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Quantitative Analysis on Value Chain Risks in the APEC Region

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EXECUTIVE SUMMARY

Value chains are an important way of organizing economic activity in the Asia-Pacific. They are common in sectors such as electronics, textiles and clothing, and increasingly agribusiness. The essence of the value chain model is that the production process is split across a number of economies, rather than taking place in a single economy. The model is therefore necessarily network-based, rather than linear, as in traditional production models.

The network nature of value chains, combined with the management techniques that make such models possible, mean that risk is a key factor for all firms - a value chain is only as strong as its weakest link. An unforeseen negative development in one part of the chain, such as a natural disaster or a significant economic fluctuation, can upset the entire production process. As such, Value Chain Risk (VC Risk) is partly systemic in nature: it goes beyond traditional concerns such as inventory management, to include the risk that the entire value chain is upset due to an event that only directly affects one part of it.

This Report analyses VC Risk, and presents some of the first quantitative evidence on its nature and extent in the Asia-Pacific. Based on a review of the existing literature, it proposes five risk categories:

- Natural Disaster Risks
- Logistics and Infrastructure Risks
- Market Risks
- Regulatory Risks
- Political Risks

Each category is discussed in terms of its connection with the overall concept of VC Risk. Measurement relies on the use of a small set of proxy indicators, as well as statistical analysis of a larger dataset using the principal components methodology. The results of the statistical analysis are used to show that the inclusion of a small number of proxies in fact accounts for the overwhelming bulk of the observed variation in a wider range of indicators. The resulting indicators are therefore considered to be as simple, transparent, and easily replicable as possible.

In addition to producing quantitative indices for each category of VC Risk, the Report also provides an Overall VC Risk Index. Results from the quantitative analysis show that the level of VC Risk is, on average, low to moderate in the Asia-Pacific. Performance is comparable with that of the G-20, which, like APEC, is a group of economies at different income levels. Performance in terms of VC Risk is generally stronger in more homogeneous groups of developed economies, such as the G-8 and the OECD. However, APEC performs comparably with the OECD group in the area of logistics and infrastructure risks. ASEAN, by contrast, is in all cases found to be a riskier environment for value chains than the other groups, including APEC.

The Report also discusses the policy implications of these findings. First, the analysis of VC Risk and its importance for an increasingly-common business model in the region suggest that trade and investment issues need to be viewed from the perspective of risk, as a complement to more traditional analysis. Reinforcement of ongoing efforts in APEC, such as

the Supply Chain Connectivity Framework Action Plan, could be beneficial for regional economies.

Second, it is important to recognise that some types of VC Risk—such as regulatory risk—are directly amenable to policy action. There is thus considerable scope for policymakers to contribute to the process of managing and mitigating risk. A likely consequence of taking steps to reduce policy-related VC Risk is that the spread of value chains will be encouraged, with consequent positive implications for trade, investment, growth, and employment.

Finally, although APEC economies exhibit, on average, a low to moderate level of risk, there is clear scope to reduce their VC Risk profile further. The G-8 and the OECD—although made up exclusively of developed economies—display significantly lower VC Risk scores in a number of risk categories. Concerted policy efforts, as well as learning from the experience of other economies in the region, are likely to prove beneficial in this regard.

1. PROJECT OVERVIEW

Global and regional value chains (GVCs) are highly prevalent in the APEC region, particularly in sectors such as electronics. This new way of organizing production splits the process across numerous economies. Suppliers in multiple economies make component parts, which are then brought together for final assembly in another economy, before being shipped elsewhere - often to the large, developed-economy markets. The emergence of this business model would not have been possible without an accommodating policy environment. On the one hand, APEC economies generally have low to moderate tariff rates in sectors of primary interest for GVCs; on the other, APEC's two Trade Facilitation Action Plans were successful in lowering other types of trade transaction costs within the region. The Supply Chain Connectivity Framework Action Plan looks to build on that success by taking a broader perspective, namely that of the whole supply chain.

At the same time as GVCs have grown in importance, however, current events have shaped an emerging understanding that risk management plays an important role in their shape and extent. Risk management refers to not just traditional business risks—such as inventory management or redundancy of links—but to systemic risks as well. This latter term encompasses risks related to the failure of one link in the supply chain, which, because a chain is only as strong as its weakest link, results in negative consequences for the whole chain. An example of such a problem in the region was the severe flooding that occurred in Thailand in 2011. Thailand is an important supplier of hard drives to many companies, and the floods led to serious disruptions in production and distribution for much of the personal computer industry. As a result, some lead companies in GVCs had to urgently reorganize their production processes to meet demand in the face of this severe disruption to the supply of a vital component.

Against this background, the CTI has endorsed a new project designed to provide a comprehensive analysis of the elements of possible risk factors in cross-border value chains. Because of the nature of GVCs, risk is necessarily cross-border, and this fact makes it appropriate for a forum like APEC to investigate the matter further and ensure that economies are provided with as much information and analysis as possible. The purpose of the project is to identify possible risks while clarifying current problems and issues in the APEC region. It is not intended to collect fresh data for this task, but instead to focus on the use of existing international data from established sources.

The Value Chain Resilience Project (VCR) is divided into four phases:

1. Phase One will involve a quantitative analysis of value chain risk of the APEC region.
2. Phase Two will evaluate value chain strength in the APEC region.
3. Phase Three will evaluate value chain connectedness in the region.
4. Phase Four will involve the creation of a comprehensive model to evaluate the possible risks and impact of value chain resilience by utilizing results from the earlier three phases on value chain risks, value chain strength, and value chain connectedness.

Phase One of the VCR project is a quantitative analysis of Value Chain Risk (VC Risk). The objective is to produce a dataset and index measuring VC Risk in the APEC region with output based on the following steps:

1. Identification of the components of VC Risk.
2. Evaluation of each component of VC Risk using data from internationally comparable sources. Examples of such sources include the World Bank, the IMF, the UN, the WTO, the OECD, and the WEF, among others.
3. Compilation of the component-by-component evaluation into a comprehensive dataset to be made available to member economies interested in evaluating their VC Risk profile.
4. Synthesis of the data into a single index summarizing all of the components of VC Risk. The synthesis will be done using an averaging methodology. The approach used to choose the weights is a major analytical decision for Phase One of the project, as the final index numbers may be sensitive to the methodology adopted.
5. Comparison of VC Risk in APEC economies with other reference groups around the world; for example, the G8, ASEAN, the G20, or the OECD.

Phase One is intended to lay the groundwork for the additional phases of the VCR project. Its objectives and outputs are primarily data related. More detailed analysis of the data's economic implications will take place during later phases of the project.

This Report deals exclusively with Phase One of the VCR Project and proceeds as follows. Section 2 presents a brief conceptual overview of VC Risks and their importance from a commercial and economic point of view. In Section 3, the Report proposes a quantification method of VC Risks that is designed to be comprehensive, transparent, and easily replicable. Section 4 discusses results of the quantitative analysis, and Section 5 provides conclusions and policy implications.

2. CONCEPTUALIZING VALUE CHAIN RISK

OVERVIEW

There is no academic literature that directly provides a comprehensive evaluation of VC Risk as contemplated by this Project; see below for an evaluation of related academic and policy material. It is therefore necessary to start from the beginning in terms of methodology, and build a dataset and index from the ground up.

The first step in conceptualizing VC Risks is to state clearly what is intended by the term. In this Report, VC Risks are taken to include all factors that add to the transactional uncertainty associated with value chain processes. For example, the risk of occurrence of natural disasters such as earthquakes and floods requires firms in affected economies to adopt hedging strategies that are sometimes costly. Insurance is one case of such a strategy, as is keeping a higher level of inventory to deal with potential stock-outs brought about by a natural disaster. In the international context, lead firms in value chains are increasingly building in network redundancies as a way of managing risk: instead of sourcing all of their supplies of a particular component from just one economy, they spread sourcing across a number of economies on the assumption that it is unlikely that all are simultaneously affected by a natural disaster. However, supply chain redundancies are not without costs as they limit component producers' ability to achieve economies of scale, thus increasing the overall cost profile of the value chain.

In light of the network structure of value chains, VC Risks can be seen as a type of systemic risk. The idea behind this concept is that an interruption at one point in the value chain can affect activity all through the chain. In other words, shocks are quickly propagated within networked production structures. Moreover, small disruptions can turn into large ones at higher levels in the chain, because the way in which shocks are transmitted through networks can be highly nonlinear. If a crucial link in the value chain becomes disrupted, even temporarily, operations for the entire chain can be severely upset if an appropriate but costly hedging strategy is not in place.

The next section elaborates on these issues in the context of a review of related academic and policy literature. The purpose of the remainder of Chapter 2 is to provide the basis for the rest of the report, which develops a comprehensive, transparent, and easily replicable approach to measuring VC Risks.

RELATED LITERATURE

Though most academic literature on VC Risk has taken a firm-centric perspective, attention has been growing in recent years on global risks' policy implications. The increasing importance of outsourcing and offshoring has changed the way global firms operate and shown the importance of sound risk management strategies as part of their daily operations. The following literature highlights these new trends in risk management, both at the firm and the economy-wide level. The review is necessarily selective, focusing on the most relevant contributions from the point of view of the present exercise, namely classifying and measuring VC Risk for policy purposes.

WEF Report: New Models for Addressing Supply Chain and Transport Risk (2012)

Supply chain networks are becoming more efficient around the world, yet are also becoming more prone to disruptions. This point is particularly true for those disruptions originating from unforeseen risks outside the control of an individual company, which can bring unintended, system-wide consequences. Any single company or organization due to their global nature and impact cannot mitigate these systemic risks. The report noted that "certain external events, when combined with existing network vulnerabilities, have the potential to cause widespread, systemic disruptions".

Based on a World Economic Forum Supply Chain and Transport Risk Survey conducted in 2011, the following triggers were seen as the most likely to cause global supply chain disruptions (Table 2.1).[1]

Table 2.1 Triggers of global supply chain disruptions

Environmental	Economic
Natural disasters (59%)	Sudden demand shocks (44%)
Extreme weather (30%)	Extreme volatility in commodity prices (30%)
Pandemic (11%)	Border delays (26%)
	Currency fluctuations (26%)
	Global energy shortages (19%)
	Ownership/investment restrictions (17%)
	Shortage of labour (17%)
Geopolitical	**Technological**
Conflict and political unrest (46%)	Information and communications disruptions (30%)
Export/import restrictions (33%)	Transport infrastructure failures (6%)
Terrorism (32%)	
Corruption (17%)	
Illicit trade and organized crime (15%)	
Maritime piracy (9%)	
Nuclear/biological/chemical weapon (6%)	

Source: Figure 2, WEF (2012).

The report also noted the considerable negative impact to finances and reputation that disruptions can bring to companies and governments. The authors quote a study by Singhal and Hendricks (2005) which examined the impact of 885 operational supply chain disruptions within publicly traded companies from 1992 to 1999. It "revealed a significant financial impact on performance, as operating income dropped by 107%, return on sales by 115% and return on assets by 92%" (page 12). Additionally, the way a company or a government handles unexpected disasters while maintaining a level of service which meets their stakeholders' expectations will factor heavily in their reputation and credibility.

WEF Report: Global Risk Report (2013)

This report focuses on global risks which are external to and generally too complex to be managed by a single company. An annual survey of over 1,000 experts from industry, government, academia, and civil society forms the basis for the report. Respondents review a landscape of 50 global risks coming from five categories: economic, environmental,

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[1] In the survey, respondents ranked the external disruptions based on the likelihood of these disruptions to provoke significant and systemic effects on supply chain or transport networks. Disruptions are grouped based on four categories: environmental, geopolitical, economic, and technological

geopolitical, societal, and technological - by answering questions about the likelihood, impact, and interconnected nature of these risks.

The 2013 report shows that "economic risks" appear consistently in the top five global risks in terms of likelihood and even more so in terms of impact. Economic risks include issues such as "severe income disparity", "chronic fiscal imbalances", and "major systemic financial failure". Societal risks such as "water supply crises", "mismanagement of population ageing", "food shortage crises", and "chronic disease" also appear quite frequently on the top five list.

In terms of interconnectedness, "global governance failure," "severe income disparity," "critical fragile states," and "food shortage crises" were among the top-ten most connected risks in the 2013 Global Risks report.

Lloyd's Risk Index (2013)

Lloyd's, an international insurer, conducted a survey which asked respondents about their attitudes to 50 risks across five categories: business and strategic risk; economic, regulatory and market risk; political, crime and security risk; environmental and health risk; and natural hazard risk. The survey includes respondents' perception of their priority and preparedness for the 50 risks. In 2013, the priority score for the five general categories fell compared with the 2011 results (Table 2.2).

Table 2.2 Overall risk categories – 2013 versus 2011

2013 Priority Rank	Risk categories	2013 Priority Score	2013 Preparedness Score	2011 Priority Score	2011 Preparedness Score
1	Business and Strategic Risk	6.5	6.3	7.3	7.1
2	Economic, Regulatory and Market Risk	6.3	6.5	7.2	6.5
3	Political, Crime and Security Risk	5.2	6.0	5.4	6.5
4	Environmental and Health Risk	4.8	5.8	5.0	6.1
5	Natural Hazard Risk	4.1	5.5	4.2	5.5

Source: Lloyd's Risk Index 2013.

The top five specific risks according to respondents are: high taxation; loss of customers or cancelled orders; cyber risk; the price of material inputs; and excessively strict regulation. Two of the top risks seem to originate from the fact that recovery from the global financial crisis is still uncertain. There are significant gaps in terms of priority and preparedness scores for these two categories (Table 2.3).

Table 2.3 Top five individual risks, priority and preparedness scores 2013

	Individual Risks	Priority	Preparedness
1	High taxation	6.2	5.3
2	Loss of customers/ cancelled orders	6.1	5.7
3	Cyber risk	5.7	5.9
4	Price of material inputs	5.6	5.8
5	Excessively strict regulation	5.6	5.4

Source: Lloyd's Risk Index 2013.

Cyber risk moving into the third position reflects a large jump from previous results and indicates that businesses had underestimated the impact of this particular risk before. Nevertheless, the business community's level of preparedness for cyber risk is relatively higher than their priority score.

Risk coming from the price of material inputs is also seen as rising from previous years. The uncertainty in the price of raw materials and the price of energy are the main concerns in this category.

Lastly, excessively strict regulation potentially shows concerns over financial regulation, especially in Europe, and environmental regulation in other regions.

MIT/PWC Report: Supply Chain and Risk Management (2013)

This study examines how large companies deal with and manage their international operations in the face of supply chain disruptions. It was based on a survey of 209 global companies that face various risks in running their supply chains, including price fluctuations of raw materials or energy, currency fluctuations, environmental catastrophes and geopolitical instability. Table 2.4 provides a complete list of risks that survey respondents perceived to affect their supply chains.

Table 2.4 Survey participants' view on sources of risk faced by their supply chains.

Raw material fluctuations	53%
Currency fluctuations	47%
Market changes	41%
Energy/fuel prices volatility	38%
Environmental catastrophes	34%
Raw material scarcity	28%
Rising labour costs	26%
Geopolitical instability	22%
Supplier/Partner Bankruptcy	22%
Change in Technology	20%
Unplanned IT disruptions	12%
Counterfeiting	11%
Other	6%
Telecommunication outages	5%
Cyber attacks	2%

Source: Figure 2 in Simchi-Levi and Kyratzoglou (2013)

The survey results showed that 59% of companies mitigate risk by increasing capacity or by positioning additional inventory (buffer planning). These companies, classified as having *immature risk processes*, also tend to have a low degree of integration or minimum visibility on emerging changes and patterns outside the company. The other 41%, those with *mature risk processes* which perform financially and operationally better, have developed more sophisticated supply chain operations and risk management which emphasize collaborative, proactive, dynamic, and flexible approaches (Table 2.5).

