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Advancing Free Trade
for Asia-Pacific Prosperity

Mapping Non-Tariff Measures (NTMs) in Asia-Pacific Economies: Agriculture, Forestry and Fisheries Sectors

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CHAPTER I
BACKGROUND

1. 1. Introduction

The practice of international trade cannot be separated from the imposition of tariffs and non-tariff measures (NTMs). Both tariffs and NTMs are rules that may be used by the government of an economies as protection from imported goods. Tariffs are imposed on imported goods and recognized as one of the protection forms that are widely used in spite of reductions in bound tariffs rates through multilateral negotiations. Meanwhile, non-tariff measures (NTMs) are regulatory tools imposed on goods and potentially have economic effects on trade. Fundamentally, the NTM impose in trade will have an impact that often plays important purposes, such as human protection, animal and plant health protection, and environment protection. The absence of the essential technical NTMs or having the imperfect implementation of them will cause serious harmful impacts (e.g., the spread of diseases such as the African swine fever in parts of the region). Technical NTMs can also stimulate demand and trade under particular conditions.

The complexity of NTMs makes them less transparent and more difficult to be monitored compare to the common customs tariffs. NTMs are basically non-trade policies (such as health safety and environmental protection), however NTMs can be used as a trade instrument to protect domestic producer from international competition (NZIER, 2016; Ing et al, 2016). These effects can be decreased in quantities and product prices, in international trade (Ing et al, 2016). NTMs cover a wide range and diverse array of policy interventions including sanitary and phytosanitary (SPS) regulations, technical barriers to trade (TBT) regulations, and other regulations affecting trade flows such as, inter alia, rules of origin, licensing, price-control measures, or distribution restrictions (Ing et al., 2016). Among all types of NTMs, there is rising attention towards SPS and TBT, since they are remarked as the most constraining aspect of regulation in recent times (Rial et al., 2019).

APEC has been working on some trade and investment activities to advance the vision for the eventual realization of the Free Trade Area of the Asia Pacific (FTAAP) and support the achievement of the Bogor Goals. According to the 2020 Bogor Goals mandate, APEC economies pursue efforts on achieving free and open

trade and investment for all. Non-Tariff Measures have become one of APEC's focus areas, especially the unwarranted NTMs. According to the APEC report on November 2018 by APEC PSU, reductions in implementing new trade-restrictive measures are successfully made in the region (APEC PSU, 2018). However, there are areas that still need improvement such as agricultural, forestry, and fishery sectors since they are highly regulated in the purpose of consumer and environmental protection (Cadot et al., 2018). Thus, the use of SPS and TBT are more prevalent in the mentioned sectors due to their nature (Cadot et al., 2018).These initiative policies set out the basic rules and requirements such as inspection requirements, testing and certification requirements, labeling and packaging requirements. At this point, a number of APEC economies, still need to improve the capacity to comply with these measures.

Besides, ABAC and Marshall School of Business point to Non-Tariff Measures (NTMs) as one of the main-challenges that APEC economies should pay attention to. UNCTAD also suggests that any economies that apply lower most favored nation tariffs are also those that have a more considerable number of products and a larger extent of imports affected by NTMs. This may indicate that NTMs have been used, at least to some degree, to reinforce the tariffs to continue protecting key economic.

1.2. Non-tariff measures (NTMs): The Impose of SPS and TBT Measures and Its Impact towards Trade

Non-tariff measures (NTMs) can impact trade and distort the behavior of producers and consumers. Meanwhile, there is no consensus on the range of NTMs since they cover all trade-distorting measures except tariffs, regardless of whether it is border type or internal type.

UNESCAP (2019) found that within the past two decades, applied tariff in the Asia Pacific region have decrease significantly and at the same period, the number of Non-tariff measures has risen significantly. As can be seen in figure 1, where NTMs calculated is including sanitary and phytosanitary (SPS) measures and technical barriers to trade (TBTs)[1]. The imposition of NTMs causes extra costs in trade practice, and it is estimated to be more than double that of ordinary custom tariffs. The economic

[1] In the paper by UNESCAP (2019), it is not explained further whether the chart include all the APEC member economies.

cost of SPS and TBT measures is estimated to be up to 1.6% of global gross domestic product, which is $1.4 trillion (UNESCAP, 2019).

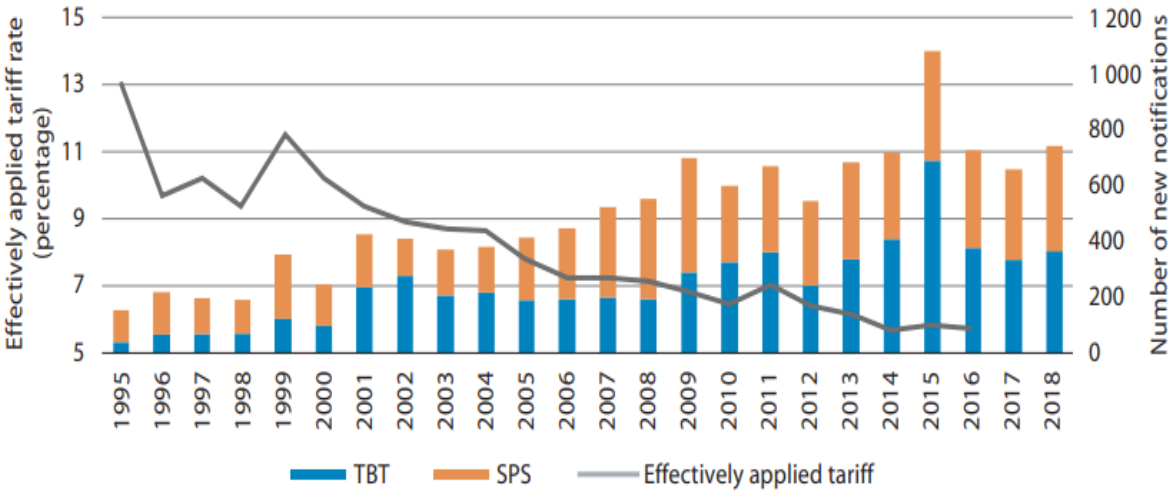


Figure 1. The Average Applied tariffs and New Annual Notifications to WTO of SPS and TBT Measures in the Asia-Pacific Region

Source: UNESCAP, 2019

This research discusses the impact of SPS and TBT on the economic in the APEC region and evaluate their implementation in terms of regulatory gap among APEC member. SPS and TBT take account for 95% of all notification in the global trading system in 2018 (UNESCAP, 2019). Data from WTO in 2012 showed that specific trade concerns related to SPS measures affected the agricultural sector by 94%. SPS and TBT measures prevails a lot more than any other NTMs in agricultural sector (59%) comparing to manufacturing (34%). Moreover, TBT also have a significant impact towards agricultural sector by 29%. The most important specific trade concerns are TBTs measured in terms of tariff lines and trade value towards agricultural sector (WTO, 2012).

1.3. Objective and Outcome

This research has three objectives:

a. To identify SPS and TBT measures, as examples in the wider types of NTMs, applied in APEC member economies towards the three sectors (agriculture, forestry, and fisheries);
b. To evaluate and calculate the impacts of SPS and TBT measures applied in the three sectors (agriculture, forestry, and fisheries) on trade and economy of APEC member economies;

c. To analyze possible effects from SPS and TBT measures streamlining among APEC member economies.

The outcomes of this research are as follows:

a. NTMs list focusing on SPS and TBT measures which has been implemented in APEC member economies in the three sectors (agriculture, forestry, and fisheries);
b. The calculation of the impact of SPS and TBT implementation in the three sectors (agriculture, forestry, and fisheries) on trade and economy in APEC member economies;
c. The calculation of the impact of streamlining SPS and TBT measures among APEC member economies.
d. The report of the research that contains the in-depth study of the SPS and TBT measures in the three proposed sectors. This research will use Computable General Equilibrium as the main methodology with desk research. The results will be presented later in the PPD.

CHAPTER II
LITERATURE STUDY

2.1. Definition of Non-Tariff Measures

Non-tariff measures are policy measures that can potentially have an impact on international trade. They do not relate to the import tariff but can have a significant impact on the trade practice. NTMs are usually formed as regulations or policies with many diversions of intention, such as lowering trade, achieving public policy goals, applying specific conditions of price (such as price-control measures), quantity (such as quotas), or regulatory measure, etc.

UNCTAD (2018) mentioned that the increasing prevalence of NTMs during the last decade has also triggered a demand for more transparency. Hence, the uncertainty arises from the minimum information on NTMs that lean to reinforce the perception of their harmful effects.

NTMs are divided into a specific classification to differentiate them from one and another. The classification is formed by a specific group based on their characteristics. For instance, hard measures are given for price and quantity control measures, and threat measures are for anti-dumping and safeguards. The more specific characteristics of NTMs are Sanitary and Phytosanitary (SPS) standard, Technical Barriers to Trades (TBT), export measures, trade-related investment measures, distribution restrictions, restrictions on post-sales services, subsidies, measures related to intellectual property rights and rules of origin. Different forms of NTMs are applied to each of these groups.

Furthermore, UNCTAD develops a structure in the form of a tree/branch, and measures are classified into “chapters.” The classification is based on the scope and/or design, in which it consists of measures with similar purposes. After that, they go further into several subgroups to better classify the regulations that affect the trade. The NTM classification covers 16 chapters (A to P), in which each chapter is divided into groups with a depth of up to three levels (one, two, and three digits). Although a few chapters reach the three-digit level of disaggregation, most of them stop at two digits. The chapters of the NTM classification are set out in Figure 2.

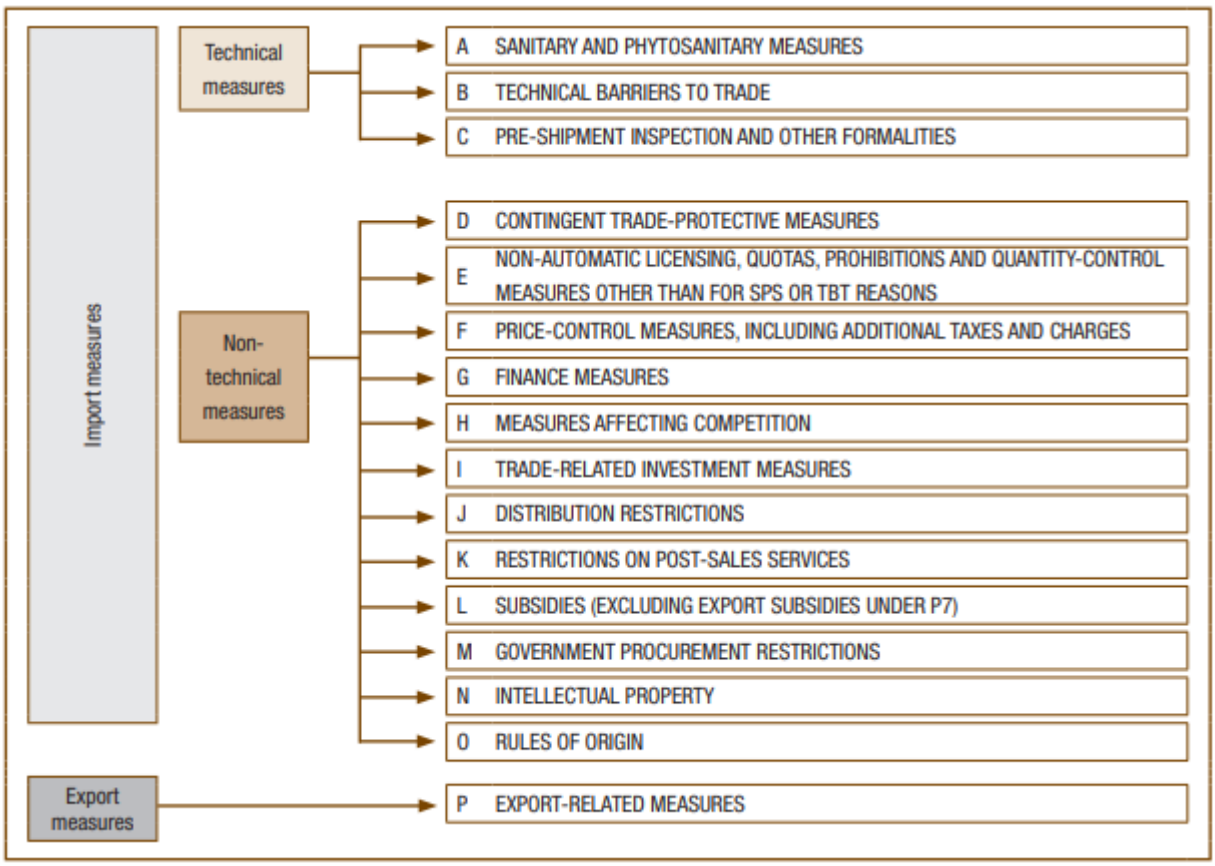


Figure 2. Non-tariff Measures Classification

Source: UNCTAD (2018)

2.2. NTMs Data Provider and their Implementation in APEC Member Economies

2.2.1. NTMs Data Provider

The NTMs data can be gathered from various sources, which each of them comes with a different scope of information that will be useful for users that also have different purposes. Ederington and Ruta (2016) mentioned that the first provider of NTMs data is international organizations besides non-government institutions. The most widely known data source is TRAINS. TRAINS provide NTMs database on the economies and the sector for HS6 product lines and the selected years. Besides TRAINS, World Bank has Temporary Trade Barriers (TTB) that contains NTMs data source, which is commonly used. It consists of trade measures for approximately 30 economies that can trace the date back to the year 1980 and at the product level. TTB has specific limitations concerning and narrow set information of NTMs.

