

KIEP
Working
Paper
97-04

Economic Evaluation of Three-Stage Approach to APEC's Bogor Goal of Trade Liberalization

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1997. 12

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KIEP Working Paper 97-04
Published Dec. 25, 1997 in Korea by KIEP
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Abstract

This paper analyzes the economic effects of three-stage approach to APEC's Bogor Goal of trade liberalization after the full implementation of the WTO tariff reductions. Three stages of tariff cuts at different times can match APEC's 2010/2020 trade liberalization.

Under the three-stage trade liberalization scenario, APEC member economies are expected to improve their welfare--and the higher the trade liberalization, the higher the welfare gains APEC economies will collect. Non-APEC regions, such as the EU and ROW, will lose welfare if APEC liberalizes preferentially, but benefit from APEC's unilateral trade liberalization.

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I . Introduction*

The objective of the Asia Pacific Economic Cooperation (APEC) forum, formed in 1989, has been to achieve comprehensive trade and investment liberalization in the region. APEC covers 18 countries throughout most of the Asia-Pacific region. Over the last six years, APEC has grown from an informal discussion group to a formalized organization, providing a framework for discussion of a broad range of economic issues. The leaders' declaration from the 1994 APEC meetings (Bogor, Indonesia) sets forth the goal of free trade and investment in the Asia-Pacific region by 2010 for industrialized economies, and by 2020 for developing economies. Even though the accord is not a legal commitment, it is an important milestone.

We perform simulations with computational general equilibrium (CGE) models, described in detail in chapter IV. CGE models have been used extensively to address the issues of trade liberalization and economic integration. Even though many authors suggest that trade liberalization in the Asia-Pacific area would accelerate development, there has been little research into the effects of such liberalization.¹⁾ This paper will be focused on the economic effects of post-WTO tariff cuts under five types of regionalism (discussed below) in the Pacific

* This paper was presented at the APEA conference, November 1997. The author appreciates comments by participants. However, any remaining errors are author's.

1) Ballard and Cheong (1997), Cheong (1997), Lewis and Robinson (1995), and Young and Huff (1996) are among the recent contributions in this area.

Rim.

In chapter II, the role of APEC in the world wide economy will be reviewed and APEC's regionalism will be discussed. Next, the relationship between regional integration and the MFN principle under the WTO will be discussed and related to APEC's non-discrimination principle. Chapter III covers the experimental design for the analysis of APEC trade liberalization. This chapter includes the UR's trade liberalization. A verbal description of a CGE model will be provided in the chapter IV, followed by the description of major parameters used for this study.

This paper also contains the interpretation of the simulation results in chapter V. The first experiment is to study the effects of APEC's own preferential trade liberalization (a closed FTA). APEC's reduced tariffs can be offered to non-member nations free of any conditions (unconditional open regionalism), or APEC may require non-member nations to reciprocate with tariffs (conditional open regionalism). The second part covers APEC's unconditional open regionalism. The next two experiments will be to examine what happens to the APEC nations and non-member nations when APEC adopts conditional open regionalism. APEC will adopt open regionalism, under which non-APEC nations are not discriminated against with respect to tariffs, as long as non-member nations reciprocate with tariffs of their own. In this paper, the world economy is disaggregated into 17 regions (countries). Of the 17 regions, 15 regions are APEC nations, and the remaining two regions are non-member nations of the European Union (EU) and the rest of the world (ROW), excluding EU and APEC nations. The third experiment is to assume that only EU will reciprocate when APEC reduces tariffs. In the fourth experiment, only the ROW will be assumed to reciprocate. This aspect distinguishes

APEC from other regional agreements, and can be important in strengthening the multilateral trading system in that APEC's open regionalism may contribute towards global trade liberalization.

The last simulation will be to study the economic effects of global trade liberalization, where APEC reduces tariffs and both the EU and ROW reciprocate. This should be interpreted as the results arising when both the third and fourth experiments are simultaneously performed; however, the effects of the last experiment may not represent the sum of the results of the third and fourth experiments because of the interactions among nations.



II . APEC and Regionalism

If APEC establishes a free trade area (FTA) in the Pacific region, it will claim almost 60% of the world GNP, and APEC's trade share will be 46% out of the world trade of commodities and services. In recent years, the Asia-Pacific region has been the most dynamic part of the world--containing the world's big three economies of US, Japan, and China and Asia's four dragons of Korea, Taiwan, Hong Kong and Singapore.²⁾ Together, these Asian NIEs have been the locomotive of growth for the world economy with their high growth rates and large investment opportunities. Since the late 1980s, the high degree of economic growth in China and ASEAN nations have inspired the Asia-Pacific economies to increase intraregional trade.

