service provider must maintain separate cost accounting systems for services where it holds the dominant market share. To this end, VNPT is currently implementing changes in its accounting system, so perhaps cost information will be more transparent in the near future. However, the cost associated with CSO remains an area of contention. But with the establishment of the universal service fund (VTF: see 20.3.3), this practice is to be phased out soon. Finally, because the Ordinance does not require disclosure of interconnection or access agreements, some regulation promoting transparency may be required in the future as Viet Nam complies with its WTO obligations.

20.3.3 Universal service obligations

Traditionally, VNPT has been the only operator to embrace the obligation to provide universal services in both the cities and rural areas. New operators have chosen to provide services only in areas that are profitable, such as Hanoi and Ho Chi Minh City.

VNPT has always cross-subsidised domestic services with revenues from international and domestic long distance services but with the declining price trend and emerging competition from new entrants, VNPT has become concerned about the gradual 'drying-up' of funding sources for universal services. The new operators, however, are concerned about being overcharged for universal services because the universal service obligation contribution was collected as a mark-up of the interconnection charges payable to VNPT.

In response to calls for reform, and consistent with the WTO Reference Paper, Section 5 of the 2002 Ordinance on Posts and Telecommunications deals specifically with universal service obligations, although it does not define the scope of universal services. However, Article 50 empowers the government to mobilise funds for the provision of telecommunications services for the public interest through interconnection or access charges or by setting up a universal service fund. The funds may be disbursed either by competitive tendering or by a universal service provider appointed by the government. The Ordinance further provides that the government can stipulate policies and measures for the provision of public telecommunications services.

As a result of the Ordinance's requirement, the Viet Nam Public Utility Telecommunication Service Fund (VTF) was established in 2004 as a public financing institution under the

Ministry of Posts and Telematics (now MIC). The mission of the VTF is to support the development and provision of public-utility telecommunications services in regions where market mechanisms fail to deliver the intended policy outcomes on a cost-effective basis. In 2006 the government approved the 'Program on provision of public-utility telecommunications service until 2010' (Decision No.: 74/QD-TTg; hereinafter the Program), which specifies the following services as part of the public-utility telecommunications service:

- universal telecommunications services, which include a standard telephone service and a standard Internet access service; and
- compulsory telecommunications services, which include emergency communication services, telecommunications services for searching, rescuing, protecting and fighting natural calamities as regulated by competent agencies and fixed telephone number enquiries and telecommunications services serving the state's emergent activities.

Funding to support the VTF comes from industry-based levies. All eligible operators contribute to the VTF fund and the contribution is collected from 5% of mobile services revenue, 4% from international voice and leased line services and 3% from domestic long distance services and leased line services.

The functions of the VTF are mainly:

- to facilitate investment in and development of new infrastructure access points in locations where adequate public-utility telecommunications services are not yet available;
- to support maintenance costs for the continued provision of public-utility telecommunications services in areas where those services are already available; and
- for the development of users of those services.

VTF financial support has two categories. The first is direct funding for the development and maintenance of public-utility telecommunications services within designated regions. The second is soft financing to assist enterprises in establishing, upgrading, and extending telecommunications infrastructure and facilities to providing public-utility telecommunications services within designated regions.

As outlined in the program, the specific objectives of the VTF were to ensure that, by 2010:

- teledensity in the areas provided with public-utility telecommunications services reaches five telephone sets per 100 people;
- 100% of communes throughout Viet Nam have public telephone service access points;
- 70% have public Internet service access points; and
- all citizens have the right to free access to compulsory telecommunications services.

According to VTF's statement, these policy targets were achieved in 2009, with 10.7 out of 100 people now using public telephones in remote areas and 4873 public telecommunications access areas already established. [7]

20.3.4 Allocation of spectrum

Prior to the Law on Telecommunications, there was no formal and official regulation relating to spectrum. While the new draft law may loosen government control of telecommunications enterprises, it still provides methods for allocating telecommunications resources. Those

[7] http://www.vtf.vn/en/news/2010/02/4F1B6200/

resources with a high value will be allocated either via public auction or 'beauty contest', while other resources will be allocated on the usual 'first come, first served' basis.

In addition, the transferability of telecommunications resources will for the first time only be recognised if the resources were obtained via public auction. Unfortunately, the draft law ignores the transferability of telecommunication resources obtained by a telecommunications enterprise via other methods, such as when it makes capital contributions to form a new telecommunications company (e.g., a joint venture with a foreign partner under Viet Nam's WTO commitments).

In 2006 and 2007 a joint pilot project between Intel, the Viet Nam Data Communication Company (VDC) and the United States Agency for International Development (USAID) was launched to deploy high-speed wireless broadband in remotely located villages in the northern part of Viet Nam, using a combination of WiMAX and geo-synchronous satellite. With limited mobile phone coverage and only two PSTN phone lines in the whole area, ShinCorp's IPSTAR satellite is being used to provide the backbone of the Internet connection. These examples of technological innovation for closing the digital divide, however, require policy support beyond financial assistance. For instance, as Viet Nam has not decided the timing and spectrum band (most likely 2.3 MHz and 2.5 MHz) for the allocation of Wimax's spectrum licensing, the pilot project is running under a trial licence. In this regard, acceleration of the spectrum licensing would facilitate not only competition for broadband access but also the provision of universal service.

20.4. ASSESSMENT OF PERFORMANCE

Viet Nam has set many policy targets before. In 2005 Viet Nam's National Institute of Posts and Telematics Strategy (NIPTS) estimated that by 2010 the total telecommunications density would be around 32–35%, including 18–20% for mobile services. Also by 2010 Internet subscriber density would be 13%, while Internet user penetration would be 50%, including 30% broadband user penetration, and PC penetration was expected to be 10%.

In hindsight, the NIPTS' 2010 vision was too modest, as all its policy targets were in principle achieved by 2008, except Internet subscription, which is just half-way towards its target. In particular, the 'explosive' style of fixed-line and mobile developments during 2006–08 underpins Viet Nam's high quality performance in recent years. By 2007 mobile services had surpassed fixed-line services to become the most widely available telecommunications service in Viet Nam, reaching a penetration rate of nearly 80% of the population by 2008 (Figure 20.3). The rapid diffusion of telecommunications services to rural and remote areas is positively a major benefit of telecommunications structural reform.

Fixed-line development seems to be modest compared to the mobile growth rate, yet it is equally outstanding when compared with other APEC economies with similar levels of economic/telecommunications developments (Figure 20.4). Prior to 2003 Viet Nam (GDP *per capita* USD1042.4 at 2008) shared a similar level of fixed-line penetration rate with Indonesia (GDP *per capita* USD2237.7) and the Philippines (GDP *per capita* USD1851.5), yet a jump-start style of rapid development was observed for Viet Nam, starting from 2003.

Viet Nam has since moved from an under-developed economy to join many of its developed peers in the region in fixed-line availability. Structural reform efforts have evidently contributed to this outcome, with the introduction of the 2002 Ordinance and the establishment of the universal service fund (VTF). The Ordinance offers a relatively

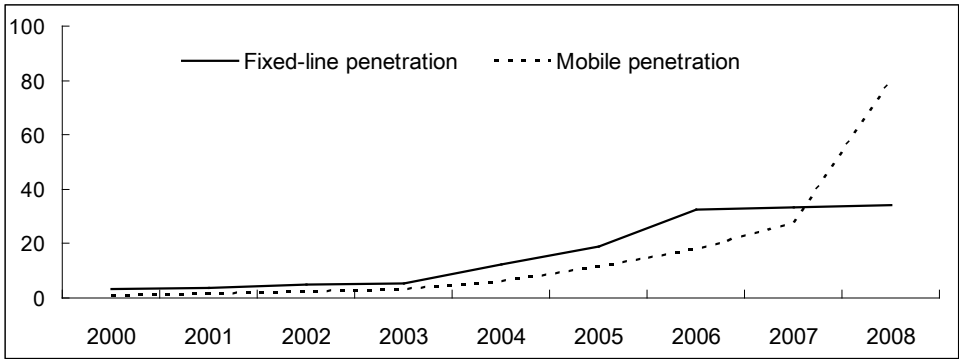
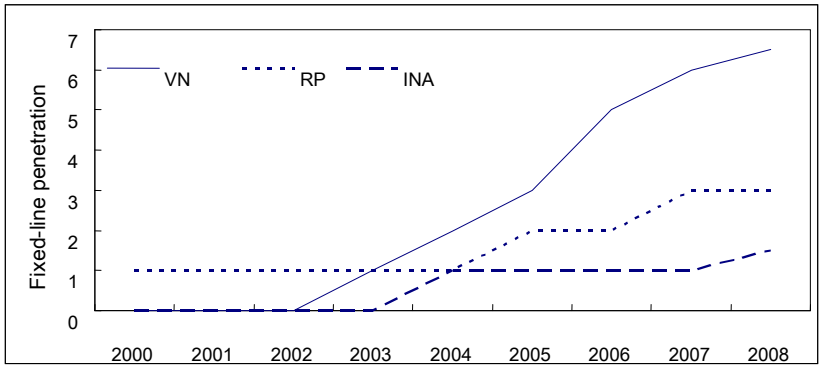
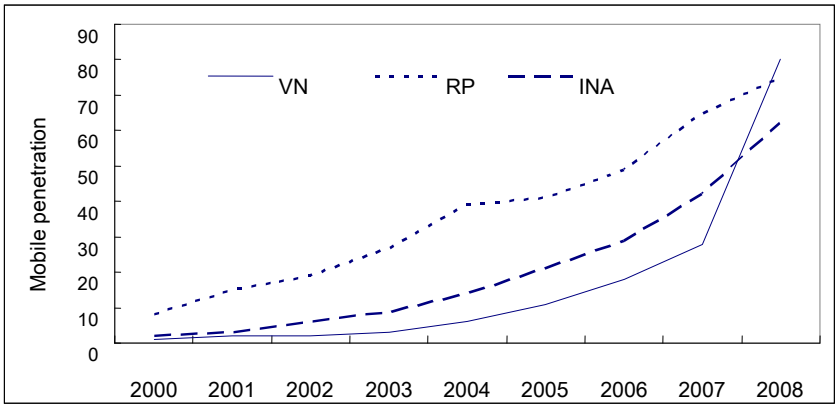


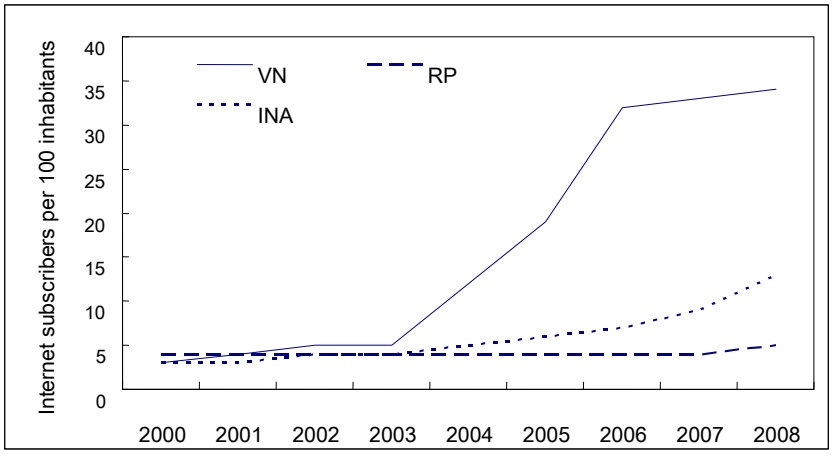
Figure 20.3: Changes in fixed-line and mobile penetration rates in Viet Nam. (Source: ITU 2009)



(1) Fixed-line subscribers per 100 inhabitants



(2) Mobile subscribers per 100 inhabitants



(3) Internet subscribers per 100 inhabitants

Figure 20.4: Comparison of the fixed-line, Internet and mobile penetration rates of Viet Nam; the Philippines; and Indonesia. (Source: ITU 2009)

transparent and predictable regulatory environment to foster competition and network investment, and the VTF offers clearly defined financial incentives to assist the rapid expansion of networks in under-served regions.