Table 2.5 Mature processes in supply chain operations and risk management.

Collaborative	Proactive
• External and internal collaboration • Visibility and information sharing between supply chain partners • Full integration of key functions • Incorporation of external input into internal planning activities • Supply chain rationalisation • Performance measured and forecasted	• Proactive risk management • Quantitative risk management • Business continuity plans • Partner resilience monitoring • Use of sensors and predictors to proactively position response mechanisms
Dynamic	**Flexible**
• Dynamic supply chain adaptation to value chain change • Full enterprise integration • Full upstream and downstream visibility • Complete alignment on key customer value dimensions across the enterprise • Use of sophisticated operations models • Supply chain segmentation matches multiple customer value propositions	• Invest in flexibility (processes, products, plants, capacity) • Manage risk pressure away from weak suppliers • Common standards and processes • Timely supply chain bottlenecks management

Source: Table 1 in Simchi-Levi and Kyratzoglou (2013).

A Combined Fuzzy Decision Making Approach to Supply Chain Risk Assessment (2010)

The study by Moeinzadeh and Hajfathaliha (2010) provides an example of how management risks within supply chains can be done using the SCOR (Supply Chain Operation Reference) framework. Under the SCOR framework, risks are categorized into supply, process, demand, control, and environmental risks, as indicated in Table 2.6.

Table 2.6 Categories of supply chain risks.

Risk category	Risk driver	Risk impact
Plan and control risk	- Applied methods, concepts and tools - IT systems (breakdown, introduction or change of IT systems, virus damage, change of interfaces, data loss)	- Opportunity costs - Cost of capital - Logistics costs
Supply risk	- Quality of material - Suppliers (failure, single sourcing, adherence to delivery dates) - Supplier dependence - Global sourcing - Supplier concentration - Supply market - Damage to cargo - Monopoly situations (single sourcing) - New strategic alignment of suppliers	- Production stop - Replacement purchase costs - Supply interruptions

	- Illiquidity and insolvency of suppliers	
Process risk	- Lead times - Capacity bottleneck - Output quality - Machine damage - Human error - Faulty planning - Trouble with third-party logistics providers - Major technological change	- Supply difficulties - Repair costs
Demand risk	- Demand fluctuations - Changes in preferences - Cancellations - Planning and communication flaws in sales dept. - Inflexibility	- Supply difficulties - Safety stock (Bullwhip effect)
Environmental risk	- Natural disasters (fire, earthquake, flood, rock fall, landslide, avalanche, etc.) - Weather (iciness, storm, heat) - Political instability (strike, taxes, war, terrorist attacks, embargo, political labour conflicts, industrial disputes) - Import or export controls - Social and cultural grievances - Crime - Price and currency risks/inflation	- Opportunity costs - Replacement costs

Source: Table 1, Moeinzadeh and Hajfathaliha (2010)

Managing Risk in Your Organization with the SCOR Methodology

This report highlighted the origins of the apparently increased volatility and sensitivity to disruptions experienced throughout a firm's supply chain. Although cost-reducing supply chain strategies such as zero-inventory or just-in-time movement of goods have been considered successful, the increasingly global nature of supply chains has exponentially increased both the likelihood and impact of disruptions. As such, achieving supply chain continuity is crucial for global corporations to remain competitive.

The report pointed out how several disastrous events (such as earthquakes, terrorist attacks, and epidemic outbreaks) have created major losses for companies affected. These losses could amount to a 10% decline in market capitalization, a $400 million loss due to late delivery of components, and to a daily cost of disruptions in the range of $50-$100 million.

Following Wagner and Bode (2006), the report introduced four interrelated concepts of risk and disruption:

1. *Supply chain risk:* defined as the negative deviation from the expected value of a certain performance measure, resulting in negative consequences for the focal firm.
2. *Supply chain disruption:* an unintended, untoward situation, which leads to supply chain risk.

3. *Supply chain risk source:* the derived category of supply chain disruptions.
4. *Supply chain vulnerability:* the susceptibility of the supply chain to the occurrence of risk or supply chain disruption. Vulnerability is also equated with "an exposure to serious disturbance" (as in Christopher and Peck, 2004).

3. APPROACH TO MEASURING VALUE CHAIN RISK

Chapter 2 discussed the complexity of measuring VC Risk. VC Risk is a many-faceted concept, which is difficult to encapsulate in a single number. To provide a quantitative overview of VC Risk in the Asia-Pacific, we therefore proceed by identifying major categories of VC Risk and building the analysis up from that point. The approach adopted here focuses on achieving three goals for the resulting indicators: comprehensiveness; transparency; and ease of replication. All three objectives are important for indicators that are to be both policy-relevant and potentially useful to value chain researchers inside and outside the Asia-Pacific region. A set of indicators that satisfies all three criteria will be easily interpretable for policymakers. Moreover, such a set of indicators will facilitate future work by researchers and policy experts, as well as timely and cost-effective updates of this Report if member economies consider that to be a fruitful avenue for future work.

It is important to highlight that measuring VC Risk needs to focus on the concept of *risk*, namely the possibility that an unforeseeable event occurs, and imposes costs on economic agents involved in value chain processes. VC Risk is therefore not just about the quality of infrastructure and other factors that influence the way in which value chains do business. Many of those factors are more relevant to an assessment of *resilience* or *strength*, which will be addressed in Phase 2 of this Project. Moreover, an economy's ability to respond to risks through a coordinated approach involving both public and private sector actors will also be examined in Phase 2. This first phase of the Project involves the analysis of risk in a pure sense, and not an economy's ability to respond to it.

A NOTE ON PRINCIPAL COMPONENT ANALYSIS

The focus on risk in Phase 1 makes it possible to identify a relatively small number of indicators that capture the main dimensions of uncertainty that affect value chain processes. To reduce the number of indicators to a manageable size while retaining a high degree of explanatory power, we have used a statistical technique known as Principal Component Analysis (PCA) to identify the indicators with the greatest explanatory power. .

PCA is a standard statistical technique that is widely used in economic analysis. It uses a mathematical procedure to produce an optimal summary indicator from a set of original indicators. The summary measure, known as the first principal component, is optimal in the sense that it accounts for the maximum possible variation in the original set of indicators. No linear combination (such as an alternative weighted average) can account for a greater percentage of the variation in the original indicators than the first principal component. This technique has previously been used in the APEC context to measure multimodal transport connectivity (PSU, 2010) and by other international organizations such as the World Bank (Logistics Performance Index), and the United Nations (UNCTAD's Liner Shipping Connectivity Index).

In the initial stage of the VC Risk project, a large set of potential indicators were analysed to help us better understand the nature and potential effects a wide range of scenarios could have on the value chain. As the analysis progressed, we observed a high degree of correlation within that indicator set, meaning that multiple data series were explaining the same effect. By using PCA, we were able to isolate a smaller subset of indicators that explained a majority of the risk in a clear, straightforward manner while removing those selections that added little to the overall analysis. Our results retain the same relative strength of explanation without the clutter of other unnecessary indicators and noise, making for an analysis that is easily understood yet robust.

The remainder of this Chapter discusses each uncertainty in turn, before presenting a methodology for rescaling and aggregating the individual data points into indices that can be used to assess VC Risk from a holistic perspective. Full details of data and sources are provided in the Appendix.

CATEGORIES OF VALUE CHAIN RISK

The literature review in Chapter 2 showed that there is no standard categorisation of VC Risks. We have therefore adopted a selective approach based on the previous literature. We focus on extracting risk categories that are important to business, as indicated in Chapter 2, but also relevant to policymakers seeking to understand and manage VC Risk at the economy level. To provide maximum transparency, we have tried to keep the number of categories to a manageable number. This approach facilitates accessibility from an end-user perspective, and makes replication and updating easier over the medium term.

Defining clearly what VC Risks are is difficult, as people will have different interpretations of what constitutes risk. Nevertheless, the following definitions serve as a useful starting point:

1. Natural Disaster Risks: the possibility that economic activity may be impeded by natural disaster.
2. Logistics and Infrastructure Risks: the set of disruptions that can occur to supply chain processes when the markets or actors that connect supply chain operators to each other do not perform as expected.
3. Market Risks: economic fluctuations that disrupt prices, output, or other economic fundamentals.
4. Regulatory and Policy Risks: unexpected changes in regulatory stance, or inconsistency in enforcement, can increase business uncertainty, and thus the transaction costs associated with value chain processes.
5. Political Risks: the possibility that economic activity may be impeded by the occurrence of political or violent conflicts inside or outside the economy.

Natural Disaster Risks

Disasters and other natural phenomena have the potential to disrupt supply chains, because they can make it more difficult to move goods across borders or, in extreme circumstances, they may even shut down production entirely in important centres. The effect of floods in Thailand on value chains that use hard disks is a relatively recent example. Of course, many economies have shown over time that they have well-developed capacities to respond to natural disaster risks. The policy and private sector development factors that contribute to that capacity will be examined in Phase 2 of this Project, which deals with Value Chain Strength. At this stage, the focus is exclusively on the underlying level of risk.

Measuring natural disaster risks is difficult, because a wide range of factors come into play. One approach would be to include as many of those factors as possible in the indicator set, with the aim of achieving comprehensive coverage. However, this approach necessarily introduces complexity into the exercise. We prefer to focus on a small number of proxy measures, which is appropriate because data on natural disasters are often strongly correlated. Moreover, not all natural disasters are common in the Asia-Pacific region, which means that

there is sometimes limited variation in the indicators across economies. The informational content of indicators that do not vary much is limited, and they can safely be excluded.

As a starting point, therefore, we consider a wide range of risks from the Project Concept Note, which we proceed to narrow down to a smaller number. We take eight into account: earthquakes; floods; storms; mass geophysical movements; volcanos; wildfires; droughts; and extreme temperatures. PCA of the eight indicators shows that just three are responsible for a large proportion of the variation in the data: floods; storms; and earthquakes. Intuitively, these three are also the most important and commonly occurring natural disaster risks from a value chain point of view. Indeed, over 75% of the observed variation in the first principal component of the eight indicators is accounted for by a simple average of these three indicators.

To compose our measure of natural disaster risks, we therefore take a simple average of the following three indicators over the 20 year period 1992-2012 (after rescaling):

- Total number of people affected by floods per year and per 100,000 population.
- Total number of people affected by storms per year and per 100,000 population.
- Total number of people affected by earthquakes per year and per 100,000 population.

The scales used for these measures—the number of people affected—are common in the literature on assessing the impacts of natural disasters. However, the same disaster would be regarded more serious if it occurred in an urban area than a rural one, because of increased population density. These measures are therefore imperfect, in the sense that they capture population effects, but not necessarily effects on transport infrastructure and connectivity, which are arguably more relevant to the operation of value chains. However, restrictions on the availability of comparable data across economies mean that these are the best data available to measure the importance of natural disaster risks in the value chain context at the present time.

Logistics and Infrastructure Risks

We use the category of logistics and infrastructure risks to refer to the set of disruptions that can occur to supply chain processes when the markets or actors that connect supply chain operators to each other do not perform as expected. Given the APEC context of this work, we focus on cross-border value chains. Logistics and infrastructure risks encompass the infrastructure risks category identified in the Project Concept Note, but also take a broader range of factors into account, including the performance of service providers.

Logistics is a broad concept, and one with many dimensions. The World Bank's Logistics Performance Index (LPI), for example, considers six core dimensions of logistics performance. In the interests of simplicity and transparency, this report proposes a simpler approach using just two indicators from the LPI database. First, the LPI questionnaire asks respondents—who are professionals in the logistics industry—to evaluate the quality of trade and transport infrastructure in countries they do business with. This indicator therefore captures infrastructure risks as they relate to logistics in the cross-border context.[2] Second,

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[2] The focus of this report is on value chains in the APEC context, so the cross-border element is important. This context is an important reason for preferring the LPI infrastructure quality measure to alternatives such as the World Economic Forum's measures of infrastructure quality, which mostly deal with domestic structures.

the survey asks respondents to indicate the percentage of shipments that satisfy their firm's quality criteria for delivery. Typically, logistics firms measure quality through such metrics as timeliness of delivery, and the state of the goods when they are delivered (e.g., undamaged, and not subject to criminal activity or loss). As a result, the inverse of the LPI measure—the percentage of shipments that do not meet firms' quality criteria—can be considered to be a measure of the risk associated with logistics processes broadly conceived. A higher score indicates a higher level of risk.

Importantly, measuring logistics and infrastructure risks in this way takes account of the full range of causes that can lead to disruptions in the logistics processes that make value chains work. For instance, an infrastructure failure typically results in delays and/or damage to goods, and so would tend to keep shipments from meeting firm quality criteria. Similarly, a deficiency in the market for transport or distribution services could lead to late delivery, which would again be recorded as a shipment that does not meet firm quality criteria. As a result of the comprehensive nature of these measures, and their inherent relationship to the idea of risk, it is unnecessary to include additional indicators—a wide range of factors are already accounted for by these indicators of logistics and infrastructure risks, and the addition of further data series will be of only limited informational benefit.

To compose our measure of logistics and infrastructure risks, we therefore use rescaled LPI measures of the quality of trade and transport infrastructure, and the percentage of shipments that do not meet firms' quality criteria. In the APEC context, the shipment quality measure has also found recent application in the closely linked area of supply chain connectivity: it is one of the external indicators of building infrastructure and capacity presented in the mid-term review of the Supply Chain Connectivity Framework Action Plan (PSU, 2012).

The Project Concept Note identifies a range of possible data sources for its category of infrastructure risks: road and rail network density; the quality of road, rail, and port infrastructure; fixed and mobile telephone subscribers; the number of internet users; and access to improved water. In terms of the broader VCR project, these indicators are more relevant to the assessment of value chain strength rather than risk: they do not directly assess the likelihood of events with negative impacts. In any case, a simple average of the indicators proposed here accounts for over 50% of the observed variation in an optimal summary index of the full set of indicators, produced as in the previous section by PCA.

Market Risks

Market risks of various types have considerable potential to disrupt value chain processes. The term is used broadly to apply to economic fluctuations that disrupt prices, output, or other economic fundamentals. For example, the global financial crisis and resulting collapse of trade seriously upset—albeit temporarily—cross-border value chain processes around the world, including in the Asia-Pacific. Economic crises, as well unforeseen fluctuations more generally, have the capacity to decrease trade and investment flows, with follow-on international effects to employment and income.

Although other types of infrastructure, such as access to electricity or water, can impede economic activity, they are not particular to cross-border value chains, and so are not considered here. Moreover, general infrastructure indicators have a closer correspondence with value chain strength (Phase Two of this project) rather than value chain risk.

As was the case for natural risks, economic fluctuations that can affect value chains come in many shapes and forms. One approach would be to include a wide range of indicators in an effort to be comprehensive. However, we have concluded that such a complex index would have relatively little added value compared with a simpler version in which just a few proxy indicators are selected which captures the most important economic fluctuations from a VC Risk perspective. Again, economic fluctuations are often correlated, so the informational content of an additional indicator can sometimes be relatively limited.

As an exploratory exercise, we have considered thirteen elements of market risk, based in part on the preliminary ideas presented in the Project Concept Note: fluctuation of the Consumer Price Index; instability of nominal GDP growth; instability of the nominal interest rate; instability of the share price index; cereal import dependency ratio; domestic food price level volatility index; proportion of oil imports to total imports; sovereign rating; central government gross debt as a proportion of GDP; foreign reserves in proportion to monthly imports; net international investment position as a percentage of GDP; instability of the current account balance as a proportion of GDP; and instability of domestic credit provided by the banking sector as a proportion of GDP.