According to the WTO (1995), the world has experienced a surge in new regional trade agreements and an expansion of existing regional agreements even after the establishment of the WTO. Many observers have regarded the development of regional economic arrangements as evidence of the fragmentation of multilateralism. Lester Thurow (1992) argues that the current proliferation of regional agreements and the recurring fear of trade conflicts will endanger the credibility of the global trading system by shifting the world to a tripolar system of Asia, Europe, and North America. Jagdish Bhagwati (1993) sees the current world trade system developments as "tumbling blocs" rather than "building blocs", arguing that the expansion of regionalism will undermine the multilateral system without making a positive contribution towards global trade liberalization.

2) See Bergsten and Noland (1993) for the dynamism of Asian NIEs.

In most cases of regional integration, an economic objective is to seek the economic efficiency gains obtained from the more efficient allocation of resources by reducing tariffs among member nations only. APEC is an exception to other regional arrangements in that APEC adopted open regionalism. That is, APEC will offer lowered tariff reductions to APEC member nations as well as non-APEC nations. APEC's position comes from one of APEC's general principles underlying its long-term goal of free and open trade and investment in the region that was adopted at the APEC leaders' meeting in Osaka, Japan November 19, 1995.

APEC's non-discrimination principle can be interpreted in a way similar to the way the Most Favored Nation (MFN) principle of the GATT is interpreted. The GATT, though, allowed an exception to the MFN principle for regional arrangements. Provided that they meet certain requirements,³⁾ this provision was enshrined in GATT Article XXIV, the only significant exception to the MFN principle. This Article XXIV permitted the formation of preferential trading arrangements such as free trade and customs unions. Moreover, this provision fueled the expansion of postwar regional integration.

It is not easy to assess the compatibility of existing regional trade agreements under the GATT's multilateral system. Although the GATT permitted discrimination against non-member nations by FTAs, it did so only in return for full liberalization in the trading area. According to Lawrence (1996), a very small number of existing agreements have

3) Regional agreements must meet the "substantially-all-trade" condition, and members of a regional integration agreement must have a trade policy with respect to third countries that is not, on the whole, higher or more restrictive than the individual policies prior to the agreement.

been found to be consistent with the rules laid down in Article XXIV. And Sampson (1996) argues that the wider the scope of intra-regional liberalization, the greater the scope of discrimination against non-member countries.

However, APEC provides some optimism to the skeptics about the new multilateral trading system under the WTO, a successor of the GATT. APEC is admittedly different from the other existing regional trade agreements, and APEC is still fully compatible with multilateralism. APEC goes far beyond the GATT, Article XXIV, by adopting open regionalism. Each individual APEC member economy will extend its trade liberalization measures to non-member economies on an MFN basis.

From this point of view, APEC seems to definitely contribute accomplishing global trade liberalization under the WTO. If global gains expected from APEC's open regionalism turn out to be quite large, this will make a substantial positive contribution in moving the world towards global free trade by inducing non-APEC economies to reduce their trade barriers.



III. The Experiment Design for the Analysis of APEC's Trade Liberalization

It is not guaranteed, however, that the APEC will smoothly move toward integrating the global economy.⁴⁾ There are still several doubts regarding the unconditional open regionalism of APEC. First, APEC's open regionalism may be regarded as too ideal, especially, given the WTO's ratification process for member nations regarding trade barrier reductions. Many developing nations had trouble persuading their parliaments of the benefits of tariff reductions derived from the multilateral negotiations. If APEC extends its liberalization to non-APEC nations, why should a country in the Asia-Pacific region reduce their tariffs and join APEC in the first place? This is a typical example of prisoner's dilemma. Young and Huff's (1997) study points out this point in that most APEC nations are expected to face lower welfare under APEC's open regionalism than under preferential free trade area in the Pacific-Rim.