Mobile penetration in Viet Nam represents another interesting story. While Indonesia and the Philippines appear to follow a more linear development approach, mobile services in Viet Nam again show a jump-start style of network expansion, surpassing both Indonesia and the Philippines during 2007–08.

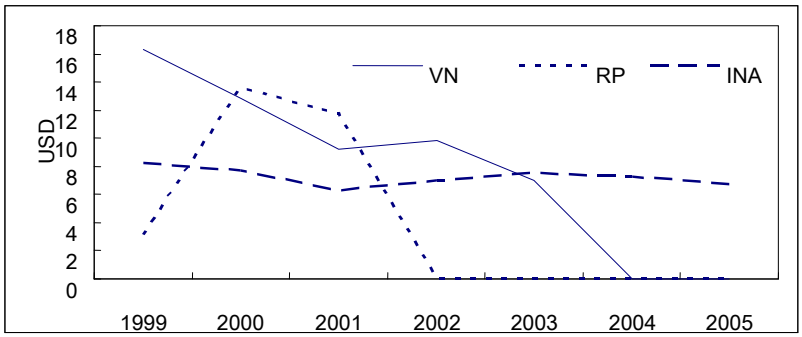
Finally, the rate of Viet Nam's Internet subscribers offers yet another good example of the correlation between reform and performance. Two primary reform initiatives are possibly responsible for the sharp increase in Internet subscription: the first, when the Internet services sector was liberalised in Viet Nam's 2002 Ordinance to allow private participation, which increased supply and the level of competition, and the second, the contribution of the VTF, which includes public Internet access as part of the universal service scheme. As noted above, however, at just halfway towards its target, this result is still short of meeting the NIPTS' vision to achieve a 13% penetration rate by 2010.

In relation to price, the experience in Viet Nam demonstrates a positive relationship between market liberalisation and performance (Figure 20.5). Monthly subscription charges for mobile services have been reduced from nearly USD17 in 1999 to zero in 2004 (Figure 20.5[1]). For the average tariff of a 3-minute off-peak mobile call, as at 2005 Viet Nam was the highest of the three sample economies, yet by 2008 it became the economy with the lowest rate. The main reason for the zero subscription charge strategy is that, as network coverage expands to a nation-wide level, free subscription is an effective way of achieving scale economies and enhancing the positive network effects. The latter, for example, gives a network with a larger subscription base an advantage in interconnection negotiations. From a universal service perspective, this outcome could be considered as an alternative and efficient way of achieving the universal service objective through a market mechanism.

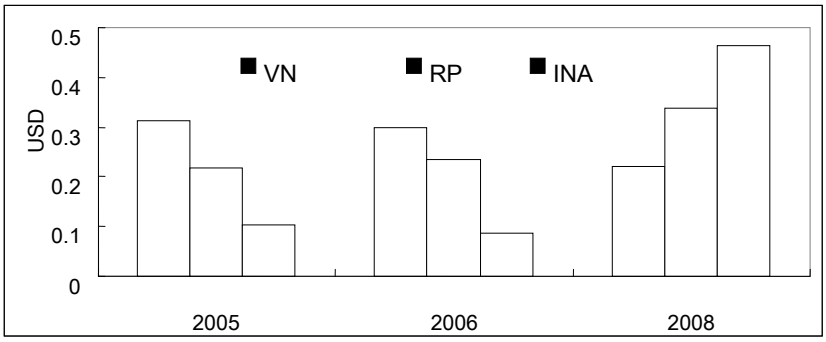
A different development, however, can be observed for fixed-line connection charges. Unlike usage-based charges, the fixed-line connection charge is something a potential subscriber cannot avoid. This has a direct impact on the affordability of a basket of fixed-line services, such as voice telephony and broadband. For this reason the fixed-line connection charge in Viet Nam has remained basically unchanged between 2000 and 2008, reflecting perhaps the cross-subsidy strategy adopted by the government (through VNPT) to promote affordability of telecommunications services in Viet Nam. This also indicates that tariff rebalancing will be an ongoing policy challenge for Viet Nam. Indonesia introduced a tariff rebalancing policy between 2000 and 2003, and this is reflected in the change in its connection charge. The charge is, however, too high for the Philippines. This is perhaps the result of the regional monopoly policy adopted in the Philippines.

20.5 CONCLUSION

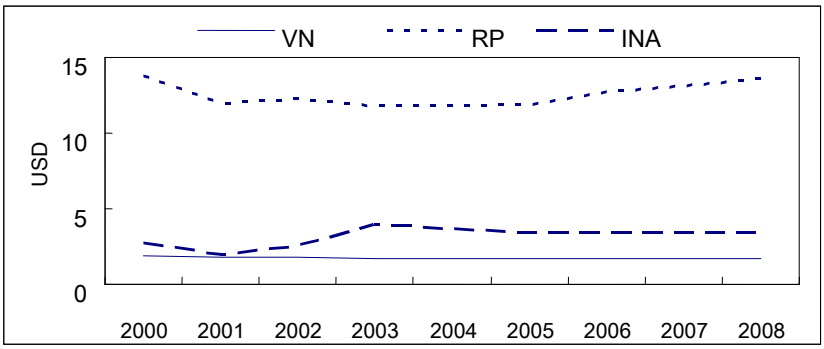
Viet Nam has achieved great success in its telecommunications structural reform process. The market was liberalised to both domestic and foreign investment in a gradual, phase-in manner, with the contract-based BCC scheme as the foundation for future participation. This approach is common among other APEC economies. Indonesia's KSO scheme and Thailand's BOT project are all based on a similar rationale and policy considerations. But the KSO failed in Indonesia, and Thailand is having a difficult time converting BOT contracts into formal



(1) Mobile service monthly subscription charge (USD)



(2) Price of a 3-minute off-peak mobile call (USD)



(3) Fixed-line connection charge (USD)

Figure 20.5: Comparison of selected retail tariffs between Viet Nam; the Philippines; and Indonesia. (Source: ITU 2009)

operational licences (Lee & Findlay 2005). It appears that Viet Nam has suffered less from the drawbacks of these types of structural reform strategies and experienced good performance improvements.

Yet there are still a number of issues that need to be addressed, some of which might critically affect Viet Nam's ability to continue its remarkable performance.

20.5.1 Continuing structural reform through market liberalisation

Governments often argue that temporary control of market entry and foreign investment in the telecommunications sector is needed to allow the domestic 'infant industry' more time to adjust before full competition (Vickers & Yarrow 1991). However, as demonstrated in Indonesia and Thailand's experiences and in the literature (Ros 1999; Fink et al. 2003), ownership control does not always bring about the desired policy outcomes in the long run. For this reason, Viet Nam committed in its WTO accession that exclusive state ownership in FBO licences would be removed and existing BCC partners would have the opportunity to

convert into operational licences with an investment ceiling. This movement away from ownership control is consistent with best practice and economic theory. It also unveils many regulatory issues that are not of concern when all operations are state owned. A transparent, predictable and non-discriminatory regulatory regime would be prerequisite to further advances in liberalisation.

Viet Nam's WTO commitments and the Law on Telecommunications provide a good opportunity to grasp the benefit of its market liberalisation, but reducing investment uncertainty at the time when current BCC partners will be applying for licence conversion remains a task for the future. Before then, it would be preferable for the government to publish clearly defined conversion requirements and procedures.

Vietnam's status as a Newly Acceded Member (RAM) means that it has virtually no obligation to offer new commitments in the WTO Doha round negotiation. Yet the telecommunications liberalisation process in Vietnam is half way through, with many structural and regulatory reform efforts still needed to fully realise the objectives and benefits of telecommunications structural reform. To this end, APEC's Leaders' Agenda to Implement Structural Reform (LAISR, 2004) would provide a valuable mandate for Vietnam to identify the telecommunications sector as a priority area to continue reform.

20.5.2 State dominance and the creation of an independent regulator

The incumbent VNPT still dominates the fixed-line and mobile markets in Viet Nam, so regulating market dominance to foster competition is not an easy task. While, under the Law on Telecommunications, facility-based services are opened to private participation, the legacy of state ownership in all existing FBO operators will be an obstacle to competition and investment.

Indeed, the Law establishes a pro-competition regulatory regime to prevent anti-competition practices and ensure interconnection as well as access to bottleneck facilities, even though the ownership relationships between the various state ministries and existing FBO operators indicates the importance of a more impartial and non-discriminatory regulatory environment. To achieve this objective, the creation of an independent regulator would be a critical step.

The current regulatory structure in Viet Nam is already consistent with the WTO Reference Paper's definition of an independent regulator that is separated from service provisions. Nonetheless, the fact that all existing FBO operators are state owned warrants a more demanding independence for the regulator. The independence of the regulator can be ensured in different forms. As a threshold, the regulator should be separated from the ministry responsible for policy decision making (MIC in Vietnam). Independence can be further enhanced by way of providing a certain degree of autonomy in carrying out core regulatory functions, such as investigating anti-competition activities, tariff regulation and interconnection/access dispute settlement. These regulatory structural reforms would significantly improve the quality of regulation and ensure a predictable, fair and non-discriminatory regulatory regime. It would also reduce the concerns of policy interference in regulations.

20.5.3 Reducing development disparity

Universal service obligation schemes in developed economies are usually centred on a few disconnected remote households and marginal socio-economic groups, such as low-income

earners and the disabled. However, similar development schemes in developing economies such as Viet Nam are focused on improving the overall availability of basic telecommunications services at community level to the vast majority of the population (ITU 2003). Given the lower deployment cost and above-cost tariffs, competition in long distance and international markets is more likely than competition in local telephony services. Furthermore, even if competition does occur in the local telephony market it will not automatically benefit rural areas, where networks are limited.

Refinement of the great disparity in access to telecommunication services between different geographical regions is one of the primary reform objectives. The literature demonstrates that liberalisation and competition enhance overall sector performance and facilitate network expansion, yet market-based policy has its limitations. For instance, for uneconomic areas the costs of providing telecommunications services are often greater than the subscribers' willingness to pay, thus preventing the operator from extending network coverage into these areas (World Bank 2000). Both cases warrant the implementation of a universal telecommunications service development scheme that often requires mandatory network deployment and service provisions, supported by an appropriate subsidy program.

A major issue commonly faced by many economies is the estimation of the costs for providing universal service (DCITA 2004). Before 2004 universal service in Viet Nam was financed primarily by inter-service cross-subsidisation and the levy of the CSO as part of the interconnection charge. Yet none of these funding programs was sustainable in the face of competition. For instance, cross-subsidy between international and local telephony services or between monthly rental and per call charges offers no incentive for operators to reduce cost or improve efficiency, since none of the tariffs are cost-based and operators can always manipulate the regime by allocating costs in subsidised services. There was a lack of transparency in the way revenue generated from subsidised services and CSO was used. While network rollout in both a profitable and an uneconomic area could each be receiving a subsidy and CSO, revenue from subsidised services and CSO could also be used in an anti-competitive manner to subsidise services – such as a mobile service – that were facing competition. But with market opening the above-cost tariffs of subsidising services often attract new entrants to compete in those lucrative segments rather than focusing on local network development.

The establishment of the VTS provides an ideal starting point to implement reform in the provision of universal telecommunications services. The industry-based levy funding arrangement also appears to be self-sustainable. Indeed the rural area focus and industry-wide funding arrangement of the VTS creates a more competitively neutral universal service regime in the light of competition. Yet given that the nature of VTS is to provide funding that has been collected from rivals for network development that would otherwise be carried out on the provider's own investment, this requires caution in order to avoid over and/or under compensation that could hamper competition.

For previously unserviced areas, it is difficult but essential to identify genuine loss-making areas and to exclude areas with only temporary loss, such as emerging new housing areas. Also, cost estimation is affected by the scope of technologies (e.g., copper wire, satellite, CATV) to be included in the formula. This often requires updated understanding of, and prediction on, technological advancements and efficient network development over time. A more technology neutral approach is valuable for selecting universal service providers and determining the level of funding required.

With the proliferation of mobile and other wireless technologies (e.g., Worldwide Interoperability for Microwave Access [WiMax]), a wireless universal services scheme appears to be a cost-effective policy solution, as such a scheme has already been implemented in India, South Africa, Uganda, Nigeria, Bangladesh and Colombia (Oestmann 2003).

