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The Macro and Sectoral Significance of an FTAAP

by

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Abstract

This paper discusses the relative significance of a Free Trade Area of the Asia-Pacific (FTAAP) at the macro and sectoral levels. The impacts of trade liberalization and facilitation measures in an FTAAP are studied using a Computable General Equilibrium (CGE) model of global trade. The dynamic aspects of capital formation and productivity improvements are incorporated into a standard static model based on the most updated version of a global trade database. Real GDP of the APEC economies will be boosted on average by 1.9 percent by trade liberalization measures and 0.4 percent by trade facilitation measures, respectively. However, because of differences in the trade structure of the economies, the relative macroeconomic benefits of the economies from several regional trade agreements are shown to differ largely. Moreover, the relative significance of negative impacts in sensitive sectors such as agriculture may also vary according to several scenarios of trade liberalization.

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I. Introduction

In 1994, the APEC Economic Leaders agreed in the "APEC Economic Leaders' Declaration of Common Resolve (Bogor Declaration)" to announce their commitment to complete the achievement of their goal of free and open trade and investment in the Asia-Pacific no later than the year 2010 for the industrialized economies and 2020 for the developing economies. It reflected the basic principle of APEC cooperation: voluntary participation, comprehensiveness, mutual respect, and consensus-based decision making.

Since its establishment in 1994, the APEC Economic Committee has undertaken a broad range of analysis in support of APEC's work on trade and investment liberalization and facilitation. The first study[1] using computable general equilibrium (CGE) model simulation concluded in 1997 that implementation of the Manila Action Plan for APEC (MAPA) by the APEC economies would bring substantial income and trade benefits. It was followed by the Trade and Investment Liberalization and Facilitation (TILF) project,[2] which was carried out as the flagship project of the APEC Economic Committee for 2001-2002, and the accomplishment of the project has become an important factor in the drive to achieve the Bogor Goals.

Moreover, responding to the instructions of the APEC Leaders, an analytical study by officials in 2009 showed that there are significant economic benefits from a Free Trade Area of the Asia-Pacific (FTAAP). Since we are now in 2010, the target year of the Bogor Goals for the industrialized economies, the impacts of an FTAAP should be worth looking at from various angles.

On the other hand, Japan's new political party in power, the Democratic Party of Japan (DPJ), came into office in 2009, has included the establishment of an FTAAP as a key element in its "new growth strategy" decided in June 2010. In conjunction with other growth measures, the impacts of an FTAAP were highlighted. Moreover, the strategy also called for the creation of a fundamental policy on comprehensive economic partnership by autumn this year.

The purpose of this paper is to re-visit the rising concerns on the impacts of an FTAAP and to update the numerical estimates on those impacts by conventional CGE model simulations.[3] In addition, the relative significance of an FTAAP is analyzed from

[1] See APEC (1997).
[2] See APEC (2002).
[3] The simulations throughout this paper were carried out to assess the impact of the removal of

the perspective of various participants in regional trade agreements and in relation to sensitive sectors such as agriculture.

The remaining part of this paper is organized as follows. In Chapter II, the framework of a CGE model employed for the simulation experiments in this paper is presented. Chapter III discusses the impacts of APEC trade liberalization and facilitation, and Chapter IV compares the impacts of APEC trade liberalization with those of other regional trade agreements. Chapter V examines the relative significance of trade liberalization in agricultural sectors, and the paper concludes with Chapter VI.

II. 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 paper. A CGE model numerically simulates the general equilibrium structure of the economy. It is built on the Walrasian general equilibrium system, the central idea of which is that market demand equals supply for all commodities at a set of relative prices. 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 1) the partial equilibrium model, which is not economy-wide, 2) the macroeconomic model, which is not multi-sectoral, and 3) 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.

On the other hand, it must be noted that the estimated economic impact of a CGE model is not a forecast. As described in Dee, Geisler, and Watts (1996), economic policy measures will be implemented over time and adjustments to those changes may take time. During the course of such adjustments, other economic changes will also take place. However, those changes, including economic growth and structural changes in trade and industries, are not taken into account in the current analysis. The model

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import protection on and trade costs of goods. Trade liberalization and facilitation in service sectors are not included. Other measures, such as those for investment liberalization and free movement of labor, are not explicitly considered.

simulation shows the differences at a certain point in time between when trade liberalization and facilitation measures were implemented and when they were not.[4]

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[5]-and thus describes realistic trade developments.

Among others, the database and the standard version of a model by the Global Trade Analysis Project (GTAP)[6] are utilized as a basis for the simulation experiments in this paper. The standard version of the GTAP model includes several key assumptions.[7] It must be noted that the amount of total labor-one primary factor of production-among other factors, 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.

A common criticism has often been that a standard CGE model focuses on evaluation of static efficiency improvements, and therefore the dynamic effects among production, income, and savings and investment are not captured. In fact, concerning the dynamic impact of trade liberalization, the growth effects through productivity gains and capital accumulation have been pointed out. In this paper, certain dynamic aspects are studied in the model simulations.

One deals with the dynamic aspects of capital formation by modifying the

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[4] Although the structure of the model is non-linear, simulation outcomes tend to be almost linear to external shocks. The impact of trade liberalization is estimated to be not so much different, based either on the current or future economic structures incorporating growth effects as far as it can be estimated in terms of rates of change, given that the general equilibrium elasticities are unchanged.

[5] See Armington (1969) for a description of the Armington assumption.

[6] 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 for APEC (MAPA) 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 a description of the GTAP database and model.

[7] It must be noted that the outcomes of model simulations may vary according to these macroeconomic assumptions and closures. These variations are suggested not just in terms of magnitude but also in direction. See, for example, Kawasaki (1999) for a diagnostic analysis of such model sensitivities in case of simulations on the impact of trade liberalization.

standard version of the GTAP model. Two mechanisms are considered in this paper. First, the important "dynamic" effects of capital accumulation are introduced[8] into the standard static model. The initial increase in income is assumed to increase savings (a fixed share of additional income is saved) and investment. The induced savings and investment (larger capital stock) in turn link to production capacities and cause a further increase in income. Second, the trade balance is endogenously determined and international capital movement is allowed. It is assumed that the expected rate of return on capital would be equalized among the regions.

In addition to these, pro-competitive productivity growth effects[9] are also investigated in the model simulation. It is assumed that productivity of domestic industries would increase to compensate for the lower import prices. Such a rate of productivity increase is set as equal to the rates of change in import prices weighted by a share of imports over total production, including domestic goods.

The GTAP database provides fairly arranged data of countries and regions in which Japan is highly interested, namely the Asian Newly Industrializing Economies (NIEs), the Association of Southeast Asian Nations (ASEAN) countries, among others. One notable distinguishing feature of the model is its function to separately evaluate the mutual dependence between Japan and these economies. The GTAP database currently consists of 57 disaggregated sectors and 113 economies,[10] which are aggregated into the appropriate version for simulations. In this paper, as shown in Table 1, economies are aggregated into 27 areas, and 19 areas are allocated to APEC economies. The APEC economies are disaggregated individually where data is available (Data for Brunei Darussalam and Papua New Guinea is not available). Industries/commodities are aggregated into 15, in accordance with the medium classifications of standard national

[8] See Francois, McDonald, and Nordstrom (1996) for the methodology to implement this mechanism into the GTAP model. They explore the interaction between trade policy and capital accumulation in the GTAP model. According to the growth theory, a medium-run growth or accumulation effect induces additional savings and investment, which yields more output. In general, a permanent shock to the GDP is translated into a shock to the steady-state level of capital. The magnitude of this effect crucially depends on the assumed underlying saving behavior. Under the assumption of a fixed saving ratio, the change in steady-state capital stock is proportionate to the change in the steady-state level of GDP.

[9] For examples, see Itakura, Hertel, and Reimer (2003) regarding incorporating productivity linkages in general into the GTAP model simulations, and Ianchovichina, Binkley, and Hertel (2000) for incorporating pro-competitive productivity effects into a CGE model with an assumption of imperfect competition.

