

***THE IMPACT ASSESSMENT OF THAILAND FTA
BY GTAP ANALYSIS***

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論文題目 The Impact Assessment of Thailand FTA by GTAP Analysis

This thesis tries to address the economic assessment of impacts of Thailand Free Trade Agreements (FTA) and trade liberalization between Thailand and regional countries quantitatively. The analysis is based on a Computable General Equilibrium (CGE) model of global trade. For performing general equilibrium analysis of the impact of Thailand FTA, the GTAP model (version 5-beta) was employed. This database provides input-output table with 78 regions and 57 commodities and bilateral trades. We aggregated it into 10-regions; 3-sectors; and 5-factors. The data of each country in this model corresponds to the global economy in 1997. In addition, all reforms simulated of the thesis are assumed to take place in 2005.

The experiments are set as 9-scenarios: S1-Thailand and Japan FTA; S2-Thailand and ASEAN-CH FTA; S3- Thailand and Australia FTA; S4-Thailand and BIMSTEC FTA; S5-Thailand and EFTA FTA; S6-Thailand and EU FTA; S7-Thailand and NAFTA FTA; S8-Thailand and New Zealand FTA; and S9-Thailand and Peru FTA.

The analysis revealed that most of GDP and the welfare decomposition index of all regions, Thailand is a gainer especially for Thailand – Japan FTA but Thailand will a bit able to be disadvantaged with Thailand – Australia FTA; and Thailand - New Zealand FTA. On the other hand, all of regions will also able to benefit FTA with Thailand in each region aspect.

In addition, imports and exports on Thailand FTA were found that Thailand is a big importer to imports food sector from all of regions especially from Japan. However, in the opposite Thailand is a big exporter also. And exports lot of food sector to Japan.

To comparing between imports sector and exports sector as a Thailand aspect, Thailand can able to make much exports more than imports on food sector but Thailand dose not attainable profiter to advantaging exports on manufacture sector and service sector more than imports.

In conclusion, Thailand and FTA member with all of regions had the potential to increase trade and investment between Thailand and FTA members, also to generate net benefit for Thailand. However, Thailand will be in a good position to perform a gratifying consequence, and entirely advantage from FTA.

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Once again it is a good opportunity to write an acknowledgment into this thesis. At this moment, it would better be retrospected in a pass few years that what is gone?

First of all, I wish to give my proudness to my Father, even if, he is now so far away from me. He always led me to the human being. He is the person who is my great pattern. I always believed that he is watching me and always gave me a powerful to help me keep walking in my life. The next inspiration for me is my Bootsumran family, and I would like to give my great thanks to them. All of them gave me life and look after me so well till I have today with my accomplishment. They always help me and cheer me up. I will let them be my dream in every of my destination.

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Thus I am interested to study in the field of agricultural economics development in the Honor University. And, Kagawa University offers me the wonderful experience to be the Master Student for two year here, even if I would not to continuable study in the

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Chapter I

Introduction

I.1 Overview

In recent years, the acceleration of the movement in various parts of the world for concluding Economic Partnership Agreements (EPA)¹/Free Trade Agreements (FTA) has become the current global trend. But in this research was consider only on FTA.

FTA is reason from the economic standpoint, namely in terms of promoting free trade. At the same time, negotiations within the World Trade Organization (WTO) have become more complicated due to its increased number of member countries and to the expansion and deepening of the fields that it covers, and it has been pointed out that there are difficulties in the WTO responding swiftly to new issues as well as to working out new rules. Thus, there is a growing need to consider a wide range of measures to promote free trade in a way that complements the WTO system. FTA is examples of such means. It is significant to conclude FTA for a country as a means of strengthening economic partnership beyond the levels attainable under the WTO and in areas not covered by the WTO so that a country can expand its external economic relations.

Furthermore, FTA is to be comparable to the security perspective. The advancement of globalization after the end of the Cold War has enhanced economic efficiency on a global scale and brought significant improvements in the standard of living among some areas or peoples. Meanwhile, the negative aspects of globalization are emerging. In other words, there is a widening gap between rich and poor countries. Such

¹ Economic Partnership Agreements (EPA) is generally based on the content of FTA.

growing global economic disparities could destabilize the international order. Therefore, it is necessary to boost the economic benefits of developing countries not only by Official Development Assistance (ODA) but also by comprehensive efforts through the expansion of trade and investment, in order to solve the issues caused by globalization that developing countries are facing. In particular, regarding the expansion of trade, maintaining and strengthening the multilateral free trade system under the WTO should be the core approach for expanding trade, but it is also important to utilize bilateral and regional FTA to complement this approach.

On the other hand, FTA is the strategic viewpoint in terms of international politics and diplomacy. As mentioned above, while economic globalization advanced after the end of the Cold War, both economic and political partnerships are being strengthened at the regional level. Such trends had not developed rapidly in Asia, but the network of partnerships has recently been growing in Asia in diverse ways. From a perspective of diplomatic strategy, it has become extremely important for Thailand and Asian countries to make use of FTA as a means of reinforcing partnerships with each countries or regions to which it attaches political and diplomatic importance, but enhancing linkages with Asian countries through FTA has become indispensable for our countries to consolidate its position within the international community.

With the above-mentioned viewpoints in mind, it is necessary to determine comprehensively what kind of FTA should be concluded and when, based on various perspectives that include not only the economic relations between Thailand and its partner country or countries, but also security and economic cooperation, so that Thailand can achieve its objective of building external economic relations desirable for it.

Meanwhile, domestic structural reforms in the relevant fields are also required to promote the conclusion of FTA. In other words, it is to eliminate tariffs on products, including agricultural goods, for which tariffs still remain out of consideration for the domestic industries concerned, because the conclusion of FTA call for the elimination of

duties and other restrictive regulations of commerce with respect to substantially all the trade. Eventually, it is inevitable for such industries to promote vigorously structural reforms further in order to enhance their competitiveness.

With respect to other areas, there is a need, for example, to have sufficient discussion on the “movement of natural persons,” which involves the acceptance of foreign nationals in the field of labor such as nurses, caregivers and cooks among other professions. Therefore, the Thailand Government as a whole must advance domestic structural reforms in the relevant fields and work on that issue so as to maximize profits of each other countries and the entire country.

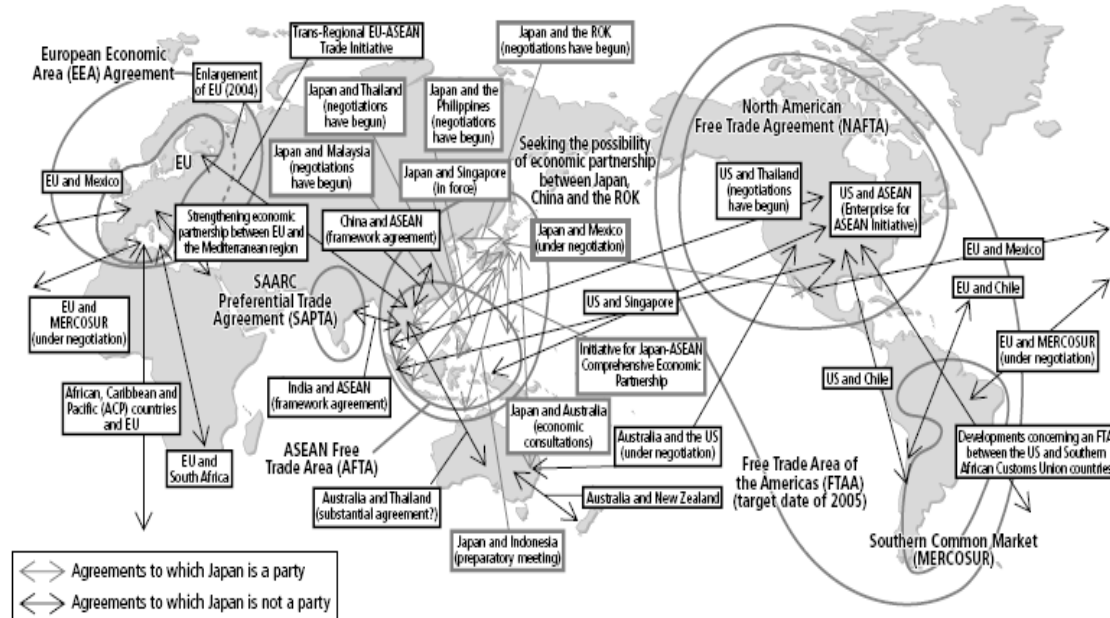
Beyond FTA are generally agreements aimed at eliminating tariffs, etc. and liberalizing trade in goods and services among designated countries and regions. FTA is recognized as exceptions to the WTO Agreement and most favored nation (MFN)² treatment, especially in our East Asia is vital for the region’s future. See figure 1 to acknowledge the idea of trade globalization and development of FTA.

Moreover, FTA is a view to trade liberalization among designated countries and regions and aim to harmonize various economic systems and reinforce economic relations in a broader range of fields by promoting investment and movement of persons, rule-making in government procurement, competition policy, intellectual property rights, etc. and cooperation in various fields.

Since Thailand is in the process of concluding or negotiating FTA with a number of countries, e.g., Australia, U.S.A., Asian countries, etc. Thus the FTA can potentially increase market access for Thai exporters to the market in other countries, they will also introduce more competition into the local industries by means of reduction of tariffs and non-tariff barriers.

² See MFN as a detail in chapter III. The Framework of CGE Model Simulations.

Figures 1. Development in EPA and FTA



Resource: Free Trade Agreement and Economic Partnership Agreement (2003).

Notes:

AFTA: The 10 countries of ASEAN (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam)

EU: 15 countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden and the UK). The EU is scheduled to expand in 2004. It is expected that the 10 countries of Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia will become new members.

EEA: Includes the EU, Iceland, Liechtenstein and Norway

NAFTA: 3 countries (US, Canada and Mexico)

MERCOSUR: 4 countries (Argentina, Brazil, Paraguay and Uruguay)

SAPTA: 7 countries (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) of the South Asian Association for Regional Cooperation (SAARC)

1.2 National Trade

From the principle of absolute advantage³ there have the evidence that a country has an absolute advantage over it trading partners if it is able to produce more of a good or service with the same amount of resources or the same amount of a good or service with fewer resources.

In the other hand, Ricardo shown his idea through the principle of comparative advantage⁴ that a country has a comparative advantage in the production of a good or service that it produces at a lower opportunity cost than its trading partners.

1.3 Global Economic Situations

In the last decade, it is clear that the global trading system has become much more liberalized and the world economies have become increasingly integrated. On the one hand, this is due to the successive rounds of trade negotiations under the auspices of WTO, which have resulted in the progressive liberalization of both traditional and new sectors, such as trade in agriculture and services, and, on the other hand, to the establishment of regional trading arrangements and FTA.

Since the latter half of the 1990's, due in part to the slow down of the WTO trade liberalization processes, it is evident that there has been an exponential increase in the number of FTA in every part of the world. For instance, in the Americas, the North America Free Trade Agreement (NAFTA) was formed in 1994, and now 34 countries in that region are moving ahead with the creation of the Free Trade Area of the Americas (FTAA). Likewise, at the beginning of 2004, we all saw the successful enlargement of the European Union (EU) from 15 to 25 countries. The Asia Pacific Economic Cooperation (APEC) group was established in 1989, with 12 founding members. Its goal is promote

³ Adam Smith, 1776.

⁴ David Ricardo, 1817.

multilateral trade reform and to facilitate regional trade. Since its inception, APEC has expanded to its present membership of 18, including: the Association of South East Asian Nations (ASEAN) which are of Thailand, Malaysia, Indonesia, Philippine, Singapore, and Brunei; the “three Chinas” which is China, Hong Kong, and Taiwan; South Korea; Australia; New Zealand; Papua New Guinea; the US; Canada; Mexico; and Japan. Papua New Guinea and Mexico were admitted during the APEC summit in November of 1993 and Chile was admitted in 1994. Its member economies now account from 50 % of the world’s production and 40% of world trade⁵. In November 1994 the APEC members signed the Bogor Accord, which states that they will “adopt the long-term goal of free and open trade and investment” in the region. This will be accomplished by 2010 for industrialized countries and by 2020 for developing countries⁶. Therefore, regarding the FTA by looking in the Asian region, China, Japan, Korea, and India have also begun a series of FTA negotiations with their major trading partners. And beside the ASEAN Free Trade Area (AFTA), the ASEAN countries are now engaging in the process of establishing an FTA with China, India, and Japan. As a consequence, the WTO has estimated that the numbers of these arrangements will exceed 300 by 2005, of which up to 70 percent will be in the form of bilateral FTA.

1.4 Thailand and FTA

Accordingly, as a strong supporter of free and fair trade, Thailand has also been an active participant in the global trade liberalization process through the various regional and international fora, such as ASEAN, the Asia-Europe Meeting (ASEM), the APEC, the WTO, and is now in the process of developing free trade arrangements and closer economic cooperation with countries across the world.

For instance, Thailand has concluded an FTA negotiation with Australia at the end

⁵ Far Eastern Economic Review, 1993.

⁶ Wall Street Journal, 1994.

of 2004 and will begin to implement the Agreement on January 1st, 2005. Thailand has also signed an FTA Agreement with New Zealand in April 2005 so that both countries can become an FTA by 2010, the content of which is similar to our agreement with Australia. Our Agreement with Peru is also expected to be signed this year so that we can start the implementation process. The first phase of our FTA Agreement with India, or the so called Early Harvest Agreement, in 82 products started on September 1st of last year, and we are currently negotiating the details of the full FTA. Thailand is also working with Bahrain and Japan on free trade arrangements and we have begun our FTA talks with the U.S. in June 2004. Furthermore, Thailand has signed a Framework Agreements with the Bay of Bengal Initiative for Multi Sectorial Technical and Economic Cooperation (BIMSTEC) countries so as to establishment an FTA by 2015/17, and our formal consultations with European Free Trade Association (EFTA) will commence by mid-2005.

Moreover, apart from the establishment of AFTA, Thailand is now working closely with other Association of South East Asian Nations (ASEAN) members to establish a free trade area with other countries, such as India, China, Japan, Korea, Australia and New Zealand. The negotiations between ASEAN and each of these countries are expected to be concluded within 2 years in order to become full fledged FTA by 2015 or at the latest 2020.

1.5 FTA Potential Benefits and Costs

The basic reason that Thailand, like a majority of countries, have been actively engaged these trade liberalization efforts is due to the simple fact that free trade enhances the opportunity for economic growth and development.

For instance, with the removal of tariffs and non-tariff measures and thus the creation of a more open trading environment, FTA can greatly expand Thailand's trade and exports, and thus growth opportunities. Thai companies, especially those within the manufacturing sector, can also expand and diversify their resource and production base

and therefore gain the economies of scale, boost their productivity, and obtain specialization in order to develop. In this connection, the increase competitive level from the more open business environment can also help to ensure the better use and allocation of existing resources, as well as encourage the restructuring and reform process both in the private and public sectors so as to create a more favorable business environment. Similarly, an open trade policy can also effectively raise the attractiveness of a country to foreign direct investment, thereby helping to inject greater capital and know-how into the economy which are vital ingredients to improve efficiency and promote growth. Furthermore, with greater exchanges and better understanding through the creation of FTA, Thailand will not only become better acquainted with partner countries which is the basis for a long-term partnership but also develop joint cooperation to raise international competitiveness and status within the international trading forum.

However, this is not to say that there are no costs associated with freer trade. With the more open market, for example, Thailand is likely to be much more vulnerable to outside forces and global instabilities. With freer trade, Thai local companies will also encounter an increasing level of competition, which could result in the crowding out of less competitive firms and industries. And the political, social, and cultural repercussions of a more open environment could also be high. Nonetheless, it is clear these negative ramifications can be effectively dealt with through proper preparations, adjustments, reforms, and through joint efforts and intensify cooperation from all sides. More importantly, the lost of opportunities for not participating in this globalization and trade liberalization process can be extremely high - not only will Thailand's trade and market opportunities be severely limited, or even diminish, but the country will also be shutting itself out from an enormous pool of global resources and capitals needed for development.

1.6 Research Objectives and FTA Negotiating Strategy

The general objectives of this thesis are:

1. To study the impacts of Thailand FTA in various sectors.
2. To study on what effects between Thailand and trade bilateral country.

In this thesis also would like to show the negotiation and strategy of Thailand FTA to provide the good alternative ways which it's should be in agreements as the followings:

- FTA should be comprehensive in scope covering trade liberalization in goods, services, and investment, as well as the elimination of non-tariff barriers and cooperation to facilitate trade and development.
- FTA should be based on reciprocity by taking into account the distinct levels of economic development of each country, and flexibility, such as a longer liberalization period, should be granted to accommodate necessary adjustments.
- FTA should be consistent with WTO rules and conditions, which indicate that FTA must cover substantially all the trade in goods and services between the FTA partners.
- FTA should incorporate mechanisms to prevent or annul the negative effects on domestic industries, such as Anti-Dumping (AD) and Countervailing Duties (CVD) measures⁷, Safeguards, and Dispute Settlement Mechanism (DSM)

1.7 FTA Preparations and Adjustments on Research Anticipatory

In order to ensure that Thailand's national interests are protected and Thai people and businesses will fully benefit from the FTA, Thailand has undertaken numerous steps and adopted several measures, which include the followings:

- The establishment of FTA Working Groups consisting of the Negotiation

⁷ See Chapter III for AD and CVD measures explanation.