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Chapter 21

TELECOMMUNICATIONS IN PAPUA NEW GUINEA

Ronald Duncan[1]

- The introduction of competition into the mobile sector has effectively led to universal coverage: prices are lower and a wider variety of services are available.
- The benefits to the many remote communities now able to interact with the rest of the economy are important: the availability of mobile phone services is helpful in medical emergencies and mobile banking initiatives are now underway.
- The provision of market pricing information for rural commodities through mobile phone services will be valuable because the livelihood of the bulk of the population is from agricultural and fishing activities.

21.1 INTRODUCTION

Telecommunications reform, specifically reform of the market for mobile phone services, has been adopted in five Pacific island economies in recent years. Reform of this market in Papua New Guinea (PNG) was perhaps the most difficult of the five cases, particularly with respect to the political struggle over the nature and pace of the reform. This study illustrates the benefits of being able to lock in domestic reforms through international commitments – in this case through the World Trade Organization's telecommunications commitments.

This study also illustrates the problems that regulatory capture can give rise to in trying to bring about reform. PNG's Independent Consumer and Competition Commission (ICCC), which was initially given the power to issue licences to mobile phone providers, fought a gallant battle to ensure competition. However, this eventually resulted in the loss of its role as an independent regulator of telecommunications. This study also demonstrates the potent power of consumers realising the benefits of market reform and the irresistible force that consumer power can exert with respect to reforms.

21.2 HISTORICAL BACKGROUND[2]

A plan for a national telephone system in PNG was drawn up in 1964 when a Telecommunication Division of the Department of Posts and Telegraph was established and 'overseas' expert advice was sought from Australia. A telephone service was subsequently introduced.

In 1973 the Department of Information and Communication Services was established when the National Broadcasting Commission (NBC) was set up to take over the PNG branch of the

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[2] This section draws on Sinclair (1984, 1993) and Stanley (2008a, 2008b).

Australian Broadcasting Commission. The NBC became the broadcasting arm of the department. This was a vital event in PNG's history. Given the very rugged topography and the isolation of many clans, radio played a crucial role in the dissemination of information throughout the land, using an extensive network of provincial radio stations. Radio has subsequently played a huge role in building a more cohesive society from what was then more than 1000 diverse tribes.

After gaining independence from Australia in September 1975, the Department of Information and Communication Services was responsible for information services, communication policy, and research and development. The newly formed Department of Public Utilities took over the functions and the responsibilities of the Department of Posts and Telegraphs and became the Division of Postal and Telecommunication Services (DPTS). DPTS continued to function as a separate organisation until it was incorporated as the Post and Telecommunication Corporation (PTC) in October 1982.

On 9 September 1981 an executive steering committee was set up to examine ways and means of making a change in the status of the Postal and Telecommunications Services Division to a 'legal commercial entity'. This committee presented its report to the National Executive Committee (NEC; effectively the Cabinet) on 16 December 1981 and the NEC gave approval to draft enabling legislation. The Post and Telecommunication Corporation Act 1982 was passed by the National Parliament on 15 February 1982.

Due to a change in government policy in 1996, the PTC was split up and corporatised. The split saw the creation of Telikom PNG Ltd, Post PNG Ltd, and the PNG Telecommunications Authority (PANGTEL).

In 1997 the Department of Information and Communication Services was reduced to the Office of Information and Communication and there were tighter constraints on its resources. This resulted in a situation where it was not able to implement its mandated responsibilities. After the 2002 general elections, however, a new government established the Department of Public Enterprises, Information and Development Corporation (DPEIDC). Its core functions included national information and communication policy, rural connectivity and development, and the integrated government information system. It was also required under the government's Medium Term Development Strategy (2005–10) to expand telecommunication infrastructure and services.

With the re-establishment of the Ministry for Information and Communication Services in 2007, all matters relating to PANGTEL, NBC and the Office of Information and Communication were placed under its administration.

21.2.1 Telikom PNG Ltd

Under the Telikom PNG Limited Act 1996, Telikom PNG Ltd was responsible for providing telecommunication services for profit and with a consideration of community service obligations. Under the Telecommunications Act 1996, Telikom was given exclusive rights up to 2001 to provide all forms of telecommunications services within PNG and between PNG and other economies. Through a regulatory contract with the ICCC, Telikom was granted another 5-year monopoly, from 2002 until 17 October 2007, over fixed-line and mobile services and the international gateway.

21.2.2 PANGTEL

PANGTEL was established on 1 January 1997 under the Telecommunications Act 1996. Its creation was part of the government's policy to corporatise PTC and to divide it into three different organisations: two service delivery companies incorporated as public companies under the Companies Act and one regulatory and licensing authority. PANGTEL became the sole technical regulator and licensing authority of telecommunications and broadcasting in PNG. The telecommunications industry comprises all private and government-owned companies that are involved in the provision of fixed and mobile telecommunications services such as voice, facsimile, data, cellular phones, video and audio programs to the general public. The radio communications sector includes radio frequency spectrum and satellite orbital positions. The radio frequency spectrum is managed according to the Radio Spectrum Act 1996.

PANGTEL's main operational functions with respect to mobile telephony include:

- the granting of licences to carriers and suppliers of telecommunication services and equipment;
- establishing performance standards for carriers and monitoring compliance with those standards;
- regulation of the telecommunications industry to ensure competitiveness;
- protection of consumers of telecommunications services;
- promotion of fairness and efficiency in the industry;
- provision of arbitration to conflicting parties in the industry; and
- monitoring the development of telecommunication services.

21.2.3 Independent Competition and Consumer Commission

The powers and functions of the Independent Competition and Consumer Commission are set out in the Independent Competition and Consumer Commission Act 2002. The ICCC was established as part of the government's economic reforms in implementing its privatisation policy. Generally, the ICCC has very wide powers relating to price regulation, licensing, industry regulation through regulatory contracts, and ensuring compliance with the competition and consumer protection provisions of its legislation.

With respect to licensing, its powers relate to giving approval either for acquisitions or new entrants to a market and to the administration of Part IV of the ICCC Act, which deals with competitive market conduct. The ICCC is required under this part of the Act to consider all aspects of market conduct rules. When the ICCC is satisfied that the proposed activity will not have any negative effect but rather will enhance competition, it may grant the necessary approval or licence. It is in this context that the ICCC assumed authority to award carrier licences to two new entrants to the deregulated mobile phone industry.

As the principal regulator of the telecommunications sector, the ICCC was required to ensure that the provision of telecommunications services under the Telecommunications Act were fulfilled. The exception was any provision relating to the technical regulation of the sector, which was the responsibility of PANGTEL. Where the ICCC and PANGTEL were given concurrent powers, the agencies were required to consult before making any decision. In the event that they were unable to agree, the views of the ICCC would prevail.

However, the ICCC's powers with respect to mobile phone licences were removed and now rest with the Minister for Information and Communication. The ICCC participates through representation on the ICT Licensing Committee and makes recommendations to the Minister for Information and Communication for approval and awarding of SERVCO licences.

21.2.4 Pacific Mobile Communications Ltd

Pacific Mobile Communications Ltd (PMC), a wholly-owned subsidiary of Telikom PNG Ltd, was established in 2002. PMC is responsible for the provision of Internet gateway services. It is also involved in the mobile phone sector, trading as B-Mobile. Since Telikom is the sole distributor and wholesaler of bandwidth, PMC, the operator of the Internet gateway, leases bandwidth from Telikom and resells it to Internet service providers under the brand name 'Tiare'. As a wholly-owned subsidiary of Telikom PNG, B-Mobile is regulated by the regulatory contracts pertinent to competition issued under the ICCC Act.

21.2.5 Independent Public Business Corporation

The Independent Public Business Corporation (IPBC) came into being on 30 June 2002 under the Independent Public Business Corporation Act 2002. The IPBC holds all assets and liabilities of corporatised publicly-owned enterprises. The IPBC reports to the Minister for Public Enterprises.

21.2.6 Universal service obligations

One of the key objectives of PNG's information and communication technology (ICT) policy has been the provision of access to telecommunications for all users, with particular emphasis on the rural population. Strategy guidelines have been set, and these include the provision of funding for rural telecommunications and encouraging local and provincial governments to improve access to telecommunications for all citizens. The rural development obligations and the Rural Development Fund in the Telecommunications Act 1996 focused on basic telephony becoming 'reasonably' accessible to all. Consultation between the minister and PANGTEL declares specific areas for rural development obligations. Operators declared by PANGTEL to be universal service carriers may access the Rural Development Fund to pursue infrastructure developments. Funding for the Rural Development Fund is sourced from levies paid by operators and interest from the fund's investments.

21.3 DEVELOPMENT OF ICT POLICY

In December 2005 the NEC handed down a decision to open the market in mobile phone services. Several policies have been drafted and pieces of legislation amended or repealed since this decision. Prior to the introduction of mobile services, only two pieces of ICT legislation had been implemented. The first was a Communication Policy drafted as a result of a Communication Policy seminar in 1978. Then in 1992 the Department of Information and Communication was instructed to begin the process of formulating a coherent national ICT policy (Department of Communication and Information 2008 pp.2–3), the result of which was the National Policy on Information and Communication of Papua New Guinea, adopted in 1994. This latter policy was more comprehensive in setting out general guidelines on defining ownership, access and content. It emphasised the role of the publicly-owned telecommunications operator in providing access to rural communities and extending the network to complement economic development. Privatisation plans for the incumbent operator were mentioned; the introduction of competition was not.

The main objective of the ICT policy approved in 2005 was to use telecommunications for economic development. The government's stated preference was to establish electronic connectivity for disseminating information to the general public and as a means of reaching out to the public and outside world (e-government, e-commerce and e-education); however, Telikom's infrastructure through which these services were to be provided was limited and in need of major modernisation. Therefore, rehabilitation of Telikom was said to be a government priority. According to the same NEC decision, competition was to be introduced in the mobile sector. However, Telikom was inadequately prepared for competition. The lack of ability of Telikom to operate effectively in a competitive market seems to have been the key issue that drove much of the political intervention in the reform program that led to regulatory uncertainty in 2007 and 2008.

The capacity of Telikom to serve rural and isolated communities was severely constrained due to the difficult geographic terrain, the largely rural population and the diversity of languages and culture within PNG. But geography and the largely rural population were not the main reasons for Telikom's underperformance. A new administration had set out in 2002 to rehabilitate Telikom. At that time poor management was seen as one of the major contributors to inefficiency. The Prime Minister reported to Parliament in 2005 that Telikom at one time had six managing directors over an 11-month period. The government stabilised the management structure and hired experts to assist in providing strategic direction to the chairman and the board. The result was a series of positive business initiatives, including the appointment of international firms to formulate strategic policies and further the network expansion of fixed-line services.

There were three key statements in the NEC's decision in December 2005: through its regulatory contract with ICCC, Telikom PNG Ltd was to terminate its mobile phone monopoly by 31 March 2006; ICCC was mandated to select, via public tender, two new licensees to compete with Telikom's B-Mobile service; and March 2007 was the date set for open competition in mobile services.

Following the government's decision to introduce competition, the ICCC released a press statement in January 2006 outlining the processes it would follow in fulfilling its obligations (ICCC 2006 pp.1–2). There were to be four main steps: the public tender process would begin on 7 March 2006 and submissions would close in May 2006; the assessment of the applications would be undertaken by the ICCC, with the two new mobile providers being announced by mid October 2006 (in fact, the licensees were announced in September 2006); construction of network infrastructure for the mobile entrants was tentatively scheduled for December 2006; and licences would be issued. The licencses were issued on 27 March 2007 to Digicel PNG and GreenCom: the former commenced operations on 17 July 2007; GreenCom has not yet begun operations.

21.3.1 Policy uncertainty

The ICCC was required to consult with Telikom on the processes to be followed by Telikom in terminating its monopoly over mobile services. In surrendering its exclusivity rights, Telikom required the ICCC to fulfill several conditions. The ICCC claimed that these were addressed and amended the contract agreement with Telikom to reflect the termination of exclusive rights over mobile services.

However, in September 2006, Telikom claimed that the conditions were not fulfilled and that it did not consent to the release of its monopoly rights (ICCC 2007 p.1). Moreover, the

government released a National ICT Policy in the same month that effectively reversed the NEC's decision in December 2005 to liberalise mobile services. Notwithstanding the uncertainty, the ICCC kept to its timeline and announced the two new licensees in March 2007.