The second source is collected and published by WTO, which is based on various forms of government notifications. WTO members must notify their measures

in both direct and indirect ways. The direct notification is a requirement to WTO members to notify their trade-related measures under the GATT and the TBT and SPS Agreements. Moreover, governments can bring up Specific Trade Concerns (STC) on TBT and SPS measures acquired by other WTO members (indirect notifications). The direct notification information is not always available or complete because it depends on the governments that do not necessarily fully abide by their notification requirements. It is also not in standard code and not always available for researchers. Both direct and indirect notifications are more consistently available for a longer period compared to the data collected by international organizations.

NTMs identified through the STCs do not represent the entire spectrum of potential discriminatory of TBT and SPS measures. It happens when the government may have some reasons to raise, or avoid raising, a trade concern vis-à-vis other partners. WTO Members also do not always agree on whether a measure needs to be notified or not and under which agreement. Therefore, not all “indirect notifications” are TBT and SPS measures.

The third source of information regarding NTMs is provided by The International Trade Center (ITC), which concerns on business. ITC collects non-tariff measures by conducting business surveys and identifying measures that build major concerns for exporters to do their business. Moreover, trade barriers that are faced by exporting firms are collected from certain economies and made it into public information. In the specific trade concerns, the information is collected through business surveys, and it identifies the discriminatory NTMs in a detailed manner. By doing the surveys, the gathered information tends to be heterogeneous in quality and may suffer from sampling design problems. Besides, the survey respondent can be a self-selection bias for the firms that responded are not representative enough as the sample of the whole picture of exporters or potential exporters.

The limitation of NTM information that has become the problem of measurement has been tried to be solved by several organizations. For example, the one that has been done by a multi-agency consortium on Transparency in Trade (TNT) by the African Development Bank, ITC, UNCTAD, and the World Bank that, in which aims to refine and expand the data collection of NTMs and make new data available by 2016. The Integrated Trade Intelligence Portal (I-TIP) of the WTO is another initiative that is made. It provides improved information about members’ notifications of NTMs and other sources of WTO-specific information regarding non-tariff

measures. Another initiative is PRONTO, which unifies several academic and policy institutions to improve the availability of the data and the methodologies to assess the trade impact of NTMs.

Despite of the fact that the availability of data both in quantity and quality has been gradually improved, there are still drawbacks related to the use and interpretation of NTMs data (Nicita & Melo, 2018). The limitation aspect of the NTMs data is due to the characteristics of the NTMs themselves and how they are collected. Nicita and Melo (2018) mentioned several weaknesses from the NTMs data. First, there is potential for double counting while collecting the data. This can happen because the original information of NTMs are scattered among various sources. Even the most fussy effort can still encountered into this mistake. Second, NTMs data in nature are qualitative, meaning that it is difficult to determine the stringency of the regulation from its original document. The last and the most important issue is the time dimension in recording NTMs. UNCTAD records the time of an NTMs was notified but does not record whether NTMs were later withdrawn. This is because economies are only required to notify new or changed NTMs. Another problem with the time dimension is that although the UNCTAD data includes information on the date the action was executed, this information cannot be used to build a complete time series database.

Although the secondary data sources for NTMs have a numerous of limitations, but the various sources mentioned above are the best data from reliable sources that can be used by researchers studying NTMs.

2.2.2. NTMs Implementation in APEC Member Economies

NZIER (2016) brings up one of the intentions of NTMs implementation in APEC member economies in reducing transaction costs. These measures are applied to other than ordinary customs tariffs and have economic implications on international trade in goods, changing quantities traded, or prices or both. Previously, NTMs are applied, especially in the quantitative limitation of trade, such as quotas, voluntary export restraints, and import licensing, which is reflected in the non-exhaustive list of NTMs in the Osaka Action Agenda. Nowadays, NTMs include a comprehensive range of policies applied to goods and services that enforce transaction costs along supply chains.

NTMs can involve technical measures, such as sanitary or environmental protection measures, quotas, price controls, export restrictions, contingent trade

protective measures, and other behind-the-border measures like competition, trade-related investment measures, government procurement or distribution restrictions. It is important to note that NTMs vary considerably in terms of their impact on the business environment. Some are legitimately imposed on public health, safety, environment, etc. Others act more like traditional trade barriers, raising costs for businesses and households. These are not mutually exclusive, NTMs could be both. NZIER (2018) adopted The Marshall School propose that NTMs be managed in quadrants to consider how best to address them (see Figure 3 overleaf).

Meanwhile, the tendency of policymakers focuses on the distorting trade of NTMs in the top right-hand quadrant. Focusing too much on them can drain energy and attention from improving NTMs in other areas that can potentially reduce transaction costs. Similar to the line between “necessary” and “unnecessary” is fuzzy. It will be different in the economy in terms of sector and over time, but it is crucial to recall that all NTMs imply multiple trade-offs. They may hold up legitimate public policy objectives such as consumer safety or animal health. This can injure both domestic welfare (i.e., they must pay higher prices or have less choice) and the welfare of other economies (because exporters can not fully exploit their comparative advantages). Thus, the institutions such as APEC must point out their objectives to balance those trade-offs related to the NTM.

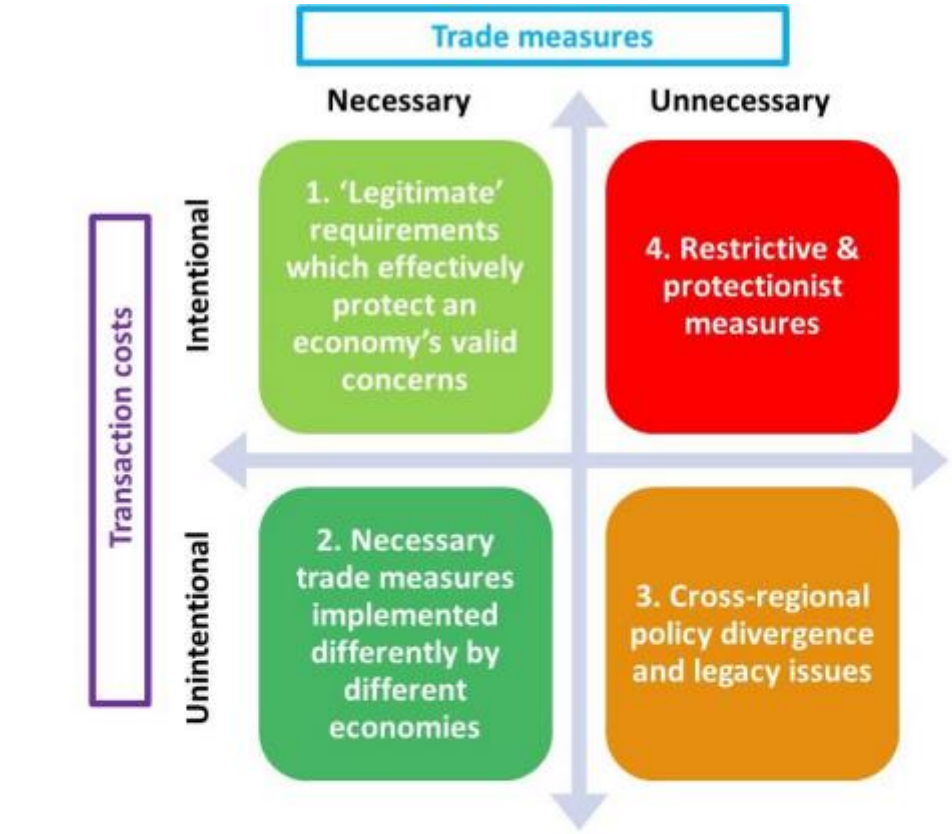


Figure 3. Non-Tariff Measures and Transaction Costs

Source: NZIER (2016)

The global tariff has fallen steadily in recent decades with the proliferation of FTAs in the global economy and APEC member economies. The average global tariff goes down from twenty years ago to 2016, around 11% to 9% in 2016. The average MFN tariff in APEC member economies slightly falls, which is around 7% in 2006 to 5.6% in 2014.

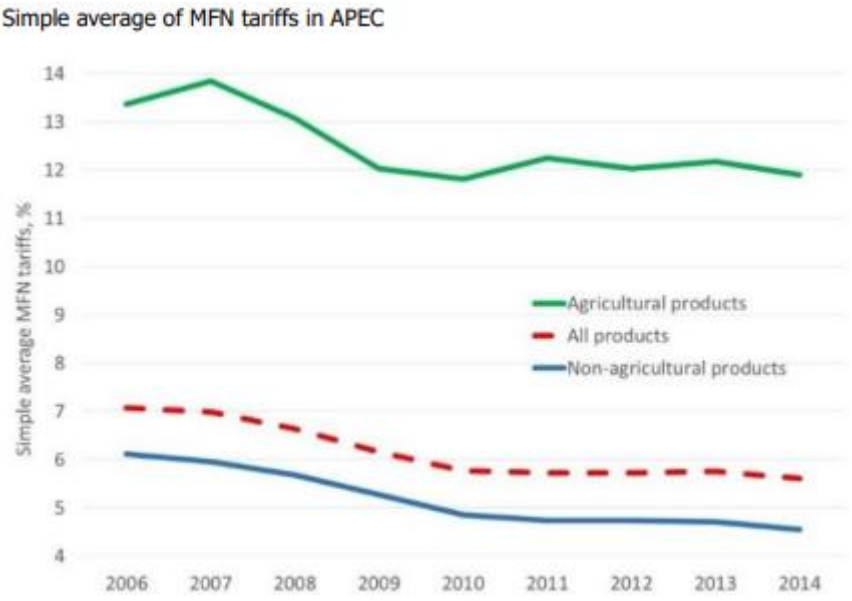


Figure 4. Declining Tariffs in APEC-but agriculture still lags

Source: NZIER (2016)

The attention of policymakers is now shifting from the tariff to the NTMs implementation. Figure 4 above shows the declining tariffs in APEC member economies. It shows that the fall of the average MFN tariffs in agriculture products remains high, although the trends fall over time. Meanwhile, the frequency of measures or notifications by governments in the fields cover the WTO's Integrated Trade Intelligence Portal (I-TIP).

Agricultural products slightly go down in terms of the implementation of Sanitary and phytosanitary measures and Technical Barrier to Trade (TBT). Those measures affect the trade practice within APEC member economies. APEC member economies have a 74% increase in the total number of NTMs, which is 814 in 2004 to 1,414in 2015. The practice of trade using NTMs as trade measurements rise significantly in consequence of the Global Financial Crisis (NZIER, 2016). Ratna (2010) stated that the year 2008 have been remembered as the global financial crisis which started in the third quarter 2008. It caused the severe contraction of world trade volume and has become a big hit to the global economy and also economies which had pursued development strategy of export-led growth (UNCTAD, 2010). Many governments in high-income or lower-income economies were pushed to protect their domestic industries and producers by implementing policy instruments, especially in the form of non-tariff measures (NTMs). It also affected Asia-Pacific economies trade that during

2009, the policymakers opted to use trade restrictions in the form of non-tariff nature (Mikich, 2010).