Committee, which is made up of FTA Chief Negotiators, the Steering Committee on International Trade Negotiations, which consists of experts from the public and private sector to coordinate and serves as a think-tank on FTA matters, and the FTA Supporting Committee, which oversees the implementation, adjustment, and restructuring processes of the Thai economy.

- The reform and restructuring of the public sector so as to facilitate and lower the costs of trade and businesses, such as the reforms of tax and tariff structures, the simplification of customs procedures, and the expansion of finance and credit facilities.

- The development of infrastructures to facilitate trade, especially in the area of land, sea, and air transportation, as well as information and data to adjust to the new trade and market conditions.

- The strengthen small and medium enterprises (SME) and the grassroots economy through research and development, training, and marketing and skill development in order to raise the productivity, efficiency, and international competitiveness of Thai people, products, and economy.

- The promotion of trade and economic relationships between Thailand and FTA counterparts, such as through establishment of joint business councils, working committees, official visits, and trade fairs and exhibitions.

- The promotion of a modern productive and innovative workforce through training and investment in knowledge, skill, and entrepreneurship development, and e-literacy.

- The establishment of social safety nets, such as job training and retraining, alternative skill development, the upgrading of the educational systems and facilities and a social and health care system.

1.8 Expected Economic Effects of FTA

A free trade area is an agreement among countries whereby tariffs and non-tariff

barriers for instance quotas, licensing requirements and products safety regulation are abolished among members. Compared to customs unions and common market, a free trade area is the least institutionalized form of economic integration, where members of FTA keep its own external tariffs and other regulations for trade with non-member countries.

An FTA may offer advantage to all member countries. An FTA will likely increase intraregional trade and enhance competitiveness, productivity and efficiency. The trade impacts of an FTA can be static or dynamic. Trade creation, trade diversion, and terms of trade are the components of static effects. When the removal of trade barriers promotes trade among the members (trade creation effect), it sometimes does so at the expense of imports from non-members (trade diversion effect). If an FTA leads to a reduction in imports from non-members, FTA members are likely to experience improvement in their terms of trade vis-a-vis non-members (terms of trade effect). The trade creation effect and terms of trade effect lead to an increase in economic welfare of the members, while the trade diversion effect is likely to reduce economic welfare of the member because imports from most efficient suppliers in non-members are replaced by imports from less-efficient member producers. It is important to note that for non-members the trade diversion effect and terms of trade effect are detrimental to their economic welfare.

FTA effects stemming from scale and enhanced competition effects are deemed dynamic. The formation of the FTA is also expected to improve productivity of firms since the abolition of intra-regional barriers forces firms from East Asia and South Asia into closer competition with one another, and may induce them to be more competitive and innovative.

The elimination of tariff and non-tariff barriers will likely facilitate trade and investment flows among FTA members and encourage more tourism and industrial cooperation, thereby lowering trade conflicts among the FTA members. That being said,

it should be noted that the establishment of an FTA will not in itself lead to a massive inflow of foreign investment, since foreign capital seems to be attracted to growing markets, not just large ones.

Chapter II

The Framework of CGE Model Simulations

To analyze the economy wide impact of trade liberalization, a CGE model of global trade is employed for model simulations in this thesis. A CGE models have become a useful tool in analyzing a number of varied trade policy issues⁸. These models have been used to study the economic effects of trade policies, such as tariffs and non-tariff barriers (NTB), in a variety of settings. Some are multi-country models that focus on analyzing the effects of global trade policies or policy changes, such as the latest Uruguay Round agreements. Others focus on analyzing commercial policies of a single country, where depending on whether the country is a developed or developing economy, the modeled trade issues and policies can be quite diverse.

CGE models are calibrated to what are known as benchmark equilibrium datasets. The calibration process computes intercept and share parameters for the model's mathematical functions, given assumed or estimated values of behavioral elasticities, to reproduce the observed data as an equilibrium solution of the model. While much attention is devoted to the assumed or estimated behavioral elasticities, the calibrated intercept and share parameters are at least as important. Regardless of the quality of elasticity estimates, comparative static results have little empirical significance if they are not evaluated with respect to observed economic conditions.

A consistent and convenient means of compiling a benchmark equilibrium dataset is the social accounting matrix (SAM). This data framework has been extensively applied to developing countries under promotion by the World Bank and has been more

⁸ See Shoven and Whalley (1984), Srinivasen and halley (1986), and de Melo (1988) for surveys of the CGE trade model literature.

recently applied to developed countries.⁹ A SAM for 1984 underlies the CGE model of the United States developed by de Melo and Tarr (1992). The CGE model in use at the U.S. International Trade Commission is currently based on a SAM updated biannually (Reinert and Roland-Holst, 1991). The analysis of the North American Free Trade Area conducted by Roland-Holst, Reinert, and Shiells (1994) is based on a three-country SAM for the region. The initial GATT assessment of the Uruguay Round was based on a SAM for nine regions of the world economy (Francois et al., 1994). These non-exhaustive examples indicate that SAMs are rapidly becoming the standard data construct for CGE models of trade policy.

A CGE model numerically simulates the general equilibrium structure of the economy. Moreover, a CGE model has solid micro-foundations that are theoretically transparent. Functional forms are specified in an explicit manner, and interdependencies and feedback are incorporated. Therefore, the model provides a framework for assessing the effects of policy and structural changes on resource allocation by clarifying “who gains and who loses.”

These characteristics differentiate it from the partial equilibrium model, which is not economy-wide, the macroeconomic model, which is not multi-sectoral, and the input-output model, in which economic agents do not respond to changes in prices. Moreover, the multi-country model is required to analyze international economic affairs such as trade and investment policies, which affect not just one but a number of economies.

Among others, the database and the standard version of a model, in this thesis we calibrate a CGE model to the GTAP social accounts [Dimaranan and McDougall (2005)], to utilized as a basis of simulation experiments and simulate the removal of bilateral trade areas.

⁹ Applications to developing countries are reviewed in Pyatt and Round (1985). Hanson and Robinson (1991) and Reinert and Roland-Holst (1992) apply the SAM framework to the United States. Reinert, Roland_Holst, and Shiells (1993) apply the SAM framework to North America.

II.1 Partial General Equilibrium Modeling Descriptive

When problems arise where the economic impact of policy or economic changes must be estimated, partial equilibrium economic models can offer a reasonable, cost-effective way to provide answers. Even simple mathematical models encourage disciplined thinking about economic problems. They also force the modeler to make explicit assumption about economic behaviour. Too often informal economic analysis, critical economic assumptions about a problem are overlooked or simply not understood. Therefore even if the economic impact problem is not completely resolved with the use of a model, the problem itself is much better understood after the modeling exercise.

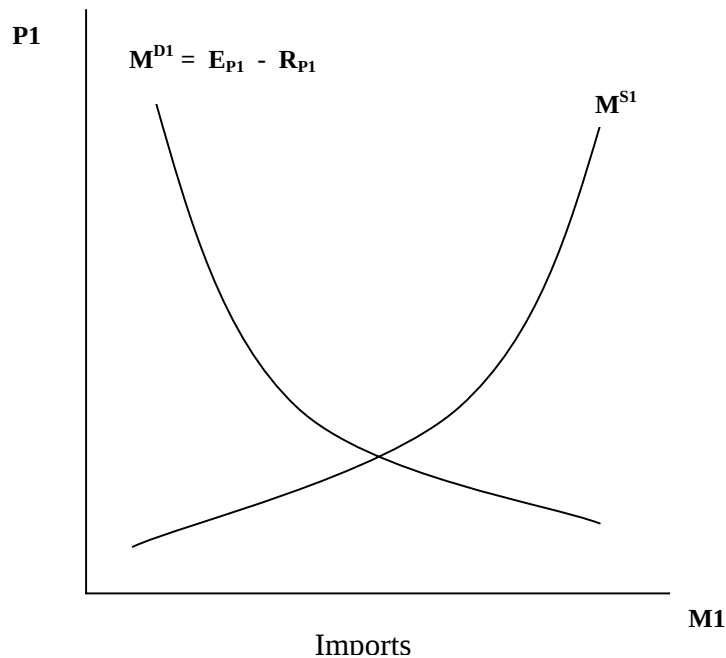
In this thesis will explanation some ideas about the Partial General Equilibrium of the CGE model for understanding the basic idea in the methodological analysis as the follow.

II.1.1 Import Market Equilibrium

$$M^{D1} = E_{P1} - R_{P1} \quad (1)$$

Equation (1) tells us that, properly defined, an import demand function represents the reduced form, general equilibrium excess demand for that good. In Figure 2, we have represented this with the curve M^{D1} , which plots import demand as a function of changes in internal prices for the good. As developed, the curve represents the reduced form response of import demand to changes in prices in the import market. To close the system, we have drawn import supply as the curve M^{S1} .

Figure 2. Import market equilibrium



Source: Joseph F.Francois and H.Keith Hall

II.1.2 Multi-Market Models

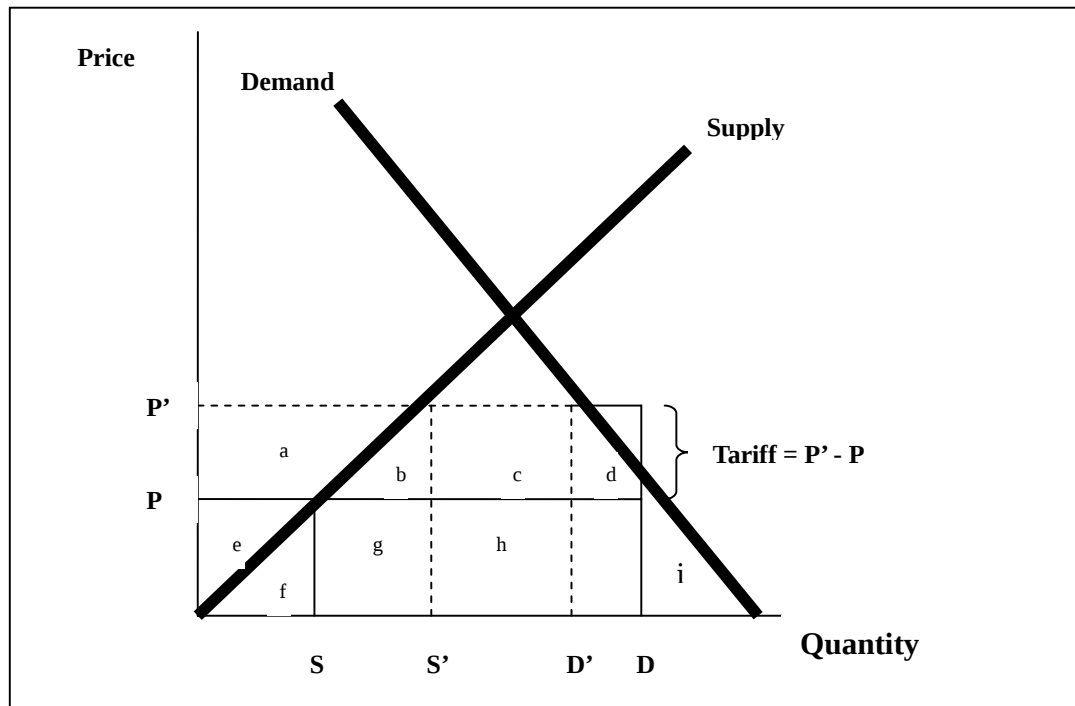
Basic partial equilibrium modeling can be understood with a supply and demand diagram for a simple model for an importing country, as shown in Figure 3. The supply schedule shows what producers will produce at a particular price while the demand schedule shows what consumers will purchase. The supply and demand schedules summarize behavior in the domestic market; the trade price marks what domestic consumers pay for the domestic or imported product. Figure 3 also shows how an import tariff can affect prices and quantities in the domestic market by adding a tax on imports. Without a tariff, the market in Figure 3 is cleared (domestic supply plus imports equal domestic demand) at price P where producers produce the quantity S and consumers purchase the quantity D , which includes the quantity $(D - S)$ of imports. If an import tariff $(P' - P)$ is imposed, the consumer now has to pay price P' and consumers only D' ,

which includes $(D' - S')$ of imports. At this higher price, producers now sell a greater quantity S' in the domestic market.

Even though the analysis in Figure 3 is simple, there are important economic assumptions about the market behind it. Since the figure represents changes that can occur in market equilibrium, the time required for those changes is embedded in the supply and demand schedules themselves. For example, in a short period in response to a price increase, producers can only adjust their variable costs by hiring extra workers or paying overtime. This means that in the short run, price increases are likely to bid up input prices and raise production costs as production increases. A supply schedule will be steeper if Figure 3 represents market adjustment possibilities for a short period. In the longer run, producers can add plant, machinery, and other capital equipment, which will allow more production without these extra short-run costs, yielding a flatter supply schedule. Similar considerations apply to the demand schedule. If the demand price change in Figure 3 occurs over a long time, other markets might produce substitutes for some consumers. This would make the demand schedule more prices responsive. The parameterization of the supply and demand schedules in Figure 3 implicitly defines linkages to parts of the economy not included in the model as well as the period for those linkages to play out.

Figure 3 also contains assumptions about the trade market for the product. The quantity of imports is shown as a flat line at the price P (or P' in the case of a tariff). The price of imports does not depend upon the quantity; this assumes that the quantity of imports in this market is small enough so that it does not affect prices elsewhere in world markets. We have also assumed that the consumer accepts the import as a perfect substitute for the domestically produced product. Finally, the schedules in Figure 3 contain assumptions about the domestic market's competitive structure. The slopes and position of the schedules would differ if production or consumption were not competitive in nature.

Figure 3. A simple model for an importer



Source: Vernon O. Roningen

In the domestic market shown in Figure 3, changed market conditions cause a new equilibrium to be established (as illustrated by the previous example with import tariff). This type of model is referred to as a “static” model. The initial conditions, such as the “no tariff” free trade equilibrium in the figure, are the “base period” equilibrium conditions. Analysis consists of calculating the economic changes occurring in a new equilibrium situation and comparing them to those prevailing in the base period.

Many economic changes can be shown when a new equilibrium is established in Figure 3. For example, the tariff on imports ($P' - P$) allows producers to raise the domestic market price to P' while remaining competitive with imports. With the tariff in place, producers gain extra net income (area a) over the extra cost ($b + g$) of producing S' . The consumer buys less ($D - D'$) but pays more ($a + b + c$) for the quantity D' consumed. The government collects tariff revenue (area c). Economists speak of a national welfare loss in this situation ($b + d$). The economy loses the values of area b because extra

domestic resources are now needed to produce $(S' - S)$, which used to be imported. The consumer, with a given income, now chooses to buy less (D') at the higher market price. Some of the consumer's extra expenditure goes to the producer $(a + b)$ and some to the government as tariff revenue (area c). Area d represents the net value of the consumer's loss, being unable to purchase $(D' - D)$ of the commodity at the lower price P . With the tariff, imports fall from $(D - S)$ to $(d' - S')$.

The tariff scenario in Figure 3 assumes that the quantity imported by the country imposing the tariff is small enough that its actions will not affect the trade price P . If this assumption is not true, the decrease in import demand would cause the world price P to fall. The government would collect more revenue (area c would increase). All of the calculations based upon a fixed trade price P would change. This alternative situation is especially important when calculating the effect of policy changes of large trading countries like the United States, which can affect world markets by their policy actions.

Producer support mechanisms other than tariffs can also be analyzed in Figure 3. Other trade and domestic policy mixes, appropriately set, could yield identical results for the quantity of production, consumption, trade, and producer income. For example, if an import quota of $(D' - S')$ were imposed instead of a tariff, the same price and quantity results would occur for the producer and consumer. The extra revenue (area c) from sales of imports at the higher price P' in the domestic market does not accrue to the government but is captured by the importer and/or the foreign exporter.

Another way to support producers at the same income level in Figure 3 is for the government to pay the producer a subsidy of $(P' - P)$ per unit of commodity produced. If the payment affected producers' production incentives, S' would still be produced. The consumer now would pay only P and imports would be greater $(D - S')$ than in the tariff or quota example $(D' - S')$. Now the government would have to spend money $(a + b)$ to pay the subsidy to the producer.