Three public entities pressured the ICCC to stall the mobile liberalisation program. Firstly, Telikom commenced three separate judicial proceedings to challenge the ICCC's actions: one through an Appeal Panel and the other two through the court system. However, the Appeal Panel ruled in favour of the ICCC. The first court decision also dismissed Telikom's claim for abuse of process (Supreme Court of Papua New Guinea 2008 p. 1). Telikom voluntarily discontinued the second court proceeding.

Secondly, the IPBC—the sole shareholder of Telikom—advocated a position that would have prevented the introduction of mobile competition (Abe 2007a p. 4). Finally, the minister responsible for the DPEIDC pushed for the policy reversal in order to allow for the rehabilitation of Telikom's capacity to compete effectively.

This reversal attempt referred to the September 2006 National ICT Policy, which stated that Digicel should not be granted a licence for immediate competition but that there should be staged competition. However, the licence that the ICCC granted in March 2007 was based on the NEC's decision in 2005, which had not been amended before Digicel began to establish its infrastructure network in September 2006. Although the ICT Policy was passed in September 2006, coinciding with the announcement of the result of the tender process, it was rather late as the ICCC had followed its public tender process mapped out from January 2006, soon after the NEC's decision in 2005.

Two reasons for the policy reversal were put forward in the National ICT Policy. The firstl was that Telikom's network was technically not capable of interconnecting to another carrier's network and, therefore, customers of one carrier would not be able to call customers of another carrier. Digicel had requested interconnection with Telikom 3 months before its official launch in May 2007 (Joku 2008). Digicel only began testing interconnection with Telikom on 31 January 2008 and nationwide connection was not possible until July 2008. Much of the delay was due to the technical capacity of Telikom to allow interconnection. Also, the numbering plan in Telikom's network limited subscribers to 400 000 mobile telephone numbers.

Secondly, it was claimed that the 'ICCC has both a regulatory function under the ICCC Act (2002) and the regulatory authority to issue and revoke licences under the Telecommunications Act (1996) ... which is a conflict of interest and ought not be allowed to subsist' (DPEIDC 2006 p. 32). The National ICT Policy recommended that the ICCC's power to issue and revoke licences return to a committee comprised of representatives from PANGTEL and the ICCC, with a former Chief Justice in the chair. This recommendation would have effectively returned licensing power to government control and not to an independent entity.

The National ICT Policy was never implemented. No publicly accessible document is available to shed light on why this was so, although its timing does provide hints about the purpose of the policy. The policy was finalised at the same time that the ICCC announced the results of the public tender process for the two new mobile service providers. The ICCC timeline set for March 2007 was based on the December 2005 NEC decision.

In March 2007 Digicel launched several mobile stations. In accordance with its legislative mandate, PANGTEL issued Digicel with a spectrum licence. However, several days later it

withdrew the licences, stating 'amended ICT policy' as the reason. PANGTEL's Acting Director-General was reported as saying that under the amended ICT policy, access to spectrum would be restricted to NETCO, the proposed new operator of all telecommunications infrastructure. Digicel obtained a court order shortly afterwards that overrode PANGTEL's action and allowed it to continue operations.

The ICT policy was reviewed again in early 2007. A Telecommunications Blueprint was developed in May 2007, which was the basis for the May 2007 National ICT Policy. The May 2007 policy reflected the recommendations of the draft September 2006 National ICT Policy in three crucial regulatory areas. The first was there was a recommendation for the adoption of the 'NETCO/SERVCO model' in which Telikom retained an indefinite monopoly over NETCO infrastructure, whereas SERVCO would be opened for new licences. Secondly, that competition (SERVCO services) would only commence after 1 June 2008. Thirdly, the government, through DPEIDC, would establish new committees to oversee licensing issues and the overall ICT policy. The authority of the ICCC to issue and revoke licences would be 'removed and will rest with the Minister for the DPEIDC' (DPEIDC 2007 p. 12).

However, due to pressure from key stakeholders, including Digicel, the May 2007 policy was never implemented. Subsequently, the latest ICT Policy (March 2009) gave the power to issue and revoke licences to a new body, the National Information and Communication Authority (NICTA). NICTA is primarily composed of PANGTEL staff and assets.

21.3.2 Multilateral policy restraints

Digicel was methodical but diplomatic in how it dealt with the policy uncertainties. Digicel pressured the government through two main channels. Firstly, it negotiated directly with the government on ensuring security for its investment, meeting with the Prime Minister early in March and being given an assurance that its investment and licence to operate in PNG were protected. Digicel continued to engage in regulatory dialogue with Telikom, the ICCC, PANGTEL and the government to ensure that its initial licence, based on the December 2005 NEC decision, was protected. Digicel was also assisted in protecting its investment through government-to-government dialogue channels between the Irish and PNG governments (Digicel is an Irish company) (*Islands Business*, 3 September 2007).

Digicel's main investment concerns up to the May 2007 ICT Policy were basically two-fold: the withdrawal of its spectrum licence by PANGTEL in March 2007 and concern over the NETCO 'model' through which Telikom controlled the international gateway. The chief executive officer of Digicel PNG was reported as saying that:

> with only one gateway operating, people will experience higher calling rates, lower quality of calls due to network congestion as well as limited international roaming services [and] to remove Digicel's international gateway would be a step backward from the current open market approach. The people have tasted the benefits of competition and have the right to continue to enjoy those benefits – lower prices, better quality, increased coverage and introduction of new services (Digicel 2008).

There is evidence that Digicel PNG also relied on PNG's WTO commitments on telecommunications reform to protect its investment and to ensure that it was able to operate mobile services. Two events in the telecommunications reform process strengthen the case for this point. First, that the latest ICT Policy stated that the model proposed was consistent with PNG's WTO obligations (Department of Communications and Information 2009 p. 22)

indicates that the government was trying to ensure that its policy was compatible with its WTO commitments. Secondly, the September 2006 National ICT Policy had argued for a phased liberalisation under which, in phase 1, Telikom retained its monopoly over the international gateways. The two ICT policies issued in 2008 adopted similar frameworks. There was no timeframe indicated in the 2008 ICT policies as to when phase 2 would begin. However, the March 2009 ICT Policy did come up with a clear timeframe and set milestones to be achieved.

21.3.3. Domestic restraints

Local business communities in PNG also put pressure on the government. The Port Moresby Chamber of Commerce made known its concerns that the government had not consulted with them on the policy.

As noted above, the ICCC also resisted changes in the government's policy (Abe 2007). Since the ICCC's involvement with the reform program in December 2005, its position was to act as the independent regulator for telecommunications services and to provide competition in the mobile service sector through the granting of licences. The ICCC's role in accordance with its legislation was effective during the reform program on one key regulatory aspect – independence. Maintaining independence amid commercial and political interference was achieved by the ICCC, although it may have contributed to the loss of its power to grant and revoke telecommunications licences.

21.4 THE BENEFITS FROM OPENING THE MOBILE PHONE MARKET

As mentioned earlier the government tender process was completed in September 2006. Two carriers were selected: Digicel, which had been successful in privatising the telephony market in the Caribbean; and GreenCom, an Indonesian engineering and telecommunications company. In March 2007 mobile carrier licences were issued to Digicel and GreenCom by the ICCC, while PANGTEL issued the spectrum licences. Digicel PNG commenced operations on 17 July 2007 and has since extended its services to most of PNG.

In setting up its services, Digicel made two strategic moves. It established widespread coverage very quickly and put mobile phones into the hands of as many Papua New Guineans as quickly and as cheaply as possible. The novelty of having a mobile phone and of being able to call relatives and friends over large distances in an economy where physical movement is so difficult gave a huge impetus to Digicel's efforts to retain its licence. Essentially, the public pressure from consumers to retain Digicel's licence became impossible to resist.

Digicel claims to have invested in excess of PGK450 million in the PNG mobile telecommunications market in 2008 and 2009 (Batten et al. 2009). This investment has had a large impact on the coverage and quality of domestic services, with mobile phone coverage now very extensive. The quality of international connections has also improved, with a substantial amount of the investment going towards enhancing an international gateway. Moreover, there are plans for an additional PGK1 billion investment in rolling out further services over the next 3 years (Stanley 2008b). Extending coverage to most of PNG is anticipated.

ICCC and World Bank estimates placed the number of mobile phone subscribers (through B-Mobile) at 130 000–140 000 prior to the entrance of Digicel in July 2007. While exact

industry figures are not available, Telikom and Digicel now claim to have over 500 000 customers each. This suggests a remarkable 700% growth in the number of mobile phone subscribers (Batten et al. 2009).

Average peak time and off-peak time domestic call billing rates have fallen by 11% and 51% respectively since the introduction of Digicel and average peak and off-peak international call rates have fallen by 40% and 38% respectively (Table 21.1). As well, calling rates for both carriers for both domestic and international calls have moved from 30 second billing increments to per second billing increments. Charges by B-Mobile and Digicel are generally similar, except when special pricing events are being run.

Table 21.1: Average call rates for domestic and international phone calls, 2008 (PGK/minute).

Charges	Peak	Off-peak
Domestic		
Pre-Digicel	K1.80	K1.60
Post-Digicel (Sept. 2008)	K0.99	K0.49
International		
Pre-Digicel	K2.45	K1.60
Post-Digicel (Sept. 2008)	K1.48	K0.99

Source: Batten et al. 2009, Table 4.

Digicel has a wide range of market products and services, such as a pre-paid handset pack, 24/7 customer care, post-paid price plans, international text messaging, missed call alerts and other promotional products such as ‘talk-for-free’ and ‘Happy Fridays’. It claims to have provided employment opportunities to some 300 people of whom 90% are Papua New Guineans and indirect employment for about 500 people through dealer stores, top-up vendors, distributors etc. Furthermore, it has committed itself to community relations programs such as Operation Open Heart, Street Vendors and to providing technical support to St John’s Ambulance and Food for Schools, and sponsorship of the Pukpuk national rugby 7s team at the South Pacific Games in Samoa (*The National*, 12 September 2007).

On 26 June 2008 the long-awaited interconnection of B-Mobile and Digicel services was achieved. Previously, they had been operating on separate and unconnected networks. The interconnection ended the rather bizarre situation where many consumers carried two mobile phones, one for calling through Digicel and the other for calling through B-Mobile.

Mobile phone sector reform and growth has made a strong contribution to PNG’s GDP. Following the entry of Digicel in 2007, the contribution of the transport, storage and communication sector to total and non-mining GDP almost doubled – from 2.7% and 3% respectively in 2006 to 5.1% and 5.7% respectively in 2008 (Batten et al. 2009). The sector contributed just over 20% of total GDP growth for 2008. With total GDP growth estimated at 7.16%, this means that the sector contributed approximately 1.4 percentage points to GDP growth in 2008.

Since the introduction of competition, Telikom has adapted by selling 50% of the equity in its mobile service (B-Mobile) for PGK130 million. The 50% equity investment was contributed by a ‘consortium of companies, including the US-based Trilogy International Partners LLC (20%), GEMS Ltd (20%), PNG’s National Superannuation Fund (5%) and Nambawan Super Ltd (5%)’ (*Post Courier* September 2008). With separate ownership and management of the mobile service, it is anticipated that B-Mobile will be able to compete with Digicel.

21.5 LOCKING-IN POLICY THROUGH WTO COMMITMENTS

The multilateral policy restraint provided by the WTO's telecommunications commitments has been very important in progressing mobile telephony reform in PNG. The main difference between this form of policy restraint and domestic policy restraint provided by an independent regulator is in the domestic and international costs of policy reversal by governments.[3] Commitments on telecommunication's liberalisation reform in the WTO are legally binding and failure to adhere to the commitments can be challenged by member economies through the WTO's Dispute Settlement Body. Bosworth and Duncan (2002 p. 10) capture this argument in suggesting that:

> the main economic benefit to be gained … from WTO membership is help in facilitating policy reforms that liberalize trade and, as a by-product, support a market economy ... By 'locking in' such reforms internationally, WTO accession [commitments] provide governments with a defence mechanism against future policy backsliding or 'de-liberalization' in response to domestic protectionist pressures.