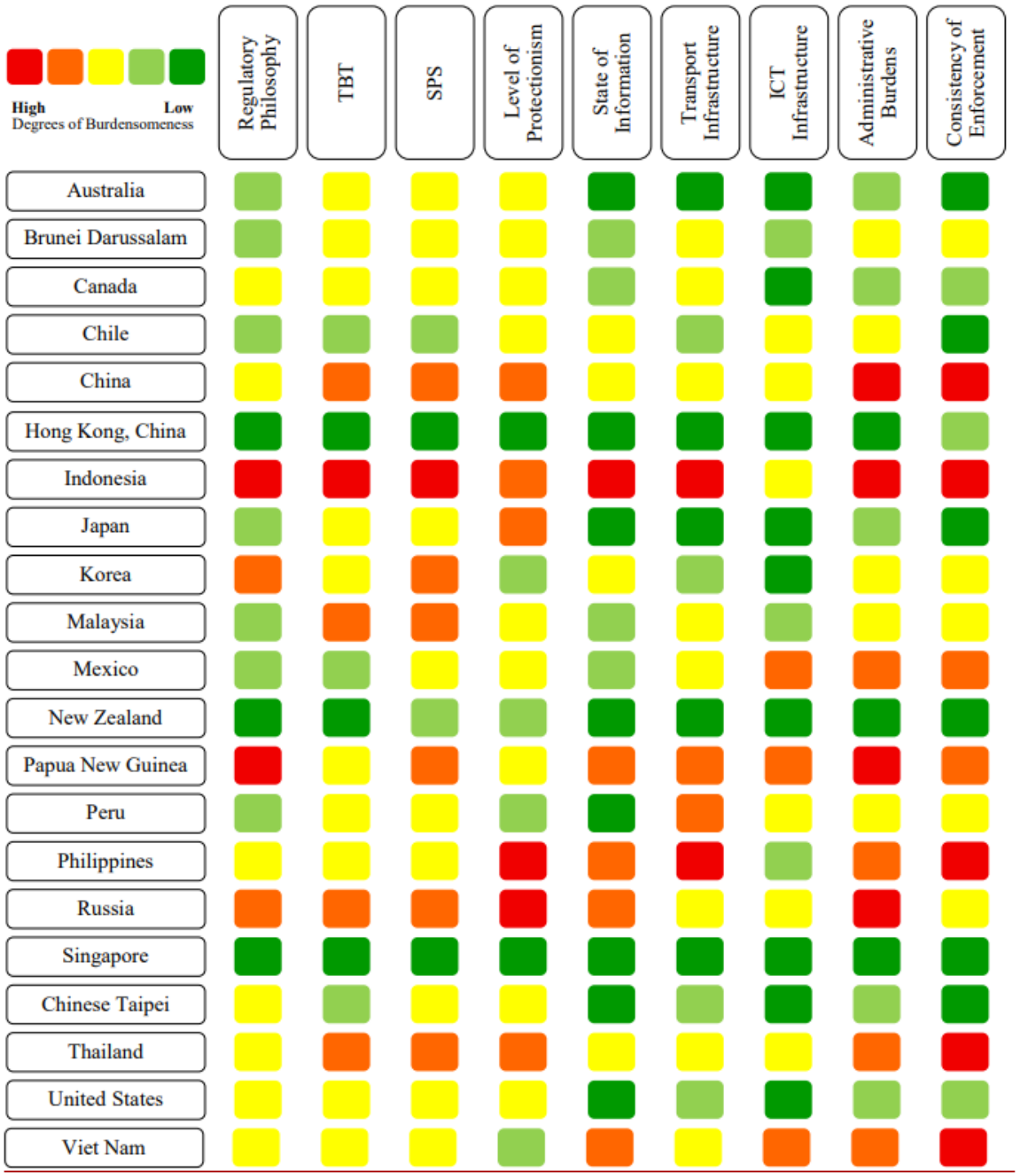


Figure 5. Degrees of NTMs Implementation in APEC Member Economies

Source: ABAC (2016)

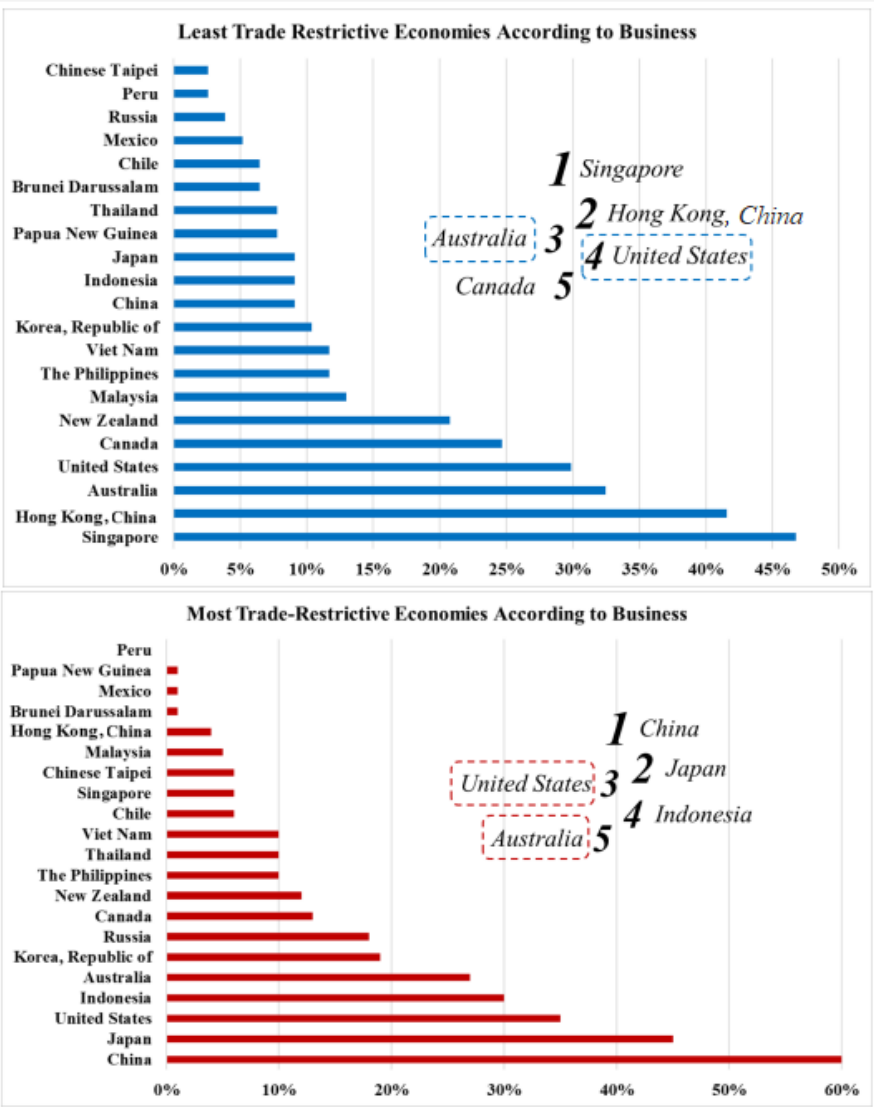


Figure 6. Least and Most Restrictive APEC Economies

Source: ABAC (2016)

The significant use of NTMs in APEC member economies raise questions about the appropriate reasons for their widely used. With the fact that the applied tariff rate is declining over the period, the use of tariff as domestic protection follows the trend, the extensive use of NTMs within APEC member economies has led some economies to create more creative and extensive use of NTMs for protection purposes. Concerning NTM, what needs to be considered for an economy is that NTM provisions will continue to develop in line with the emergence of new products, new health issues, environmental and safety issues, as well as other emerging issues.

The effect of NTMs implementation in APEC members will be analyzed by using Computable General Equilibrium (CGE) multi economies and multi-sector methods with the application of the Global Trade Analysis Project (GTAP) software. The number of NTMs research that has the CGE method is still limited because it mostly uses partial equilibrium. Through the CGE, the expectation of capturing the complexity of implementing the NTMs in APEC member economies can be seen, and it is suitable for the fact that in the future, the international trade practice will be more liberal as general tariffs steadily decline over time.

Besides, CGE is better in capturing the inter-sectoral linkages and linkages between sectors, as well as macroeconomic conditions. It is also compatible to analyze the issues related to the relevance of foreign trade policy proposed by De Melo (1998) and Yeah et al. (1994). CGE can thoroughly analyze the markets and interact with each other by involving macroeconomic and sectoral variables at the micro and sectoral levels to be analyzed simultaneously. Dixon et al. (1992) state that the general equilibrium model sees the economy as a complete system and has a microeconomic foundation that unifies the relationship of microeconomic behavior and its parameters. The general equilibrium model is powerful to capture and provide more information about changes in an economic variable concerning other variables than the partial equilibrium.

CHAPTER III
METHODOLOGY AND DATA SOURCE

3.1. Methodology

NTMs can be translated as the whole form of policy besides the common import of tariff that exists. NTMs can potentially bring economic implication on cross-border trade of goods with a mechanism affecting the tradeable goods quantity, price, or both. NTMs can be used as Non-tariff Barriers (NTBs). The difference between NTMs and NTBs is that the NTMs have a broader scope than NTBs. NTMs are considered NTBs when they are: (1) made to protect; (2) excessive in affecting trade from what is supposed to be; (3) influencing the price and quantity of trade practice, also proven doing discrimination in practice.

SPS and TBT strike a balance between the protection of public health or the environment and minimize trade costs. The context on which extent the public health and environment would affect the economy won't be the focus on this research. Therefore, we do not enter a scientific debate over the sensible levels of SPS or TBT stringency. Our focus is on the economic costs of such measures, which need to be considered with health and environmental benefits in the scientific analysis (UNCTAD, 2015).

This research has three main objectives that have been mentioned earlier. We apply different approaches to answer each of the main objectives. In the first objective, this research comes to observe the SPS and TBT measures applied in APEC member economies towards the three sectors. This research uses the measures called the Distance in Regulatory Structure and Distance in Regulatory Stringency. These two measures are introduced by UNCTAD (2015) to measure the similarity of regulation. The Distance in Regulatory Structure measures whether a regulation of the same type – as per the UNCTAD-Multi-Agency Support Team (MAST) nomenclature – is applied by two different economies to the same product or not.

Meanwhile, Distance in Regulatory Stringency observes the relative stringency of the comparable NTMs. For example, the differences in labelling regulations or maximum residue limits (MRLs) applied to the same product in different economies. The first measure can be calculated directly from the UNCTAD-TRAINS NTM data.

The second one requires an analysis based on full-text regulations, which can also be found through the database. The example of both is provided below.

The Distance in Regulatory Structure quantifies the difference between the patterns in which two economies impose NTMs across products. Shortly, it indicates whether two economies apply the same NTM types to the same products or not. Based on UNCTAD (2015), Distance in Regulatory Structure is calculated in the three steps[2] below[3].

Step 1.

For instance, if economies i imposes the NTM B840 (TBT inspection requirements) on product HS 840731 (spark ignition reciprocating piston engines of a kind used for the propulsion of vehicles of Ch.87, of a cylinder capacity not >50cc)and economies j also imposes B840 on HS840731, it can be said that for the given measure-product pair, economies i and j have a "similar" regulatory structure and the code of the regulatory distance variable becomes zero. In contrast, if economies j does not impose B840 on that product, but imposes either no NTM or instead, say, B810 (product registration requirements), then it can be said that i and j are "different" for the measure product pair and the code of the regulatory distance variable is one. Formally, let i index economies, k HS6 products and j NTM types, and let

$$n_{ilk} \begin{cases} 1 & if\ economies\ i\ applies\ NTM\ l\ to\ product\ k \\ 0 & otherwise \end{cases} \text{.....(i)}$$

be a "dummy" (binary) variable that marks the application of NTM type *l* by economies i on product *k*. The measure of the regulatory distance at the measure-product level is

$$RD_{lk} = \left| n_{ilk} - n_{jlk} \right| \text{. ..... (ii)}$$

Step 2.

[2]UNCTAD (2015) explained the calculation in two steps. How two plot the Distance in Regulatory Structure UNCTAD (2015) described in the Annex of its paper, while this paper suggests this part as the third step.

[3]To avoid miss perception in describing the steps of calculation, this research uses the same explanation as in UNCTAD (2015).

After that, we collect our regulatory distance variable over all measures and products (several thousand cells) to obtain the whole measure of dissimilarity. To formalize the definition, let N becomes the total number of observed product-NTM combinations. The distance of regulatory structures between economies i and j, D_{ij} is

$$D_{ij} = \frac{1}{N}\sum_k \sum_l \left| n_{ilk} - n_{jlk} \right| \quad \text{(iii)}$$

which is the sum of the absolute values of the differences in NTM application status. Since each of terms RD_{lk} is zero (when the given NTM is applied to *i* and *j*in the same product) or one (when one of the two economies applies a measure that the other does not to a given product), it does not matter which distance concept we use (e.g., Euclidean or Manhattan).

Step 3

The last step is creating a projection of two-dimensional space of D_{ij} for all combinations of *i* and *j*. The idea is to project the bilateral distances onto a plane akin to a map. To make such projection, the mathematical calculation named Multidimensional Scaling (MDS) is used. Let i and j index economies stand for the distance between i and j. MDS defines the dissimilarity matrix, which is

$$\Delta = \begin{bmatrix} D_{ii} & \cdots & D_{1m} \\ \cdots & \cdots & \\ D_{mi} & \cdots & D_{mm} \end{bmatrix} \quad \text{(iv)}$$

a square, symmetric matrix with zeros on the diagonal and bilateral distances off the diagonal. MDS consists of finding m coordinate vectors x_{ij} (one for each economies) such that, using an appropriate distance metric

$$D_{ij} = \left\| x_i - x_j \right\| \quad \text{(v)}$$

i.e., the projection of the individuals onto a space of fewer than *m* dimensions represents reasonably well their true dissimilarity. If the space had *m* dimension, the representation would be perfect for the number of space dimensions shrinks (or much less than *m*) the distortion potentially grows.