A less trade distorting version of a direct government subsidy to the producer

would exist if the producer receiving the subsidy were required to limit production. If production were limited by the amount $(S' - S)$, consumers would import the same amount $(D - S)$ as in the free trade situation. This example could be labeled a “trade neutral” policy where there are no trade changes caused by the producer subsidy accompanied by a supply control policy. This variation in policy structure is found. For example, in some U.S. agricultural policies, where crop producers received direct government payments but are required to limit production.

Factors other than tariff or trade policies can impact the market in Figure 3, causing a new equilibrium to be established. For example, a technical improvement in production could lead to more production with the same inputs, shifting the supply schedule to the right. An increase in the production of other products competing for the same resources could require higher prices to maintain production, shifting the supply schedule to the left. An increase in the demand for a product in another market that is a substitute in consumption could shift the demand schedule for the product to the right. The creation of a multi-market model involves the explicit quantification of these important linkages between markets.

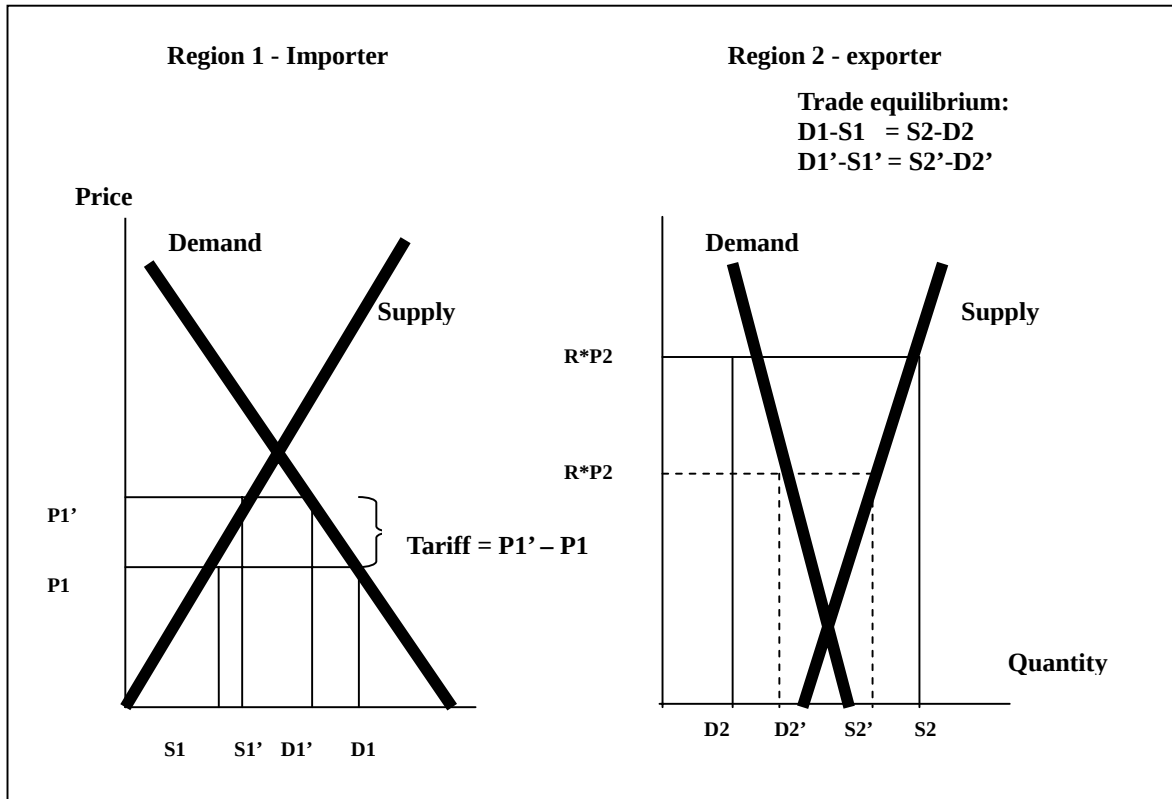
II.1.3 A Two-Region Model

When markets in different countries are linked, multi-region models are required. As an illustration of this process, the simple model for an importing region from Figure 3 is made part of a two-region trade model in Figure 4 by adding the supply and demand schedule for the exporting region (2), which provides all the imports for region 1. In the free trade situation, region 1 imports $(D1 - S1)$, which equals $(S2 - D2)$, the exports of region 2. The explicit linkage added is that the imports of region 1 always must equal the exports of region 2. The free trade price in region 1 is $P1$ while in region 2, the free trade price is $R * P2$, where R is the exchange rate converting region 2's currency to the currency units of region 1.

When region 1 imposes a tariff ($P1' - P1$), its domestic price increases to P' and its imports decrease to $(D1' - S1')$. Exports of region 2 decline to $(S2' - D2')$ (which equals $D1' - S1'$) at the lower domestic price $R*P2'$. The market conditions are different in regions 1 and 2. In this example, region 2's supply and demand schedules are steeper, requiring a larger price change to clear the market, so the price decline in region 2 is greater than the price increase in region 1. The explicit linkage of these two regions by trade means that any disturbance in the market of one region, such as a demand shift or trade policy change, leads to simultaneous changes in prices, supply, demand and trade in both regions.

The example in Figure 4 assumes that the traded product is a perfect substitute for the domestic product in both countries, leading to trade's being modeled on a "net trade" basis. Depending upon where supply and demand schedules intersect relative to the international price, a region is either an exporter (region 2) or an importer (region 1). More complex models which allow the same product to be exported and imported require a relaxation of the simple assumption that traded and domestic products are perfect substitutes in consumption.

Figure 4. A two-region trade model



Source: Vernon O. Roningen

Geometric analysis illustrates important economic relationships in multi-market, multi-region partial equilibrium models. But the specification of larger multi-market, multi-region models with complex relationships requires an algebraic presentation, and computation requires that these be written as a set of simultaneous equations. This process can be illustrated with the creation of a simple two-market, two-region partial equilibrium model, first as a set of equations, and then as an operating model in a spreadsheet.

II.1.4 A Two-Country Model

CGE model have increasingly been used as a tool for empirical assessments of the impact of trade and tax policies on economic welfare and environmental quality. While the two-country CGE model described here is in most respects typical of comparative

static, multi-sectoral, economy-wide model in use today. We incorporate detailed sectoral emission data in the model.¹⁰ An important feature of this model is its endogenous specification of domestic supply, demand, and bilateral trade for the two countries at the sectoral level. While trade between the two countries is modeled endogenously, we assume that their individual trade flows with the rest of world (ROW) are each governed by the small country assumption. The resulting six sets of sectoral trade flows are then directed by two endogenous price systems (country 1 and country 2 imports and exports) and four exogenous price systems (a country 1 - ROW and country 2 – ROW imports and exports).

II.1.5 A Two-Market, Two-Region Trade Model

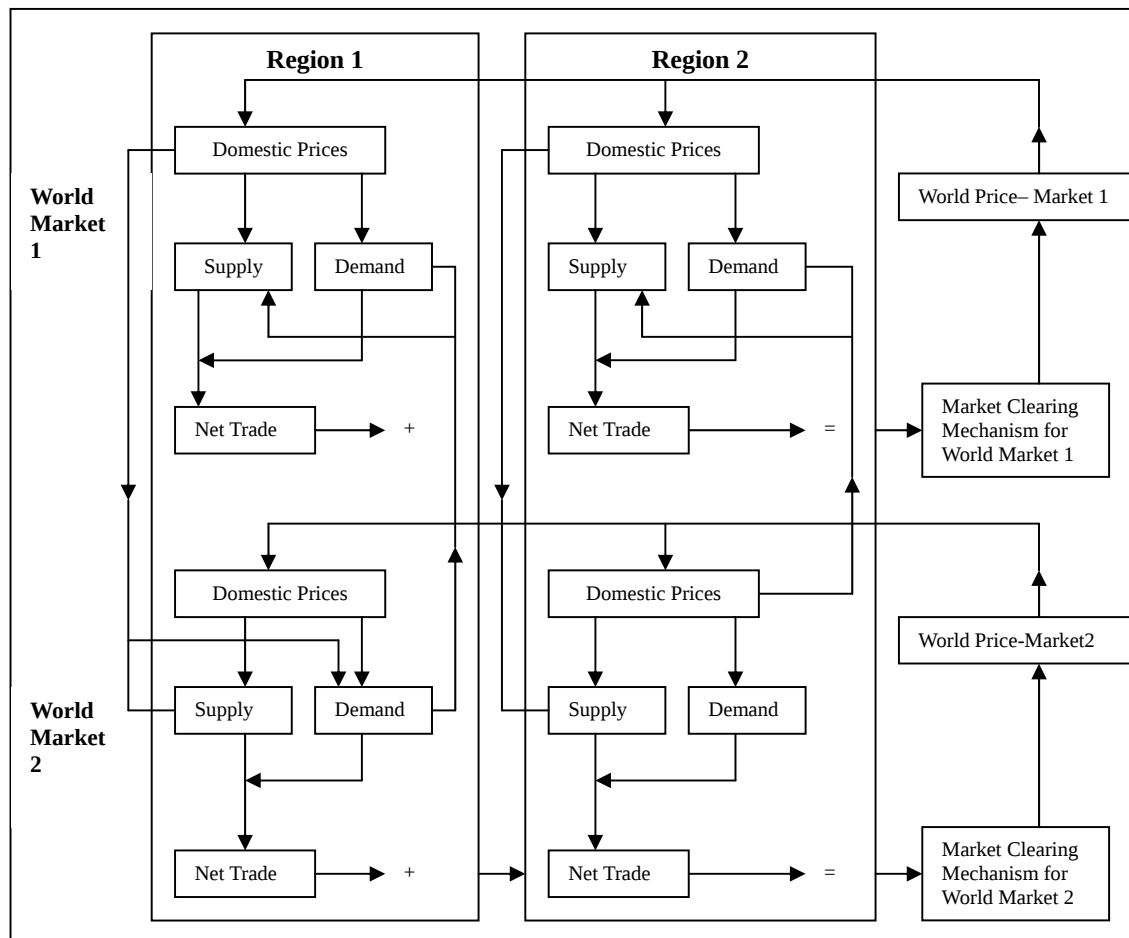
The simultaneous nature of a multi-market, multi-region model is illustrated with a flowchart of linkages for a simple two-market, two-region trade model in Figure 5. Lines and arrows show the direction of the linkages. Each region and market has a set of domestic prices which determine supply and demand quantities. These quantities, in turn, define the net trade for each market in each region. Domestic prices or one market in a region help determine the quantity supplied and demanded not only in that market but also in the other market through cross-market price linkages.

Each market itself is linked across regions through net trade. The sum of net trade for each market has to equal zero in the equilibrium state because world exports equal world imports. If world net trade for a market is not zero, a new world market clearing price is calculated; it, in turn, feeds back into the domestic market price structure for each market. In the model, this process continues until both markets are cleared (world net trade in both markets equals zero). The result of all of these simultaneous cross-markets, cross-region linkages is that all market effects and internationally through trade and world prices. Trade policies typically affect price linkages between world and domestic

¹⁰ Simple general equilibrium models by Devarajan, Go, Lewis, Robinson, and Sinko.

prices. Domestic policies affect supply and demand schedules themselves but have cross-region effects as well through trade linkages. More complex models with more markets and regions would have more boxes and lineage arrows. However, their structures are conceptually similar.

Figure 5. A flow chart for two-markets, two-region partial equilibrium trade model



Source: Vernon O. Roningen

II.1.6 Armington Models

One more coefficient which influences the analytical result is “Armington parameter”. It is the coefficient to show the magnitude of substitution between domestic products and imported products. The more it is, the more the change of import and

export products increase and the degree of reduction and increment of produce become bigger. In GTAP database for each agricultural, forestry, and fishery products. Generally speaking Armington parameter in GTAP is said to be under value. Particularly the products with low difference of quality, such as sugar and livestock products, the substitution rate are supposed to be higher.

As follow Armington (1969) in assuming well behaved preferences over a weakly separable product category that comprises similar, but not identical products. These imperfect substitutes are differentiated by their country of origin. The first version of the model is a log-linear version with constant own and cross-price elasticities of demand. This type of approach is relatively standard, and is followed in a number of spreadsheet-based partial equilibrium models, including the CADIC dumping model (Boltuck, 1991) and the COMPAS model (Francois and Hall, 1993). The second version of the model is specified as a non-linear system with a constant elasticity of substitution between products.

A common alternative to the perfect substitutes model involves more complex specification of the markets for related products. Two tacks are often followed here. One involves the analysis of upstream and downstream markets; the other involves the analysis of competing products. Upstream and downstream linkages are explored in later chapters, both in partial and in general equilibrium. This thesis, we focus in the section on horizontal linkages between markets.

II.1.7 Anti-dumping and Countervailing (AD/CVD)

AD and CVD are other important policy instruments that discriminate among import sources. Anti-dumping duties, by far the more prevalent of the two, are common in most major trading countries, with the exception of Japan. As of December 1994, the United States had 277 final anti-dumping duty orders in effect, each order country- and

product-specific.¹¹ In late 1994, the European Union applied final anti-dumping duty orders on some 115 countries and product combinations and had 51 price undertakings in effect.¹² In both these major traders, anti-dumping duty margins typically are in the range of 20 to 40 percent many times the rates of MFN tariffs – and sometimes exceed 100 percent. AD/CVD actions have not yet been fully incorporated into multi-region model databases. To our knowledge, the first step in this direction is the 1994 release of the GTAP database, which incorporates, on a bilateral basis, aggregated anti-dumping duties and price undertakings of the United States, European Union, and Canada (Gehlhar et al., 1996).

The extent to which the neglect of discriminatory policies in multi-region models will distort results is not known, but it can be expected to depend on several factors. One example with the potential to distort results is when preferential tariffs are in place but are neglected in the benchmark data, and counterfactual simulations are run in which MFN tariffs are reduced. In fact, we might expect a reduction in exports by preference-receiving countries as their margin of preference is eroded. If the preferential tariffs are not reflected in the benchmark data, however, the model results can be expected to show an increase in exports by the preference-receiving countries, as well as other exporters.

The neglect of bilateral policies will also lead to what we term “dirty calibration”. An example is when imports are influenced by anti-dumping duties, but these duties are neglected in the benchmark protection data and in the calibration process. The calibrate share parameter in the Armington function will then be understated. Because the benchmark equilibrium is inaccurately recorded, dirty calibration will distort the results of all counter-factuals, although the magnitude of such effects has not been studied.

¹¹ U.S. Department of Commerce (1994).

¹² Ant-dumping and countervailing duty actions of the European Union are reported in the *Official Journal*.

II.1.8 Endogenous Versus Exogenous Differentiation

Once one introduces the idea of product differentiation, the immediate question that arises is, why are the products differentiated? The traditional approach to modeling product differentiation, due to Armington (1969), is to assume that it is related to exogenous considerations that somehow are linked to the country of origin. For example, as a result of variation in climate and soils, Canadian wheat tends to be differentiated from U.S. wheat. Alternatively, it is sometimes argued that while particular products such as soft wheat are nearly identical regardless of source, the aggregation of soft wheat and hard wheat into a single product, “wheat,” means that the composition of wheat produced in different regions varies. One can capture these phenomena by introducing imperfect substitutability among wheat from different sources. Whatever the source of this differentiation, the key assumption in the Armington approaches is that it is exogenous to the model.¹³

An alternative approach to product differentiation in models of international trade is based on the work of Spence (1976), and of Dixit and Stiglitz (1977), in which products are differentiated by firm. In this case firms incur fixed or overhead costs, such as research and development and product marketing, when producing differentiated goods. This endogenous differentiation has important implications for the structure of costs and the consequences of trade liberalization. In particular, it is customary to treat the resources associated with differentiation as fixed costs. Coupled with constant returns to scale in production (i.e., fixed marginal costs), this gives rise to declining average total costs. Therefore, any shock that causes individual firms (as opposed to the industry) to increase their output results in positive scale effects for the economy, as fixed costs are spread over more units.

¹³ There is no particular reason why all products and/or all regions need to have the same Armington structure. For example, in the RUNS model (Goldin, Knudsen and van der Mensbrugghe, 1993), trade in industrial products was described by two-stage CES Armington functions. Agricultural products, on the other hand, were not assumed to be differentiated by region of origin and trade in these products was on a net trade basis.

II.1.9 MFN Tariffs and the Compositional Effects of Aggregation

When working with single-region models, one faces the question of how to aggregate most favored nation (MFN) tariffs. One approach often used is the weighting of tariffs by import value. With hundreds or perhaps thousands of individual lines in the tariff schedule being combined into one model sector, the compositional effects that can be captured by import weighting are potentially of great importance. It is often noted, though, that weighting by import value can lead to a downward bias in tariff aggregations. Higher tariffs lead to smaller (tariff-exclusive) import values, since imports are themselves a decreasing function of tariffs.¹⁴ This is sometimes used as an argument in favor of another often-used approach, the simple averaging of tariffs, which in effect assumes the identical weight for each tariff line, regardless of its importance in trade. It also sometimes goes unrecognized that, for political economy reasons, past tariff reductions may have been deepest on those items that were more lightly imported. This implies that higher tariffs may remain on items of greater importance to trade and argues against the use of simple averaging.¹⁵

Uneven tariffs are more distorting than a uniform tariff with the same mean. Regardless of the weighting method used, the averaging process may incorporate tariff variance. This will be particularly desirable when dealing with policies that lead to very uneven protection, either across tariff lines (within a model sector) or across import sources. Magee (1972) proposed an averaging method that incorporates tariff variance. This method was applied in calculations of average anti-dumping duties or the 1994 GTAP database (Gehlhar et al., 1996).