[10] This is Version 7 of the database, the beta version of which was released in December 2008, although the base year is 2004.

Table 1: Regional and Commodity Aggregation

Countries and Regions		Commodities/Industries	
JPN	Japan	AFF	Agriculture, Forestry and Fisheries
CHN	China	MNG	Mining
KOR	Korea	PFD	Processed foods
HKG	Hong Kong, China	TXL	Textiles and Apparel
TWN	Chinese Taipei	CHM	Chemical products
SGP	Singapore	MTL	Metals and metal products
IDN	Indonesia	TRN	Transport equipment
MYS	Malaysia	ELE	Electronic equipment
PHL	the Philippines	OME	Other machinery and equipment
THA	Thailand	OMF	Other manufacturing
VNM	Viet Nam	CNS	Construction
LAO	Lao	EGW	Electricity, Gas and Water
KHM	Cambodia	T_T	Transport
MMR	Myanmar	OSP	Other private services
IND	India	OSG	Public services
AUS	Australia		
NZL	New Zealand		
OAO	Other Asia and Oceania		
USA	USA		
CAN	Canada		
MEX	Mexico		
CHL	Chile		
PER	Peru		
OAM	Other Ameica		
RUS	Russia		
EUM	European Union		
ROW	Rest of the World		

Source: GTAP database 7

accounts (SNA).[11]

III. Impacts of Trade Liberalization and Facilitation in Asia-Pacific

1. Magnitudes of Trade Protection and Cost

The impact of trade liberalization and facilitation can more or less be determined by actual trade structures and the degree of import liberalization and facilitation, in addition to the comparative advantage of the sectors among regions,

[11] See Annex Tables 1-A and 1-B for the concordance of these aggregations and the classification in the GTAP database.

Table 2: Trade Protection and Cost

(%)

	Protection	Costs		
		Administrative	Labor and Capital	Total
Japan	4.0	0.2	1.1	1.4
China	6.2	0.5	1.9	2.3
Korea	6.3	0.3	2.0	2.3
Hong Kong, China	0.0	0.2	1.8	2.0
Chinese Taipei	4.2	0.3	1.8	2.0
Singapore	0.0	0.3	1.8	2.1
Indonesia	4.3	0.3	0.8	1.1
Malaysia	5.9	0.4	1.6	2.0
the Philippines	3.5	0.7	2.0	2.6
Thailand	9.1	0.3	1.2	1.4
Viet Nam	12.9	0.3	3.0	3.3
Lao	10.8	n.a	n.a	n.a
Cambodia	14.9	n.a	n.a	n.a
Myanmar	4.0	n.a	n.a	n.a
India	15.1	0.3	1.3	1.6
Australia	3.9	0.4	2.0	2.4
New Zealand	3.1	0.3	2.1	2.4
USA	1.7	0.2	1.4	1.6
Canada	1.5	0.1	0.9	1.0
Mexico	3.0	0.4	0.9	1.3
Chile	1.9	0.2	1.3	1.4
Peru	8.7	0.3	1.6	2.0
Russia	9.8	0.4	1.0	1.4
APEC	3.6	0.3	1.5	1.8
World	3.3	n.a	n.a	n.a

Source: GTAP database 7 and ESRI (2010)

which is suggested to be a key factor in standard trade theory. The magnitudes of trade protection and cost assumed in this study are shown in Table 2.

Trade liberalization measures are to remove trade protection such as import tariffs and quotas. Trade protection data in this paper are derived from the current GTAP database as they are, without any modification. They are expressed in the form of ad valorem equivalent, tariff barriers, and non-tariff barriers. The best-quality data are those relating to tariffs. Non-tariff information is most complete for agriculture and textiles and apparel. Data for subsidies are also available, distinguishing those for factor-based, intermediates, and ordinary output, but are not comprehensive. Protection of the service sector is especially difficult to quantify, and is mostly neglected in the current database.

Trade liberalization has widely been promoted in the world economy during the last several decades. However, according to the most updated version of the GTAP database, an import protection of around 3.3 percent remained in world trade on average in 2004 and 3.6 percent in APEC economies, respectively.[12] By region, trade barriers are lower in North America and the EU, and free trade is mostly realized in Hong Kong, China; and Singapore. However, higher trade protection is still observed, mainly in developing economies. By commodities and industries, although variations are smaller compared with regional differences, trade protection is higher in primary products and food, followed by textiles and apparel. Detailed data are available in Annex Table 2.

On the other hand, trade facilitation measures are to reduce non-tariff barriers, lowering the costs of administration, standardization, technology, information, transaction, labor, communication, insurance, and financing. Trade cost data in this paper are estimated from such cost for trading across borders in terms of US dollars shown in *Doing Business,* published by the World Bank. *Doing Business* compiles procedural requirements for exporting and importing a standardized cargo of goods by ocean transport. For importing goods, those included procedures range from the vessel's arrival at the port of entry to the cargo's delivery at the warehouse. Trade cost measures all the fees associated with completing the procedures to export or import the goods. These include costs for 1) document preparation, 2) customs clearance and technical control, 3) ports and terminal handling, and 4) inland transportation and handling. However, the cost measure does not include tariffs or trade taxes.

Those four costs are further broken down between administrative cost and production factor cost in light of the model structure. Administrative cost is not necessarily tariffs or taxes; it's composed of procedural and administrative fees those are decided by laws, rules, and others and paid more or less compulsorily. The remaining costs are attributed to production factors such as labor and capital of transportation industries. Detailed background data and the methodology of estimating trade cost are discussed in Annex 2.

Estimated trade cost is 1.8 percent in the APEC economies on average, ranging from one to three percent, which accounts for half of trade protection in the APEC economies. This is not so much different from those in the past studies.[13] In trade cost,

[12] It may be noted that this figure is weighted by the actual volume of imports. If the import volume of certain products with higher import protection is smaller, an average level of import protection in this measurement would be calculated to be somewhat lower.

[13] Among others, APEC (1997) assumed trade facilitation measures committed in Individual Action Plans in 1996 would reduce trade cost by one to two percent. APEC leaders committed in 2001 to

administrative cost is a relatively smaller portion in most economies, but it is not negligible. The difference in trade cost among the economies is much smaller than that of trade protection, which ranges between zero to double digits. Strong correlation is not found between trade cost and degree of economic development. In other words, trade protection is relatively higher than trade cost in developing economies, while trade cost is still sizable in developed economies, where trade protection is relatively lower.

2. Methodology for Model Simulations

In addition to the quantification of trade liberalization and facilitation measures, the methodology of incorporating those measures in simulation studies putting exogenous shocks into model structure must carefully be designed. In the case of trade liberalization measures, import tax in the following equation (a) is removed for the import of good (i) from exporting region (r) to importing region (s).

(a) pms(i,r,s) = tms(i,r,s) + pcif(i,r,s)
pms: Import prices
tms: Import tax
pcif: CIF prices

As for trade facilitation measures, import-augmenting technological improvements[14] have frequently been used to incorporate exogenous shocks in the recent GTAP model simulations. However, as shown before, administrative costs are not negligible, which cannot entirely be attributed to productivity and technology, and whose key feature is much closer to a tax. Therefore, in this paper, import tax is reduced[15] to evaluate the impacts, removing the administrative part of trade cost. Moreover, other trade costs are likely generated by the transportation sector but not by the other individual industries. Therefore, labor and capital production cost of the global transportation sector is assumed to be cut in half of measured cost by technological improvements in the transportation sector in the following equation (b) rather than by import-augmented technology of individual goods producing industries.

(b) pcif(i,r,s) = FOBSHR(i,r,s) * pfob(i,r,s) + TRNSHR(i,r,s) * [pt - atr(i,r,s)]
pfob: FOB prices

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implement the APEC Trade Facilitation Principles (Shanghai Accord), reducing trade cost by five percent of transaction costs by 2006.

[14] This variable expresses as ams(i,r,s) in the standard GTAP model.