PCA shows that most of the common variation in these indicators is accounted for by just three: fluctuation of the CPI; sovereign ratings; and the net international investment position. A simple average of these three indicators accounts for over 75% of the observed variation in the first principal component of the thirteen series.

Our market risks index is therefore a simple average of the following three indicators (after rescaling):

- Instability of the CPI (a 5-year simple average).
- Sovereign ratings (an average of the 3 ratings components from Moody's, S&P and Fitch).
- Net international investment position (the difference between an economy's external financial assets and liabilities) as a percentage of GDP.

Regulatory Risks

Regulatory and policy risks can affect value chain performance as unexpected changes in regulatory stance which are not in accordance with international norms; which foster protectionist policies; or allow for inconsistent enforcement, can increase business uncertainty and thus the transaction costs associated with value chain processes. It is therefore appropriate to include information on such risks in the VCR project, even though they are difficult to quantify.

For the previous categories of VC Risks, we have used a limited range of proxy indicators to capture the essential aspects of the relevant risks, rather than adopting an approach in which a full range of correlated indicators is included. The case of regulatory risks is made much simpler than the others by the existence of the World Bank's World Governance Indicators (WGIs). The WGIs cover six core elements of governance, each consisting of an index constructed from a large number of underlying data series using sophisticated statistical techniques. The result is a set of indices ranging from -2.5 to 2.5, with a higher score indicating better governance.

Two of the WGI indices are of particular interest for regulatory risks: rule of law; and control of corruption. Economies with a stronger rule of law are less likely to impose arbitrary and unforeseen regulatory changes, and those where corruption is limited provide firms with greater transparency and certainty when it comes to the costs linked with common transactions. To convert the indicators to measures of regulatory risk rather than regulatory good practice, each is multiplied by negative one: a higher score therefore implies a weaker rule of law (greater risk), or a greater prevalence of corruption (again, greater risk). These two indicators together capture the most important aspects of regulatory risk from the point of view of value chain processes.

Our regulatory risks indicator is therefore a simple average of the following indicators, rescaled as discussed below:

- The WGI rule of law index.
- The WGI control of corruption index.

To show that these indicators indeed capture a wide range of regulatory risks, we again conduct PCA using a broader set of indicators, as foreshadowed in the Project Concept Note: the six World Governance Indicators (rule of law, regulatory quality, control of corruption, political stability and the absence of violence, voice and accountability, and government effectiveness); the number of free trade agreements and economic partnership agreements in force; and the numbers of international investment agreements and double taxation agreements concluded. The simple average of the two series we have proposed accounts for over 92% of the observed variation in the first principal component of that set of indicators. We are therefore confident that using just these two indicators captures a wide range of regulatory risks that have the capacity to affect value chain performance.

Political Risks

Armed conflict, terrorism, and political instability can affect value chain processes by increasing the time and cost of transactions, and reducing reliability. It is therefore important to consider them as part of the VC Risk assessment process, even though they are sometimes difficult to quantify.

The types of political risks that can affect value chains are numerous and include all forms of political instability and violence that add to the risk profile of operators. In this particular case, as for regulatory risks, it is unnecessary to examine a wide range of indicators in order to construct a comprehensive index. The World Bank's WGIs already have an index of political stability and the absence of violence, which is constructed from a large number of underlying data series using sophisticated statistical techniques.

The WGI political stability index ranges from -2.5 to 2.5, with a higher score indicating a more stable environment. We therefore rescale it by multiplying by negative one, so that it becomes an indicator of risk: a higher score indicates a riskier (less stable) environment. It is also rescaled in the same way as the other indicators (see further below). In light of the comprehensive nature of this index, it is unnecessary to add more indicators to the analysis of political risk; using just one index that is already comprehensive in its coverage is a simple and effective approach.

To demonstrate this last point, we compare our proposed approach with the data series mentioned in the Project Concept Note under the geopolitical risks category: the scale of terrorism and the number of terrorist incidents; and the number of battle-related deaths. A PCA-based summary index of these data series correlates strongly with the WGI political stability and absence of violence indicator: the latter accounts for nearly 60% of the observed variation in the first principal component of the full set of indicators. We therefore believe that it is a reliable proxy for political risks in the value chain context, and takes account of an appropriately wide range of factors.

RESCALING AND AGGREGATION SCHEMES

As discussed at the beginning of this Chapter, it is desirable to produce indicators that are simple, straightforward, and transparent. However, it is necessary to introduce an additional step into the analysis because of the presence of multiple indicators in some cases: rescaling and aggregation. By keeping these processes as simple as possible, without sacrificing quality or appeal to the end-user, the data product will be easier to interpret and reproduce. This approach also substantially reduces the costs associated with updating results in the future.

Rescaling is important because the underlying indicators are measured on different scales, so there is the possibility for one or more to act as dominant measures simply due to their size, rather than their economic importance. For purposes of enhanced transparency, it is important to apply the same rescaling scheme to all variables in the analysis. We therefore opt to apply a statistical technique, standardization, to rescale all variables prior to conducting any further analysis. Standardization subtracts each variable's mean (average) from each observed value, and then divides the result by the variable's standard deviation. The result is a set of variables each of which has an average value of zero, and a standard deviation of one. This rescaling technique can be applied to variables on any scale, including percentages and, importantly, indices with negative values. It is commonly used in statistical work. For example, it is usually applied prior to using techniques such as PCA, which was the basis of PSU's approach to the measurement of multimodal connectivity in the Asia-Pacific (PSU, 2010).

It is also important that the aggregation scheme used to combine underlying indicators into summary indices be as simple, transparent, and easy to reproduce as possible. To that end, we propose two levels of analysis: indicators and indices. Indicators are individual data series taken from international sources, as proposed in the Project Concept Note. Indices are summary measures based on those indicators. Figure 4.1 illustrates the approach.

Figure 4.1 VC Risk Information Tiers
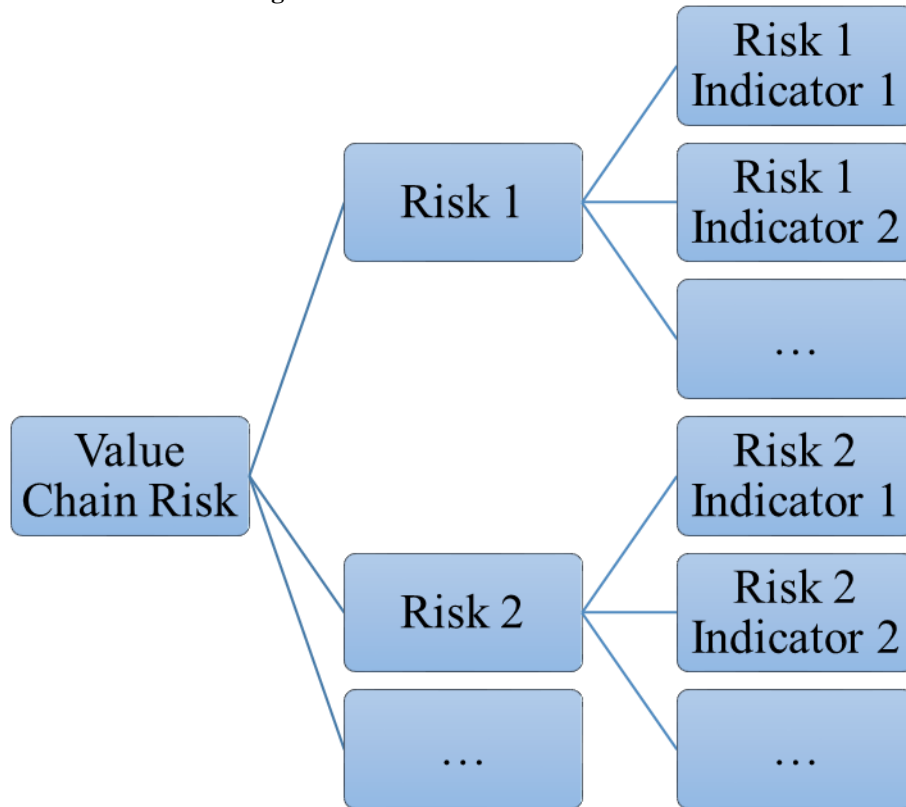
Source: Authors

To aggregate indicators into summary indices, we use simple averages. The advantage of adopting simple averages is that they are transparent and easily replicable. An alternative methodology is to construct weighted averages, either based on professional judgment or on a statistical technique such as PCA. However, weighted averages suffer from the disadvantage that the choice of weights is never free from controversy, and it has the potential to significantly affect final results. In addition, it is difficult to exercise objective, professional judgment in this area because of the novelty of the exercise, and the difficulty of comparing economic impacts from one indicator to another at this stage of the Project (i.e., before impact analysis has been undertaken). An additional point in favour of using simple averages is that PCA—which produces objective weights based on a statistical technique—gives results that are statistically identical to those obtained with a simple average in all cases except natural risks and market risks; in those cases, results from PCA correlate very strongly with the simple average (rho = 0.93 and 0.99 respectively). We therefore prefer the less complicated and more transparent approach.

The fact that all indicators are rescaled to have mean zero and standard deviation one means that some of them, and by extension, some indicators, have negative values. These numbers are difficult to interpret from a policy point of view. To make the results easier to read, we adopt a second rescaling procedure in which a simple linear transformation is applied to convert the data to a scale of one (lowest risk) to ten (highest risk). This outcome is achieved by setting the minimum value of each index as observed in the data equal to one, and the maximum value equal to ten. Observations between the extremes are then proportionately distributed between one and ten.

The final stage in the analysis is to produce an overall VC Risk index. Rescaling is unnecessary at this point, because all of the risk indices are on the same scale (one to ten). To

aggregate them into a final VC Risk index, we again use a simple average. The advantage of a simple average over other possible aggregation schemes is that it is simple and transparent. Moreover, statistical analysis using the PCA methodology shows that a simple average correlates very strongly with the first principal component of the five VC Risk category indices presented in the next Chapter. Concretely, the simple average accounts for nearly 95% of the observed variation in the principal components index. The gain from using a more sophisticated methodology is therefore negligible, and we prefer the simpler and more transparent approach. The overall index is available only when there are complete observations on all sub-indices, to enable cross-economy comparability.

4. RESULTS OF QUANTITATIVE ANALYSIS

This Chapter reviews the results of the data collection and quantitative analysis exercise described in Chapter 3. Each category of VC Risk is dealt with separately, before discussion of an overall index that combines the five categories. Performance in the APEC region is measured by calculating scores for each economy individually, and then taking the regional (simple) average. To put APEC's performance in comparative perspective, results are also presented for the OECD, the G-8, the G-20, and ASEAN. Although individual economy results are not presented in this report, they are available from the Policy Support Unit at the request of individual economies interested in conducting their own diagnostic exercises, in order to come to a better understanding of the nature and extent of VC Risks in their own economy.

NATURAL DISASTER RISKS

As discussed in Chapter 3, the natural disaster risks category is the simple average of three indicators: floods; storms; and earthquakes. The natural disaster risks index is measured on a scale of one through ten inclusive, with one being assigned to the least risky economy in the sample, and ten being assigned to the riskiest economy. Comparative results are in Figure 4.1.

Figure 4.1 Natural disaster risks: results for APEC, ASEAN, G-8, G-20, and OECD.
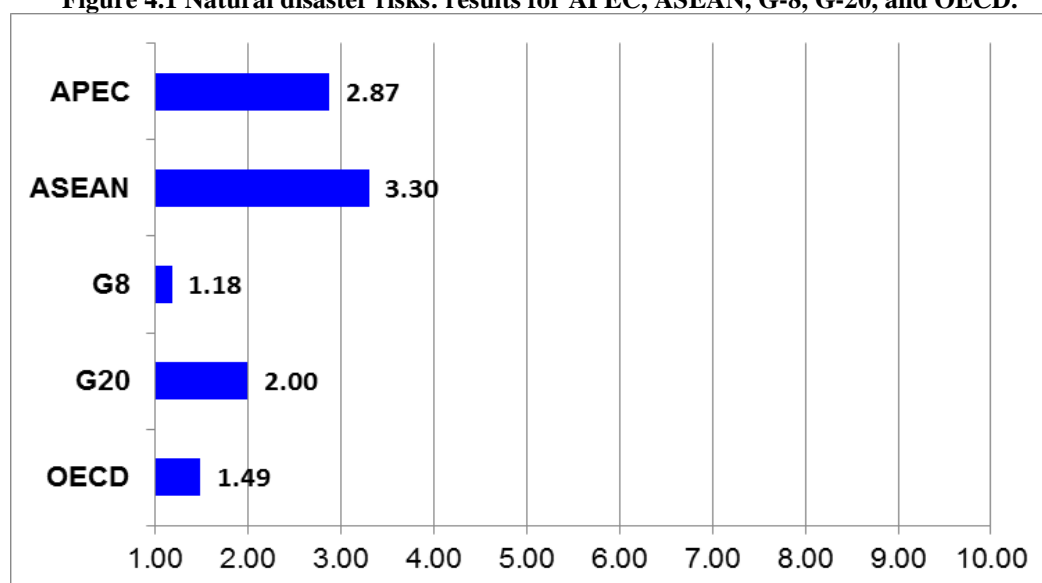
Source: Authors.

The average level of natural disaster risk in APEC economies is low to moderate compared with the riskiest economies in the sample, as evidenced by an average score of less than three out of ten. However, APEC's score is noticeably higher than that of the OECD, the G-8, or the G-20. Of the comparator groups, only ASEAN has a higher score.

These results suggest that natural disaster risks certainly need management in the APEC context, arguably to a greater degree than in some comparator regions. For instance, the United Nations Office for Disaster Risk Reduction has stated: "In Asia and the Pacific, over the past four decades, the average number of people exposed to annual flooding has increased from 29.5 to 63.8 million, whilst populations in cyclone-prone areas have grown from 71.8 million to 120.7 million. The region also represents more than 85 per cent of global economic

exposure to tropical cyclones - pointing to a pattern of economic growth in typhoon prone coastlines and flood plains."[3] The region's geography means that natural disaster risks are a serious issue in some economies, for example those around the Pacific Rim that are subject to earthquakes, and those that are subject to storm risks because of direct oceanic exposure.

In part, the finding on natural disaster risk scores is due to the heterogeneous nature of APEC, which includes both developed and developing economies. The low scores for the G-8 and the OECD compared with other comparator regions suggests that natural risks are relatively less important as a VC Risk issue in more developed economies.

LOGISTICS AND INFRASTRUCTURE RISKS

Chapter 3 defined logistics and infrastructure risks as the average of trade and transport infrastructure quality, and the percentage of shipments that do not meet firm quality criteria, as assessed by logistics professionals through the World Bank's Logistics Performance Index. APEC's score in this case is again around three out of ten. However, the comparative perspective on that score is quite different. In the case of logistics and infrastructure risks, APEC's performance is comparable to that of the OECD, although the latter group of economies does record a slightly lower score. Only the G-8 has a considerably lower score, again due to the homogeneity of that group in the sense that it only includes highly developed economies. APEC's performance in the area of logistics and infrastructure risks is superior to that of ASEAN and the G-20, which suggests that in global perspective, logistics and infrastructure risks—although low to moderate on average in APEC economies—are relatively less problematic than in some other economic groupings.