Multi-region modeling adds yet another dimension to the debate over tariff

¹⁴ By weighting tariffs with the duty-inclusive value of imports, some of this bias might be offset. Ultimately the degree of bias will depend on the price elasticity of import demand.

¹⁵ An additional argument in favor of import weighted averaging in the context of AGE modeling is that this method gives an accurate accounting of the tariff revenue. The importance of this accuracy will depend on several factors, including the presence of certain model features (are government revenue sources distinguished?), the size of tariff revenue collections relative to total government revenue or to GDP, and the value of imports that enter the country under other than MFN tariffs (for example, under preferential tariff arrangements).

averaging methods. The composition of the imports of a product from one source differs from the composition of imports of the same product from another source. By using the Armington assumption of product differentiation by region of origin, one recognizes this compositional effect in trade flows. It is reasonable to extend this recognition to tariffs as well and to use *bilateral* import-weighted tariffs, with the result that each of the model's bilateral trade flows (potentially $G * R * (R - 1)$ of them) has an associated MFN tariff rate.

II.1.10 Social Accounting Matrix

Economic accounting is based on a fundamental principle of economics: For every income or receipt there is a corresponding expenditure or outlay. This principle underlies the double-entry accounting procedures that make up the macroeconomic accounts of any country. A SAM is a form of *single* entry accounting. SAMs also embody the fundamental principle, but they record transactions between accounts in a square tableau or matrix format. The transactors or accounts constitute the dimension of the square matrix. By convention, incomes or receipts are shown in the rows of the SAM while expenditures or outlays are shown in the columns. The utility of SAMs is that they can provide a *comprehensive* and *consistent* record of the interrelationships of an economy at the level of individual production sectors, factors, and general public and foreign institutions. They can be used to disaggregate the macroeconomic accounts, and they can reconcile these with the economy's input-output accounts.

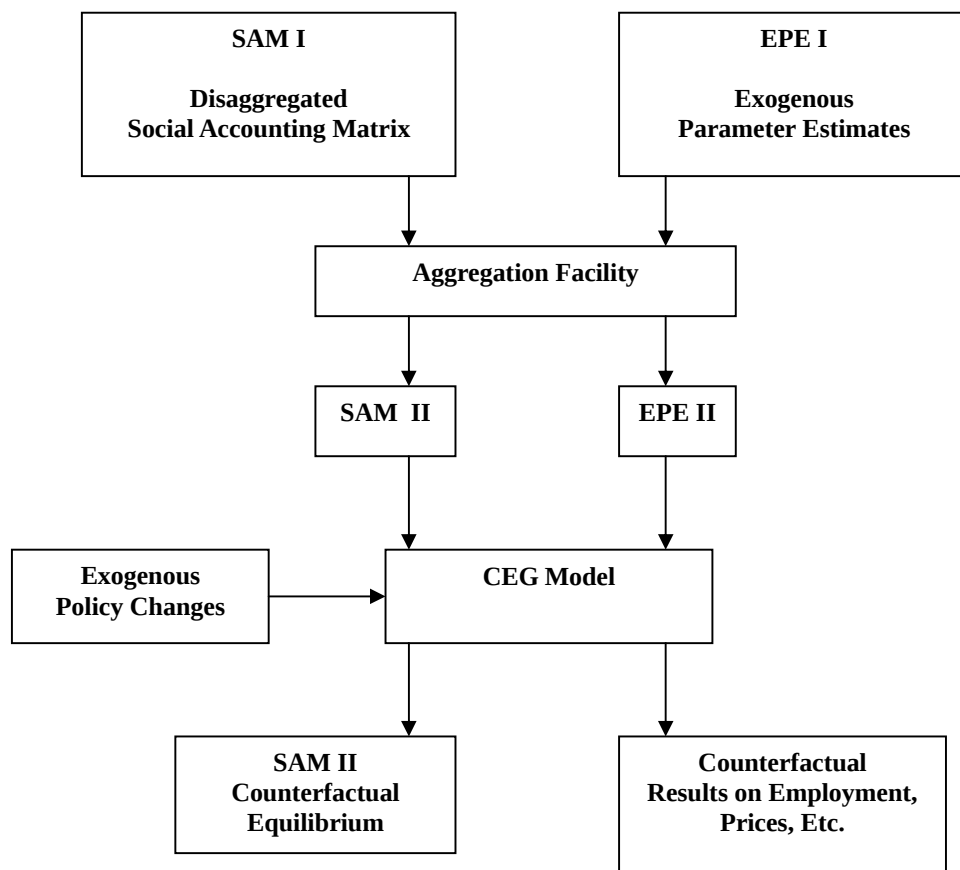
- SAM and the General Equilibrium Analysis of Trade Policy

By themselves, SAMs are insufficient to allow the analyst properly to assess the impacts of changes in trade policies. This limitation has been clearly expressed by Thorbecke (1985):

The SAM is clearly an essential tool in diagnosing the initial situation and in organizing data in a systematic way with respect to accounts and the classification and

interrelationship of variables appearing in these accounts. At the same time, by itself, the SAM is nothing more than a snapshot in time, yielding base-year information in a consistent way among a whole set of variables. If the SAM is to be used for policy rather than purely diagnostic purposes, it has to be coupled with a conceptual framework that contains the behavioral and technical relationships among variables within and among sets of accounts or modules. In other words, the SAM as a data framework is a large-scale identity which, to come alive, should be linked to a model of the causal relationships among variables.

Figure 6. The Flexible aggregation procedure



Source: Kenneth A. Reinert and David W. Roland-Holst

II.2 The GTAP model, database and calculation method

The GTAP model is an applied general equilibrium model which was established in 1992, with the objective to quantitatively grasp the impact of trade policies under the Uruguay Round Negotiations and General Agreement on Tariffs and Trade (GATT).¹⁶

The GTAP model and database are commonly used for analyzing multilateral trade agreement¹⁷. GTAP offers a variety of products, including data, model and software for multi-region general equilibrium analysis. The GTAP model is a standard CGE model, which depicts the behavior of households, governments and global sectors across each economy in the world. It is composed of regional models, which are linked through international trade. Prices and quantities are simultaneously determined in factor markets and commodity markets by accounting relationships, by the equilibrium conditions specified by the behavior of economic agents, and by the structure of international trade.

The GTAP model is composed of databases for specific moments in time that are created using actual data and with the objective of reaching actual equilibrium, and parameters that define the behavior of entities (elasticity of substitution, income elasticity on the demand side and own price elasticity). The latest database is Version 5, by the way, due to this thesis The GTAP (version 5 – beta) was used. The data of each country corresponds to the global economy in 1997. The GTAP database is publicly available and contains information on 78 regions and 57 commodities, including (i) comprehensive input-output data by regions, (ii) bilateral trade and protection data, and (iii) quantity and tax data¹⁸.

The model includes three main factors of production: labor, capital, and land. Labor and capital are used by all industries, but land is used only in agricultural sectors.

¹⁶ The GTAP model was applied to the analysis of the economic impact of the Uruguay Round Agreement by the Secretariat of the General Agreement on Tariff and Trade (GATT) for that day, as seen in GATT (1994). And later, in 1997, it was also utilized in the assessment of the economic impact of the Manila Action Plan by the APEC Economic Committee, as seen in APEC (1997). At present, this model and database are widely used by international organizations and researchers on international affairs. See Hertel (1997) for the description of the GTAP database and model.

¹⁷ The project web page is <http://www.agecon.purdue.edu/gtap>.

¹⁸ A complete description of the data can be found in <http://www.agecon.purdue.edu/gtapatabase>.

Capital and intermediate inputs are traded, while labor and land are not traded between regions. The standard version of the GTAP model includes several key assumptions. First, perfect competition, therefore a constant return to scale, is assumed. Second, imperfect substitution in goods and services between the home economy and those abroad and among different origins of economies are assumed by the Armington parameters.¹⁹ Third, the amount of total labor -- one factor endowment -- is fixed. This means that the model assumes full employment and no unemployment. The amount of total capital is also fixed in the standard GTAP model.

The standard GTAP model has a competitive economic environment (zero-profit). On the demand side, a regional household consisting of private households and government maximizes utility. The production structure of the model is fairly complicated as it belongs to the category of top-down CGE models. At the top of production structure, value-added factors of production are combined with intermediate goods. The bilateral trade flows between regions are handled with the Armington assumption, which is based on the idea that imported intermediates are separable from domestically produced intermediate inputs, i.e. firms first decide on the sourcing of there inputs, then, based on the resulting composite import price, they determine the optimal mix of imported and domestic goods.²⁰

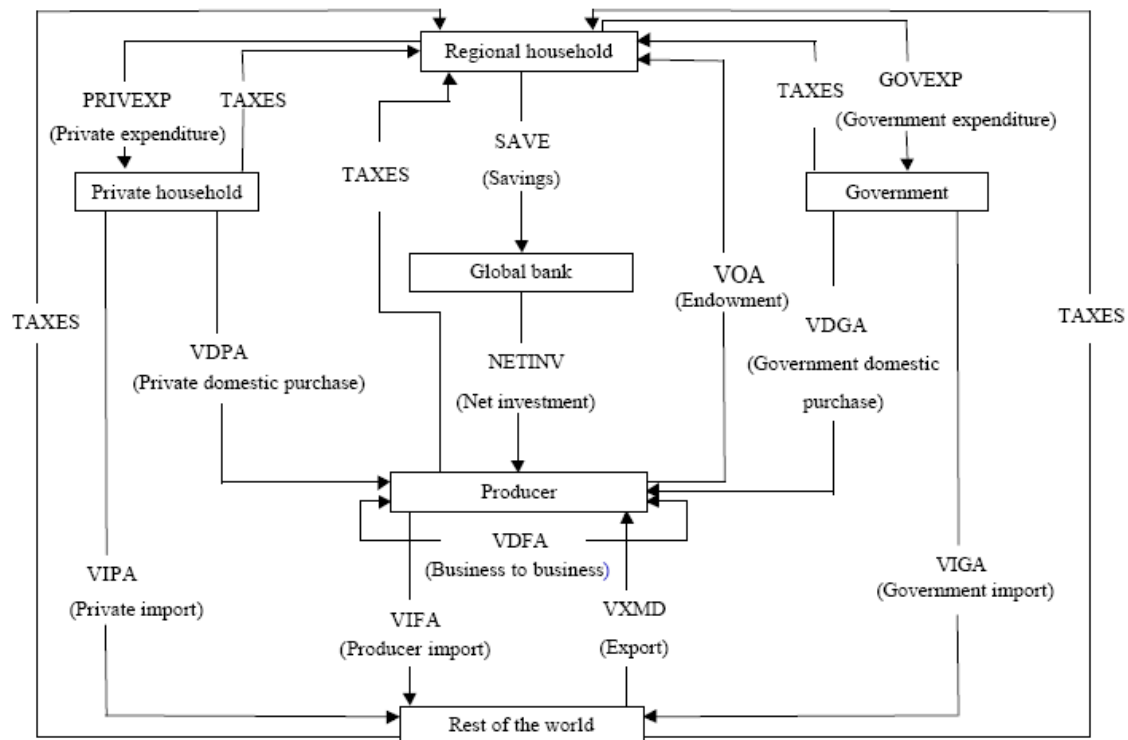
The structure of the GTAP model is as follows (see the Figure 7). First, to analyze the consumption or investment of a national economy a regional household is used. The regional household is divided into two entities: private household and government. The consumption expenditure is classified into two categories by type of entity: private

¹⁹ The basic framework of the trade model is guided by the comparative advantage theory by Hecksher-Ohlin. However, the original theory of comparative advantage cannot explain such aspects as the two-way trade seen in actual trading behavior. This is because the theory makes no distinctions between the same goods from different areas of production. Therefore, the general equilibrium model introduces heterogeneity into the same goods according to their production areas, namely, imperfect substitutes of goods between home and abroad, the so-called Armington assumption, and thus describes realistic trade developments. See Armington (1969) for the description of the Armington assumption.

²⁰ Critics of the Armington assumption claim the functional form is too restrictive. Moreover, industrial organization literature on imperfect competition product differentiation is seen as endogenous rather than as exogenous as in the Armington approach. Despite this critique, however, the assumption permits the tracking of bilateral trade flows and explanation of cross-hauling of similar products, which is why it is included in almost any CGE trade model.

household consumption expenditure and governmental consumption expenditure. In exchange for labor, capital or land provided to the producer as output factors, the private household gains factor income. The government collects income tax, and production- and trade-related taxes from the private household (subsidies are calculated as negative taxes). The income of the regional household (total of private household and government) is calculated by subtracting the capital depletion portion from the sum of the factor income of the private household, and the production- and trade-related taxes of the producer. Also, the amount that remains after the consumption expenses of the regional household is subtracted from its income is defined as the regional household's savings.

Figure 7. Structure of GTAP Model (Multi Region Open Economy)



Note: The arrows show the flow of money.

Source: Hertel (1997), *The Economic Analysis* No.156 (Economic Research Institute, Economic Planning Agency).

On the other hand, this model assumes that the producer is the entity that provides goods and services to the regional household in its own country or region or to overseas

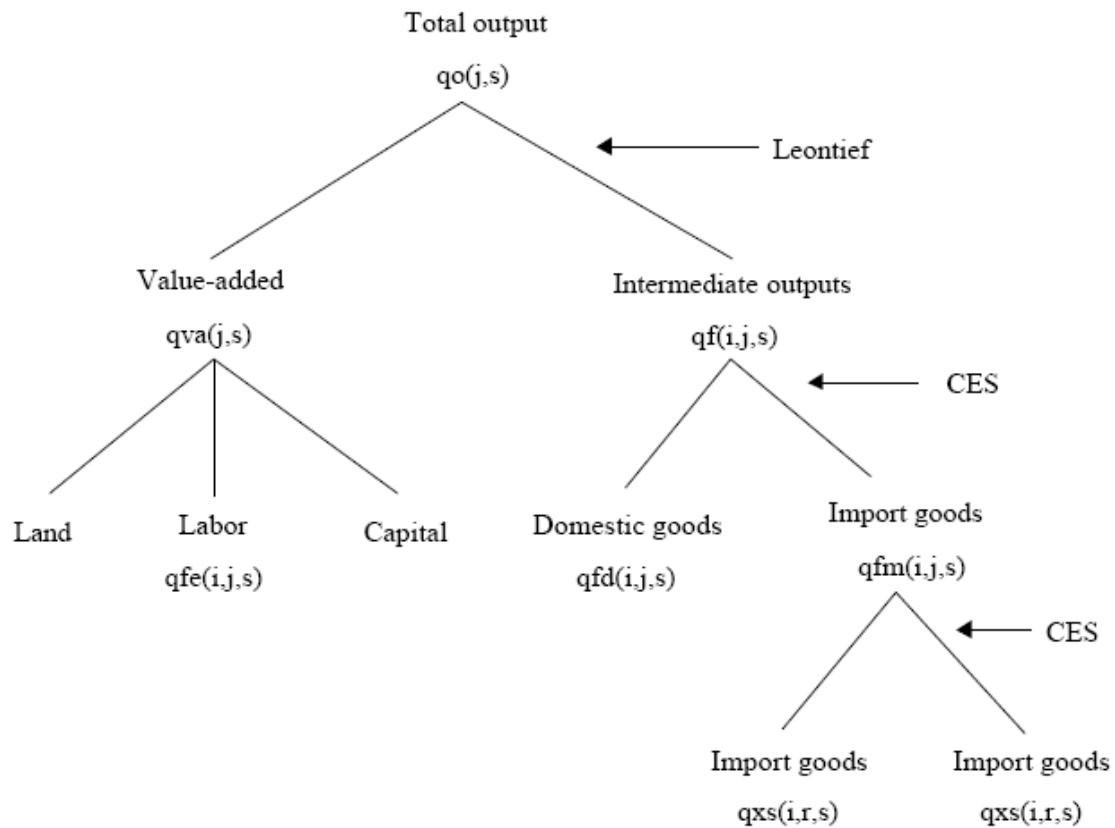
customers. Based on factors of production of the household and on domestic or overseas intermediate output, the producer provides goods and services, and makes investments that correspond to the private household consumption expenditure, the governmental consumption expenditure and exports.