The most usual way of formulating the problem is to minimize a quadratic loss function:

$$\min_{x_1 \ldots . x_m} \sum_{i<j} \left(D_{ij} - \left\| x_i - x_j \right\| \right)^2 \quad \text{..... (vi)}$$

Practically, the MDS procedures are done by using the statistics programme SPSS.

The Distance of Regulatory Structure approach is highly flexible. The regulatory distance can be easily disaggregated to a product or sector level. The comparison is possibly made between two or more economies, or entire Preferential Trade Agreements, or regional groups can be benchmarked against each other. The assessment can also focus on specific groups of NTMs only. In this research, the aggregation of products is for all HS 01 to HS 24 which covers agriculture and fishery products, and HS 44 which covers forestry products. The economies that are analysed in this research are all 21 APEC member economies.

The other measurement to evaluate the dissimilarity of NTMs imposed by different economies is Distance in Regulatory Stringency. As described earlier, the Distance in Regulatory Structure evaluates patterns of NTMs at the 6-digit level of products. Meanwhile, Distance in Regulatory Stringencyrepresents a high degree of disaggregation. The reality of NTMs is even more complex. The Distance in Regulatory Stringency explores more detail the differences between NTMs, even within the same NTM code. This requires a case study analysis of full-text regulations. The UNCTAD-TRAINS database gives detailed information about the regulations, in which NTMs are specified. Thus, it provides an easy access point for the connection between regulatory structures and regulatory stringency.

Since Distance in Regulatory Stringency explains the difference of NTMs between economies, a different approach is used for different measures. In many cases, the evaluation is entirely qualitative, while in other instances, quantitative approaches can be used. UNCTAD (2015) gave one example for each qualitative approach and quantitative approach.

The second objective of this research is to evaluate and calculate the impact of NTMs on trade balance, welfare and GDP applied in the three sectors (agriculture, forestry, and fisheries) on trade and economy in APEC member economies. To accomplish the objective, this research uses the CGE methods giving the GTAP

model. GTAP model is a standard model having multiple economies and commodities by applying the general equilibrium economic model. The GTAP model explicitly models the international transport margins. A global bank is also formed in the model as an intermediary for investment and world savings. The consumer demand system is assumed to use the Constant Difference of Elasticities (CDE) to capture sensitivity to price and income differences between economies (Hertel et al., 2000).

In addition, the flow of goods in international trade follows the Armington (1969) model, where each product is distinguished by economies of origin. Each item is assumed to be an imperfect substitute for another commodity that is produced domestically. Through this assumption, the model can capture the flow of trade between the two economies. The weakness of this model is that it assumes a perfectly competitive market system and a constant business scale on production activities. Hertel (1997) recognizes that in the context of a small and open economies, the assumption of perfectly competitive market results in a simulation of the impact of lowered tariffs being greater than they are.

The GTAP model, with its base data, is processed by using RunGTAP software. The stages of data processing are explained in Figure 7. The sector and economies/member aggregation process are one of the stages of data processing in the GTAP model. In this stage, closure and shock adjustments are also made according to the purpose of the study. By using RunGTAP software, the output will be generated (out) like the solution file (volume solution), volume changes, and decomposition.

In the economic GTAP model, a region is represented by a regional household that earns income from the sale of endowments, VOA (value of output at agent prices), and tax revenues, and industry (TAXES). Moreover, taxes are also received from other regions (rest of the world) in the form of export taxes (XTAX) and import taxes (MTAX). The region's household income is then allocated as private household sector expenditures (PRIVEXP), government households (GOVEXP), and as savings to global banks (SAVE).

Private household consumption and VDPA (assumed value of domestic purchases by private households at agent's prices) are assumed to follow the CDE (Constant Difference of Elasticity) expenditure function. Government household consumption and VDGA (value of domestic purchases by government households at

agent's prices) are represented by the Cobb Douglas utility function so that the portion of expenditure for all commodities is constant. In the GTAP model, it is assumed that all savings are used as investments (NETINV) through global banks.

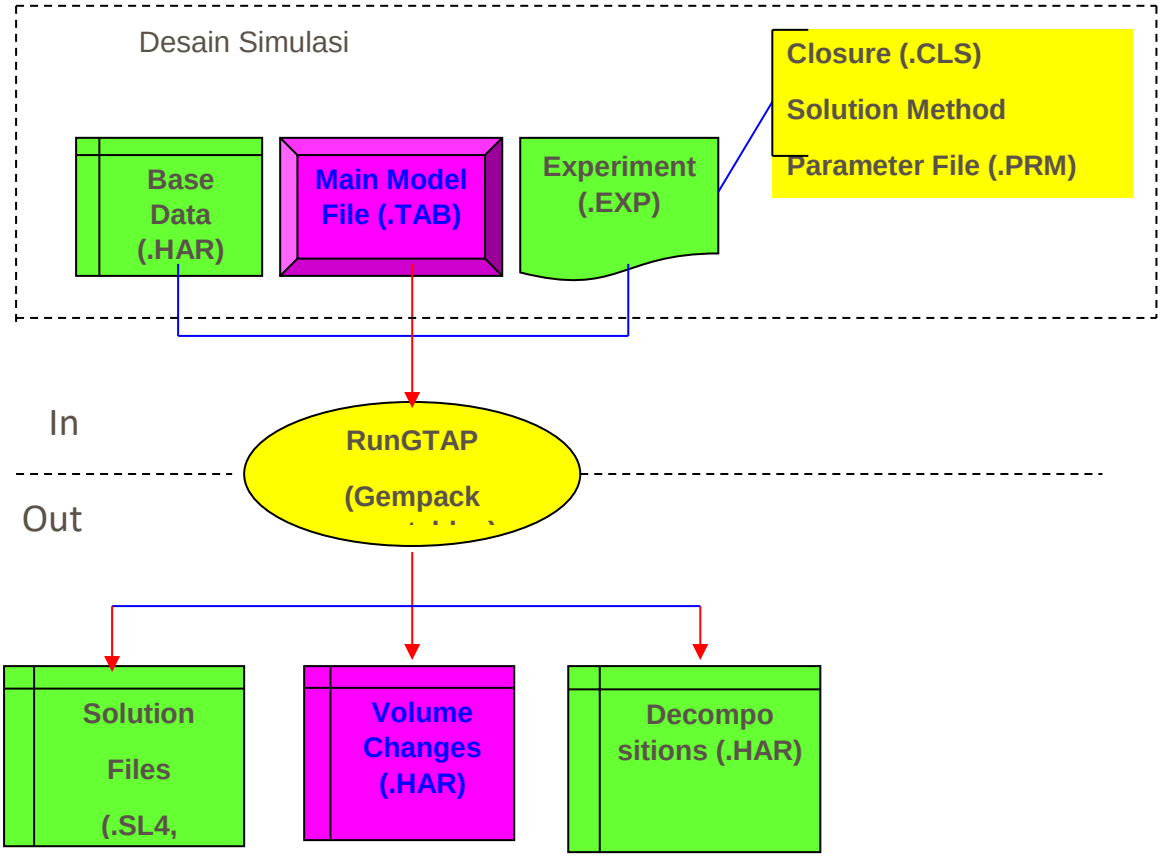


Figure 7. The Utilization of GTAP with the RunGTAP Tool and Its Settlement

Source: Hertel (1997)

On the producer (industry) side, revenue is derived from the sale of consumed products to private households (VDPA) and the government (VDGA), sales of intermediate products to other industries (VDFA), and sales of investment goods to the savings sector (NETINV). In addition to the sales results in the domestic market, producers also receive revenue from the export of goods to other regions (Rest of the world). The export receipt value is expressed as the value of exports at market prices by destination (VXMD). Since each industry is assumed to operate in a zero-profit condition, the total producer revenue is spent on purchasing primary factors (VOA), intermediate inputs produced domestically (VDFA), and intermediate inputs originating from imports (VIFA).

The multi-region nature of the GTAP model is not only shown by the global banks but also by the international trade sector (exports and imports) from one region

to another (Rest of the world). The other regions obtain the import receipts from private households (VIPA), government households (VIGA), and industry (VIFA). The revenues are then spent on imported goods (VXMD), export tax payments (VTAX), and import taxes (MTAX) to regional households.

All relations that describe the relationship between income and expenditure by each economic agent in a region (accounting relationship) in the GTAP model are written in the form of equations. These equations explain the distribution of sales to regional markets in an open economic model with taxes, sources of household and government expenditure, sources of corporate expenditure and household factor income, dispositions and sources of regional income, the global sector, and general clearing conditions (market clearing).

The relationships in the GTAP model are summarized in the relationships between the various aggregate values. Equations that have been changed in percentage changes are equations that will exist in the main GTAP model. All notations, variables, parameters, equations, and others can be read in more detail in Hertel (1997).

The structure of the GTAP model consists of simultaneous equations, which can be grouped into two parts, which are (1) the equations that describe the relationship between income and expenditure by each economic agent in a region (accounting relationship), and (2) the equations that explain a behavior economic agents (behavioral equations). All sets, sub-sets, parameters, and nominal form variables (value/levels form) are denoted by capital letters. Whereas variables in the form of percentage change or linear form are denoted by lowercase letters. For example, $PM(i,r)$ is the variable of level form for commodity market price for *i* in region *r*, and $pm(i,r) = [dPM(i,r)] / PM(i,r)$ is a linear form of the price variable. The sets, sub-sets, parameters, and variables used in the standard GTAP model are presented in the appendix. The following is a brief description of the structure of the standard GTAP model sourced from Hertel (1997).

The last objective of this research is to analyze the possible effects of NTMs streamlining among APEC member economies. When doing this, this research uses the econometric model to see the impact of the Regulatory Gap on trade flows. To do the regression, this study uses the Regulatory Distance indicator discussed by Nabeshima and Obashi (2019) called RD cosine. Basically, RD cosine and RD that

we discussed earlier have the same feature to show a gap in the regulations applied by each economies. While RD shows how different the regulatory applied for each pair of economies based on relative distance, RD Cosine can explain the different regulatory in a numerical manner.

First, we calculate RD cosine indicator that explain show different the application of NTMs of each APEC member to the average NTMs applied by all APEC members.

From equation (i) we have defined n_{ilk} , then we define F_i , where

$$F_i = \left(n_{il1}, \cdots, n_{ilk}, \cdots n_{ilK}\right) \quad \text{..... (vii)}$$

Using the vectors representing the implementation pattern of NTMs, we can calculate the cosine similarity between a certain pair of economies. However, to provide an overview of international regulatory differences in this research, we calculate the cosine similarity for each economies concerning the APEC average implementation pattern of NTMs. We construct the APEC average vector of

$$F_{APEC} = \left(F_{APEC.l1} \cdots, \cdots, F_{APEC.lk}, \cdots F_{APEC.lK}\right) \quad \text{..... (viii)}$$

Where

$$F_{APEC.lk} = \sum_i n_{ilk} \quad \text{. ..... (ix)}$$

The cosine similarity between economies i's vector of Fi and the APEC average vector of F_{APEC} is

$$\cos(\theta)i = \frac{F_i \cdot F_{APEC}'}{\left\|F_i\right\| \cdot \left\|F_{APEC}\right\|} = \frac{\sum_l \sum_k n_{ilk} F_{APEC.lk}}{\sqrt{\sum_l \sum_k {n_{ilk}}^2} \sqrt{\sum_l \sum_k {F_{APEC.lk}}^2}} \quad \text{..... (x)}$$

Where $\cos(\theta)i$ is represented using an inner product of the two vectors and their magnitudes. θ is the measure of an angle between the vectors and takes a value between 0 degrees (identical) and 90 degrees (orthogonal) because both F_i and F_{APEC} are composed only of elements with positive values.

Finally, we obtain the dissimilarity indicator for economies i's implementation pattern of NTMs with respect to the APEC average pattern as follows:

$$RD\cos_i = (1 - \cos(\theta)i) * 100 \quad . \quad \text{.....} \quad \text{(xi)}$$

The resulting regulatory dissimilarity indicator ranges from 0 (meaning exactly the same) to 100 (indicating orthogonality or decorrelation).