The telecommunications regulatory reforms in PNG encountered challenges that the domestic independent regulator dealt with to the best of its ability. However, the frequent policy changes over the past 5 years point to the limited ability of the independent regulator to provide credibility to the reform process. Actions instigated through various channels by the Irish-owned Digicel operator, including the European Commission reminding the PNG government of its WTO obligations, provide evidence that multilateral policy restraints can provide credibility to the telecommunications reform process. The government recognised its WTO obligations, as evidenced by revisions to PNG's ICT policy in 2008 and 2009.

21.6 CONCLUSION

Notwithstanding an eventful process to liberalise the mobile telephony market in PNG, the benefits are already large and appear likely to become much larger in the future. Call rates have been reduced significantly and coverage has increased hugely and looks to become almost universal. In a land with a terrain as difficult as PNG's, the benefits to the many remote communities of being able to interact with other people cannot be underestimated. Already the availability of mobile phone services has done much for social interaction as well as being helpful in medical emergencies. Moreover, the mobile banking initiatives now underway will be enormously helpful. Until now, banking services in rural areas have been very limited. Further, the provision of market pricing information through mobile phone services will be very helpful because the livelihood of the bulk of the population is from agricultural and fishing activities.

However, the liberalisation of the mobile phone sector has been a difficult experience at a political level. In this there are several lessons for PNG and other economies. One of the main lessons is that regulatory capture provides incentives for government to reverse commitments on telecommunications reform. The eventual 'internal reform' of the ICCC since its involvement in the telecommunications reform process in 2005, culminating in the removal of its autonomous power to grant licences and essentially giving this power back to the minister responsible for telecommunications, shows the vulnerability of domestic policy restraints to vested political interests.

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[3] International reputation, borrowing capacity, aid programs and political and socio-economic partnerships of economies are at stake when departing from international rules.

The publicly-owned telecommunications operator, Telikom, needed significant rehabilitation time and funding to prepare for open competition. The government may not have been clear about the necessary rehabilitation following the NEC's decision in December 2005. Since then, seven national ICT policies were passed over about 3 years. These frequent policy changes created significant uncertainty about investment regulations. Nevertheless, when PNG authorities were reminded of their WTO telecommunications commitments, they realigned their policies to those commitments. This multilateral policy restraint, therefore, provided credibility to the reform program and gave confidence to international and domestic investors.

Another lesson is that technical assistance in making the case for reforms is vital. Once it was seen that the introduced competition would have significant benefits, including for those in rural and isolated areas, the general public's support for the liberalisation of the mobile service sector increased dramatically. As a result, it became much more difficult to resist or reverse the reform. Therefore, convincing the public that services will improve and prices will be reduced is critical to gaining their support for the introduction of competition.

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Chapter 22

LOGISTICS IN INDONESIA

Lena Herliana and David Parsons[1]

- Indonesia has been undertaking major and simultaneous structural reforms in the logistics and transport sectors with new laws since 2007, and the detailed and final National Logistics Blueprint is expected to be formally released later in 2010.
- Critical to achieving the coordination required includes: establishing a formal process in which all relevant parties are involved, providing funding for it and providing the process with relevant powers to make changes to policies and practices.
- It is important to include all stakeholders, not only the suppliers but also the users of the services – public and private – from the beginning and to have a functional organisation as well as to monitor progress.

22.1 INTRODUCTION

Indonesia has undergone various major periods of structural reform over the last two decades and these have brought considerable benefits and a generally strong economic growth trajectory, except during the Asian economic crisis of 1997–98.

In this case study on the impacts and benefits of structural reform in Indonesia, the focus is on the logistics sector. This sector was chosen not only because the performance of logistics itself is vital to Indonesia's domestic and regional integration and competitiveness but because the logistics sector also provides a window into a wide range of simultaneous structural reforms now underway in Indonesia, particularly in the transport sectors, where inadequate infrastructure and outdated regulations are holding back performance.

This case study offers an opportunity to examine how effectively Indonesia is implementing structural reforms in a policy environment where connectivity and linkages are important. It explains why a multi-sectoral approach is required, presents an example of a project of that type in progress and identifies the challenges for the future. The preparation phase in Indonesia is just being completed but work to date provides a variety of insights and lessons for the design and implementation of projects of this type.

The study is structured as follows. First, it outlines the unique strategic environment in Indonesia in which structural reforms are being considered and made. These include geographic and economic features. It reviews the current performance of the logistics sector using the World Bank 2010 Logistics Performance Index (LPI), which highlights particular

[1] Business Support Desk, Indonesian Chamber of Commerce and Industry (Kadin Indonesia). In addition, the team comprised I Gusti Surya Pranata, Syamsul Ibad, Lucky Andrianto and Rahmat Dani. The views in this paper are not necessarily the official views of Kadin Indonesia. Supporting materials containing details of reforms to date in each component sector of logistics are available from the authors on request.

weaknesses in transport infrastructure. It then provides an overview of the directions of Indonesia's new National Logistics Blueprint which, as of the time of writing, is with the Government of Indonesia (GOI) for approval and formal release. Finally, the key drivers of the future structural reform process are identified and analysed in order to provide insights into the challenges and potential for achieving difficult and complex outcomes. A theme of this case study is that the international context matters to a significant degree as a driver of reform, both in its competitive and cooperative dimensions. Linkages to work on logistics and supply chains in APEC and in ASEAN are also noted.

22.2 THE IMPORTANCE OF EFFICIENT LOGISTICS TO INDONESIA

Logistics is vital for the economic performance of any economy. For Indonesia, there are particular reasons why logistics is a high priority issue and why the challenges of designing and implementing reform programs are more challenging. There are also reasons why transport infrastructure and transport services play a major role in the outcomes for logistics.

As indicated in Table 22.1, Indonesia's geography and the distribution of industry and resources pose a major challenge for efficient and low cost logistics. Indonesia is the world's largest archipelago spanning more than 5000km. Approximately 60% of its population of about 240 million people live on Java; the remaining 40% are distributed among 6000 inhabited islands which are often very sparsely populated. Java is also the centre of manufacturing, while resources are widely spread over the archipelago.

Even though Indonesia has 25 strategic ports and 27 airports with international status, domestic and international transport hubs are focused on Jakarta, in Java, creating major challenges for inter-island connectivity and development. Many of the inter-island connections are conducted through small commercial and non-commercial ports and hundreds of small domestic airports.

In the recent years of growing regional and provincial autonomy, issues associated with the distribution of resources, industry and people have taken on new importance, as popularly elected governments and officials across the economy demand a larger share of national development.

Table 22.1: Strategic environment and challenges of Indonesia.

Distances	• More than 5000km across from northwest to southeast
Coverage	• 6000 inhabited islands • Equipped only by: *Ports*: 25 strategic; 111 commercial; 614 non-commercial *Airports*: 27 with international flight status; 100s more domestic
Distribution of People	• Total population: 240 million people Sumatra: 20% Kalimantan: 10% Java: 60% Sulawesi: 8% Irian Jaya: 1%
Distribution of Activities	• Manufacturing: Java • Natural resources: Outside Java
Integration and Development	• Integration of Indonesia's 33 provinces now an imperative for development • Regional integration with ASEAN and ASEAN-based FTAs and EPA with Japan • Competitiveness in regional and international supply chains

There are high cost differentials among regions on products like staple foods and basic products for industry and construction, which leads to constraints on development. According to the World Bank, the cost of shipping of a 40ft container from Padang on the coast of West Sumatra to Jakarta is currently USD600, while transporting the same container from Jakarta to Singapore costs USD185, despite the latter being further away. In addition, differences in logistics costs are an important reason why rice prices in one province can be up to 64% higher than in another (World Bank 2010).

The results of poor connectivity are evident in many other price differentials and transport problems. These are major issues for the achievement of the goal of inclusive growth. World Bank research in Indonesia in 2010 also reveals that:

- The price of a bag of cement in certain parts of Papua is 20 times that in Java. The price of a gallon of water in Medan is double that in Jakarta. Oranges from China are cheaper than oranges from Pontianak (Kalimatan). High domestic transport costs are the main reason.
- 70% of price differences in rice across provinces can be explained by the degree of remoteness, which in turn is a reflection of poor logistics and inadequate transport infrastructure.
- Availability and prices of basic commodities fluctuate widely in remote areas. For example, gasoline prices in Di Kisar Island are three times higher in rainy season than in dry season.
- High quality products with great potential, such as shrimps from eastern Indonesia, cannot be commercially processed in Java, and commodities like pineapples are canned abroad because it is cheaper to transport them to Malaysia than to ship them to Java.
- The costs of bringing a container from Jakarta's main industrial sites to the port are double that in Malaysia and Thailand.
- Some 10% of Indonesian exports leave ports too late and consequently do not reach the regional transhipment ports on time. Ships destined for local destinations are frequently delayed.
- Trucks transport approximately 70% of freight in Indonesia. The majority of the trucks on the road in Indonesia are old and poorly maintained.
- A truck making a round-trip from Bandung to Jakarta may spend up to 75% of its time parked due to customs processes, warehouse delays, and lift-on and lift-off queues.
- Trade and transport logistics are still mainly 'paper-based systems', which increases logistics costs in addition to illegal charges.

Deregulation of the transport sectors began in the 1990s. Some of those structural reforms are already yielding benefits. For example, when in 2002 Indonesia deregulated scheduled commercial air transport passenger tariffs, the price of air tickets fell considerably. Figure 22.1, prepared by the World Bank in Jakarta, illustrates the geographic distance between several major Indonesian cities and contrasts this with the economic costs of passenger air tickets and maritime transport costs which have not yet been deregulated. The results show that the economic distance measure based on the price of air transport tickets is now much lower than that based on sea transport costs.

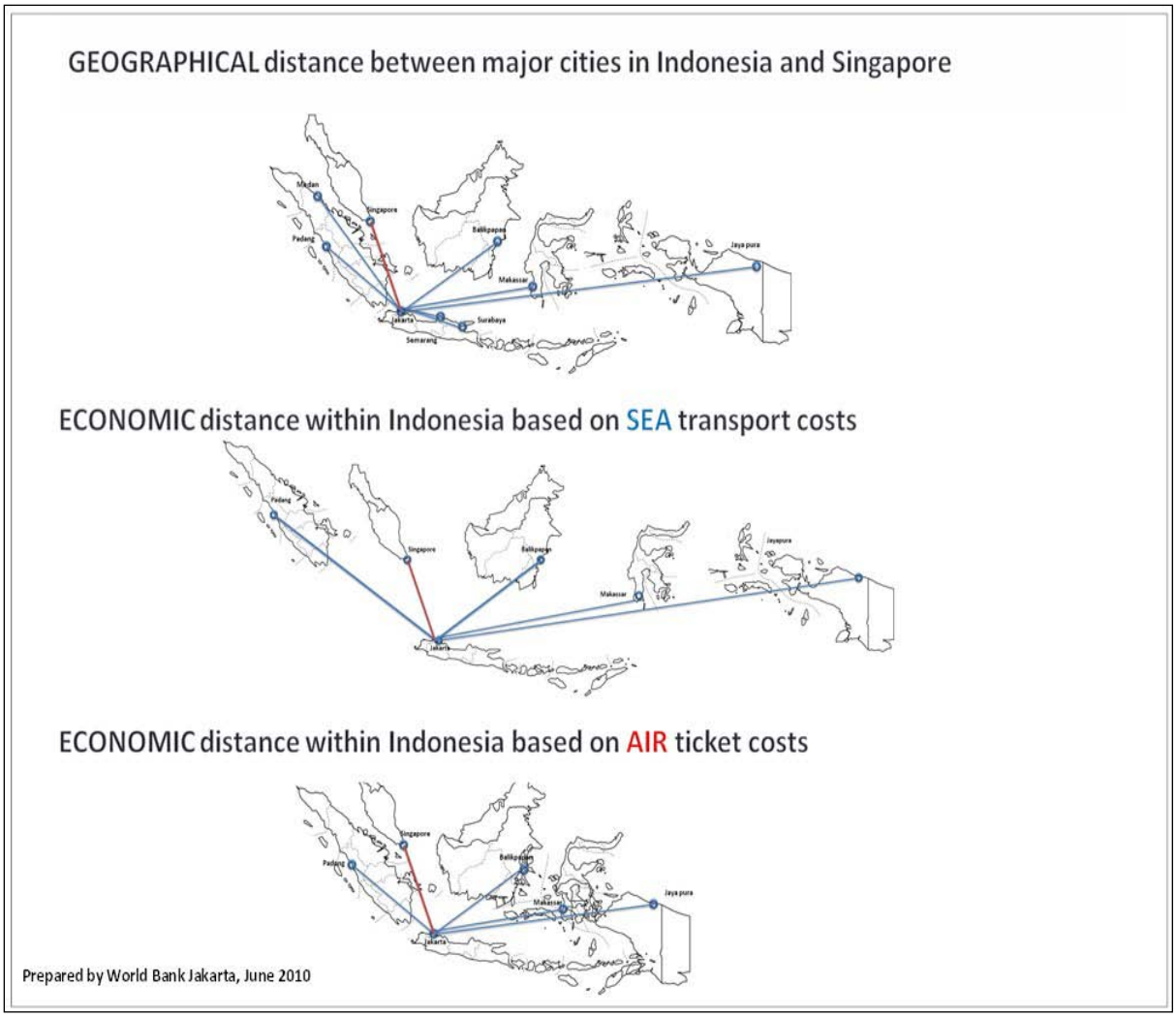

Figure 22.1: The economic distance within Indonesia based on deregulated air ticket costs vs regulated sea transport costs.