Finally, in order to equalize national/regional savings and investments on a global level, an entity (independent from countries/regions) hypothetically called “global bank” is introduced in the GTAP model. Once the savings of a country/region are sent to the global bank, they are turned into net regional investment (gross investment minus depreciation). Also, in the GTAP model, the global composition of capital stocks does not change (therefore the global composition of net investment does not change), and allocation of investment in each country by the global bank varies in line with the rate of return on investment.

The following looks into the behavior of producers and consumers that are the basic elements in the economic structure of countries/regions.

First, producers possess technologies that yield a constant return to scale and the calculation of intermediate demands and factor demands uses the total output derived in accordance with the Leontief production functions (Figure 8). Thus, the substitution for intermediate demands and factor demands are constant. Land, capital and labor are envisioned as factor demands corresponding to the derived total output, and each demand is determined according to the Constant Elasticity of Substitution (CES) production function. The intermediate demands can be divided into domestic demands and imports by country/nation, and, as with the factor demands, are determined according to the CES production function. Also, export of goods by countries/regions is defined as the difference between total output and domestic consumption, and that difference is directed to exports to meet the import demands of other countries.

Figure 8. Structure of producer behaviour

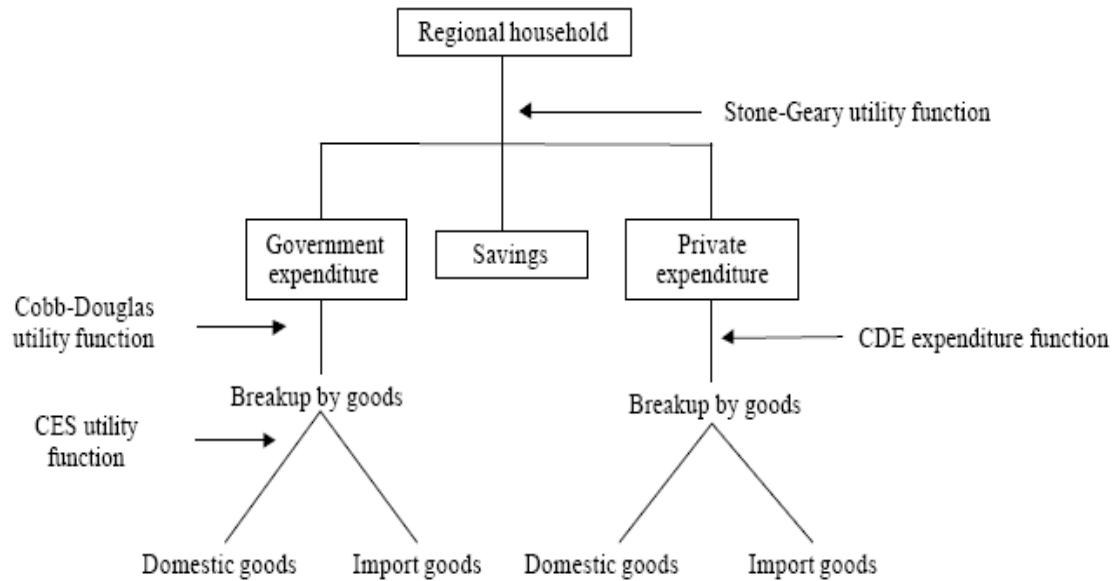


Source: Thomas W. Hertel and Marions E. Tsigas

The behaviour of consumers (regional economies) is governed by the objective to optimize the Stone-Geary utility function, which includes savings as explanatory variables under budgetary restrictions. This behavior determines the standards for government expenditure for the country as a whole, private household expenditure and savings (Figure 9). Government expenditure for the country as a whole is derived from a Cobb-Douglas function for demand by products and from a CES function for demand for domestic and for imported goods. Also, macro private household expenditures is determined by a Constant Difference of Elasticity (CDE) expenditure function for expenditure in each category of goods, and demand for domestic goods and for imported goods are determined by a CES function. As for substitutes among domestic goods and imported goods, or goods imported from different countries/regions, because the

Armington approach is used, the substitute relations among different countries are incomplete even for identical goods.

Figure 9. Structure of consumer behavior



Source: Thomas W. Hertel and Marions E. Tsigas

II.2.1 Economy-wide effects on liberalization

The economy-wide effects from liberalization are measured with three variables. The first variable is the change in the equivalent variation (EV). EV is well known variable in microeconomic theory. It is typically used to evaluate the change in money-metric welfare, giving an estimate for the amount of money that would have to be given to consumer to keep them as well off in the new equilibrium after the shock (with new prices) as in the old one (old prices). The second variable is the change in aggregate production of Gross Domestic Product (GDP) and the third variable is the change regional terms-of-trade. These three variables give a good estimate of the overall impact on economic activity and welfare.

II.2.2 Welfare Decomposition

The theory says that welfare changes may result from different sources. Terms-of-trade movements are one source; economic distortions are another. The Global Trade Analysis Project (GTAP) model makes it possible to determine the relative role of these and other underlying reasons for the welfare changes.

One of the truly great innovations with the GTAP model framework was a mechanism for decomposing the welfare implications of trade liberalization scenarios, which can be highly complex, into a series of intuitive components.²¹ The basic intuition of the GTAP decomposition is as follow.

National utility depend on real household consumption C , real government consumption G , and real national saving S . Ti is determined by the following maximization problem as show in the equations as below.

$$\text{Max } U(C, G, S) \text{ subject to } P_c C + P_g G + P_s S = \text{Net national income} \quad (2)$$

If U takes a Cobb- Douglas form, then the EV, which is a money measure of absolute changes in national utility, take a particularly simple form:

$$EV = \text{scale term} * [NNP - p] \quad (3)$$

Where the net national product (NNP) is the percentage change in net national income, and p is the percentage change in a price index that is it self a share weighted sum of percentages in P_c , P_g and P_s . In a model without FDI or other forms of international capital mobility, net national income is measured by total factor income (net of depreciation) and total indirect tax receipts.

It turns out that a number of the standard zero pure profit and market clearing

²¹ Huff and Hertel 1996, base on Keller 1980.

equations of a GCE model can be substituted into this expression for net national income, to yield a particularly useful decomposition of the EV measure:

$$EV = \text{scale term} * [TAX_1 * q_1 + TAX_2 * q_2 + \dots + TAX_N * q_n] \quad (4)$$

+ ‘terms of trade’ effect

+ ‘terms of saving and investment’ effect

+ contribution from endowment growth

+ contribution from technical change

+ term arising from non-homotheticity of household preferences in GTAP]

The first terms, involving the product of an initial tax rate (TAX_i) and the percentage change in the quantity moving across that tax wedge (q_i), spell out the efficiency effect of trade liberalization.

Imagine a commodity or service that has a high production tax to start with, so that TAX_i is large and positive for that commodity. Economic theory would tell us that production of that commodity would be smaller than it would be in an undistorted equilibrium. Thus any trade liberalization scenario that increased the quantity produced, so that q_i was positive, would move the economy closer to undistorted equilibrium and contribute positively to national welfare (because $TAX_i * q_i$ would be positive). This could come about because this commodity was itself subject to liberalization, and the initial TAX_i reduced as part of the scenario. But it could equally come about as an indirect result of liberalization elsewhere. If so, it would still contribute positively to

overall welfare.

The welfare decomposition also notes that if capital stocks increase exogenously for some reason, this contributes directly to national utility. However, the normal non-static welfare decomposition for GTAP does not consider the question of how the increase in capital stocks comes about, or who finances it. This will be addressed shortly. The decomposition also notes that technical changes contribute directly to overall welfare. The final term in the decomposition arises because of the functional form of household preferences cross commodities.

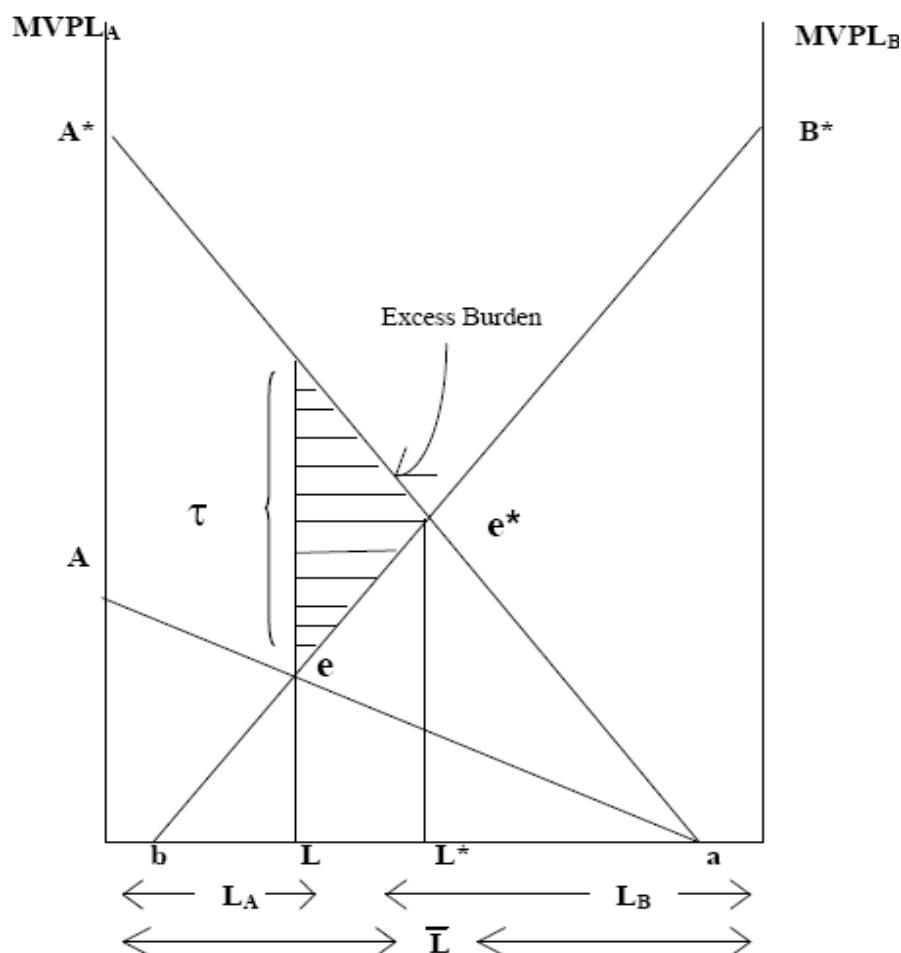
In the GTAP model, economic welfare is represented as being derived from the allocation of national income between private consumption, government consumption and savings (Hertel 1997). This recognizes that households gain benefits from their own current household consumption expenditure. They also benefit from current net national saving, since this increases their future household consumption. Finally, they benefit from the government's provision of public goods and services, as proxied by current government expenditure. National income is allocated between aggregate private consumption, aggregate government consumption and saving to maximize a top-level Cobb-Douglas utility function. With this functional form, successive increases in real household or government expenditure or saving generate equi-proportional increases in economic wellbeing.

Consequently, given such a definition of economic welfare, how well off a policy change actually makes a region depends on what the change does to its national income. It also depends on the effect of the policy change on prices, and hence the purchasing power of that income. Finally, it depends on how households evaluate the benefits of additional real expenditure. The last item, the marginal utility of real income is a consequence of the assumed utility functions. National income is nominal NNP and is equal to GDP less depreciation less net income payments to foreigners.

II.2.3 Decomposing Welfare Changes in the GTAP Model

Huff and Hertel (2000) mentioned to the welfare change in the technical paper no.5 of GTAP that, the decomposition developed in the graphical exposition may be most easily understood in terms of a simple graphical example. In the Figure 10 depicts us a small, closed economy in which all economic activity has been divided into two sectors: *A* and *B*. Furthermore, there is only one mobile factor of production, labor. The two lines, aA^* and bB^* , portray the social marginal value product of labor in each of the two sectors.

Figure 10. Excess Burden in a Two Sector Economy



Source: Karen M. Huff and Thomas W. Hertel.

The optimal allocation of labor between A and B , L^* , is defined by the intersection of these two lines. By equating the social marginal value product of labor in the two sectors, this is the allocation which maximizes welfare in this simple economy.

However, the actual allocation of labor in Figure 10 diverges from the optimal point e^* . This is due to the presence of an *ad valorem* tax on labor usage (with rate t) in sector A . The marginal value product of labor, net of this tax, is represented by the line aA . This discourages the employment of labor in A , resulting in an equilibrium at point e . In the face of this market outcome, the economy experiences a deadweight loss equal to the shaded triangle in Figure 10. With the endowment of labor fixed exogenously (as is usually the case in comparative static simulations). The only way to increase welfare in this economy is to reduce the excess burden associated with this distortion. In the GTAP model there are many such distortions, and a key contribution of this technical paper is to identify how these interact with simulation experiments in order to generate changes in welfare. (Huff and Hertel: 2000)

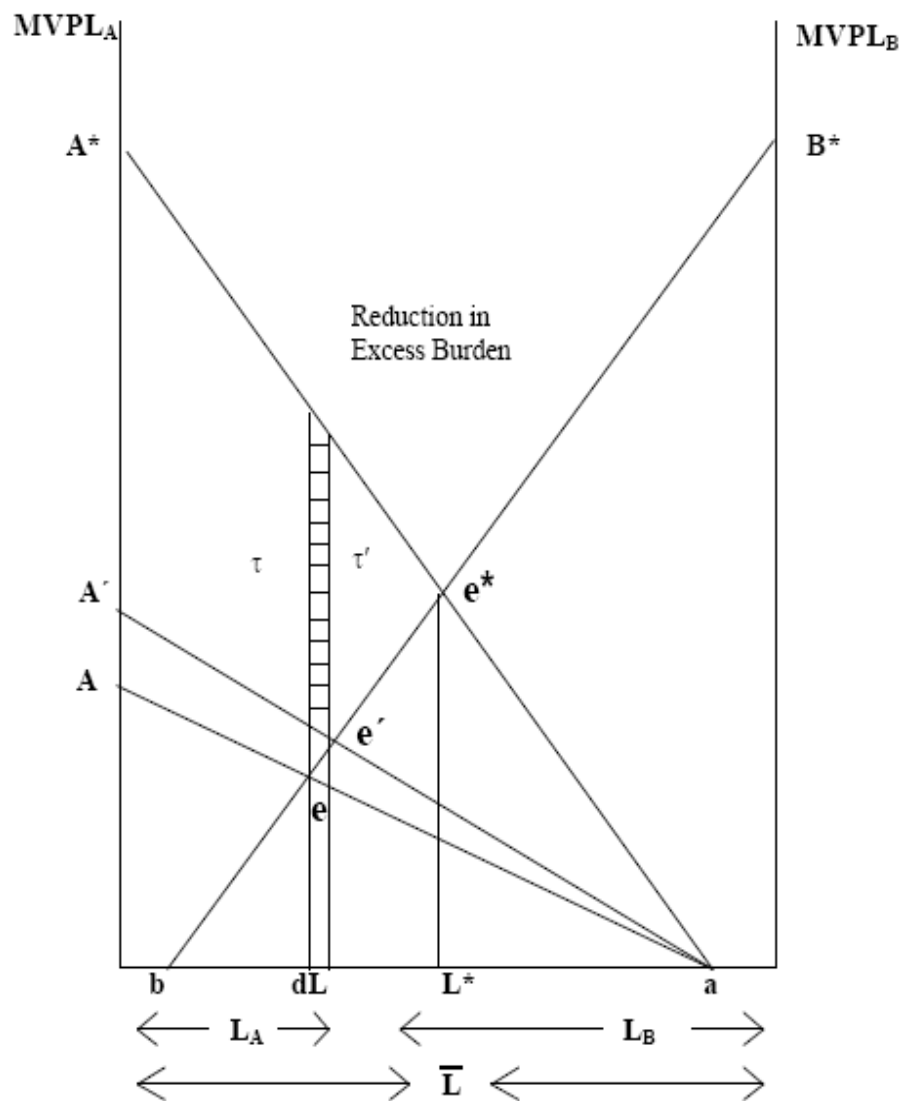
Moreover, Huff and Hertel(2000) revealed that in Figure 11 shows the outcome of a simulation experiment whereby the tax on labor in this two sector, closed economy is reduced from t to t' . This shifts the net of tax MVP schedule for sector A upwards to aA' and accordingly changes the equilibrium from e to e' . The resulting reallocation of labor from sector B to sector A (dL) reduces the excess burden associated with the labor tax, and generates an improvement in Allocative efficiency equal to the shaded trapezoid. The size of this gain is seen to be a function of the size of the initial distortion (t), the degree of reform ($t - t'$), and the responsiveness of the labor market to this change (dL).