But this argument contradicts the lessons of international economics textbooks. Economists have long used the concepts of "trade creating" effects and "trade diversion" effects that Viner (1950) introduced in order to explain possible welfare gains from the formation of an FTA. Welfare gains are expected from trade creation when the formation of an FTA leads to a switching of imports from a high-cost source to a low-cost source. On the other hand, when imports switch from a low-cost source to a high-cost source, trade diversion occurs, resulting

4) See Cheong (1997) for discussions about the obstacles of economic cooperation in the APEC.

in welfare losses to the nations in the FTA. Thus, an FTA can improve welfare only when the welfare gains from trade creation exceed the welfare losses of trade diversion. Preferential free trade areas can lead to trade diversion because of differential tariffs imposed on the imports from outside of the FTA territories. Therefore, if an FTA extends tariff reductions to non-member countries, a trade diversion will not result. That is, the member nation in an FTA will not have welfare losses from trade diversion if the FTA keeps MFN, extending tariff reductions to non-member nations. This represents the open regionalism that was adopted by APEC. Therefore, higher welfare gains will be obtained under the open regionalism than under preferential FTA.

The second argument against APEC's role in the transition towards the integration of the global economy is that even though it is known in advance that tariff reductions may lead to benefits to member nations, nations may be unwilling to reduce their tariffs. This can be inferred from the negotiations about tariff reductions in the UR. Even APEC nations have had reluctant attitudes toward APEC tariff reductions. This was reflected in the Individual Action Plans (IAP) presented at the Manila APEC Leaders' Meeting (November 1996). IAPs are supposed to describe each member nation's schedule to reduce its tariffs in order to accomplish free trade in the Asia-Pacific region by 2010/2020. However, most of the member nations describe WTO tariff reductions in detail, but fail to address the tariff reduction schedule after 2005 when the UR agreements about tariff reductions will be fully accomplished.

It is not likely that APEC will remove all tariffs at one specific time, though the complete removal of tariffs is APEC's goal. The complete elimination of tariffs was assumed in Young and Huff (1996). The next question concerns the degree to which existing tariffs should

be lowered and the manner in which to deal with developed nations and developing nations in the reduction of tariffs. This was one of the hottest issues in the WTO negotiations of tariff reductions. Developing nations, of course, argued for lower reductions in their tariffs than did developed nations. For a more realistic study of welfare gains from the APEC tariff reductions after WTO's tariff cuts, this paper assumes three scenarios for APEC tariff reductions: the '50/33' scenario—developed nations cut 50% of post-WTO tariffs while developing nations cut 33% of post-WTO tariffs. '66/50'—developed nations cut 66% of post-WTO tariffs while developing nations cut 50% of post-WTO tariffs. '75/66'—developed nations cut 75% of post-WTO tariffs while developing nations cut 66% of post-WTO tariffs.

Though the CGE model used in this paper is static, the three scenarios can be implicitly considered as three stages of tariff cuts at different times, for example, the '50/33' scenario in 2005, the '66/50' in 2010, and the '75/66' in 2015. This time plan can match APEC's 2010/2020 trade liberalization. In this paper, OECD member nations except Mexico and Korea are considered as developed nations in this paper while the ROW nations are assumed to be developing nations.

Tariff reductions have been negotiated in several rounds under the GATT. Of the eight rounds, the Uruguay Round (UR) has achieved the most successful results in the agricultural and manufacturing sectors. The tariff reductions in this paper will represent additional tariff cuts on top of the WTO's tariff cuts. Since this paper is concerned with the effects of APEC's post-WTO tariff cuts, it is necessary to examine pre- and post-WTO tariffs agreed to in the UR negotiations.

For a complete analysis of the UR tariff reductions, it is necessary to aggregate the thousands of tariff lines into a number production sectors in each nation. However, this paper adopts the tariff schedule

of pre- and post-UR negotiations as calculated by Francois, McDonald, and Nordstrom (1995). One of the benefits of using Francois and his associates' study is that their calculations are based on the GTAP database which is also used in this study of APEC's economic effects. Their results need only minor modifications in order to be used for the study of the economic effects of APEC's tariff reductions. Those modifications are discussed in Appendix.

This paper may be differentiated from Young and Huff's (1997), in that this paper considers post-WTO tariffs and uses the updated database (to 2005) for global production, consumption, investment and trade. Updating the database from the WTO's tariff cuts involves running a CGE model with the GTAP database using shocks of the difference between pre-UR negotiation tariffs and post-UR negotiation tariffs. After running this simulation with WTO tariff shocks, the database will reflect the world economy after 2005⁵⁾ in that relevant components in the database of the world's trade, production, investment, and consumption will be updated to reflect the economic conditions after the full implementation of the UR's commitments for tariff reductions. Simulations with the updated database as the starting point will produce the net effects of economic cooperation, preventing overestimation.

Table 1 shows the classification of regions and industry sectors. The classification of industry sectors are based on the similarities of production requirements in intermediate goods and primary produc-

5) Even though the model used in this paper is a static CGE model, the model can be used for analyzing the effects of policy changes at different times, such as for tariff cuts. The updated data should be interpreted as the world economy after the removal of tariffs committed to in the UR.

tion factors. Modified tariff schedules for pre- and post-UR negotiations are summarized in Appendix.