Indonesia has been undertaking major and simultaneous structural reforms in the logistics and transport sectors since 2007. Table 22.2 provides a summary of the legal and regulatory reforms that have been made and highlights those that are still currently underway. The foundations of these reforms were made through new laws for rail, shipping, aviation and land transport. These changes were largely motivated by the need to increase private investment in new infrastructure and to reduce the dependency on the state budget to meet growing demand throughout the economy for more modern and efficient infrastructure and transport related services.

Table 22.2: Structural reform agenda.

National Logistics Blueprint	To be released 2010
Transportation: deregulation of transport sector	Started 1990s
New Laws	
Rail	2007
Shipping	2008
Aviation	2009
Traffic and Land Transport	2009
Master Plans	
New National Ports Master Plan	Underway
New National Rail Master Plan	Underway

In 2010 new operational plans are being developed for logistics and ports and rail. The structural reforms show a trajectory away from government ownership to private sector participation and more independent regulation. This movement is ongoing, with further deregulation foreshadowed in many sectors.

Some of these reforms are being undertaken in cooperation with regional initiatives and reforms such as those in ASEAN.[2] A further driver of reform is the commitment to work in relation to logistics in APEC. In 2009 APEC adopted its supply chain connectivity (SC) framework, which laid out a set of actions to create an integrated supply chain and to contribute to integration among member economies. The project links the work of a number of APEC committees and working groups. A first step has been to identify eight key chokepoints in regional supply chains, related to regulatory impediments, customs inefficiencies, inadequate transport networks and infrastructure.[3] Action plans are being developed around these chokepoints for implementation in 2011. As these plans become clear, the Indonesian blueprint described below can be coordinated with commitments in APEC.

22.3 BENCHMARKING LOGISTICS' CURRENT PERFORMANCE

Indonesia ranks 75th out of 155 economies in the LPI, which is used in this study to benchmark the current performance of Indonesia's logistics sector. While Indonesia's ranking remains above the average performance of the group of lower middle income economies of which it is a part, its ranking did fall from 43 in the 2007 LPI (see Figure 22.2). This is explained by relatively faster improvements and reforms in other economies since 2007.

Consequently, Indonesia's ranking is currently the lowest in the six largest ASEAN economies. Within APEC, Indonesia ranks ahead of Russia and Papua New Guinea.

The strengths and weaknesses in Indonesia's relative performance are revealed by more detailed analysis of the six components which make up the LPI, namely:

- Timeliness of deliveries;
- Ability to track and trace consignments;
- Quality and competence of logistics services;
- Ease of arrangement shipments;
- Infrastructure quality; and
- Efficiency of customs clearance.

Figure 22.3 shows the scores of Indonesia against APEC, ASEAN 6 and lower middle income economies for these six components. Indonesia performs relatively better in timeliness, tracking and tracing and international shipments and relatively worse in logistics competence, customs and infrastructure, even though it equals or is above the average of lower middle income economies.

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[2] These include: ASEAN Framework Agreement on Multi-modal Transportation in 2005; ASEAN Economic Community Blueprint 2007: Single Market and Production Base; Competitive Economic Region; Equitable Economic Development; Full Integration into Global Economy; ASEAN Integration Protocol for the Logistics Services Sector in 2013-2015; ASEAN Roadmap for the Integration of Logistics Services in 2007; ASEAN Multilateral Agreement on the Full Liberalization of Air Freight Services; and ASEAN Multilateral Agreement on Air Services; and ASEAN Framework Agreement on the Facilitation of Inter-State Transport.

[3] For the eight critical chokepoints refer to Appendix 8 of the CTI Annual Report to Ministers, 2009. A symposium in May 2009 contributed to the development of the APEC work plan (CIE [2009]).

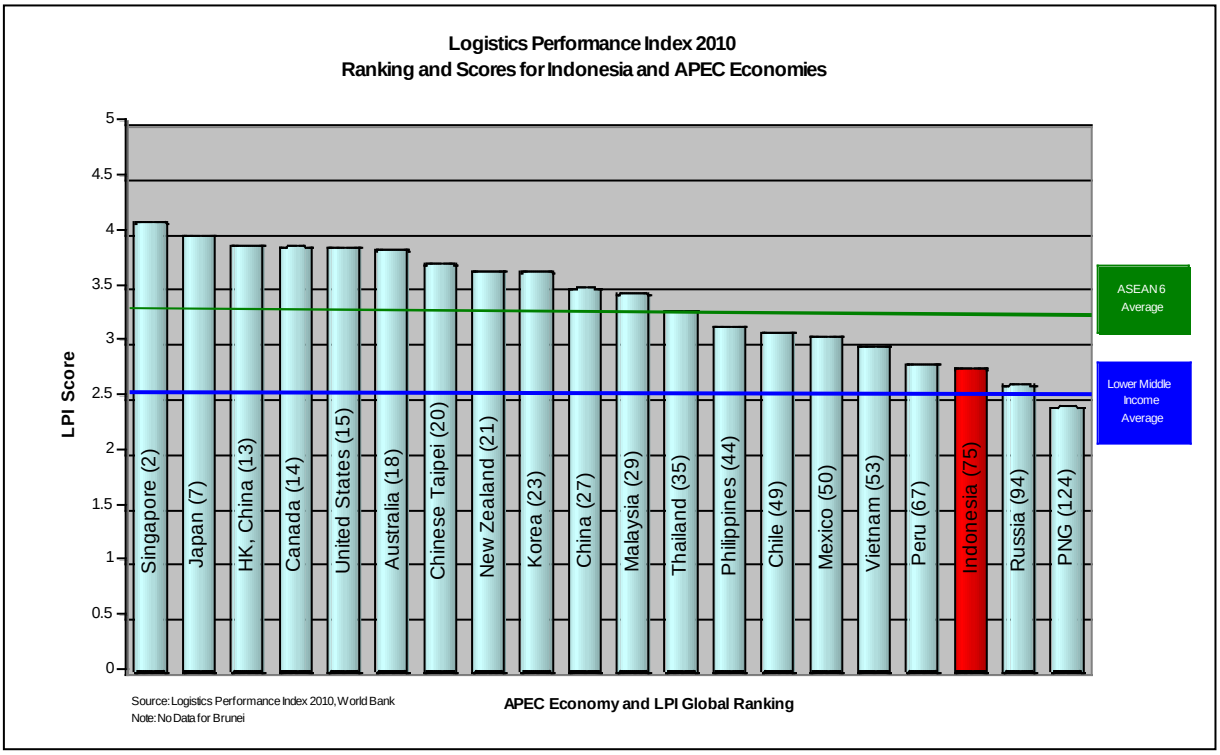


Figure 22.2: Global ranking and scores for APEC economies. (Source: World Bank Logistics Performance Index 2010)

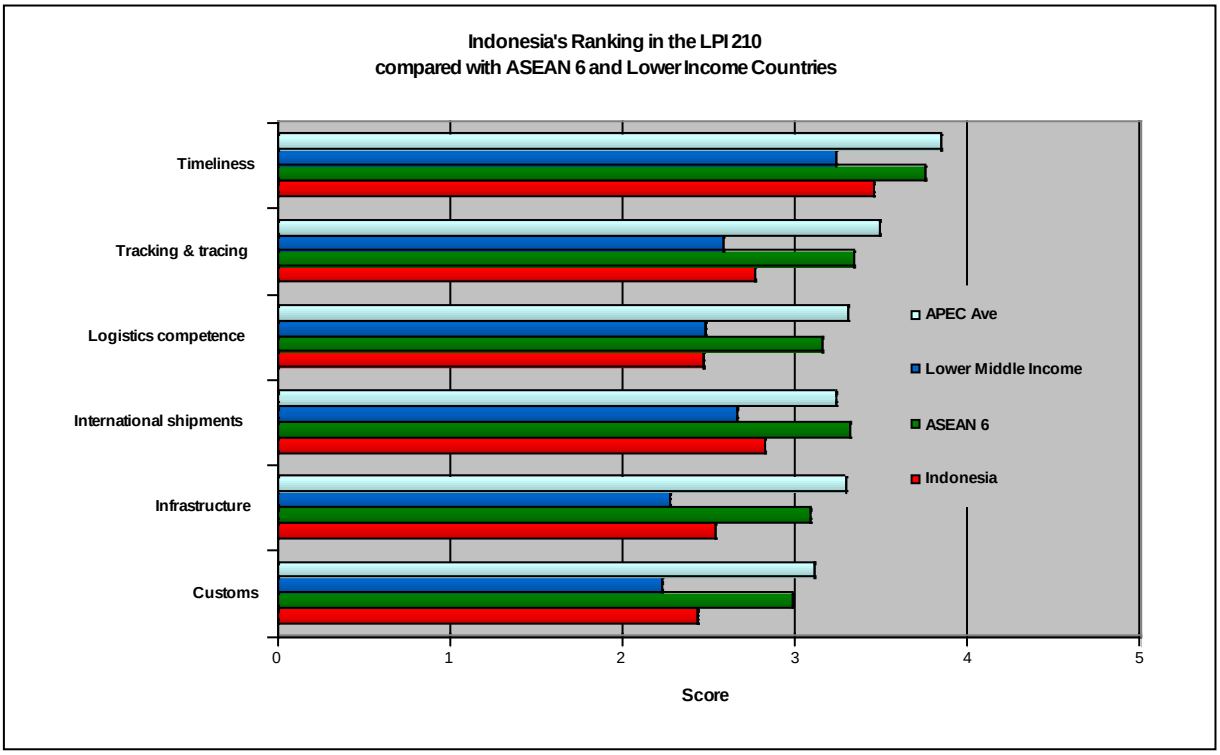


Figure 22.3: Indonesia's ranking in the LPI 2010 compared with APEC, ASEAN 6 and lower middle income economies.

This performance also reveals why the Indonesian government is placing a high priority on improving customs and infrastructure. In addition to the reform agenda on infrastructure, Indonesia has undertaken major reforms in customs to reduce corruption and increase

clearance times through the National Single Window (NSW), which is reviewed in more detail below.

The business respondents to the surveys associated with the LPI 2010 scores and rankings show a particular concern about the quality of transport-related infrastructure (see Table 22.3). Two-thirds of respondents evaluated the quality of port infrastructure as low or very low and more than 83% considered that road, rail and airport infrastructure was low or very low. These results point to the need to prioritise transport infrastructure in the structural reforms to improve logistics performance.

Table 22.3: Quality of Indonesia's transport-related infrastructure.

Sector	Respondents evaluating the quality of transport infrastructure as low/very low (%)
Ports	66.67
Airports	83.33
Roads	83.33
Rail	83.33
Warehousing/transloading facilities	16.67

Source: World Bank 2010

22.4 NATIONAL LOGISTICS BLUEPRINT

The response to these issues has been the design of a plan for logistics reform. The detailed and final National Logistics Blueprint is expected to be formally released by the government in late 2010.