Of course, most GTAP simulations only perturb a few of the taxes/subsidies in the model. Indeed, in some cases, none of the distortions are shocked. Instead, technology or endowments are perturbed. Nevertheless, welfare may change as a result of Allocative efficiency effects. This point is illustrated in Figure 12. Here, there is an improvement in the technology used to produce good A , resulting in an upward shift of both the social and

net-of-tax MVP schedules. This has the effect of shifting the equilibrium allocation of labor in the economy to e' . Now the gains from this technological improvement may be decomposed into two parts. The first is the direct gain due to the use of improved technology to produce current levels of good A . However, there is also an indirect gain which results from the reallocation of labor between sectors in the face of the pre-existing labor market distortion. This Allocative efficiency effect stems from the fact that any external shock which causes labor to be reallocated from the relatively low social MVP sector B to the higher social MVP sector A , will bring gains to the economy. Alternatively, this is the gain which is forgone, if for some reason the labor were prevented from moving from B to A in the wake of this technological improvement. This area is a function of the size of the pre-existing distortion (t) and the amount of labor reallocated across this distortion as a result of the simulation (dL).

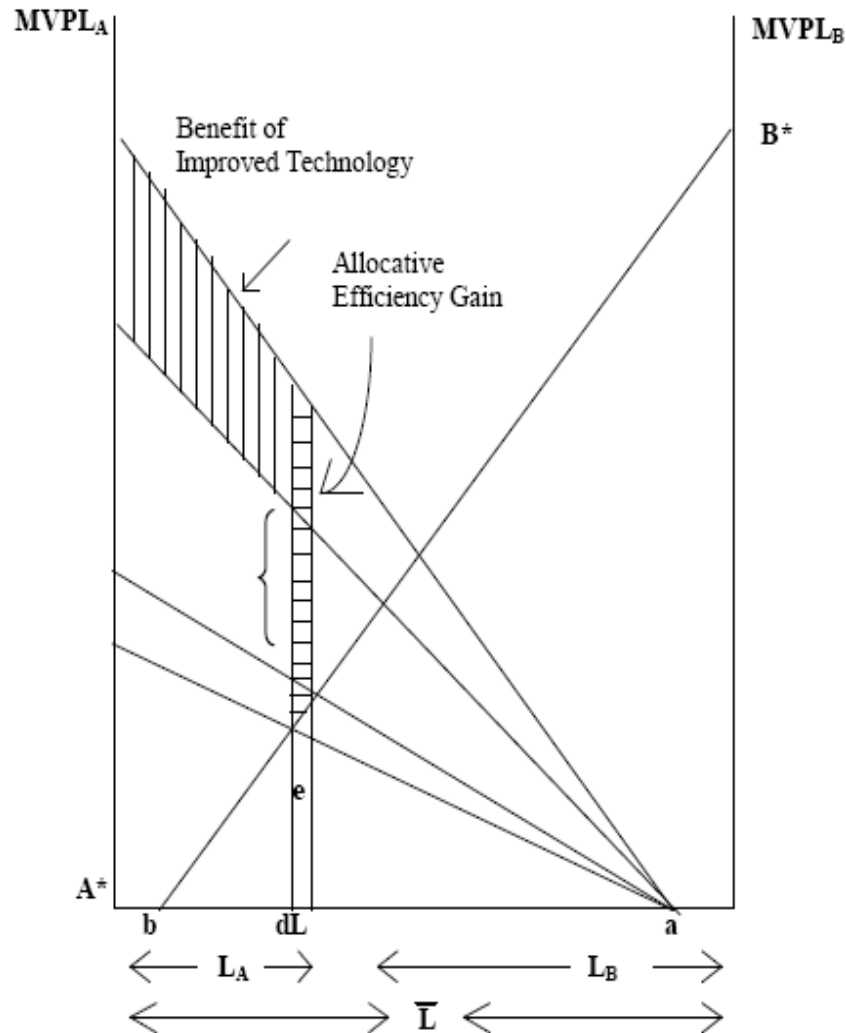
Finally, Huff and Hertel (2000) given us the remainder of this conclusion outlines an approach to measuring the area of the trapezoid in Figure 11. The beauty of this numerical approach is that it generalizes to handle any arbitrary number of distortions, of which there are thousands in most GTAP applications.

Figure 11. Reduction in Excess Burden in the Two Sector Economy



Source: Karen M. Huff and Thomas W. Hertel.

Figure 12. Allocative Efficiency Consequences of an Advancement in Technology in Sector A.



Source: Karen M. Huff and Thomas W. Hertel.

II.2.4 Equivalent Variation

When the result of GRAP model is evaluated, it should be noticed that in the analysis of based on GTAP the impact to the welfare is often calculated by EV. Whenever the trade liberalization is analyzed, theoretically EV always increases, so based on this result not a few, the liberalization is concluded that it is desirable. Index is based on the consumer utility function and it does not account for producers behavior and

externalities. FTA obliges many labors to move among industries, and much unemployment might break out in short run. But since GTAP model usually assumes the perfect mobilization of production factors, these negative effects are not reflected. Besides taking into considered the multi-functionality of agriculture, when the agricultural production is decreased by FTA, it might decrease economic welfare. But it is also not influenced in EV. These cost and negative impacts are ignored in EV.

II.2.5 Terms-of trade movement

The effects of the liberalization of the commodity prices are crucial for the terms-of-trade effects. It can be verified from the GTAP model. Terms-of-trade for a particular region may change because of changes in export prices, import prices or both. Terms-of-trade improve if the composite export price of exports increases relative to the composite of imports. These movements can be traced back to individual commodities taking into account both the change in volumes and the change in prices of individual commodities.

Intuitively, we may view the terms-of-trade effect as giving an estimate of the change in terms under which a region engages in international trade.

II.3 Experimental Design

All experiments were conducted with a multi-country of the model, general equilibrium closure. The general equilibrium closure is appropriate for capturing the substitution in production and consumption that occurs between goods and the resulting change in trade flows and values. Output levels, prices, and income are endogenous for all regions.

Policy instruments enter the model in the form of taxes related to international trade (import duties and export taxes), as well as direct output and consumption taxes. For our propose, we aggregate countries into 10 regions (See the Table 1) and commodities into 3 sectors (See the Table 2).

Table 1. Regional aggregate *

Region code	Region description	Regions comprising
THA	Thailand	Thailand
JP	Japan	Japan
ASEAN-CH ²²	ASEAN-China	Indonesia, Malaysia, Philippine, Singapore, Vietnam and China
Aus	Australia	Australia
BIMSTEC	Bay of Bengal Initiative for Multi Sectorial Technical and Economic Cooperation.	Bangladesh, India and Sri-Lanka
EFTA	European Free Trade Association.	Ireland and Switzerland
EU	European Union.	Austria, Belgium, Denmark, Finland, France, Germany, United Kingdom, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain and Sweden
NAFTA	North America Free Trade Area.	Canada, USA and Mexico
NewZ	New Zealand	New Zealand
Pru	Peru	Peru

Source: Author aggregations.

Remark: * See more details in Appendix 2

Table 2. Sectoral aggregate**

Sector code	Sector description	Sector comprising
Mnfcs	Shoe polish and other manufacture	Forestry; Fishing; Coal; Oil; Gas; Minerals nec; Textiles; Wearing apparel; Leather products; Wood products; Paper products, publishing; Petroleum, coal products; Chemical, rubber, plastic prods; Mineral products nec; Ferrous metals; Metals nec; Metal products; Motor vehicles and parts; Transport equipment nec; Electronic equipment; Machinery and equipment nec; Manufactures nec.

²² ASEAN-CH or ASEAN-China in this thesis experimental and in this aggregation methodical is not be included The Kingdom of Thailand.

Svces	Services and activities NES	Electricity; Gas manufacture, distribution; Water; Construction; Trade; Transport nec; Sea transport; Air transport; Communication; Financial services nec; Insurance; Business services nec; Recreation and other services; PubAdmin/Defence/Health/Educat; Dwellings.
Food	Food and Ag,inc. onion pizzas	Paddy rice; Wheat; Cereal grains nec; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Cattle, sheep, goats, horses; Animal products nec; Raw milk; Wool, silk-worm cocoons; Meat: cattle, sheep, goats, horse; Meat products nec; Vegetable oils and fats; Dairy products; Processed rice; Sugar; Food products nec; Beverages and tobacco products.

Source: Author aggregations.

Remark: ** See more details in Appendix 1

In a way on the input side, the model is aggregated into 5 factors (Land, Un-skill labour, Skill labour, Capital and NatlRes) as show in Table 4. In addition, all reforms simulated in this thesis are assumed to take place in 2005. Since the GTAP database corresponds to the global economy in 1997, so we first need to create a reference scenario that corresponds as the current year as to the global economy in 2005. The Table 3 will show the scenario experimental in this thesis.

Table 3. The scenario experimental

Scenario code	Code description	Scenario description
S1	tha-jp	Thailand and Japan
S2	tha-asean-ch	Thailand and ASEAN-China
S3	tha-aus	Thailand and Australia
S4	tha-bimstec	Thailand and BIMSTEC
S5	tha-efta	Thailand and EFTA
S6	tha-eu	Thailand and EU

S7	tha-nafta	Thailand and NAFTA
S8	tha-newz	Thailand and New Zealand
S9	tha-pru	Thailand and Peru

Source: Author aggregations.

Table 4. Factors aggregation

Factor code	Factor description
Land	Land
UnSkLab	Un-Skill labour
SkLab	Skill labour
Capital	Capital
NatlRes	Natural resources

Source: Author aggregations.

Chapter III

Simulation results

The simulation results reported in this thesis are derived from a model analysis. The model has assumes perfect competition as meaning that all simulations are implemented as comparative static experiments. This thesis evaluates the Thailand FTA impact based on each indexes (GDP, EV TOT, Welfare decomposition, Summing up of welfare of all regions, Import price, and Export price). Each table and each figure also shows how data can represent each evaluation. The summary of tables or figures can further specify in each index of regions and scenarios. The thesis results are interpreted as representing what impact for trade liberalization and what impact for Thailand FTA and partnership member.

As a following of various tables as below, there are seven-main indexes to evaluate the impact of Thailand FTA. In each table stated that the total of amount of each scenarios in each index. (See each index in each table)

GDP price index for Regions and scenarios measured by % change

Table 5. Regions and scenarios GDP price index (% change)

GDP	Scenario experimental								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
THA	3.3	1.5	0.0	0.4	0.4	1.3	1.2	-0.1	0.0
JP	0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0
ASEAN-CH	-0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUS	-0.1	-0.1	0.3	0.0	0.0	-0.1	0.0	0.0	0.0
BIMSTEC	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EFTA	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
EU	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NAFTA	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NewZ	-0.1	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.5	0.0
Pru	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
ROW	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Author calculations.

From the Table 5, evaluated from the model simulations. The figure is the real GDP prices index, measured in % change.

There are 11-main regions and 9-scenarios (11Regions are THA, JP, ASEAN-CH, Aus, BIMSTEC, EFTA, EU, NAFTA, NewZ, Pru, and ROW: 9 scenarios are S1, S2, S3, S4, S5, S6, S7, S8, and S9). In the Thailand FTA impact of GDP, Thailand aspect tended to large number of all real GDP % change in every scenario especially in S1 [Thailand and Japan] show us is very high of value and ranged number one in all of scenarios and S2 [Thailand and ASEAN-CH], S6 [Thailand and EU], S7 [Thailand and NAFTA], S4 [Thailand and BIMSTEC], S5 [Thailand and EFTA] respectively, but excepted in S8 [Thailand and New Zealand] and S3 [Thailand and Australia] to shows us in the negatives of values (See under “THA” category).

In another hand, from the other regions aspect, there were shows us not too much differenced in % changes. As we can see the amount of values in each region is not so high and dose not change in a big part of % change (See in each regions under “JP; ASEAN-CH; Aus; BIMSTEC; EFTA; EU; NAFTA; NewZ and Pru”).

Equivalent Variation for Regions and Scenarios measured by \$US.Million

Table 6. Regions and scenarios equivalent variation (\$US. Million)

EV	Scenario experimental								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
THA	2,528	813	-50	207	232	764	617	-49	-2
JP	333	-554	-52	-20	-66	-363	-290	-10	-1
ASEAN-CH	-870	897	-25	-38	-40	-236	-191	0	-1
AUS	-99	-73	173	-6	-3	-39	-31	-6	0
BIMSTEC	-32	-39	-5	-45	-3	-18	-17	-2	0
EFTA	-47	-29	-1	-9	-185	-58	-20	0	0
EU	-603	-401	-24	-53	-104	875	-274	-24	-2
NAFTA	-873	-448	-21	-36	-35	-246	422	-7	-3
NewZ	-12	-12	-7	-1	0	-9	-7	84	0
Pru	-3	-7	0	0	0	-3	-3	0	15
ROW	-891	-506	-54	-65	-18	-492	-334	-24	-4

Source: Author calculations.

According to Table 6, the table shows the data of “Equivalent Variation” in 11-regions and 9-scenarios. The data have been evaluated based on the model simulations in each category. The figure is the EV index, measured in \$US million.

We can discuss this table briefly as following to the Thailand aspect: Look at the value of 2,528 in S1 as it is show us very high level of EV, then slightly decreased to the level of 813; 764; 617; 232; and 207 \$US million in S2; S6; S7; S5; and S4 respectively. Again, the rate of this category has been decreased into the negative level of -2; -49; and -50 \$US million in S9; S8; and S3 (See under “THA” as a Thailand aspect).

In another hand, from another region aspect to Thailand we found the interested data for instance ASEAN-CH and EU, there were show us the high positive value of 897 and 875 \$US million then decreased slightly in the NAFTA; JP; Aus; NewZ; and Pru at

the amount of 422; 333; 173; 84; and 15 \$US million respectively. But in case of BIMSTEC and EFTA, there were decreased to negative side at the amount of -45 and -185 respectively (See in each region).

Term of trade for regions and scenarios measured by % change

Table 7. Term of trade for regions and scenarios (% change)

TOT	Scenario experimental								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
THA	2.7	1.1	0.0	0.3	0.3	1.0	0.9	0.0	0.0
JP	0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0
ASEAN-CH	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUS	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
BIMSTEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EFTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NAFTA	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NewZ	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Pru	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
ROW	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Author calculations.

From the Table 7, this data is the Term of Trade index, measured in % change. There are 11-regions and 9-scenarios for stated that the Thailand FTA impact of TOT.

In the Table 7, from Thailand aspect there are dose not large the number of TOT % change in every scenario. For instance, in S1 [Thailand and Japan FTA] as show us a mount of 2.7 % change of value, then 1.1 % change in S2 [Thailand and ASEAN-CH FTA]; 1.0 % change in S6 [Thailand and EU FTA]; 0.9 % change in S7 [Thailand and NAFTA FTA]; 0.3 % change in both of S5 [Thailand and EFTA FTA]; and S4 [Thailand

and BIMSTEC FTA] respectively.

But in S9 [Thailand – Peru FTA]; S3 [Thailand - Australia FTA] and S8 [Thailand - New Zealand FTA], there were shows us in the constantly of values is 0.0 % change (See under “THA” category).

Welfare decomposition of scenarios measured by % change

Table 8. Welfare decomposition of scenarios (% change)

Welfare	1 alloc_A1 Allocative Efficiency Effect	2 endw_B1	3 tech_C1	4 pop_D1	5 tot_E1 Term of Trade Effect	6 IS_F1 Explanatory Factors	7 pref_G1
S1	570.8	0	0	0	1,958	-0.6	0
S2	2.1	0	0	0	820.6	-10	0
S3	-45.2	0	0	0	-4.4	-0.2	0
S4	16.2	0	0	0	197.2	-6.7	0
S5	21.7	0	0	0	213.9	-3.9	0
S6	58	0	0	0	715.1	-9.1	0
S7	-0.7	0	0	0	631.3	-13.8	0
S8	-14.9	0	0	0	-34.4	0.4	0
S9	-1.9	0	0	0	0.5	-0.1	0

Source: Author calculations.

According to Table 8, this table shows the data of “Welfare Decomposition” in 9-scenarios and 7-coefficient (Allocative Efficiency Effect-A1; Endowment Effect-B1; Technical Change Effect-C1; Term of Trade Effect-E1; and Explanatory Factors-F1). The data have been evaluated based on the model simulations in each category. The figure is the welfare index, measured in % change.

We can discuss from this table briefly as shown below:

1. For TOT [Term of Trade Effect]: It started with a large number of 1,958 % change in S1 and then slightly decreased the amount of value to 820.6; 715.1; and 631.3 % change in S2; S6; and S7 respectively. After that continuously decreased

to 213.9 and 197.2 % change in S5 and S4; and down to 0.5 % change in S9. Again, the rate of this category has been negatively decreased into the amount of -4.4 % and -34.4 % change in S3 and S8 (See under “TOT”).

2. For alloc [Allocative Efficiency Effect]: The quantity index for this category show high value at 570.8 % change in S1 then deeply decreased to 58; 21.7; 16.2; and 2.1 % change in S6, S5, S4, and S2 respectively. And decreased a bit to the negative side of amount of -0.7; -1.9; -14.9; and -45.2 % change in S7, S9, S8, and S3 respectively (See under “alloc”).
3. For IS [Explanatory Factors]: There are stated that negative value of all of amount except 0.8 % change in S8. However, even if there were shows us in the negative of value but seem slightly change (See under “IS”).