Table 1. Classification of Regions and Production Sectors

Production Sector	Region
(1) Agriculture (AGR)	(1) Australia (AUS)
(2) Mining (MIN)	(2) Canada (CAN)
(3) Textiles (TEXT)	(3) China/Hong Kong (CHK)
(4) Apparel (APPL)	(4) Chile (CHL)
(5) Paper, Wood Products (PWP)	(5) EU (EU)
(6) Chemicals (PCHM)	(6) Indonesia (IDN)
(7) Steel Industry (PRST)	(7) Japan (JPN)
(8) Non Ferrous Metal (N_FM)	(8) Mexico (MXC)
(9) Fabricated Metal (FBMT)	(9) Malaysia (MYS)
(10) Transport Industry (TREQ)	(10) New Zealand (NZL)
(11) Machinery (O_MC)	(11) Philippine (PHL)
(12) Other Manufacturing (O_MN)	(12) Korea (ROK)
(13) Service (SVC)	(13) The Rest of World (ROW)
	(14) Singapore (SGP)
	(15) Thailand (THA)
	(16) Taiwan (TWN)
	(17) USA (USA)

As shown in Table 1, the data for world production, consumption, trade, *etc* are aggregated into 17 regions and 13 production sectors within each region. Production sectors consist of one agricultural sector (AGR), 12 manufacturing sectors (MIN, TEXT, APPR, PWP, PCHM, PRST, N_FM, FBMT, TREQ, O_MC, O_MN) and one service sector. Of 17 nations, 15 are APEC members and the other two regions (EU, ROW) are non-APEC. Small countries of Brunei and Papua New Guinea are ignored due to the lack of reliable data. Further, Hong

Kong is included in China because Hong Kong will be governed by China after July 1, 1997. Australia, Canada, the EU, Japan, New Zealand, and the US are assumed to be developed nations and the remaining regions are assumed to be developing nations.

IV. The CGE Model and Parameters

The general equilibrium framework is most appropriate for analyzing the economic effects of major policy changes such as the implementation of the WTO commitments such as tariff cuts. Firstly, the reduced trade barriers in the Asia-Pacific region would generate more competition between the firms of member nations. More competitiveness may induce producers to lower their prices, allowing the general equilibrium models to catch the economic effects occurring from enhanced competition. Further, the model will provide a more accurate estimation on these variables than the triangular calculations of partial equilibrium analysis. Secondly, the general equilibrium approach allows factor prices to vary. Thus, the relative changes in the intermediate inputs and primary input prices would presumably affect the ratios of a firm's material components and the amount of the value-added to the primary production factors in each equilibrium. On the other hand, partial equilibrium analyses assume constant factor prices during the experiments. However, it is generally believed that prices will change with changes in the economic environment. Works on general equilibrium settings take into account the market interactions that are missed in the partial equilibrium analysis.

The CGE models have been used extensively to capture the essential features of economic activities. A CGE model is a simplified computer representation of one or more economies. Each economy in the model has activities by consumers, producers, and the government. The CGE model provides a framework through which different and diverse policies can be examined. Once the basic model has been specified and applied with actual data, various policies can be studied with

minor modifications. The model used here is a static, Walrasian general equilibrium model that endogenously determines quantities and prices by using a descendant of the Johansen (1960) simulation approach. Two initial assumptions are: (1) there are no pure profits in any economic activity (producing, importing, exporting, transporting, etc.); and (2) all sectors in all countries are assumed to be in equilibrium. It is a multi-sector and multi-region model. This allows for the analysis of the effects of policy changes on regional welfare, production and demand per agent and per region, equilibrium prices, rates of return to factors of production, *etc.*

The CGE model provides a framework in which different and diverse policies can be examined. Each economy in the model exhibits activities by consumers, producers, and government. The description of a CGE model in this chapter is for a single economy in the world economy.