**Figure 4.2 Logistics and infrastructure risks: results for APEC, ASEAN, G-8, G-20, and OECD.**
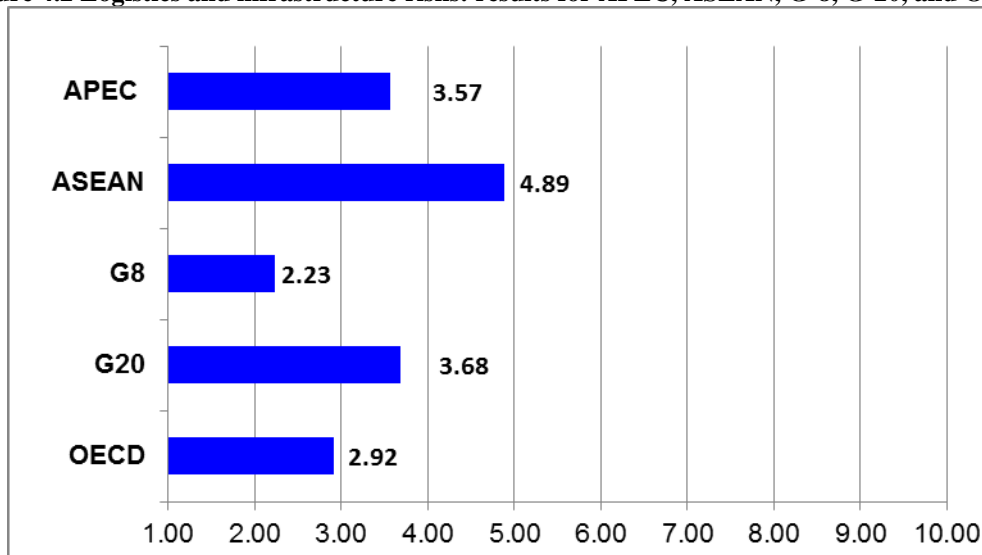
Source: Authors.

MARKET RISKS

Chapter 3 defined market risks as the simple average of three data series: fluctuation of the CPI; sovereign ratings; and the net international investment position. Results by economy group are in Figure 4.3. The average level of market risk in APEC is again moderate, as indicated by a score of just under four out of ten.

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[3] http://www.unisdr.org/files/29288_apdr2012finallowres.pdf.

**Figure 4.3 Market risks: results for APEC, ASEAN, G-8, G-20, and OECD.**
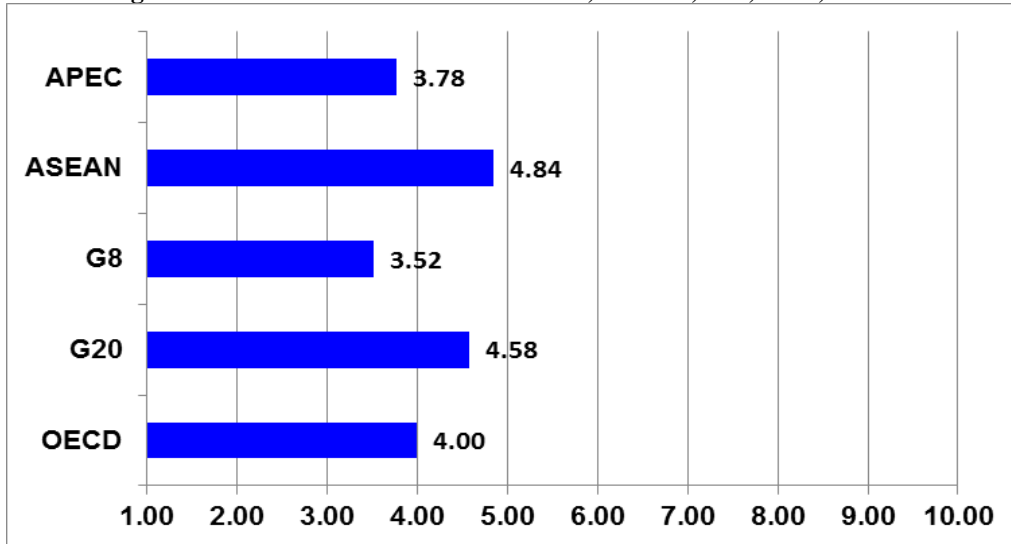
Source: Authors.

APEC's score is in line with all of the comparator groups, although the G-8 developed economies have a noticeably lower score. APEC's score is close to that of the OECD, but in fact slightly lower. ASEAN and the G-20 have significantly higher scores, which is indicative of higher levels of market risk.

REGULATORY RISKS

Chapter 3 defined regulatory risks as the simple average of two data series from the World Governance Indicators: corruption; and the lack of the rule of law. Figure 4.4 presents results in comparative perspective. APEC's average score on this index is noticeably higher than for the three preceding indices, but the same is broadly true of the other economic groupings used for comparative purposes. This finding suggests that regulatory risks may be a particularly important source of VC Risks in APEC and elsewhere globally. Given that these risks are more directly within the control of governments than some other categories of VC Risk, there is correspondingly more scope for appropriate policy interventions to help mitigate the extent to which these risks affect value chain activities.

**Figure 4.4 Regulatory risks: results for APEC, ASEAN, G-8, G-20, and OECD.**
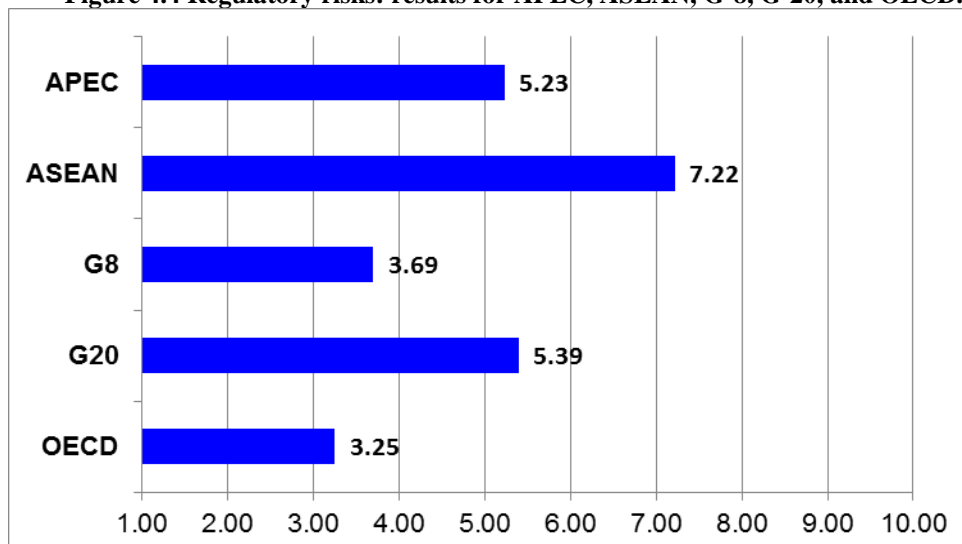
Source: Authors.

APEC's score of approximately five out of ten indicates that regulatory risk is of a moderate level on average. The region's performance is comparable to that of the G-20, and is significantly better than that of ASEAN. However, APEC's risk score is noticeably higher than the G-8 and OECD groups. This result again partly reflects the fact that APEC is a relatively heterogeneous forum compared with these comparator groups, as it includes developing as well as developed economies. The data suggest that regulatory risks are generally more significant in developing economies than in developed ones.

POLITICAL RISKS

Chapter 3 defined political risks using the political instability and violence index from the World Governance Indicators. Results are in Figure 4.5. They show that the level of risk in APEC economies is moderate, on average. The score in this category is comparable to that on the regulatory risks index, which is unsurprising in light of the well-known correlation among the various components that make up the World Governance Indicators.

Figure 4.5 Political risks: results for APEC, ASEAN, G-8, G-20, and OECD.
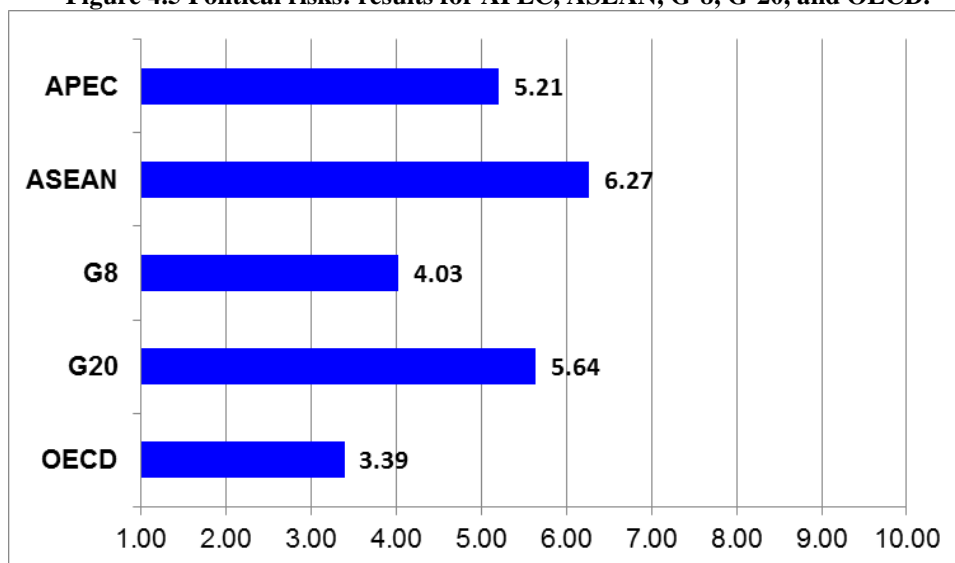
Source: Authors.

In comparative perspective, APEC displays a lower average level of risk than ASEAN or the G-20. However, this category of VC Risks is scored more highly in APEC than in the G-8 or the OECD. As in previous cases, this finding surely reflects the heterogeneity of APEC as a forum, namely its inclusion of developing and developed economies alike. The developed economies of the G-8 and the OECD tend to perform more strongly in this area of risk.

OVERALL VC RISK INDEX

As discussed in the previous Chapter, the Overall VC Risk Index is calculated by taking the simple average of the five category indices. Results are in Figure 4.6. In line with the findings for the category indices, Figure 4.6 shows that the overall level of VC Risk in APEC economies is, on average, low to moderate. In comparative perspective, APEC's performance is comparable to that of the G-20 group of economies, which is also heterogeneous in the sense that it includes both developed and developing economies. The OECD and the G-8— which include developed economies only—have lower VC Risk scores, in line with the findings from most of the category indices. By contrast, ASEAN has a higher average VC Risk score than APEC.

Figure 4.6 Overall VC Risk index: results for APEC, ASEAN, G-8, G-20, and OECD.
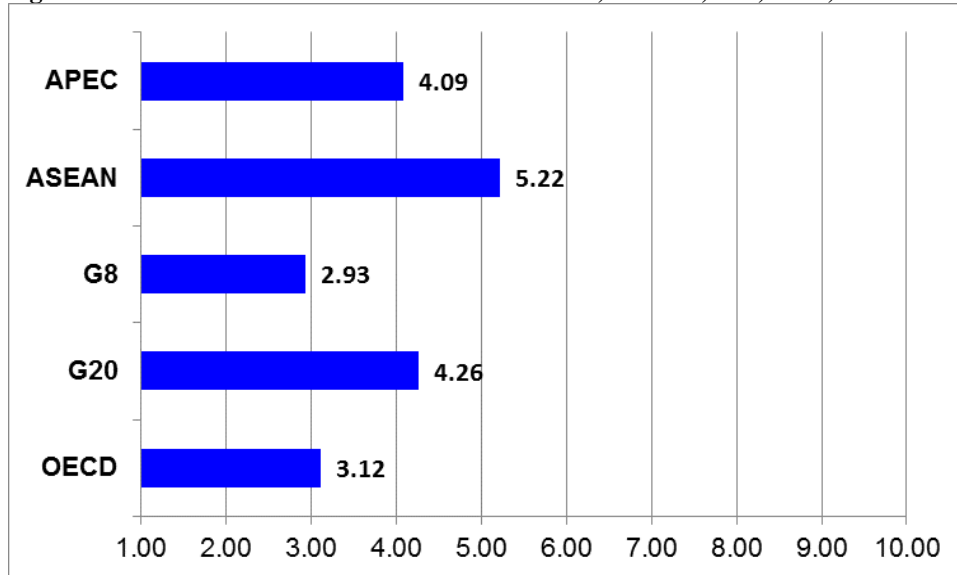
Source: Authors.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Value chains have become an important means of organizing production on a global and regional basis. They are common in many sectors of economic activity, including electronics, automobiles, textiles and clothing, and increasingly agribusiness. Understanding the factors that contribute to successful value chain-based business models enables policymakers to support the continued growth of this form of economic activity, a key driver of regional connectivity and economic growth in the APEC region.

Though many factors influence their outcome, a central component in creating a successful value chain is understanding and minimizing risk. Spreading production across multiple locations in different economies necessarily increases the risk profile of the lead firm. There is therefore a benefit-cost trade-off that needs to be satisfied before these kinds of trade and investment relationships can be implemented on the ground. Firms at all points in the value chain need to manage risk effectively. "Risk" in this context refers not only to the specific risks linked to the tasks that an individual firm performs, but the systemic risks linked to participation in a global value chain. Disruption of one part of the value chain due to, for example, a natural disaster, is a shock that propagates through the rest of the chain. It can conceivably have negative impacts on producers and consumers in a variety of economies through the links they have formed among themselves as a result of the value chain. Managing VC Risk is therefore crucial not only for the private sector, but also—to the extent that some risks lie within the purview of governments to alter—for policymakers.

Measuring VC Risk from an economy-wide perspective is a challenging task, as a wide range of factors potentially come into play. This Report has proposed a quantitative measurement methodology with three goals in mind: comprehensiveness; transparency; and ease of replication. All three objectives are important for indicators that are to be both policy-relevant, and potentially useful to value chain researchers inside and outside the Asia-Pacific region. A set of indicators that satisfies all three criteria will be easily interpretable for policymakers. Moreover, such a set of indicators will facilitate future work by researchers and policy experts, as well as timely and cost-effective updates of this Report if member economies consider that to be a fruitful avenue for future work.

With these points in mind, this Report has analysed five categories of VC Risk: natural disaster risks; logistics and infrastructure risks; market risks; regulatory risks; and political risks. Each category is measured using one or more proxy indicators. The choice of indicators is based on the statistical analysis of a wider set of indicators, with the aim of identifying a relatively small number of series that have maximum explanatory power. After rescaling, the indicators are aggregated into separate indices for each VC Risk category. A score of ten indicates that an economy is the riskiest economy in the sample, which includes APEC, ASEAN, the G-8, the G-20, and the OECD. A score of one indicates that an economy is the least risky in the sample. Results are not presented economy by economy, but instead simple averages are calculated for APEC and each of the comparator groups in the sample.

Results show that VC Risk levels are, on average, low to moderate in the APEC region. APEC's performance is typically stronger than that of ASEAN, and is sometimes stronger than that of the G-20. Usually, the developed economy groups of the G-8 and the OECD perform more strongly than APEC. This result is to be expected in light of the heterogeneity of the Asia-Pacific region in terms of development status and income level.

In addition to presenting results for each index separately, the Report also calculates an overall index that includes all five areas simultaneously. In line with the findings for the category indices, results show that the level of VC Risk in APEC is, on average, low to moderate. It is comparable to the level observed in the G-20 group of economies, which partly reflects the fact that both groups are relatively heterogeneous in terms of their composition: they include economies at different levels of development. The developed economy G-8 and OECD groups display an average level of VC Risk that is lower than what is observed in APEC, but the reverse is true for the ASEAN economies.

A number of important policy implications flow from this Report's findings. First, we have highlighted the important role that VC Risk can play in determining regional and global patterns of trade and investment. The importance of VC Risk suggests that policymakers should increasingly examine trade- and investment-related issues from a risk perspective. To some extent, this process has already started in APEC. For example, the Supply Chain Connectivity Framework Action Plan contains elements that relate to VC Risk, and APEC economies are working steadily towards the goal of a 10% improvement in terms of time, costs and uncertainty. The evidence presented here suggests that a broader perspective, encompassing multiple dimensions of risk, might be appropriate.