Using the same logic of thought, the bilateral RD cosine can be given as follows:

$$\cos(\theta)ij = \frac{F_i \cdot F_j'}{\|F_i\| \cdot \|F_j\|} = \frac{\sum_l \sum_k n_{ilk} n_{jlk}}{\sqrt{\sum_l \sum_k n_{ilk}^2} \sqrt{\sum_l \sum_k F_{jlk}^2}} \quad \text{..... (xii)}$$

$$RD\cos_{ij} = (1 - \cos(\theta)ij) * 100 \text{.....} \quad \text{(xiii)}$$

Furthermore, as has been explained, this study will examine whether streamlining NTMs in the APEC region will have a significant impact on increasing trade in the region. To answer this, this study uses an econometric model that calculates the impact of Regulatory Dissimilarity between APEC member economies on intra-trade in three sectors (agriculture, fishery, and forestry) in APEC. To get a comprehensive picture, this study creates an econometric model for both export and import trade flows and calculates the impact of Regulatory Dissimilarity in bilateral trade between APEC member economies on a bilateral basis and the total trade of APEC member economies in the region. Thus, this study has four econometric models, namely:

$$\ln(EXPORT_{ijk}) = \alpha_1 + \beta_1 \cdot \ln(RD\cos_{ijk}) + \varepsilon_1 \text{.....} \quad \text{(xiv)}$$

$$\ln(IMPORT_{ijk}) = \alpha_2 + \beta_2 \cdot \ln(RD\cos_{ijk}) + \varepsilon_2 \text{.....} \quad \text{(xv)}$$

$$\ln(EXPORT_{i.apec.k}) = \alpha_3 + \beta_3 \cdot \ln(RD\cos_{ijk}) + \varepsilon_3 \text{.....} \quad \text{(xvi)}$$

$$\ln(IMPORT_{i.apec.k}) = \alpha_4 + \beta_4 \cdot \ln(RD\cos_{ijk}) + \varepsilon_4 \text{.....} \quad \text{(xvii)}$$

The first and second models explain the impact of Bilateral Regulatory Dissimilarity on bilateral trade between APEC member economies. Meanwhile, the

third (and fourth) models explain the impact of the Regularity Dissimilarity of certain APEC member economies to the average of APEC on the economy's export (and import) in APEC. All trade value and Regulatory Dissimilarity are expressed in the logarithmic term. Thus, the coefficient indicates the elasticity.

3.2. Data Source

The data used in this analysis are secondary data taken from CEIC, COMTRADE, WITS, World Bank, and GTAP Database version 9 published in the year 2015. The GTAP is a CGE model that provides multi-region and multi-sector with by default, which consists of 140 regions, 57 commodities, and five productive factors for each region (Qi & Zhang, 2017). We keep the commodities at 57 commodities and aggregate the regions into regions of APEC member economies from originally 140 regions. STATA will also use in this research to process and compile a huge data, which consists of data on trade flows between economies in the world, especially APEC member economies.

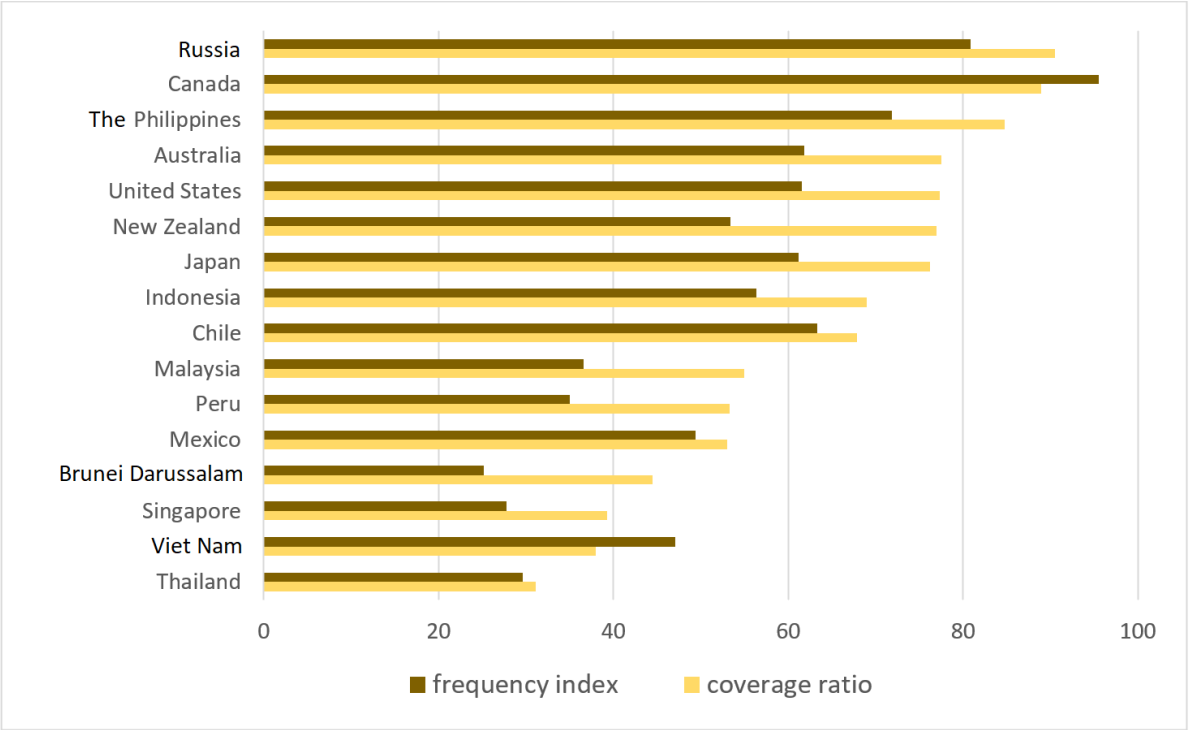
For the purpose of the study, we classify agriculture, fishery, and forestry product as follow. Agriculture products are products therein chapter 01-24 with exclusion of fishery products. While fishery are the products consisted in chapter 03 and some of heading in chapter 16 which are 1604 and 1605. Forestry products are all the products in the chapter 44.

CHAPTER IV
RESULT AND DISCUSSION

4.1. SPS and TBT Measures Across APEC Member Economies

Many methods and approaches are used to identify the importance of trade measures and assess their international trade impact. The approach is taken from simple measures such as NTMs inventory to the gravity method to calculate the ad valorem equivalent of a product exposed to NTMs. CEPIIs NTM MAP provides three basic indicators that can capture issues in NTM, namely frequency index, coverage ratio, and prevalence score (Gourdon, 2014). The Frequency Index simply states the percentage of a product exposed to one or more NTMs to the entire product. The coverage ratio states the percentage of imports affected by one or more NTMs. Meanwhile, the prevalence ratio states the average number of NTMs implemented in a product.

This study utilizes the World Integrated Trade Solution (WITS) analysis tool to provide indicators of the Coverage Ratio and Frequency Index for APEC member economies. WITS established on 1962 and it has been used in prominent researches e.g Gravity Model For Import Flow – A Case Of India's Oil And Non-Oil Imports From The OPEC Cartel (Habib, 2019) and Assessing the Impact of Non-Tariff Measures on Imports (Grübler, et al, 2016). The data presented in this study are aggregated by economies and sector for NTMs implemented in imported products. For aggregation by economies, the Coverage Ratio and Frequency Index are the accumulations for SPS and TBT measures for each economies. Meanwhile, the sector's aggregation is calculated based on the average coverage ratio and the average economic frequency index of APEC members for the respective SPS and TBT measures.



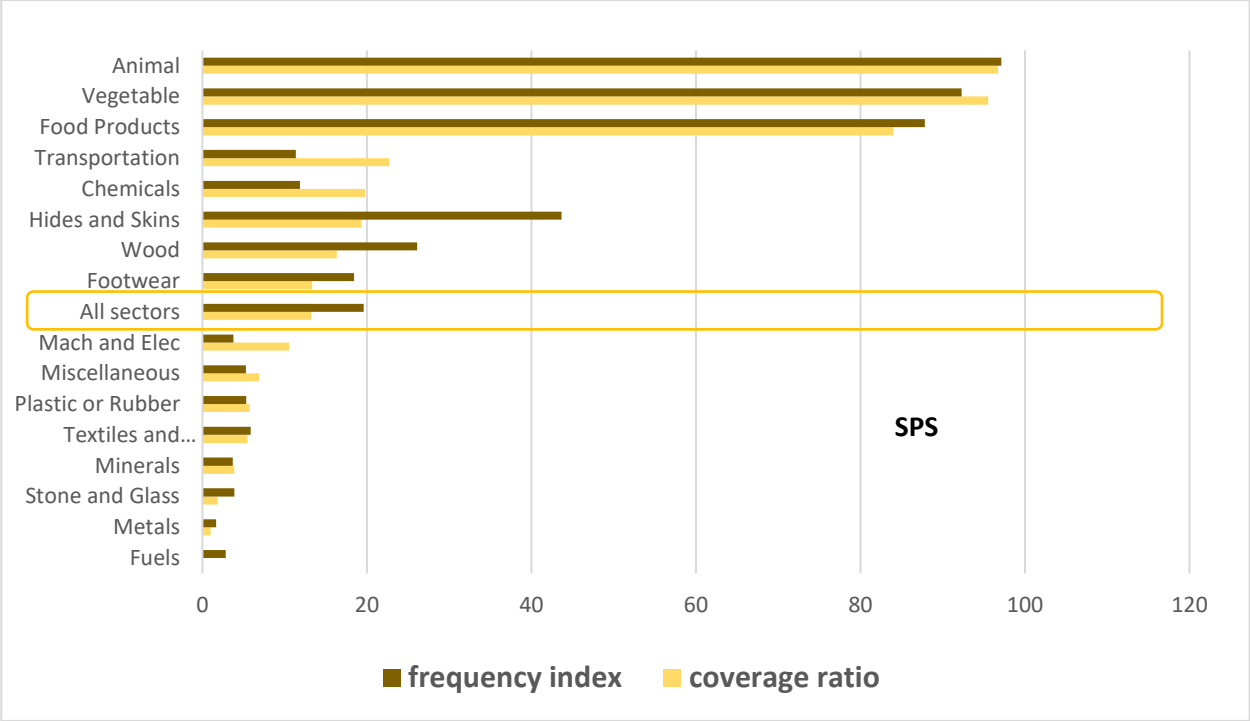


Figure 8. Coverage Ratio and Frequency on SPS Measures by Products in APEC APEC Member Economies

Source: WITS, compiled by Author[4]

[4] Some economies NTMs data are not available in WITS database

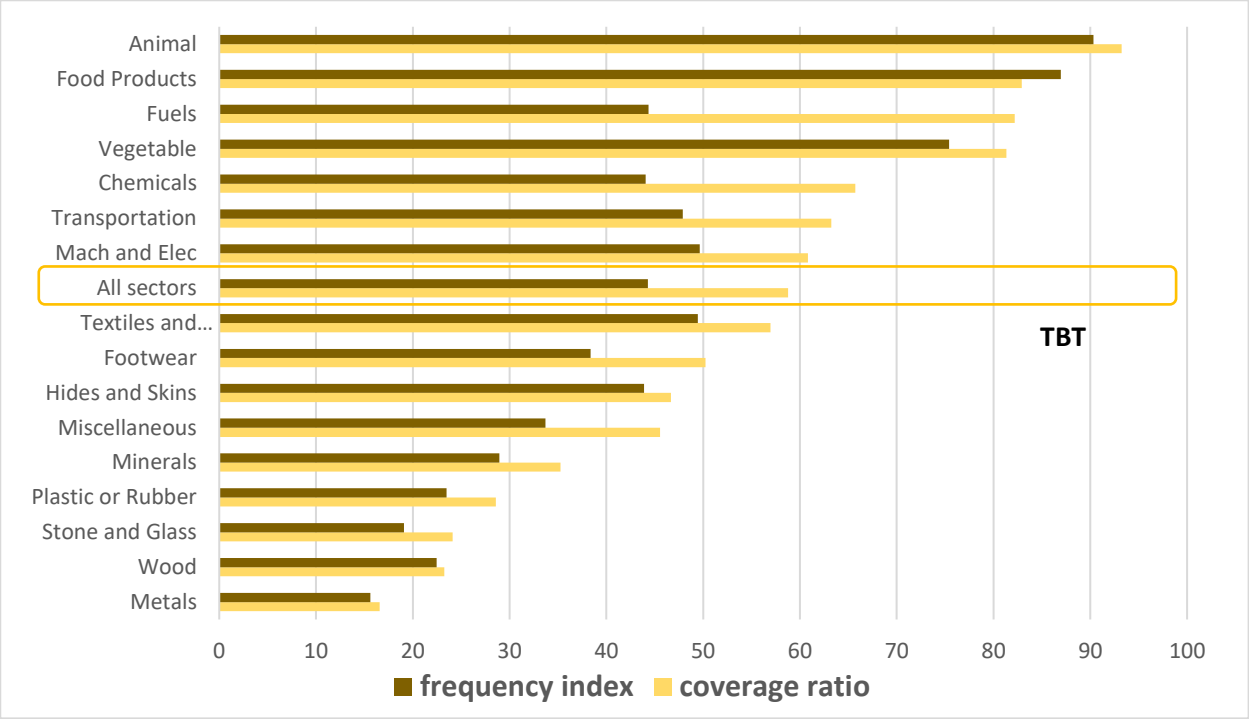


Figure 9. Coverage and Frequency Index on TBT Measures by Products in APEC Member Economies

Source: WITS, compiled by Author

Based on Figure 8 and Figure 9 the SPS and TBT measures dominate the animal product, vegetable, and food product sectorsin terms of product coverage and frequency index. As stated in Gourdon (2014), Doan and Buban (2019), in general, agricultural, plantation, and forestry products and their derivative manufactured products have a higher coverage ratio and frequency index than products from other manufacturers. These figures also in line with (Ederington & Ruta, 2016) that explain the distribution of SPS dan TBTs measures across the world and (Ing et al., 2019) for the case of ASEAN. Gourdon (2014) explains that the use of SPS and TBT greatly varies across economic sectors for technical and economic reasons. An intuitive explanation for the generally strong regulatory dispersion in those sectors is that those sectors have a larger impact on health (Ederington & Ruta, 2016), well being of consumers and protecting the environment (Cadot et al., 2018) further mentioned that their regulation is often subject to strong lobbies (Cadot et al., 2015).