[15] When the tax variable is shocked, tax revenue changes in the model simulation, an outcome not likely in the case of trade facilitation. However, this may cause a minor distortion at the national

Table 3: Real GDP Gains from an FTAAP

(%)

	Liberalitaion	Facilitation	Total
Japan	0.9	0.2	1.1
China	6.5	1.0	7.5
Korea	7.5	1.0	8.5
Hong Kong, China	2.8	1.0	3.8
Chinese Taipei	7.3	1.5	8.7
Singapore	2.8	1.9	4.7
Indonesia	3.7	0.7	4.4
Malaysia	12.6	1.9	14.5
the Philippines	6.8	2.3	9.1
Thailand	25.1	1.9	27.0
Viet Nam	37.3	2.8	40.1
Lao	2.0	0.2	2.1
Cambodia	3.6	0.5	4.1
Myanmar	1.5	0.3	1.8
India	-0.3	0.1	-0.2
Australia	2.4	0.6	3.0
New Zealand	3.4	1.1	4.5
USA	0.3	0.2	0.5
Canada	0.6	0.4	1.1
Mexico	4.5	0.7	5.2
Chile	1.5	0.6	2.0
Peru	1.9	0.3	2.2
Russia	4.9	0.4	5.3
EU	0.2	0.0	0.2
APEC	1.9	0.4	2.3

Source: Author's simulations

pt: Price of global shipping services
atr: Technology change in global shipping services
FOBSHR: FOB share in import values
TRANSHR: Transportation cost shares in import values

3. Simulation Outcomes

Real GDP gains from trade liberalization and facilitation in Asia-Pacific is shown in Table 3. Real GDP of the APEC economies on average will be boosted by 1.9 percent by trade liberalization measures. It is further stimulated by 0.4 percent by trade facilitation measures.

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macro level since the government's income and expenditure behaviors are endogenous in the model.

According to conventional simulations by a CGE model of global trade, trade liberalization measures, including tariff reductions, will stimulate trade by lowering the prices of tradable goods. This will result in increases in the national output of exporting countries while increasing access to the market of trading partners. Meanwhile, domestic production resources-land, capital, labor, and intermediate inputs-will be used more efficiently in importing countries, in particular, when domestic distortions, including those due to trade barriers, are reduced. These combined effects-one from foreign markets and the other from the domestic market-are expected to result in the expansion of production and an increase in income and welfare. In addition, economic benefits would be expanded by dynamic impacts through capital formation mechanisms and productivity improvements. Although negative impacts due to trade diversion effects and the terms of trade effects are suggested by theoretical studies, empirical analyses, including model simulations, have generally indicated macroeconomic benefits from trade liberalization.

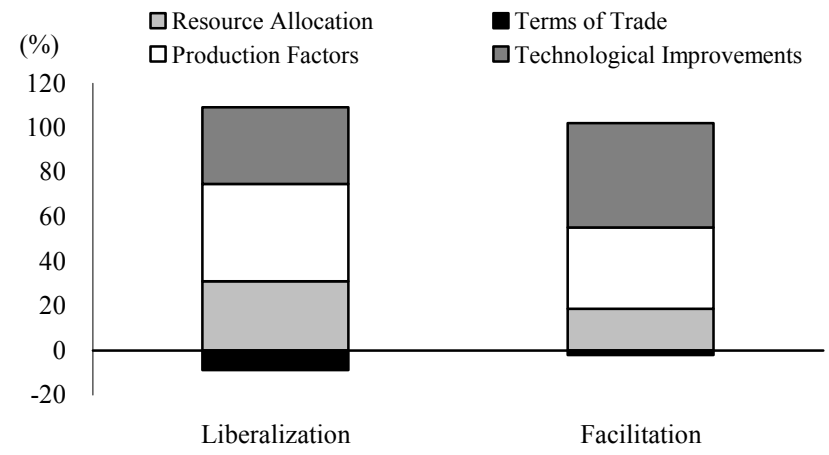
The size of macroeconomic benefits from trade liberalization depends to a large extent on the degree of liberalization, i.e., the degree of protection prior to trade liberalization. As already discussed, there tends to be more scope to liberalize trade in developing economies; as shown in Table 3, they would benefit more from trade liberalization. In terms of changes in real GDP, several ASEAN countries such as Malaysia, Thailand, and Viet Nam are suggested to enjoy relatively larger gains[16], while developed APEC economies such as Japan and the United States are not likely to experience significantly larger gains. Trade liberalization is expected to correct income differentials among the economies.

On the other hand, the macroeconomic benefits from trade facilitation measures are relatively significant in such developed economies, though it is less important in many developing economies. This is primarily because of the relative degree of trade liberalization and facilitation measures discussed above.

Moreover, breaking down the welfare gains of the APEC economies as a whole from trade liberalization and facilitation, as shown in Chart 1, sources of those macroeconomic benefits are shown to be somewhat different between the two measures. In the case of trade liberalization, the welfare gains measured in terms of changes in

[16] It must be noted that the outcomes of model simulations may vary according to macroeconomic assumptions and closures. These variations are suggested not just in terms of magnitude but also in direction. See, for example, Kawasaki (1999) for a diagnostic analysis of such model sensitivities in case of simulations on the impact of trade liberalization. Relatively larger macroeconomic benefits are estimated in developing economies when the dynamic aspects of capital formation and

Chart 1: Compositions of Welfare Gains



Source: Author's Simulations

Equivalent Variation (EV) are primarily given by more efficient resource allocation, while technological improvements are expected to be key drivers of those macroeconomic gains in the case of trade facilitation.

IV. Relative Significance of Regional Trade Agreements

In addition to the movements of global trade liberalization, regional efforts have been made through Regional Trade Agreements (RTAs) and bilateral Free Trade Agreements (FTAs). There are several regional agreements existing in the APEC economies, which include following:

- North American Free Trade Agreement (NAFTA) came into force in 1994
- China - ASEAN Free Trade Agreement came into effect in 2005 on goods and 2007 on services respectively
- Japan ASEAN Comprehensive Economic Partnership Agreement came into force in 2008
- Korea-ASEAN Free Trade Agreement completed in 2009
- ASEAN - Australia - New Zealand Free Trade Agreement (AANZFTA) signed in 2009
- Trans-Pacific Strategic Economic Partnership Agreement (P4 Agreement) between New Zealand, Brunei, Chile and Singapore concluded in 2005

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pro-competitive productivity growth effects are incorporated.

Moreover, other regional agreements are suggested or proposed. Those include:

- East Asia Free Trade Agreement between ASEAN - China, Japan and Korea (EAFTA)
- Comprehensive Economic Partnership in East Asia (CEPEA) covering ASEAN, Australia, China, India, Japan, Korea, and New Zealand
- Expansion of the Trans-Pacific Strategic Economic Partnership Agreement (TPP) that the United States, Australia, Peru, and Viet Nam joining the P4 Agreement