Welfare decomposition for Summing up as a total of all scenarios measured by % change

Table 9. Welfare decomposition. Summing up as a total of all scenarios (% change)

Welfare	1 alloc_A1 Allocative Efficiency Effect	2 endw_B1	3 tech_C1	4 pop_D1	5 tot_E1 Term of Trade Effect	6 IS_F1 Explanatory Factors	7 pref_G1
S1	-546.5	0	0	0	-22.2	0.3	0
S2	-353.6	0	0	0	-5.6	0.1	0
S3	-64.1	0	0	0	-0.2	0	0
S4	-67.7	0	0	0	-0.3	0	0
S5	-222.7	0	0	0	-0.3	0	0
S6	179.1	0	0	0	-3.7	0.1	0
S7	-127.1	0	0	0	-3	0.1	0
S8	-38.8	0	0	0	-0.2	0	0
S9	1.4	0	0	0	0	0	0

Source: Author calculations.

From the Table 9, show us the data of the world aspect as a “Welfare decomposition on the summing up as a total of all scenarios”. In other words is a “Welfare Decomposition from world aspect”.

The Table 9 shows data based on the model simulations in 9-scenarios and 7-coefficient as a world aspect. The welfare decomposition by summing up as a total of all scenarios index, measured in % change.

Only the three-main categories [alloc; tot; and IS] given us the amount of value at the most of all in negative side except S6 and S9 of alloc categories. However, we can discuss in this part as briefly as below:

1. For alloc as a total of % change: There were stated the negatively decreased in every scenarios as shown the amount are -546.5 % change in S1; -353.6 % change in S2; -222.7 % change in S5; -127.1 % change in S7 then slightly decreased to -67.7 % change in S4; -64.1 % change in S3; and -38.8 % change in S8 respectively, except S6 and S9 were positively increased (See under “alloc”).
2. For tot as a total of % change: There were presented all of amount in the negative side. And S1 is the large scenario of amount of value which it negatively decreased at -22.2 % changes. In the other scenarios, there also were slightly decreased in to the negative side. While S9 is constantly at 0.0 % change (See under “tot”).
3. For IS as a total of % change: In this category there are not different changes in a total of % change.

Total trade bilateral import to Thailand at world prices measured by % change

Table 10. Total trade bilateral import at world prices (% change): [Import to tha]

VIWS	Scenario experimental								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
1 Mnfcs	8.7	6.5	0.4	0.8	0.3	5.0	4.4	0.0	0.0
2 Svces	6.2	3.9	0.1	0.9	0.5	3.2	3	0	0
3 Food	38.7	26.2	6.4	4.9	6.3	31.6	22.1	4.8	0.6

Source: Author calculations.

According the Table 10, in this table shows the total trade bilateral import at world prices. In another word is the total import from foreignness to Thailand.

There are 3-main categories that we will mainly mention here: Mnfcs(Shoe polish and other manufacture); Svces(Services and activities NES); and Food(Food and Ag,inc. onion pizzas), and 9-scenarios. This source was evaluated by the model simulations, measured in % change.

To discussion this index, we will mainly evaluate the data of 9-scenarios to the 3-main categories as following:

First, we are going to take a look at the “Mnfcs” category and itself found positively increased in S1, S2, S6, and S7 of the value 8.7; 6.5; 5.0; and 4.4 respectively. For another scenario there was not too much different change in this category.

Secondly, focusing on the “Svces” category, from the table show us about all of scenarios are positively increased in this category, especially S1 increased much more than another scenario at the level of 6.2 of % change. And then 3.9 in S2; 3.2 in S6; 3.0 in

S7; 0.1 in S3; 0.5 in S5; 0.9 in S4; and 0.0 % changes in both of S8 and S9 respectively.

Thirdly, in the category named “Food”, we found that too much positively increased of all of scenarios. Especially in S1, S6, S2, and S7; and slightly increased in S5, S3, S4, S8, and S9 respectively.

Total trade bilateral export from Thailand at world prices measured by % change

Table 11. Total trade bilateral export at world prices (% change): [Export from tha]

VXWD	Scenario experimental								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
1 Mnfc	-1.5	5.3	0.6	1.5	-0.6	3.6	4.9	0.2	0.0
2 Svces	-9.4	-5.8	-0.3	-1.2	-0.9	-4.8	-4.4	0.0	0.0
3 Food	90.3	23.3	1.4	0.3	10.1	26.6	11.1	0.8	0.2

Source: Author calculations.

According to the Table 11, shows the total trade bilateral export at world prices or the total of exporting from Thailand to foreignness. The data in this table have been evaluated based on the model simulations in each category. The figure is the export index, measured in %change.

Also in this index there have the same categories and same scenarios with the previous table (3-categories and 9-scenarios).

From amount of data we can make discuss as following:

1. For Food sector: In S1 [Thailand - Japan] stated that food sector was positively increased too much at the a mount of 90.3 % change, then slightly decreased to the next S6, S2, S7, and S5 at the amount of 26.6; 23.3; 11.1; and 10.1 % change,

after that constantly decreased to 1.4; 0.8; and 0.2 % change in the S1; S8; and S9 respectively.

2. For Mnfc sector: There were presented in various amount of value as we can see the S2, S7, S6, S4, S8, and S3 positively increased and S9 is stated that constantly at 0.0 %change. But the other side, S5 and S1 were decreased to the negative side.
3. For Svces sector: All of scenarios slightly decreased into negative side. This category stated that a large number of -9.4 % changes in S1, then slightly increased to the amount of -5.8; -4.8; -4.4; -1.2; -0.9; and -0.3 % change in S2; S6; S7; S4; S5; and S3 respectively. After that constantly increased to the positive side at the amount of 0.0 % change in both of S8 and S9.

Chapter IV

Summary and Conclusions

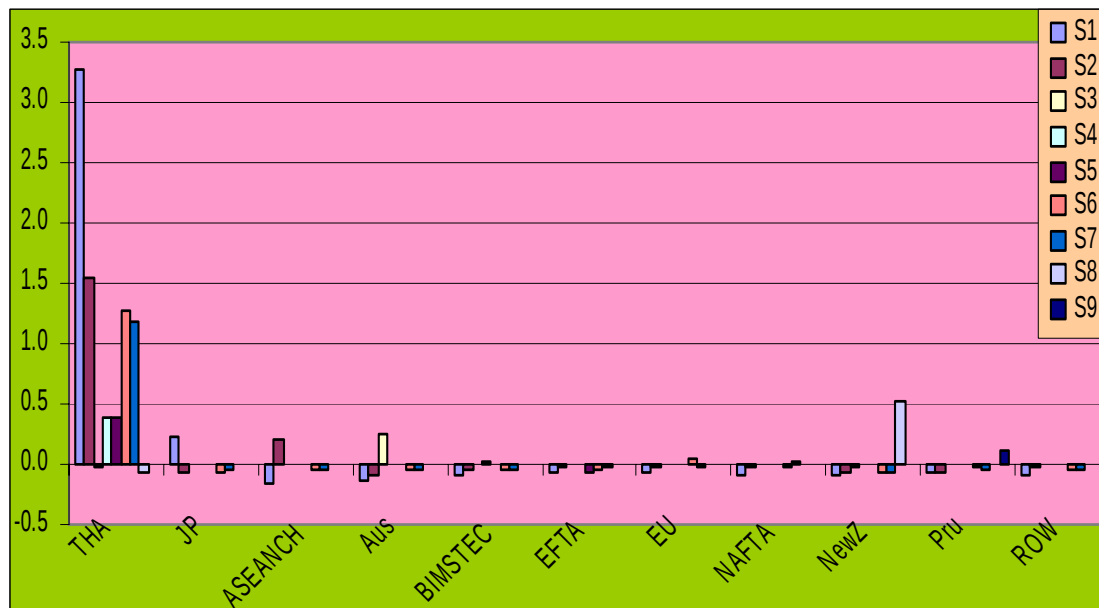
IV.1 Summary

The simulation results in chapter III were presented us in various tables. And in each table we can draw several figures in this chapter to summarize briefly a comment or idea of trade liberalization. Moreover, it cans significantly such a policy maker to lead a country in the way of global trade.

Initially, all of results in the previous chapter accomplished from the GTAP model simulations and the GTAP database. This thesis highlights the importance of scenarios design and thesis experimental from usefulness of the GTAP analysis. Nine different scenarios for the world regional trade liberalization in this research are examined and compared.

The figures below show each index of a Thailand aspect also a country aspect and a world aspect is included. (The figures are following)

Figure 13. Regions and scenarios GDP price index (% change)



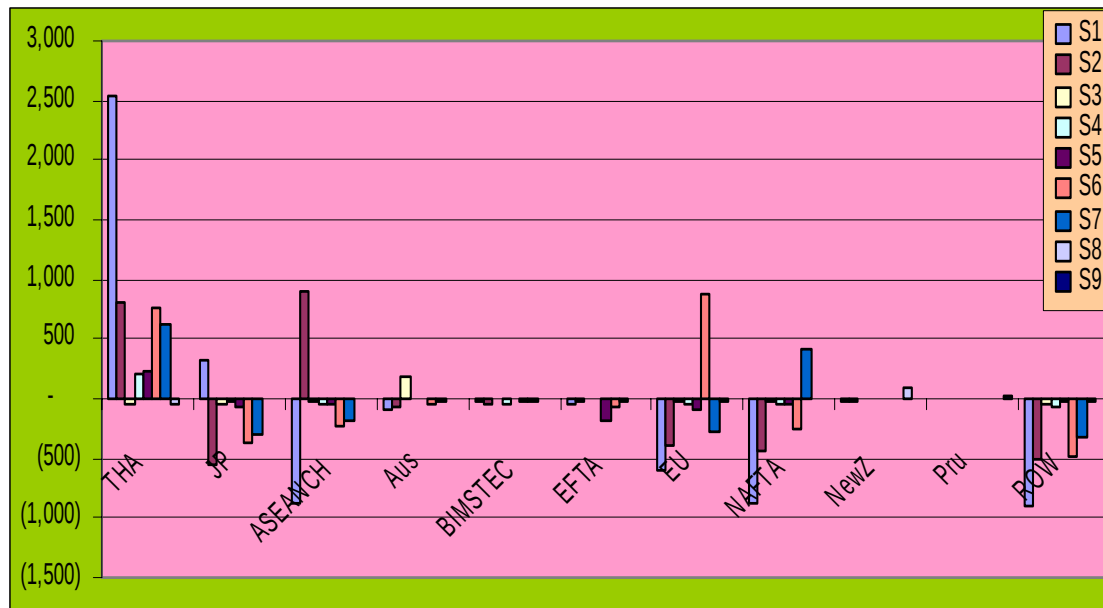
Source: Author calculations.

From the Figure 13, we can also see the significant figures of the Thailand FTA impact on GDP index from each category. We can make some specific summary based on the data, for instance:

1. Thailand will get too much benefit on GDP with Thailand – Japan FTA because of THA's output increased too much % change in S1.
2. Thailand also will get benefit of GDP with the ASEAN-CH; EU; NAFTA; BIMSTEC; and EFTA region respectively after FTA begins, since the numbers of values were positively increased in S2, S6, S7, S4 and S5 respectively of THA's output.
3. Thailand will lose GDP to New Zealand and Australia when Thailand FTA begins. Since in S8 and S3 of THA's output of the value were a bit change into negative side.
4. For New Zealand aspect, maybe New Zealand get benefit of GDP after complete FTA with Thailand, as show as the figure increased in S8 of NewZ's output.

5. Australia, ASEAN-CH and Japan aspect also may get benefit in GDP when complete FTA with Thailand, as shows a value increased in S3; S2 and S1 of Aus's output; ASEAN-CH's output and JP's output respectively.

Figure 14. Regions and scenarios equivalent variation (\$US Million)



Source: Author calculations.

From the Figure 14, show the significant figures of the Thailand FTA impact on EV index of each scenario in each region aspect. We can make some specific summary based on the data, for instance:

1. From Thailand aspect stated in EV index that, Thailand will get benefit almost of regions especially gain too much in S1 [Thailand – Japan FTA] but will lose a bit in S9 [Thailand – Peru FTA]; S8 [Thailand – New Zealand FTA] and S3 [Thailand – Australia FTA]. (See under “THA”)
2. On the other hand, from each region aspect or country aspect. There were also gains in each region when do FTA with Thailand excepted in BIMSTEC and EFTA regions. (See under “JP”; “ ASEAN-CH”; “Aus”; “BIMSTEC”; “EFTA”;

“EU”; “NAFTA”; “NewZ”; and “Pru”)

Figure 15. Term of trade for regions and scenarios (% change)



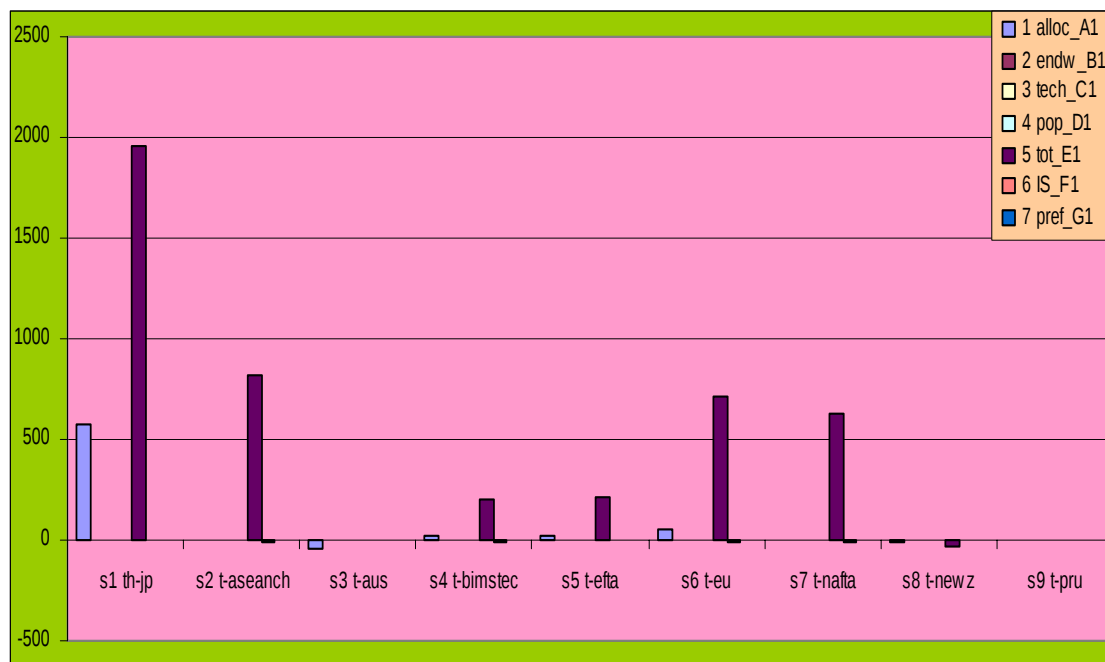
Source: Author calculations.

According to the Figure 15, there shows the data of the Thailand FTA impact on TOT index as a % change. From this point we can make some specific summary based on the data, for instance:

1. Thailand will gain too much on TOT index with Thailand – Japan FTA as we can see too much increased in S1 of THA’s output (See under “THA”).
2. Thailand also will get benefit of TOT with the ASEAN-CH FTA; EU FTA; NAFTA FTA; EFTA FTA; and BIMSTEC FTA as respectively, since the numbers of values were increased in S2, S6, S7, S5 and S4 of THA’s output (See also under “THA”).
3. Thailand will get a bit benefit of TOT to Peru. But will lose on Australia FTA and New Zealand FTA when start FTA together. As stated in S9, S3 and S8 respectively of THA’s output.

4. On the other hand, as a country aspect there were stated that New Zealand will also benefit on TOT when complete FTA with Thailand as it was show in S8 of “NewZ” output (See under “NewZ”). It is not only that, in S3 of “Aus” output; S2 of “ASEANCH” output; S1 of “JP” output; and in S9 of “Pru” output will also get benefit with Thailand FTA as respectively (See under “Aus”; “ASEANCH”; “JP”; and “Pru”).
5. Moreover, we can say that New Zealand, Australia and Peru are gainers more Thailand when started FTA with Thailand, since there are stated the positives data increased in each country aspect but the opposite in Thailand aspect these three-countries are negatives.