4.2. Regulatory Dissimilarity between APEC Member Economies

In principle, NTMs are defined as policy measures that impact trade. Similarly, with ordinary customs tariffs, they both can have an economic effect on international trade (Vanzetti et al., 2018). NTMs thus include a wide array of policies. On the one hand, NTMs act as the traditional trade policy instruments, such as quotas or price controls, which are often termed non-tariff barriers (NTBs). On the other hand, NTMs also comprise sanitary and phytosanitary (SPS) measures and TBT measures that stem from legitimate objectives. Though SPS and TBT possibly increase trade costs, their primary regulatory objectives make them indispensable. SPS and TBT measures may ensure food safety, protect harvests against pests and invasive species, regulate the trade of hazardous substances and waste, and prohibit endangered species' trade. Knebel and Peters (2019) recognising the necessity of SPS measures and TBT to protect the health, safety, and environment suggested that such NTMs need to be convergenced rather than eliminated. However, there are numerous examples of such regulations being unnecessarily strict and arbitrarily distorting trade.

Before discussing about regulatory differences affect the pattern on international trade relationships, one needs to determines how large those differences are. Recent tool has been used to assess how wide the gap is between member state's practices called Regulatory Distance (RD). Cadot and Ing (2015) suggested that RD could be useful to assess prior to the initiation of regional negotiations on [regulatory converence] or mutual recognition. At least RD explains whether the two economies tend to apply the same type of measure (e.g.quotas or inspection requirements) to the same products.

Some researchers have been paying attention to the implication of regulatory distances of NTMs regime on international trade. Cadot and Ing (2015) have found that RTAs may reduce the regulatory distance between their members as much as 41 percent. While Ven (2017) argued that there is not enough empirical evidence to assert the closer regulatory distance associated with more or less trade, other researchers have conducted some empirical tests. Knebel and Peters (2019) found that compliance cost associated with technical NTMs depends not only on the stringency and number of measures abroad but also significantly on the similarity of the foreign measures with domestic market requirements. Moreover, in line with the Vanzetti et al. (2018) finding, Knebel and Peters (2019) suggest that SPS and TBT measures have significant price-raising effects that exceed traditional non-tariff

barriers. Since SPS and TBT are proposed to protect health and the environment, they cannot be eliminated. However, estimations show that their actual burden is substantially reduced by regulatory convergence. Vanzetti et al. (2018) have proven that converging regulations, without reducing their number, could reduce the effects of NTMs by 15-25 percent. For instance, regulatory convergence in mega-regional agreements could further reduce trade costs with these trading partners.

Figure 10 is presenting Regulatory Distance for agriculture, fishery, and forestry products among APEC member economies. The distance between two economies-points in the graph, therefore, reproduces the calculated regulatory distance measure. Knebel and Peter (2019) explained how to interpret the RD graph well. The graphs are best understood as maps, where distances between economies-points imply regulatory distances just like the geographical distance. It is necessary to point out that the graphs do not state the 'more' or 'less' regulation applied by the economies. It only demonstrates relative positions of regulatory similarity. Therefore, each economy's point position towards the left, right, top, or bottom of a graph has no significance.

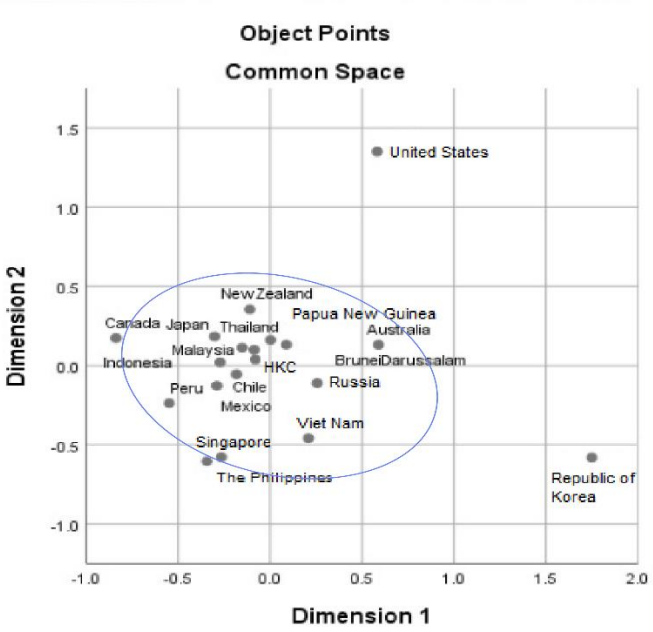


Figure 10. Regulatory Dissimilarity for Agriculture, Fishery and Forestry Product Among APEC Member Economies

Source: Author's Calculation

Note: HKC is the abbreviation of Hong Kong, China

Figure 10 suggests several observations. First, a small number of APEC member economies stand out for different SPS and TBT imposition patterns, which are the Republic of Korea and United States. Though, their distance to each other is also quite significant. Meanwhile, the rest of the APEC member economy tends to group. It indicates the level of similar patterns of NTMs, This is probably because government among APEC member have developed regulatory patterns that inspired by international experience, or that economies effort to bring regulatory convergence had come to effect. This finding is aligned with Cadot and Ing (2015), which observed RD for the member of the Regional Comprehensive Economic Partnership (RCEP). Cadot and Ing (2015) found that there is a core of economies with similar patterns of NTMs.

In this section, we also provide an overview of regulatory differences across APEC member economies in terms of the implementation pattern of NTMs using the cosine similarity-based regulatory dissimilarity indicator, as explained in the previous section. Figure 11 shows the regulatory dissimilarity indicators calculated for APEC member economies with respect to the APEC average implementation pattern of NTMs. The bars representing different economies are arranged in descending order according to the Regulatory Dissimilarity indicator's score.

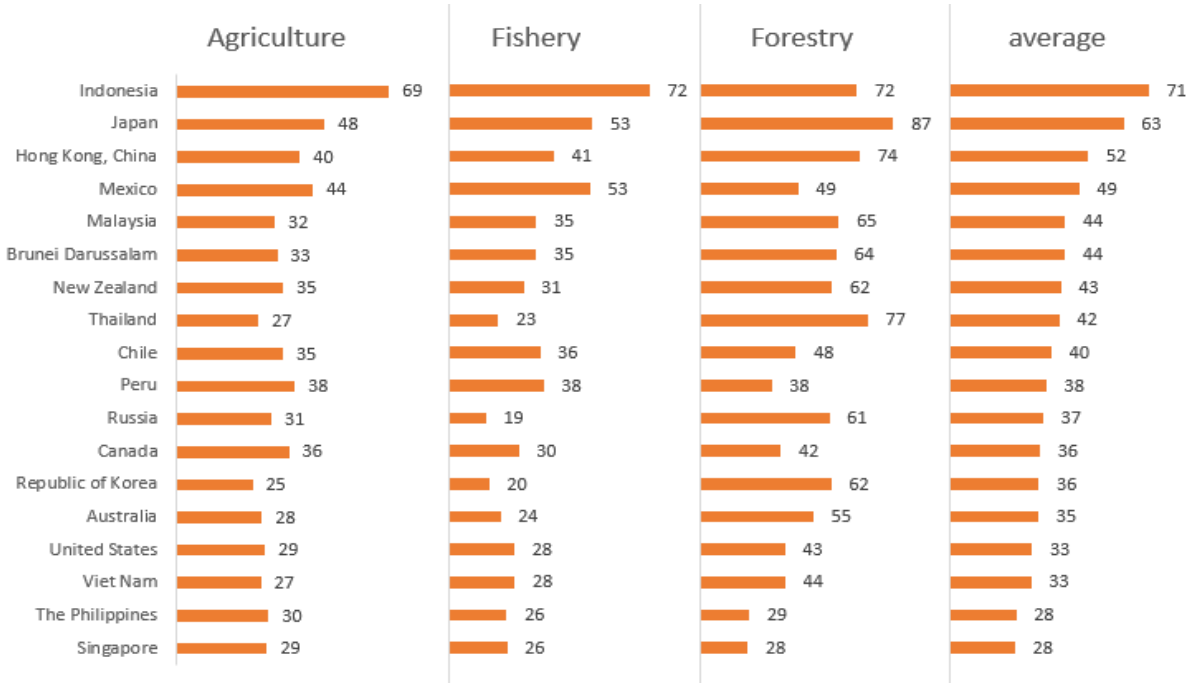


Figure 11. Regulatory Dissimilarity Cosine Rank for APEC Member Economies.

Source: Author's Calculation[5]

There are two notable features of regional regulatory dissimilarity in the implementation pattern of NTMs in the APEC region. First, the dissimilarity pattern appears to be higher for the forestry sector, while agriculture and fishery are relatively lower. The average of Regulatory Dissimilarity Cosine across APEC member economies for each agriculture, fishery, forestry, and average across sectors respectively are 35, 34, 56, and 42. The number shows that the value in the forestry indicator is even greater than the average. Second, both lower-income and high-income APEC member economies are dispersed across the bar chart. The same distribution also appears in terms of the regional part of APEC. For example, ASEAN member and other East Asian are spread along with the bar chart as well as the APEC members in the American region part. It indicates that the different implementation pattern of NTMs regulation between APEC members is not correlated with the distance and size of the economy.

4.3. The Impact of SPS and TBT Measures Applied in APEC

Since the WTO was officially formed in 1995, its member economies have been competing to establish trade cooperation so that the applied tariffs of the economies involved became very low, even to 0 (zero). Even though economies may have implemented low applied tariffs, it does not mean that trade flow in goods becomes smooth without any obstacles. Every economies continues to protect its respective domestic interests by implementing a non-tariff barrier policy, or what is known as a Non-Tariff Measures (NTMs) policy. NTM are considered necessary because of their effects. NTMs are generally enforced on the grounds of protecting domestic consumers and producers of the respective economies. If the NTMs cannot be resolved, the flow of goods from trading partner economies will be hampered or stopped even though the tariff is liberal/lowered. This is in accordance with the analysis conducted by UNCTAD, the higher the trade liberalization in economies; the more NTMs are applied by the economies (UNCTAD, 2017). Likewise, in APEC, the NTMs in force have increased from year to year, from 1,576 measures in 2008 increased to 2,010 measures in 2012.

[5] Some economies NTMs data are not available in WITS database

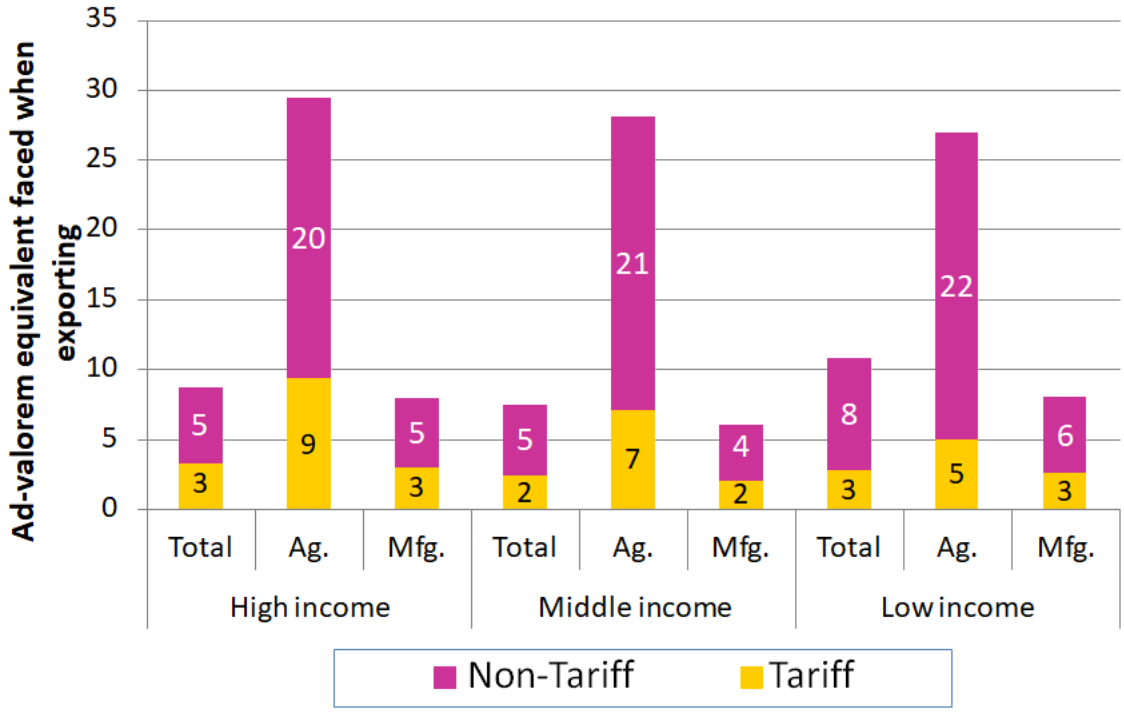


Figure 12. Comparison of Tariffs and Ad Valorem Equivalents of Non-Tariff Measures Imposed on The Exporting Economies

Source: OECD, 2016

This has become the interest of many researchers and academics to quantify the amount of non-tariff barriers, or what is called the ad valorem tariff equivalent. Along with the liberalization scheme in every international trade agreement, the tariffs tend to get smaller and closer to 0 (zero). However, likely, economies in the world are currently implementing non-tariff barrier policies that have more significant influence than the tariff's amount.