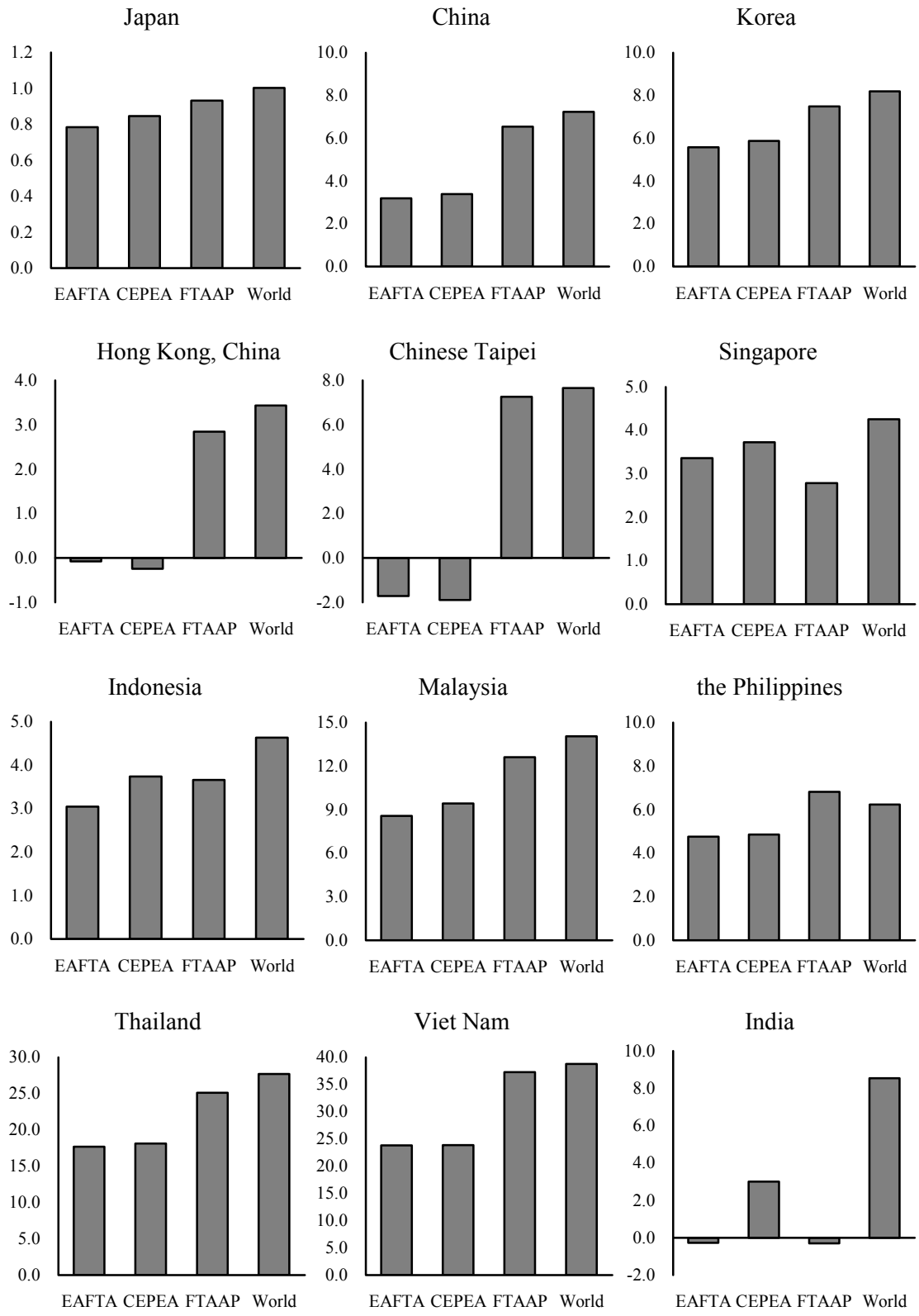
It has generally been suggested by model simulation studies that wider trade liberalization in terms of the coverage of economies would generate larger macroeconomic benefits. However, considering the differences in trade structure of the economies, relative benefits of the economies from several regional agreements may well differ significantly. From the point of view of prioritization and choice of such regional agreements, it is worth looking at such differences in macroeconomic benefits.

Real GDP gains from trade liberalization in three regional agreements of 1) EAFTA, 2) CEPEA and 3) Free Trade Area of the Asia-Pacific (FTAAP)[17] are compared in Chart 2 with those of trade liberalization in the world without any regional exceptions.

For Japan, trade liberalization in EAFTA and CEPEA would be enough to achieve sizable benefits in comparison with that in FTAAP and the world. This is because China is the most important trading partner for Japan. By contrast, it is estimated that Korea and, especially, China would have to extend trade liberalization to a larger FTAAP. For China, the United States is far more important than other economies. Meanwhile, Australia may maximize its benefits from trade liberalization in CEPEA rather than expanding to FTAAP. For Australia, the United States and Canada are more likely competitors in particular agricultural sectors.

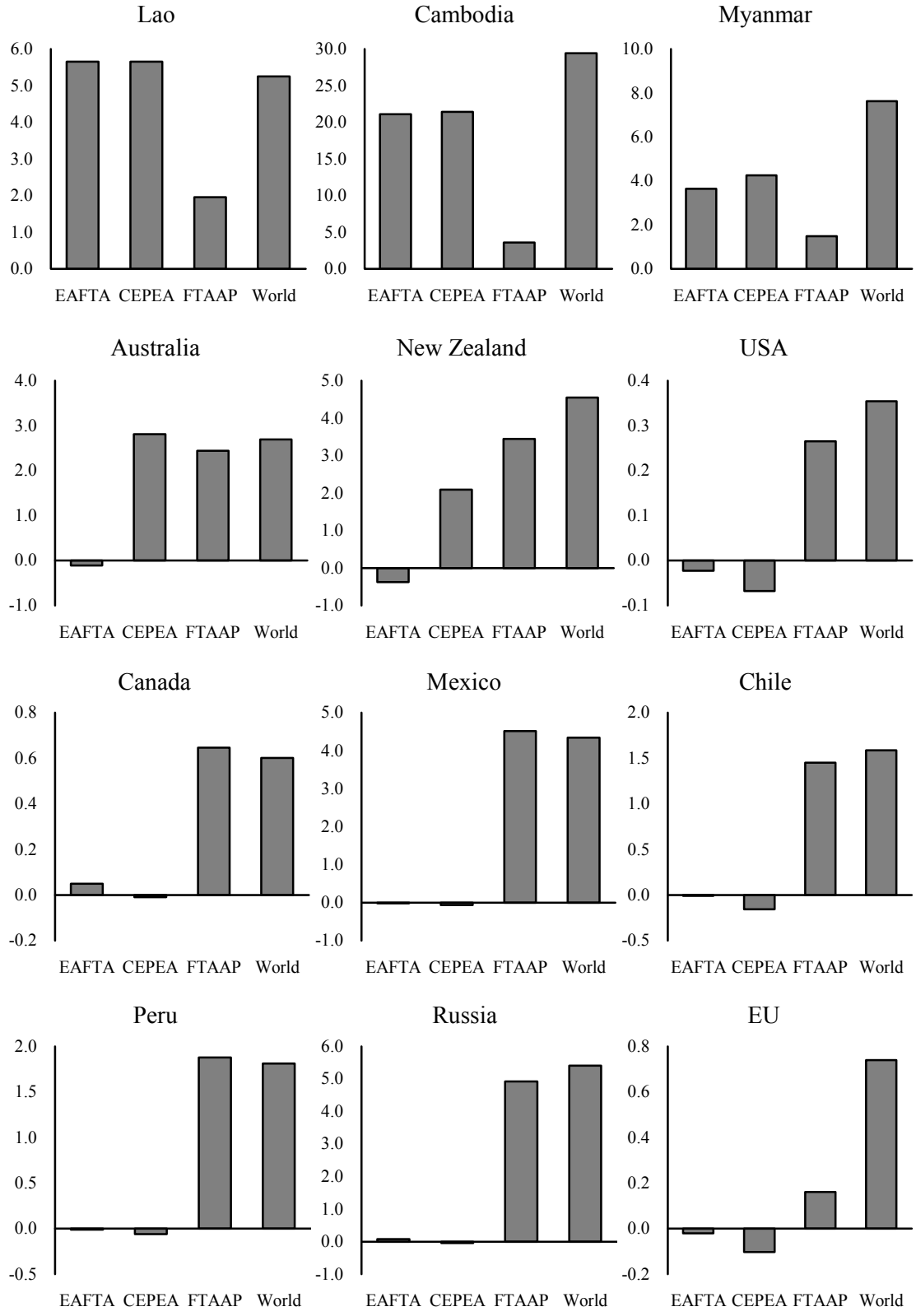
[17] In this simulation, it is assumed that all the APEC economies would liberalize their trade not just from the APEC economies but also from the rest of the world in an "open" manner in the case of FTAAP. If the APEC economies would liberalize trade just within the APEC member economies, the impacts should be different, especially on the other economies. For example, it is estimated that EU would no longer gain in real GDP by 0.16 percent shown in Chart 2, but could lose by 0.32 percent.