In this document, logistics is defined as 'an operating procedure of goods-flow, information-flow, and cash-flow via procurement, storage, transportation, distribution, and delivery according to its type, quality, quantity, time, and location ordered by consumers, from the original point into final destination in an effective and efficient way'.

The vision of the Blueprint is for Indonesia to be locally integrated and globally connected by 2025 to increase national competitive advantage and national welfare. Box 22.1 provides a summary of the Blueprint and Figure 22.4 its framework. The functions of the Blueprint are:

- As guidance and direction in developing logistics for both the government and private sectors in order to:
    - o determine the economy's logistic policy and framework to increasing national competitive advantages in the global market;
    - o coordinate, synchronise, and integrate respective parties on the actuation of national logistic policy; and
    - o coordinate and utilise resources needed in an optimal manner.
- As a tool to communicate the vision, mission, objectives, strategy and action plan in the development of the National Logistic Blueprint.

The development of Indonesia's National Logistics Blueprint was coordinated by the Coordinating Ministry of Economy with significant technical assistance from the World Bank and has been carried out over the last 2 years. It has involved 11 ministries, agencies and groups.[4] It has also involved lengthy consultations with independent experts and regular

[4] The groups involved are the Ministries of Trade, Transport, Finance, Industry, Public Works, Communication and Information, State-Owned Enterprises and National Development Planning/Bappenas, representatives from logistics service providers, professionals and academics in supply chain and logistics, and related associations such as the Indonesian Chamber of Commerce and Industry.

Box 22.1: National Logistics Blueprint in summary.

The National Logistics Blueprint:

- recognises a growing problem;
- is a high priority objective in the government's agenda;
- is a product of public and private consultation;
- has a commodity specific and supply chain approach that provides a framework to define distribution centres and to consider special treatment for products such as coal, oil and gas;
- identifies quick wins and actions that require more substantial preparations and investments; and
- recognises the need of a coordinating team and possibly an agency or council in the longer run.

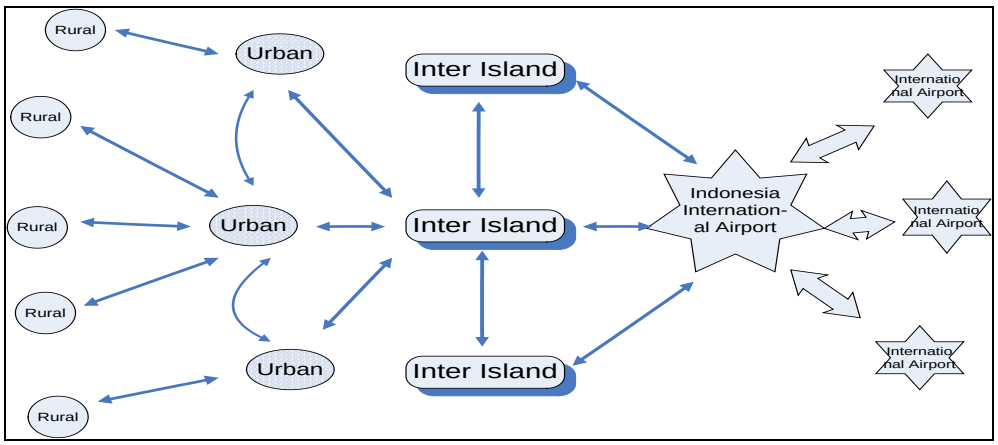


Figure 22.4: Framework of the National Logistics Blueprint network. (Source: National Logistics Blueprint 2010, executive summary)

roundtable discussions with government agencies and the private sector hosted by the World Bank in Jakarta.

In accordance with the vision, two missions in the development of the Blueprint relate to inclusiveness and integration. These broad goals are aligned with Indonesia's development objectives and with commitments to APEC and to ASEAN. The more specific missions of the Blueprint are ensuring that primary goods and services are available and affordable to the citizens and adding to the efficiency of material flows in order to improve Indonesia's competitive advantage in the global market. More specific objectives are therefore:

- To ensure the availability of strategic commodities throughout Indonesia at affordable prices to create a just and prosperous society and strengthen the integrity of the Unitary State of the Republic of Indonesia (NKRI);
- To reduce logistics costs, facilitate the movement of goods and improve services, thus increasing the competitiveness of export-superior products on the global market; and
- To prepare for achieving the targets of integration into ASEAN logistics by 2013, integration into the ASEAN market by 2015 and integration into the global market by 2020, the latter date also being consistent with Indonesia's commitment to the Bogor Goals of APEC.

In order to clarify the Blueprint in a more operative manner, it indicates six major drivers which will determine and promote the success of the logistics revitalisation programs:

1. Primary commodity;
2. Logistics infrastructure;
3. Laws and regulation;
4. Logistics service providers;
5. Human resource and management; and
6. Information and communication technology.

The development of the National Logistics Blueprint is planned to take place in a systematic way over a 5-year timeframe from 2010 to 2014 (Table 22.4). Using the matrix approach, action plans have been grouped according to the six major drivers and classified according to priorities. This will streamline the implementation of the plans which are detailed in the matrix strategy and action plan of the Blueprint (Table 22.5).

Table 22.4: Implementation schedule of the National Logistics Blueprint, 2009–25.

Terms	Short	Middle I	Middle II	Long
Periods	2009–10	2010–14	2015–19	2019–25
Stages	Preparation	Phase I	Phase II	Phase III
Targets	Blueprint operation of National Logistics Blueprint Development	Laws improvement HR development Improvement of facilities and infrastructure.	Strengthen logistic facilities and infrastructure Development of logistic service providers' capacities.	Integration of National Logistics Blueprint in the domestic and global scale
Direction		Strengthen domestic logistic system	Integration to ASEAN logistic networks	Integration to global logistic networks

Source: National Logistics Blueprint, executive summary, 2010

Table 22.5: Summary of the matrix strategy and action plan for the National Logistics Blueprint.

Key Drivers	Strategies	Action Plans	Timetable	Ministry in Charge	Related Ministries	Priorities
6	Up to 3 in each driver	Up to 8 in each driver	More than 10 time periods	1	Up to 8 for an action plan	3 levels

Source: National Logistics Blueprint, executive summary, 2010

One of the principal challenges is how to ensure that the Blueprint can also be a useful and operational reference for implementation. The Blueprint involves a very significant number of strategies and actions to be implemented over a series of years. The difficulty is how to prioritise and sequence implementation in order to maximise the efficiency of logistics in the shortest possible time.

In discussions between the representatives of the Indonesian Chamber of Commerce and Industry, logistics industry associations and World Bank experts, several specific issues have been raised to improve the implementation process. Some of the priorities that should be addressed in the implementation of the Blueprint are:

1. Align objectives with priorities in implementation.
    - Create programs for implementation with various actions that are not carried out by a single ministry or agency alone. This will help to identify selected key performance indicators that are relevant.
2. Ensure there is a clear governance structure for implementation.
    - Empower agencies and authorities to issue or change necessary legislation or regulations, promote their implementation as a priority, and allocate resources for this;
    - Create smaller teams to implement and monitor the progress of the various programs.
3. Establish a clear monitoring scheme to assess the progress and impact of the reform.
    - Monitoring can be done from different perspectives: national, by program, by action and by the public or private sector.

4. Ensure that all relevant issues and relevant stakeholders are mentioned or involved in the reform process.
    - Include security, labour union management, environmental impact protection and quality and international standards;
5. Provide private sector incentives for envisaged investments in infrastructure and logistics services. Provide a role for stakeholder organisations in the implementation.
    - Explore methods to encourage their participation.
6. Develop pilot and phased implementation.
    - Ensure that implementation on key issues can be started and provide practical evidence of useful progress; and
    - Help to maintain expectations according to the stage of a specific initiative.
7. Develop a communications strategy.
    - Disseminate information on progress and initiatives on a regular basis; and
    - Keep the business community informed about new developments so they can adapt to new procedures more effectively.

The discussions among stakeholders revealed a concern about the capacity of government and the many agencies involved to coordinate implementation across the wide range of issues in the Blueprint. In the context of setting the institutional frameworks, Figure 22.5 summarises some of the lessons learned from the past in implementing significant multi-agency reforms, with suggestions on how to get the implementation started.

22.5 FIRST STEPS

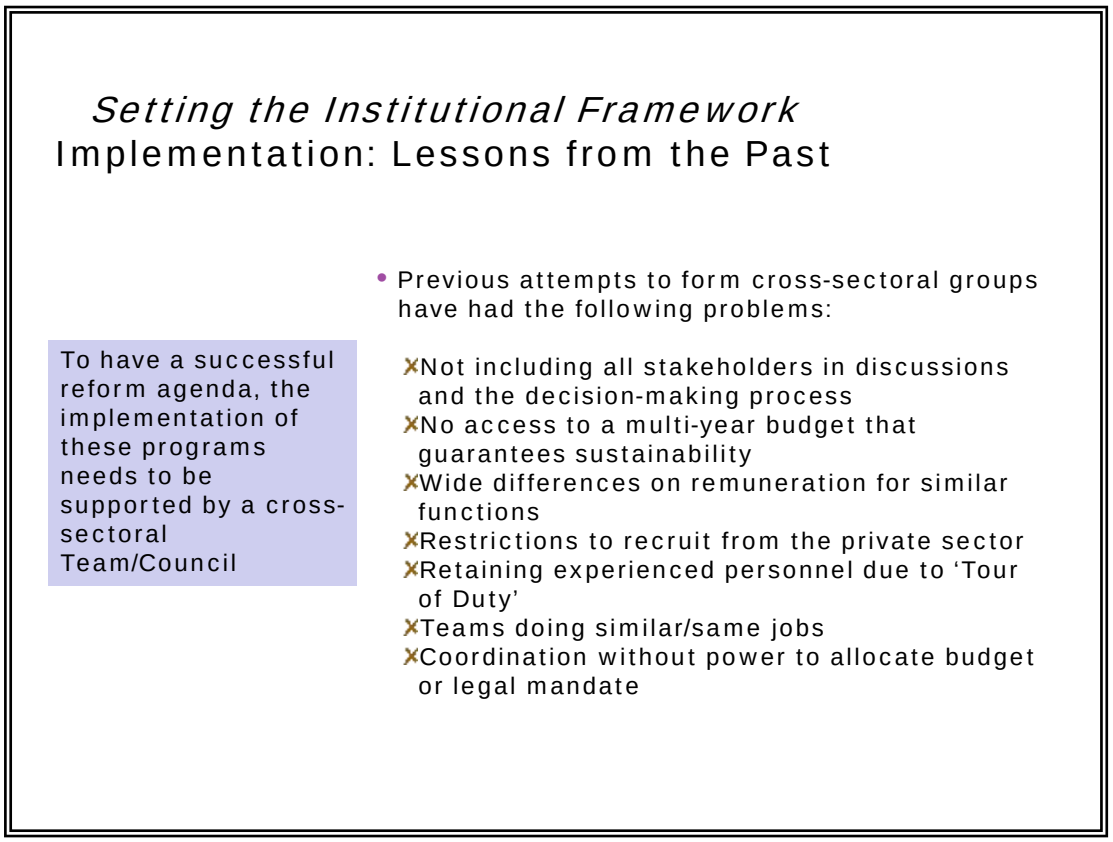
The second Yudhoyono Government put measures in place in 2009 to remove ‘bottlenecks’. These trade facilitation measures were made to support and improve national logistics and they contribute to the implementation of the Blueprint. They are reported here to specifically illustrate reforms to date.

22.5.1 One-stop shop to facilitate investment

In line with the momentum of Indonesia’s improving economic fundamentals, which has led to the improvement of the economy’s sovereign risk rating, Indonesia is in the process of reforming its business licensing services by establishing a one stop service. All business licensing procedures in all regional branches will be linked by an electronic licensing and information services – also known as the National Single Window for Investment, the same concept used for the National Single Window for export/import activities. The chairman of the Investment Coordinating Board has issued a joint decree designed to expedite all licensing procedures for starting a business. At present the process takes about 60 days to complete. After abolishing 70 redundant permits only 17 permits are required now. The final step will be to produce one page showing that all requirements have been fulfilled for granting a licence to start a business anywhere in Indonesia.