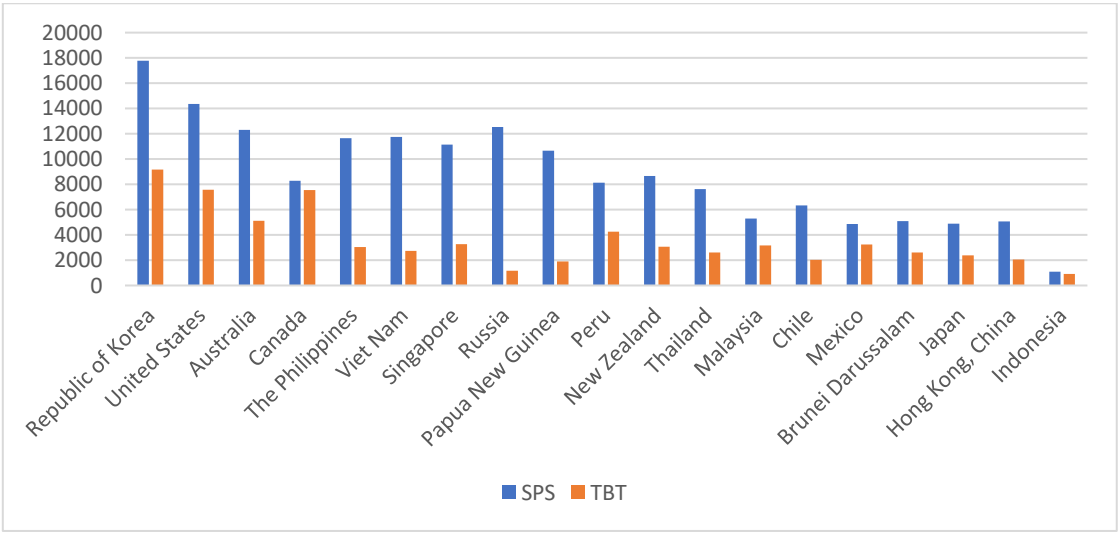


Figure 13. NTMs in APEC Member Economies in the Three Sectors (Agriculture, Fisheries, and Forestry)

Source: WITS, compiled by Author[6]

Based on the figure, it can be seen that the most NTMs types in the three sectors (agriculture, fisheries, and forestry) in the APEC member economies are SPS. The economies that use the most NTMs in these three sectors are Republic of Korea; United States; and Australia; while Indonesia is one of the economies imposing the least NTMs. For more details regarding the types of NTMs for each APEC Member Economies, see the following table.

Table 1. SPS and TBT measures by Sector in the APEC Member Economies

Economies	Agriculture		Agriculture Total	Fishery		Fishery Total	Forestry		Forestry Total	Grand Total
	SPS	TBT		SPS	TBT		SPS	TBT		
Australia	8362	3587	11949	3782	1177	4959	152	342	494	17402
Brunei Darussalam	3645	1503	5148	1370	931	2301	65	172	237	7686
Canada	5018	5368	10386	3014	2073	5087	237	109	346	15819
Chile	5053	1606	6659	1093	417	1510	194	9	203	8372
Hong Kong, China	3814	1518	5332	1230	494	1724	15	36	51	7107
Indonesia	639	722	1361	374	179	553	78	0	78	1992
Japan	3867	1972	5839	996	388	1384	30	23	53	7276
Republic of Korea	12623	6401	19024	4988	2368	7356	159	392	551	26931
Malaysia	3657	1555	5212	1606	1460	3066	28	152	180	8458
Mexico	3497	1983	5480	1174	1145	2319	187	111	298	8097
New Zealand	5921	2157	8078	2467	883	3350	282	13	295	11723
Papua New Guinea	7157	1310	8467	3175	524	3699	335	78	413	12579
Peru	5954	3337	9291	1709	907	2616	471	20	491	12398
The Philippines	7410	2094	9504	3551	717	4268	685	231	916	14688
Russia	8256	768	9024	4162	241	4403	114	160	274	13701
Singapore	6987	2302	9289	3535	735	4270	624	231	855	14414
Thailand	5437	1771	7208	2176	710	2886	2	120	122	10216
US	9801	4610	14411	4034	2658	6692	526	317	843	21946
Viet Nam	7743	1633	9376	3645	944	4589	351	148	499	14464

[6] The information therein were compiled by the author, subject to the data available for each economy in the WITS database. Some economies NTMs data are not available in WITS database

Source: WITS, compiled by Author[7]

The table describes SPS and TBT measures for each economies in the agriculture, forestry, and fisheries sectors. Republic of Korea applies the largest number of such measures, amounting to 26,931, where the most come from the agriculture sector with 19,024, followed by fishery with 7,356, and forestry with 551. Republic of Korea followed by the United States and Australia, which implemented such measures of 21,946 and 17,402. Meanwhile, the economies with the least number is Indonesia, with 1,992 for the agriculture, forestry, and fisheries sectors. The economies that apply the most tend to be high-income economies, such as the Republic of Korea; United States; Australia; and Canada.

In all economies, the agriculture sector has the highest SPS and TBT measures value compared to the fishery and forestry sectors. Meanwhile, types of SPS and TBT measures most applied in the agriculture, forestry, and fisheries sectors are B31 with 14,970 measures, A31 with 13,254 measures, and A83 with 11,047 measures. B31 is labeling requirements that define information directly related to food safety, which should be given to consumers. Meanwhile, A31 is labeling requirements that regulate the type, color, and size of printing on packages and labels that define the information that must be given to consumers. A83 is Certification requirements or certification of conformity with the importer economies' regulations but can be issued in the exporting or importing economies.

The scenario of decreasing SPS and TBT measures will positively impact trade balance, welfare, real GDP, and investment for APEC member economies. It also shows that reducing such measures can provide benefits. This scenario is carried out by reducing the SPS and TBT measures by 20% for the agriculture sector, which is the sector with the most number of SPS and TBT measures.

Impact on trade balance

The following table shows the simulated impact of a decrease in number of SPS and TBT measures on the trade balance. Several economies experienced a negative impact on the trade balance, such as Japan; Malaysia; People's Republic of China;

[7] The information therein were compiled by the author, subject to the data available for each economy in the WITS database. Some economies NTMs data are not available in WITS database

Republic of Korea; Indonesia; Thailand; Hong Kong, China; and Chinese Taipei[8]. This is due to the increasingly open trade access and increased trade flows. The largest trade deficit occurred in Republic of Korea, amounting to - USD 2,764.74 million.

Table 2. Impact of Decreasing *SPS and TBT measures* on the Trade Balance in the APEC Member Economies

Trade Balance	Value
Australia	483.66
Brunei Darussalam	0.79
Canada	138.89
Chile	43.88
People's Republic of China	-1138.48
Hong Kong, China	-11.52
Indonesia	-60.14
Japan	-785.13
Republic of Korea	-2764.74
Malaysia	-90.74
Mexico	95.01
New Zealand	20.19
Peru	47.36
The Philippines	61.27
Russia	138.44
Singapore	26.27
Chinese Taipei	-41.24
Thailand	-71.95
United States	918.89
Viet Nam	23.59
Rest of the World	2965.70

Source: GTAP (compiled by Author)[9]

Meanwhile, the economies with the most substantial positive impact on the trade balance is the United States at USD 918.89 million; followed by Australia with USD 483.66 million. Brunei Darussalam gets the smallest trade balance surplus of USD 0.79 million.

Impact on welfare

[8] The impact of decreasing NTMs on the trade balance in APEC member economies was calculated by the author based on the methodology as set out in Chapter III of this report
[9] Some economies NTMs data are not available in WITS database

The table below presents the simulated impact of the decrease in the number of SPS and TBT measures on welfare as measured by the equivalent variation, which is the sum of the consumer surplus, producer surplus, and government surplus in each APEC member economy[10].

Table 3. Impact of Decreasing *SPS and TBT measures* on Welfare in the APEC Member Economies

Welfare	Value
Australia	440.19
Brunei Darussalam	-0.30
Canada	56.88
Chile	48.33
People's Republic of China	985.59
Hong Kong, China	63.41
Indonesia	56.10
Japan	781.90
Republic of Korea	2473.54
Malaysia	97.43
Mexico	119.44
New Zealand	80.84
Peru	18.32
The Philippines	49.99
Russia	123.37
Singapore	70.73
Chinese Taipei	23.59
Thailand	156.73
United States	1153.39
Viet Nam	117.11
Rest of the World	-993.43

Source: GTAP (compiled by Author)[11]

Increased welfare occurred in all economies except Brunei Darussalam, which experienced a decrease of USD 0.30 million. Based on the table, it can be seen that the highest increase in welfare is obtained by Republic of Korea, amounting to USD 2,473.54 million; followed by the United States and Japan amounting to USD 1,153.39 million and USD 781.90 million. While the smallest increase in welfare occurred in Peru, amounting to USD 18.32 million.

[10] The impact of decreasing NTMs on the welfare and real GDP in APEC member economies was calculated by the author based on the methodology as set out in Chapter III of this report
[11] Some economies NTMs data are not available in WITS database

Table 4. Impact of Decreasing *SPS and TBT measures* on Real GDP in the APEC Member Economies

GDP	Value
Australia	-0.001
Brunei Darussalam	0.000
Canada	0.005
Chile	0.005
People's Republic of China	0.017
Hong Kong, China	0.015
Indonesia	0.012
Japan	0.016
Republic of Korea	0.173
Malaysia	0.034
Mexico	0.005
New Zealand	0.012
Peru	0.009
The Philippines	0.016
Russia	0.009
Singapore	0.015
Chinese Taipei	0.016
Thailand	0.041
United States	0.004
Viet Nam	0.044
Rest of the World	0.001

Source: GTAP (compiled by Author)[12]

From these results, it can be seen that the simulation results show a positive impact on changes in Real GDP for all economies except Australia, which has a negative impact of - 0.001%. The economies with the most significant positive impact on Real GDP is Republic of Korea at 0.173%; followed by Viet Nam at 0.044%. Meanwhile, based on the simulation results, Brunei Darussalam does not have a positive or negative impact.

4.4. Streamlining SPS and TBT measures among APEC Member Economies

The simulation using the CGE model shows the impact of removing trade barriers in the form of NTMs. However, removing SPS and TBT measures does not necessarily narrowing the dissimilarity between APEC member economies if they do

[12] Some economies NTMs data are not available in WITS database

not remove their SPS and TBT measures in the same manner. It happens when one member removes one type of SPS and TBT measures , and the other member removes the other type of SPS and TBT measures, and the rest of the members also perform the same action. In this point of view, streamlining the SPS and TBT measures means all APEC member economies agreed to harmonized their regulation. SPS and TBT are justified by legitimate objectives such as the protection of health, safety or the environment. So elimination should be interpreted as the shifting the measures carried out by each member in such a way narrowing the dissimilarity gap.

This research estimates the impact of regulatory gaps in trade flow on the agriculture, fishery, and forestry sectors using the econometric model. The econometric model is applied for each trade flow (export and import) and each sector (agriculture, fisheries, and forestry) to provide a comprehensive conclusion. The econometric model also estimates both bilateral trade flow between APEC member economies and each member's trade with total APEC.