Chart 2: Real GDP Changes in Regional Trade Agreements (Percent)



Source: Author's Simulation

Chart 2: Real GDP Changes in Regional Trade Agreements (Percent, Cont.)



Source: Author's simulations

V. Impacts on Sensitive Sectors

The impact of structural reform measures, including trade liberalization, would be more widely observed at sectoral levels compared with those changes in income and production at the macro level. In particular, trade liberalization may result in a realignment of regional production. In principle, that would be in accordance with the comparative advantage of the regions. According to conventional simulations by a CGE model of global trade, developing and transition economies are expected to expand production of labor-intensive manufactured products as a result of broadly based trade liberalization measures. On the other hand, developed economies are expected to expand production in the capital- and technology-intensive manufacturing sectors, while in the geographically larger countries agricultural and food industries would expand production.

An estimated impact on the structure of sectoral production according to global trade liberalization is shown in Annex Table 5. As a result of global trade liberalization, output will increase in transport equipment in Japan, in textiles and apparel in ASEAN countries, China, and Asian NIEs, and in agriculture and food industries in Australia and North America.

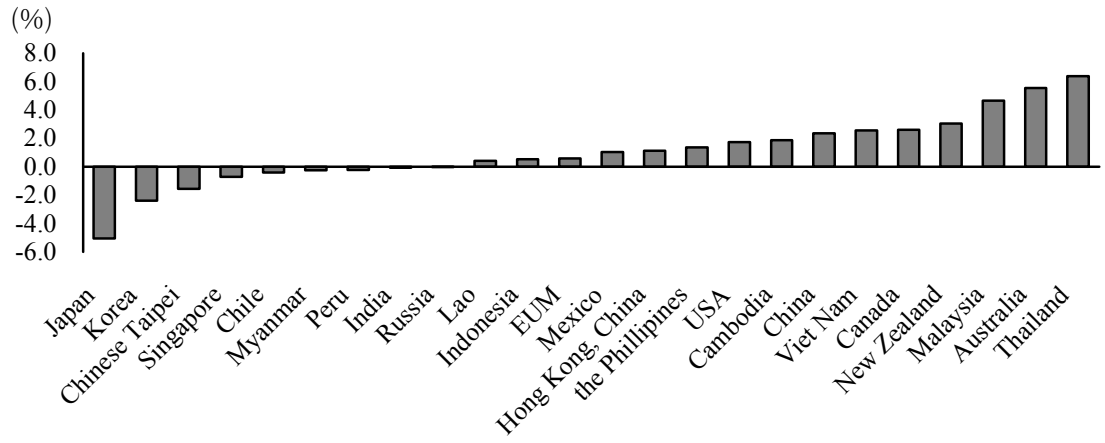
It is indicated that not just "winners" but also "losers" may emerge from implementing trade liberalization measures. It should be noted that the reallocation of resources to more productive uses usually involves some adjustment costs,[18] including the displacement of employment across industries within the economies. To enjoy the macroeconomic benefits from trade liberalization, successful structural adjustments would be required.

Nonetheless, the negative impacts on sensitive sectors are worrisome. Among others, changes in the productions of primary industries, i.e., agriculture, fisheries and forestry, by trade liberalization in FTAAP are shown in Chart 3. Primary production will decrease the most in Japan, followed by Korea and Chinese Taipei. Actually Japanese policymakers and agricultural industries have worried about those possible damages and have expressed objections to trade liberalization in the sector.

The impact of partial and preferential trade liberalization has generally been shown to be limited compared with that of much wider trade liberalization without any discriminative treatment in earlier studies by CGE model simulations. However, in the

[18] These adjustment costs are not considered in the current model simulations.

Chart 3: Changes in the Productions of Primary Industries



Source: Author's simulations

negotiation process for trade liberalization, it is possible that certain economies prefer trade liberalization in limited sectors to protect their less-competitive sectors. From the perspective of interests of domestic industries and policymakers, it is also worth looking at the relative significance of trade liberalization in such sensitive sectors, according to several scenarios of trade liberalization.

Therefore, the relative costs and benefits of Japan's regional trade agreements are examined. They are compared in terms of reduction in primary production and real GDP gains. As discussed above, in terms of Japanese real GDP gains, China is ranked as the top trading partner of Japan. Japan's real GDP gains are estimated to be not so different among four cases of trade liberalization in EAFTA, CEPEA, FTAAP, and the world as a whole once China is included in regional and global trade agreements.

On the other hand, as shown in Chart 4-A, the Japanese loss in primary production is relatively larger in the case of trade liberalization in FTAAP and the world in comparison with EAETA and CEPEA. This is because Japan would lose more primary production from trade liberalization with the United States, Australia, and Canada. In fact, estimating the impacts of trade liberalization in non-primary sectors, as shown in Chart 4-B, reductions in primary production shouldn't be much different between CEPEA and FTAAP. However, it must be noted that less-competitive sectors may lose even when trade in such sectors is not liberalized. Meanwhile, macroeconomic impacts from trade liberalization in such sensitive sectors of primary industries may not necessarily be negative (Chart 4-C).

Chart 4-A: Impacts of Full Trade Liberalization (Japan)

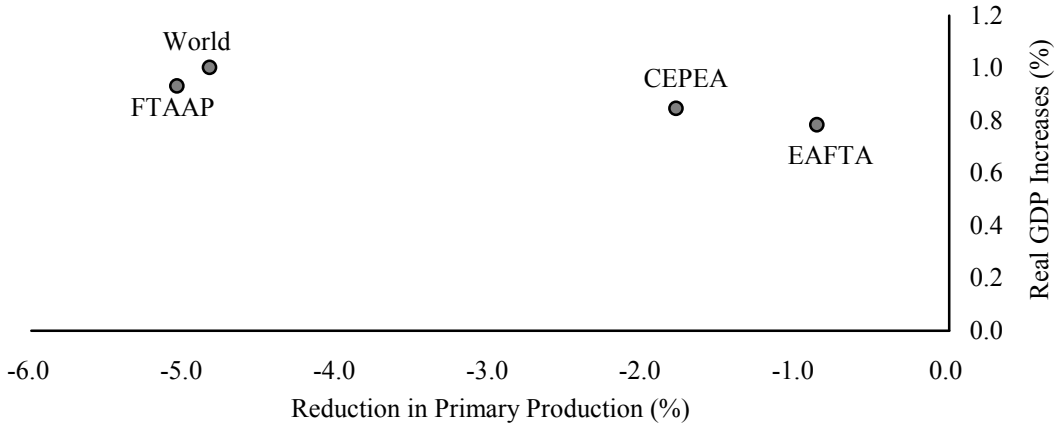


Chart 4-B: Impacts of Non-Primary Trade Liberalization (Japan)