A second important finding for policymakers is that although risk levels as we have measured them are, on average, low to moderate within APEC, there is room to progress even further, as evidenced by the performance gap with respect to groups like the G-8 and the OECD. Although APEC is, of course, a more heterogeneous forum than those two groups of developed economies, the point remains that performance improvements are possible for APEC, an issue that is deserving of increased policy attention.

Finally, this Report has highlighted the fact that some VC Risks are amenable to action on a policy level. For example, although there is little that policymakers can do to limit the risk of a natural disaster, there is much that they can do to limit regulatory and political risks. The same applies for market and logistics and infrastructure risks; prudent economic policy and better transport services could reduce these risks. Of course, even in the case of natural disasters, there is considerable scope for policymakers to put in place systems that contribute to preparedness and recovery. However, those issues come under the heading of resilience rather than risk, and will be dealt with separately in Phase 2 of this Project.

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APPENDIX: DATA SOURCES AND DEFINITIONS

Natural Risk	Definition	Source
Population (Total)	Average Population, 1992-2012	World Development Indicators, World Bank
Earthquakes	Total Number of People Affected, 1992-2012	EM-DAT International Disaster Database
Floods	Total Number of People Affected, 1992-2012	EM-DAT International Disaster Database
Storms	Total Number of People Affected, 1992-2012	EM-DAT International Disaster Database
Logistics and Infrastructure Risks		
Quality of trade and transport infrastructure	Quality of trade and transport infrastructure	Logistics Performance Index, World Bank
Shipments not meeting company quality criteria	Percentage of shipments which do not meet firm's quality standards	Logistics Performance Index, World Bank
Market Risk		
Instability of the CPI	A 5-year simple average	International Financial Statistics, IMF
Sovereign ratings	An average of the 3 ratings components from Moody's, S&P and Fitch	Respective credit rating agencies websites
Net international investment position as a percentage of GDP	The difference between an economy's external financial assets and liabilities (the latest year available)	International Financial Statistics, IMF
Regulatory Risk		
Control of Corruption Index	Inverse of estimated score, 2012	Worldwide Governance Indicators, World Bank
Rule of Law Index	Inverse of estimated score, 2012	Worldwide Governance Indicators, World Bank
Political Risk		
Political Stability and Absence of Violence Index	Inverse of estimated score, 2012	Worldwide Governance Indicators, World Bank

APPENDIX: INDIVIDUAL ECONOMY ANALYSIS

AUSTRALIA

Australia has an overall VC Risk score of 2.76. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on Natural Disaster, Political Risk and Regulatory Risk are noticeably lower than its overall risk score, at 2.42, 2.38 and 1.66 respectively. By contrast, its scores in the areas of Market Risk and Logistic Risk are higher than its overall VC Risk score, at 3.5 and 3.82 respectively.

The pattern of the Australia's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on Natural Disaster Risk, Political Risk and Regulatory Risk tend to keep the overall score lower. By contrast, its scores on Market Risk and Logistic Risk tend to make the overall score higher. Priority areas for action for the Australia in the area of VC Risk therefore include Market Risk and Logistic Risk. Logistic Risk is relatively the highest risk faced by Australia in this context.
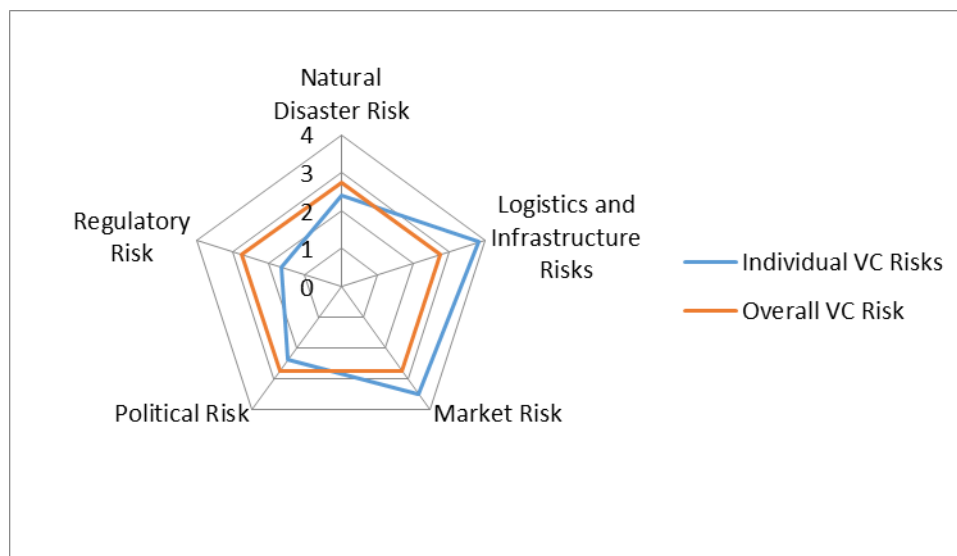
BRUNEI

The overall VC Risk score for Brunei cannot be calculated due to the unavailability of data to calculate Market Risk and Logistics and Infrastructure Risks. The average of the existing three risk categories provided the value of 2.79. This economy's scores on Natural Disaster Risk and Political Risk are noticeably lower than its overall risk score, at 1 and 2.64 respectively. By contrast, its scores in the areas of Regulatory Risk are higher than its overall VC Risk score, at 4.71.

The pattern of the Brunei's VC Risk component scores is shown in the figure below, with its average score as a reference point. The averaging score means that this economy's scores on Natural Disaster Risk and Political Risk tend to keep the overall score lower. By contrast, its scores on Regulatory Risk tend to make the overall score higher. Priority areas for action for the Brunei in the area of VC Risk therefore include Regulatory Risk.

Brunei's economy has been very dependent on oil, as such the fluctuations in oil price will have impact on the macroeconomic condition. Nevertheless there has been attempts to diversify the local economy to reduce the dependency by encouraging the growth of the agriculture and tourism sector.
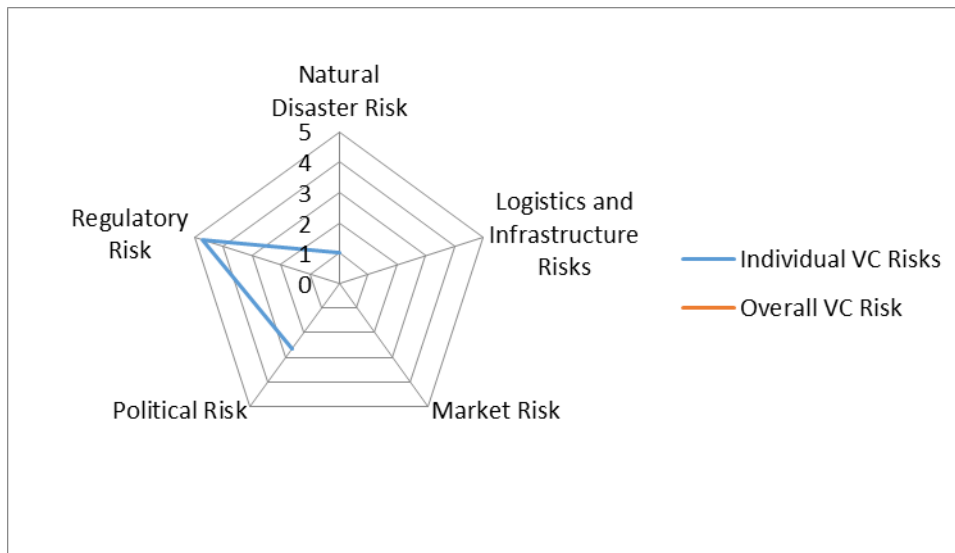
CANADA

Canada has an overall VC Risk score of 2.04. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and regulatory risk are lower than its overall risk score at 1.01 and 1.74. Political risk is near the average at 2.05.   Canada's scores in the areas of logistics and infrastructure risks and market risk are higher than its overall VC Risk score, at 2.56 and 2.85 respectively.

The pattern of Canada's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and regulatory risk tend to keep the overall score lower. By contrast, its scores on logistics and infrastructure risks and market risk tend to make the overall score higher. Priority areas for action for Canada in the area of VC Risk therefore include logistics and infrastructure risks and market risk.
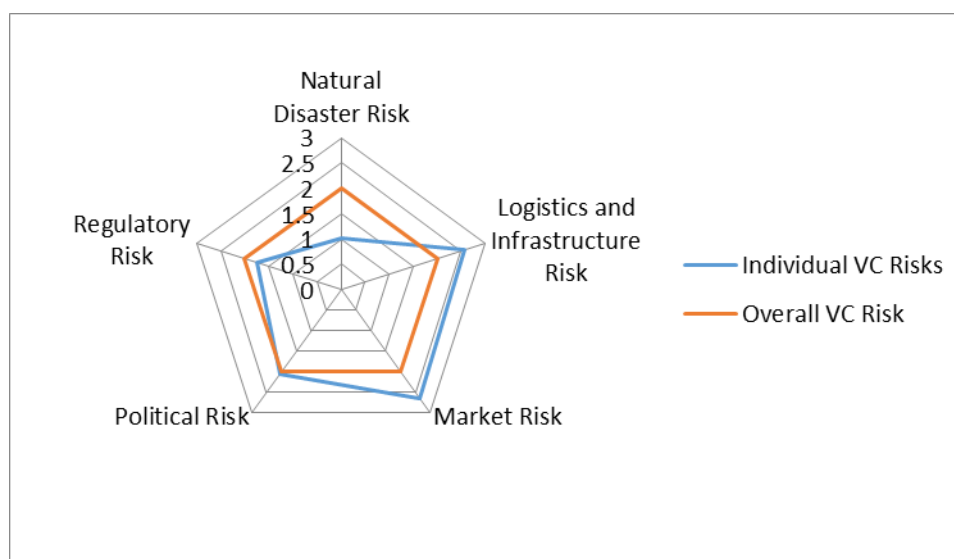
Various issues within each category exist across the APEC region yet are not important to all economies. To complement the areas highlighted in this report, other data points stand out when examining Canada's VC risk index, primarily trade dependence on a single foreign market. Over reliance on a single trade partner could have negative macroeconomic effects should the partner economy experience a reduction in external demand, a potential concern for firms investing in their global value chains.

CHILE

Chile has an overall VC Risk score of 4.27. This average is made up of varying scores on each of the five components of VC Risk. This economy's score on logistic risk at 3.44, market risk at 4.04, and regulatory risk at 2.75 are lower than the overall score. The scores on political risk and natural disaster risk are higher at 4.59 and 6.56 respectively.

The pattern of Chile's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on logistic risk, market risk, and regulatory risk tend to keep the overall score lower. By contrast, its scores on political risk and natural disaster risk have pushed the overall score higher. Chile could make political risk and natural disaster risk priority areas as they analyze their overall VC Risk performance.
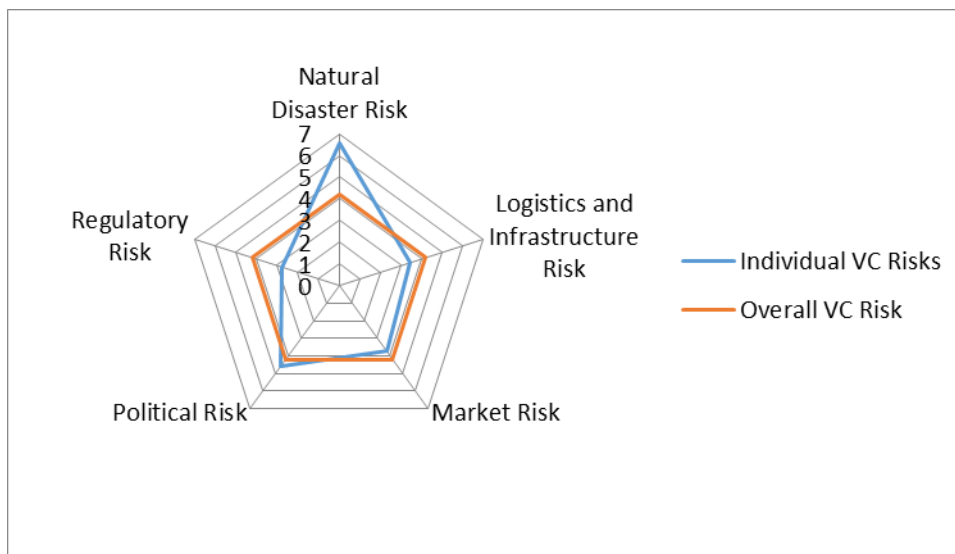
Chile has recognized the importance of studying natural disasters and has funded a National Center for Interdisciplinary Research on Natural Disaster Management to better understand and mitigate the effects natural events have on the economy and society.[4] For example, the February 2010 earthquake and subsequent tsunami caused severe but temporary disruptions to maritime and road traffic and required substantial investment in rebuilt infrastructure.[5] Reducing the impact of natural disasters will continue to reduce Chile's value chain risk profile. Further information on Chile's capacity to respond to natural disaster risks—which is strong—will be provided in Phase 2 of this project, on Value Chain Strength.

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[4] "New Center for Interdisciplinary Research on Natural Disaster Management", Boston University Pan-American Advanced Studies Institute, November 2012. http://www.bu.edu/pasi-tsunami/2012/11/02/new-center-disaster/
[5] "The Social, Political and Economic Aftershocks of the Chilean Earthquake", University of Pennsylvania, March 2010.

CHINA

China has an overall VC Risk score of 6.76. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on logistics and infrastructure risks, and market risk are noticeably lower than its overall risk score, at 4.56, and 3.65 respectively. By contrast, its scores in the areas of natural disaster risk, political risk, and regulatory risk are higher than its overall VC Risk score, at 10.00, 7.61, and 7.97 respectively.

The pattern of China's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on logistics and infrastructure risks, and market risk tend to keep the overall score lower. By contrast, its scores on natural disaster risk, political risk, and regulatory risk tend to make the overall score higher. Priority areas for action for China in the area of VC Risk therefore include natural disasters[6], and political and regulatory risks.
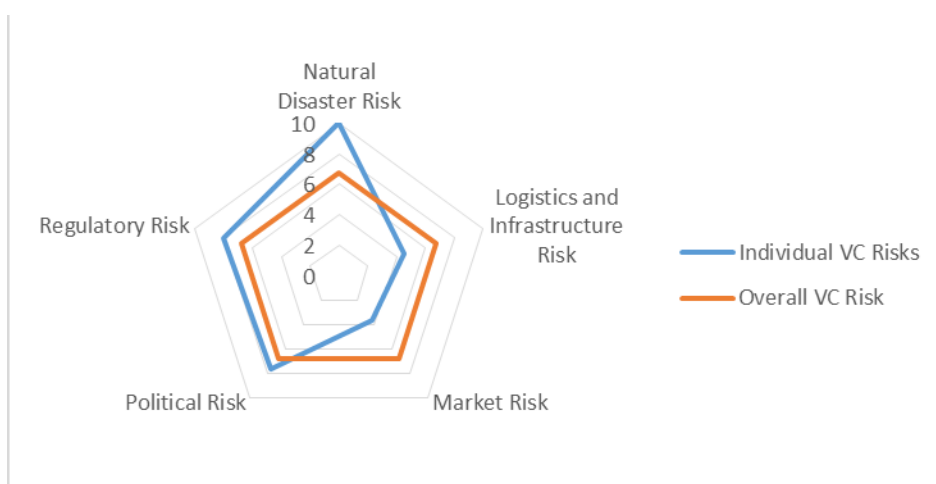
In addition to the quantity and quality of the infrastructure used for cross-border logistics processes, domestic logistics are also a point of concern. China's ratio of total logistics costs to GDP was 18.0% in 2012, a slight decrease from 18.1% in 2008. Nevertheless the ratio is almost twice that observed in other developed countries.[7] One possible reason for this relatively high logistics cost is the fragmented nature of the domestic logistics sector where it involves a mixture of foreign, state-owned and domestic private businesses[8].