22.5.2 New funds for infrastructure

As part of the government’s commitment to accelerate improvements in infrastructure the Ministry of Finance has established a PPP infrastructure financing facilities framework, which includes new processes for access to land, an infrastructure fund and a guarantee fund.



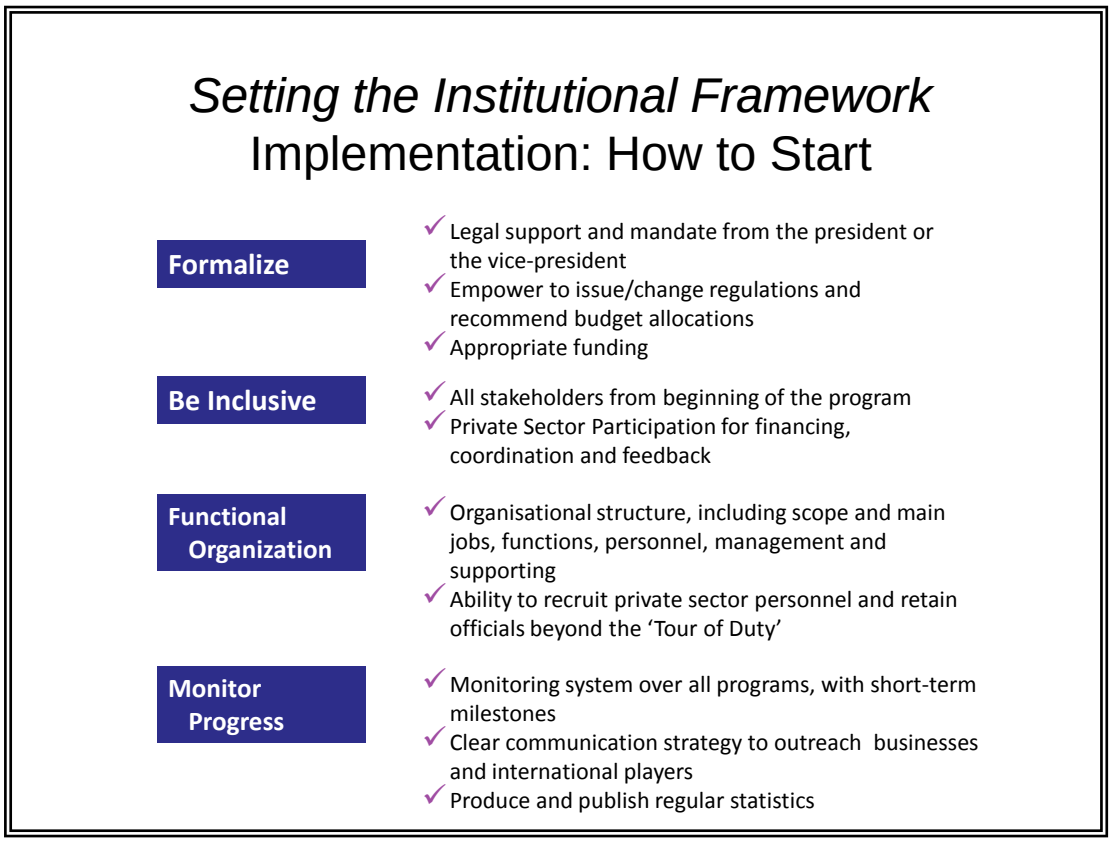


Figure 22.5: Institutional framework for implementing the National Logistics Blueprint. (Source: Discussions among Indonesia stakeholders, 7 May 2010)

The infrastructure fund serves as a strategic partner of the government to expand and accelerate reliable infrastructure development by cooperation with third parties, including private business, local government, state enterprises and multilateral organisations. The company, which started operating in April 2010, will have several subsidiaries to help in the task. The company will be a catalyst to encourage infrastructure financing – making first moves in financing risky or expensive projects, which the private sector might avoid. Thus, it will not compete with firms in financing infrastructure projects in the economy. Furthermore, it was designed to focus on specific projects without 'crowding out' business opportunities for private financing firms. The company has initial capital of IDR1 trillion (USD110 million) allocated from the 2009 state budget, and will get up to IDR2 trillion (USD220 million) more in financial support from the Asian Development Bank and World Bank.

The objectives of the guarantee fund PT PII are:

- To reduce the cost of financing of PPP infrastructure projects by improving their quality and their creditworthiness through the provision of guarantees for government obligation in the PPP contracts;
- To help the government manage its fiscal risk better by ring-fencing government obligations related to guarantees; and
- To improve the quality of PPP projects and establish a comprehensive and consistent framework for appraising projects and making decisions regarding the provision of government guarantees to PPP projects.

22.5.3 Changes to the negative list for investment

In 2007 a new negative list for investment (Daftar Negatif Investasi; DNI) was released by the government to provide greater transparency and certainty to investors. The DNI reflected current laws in the transport sectors and further amendments to the list were foreshadowed as these laws were amended or new laws were enacted by the Indonesian legislature. After much discussion with stakeholders and some interim changes, a final revision of the DNI was released by the Government on 25 May 2010. The revision satisfactorily addressed many business concerns about the hierarchy of the law, compliance with international commitments and issues relating to mergers, acquisitions and consolidation. According to the DNI, all of the transport sectors have become more open to foreign investment. However, the 49% foreign ownership cap on transport sectors may dissuade some foreign investors. This rule makes the process more complicated as foreign businesses will need to find local partners. The direction of change in the DNI has been debated. For example, the Indonesian Ship Owners Association appealed publicly to the government that in implementing new regulations on ports it should prioritise local investors over foreign ones.[5]

22.5.4 Six new economic development corridors

The government has planned six economic development corridors in Indonesia: Eastern Sumatra–North West Java, Northern Java, Kalimantan, Western Sulawesi, East Java–Bali–East Nusa Tenggara and Papua (Figure 22.13). These are intended to connect hubs and industries between regions in order to accelerate infrastructure development, foster foreign investment and spur economic growth. Each corridor will be cross-provincial and have its own focus industries. The two fundamental attributes for growth in the corridors are lower distribution costs and more access to land to support economic activities in that location. In

[5] http://berita.liputan6.com/ibukota/200109/19746/Ratusan.Pengusaha.Perkapalan.Mendesak.Pembatalan.PP.821999

Figure 22.6: Six economic development corridors across Indonesia.

order to achieve this, physical links and logistics facilitation must be available along the corridors.

Indonesia has offered two special economic zones to Japanese investors, which will serve as pilot projects. The first corridor will connect locations in the eastern part of Sumatra Island and the northwestern part of Java Island to improve the palm oil, rubber and coal industries. The second corridor will connect locations in the northern part of Java to improve the textile, food product and transport equipment industries.

22.5.5 National Single Window implementation

The main driver for the establishment of a National Single Window (NSW) for trade facilitation is the broader initiative to create an ASEAN Single Window. The agreement to establish an ASEAN Single Window was signed by economic ministers of ASEAN in December 2005. In December 2006 the finance ministers of ASEAN signed the ASEAN Protocol to Establish and Implement the ASEAN Single Window. Based on this protocol, the six ASEAN members were required to set up their own NSWs by 2008.

The purpose of establishing an NSW in each ASEAN member is to simplify export and import procedures by allowing traders to submit a single document and receive a single approval. The challenge is to link the various agencies related to export and import approvals in one agency. NSW will facilitate the development of customs and electronic cargo agreements, allowing paperless trading and eliminating the necessity for direct contact between employers and entrepreneurs.

After an initial start at Indonesia's main port of Tanjung Priok and further trials and implementation at other sea and air ports, the NSW in now underway in Indonesia. Five major ports will have NSW facilities and be integrated into the ASEAN NSW by 2012. While some government agencies are not yet fully integrated into the system and some administrative problems have been identified by exporters and importers in outlying ports, implementation of the NSW has already led to significant improvements in efficiency.

22.5.6 Round-the-clock port services

To give importers and exporters simpler access to services, the government has launched a new policy called '24/7 programs'. All ports will need to operate 24 hours a day for 7 days a week in order to speed up customs clearance and reduce logistics costs. The government began running Indonesia's ports around the clock in January 2010, supported by the NSW. However, this out-of-normal business hours operation of ports and port-related services has raised several new questions about pricing of services, incentives for service providers to make use of the longer opening times, the capacity of factories to coordinate production with the new transport flows, and so on.

22.6 CONCLUSION

Indonesia has a long-standing record of successful structural reforms but these were carried out either under more autocratic regimes or under International Monetary Fund conditionality associated with the economic recovery programs following the Asian economic crisis of 1997–98.

The structural reforms in the logistics and transport sectors in Indonesia today are part of the wider economic reform agenda of the Yudhoyono Government. They are being undertaken in an entirely different context – one of democracy and open debate, pluralism and regional autonomy.

On the one hand this makes the policy reform agenda more complex and challenging. On the other hand it enables new drivers of reform to press for change in a way that they were not able to do before. The emergence of these drivers of reform is critical to the ambition of the structural reform agenda and to timely implementation, especially in the difficult areas of logistics and transport.

The activism of some of these groups is also driven by the urgency of infrastructure reform after many years of delays in progress. The lack of quality infrastructure, especially in the transport sectors and in the provinces, is now a clear constraint to growth and improved competitiveness. It is holding back domestic and foreign investment that is critical for Indonesia's long term growth and development objectives.

Substantial reforms are already in progress in the component transport sectors. It has also been important to coordinate reform across these sectors. The response has been the development of a national plan for the development of the logistics sector. This plan is challenging in its scope – in the number of sectors involved and the number of agencies involved. The formal plan is about to be released but a substantial amount of work has already been completed. Key principles for the design of its implementation have already been identified.

The next steps are the schedule of measures of implementation. During these stages the momentum will depend on some key drivers of reform. The key drivers of structural reform in logistics and transport in Indonesia now are:

1. Domestic business and foreign investors who are concerned about the cost of doing business in Indonesia in existing areas and who believe that opportunities are being missed to expand business in the potentially lucrative regions. They stress the urgency of action and the importance of finding short-term solutions along with the longer

term programs. Foreign investors are also concerned that Indonesia cannot be integrated into their supply chains without efficient logistics.

2. The 33 provinces of Indonesia which often face the consequences of the high cost of domestic transport and logistics and which are constrained in their ability to attract more domestic and foreign investment in other sectors without adequate transport and logistics. Popular elections and regional autonomy mean that the provinces are much more active in domestic political debate.
3. The Ministry of Trade which oversees both domestic and international trade and views the poor performance in logistics as a constraint to export growth.
4. The Ministry of Industry which is developing an ambitious agenda for the revitalisation of industry, including in the provinces. The share of manufacturing in GDP has not returned to that seen before the Asian economic crisis, and the lack of good infrastructure and logistics is seen as an impediment to markedly increasing this share. Cutting the costs of logistics and domestic transport is a pillar for the Ministry's regional development policy.
5. Obligations under the ASEAN Economic Community Blueprint commit Indonesia, along with the other major ASEAN economies, to open the logistics sector by 2013. While there is some concern about foreign competition in parts of the logistics sector there is also pressure to prepare for the target date set by ASEAN. This commitment in ASEAN is being reinforced by the development of the Supply Chain Framework in APEC.
6. Stronger international competition brought about through free trade agreements is already putting pressure on manufacturing sectors that are intensive users of logistics. There is a clear understanding in business and government that logistics performance remains critical to Indonesia's ability to integrate through global and regional supply chains.

There is also a fiscal dimension to the drivers of reform. State-owned enterprises and others who have enjoyed monopolies in the sectors associated with transport and logistics have often been reluctant to give up their exclusive ownership, but the government's inability to fund sufficient infrastructure from the state's budget means that they are now less active in opposition to reform.

Finally, these changes take place in an international context. The last two items on the list above highlight its importance. On the one hand the international context places competitive pressures on the Indonesian economy. But on the other hand it also provides various forms of international cooperation, including commitments to ASEAN and through APEC's focus on trade facilitation and connectivity through its supply chain initiative. This informational context provides both encouragement and credibility for the components of Indonesia's plan.

22.7 REFERENCES

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