Figure 16. Welfare decomposition of scenarios (% change)

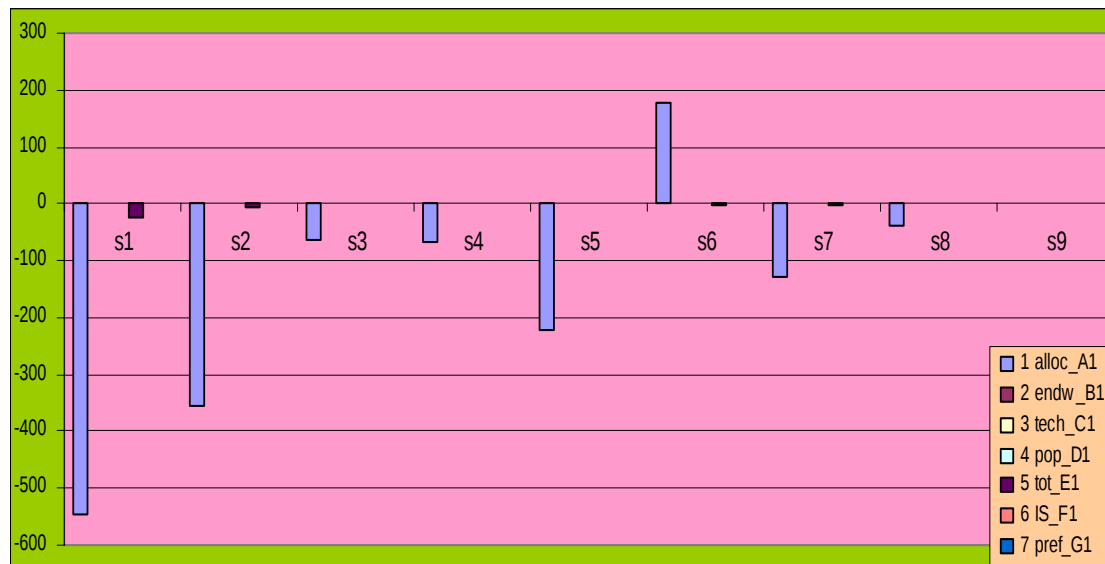


Source: Author calculations.

From the Figure 16, stated in welfare decomposition index, measured in % change. As we can summarize briefly in the following:

1. There were shows that, S1 [Thailand – Japan FTA] will gain too much in Term of Trade category, since the figure show the high of level (See under “S1 th-jp).
2. Also Thailand FTA impact on this TOT will benefit to most of all of scenarios (See under “S2”; “S4”; “S5”; “S6”; and “S7”).
3. In case of Allocative Efficiency Effect category, also show us the high level in S1 which it means Thailand – Japan FTA will benefit more than other scenarios.

Figure 17. Welfare decomposition [Summing up as a total of all scenarios] (% change)



Source: Author calculations.

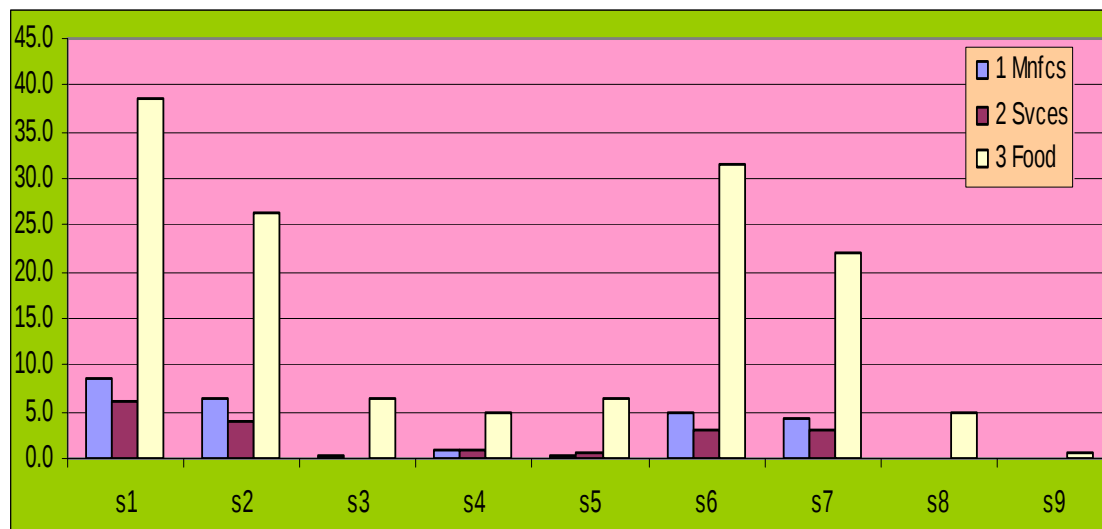
From the Table 8, in chapter III we drawn the Figure17, to shows the “Welfare decomposition” on a summing up as a total of all scenarios or the other word is a Welfare decomposition as a world aspect.

Thorough this figure we found that every scenario negatively decreased the welfare decomposition as a world aspect. For instant:

1. For category named “alloc” [Allocative Efficiency Effect], there were too much decreased in S1 also negatively decreased in S2; S5; S7; S4; S3; and S8

- respectively excepted in S6. It means in S1, S2, S3, S4, S5, S7, S8, and S9 will lose the welfare decomposition as a world aspect.
2. On the opposite, this alloc stated that only S6 [Thailand – EU] will gain the welfare decomposition as a world aspect (See under “S6”).
 3. For TOT category: All of scenarios were slightly decreased into negative side. This gave us the summary that every scenario will lose a bit TOT-welfare decomposition at a global aspect.

Figure 18. Total trade bilateral import at world prices (%change): [Import to tha]



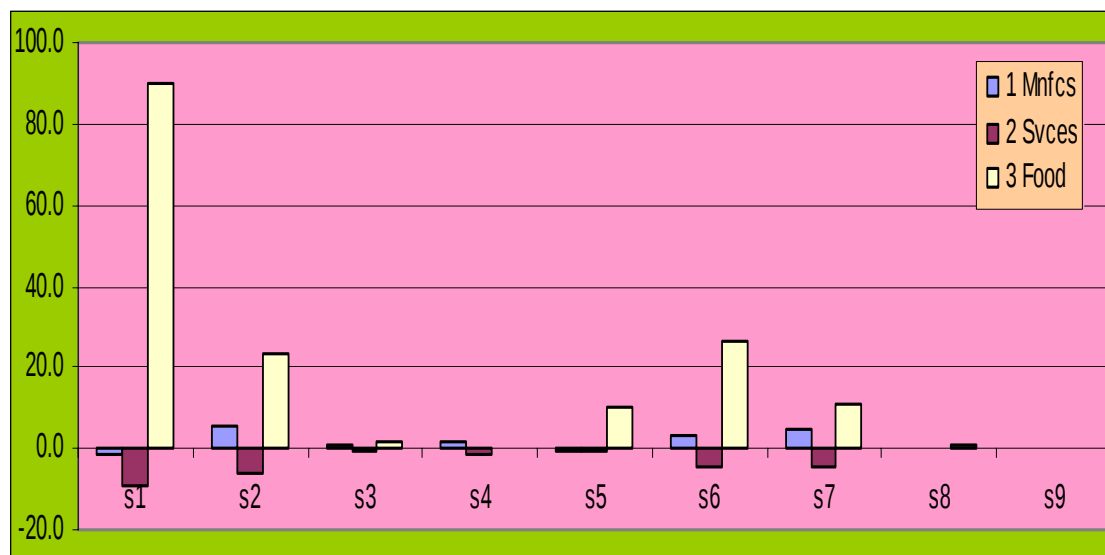
Source: Author calculations.

According to Figure 18, there shows the data of the Total trade bilateral import at world prices index, or importing to Thailand, measured in % change. To see the Thailand FTA impact on importing goods, from this point we can make some specific summary based on the data, as following:

1. As a total of Figure 18, we found that all of categories are increased in all of scenarios. It is signifiabile that Thailand import 3-main categories from out side especially in the food sector.

2. For the Thailand aspect, Thailand import a lot of food from out-sides. And imported too much from Japan. Furthermore, Thailand also imports food from EU, ASEAN-CH, and S7 respectively.
3. Generally speaking, Thailand will lose in the importing side because of in every scenarios shows that Thailand was import from out-side. But in another hand, compared with the export side to this index, there were shown in amount of % change as a low value more than Thailand export to the foreign. (See continuing in the Figure 19)

Figure 19. Total trade bilateral export at world prices (%change): [Export from tha]



Source: Author calculations.

According to Figure 19, it is the last figure of this simulation to shows the data of the Total trade bilateral export at world prices index, or exporting to Thailand, measured in % change. To see the Thailand FTA impact on exporting goods, from this point we can make some specific summary based on the data, as following:

1. From these data in the figure, there is a significant of a summary that Thailand can export foods to all of FTA members especially to Japan.

2. The level of Food category in S1 stated a high of level of % change as a meaning that Thailand will gain a lot on food sector when start FTA with Japan. While Thailand also will benefit FTA on food sector with EU; ASEAN-CH; NAFTA; EFTA; Australia; and New Zealand respectively.
3. On the other hand, Thailand will lose FTA on service sector to Japan; ASEAN-CH; NAFTA; EU; BIMSTEC; Australia; and EFTA respectively.

IV.2 Conclusions

The purpose of this thesis is to present quantitative impacts of Thailand FTA and trade liberalization. This analysis employed a CGE model of global trade to evaluate, since a CEG model is extensively used for the analysis of FTA. In this thesis, we apply GTAP database and model. The GTAP database itself was used to simulate the potential impact on Thailand FTA. Also, the welfare impacts of Thailand of all of regions in the thesis scenarios [Thailand + Japan, Thailand + ASEAN-CH, Thailand + Australia, Thailand + BIMSTEC, Thailand + EFTA, Thailand + EU, Thailand + NAFTA, Thailand + New Zealand, and Thailand + Peru] were reported.

The GTAP model simulations were help us to identify that what region may benefit and what region may suffer losses, in other words “winner and loser” aspect. It was found that all FTA members would benefit with a Thailand FTA. Also FTA liberalization may increase economic efficiency and enhance economic growth. Moreover in the long term we expected that all FTA members increase investment to growing sectors and bring economic growth. The GTAP model simulation however, dose not make much effort to forecast the future for trade liberalization.

Nevertheless, the conventional simulations by a GTAP model in this thesis have shown that trade liberalization measures including tariff reductions would stimulate trade with lower prices on tradable goods. Also, the result would increases in exporting countries, and increasing access to the markets of trading partners. On the other hand,

domestic production resources (i.e. land, capital, labor) would be used more efficiently in importing countries. As an impact, we are expected to result in the expansion of production and an increase in income and welfare.

Moreover, an FTA can be a measure political and diplomatic for government to designate the direction of a country.

However, there is no denying for global trade liberalization to all countries and especially Thailand. FTA members will encounter difficulties and obstacles as the country proceeds with the restructure and adjustment processes so as to keep pace with the rapid changes of the more open trading environment. But it is also clear that with appropriate adjustments, there can be considerable gains for both in terms of increasing resource base and expanding market opportunities; and in terms of acquiring the needed technological know-how, and expertise needed to further development; and prosper.

Finally, Thailand will continue to intensify all efforts to upgrade domestic resources, industries and prepare for the challenges ahead. Thailand will also remain fully committed to the strengthening of economic cooperation and partnership with all trading partners. And Thailand actively participates in the international trading fora in order to create a free and fair global trading system. Indeed, it is through this dual track approach that Thailand can assure itself of continual growth and development and succeed expeditiously and to keep the honour of Thailand's position within the global arena.

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Appendix

Appendix 1. Aggregation of sectors

Sectors in the thesis experiments

<u>Sector Code</u>	<u>Comprising Description</u>
Mnfcs	Shoe polish and other manufact
Svces	Services and activities NES
Food	Food and Ag, inc. onion pizzas

Mapping of sectors

<u>sector Code</u>	<u>Description</u>	<u>sector Code</u>
pdr	Paddy rice	Food
wht	Wheat	Food
gro	Cereal grains nec	Food
v_f	Vegetables, fruit, nuts	Food
osd	Oil seeds	Food
c_b	Sugar cane, sugar beet	Food
pfb	Plant-based fibers	Food
ocr	Crops nec	Food
ctl	Cattle, sheep, goats, horses	Food
oap	Animal products nec	Food
rmk	Raw milk	Food
wol	Wool, silk-worm cocoons	Food
for	Forestry	Mnfcs
fsh	Fishing	Mnfcs
col	Coal	Mnfcs
oil	Oil	Mnfcs
gas	Gas	Mnfcs
omn	Minerals nec	Mnfcs
cmt	Meat: cattle, sheep, goats, horse	Food
omt	Meat products nec	Food
vol	Vegetable oils and fats	Food
mil	Dairy products	Food
pcr	Processed rice	Food
sgr	Sugar	Food
ofd	Food products nec	Food
b_t	Beverages and tobacco products	Food
tex	Textiles	Mnfcs
wap	Wearing apparel	Mnfcs
lea	Leather products	Mnfcs
lum	Wood products	Mnfcs
ppp	Paper products, publishing	Mnfcs
p_c	Petroleum, coal products	Mnfcs
crp	Chemical, rubber, plastic prods	Mnfcs

nmm	Mineral products nec	Mnfcs
i_s	Ferrous metals	Mnfcs
nfm	Metals nec	Mnfcs
fmp	Metal products	Mnfcs
mvh	Motor vehicles and parts	Mnfcs
otn	Transport equipment nec	Mnfcs
ele	Electronic equipment	Mnfcs
ome	Machinery and equipment nec	Mnfcs
omf	Manufactures nec	Mnfcs
ely	Electricity	Svces
gdt	Gas manufacture, distribution	Svces
wtr	Water	Svces
cns	Construction	Svces
trd	Trade	Svces
otp	Transport nec	Svces
wtp	Sea transport	Svces
atp	Air transport	Svces
cmn	Communication	Svces
ofi	Financial services nec	Svces
isr	Insurance	Svces
obs	Business services nec	Svces
ros	Recreation and other services	Svces
osg	PubAdmin/Defence/Health/Educat	Svces
dwe	Dwellings	Svces

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Appendix 2. Aggregation of regions

Regions in the thesis experiments

<u>New Code</u>	<u>Region Description</u>
THA	Thailand
JP	Japan
ASEANCH	ASEAN-China
Aus	Australia
BIMSTEC	BIMST-EC
EFTA	European Free Trade Associations
EU	European Union
NAFTA	North America Free Trade Area
NewZ	New Zealand
Pru	Peru
ROW	All other regions

Mapping of regions

<u>Old Code</u>	<u>Region Description</u>	<u>New Code</u>
aus	Australia	Aus
nzl	New Zealand	NewZ
chn	China	ASEANCH

hkg	Hong Kong	ROW
jpn	Japan	JP
kor	Korea	ROW
tw	Taiwan	ROW
idn	Indonesia	ASEANCH
mys	Malaysia	ASEANCH
phl	Philippines	ASEANCH
sgp	Singapore	ASEANCH
tha	Thailand	THA
vn	Vietnam	ASEANCH
bgd	Bangladesh	BIMSTEC
ind	India	BIMSTEC
lka	Sri Lanka	BIMSTEC
xsa	Rest of South Asia	ROW
can	Canada	NAFTA
usa	United States	NAFTA
mex	Mexico	NAFTA
xcm	Central America, Caribbean	ROW
col	Colombia	ROW
per	Peru	Pru
ven	Venezuela	ROW
xap	Rest of Andean Pact	ROW
arg	Argentina	ROW
bra	Brazil	ROW
chl	Chile	ROW
ury	Uruguay	ROW
xsm	Rest of South America	ROW
aut	Austria	EU
bel	Belgium	EU
dnk	Denmark	EU
fin	Finland	EU
fra	France	EU
deu	Germany	EU
gbr	United Kingdom	EU
grc	Greece	EU
irl	Ireland	EFTA
ita	Italy	EU
lux	Luxembourg	EU
nld	Netherlands	EU
prt	Portugal	EU
esp	Spain	EU
swe	Sweden	EU
che	Switzerland	EFTA
xef	Rest of Eur Free Trade Area	ROW
alb	Albania	ROW
bgr	Bulgaria	ROW
hrv	Croatia	ROW
cze	Czech Republic	ROW
hun	Hungary	ROW
mlt	Malta	ROW
pol	Poland	ROW
rom	Romania	ROW
svk	Slovakia	ROW
svn	Slovenia	ROW
est	Estonia	ROW
lva	Latvia	ROW
ltu	Lithuania	ROW

rus	Russian Federation	ROW
xsu	Rest of Former Soviet Union	ROW
cyp	Cyprus	ROW
tur	Turkey	ROW
xme	Rest of Middle East	ROW
mar	Morocco	ROW
xnf	Rest of North Africa	ROW
bwa	Botswana	ROW
xsc	Rest of South Afr C Union	ROW
mwi	Malawi	ROW
moz	Mozambique	ROW
tza	Tanzania	ROW
zmb	Zambia	ROW
zwe	Zimbabwe	ROW
xsf	Other Southern Africa	ROW
uga	Uganda	ROW
xss	Rest of Sub-Saharan Africa	ROW
xrw	Rest of World	ROW