China's air quality could be an issue looking the data from the urban outdoor air pollution monitoring which is represented by annual mean concentration of fine particulate matter (PM10, particles smaller than 10 microns). China's score on the Annual mean PM10 is higher than the world's average of 71 ug/m3.

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[6] China suffers significant disruptions from floods and storms in the natural disaster category. According to a report about the climate risks cities face by Swiss Re, the Pearl River Delta, one of the main economic centers in China, ranks number one among all metropolitan areas based on the number of people potentially affected by storm, storm surge and river flood. The value of the working days lost could reach 1-2 percent of the region's annual GDP (Source: http://media.swissre.com/documents/Swiss_Re_Mind_the_risk.pdf).
[7] Source: http://www.funggroup.com/eng/knowledge/research/china_dis_issue113.pdf
[8] Source: https://www.kpmg.com/cn/en/IssuesAndInsights/ArticlesPublications/Documents/Transport-Logistics-in-China-201112.pdf

HONG KONG, CHINA

Hong Kong, China has an overall VC Risk score of 1.91. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and market risk are noticeably lower than its overall risk score, at 1.03 and 1.00 respectively. By contrast, its scores in the areas of logistics and infrastructure risks, regulatory risk, and political risk are higher than its overall VC Risk score, at 2.79, 2.44, and 2.29 respectively.

The pattern of Hong Kong, China's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and market risk tend to keep the overall score lower. By contrast, its scores on logistics and infrastructure risks, regulatory risk, and political risk tend to make the overall score higher. Priority areas for action for Hong Kong, China in the area of VC Risk therefore include logistics and infrastructure risks, regulatory risk, and political risk.
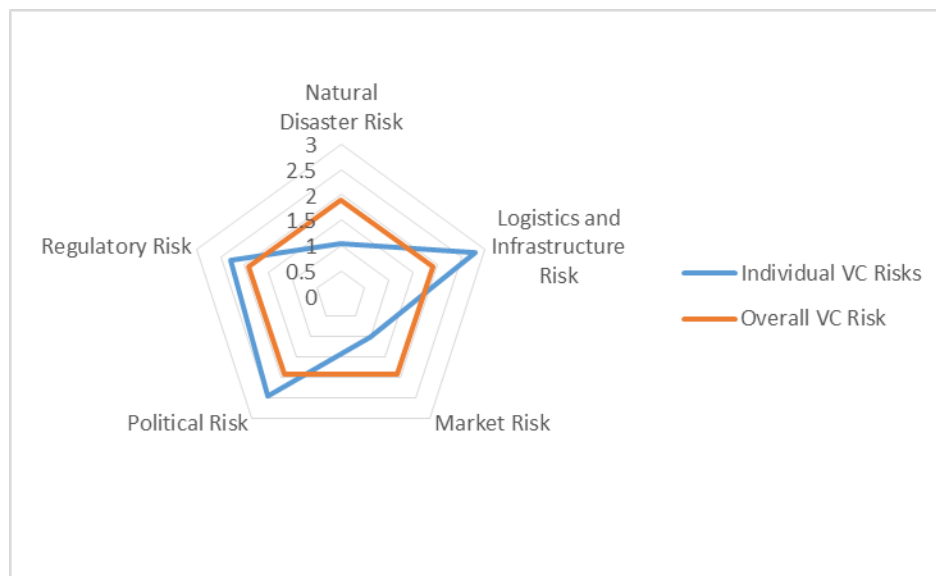
The factors included in the five risk indices presented in this report are representative of common VC Risks in APEC economies, but are not exhaustive in the sense of covering all risks that apply to particular economies, but to much greater or lesser degrees depending on the economy.

In terms of data points outside the scope of the representative analysis in this report, Hong Kong, China's position stands out in terms of natural environment issues for one type of health risk: SARS. This issue is a particular risk for Hong Kong, China, and a small number of other APEC economies, but cannot be considered a representative health risk in the region.

INDONESIA

Indonesia has an overall VC Risk score of 6.51. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on Natural Disaster Risk and Market Risk are noticeably lower than its overall risk score, at 2.27 and 6.07 respectively. By contrast, its scores in the areas of Logistic Risk, Political Risk and Regulatory Risk are higher than its overall VC Risk score, at 8.16, 7.71 and 8.34 respectively.

The pattern of the Indonesia's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on Natural Disaster Risk and Market Risk tend to keep the overall score lower. By contrast, its scores on Logistic Risk, Political Risk and Regulatory Risk tend to make the overall score higher. Priority areas for action for the Indonesia in the area of VC Risk therefore include Logistic Risk, Political Risk and Regulatory Risk.
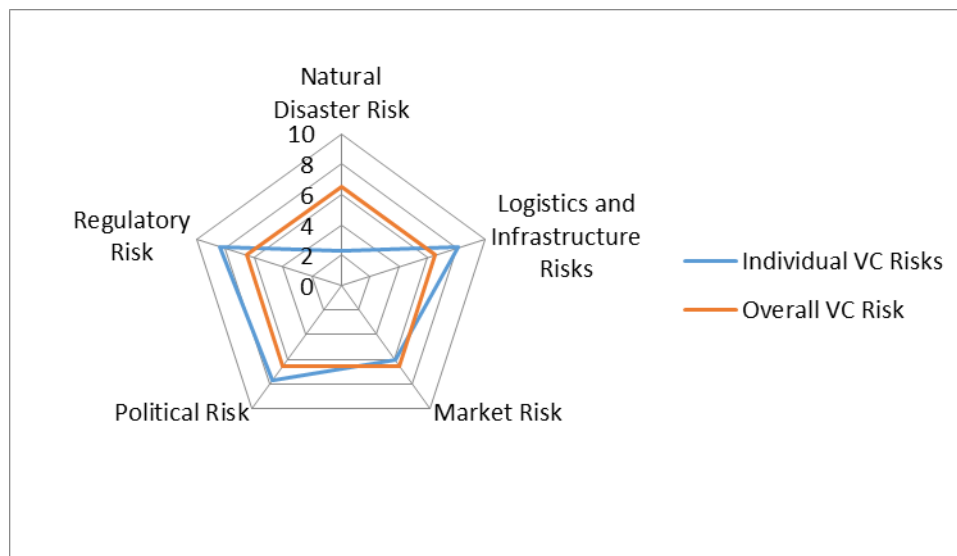
A recent report about the state of logistics in Indonesia[9], highlighted the issue of increasing Dwell Time (DT). DT measures the time from the container is being unloaded from a vessel until the container leaves the container terminal gate. The increase in DT could increase uncertainty as well as costs for exporters and importers.

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[9] State of Logistics Indonesia 2013, a joint report prepared by Center of Logistics and Supply Chain Studies, Asosiasi Logistik Indonesia, Panteia/NEA and The World Bank Office Jakarta.

JAPAN

Japan has an overall VC Risk score of 2.06. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and logistics and infrastructure risks are noticeably lower than its overall risk score, at 1.35 and 1.37 respectively. By contrast, its scores in the areas of political risk and regulatory risk are higher than its overall VC Risk score, at 2.58 and 2.75 respectively. Its score for market risk is just slightly higher than its overall risk score, at 2.26.

The pattern of Japan's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and logistics and infrastructure risks tends to keep the overall score lower. By contrast, its scores on political risk and regulatory risk tend to make the overall score higher. Priority areas for action for Japan in the area of VC Risk therefore include political risk and regulatory risk.
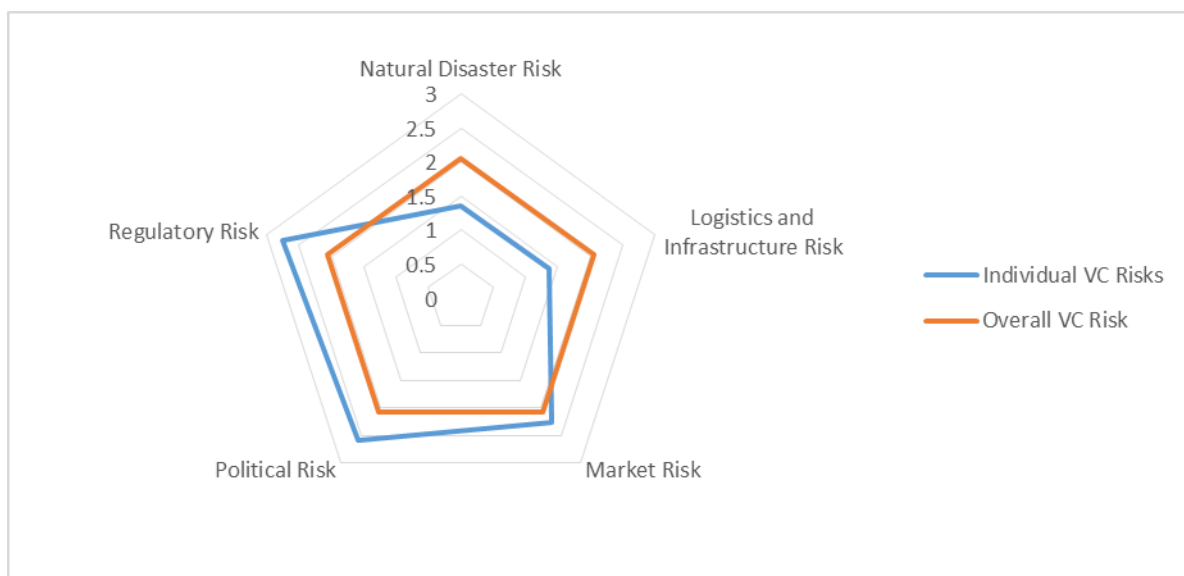

As previously noted, the indices presented here are broadly representative of the types of risks faced in APEC economies. Particular economies also face individual, non-representative risks. In the case of Japan's natural disaster risk category, earthquakes are a significant issue, but the quality of construction means that risk is significantly minimized; the natural disaster risk category takes account of loss of human life from earthquakes. In terms of market risks, two additional factors stand out: dependence on external sources for fuel and cereal imports; and a high level of central government debt. Both factors could be associated with long-run economic uncertainty.

KOREA

Korea has an overall VC Risk score of 3.31. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and logistics and infrastructure risks are noticeably lower than its overall risk score, at 1.09, and 1.67, respectively. By contrast, its scores in the areas of political risk and regulatory risk are higher than its overall VC Risk score, at 5.20 and 4.70 respectively. Its score on market risk is approximately the same as its overall score, at 3.89.

The pattern of Korea's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and logistics and infrastructure risks tend to keep the overall score lower. By contrast, its scores on political risk and regulatory risk tend to make the overall score higher. Priority areas for action for Korea in the area of VC Risk therefore include political risk and regulatory risk.
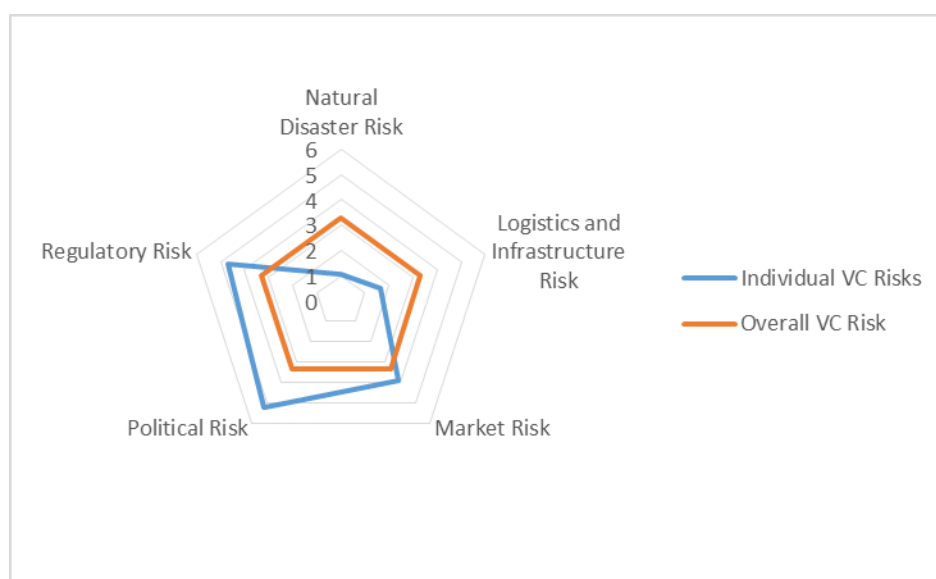

As a complement to the information included in this report, a number of other data points stand out for Korea in the general area of VC Risk. In terms of natural environment issues, the level of air pollution is potentially one that could be of ongoing concern to operators. Based on the Environmental Performance Index (http://epi.yale.edu/epi/issue-ranking/air-quality), air quality in Korea is ranked 166 out of 178 economies. The area of market risks sees dependency on oil and the level of exchange rate fluctuation as a potential issue. EIA estimates that South Korea was the world's tenth largest energy consumer in 2011 and also one of the top energy importers in the world.[10]

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[10] Source: http://www.eia.gov/countries/cab.cfm?fips=KS

MALAYSIA

Malaysia has an overall VC Risk score of 4.25. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and market risk are noticeably lower than its overall risk score, at 1.10 and 4.08 respectively. By contrast, its scores in the areas of logistic risk, political risk and regulatory risk are higher than its overall VC Risk score at 4.71, 5.77, and 5.57.

The pattern of Malaysia's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and market risk tend to keep the overall score lower. By contrast, its scores on logistic risk, political risk and regulatory risk tend to make the overall score higher. Priority areas for action for Malaysia in the area of VC Risk therefore include logistic risk, political risk and regulatory risk.
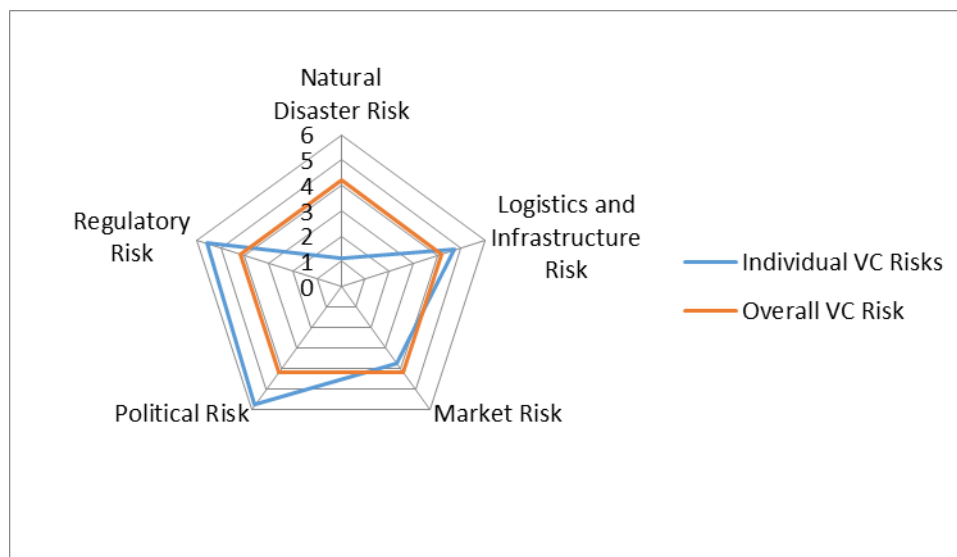

Regulatory risk in the supply chain context often deals with barriers to trade and foreign investment as firms may view these restrictions as contrary to the long-term viability of their operations. For Malaysia, the WTO notes that considerable progress has been made in opening the economy to foreign investment, allowing 100% foreign equity participation, but that competition-promoting policy measures have room for strengthening.[11]

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[11] "Trade Policy Review: Malaysia", WTO Secretariat, December 2009.