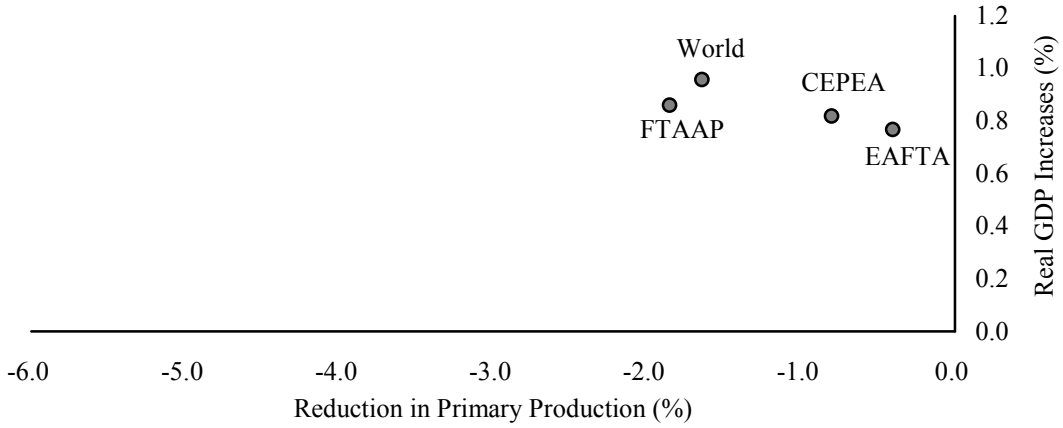
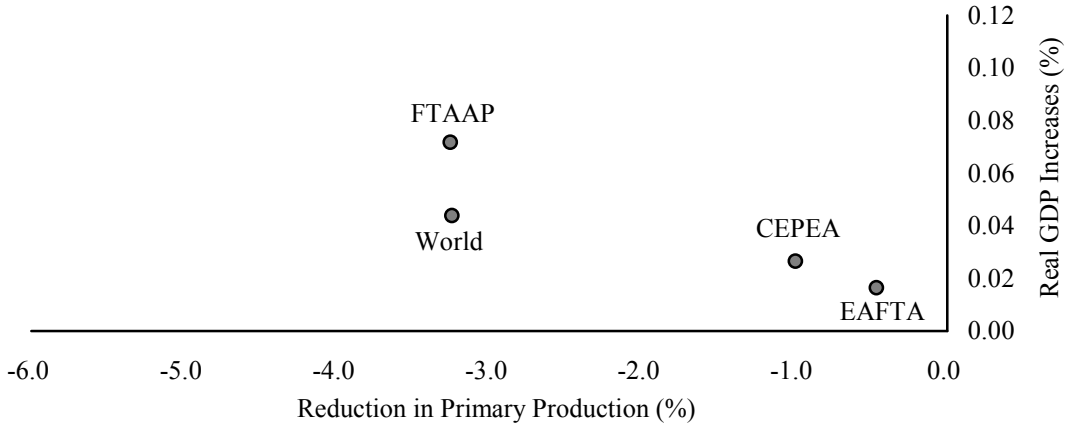


Chart 4-C: Impacts of Primary Trade Liberalization (Japan)



Source: Author's simulations

VI. Summary and Conclusions

In this paper, the impacts of regional trade liberalization and facilitation measures were quantitatively analyzed using the CGE model of global trade. The dynamic aspects of capital formation and productivity improvements are incorporated into a standard static model based on the most updated version of a global trade database.

It is estimated that real GDP of the APEC economies on average will be boosted by 1.9 percent by trade liberalization measures and 0.4 percent by trade facilitation measures, respectively, in an FTAAP. Developing economies are suggested to enjoy relatively larger gains from trade liberalization in comparison with developed economies and, therefore, income differentials among the economies are expected to be corrected. On the other hand, the benefits of trade facilitation measures are relatively significant in developed economies.

Reflecting the difference in the trade structure of the economies, relative macroeconomic benefits of the economies from several regional trade agreements are shown to differ significantly. For Japan, China is the most important trade partner. But for China, the United States is far more important than other economies. For Australia, the United States and Canada are more likely competitors in agricultural sectors.

Moreover, the relative significance of negative impacts in sensitive sectors such as agriculture may also vary according to several scenarios of trade liberalization. Japan's real GDP gains are estimated to be not so different among four cases of trade liberalization in EAFTA, CEPEA, FTAAP and the world as a whole, but the Japanese loss in primary production is relatively larger in the case of trade liberalization in FTAAP and the world in comparison with EAFTA and CEPEA.

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Annex 1: Structure of the GTAP Model

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 that 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 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. Capital and intermediate inputs are traded, while labor and land are not traded between regions.

The GTAP model assumes that firms use a constant-returns-to-scale technology, and minimize the cost of inputs, given a level of output and technology. Firms are assumed to combine a bundle of intermediate inputs in fixed proportion with a bundle of primary factors. The demand for each intermediate input is also assumed to vary in fixed proportion with the level of output. That is, the production function in the GTAP model has a Leontief structure.

This production structure yields the demand equations for a bundle of primary factors and intermediate inputs. By determining the demand for primary factors, the Constant Elasticity of Substitution (CES) functional forms are assumed. The CES production function yields the demand equations for primary factors and the prices of value-added in industries evaluated at firms. Firms purchase intermediate inputs, some of which are produced domestically, and some of which are imported. Domestic and imported intermediate inputs are substituted according to a constant elasticity of substitution. Similarly, a constant elasticity of substitution is assumed to capture the degree of substitutability between imports from different sources. The two-level CES functional form yields the demand functions.

Regional household behavior is governed by an aggregate utility function specified over composite private consumption, composite government consumption, and savings. The other features of the regional household utility function is the use of an index of current government expenditures to proxy the welfare derived from the government's provision of public goods and services to private households in the region. The share of each of private household expenditures, government expenditures, and savings are constant in total income. Once the changes in real government spending has been determined, this spending is allocated across composite goods and aggregate demand for the composite is allocated between imports and domestic products under the

assumption of constant elasticity of substitution. Private household demand has a non-homothetic nature. The allocation of private household expenditures across commodities is based on the constant difference of elasticity (CDE) expenditure functions.

The GTAP model introduces two global sectors. One is the global transportation sector, which provides the services that account for the difference between fob and cif values for commodities. The other is the global banking sector. The global banking sector intermediates between global savings and investment. It creates composite investment goods, based on a portfolio of net regional investment, and offers this to regional households to satisfy their savings demand. Therefore, all savers face a common price for this saving commodity. A consistency check on the accounting relationships involves separately computing the supply of the composite investment goods and the demand for aggregate savings. If all other markets are in equilibrium, all firms earn zero profit, and all households are on their budget constraints, then global investment must equal global savings by virtue of Walras' Law.

There are four types of behavior parameters in GTAP: elasticities of substitution (in both expenditures and production), transformation elasticities that determine the degree of mobility of primary factors across sectors, the flexibilities of regional investment allocation, and consumer demand elasticities. In this paper, three sets of elasticities of substitution are taken from the GTAP database and aggregated with weights of trade shares. It should be noted that these parameters are commonly applied to all regions in this paper.

The first set of elasticities is a set of parameters for the Armington assumption, which describes the ease of substitution between domestic goods and composite imports, by commodity. Those Armington elasticities vary by sectors but are on average around 2.9 for primary, 3.8 for manufacturing, and 2.1 for services. The second Armington parameter determines the case of substitution among imports from different sources. This is equal to twice the value of the first one. The third set is for primary production factors of labor and capital. Those are 0.20 or 0.23 for primary, 1.12 or 1.26 for manufacturing, and 1.26 to 1.68 for services. The demand of the primary sector for primary production factors is less sensitive to the price changes in production factors.

Annex Table 1-A: Regional Aggregation

Countries and Regions		GTAP Classification	
AUS	Australia	aus	Australia
NZL	New Zealand	nzl	New Zealand
CHN	China	chn	China
HKG	Hong Kong, China	hkg	Hong Kong
JPN	Japan	jpn	Japan
KOR	Korea	kor	Korea
TWN	Chinese Taipei	twn	Taiwan
KHM	Cambodia	khm	Cambodia
IDN	Indonesia	idn	Indonesia
LAO	Lao	lao	Lao People's Democratic Republic
MMR	Myanmar	mmr	Myanmar
MYS	Malaysia	mys	Malaysia
PHL	the Philippines	phl	Philippines
SGP	Singapore	sgp	Singapore
THA	Thailand	tha	Thailand
VNM	Viet Nam	vnm	Viet Nam
IND	India	ind	India
OAO	Other Asia and Oceania	xoc	Rest of Oceania
		xea	Rest of East Asia
		xse	Rest of Southeast Asia
		bgd	Bangladesh
		pak	Pakistan
		lka	Sri Lanka
		xsa	Rest of South Asia
CAN	Canada	can	Canada
USA	the United States of America	usa	United States of America
MEX	Mexico	mex	Mexico
CHL	Chile	chl	Chile
PER	Peru	per	Peru
ROA	Rest of America	xna	Rest of North America
		arg	Argentina
		bol	Bolivia
		bra	Brazil
		col	Colombia
		ecu	Ecuador
		pry	Paraguay
		ury	Uruguay
		ven	Venezuela
		xsm	Rest of South America
		cri	Costa Rica
		gtm	Guatemala
		nic	Nicaragua
		pan	Panama
		xca	Rest of Central America
		xcb	Caribbean
EUM	European Union	aut	Austria
		bel	Belgium
		cyp	Cyprus
		cze	Czech Republic
		dnk	Denmark
		est	Estonia
		fin	Finland
		fra	France
		deu	Germany
		grc	Greece
		hun	Hungary