Before discussing estimation results, let us take a look at intra-trade performance for agriculture, fishery, and forestry within the APEC region shown in Table 5. In total, export intra-APEC for all member economies on the three sectors covers 70% from export APEC to the world. While import intra-APEC contributes to 64% to import APEC from the world. The main exporters for the three sectors are dominated by the American part of APEC members, such as the United States; Canada; and Mexico. Meanwhile, main importers are dominated by the United States; Japan; and Canada. The percentage value of intra-export for each APEC member economies ranges from 30% to 95%, while the percentage value of intra-import ranges from 18% to 64%. Some APEC member economies still reveal limited intra-trade performance such as Malaysia; Indonesia; Peru; and Thailand. Russia has the lowest intra-trade performance due to its location is considered out-of-the-way in the APEC region. Although the United States has the highest trade value, the percentage of its intra-trade is still relatively low.

Table 5. Intra-APEC Trade in Agriculture, Fishery, and Forestry Sectors (in USD Million)

No	Economies	Intra APEC		% to total trade to the world	
		Export	Import	Export	Import

1	Russia	9,931.5	5,593.8	30	18
2	Malaysia	12,865.1	10,253.2	55	62
3	Indonesia	20,444.8	12,315.2	57	64
4	Peru	6,318.6	2,372.4	59	44
5	Thailand	25,313.7	8,488.9	67	58
6	United States	98,400.9	115,519.3	69	62
7	Chile	14,601.2	2,319.2	69	31
8	Viet Nam	21,338.3	11,354.7	72	52
9	The Philippines	5,393.1	11,820.5	73	77
10	New Zealand	21,808.0	3,679.9	76	70
11	Japan	6,083.3	59,977.2	78	71
12	Hong Kong, China	9,271.8	20,298.6	81	72
13	Singapore	11,368.8	8,777.2	82	64
14	Republic of Korea	7,050.8	25,344.4	82	72
15	Australia	26,331.2	11,261.1	83	62
16	Mexico	33,197.0	24,430.5	84	79
17	Canada	52,144.1	31,274.6	85	76
18	Brunei Darussalam	12.5	434.0	95	83
Total		381,874.6	365,514.6	70	64

Source: WITS, calculated by Author[13]

The results of the econometric models are given in Table 6 The four models estimated have negative coefficients with three models showing significant results. This implies that a high regulation gap will hamper trade between APEC member economies, both bilateral and total trade. The estimation results also show that the impact of narrowing the gap regulation is bigger on the import side. They are indicating that NTMs are intended to inhibit imports.

Table 6. Estimation Result of Economic Model

Dependent Variable	Coefficient Regulatory Dissimilarity Cosine
Bilateral Export between APEC member Economies	-1,229 (0,350)***
Bilateral Import between APEC member Economies	-1,170 (0.322)***
APEC member Export APEC	-1,001 (0,834)
APEC member Import from APEC	-1,131 (0,675)*

[13] Some economies NTMs data are not available in WITS database

Source: Estimation Result

Number in parenthesis are standard error, the * indicates level of significant at 10%, and the *** indicates level of significant at 1%.

Since the trade variable and the Regulatory Dissimilarity Cosine variable are expressed in logarithmic form, the coefficient is an indicator of elasticity. The RD Cosine coefficients in the table can be interpreted as follows. As an example, for the first model, for every 10 percent increase RD Cosine (a decrease in bilateral RD Cosine between two APEC members from 22 to 20 unit point), the model estimate, on average, an increase in bilateral export between those economies 12,29 percent. The explanation in fourth model is when all APEC member economies restructure their NTMs in such a way their RD Cosine are closer to average APEC by 10 percent, then the total intra export in APEC region will increase as much as 11,31 percent.

What does this mean in practical terms? Consider the trade level in Table 5 for the total intra-export in the APEC region. To get some sense of magnitude, let us assume that all APEC members reach an agreement to narrow their gap on their NTMs, so their NTMs gap reduces averagely 10 percent. In terms of Table 5 this would imply an increasing export intra-APEC for agriculture, fishery, and forestry products as much as USD 38,19 million, and the export value change from USD 381,9 billion to USD 420 billion. In the same assumption, the import intra-APEC will increase USD 36,55 million and total imports for three sectors change from USD 366 billion to USD 402 billion.

CHAPTER V
CONCLUSION

This research has three objectives. The first objective is to perceive SPS and TBT measures applied in APEC member economies towards the three sectors (agriculture, forestry, and fisheries). The second objective is to evaluate and calculate the impacts of SPS and TBT measures applied in the three sectors (agriculture, forestry, and fisheries) on trade and economy in APEC member economies. The last objective to analyze possible effects from NTMs streamlining among APEC member economies. We use several approaches to address this research's aims, such as the Regulatory Dissimilarity (RD) indicator to map the SPS and TBT implementation amongst APEC member economies. Computable General Equilibrium model is employed to calculate the potential effect when the trade barriers in SPS and TBT measures are reduced. Last, this research estimates intra-APEC trade performance to analyze the possibility of streamlining the SPS and TBT measures in APEC region by regressing RD indicators on export and import performance on the three sectors (agriculture, fishery, and forestry).

Mapping Regulatory Dissimilarity indicators for SPS and TBT measures have suggested several observations. First, almost all APEC member economies tend to group. Only two APEC member economies stand out for different patterns of SPS and TBT imposition, which are the Republic of Korea and United States. It indicates the level of similar patterns of SPS and TBT in APEC, suggesting that either government among APEC members has developed regulatory patterns inspired by international experience or that economies' effort to bring regulatory convergence had come to effect. RD Cosine rank suggests that the dissimilarity pattern amongst APEC members appears to be higher for the forestry sector, while agriculture and fishery are relatively lower. This research also finds that the different pattern of implementation NTMs regulation between APEC members is not correlated with the distance and the size of the economy.

This study provides new estimates of the economy-wide impact of removing both tariffs and non-tariff barriers among APEC member economies by employing the CGE model. The results indicate positive and significant gains for APEC in general. However, some APEC member economies encounter the adjustment cost in their economy due to reducing their trade barriers. APEC GDP in total is estimated to

increase by 0,02% as much as USD 1,06 trillion if all APEC members impose less restrictive SPS and TBT measures . The most benefit APEC member under the scenario is the Republic of Korea, which will enjoy 0,17% GDP and GDP growth followed by Viet Nam (0,04%) and Thailand (0,04%). APEC members who experience the loss in their GDP are Australia and Brunei Darussalam, where their GDP decreases due to removing SPS and TBT measures , respectively, as much as 0,0005% and 0,0003%. Removing SPS and TBT measures among APEC members also generate welfare significantly almost to all APEC member beside Brunei Darussalam. In total, APEC will obtain for almost USD 7 billion due to more free trade flow for the agriculture, fishery, and forestry products.

The last conclusion of this research is that streamlining the SPS and TBT regulation will positively affect intra-trade performance in the APEC region. This research predicts if SPS and TBT measures implementation gap in three sectors between all APEC members reduces averagely 10 percent, this will imply an increasing export intra-APEC as much as USD 38,19 million, and the export value change from USD 381,9 billion to USD 420 billion. In the same assumption, the import intra-APEC will increase USD 36,55 million, and total imports for three sectors change from USD 366 billion to USD 402 billion.

REFERENCES

APEC Business Advisory Council (ABAC).2016. *Non-Tariff Barriers in Agriculture and Food Trade in APEC: Business Perspectives on Impacts and Solutions*. University of Southern California, Marshall School of Business: 2016.

Armington , P. S. 1969. “A Theory of Demand for Products Distinguished by Place of Production,”International Monetary Fund Staff Papers 16, 159–178

Cadot, O., Asprilla, A., Gourdon, J., Knebel, C., & Peters, R. (2015). Non-Tariff Measures : a Methodology for Data Analysis. *Policy Issues in International Trade and Commodities Study Series*, *69*.

Cadot, O. and L.Y. Ing (2015), ‘Non-Tariff Measures and Harmonization: Issues for the RCEP’, Economic Research Institute for ASEAN and East Asia Discussion Paper, No. 2015-61. Jakarta: Economic Research Institute for ASEAN and East Asia. Available at: http://www.eria.org/ERIA-DP-2015-61.pdf

De Melo, J. 1998. CGE Models for The Analysis of Trade Policy in Developing Countries. Policy Research Working Paper Series 3, The World Bank.

Dixon, P., B. Parmenter, A. Powell and P. Wilcoxen 1992, Notes and Problems in Applied General Equilibrium Analysis, North Holland.

Doan, T. and S. Buban (2019), ‘Managing Non-tariff Measures in ASEAN’, in Intal, P. and M. Pangestu, Integrated and Connected Seamless ASEAN Economic Community, Jakarta, ERIA, pp. 21–33

Ederington, J., & Ruta, M. (2016). *Nontariff Measures and the World Trading System*. *May*, 211–277. https://doi.org/10.1016/bs.hescop.2016.04.010

Grübler et.al. 2016. Assessing the Impact of Non-Tariff Measures on Imports Available at : https://cepr.org/sites/default/files/2486_GRUEBLER%20-%20Assessing%20the%20Impacy%20of%20NTMs%20on%20Imports.pdf

Gourdon, Julien. 2014. CPEE NTM-MAP: A Toll for Assessing the Economic Impact of Non Tariff Measures.CEPII Working Paper 2014.

Habib, Dhrgam S. 2019. Gravity Model For Import Flow – A Case Of India’s Oil And Non-Oil Imports From The Opec Cartel. Available at: http://www.jcreview.com/fulltext/197-1577441950.pdf

Hertel, T. W., Anderson, K, Francois, J. F., & Martin, W. 2000. Agriculture and Non-Agricultural Liberalization in the Millennium Round. CIES Working Paper No. 16. Available at SSRN: http://ssrn.com/abstract=231205

Hertel, T., W. 1997. Global Trade Analysis, Modeling and Applications. Cambridge: Cambridge University Press.

Ing L. Y., Cadot O., Anandhika R., Urata S. 2016. Non-tariff Measures in ASEAN: A Simple Proposal. FERDI Working Paper Development Policies (183)

Ing, L. Y., Anandhika, R., Cadot, O., & Urata, S. (2019). *NTM in ASEAN: Ways Toward Regulatory Convergence*. *August*.

Knebel, C. and R. Peters (2019), 'Non-Tariff Measures and The Impact of Regulatory Convergence in ASEAN', in Ing, L.Y., R. Peters and O. Cadot (eds.), Regional Integration and Non-Tariff Measures in ASEAN. Jakarta: ERIA, pp.65–89.

Mikic, Mia and Martin Wermelinger. 2010. Rising Non-Tariff Protectionism and Crisis Recovery. The Asia Pacific Research and Training Network on Trade. ST/ESCAP.2587

Nabeshima, Kaoru and Obashi, Ayako. 2019. Regulatory Dissimilarity: A First Look at the Newly Collected Non-Tariff Measure Database. ERIA Discussion Paper Series. ERIA-DP-2018-12.

NZIER (New Zealand Institute of Economic Research).2016. *Quantifying the costs of non-tariff measures in the Asia-Pacific region. NZIER public discussion paper*. *Initial Estimates.* Working paper 2016/4, November 2016

OECD. 2016. METRO Development: Modelling Non-tariff Measures and Estimation of Trade Facilitation Impacts, TAD/TC/WP(2016).

Qi, Chaoying and Zhang, James Xiaohe. 2017. The Economic Impacts of China-Australia Free Trade Agreement- A General Equilibrium Analysis. China Economic Review.

UNCTAD. 2010. International Trade After the Economic Crisis: Challenges and New Opportunies. UNCTAD/DITC/TAB/2010/2

UNCTAD. 2017. Non-Tariff Measures. Economic Assessment and Policy Options for Development. UNCTAD/DITC/TAB/2017/2.

UNESCAP. 2019. Asia-Pasific Trade and Investment Report *: Navigating Non-Tariff Measures towards Sustainable Development*. UNESCAP and UNCTD:2019.

United Nations Conference On Trade And Development (UNCTAD).2015. *Deep Regional Integration and Non-Tariff Measures: A Methodology For Data Analysis*. New York and Geneva, 2015.

United Nations Conference on Trade and Development. 2018. Non-Tariff Measures: Economic Assessment and Policy Options for Development.

Vanzetti, David.,Knebel, Christian., Peters,Ralf. 2018. Non-Tariff Measures and Regional Integration in ASEAN. Contributed Paper at the Twenty First Annual Conferences on Global Economic Analysis, Colombia.

Ven Seyhah. 2017. “Existing Non-Tariff Measure in Cambodia.” Cambodia Development Review 21 (3): 1–7.

WITS (World Integrated Trade Solution). 2020. Non-Tariff Measures. Available at:http://wits.worldbank.org/WITS/WITS/Default-A.aspx?Page=Default

WTO. 2012. Trade and Public Policies : A Closer Look at Non-tariff Measures in the 21st Century. World Trade Report 2012.

Yeah, K.L., Yanogida, J.F., and Yamauchi, H. 1994. Evaluation of External Market Effects and Government Intervention in Malaysia’s Agricultural Sector: A Computable General Equilibrium Framework. Agricultural Economics.