MEXICO

Mexico has an overall VC Risk score of 5.70. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk at 1.74 is considerably lower than its overall score, while logistics and market risk are closer to the average at 5.63 and 5.12. Scores in the areas of political risk and regulatory risk are higher than its overall VC Risk score, at 8.06 and 7.98 respectively.

The pattern of Mexico's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and market risk tend to keep the overall score lower. By contrast, its scores on political risk and regulatory risk tend to make the overall score higher. The score on logistics and infrastructure risks matches the average score. Priority areas for action for Mexico in the area of VC Risk therefore include political, regulatory, and logistics and infrastructure risks.
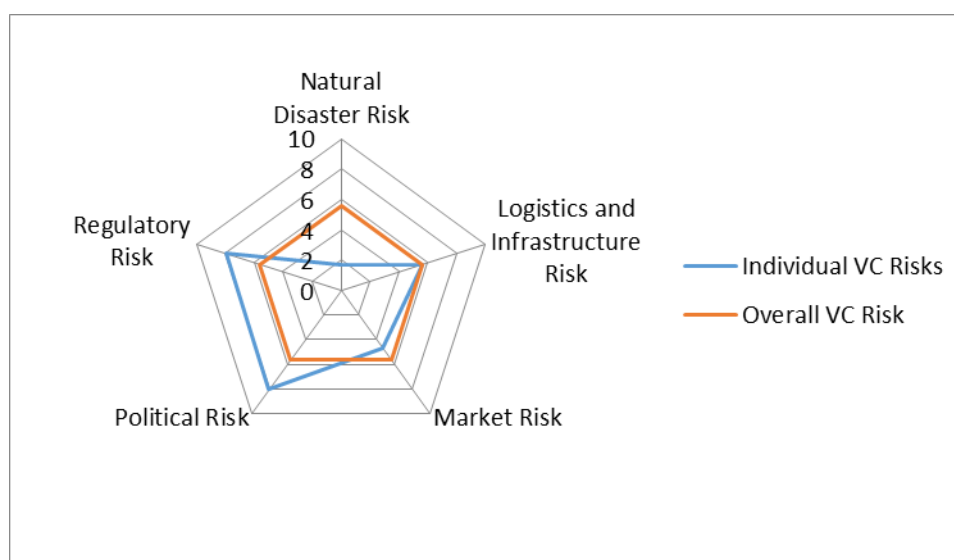

Mexico has begun undertaking reforms to improve regulatory policy, according to the OECD.[12] The report notes that positive results are being obtained, including the Single Window for Foreign Trade launched by the Customs General Administration in January 2012, and that sustained focus on continued reforms can help improve the regulatory environment, reducing the risks firms face in the process.

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[12] "Towards a Whole-of-government Perspective to Regulatory Improvement," OECD Review of Regulatory Reform: Mexico, 2013.

NEW ZEALAND

New Zealand has an overall VC Risk score of 2.95. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on Political Risk and Regulatory Risk are noticeably lower than its overall risk score, at 1.13 and 1.07 respectively. By contrast, its scores in the areas of Natural Disaster Risk, Logistic Risk and Market Risk are higher than its overall VC Risk score, at 5.53, 3.18 and 3.86 respectively.

The pattern of the New Zealand's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on Political Risk and Regulatory Risk tend to keep the overall score lower. By contrast, its scores on Natural Disaster Risk, Logistic Risk and Market Risk tend to make the overall score higher. Priority areas for action for the New Zealand in the area of VC Risk therefore include Natural Disaster Risk, Logistic Risk and Market Risk in which Natural Disaster Risk considered to be the highest risk compared with the other four.
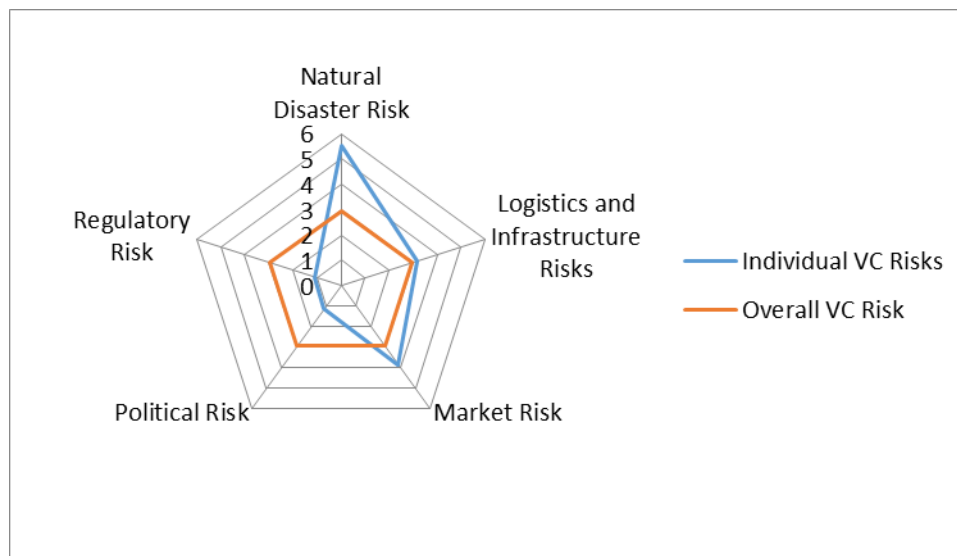

Floods and quakes have been cited as two of the most common and costly natural disasters in New Zealand. Data from http://www.teara.govt.nz/ mentioned that between 1920 and 1983, New Zealand experienced 935 damaging floods with industry payments for flood damage between 1976 and 2004 averaged $17 million per year in 2004 dollars. A 2012 IMF working paper estimated the cost of the quakes in New Zealand to reach about 10 percent of GDP. Nevertheless, these quakes had less impact on output because most of the manufacturing and agriculture sectors were largely unaffected (Laframboise and Loko, 2012 – p.10).

PAPUA NEW GUINEA (PNG)

The overall VC Risk score for PNG cannot be calculated due to the unavailability of data to calculate Market Risk and Logistics and Infrastructure Risk. The average of the existing four risk categories provided the value of 6.33. This economy's scores on Natural Disaster Risk are noticeably lower than its average risk score, at 1.82. By contrast, its scores in the areas of Political Risk and Regulatory Risk are higher than its average VC Risk score, at 7.95 and 9.21 respectively.

The average VC score means that this economy's scores on Natural Disaster Risk tend to keep the overall score lower. By contrast, its scores on Political Risk Regulatory Risk tend to make the overall score higher. Priority areas for action for the PNG in the area of VC Risk, based on the available data, therefore include Political Risk and Regulatory Risk in which Regulatory Risk considered to be the highest risk relatively compared with the other three.
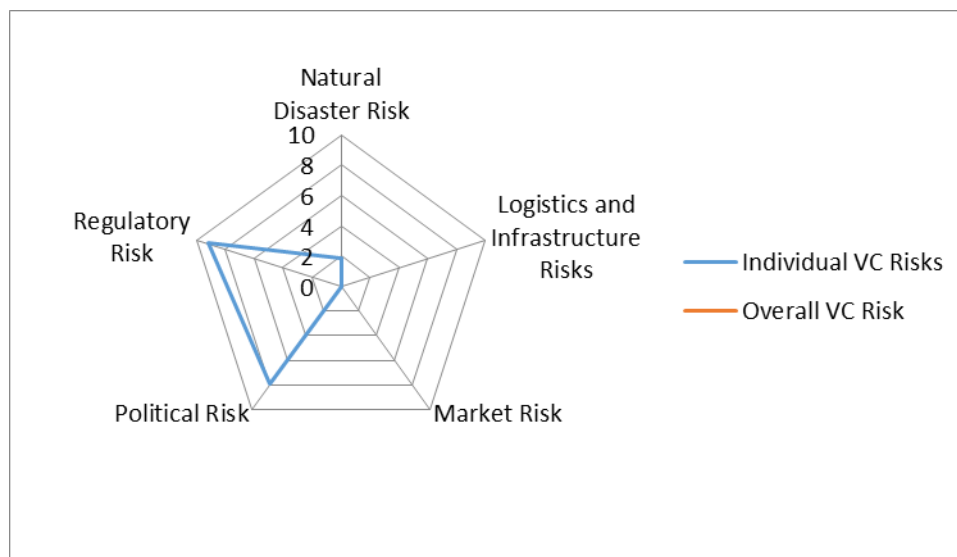

In addition to the data used to construct the index used here, areas of concern for PNG from a VC Risk standpoint include the quality and access of its telecommunication and energy infrastructure. Additionally, PNG also has significant health hazard risks based on the number of reported cases of Malaria and the incidence of tuberculosis.

PERU

Peru has an overall VC Risk score of 5.71. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk, logistics and infrastructure risks, and market risk are noticeably lower than its overall risk score, at 2.90, 4.13, and 4.79 respectively. By contrast, its scores in the areas of political risk and regulatory risk are higher than its overall VC Risk score, at 8.69 and 8.03.

The pattern of Peru's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk, logistics and infrastructure risks, and market risk tend to keep the overall score lower. By contrast, its scores on political risk and regulatory risk tend to make the overall score higher. Priority areas for action for Peru in the area of VC Risk therefore include political risk and regulatory risk.
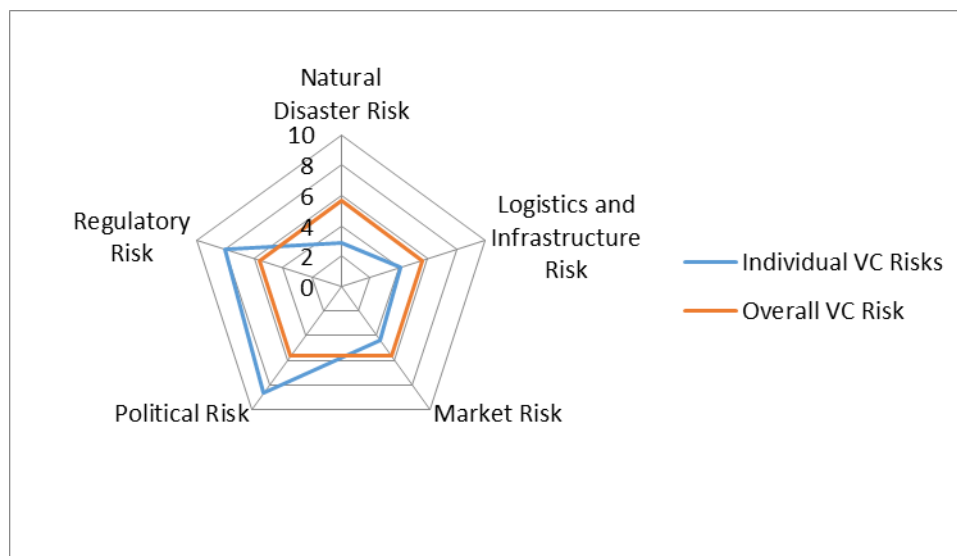

A transparent, predictable regulatory environment lowers the uncertainty faced by investors as they decide how to structure their supply chains. Peruvian manufacturers and exporters could experience significant gains through trade policy normalization and reform. A World Bank study estimated that if Peru were to bring its trade-related policies half-way to the APEC best practice standard, the economy could experience a 13% increase in GDP.[13]

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[13] "Trade Facilitation and Economic Development: Measuring the Impact", Wilson, J., C. Mann and T. Otsuki, World Bank Policy Research Working Paper, March 2003.

THE PHILIPPINES

The Philippines has an overall VC Risk score of 7.13. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on logistics and infrastructure risks and market risk are noticeably lower than its overall risk score, at 3.28 and 5.46 respectively. By contrast, its scores in the areas of natural disaster risk, political risk, and regulatory risk are higher than its overall VC Risk score, at 9.01, 9.71, and 8.18 respectively.

The pattern of the Philippines' VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on logistics and infrastructure risks and market risk tend to keep the overall score lower. By contrast, its scores on natural disaster risk, political risk, and regulatory risk tend to make the overall score higher. Priority areas for action for the Philippines in the area of VC Risk therefore include natural disaster risk, political risk, and regulatory risk.
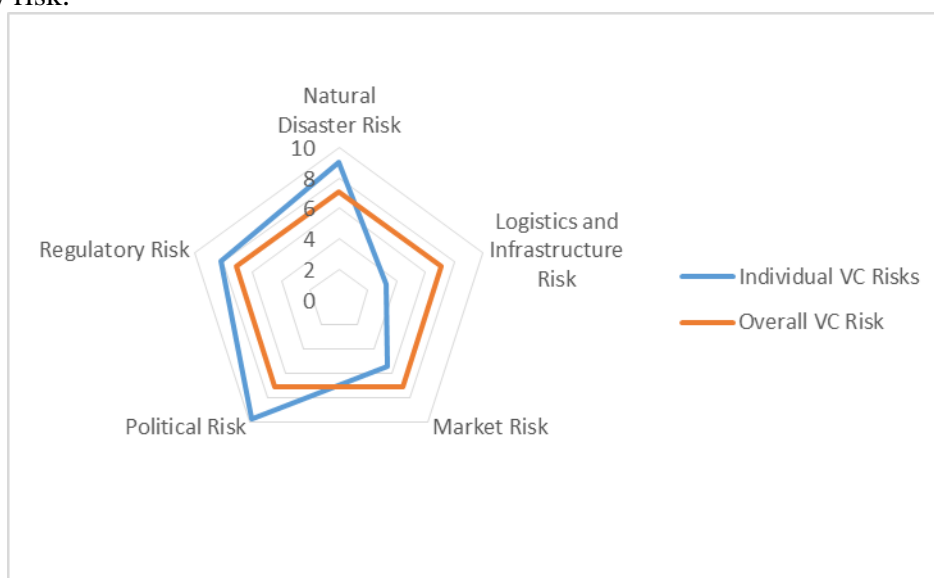
Recent tragic events have demonstrated the importance of natural disaster risks in the Philippines. In addition to the data used to construct the index used here, areas of concern for the Philippines from a VC Risk standpoint include storms, geophysical mass movements, and volcanoes. A particular factor of market risk includes possible instability in the equity market. A recent World Bank report mentioned while the stock market in the Philippines is growing strong, there are risks associated with possible asset bubbles in the stock market[14]. Although the economy's score on logistics and infrastructure risks is strong, infrastructure quantity and quality remains a particular concern[15].

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[14] Source:
http://www.worldbank.org/content/dam/Worldbank/document/EAP/Philippines/Philippine_Economic_Update_May2013.pdf
[15] In the 2013-14 WEF Global Competitiveness Report, while progressing considerably with 19 places, Philippines score on the infrastructure pillar is still low at 3.40. (Source:
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf)

RUSSIAN FEDERATION

The Russian Federation has an overall VC Risk score of 6.00. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk and logistics and infrastructure risks are considerably lower than its overall risk score, at 1.08 and 4.80 respectively. Its score for market risk is close to the overall VC risk score, at 6.43. By contrast, its scores in the areas of political risk and regulatory risk are higher than its overall VC Risk score, at 8.56 and 9.12 respectively.