		irl	Ireland
		ita	Italy
		lva	Latvia
		ltu	Lithuania
		lux	Luxembourg
		mlt	Malta
		nld	Netherlands
		pol	Poland
		prt	Portugal
		svk	Slovakia
		svn	Slovenia
		esp	Spain
		swe	Sweden
		gbr	United Kingdom
		bgr	Bulgaria
		rom	Romania
RUS	Russia	rus	Russian Federation
ROW	Rest of the World	che	Switzerland
		nor	Norway
		xef	Rest of EFTA
		alb	Albania
		blr	Belarus
		hrv	Croatia
		ukr	Ukraine
		xee	Rest of Eastern Europe
		xer	Rest of Europe
		kaz	Kazakhstan
		kgz	Kyrgystan
		xsu	Rest of Former Soviet Union
		arm	Armenia
		aze	Averbaijan
		geo	Georgia
		irn	Iran, Islamic Republic of
		tur	Turkey
		xws	Rest of Western Asia
		egy	Egypt
		mar	Morocco
		tun	Tunisia
		xnf	Rest of North Africa
		nga	Nigeria
		sen	Senegal
		xwf	Rest of Western Africa
		xcf	Central Africa
		xac	South Central Africa
		eth	Ethiopia
		mdg	Madagascar
		mwi	Malawi
		mus	Mauritius
		moz	Mozambique
		tza	Tanzania
		uga	Uganda
		zmb	Zambia
		zwe	Zimbabwe
		xec	Rest of Eastern Africa
		bwa	Botswana
		zaf	South Africa
		xsc	Rest of South African Customs Union

Source: GTAP database 7

Annex Table 1-B: Sectoral Aggregation

Commodities/Industries		GTAP Classification	
AFF	Agriculture, Forestry and Fisheries	pdr	Paddy rice
		wht	Wheat
		gro	Cereal grains nec
		v_f	Vegetables, fruit, nuts
		osd	Oil seeds
		c_b	Sugar cane, sugar beet
		pfb	Plant-based fibers
		ocr	Crops nec
		ctl	Bovine cattle, sheep and goats, horses
		oap	Animal products nec
		rmk	Raw milk
		wol	Wool silk-worm cocoons
		frs	Forestry
		fsh	Fishing
MNG	Mining	coa	Coal
		oil	Oil
		gas	Gas
		omn	Minerals nec
PFD	Processed foods	cmt	Bovine cattle, sheep and goat, horse meat prods
		omt	Meat products nec
		vol	Vegetable oils and fats
		mil	Dairy products
		pcr	Processed rice
		sgr	Sugar
		ofd	Food products nec
		b_t	Beverages and tobacco products
TXL	Textiles and Apparel	tex	Textiles
		wap	Wearing apparel
		lea	Leather products
CHM	Chemical products	p_c	Petroleum, coal products
		crp	Chemical, rubber, plastic products
		nmm	Mineral products nec
MTL	Metals and metal products	i_s	Ferrous metals
		nfm	Metals nec
		fmp	Metal products
TRN	Transport equipment	mvh	Motor vehicles and parts
		otn	Transport equipment nec
ELE	Electronic equipment	ele	Electronic equipment
OME	Other machinery and equipment	ome	Machinery and equipment nec
OMF	Other manufacturing	lum	Wood products
		ppp	Paper products, publishing
		omf	Manufactures nec
EGW	Electricity, Gas and Water	ely	Electricity
		gdt	Gas manufacture, distribution
		wtr	Water
CNS	Construction	cns	Construction
T_C	Transport	otp	Transport nec
		wtp	Sea transport
		atp	Air transport
OSP	Other private services	trd	Trade
		cmn	Communication
		ofi	Financial services nec
		isr	Insurance
		obs	Business services nec
		ros	Recreation and other services
		dwe	Dwellings
OSG	Public services	osg	Public admin and defense, education, health

Source: GTAP database 7

Annex Table 2: Trade Protection by Economies

(%)

	JPN	CHN	KOR	HKG	TWN	SGP	IDN	MYS	PHL	THA	VNM	LAO	KHM
Agriculture, Forestry and Fisheries	15.1	0.3	3.9	0.0	4.6	0.0	0.2	1.3	3.1	0.1	2.6	1.1	0.9
Mining	0.0	8.4	34.0	0.0	24.6	0.7	10.3	19.2	9.9	33.0	26.5	18.7	20.3
Processed foods	26.9	13.2	9.8	0.0	7.9	0.0	7.5	13.3	7.5	18.9	28.9	7.1	14.0
Textiles and Apparel	9.2	9.4	6.3	0.0	3.5	0.0	3.5	5.0	4.2	11.0	8.7	7.3	11.6
Chemical products	1.2	5.2	3.2	0.0	2.3	0.0	5.1	6.4	3.9	8.0	4.5	5.4	8.7
Metals and metal products	0.6	17.3	5.4	0.0	18.0	0.0	10.6	29.2	9.1	24.0	22.3	26.1	28.2
Transport equipment	0.0	2.1	1.0	0.0	0.4	0.0	1.5	1.0	0.2	3.9	7.0	9.0	15.5
Electronic equipment	0.0	7.1	6.1	0.0	2.6	0.0	3.2	4.3	3.0	7.4	6.3	6.7	14.4
Other machinery and equipment	0.1	5.8	4.8	0.0	2.5	0.0	4.6	6.5	6.0	12.1	13.5	9.6	14.4
Other manufacturing	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	4.0	5.6	4.6	0.0	3.6	0.0	3.5	5.1	3.2	7.7	11.5	10.0	13.5

	MMR	IND	AUS	NZL	USA	CAN	MEX	CHL	PER	RUS	EUM	World
Agriculture, Forestry and Fisheries	6.3	23.0	0.5	0.0	2.4	0.9	2.8	1.4	10.9	5.9	4.5	7.4
Mining	2.1	11.6	0.0	0.0	0.2	0.0	1.3	2.2	10.2	0.5	0.0	1.1
Processed foods	7.8	84.2	1.7	5.0	5.1	14.7	4.6	1.6	7.9	13.0	4.7	10.6
Textiles and Apparel	8.5	15.7	14.8	8.0	9.1	8.4	6.0	4.4	15.5	15.3	2.8	7.4
Chemical products	2.1	13.9	2.6	1.9	1.6	0.6	2.2	1.5	7.6	9.5	0.5	2.8
Metals and metal products	1.9	15.7	3.1	1.9	1.0	0.4	2.8	1.6	7.6	7.2	0.4	2.5
Transport equipment	4.8	14.8	6.6	5.7	1.1	0.9	3.7	2.0	8.8	13.8	0.9	3.2
Electronic equipment	4.9	2.6	0.8	0.4	0.3	0.0	1.7	2.0	8.0	7.3	0.7	1.1
Other machinery and equipment	1.6	14.1	3.3	2.7	1.0	0.4	3.2	1.4	7.4	7.1	0.4	2.6
Other manufacturing	5.0	14.2	3.1	2.8	0.6	0.6	3.6	1.6	8.5	12.1	0.3	2.0
Average	4.0	15.1	3.9	3.1	1.7	1.5	3.0	1.9	8.7	9.8	1.1	3.3

Source: GTAP version 7 database

Annex 2: Estimates of Trade Costs

Trade costs in *Doing Business* by the World Bank[19] measure the fees levied on a 20-foot container in US dollars. All the fees associated with completing the procedures to export or import the goods are included. These include costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes. Only official costs are recorded. To make the data comparable across economies, several assumptions about the business and the traded goods are used. Those import trading costs in the APEC economies are shown in Annex Table 3. Those four costs are further broken down between procedural and administrative costs, and production factor costs in terms of tariff equivalent percent of import prices.[20]

- Document preparation

Costs for document preparation are composed of fixed fees paid to custom brokers and others, and other labor costs. The share of former procedural cost is assumed to range 12 to 30 percent in document preparation cost depending on the stage of economic development of the economies. Looking at such fixed fees in several AESAN countries, it is found that more skilled workers for document preparation are available and the share of such labor cost is lower in more developed economies.