The pattern of the Russian Federation's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and logistics and infrastructure risks tend to keep the overall score lower. By contrast, its scores on political risk and regulatory risk tend to make the overall score higher. Priority areas for action for the Russian Federation in the area of VC Risk therefore include political risk and regulatory risk.
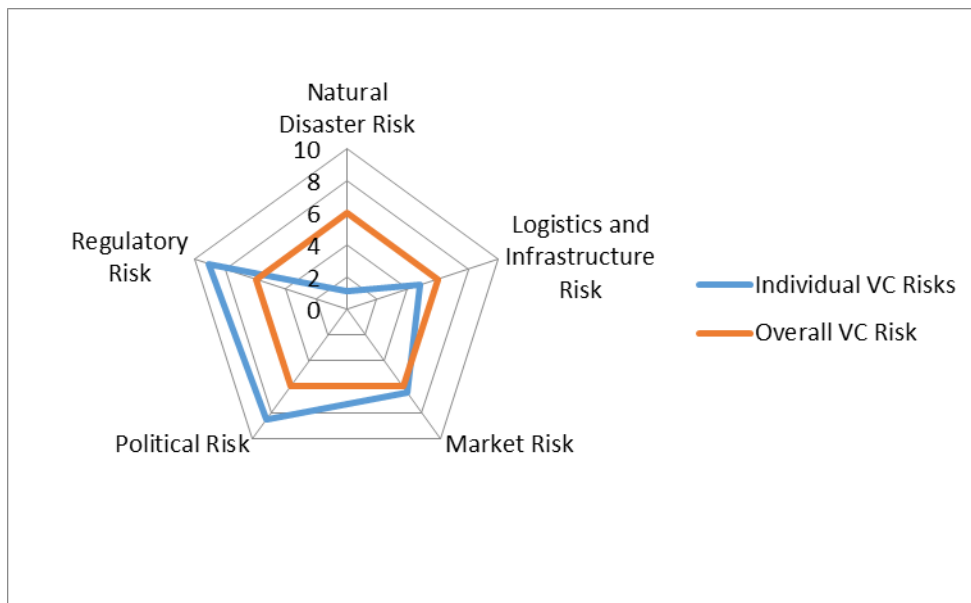
SINGAPORE

Singapore has an overall VC Risk score of 1.26. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk, logistics and infrastructure risks, and political risk are noticeably lower than its overall risk score, at 1.00, 1.11, and 1.20. By contrast, its scores in the areas of market risk and regulatory risk are higher than its overall VC Risk score, at 1.56 and 1.42 respectively.

The pattern of Singapore's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk, logistics and infrastructure risks, and political risk tend to keep the overall score lower. By contrast, its scores on market risk and regulatory risk tend to make the overall score higher. Priority areas for action for Singapore in the area of VC Risk therefore include market risk and regulatory risk.
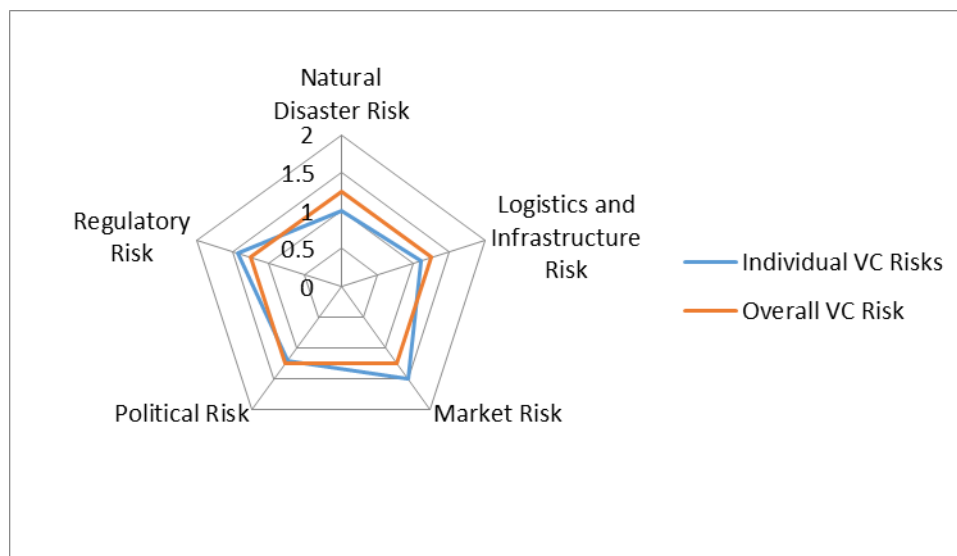

Singapore's performance from a market risk perspective was brought lower by a rate of CPI growth that slightly exceeds the average of our sample size. Firms may consider inflation in their investment decision and view higher rates as indicative of a less stable market environment. Though Singapore maintains a low overall score on the value chain risk index, above-average inflation could be an area to monitor in the future.

CHINESE TAIPEI

Chinese Taipei has an overall VC Risk score of 2.82. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk, market risk, and political risk are noticeably lower than its overall risk score, at 2.16, 1.83, and 2.75 respectively. By contrast, its scores in the areas of logistics and infrastructure risks and regulatory risk are higher than its overall VC Risk score, at 3.11 and 4.27 respectively.

The pattern of Chinese Taipei's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk, market risk, and political risk tend to keep the overall score lower. By contrast, its scores on logistics and infrastructure risks and regulatory risk tend to make the overall score higher. Priority areas for action for Chinese Taipei in the area of VC Risk therefore include logistics and infrastructure risks and regulatory risk.
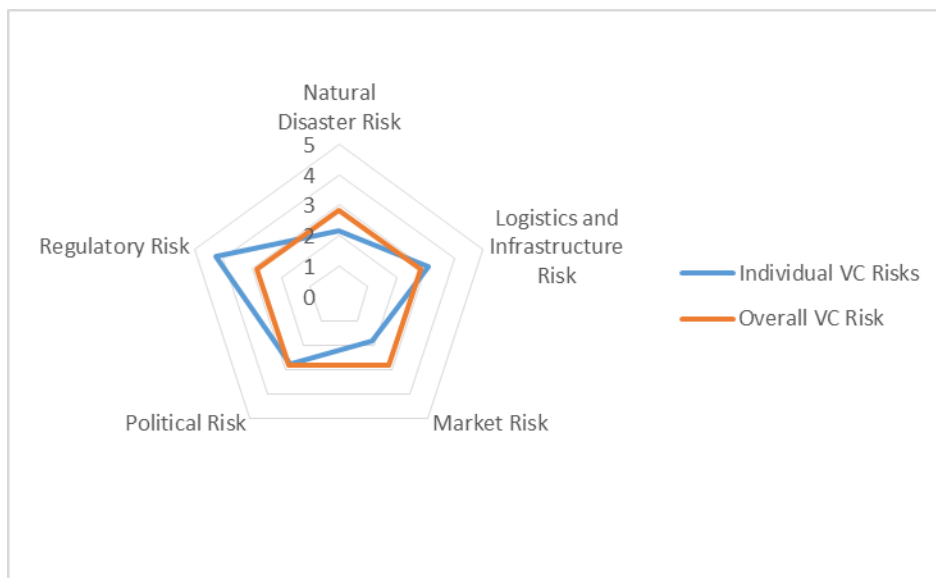

The types of VC risks most prevalent in Chinese Taipei are well covered by the categories and data identified in this report, and further elaboration on particular, non-representative risks is not required.

THAILAND

Thailand has an overall VC Risk score of 5.75. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on Natural Disaster Risk, Logistic Risk and Market Risk are noticeably lower than its overall risk score, at 4.19, 2.80 and 4.58 respectively. By contrast, its scores in the areas of Political Risk and Regulatory Risk are higher than its overall VC Risk score, at 9.86 and 7.34 respectively.

The pattern of the Thailand's VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on Disaster Risk, Logistic Risk and Market Risk tend to keep the overall score lower. By contrast, its scores on Political Risk and Regulatory Risk tend to make the overall score higher. Priority areas for action for the Thailand in the area of VC Risk therefore include Political Risk and Regulatory Risk in which Political Risk considered to be the highest risk compared with the other four.
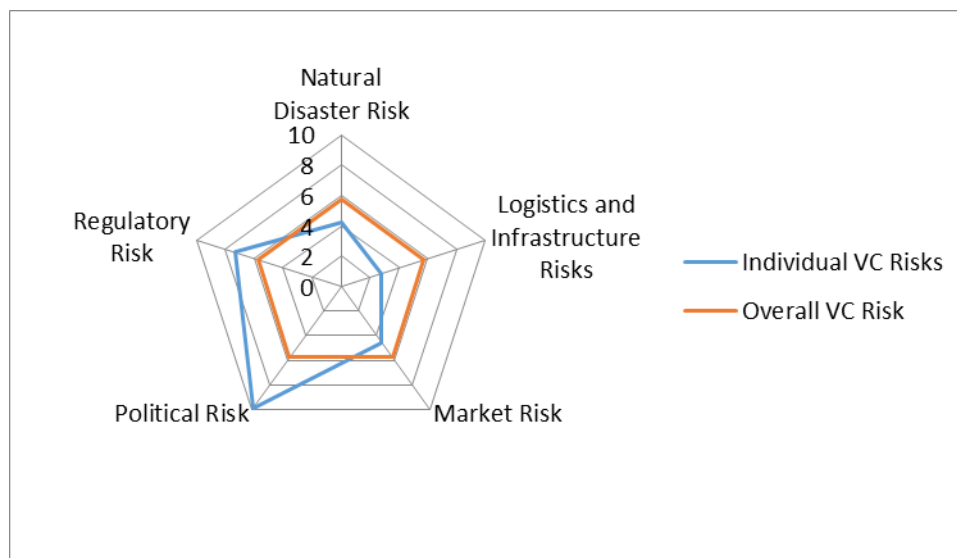

Political Risk is crucial for firms in making long-term decisions to invest and broaden their activities as firms require a certain level of political stability to operate. This is especially true for foreign firms, which generally have limited knowledge of the local situation.

UNITED STATES

The United States has an overall VC Risk score of 2.43. This average is made up of varying scores on each of the five components of VC Risk. This economy's scores on natural disaster risk at 1.49 and logistics and infrastructure risks at 1.34 are lower than the overall score. Scores in the areas of market risk, political risk and regulatory risk are higher than its overall VC Risk score, at 3.39, 3.61 and 2.65 respectively.

The pattern of the United States' VC Risk component scores is shown in the figure below, with its overall score as a reference point. The averaging procedure used to produce the overall index means that this economy's scores on natural disaster risk and logistics and infrastructure risks tend to keep the overall score lower. By contrast, its scores on market risk, political risk and regulatory risk tend to make the overall score higher. Priority areas for action for the United States in the area of VC Risk therefore include market risk, political risk and regulatory risk.
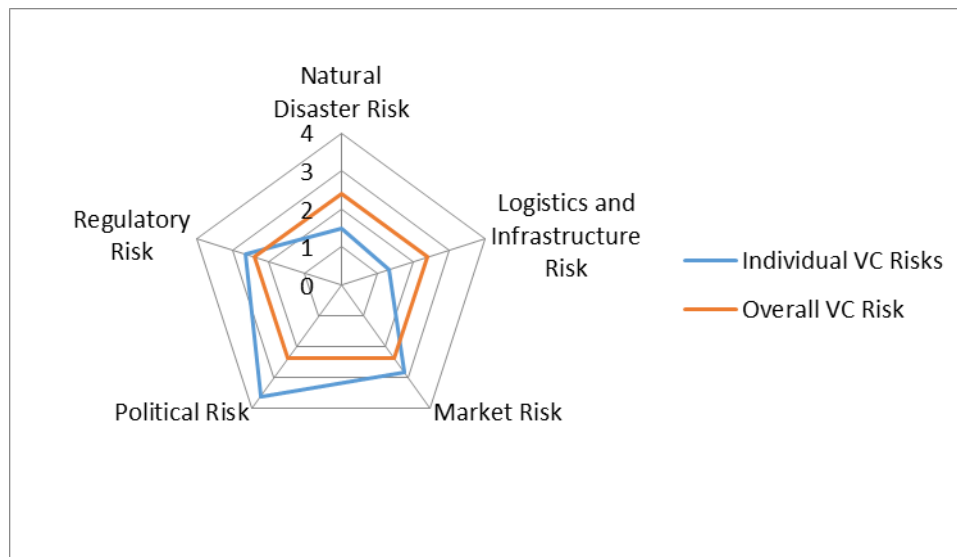
Political risk in the United States was cited by Standard and Poor's in their decision to downgrade the economy's credit rating in 2011,[16] an event which had negative effects on both the political and market risk indicators of our study. A stable, predictable political environment is associated with higher levels of investor confidence and a lower level of risk on our value chain risk index.

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[16] "U.S. Loses AAA Credit Rating as S&P Slams Debt Levels, Political Process", Bloomberg, August 2011.
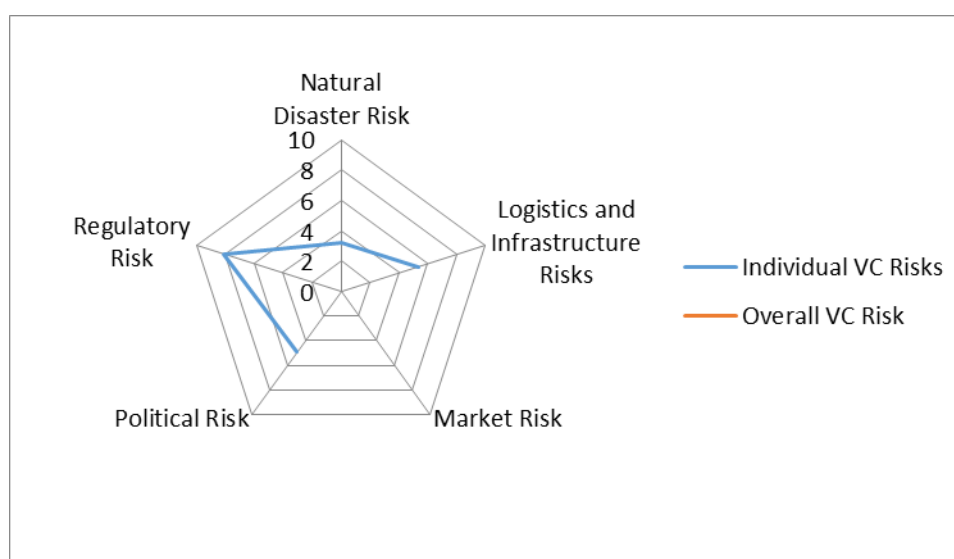
VIET NAM

The overall VC Risk score for Viet Nam cannot be calculated due to the unavailability of data to calculate Market Risk. The average of the existing four risk categories provided the value of 5.4. This economy's scores on Natural Disaster, Logistic Risk and Political Risk are noticeably lower than its average risk score, at 3.24, 5.35 and 4.91 respectively. By contrast, its scores in the areas of Regulatory Risk are higher than its average VC Risk score, at 8.09.

The pattern of Viet Nam's VC Risk component score is shown in the figure below. The average risk score means that this economy's scores on Natural Disaster, Logistic Risk and Political Risk tend to keep the overall score lower. By contrast, its scores on Regulatory Risk tend to make the overall score higher. The main priority area for action for Viet Nam in the area of VC Risk therefore focuses on Regulatory Risk.

Despite challenges in improving the regulatory environment, a recent World Bank's report noted sustained progress in this area. The 2013 Doing Business report mentioned that Viet Nam improved its business enabling environment through regulatory reform which made it easier for local firms to incorporate as a new business. Other findings from the report showed that Viet Nam has implemented a total of 18 institutional or regulatory reforms over the past eight years.[17]

In addition to the data used to construct the index used here, areas of concern for Viet Nam from a VC Risk standpoint include high and unstable interest rates that lead to increasing Non Performing Loans (OECD 2013)[18].

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[17] Source: http://www.worldbank.org/en/news/press-release/2012/10/23/vietnam-improves-its-regulatory-environment-for-the-eighth-year-in-a-row
[18] Source: http://www.oecd.org/countries/vietnam/Viet%20Nam.pdf