- Custom clearance and technical control

The amount of costs for custom clearance and technical control shown in *Doing Business* correspond to those charges paid to customs authorities in Japan and the United States. All these costs are assumed to be procedural ones and not attributed to labor cost.

- Ports and terminal handling, and inland transportation and handling

Costs for ports and technical handling and inland transportation and handling are thought to be generated by production factor of labor and capital but not by procedural and administrative requirements. These production costs are divided between labor and capital in accordance with those shares in supporting and auxiliary transport activities and land transport shown in Input-Output Tables of the economies.

[19] See http://www.doingbusiness.org/MethodologySurveys/

[20] See ESRI (2010), "Analyses of FTA and EPA utilizing CGE Models - Compilation of Data Sets for Analyses of Economic Impact of Trade Facilitation-" ESRI Study Reports No.47

Annex Table 3: Import Trading Costs

(US dollar)

	Documents preparation	Customs clearance and technical control	Ports and terminal handling	Inland transportation and handling	Totals
Japan	200	116	238	493	1047
China	260	70	80	135	545
Korea	270	40	310	450	1070
Hong Kong, China	78	40	265	200	583
Chinese Taipei	255	60	181	236	732
Singapore	88	31	180	140	439
Indonesia	210	125	165	160	660
Malaysia	85	65	135	165	450
the Philippines	187	187	270	175	819
Thailand	300	75	200	220	795
Viet Nam	70	89	431	350	940
Brunei	142	80	315	171	708
Papua New Guinea	218	57	233	214	722
Australia	269	120	350	380	1119
New Zealand	200	50	300	300	850
USA	205	90	420	600	1315
Canada	185	75	650	750	1660
Mexico	300	500	300	950	2050
Chile	185	50	210	350	795
Peru	185	100	330	280	895
Russia	200	500	250	900	1850

Source: World Bank, *Doing Business 2010*

Annex Table 4: Reclassification of Trading Costs

(%)

	Document preparation		Custom clearance and technical control	Ports and terminal handling		Inland transportation and handling		Total		
	Admi	Labor	Admi	Labor	Capital	Labor	Capital	Admi	Labor	Capital
Japan	0.08	0.18	0.15	0.15	0.16	0.48	0.17	0.23	0.81	0.33
China	0.16	0.95	0.30	0.13	0.21	0.29	0.28	0.46	1.37	0.50
Korea	0.18	0.41	0.09	0.29	0.38	0.58	0.40	0.26	1.27	0.78
Hong Kong, China	0.08	0.19	0.14	0.22	0.70	0.60	0.10	0.22	1.01	0.80
Chinese Taipei	0.10	0.61	0.17	0.36	0.14	0.53	0.13	0.27	1.50	0.28
Singapore	0.13	0.29	0.15	0.20	0.65	0.57	0.09	0.27	1.06	0.74
Indonesia	0.05	0.30	0.21	0.11	0.16	0.11	0.15	0.26	0.52	0.31
Malaysia	0.10	0.28	0.29	0.22	0.37	0.37	0.36	0.38	0.87	0.73
the Philippines	0.09	0.52	0.60	0.22	0.65	0.14	0.42	0.69	0.88	1.08
Thailand	0.14	0.40	0.14	0.13	0.23	0.20	0.20	0.28	0.74	0.42
Viet Nam	0.03	0.22	0.31	1.05	0.47	0.38	0.86	0.34	1.65	1.32
Australia	0.17	0.40	0.26	0.35	0.39	0.48	0.33	0.43	1.23	0.72
New Zealand	0.17	0.40	0.14	0.40	0.45	0.50	0.36	0.31	1.30	0.81
USA	0.08	0.18	0.11	0.38	0.14	0.47	0.27	0.19	1.02	0.41
Canada	0.03	0.08	0.04	0.29	0.10	0.26	0.19	0.08	0.62	0.29
Mexico	0.05	0.14	0.31	0.04	0.14	0.20	0.38	0.35	0.37	0.53
Chile	0.09	0.25	0.09	0.08	0.30	0.22	0.42	0.18	0.55	0.72
Peru	0.11	0.30	0.22	0.27	0.45	0.31	0.30	0.33	0.88	0.76
Russia	0.04	0.11	0.38	0.09	0.10	0.34	0.35	0.42	0.54	0.45

Source: ESRI (2010)

Annex Table 5: Changes in Production Structure

(%)

	JPN	CHN	KOR	HKG	TWN	SGP	IDN	MYS	PHL	THA	VNM	LAO	KHM
Agriculture, Forestry and Fisheries	-4.8	3.3	-1.8	1.4	-1.0	3.0	1.9	6.3	1.9	8.4	3.3	0.7	3.9
Mining	1.9	0.5	7.5	0.7	13.0	10.6	0.6	2.0	11.9	11.8	-6.4	54.3	5.2
Processed foods	-2.0	2.2	7.8	14.0	2.6	30.8	4.0	37.2	1.3	28.9	2.8	-1.5	-2.6
Textiles and Apparel	2.8	12.1	20.4	18.0	26.1	-1.9	10.5	64.2	31.1	25.0	122.7	10.5	42.2
Chemical products	0.8	3.3	7.2	10.9	12.5	1.8	1.5	12.7	7.4	20.0	33.0	13.2	24.1
Metals and metal products	1.5	4.2	4.4	-3.4	13.3	4.4	3.2	20.3	7.2	41.7	34.9	32.4	22.2
Transport equipment	7.8	3.7	7.6	-0.8	36.7	-2.2	-0.6	61.3	8.4	44.2	24.5	30.7	30.4
Electronic equipment	-0.9	10.9	5.4	8.6	-7.3	-1.8	18.1	2.3	0.0	35.5	33.7	21.9	25.8
Other machinery and equipment	-0.3	7.2	4.6	7.8	13.8	4.9	14.3	20.0	12.5	51.0	43.8	46.5	41.0
Other manufacturing	0.0	4.0	5.7	9.1	5.7	5.5	2.1	12.0	8.2	24.8	11.4	-1.8	14.1

	MMR	IND	AUS	NZL	USA	CAN	MEX	CHL	PER	RUS	EUM	World
Agriculture, Forestry and Fisheries	-0.2	1.7	6.6	5.6	3.6	6.0	1.9	0.9	0.2	0.4	-0.8	2.1
Mining	4.0	14.3	1.0	0.0	0.8	0.7	2.8	5.7	10.5	2.2	3.6	2.1
Processed foods	1.2	-3.5	10.5	14.4	1.8	6.0	3.1	-1.2	-0.2	-0.2	-0.8	2.1
Textiles and Apparel	84.6	2.4	-0.1	-8.4	-5.9	-6.8	-13.1	-5.6	-8.1	12.8	-6.3	3.6
Chemical products	9.4	11.9	-0.2	1.9	0.1	-2.4	4.1	0.3	2.1	4.0	0.3	2.2
Metals and metal products	6.4	16.4	-3.7	-3.4	-1.2	-3.6	4.4	-3.2	5.5	6.7	0.0	2.4
Transport equipment	2.7	11.4	1.4	3.4	-1.6	-2.9	7.0	0.5	-1.7	8.5	-0.4	2.7
Electronic equipment	1.9	19.5	2.1	2.8	-0.2	0.7	6.5	0.2	-2.5	13.7	0.3	2.7
Other machinery and equipment	6.1	17.5	-0.3	3.3	-0.8	-1.8	8.8	-2.0	-1.4	1.8	0.5	2.8
Other manufacturing	6.2	12.3	-0.1	-0.1	0.2	-1.5	4.6	-3.4	0.8	3.4	0.8	1.7

Source: Author's Simulation