1. Consumer

The model accounts for multiple countries, and each region has one representative consumer whose welfare level represents the welfare level of the region, and a Cobb–Douglas (C–D) formulation is specified for the top nest. Economic agents divide their composite commodity consumption into domestically-produced goods and imports at the middle nest of consumer's decision making for his/her welfare maximization. Then, the sources of imports are identified by the bottom nest of the utility function. The household's utility level will depend on the level of composite good consumption. At the second stage, the composite commodity will be divided into domestic good and composite import consumption. Mathematical C–D utility consumption

function will be defined for all final composite commodities (over imported and domestic) and regional saving, while assuming constant shares. The C-D utility function is indicated below :

$$ur = \sum_i \delta_r^i * c_r^i \text{ where } \sum_i \delta_r^i = 1 \quad (1)$$

δ_r^i is the share of total expenditure on the composite commodity i of national income in region r . ur is the percentage change in regional utility in region r , c_r^i is the percentage change in demand for the consumption of composite good i (which will be described later). In other words, regional utility will be determined by the weighted average of the consumption of composite commodities. With this specification of the utility index, any income change will be reflected in the regional utility, since the regional household will spend its income change on composite consumption goods.

By using a C.E.S. function, the second level of the utility function determines the optimal composition of domestically-produced goods and composite imports. First, composite commodity i will be defined as it is indicated in equation 2, assuming the Armington assumption.

$$c_r^i = \psi \left\{ d_{cr}^i \frac{\sigma_c^i - 1}{\sigma_c^i} + m_{cr}^i \frac{\sigma_c^i - 1}{\sigma_c^i} \right\} \frac{\sigma_c^i}{\sigma_c^i - 1} \quad (2)$$

where σ_c^i is the consumers' elasticity of substitution between domestic and imported good i , and ψ is the scale parameter with a positive value. d_{cr}^i is region r 's consumption demand for domestic good i , and m_{cr}^i is region r 's consumption demand for imported good i . Using the duality of the composite price index and linearizing equation 2, the

C.E.S. demand equations for domestically-produced goods and imports will be written as equations 3 and 4.

$$d_{cr}^i = d_r^i + d_c^i \left[p_r^{ci} - p_{cr}^{di} \right], \text{ and} \quad (3)$$

$$m_{cr}^i = c_r^i + \sigma_c^i \left[p_r^{ci} - p_{cr}^{mi} \right] \quad (4)$$

Superscripts in equations 3 and 4 are analogous : *c* stands for "composite," *d* for "domestically-produced," and *m* for "imports," while subscript *r* (*c*) denotes region (consumer). Equations 3 and 4 say that price changes in domestic goods or imports will provoke demand changes in final consumption, depending on the size of the elasticities of substitution. For example, tariff reductions will decrease import prices. Hence, the household will consume more imported goods, as it is shown in equation 4.

One point to note is the importance of the size of the elasticities of substitution. For accurate evaluation of policy changes, different elasticities of substitution for each commodity and region are required. While general equilibrium modellers adopt the values for the elasticities from econometric studies, such values are not available in many cases. For this reason, researchers such as Norman (1990) and Mercenier (1995) have used common elasticities of substitution. This paper follows the tradition of common elasticity. If reliable parameters were available, researchers would use different elasticities for each region, hence reflecting their demand patterns.

2. Production Sector

In our model, all of the production sectors are assumed to be perfectly competitive. Therefore, the perfectly-competitive firms operate with constant-returns-to-scale technologies in their production process, where producer's prices are equal to the marginal costs of production. All firms use primary production factors and intermediate goods as their production inputs. Firms employ labor and capital as primary production factors. In addition to labor and capital, land is one of the primary production factors in the production of agricultural products. Both labor and capital are assumed to be perfectly mobile within the region, but immobile between regions. The assumption of perfect mobility may be too strong for the least developed nations. This assumption can be relaxed, but it does render no substantial differences.

The goods and services can be used as final consumption and intermediate goods. Primary production factors will be aggregated into value added, once again using a C.E.S. equation. In addition, the top of the production structure combine value added and the composite intermediate goods by using a fixed-coefficient (Leontief) technology. In other words, the percentage rates for output should be equal to those of value added and composite intermediate goods. VA_r^i is the demand for value added by the production sector i in region r , and Z_r^{ji} is the conditional demand by the production sector i in region r for intermediate good j . As it is indicated in equation 5, the intermediate inputs of domestically-produced goods and imports will be aggregated into composite intermediate goods. The equations is as follows :

$$z_r^{ji} = \Phi \left\{ d_r^{ji \frac{\sigma-1}{\sigma}} + m_r^{ji \frac{\sigma-1}{\sigma}} \right\}^{\frac{\sigma}{\sigma-1}} \quad (5)$$

where Φ is a scale parameter, and d and m denote domestic goods and imported goods, respectively. The elasticities will be defined similarly as in equation 2, but subscripts and superscripts are omitted for simplicity. Similarly, as in consumer demand, firm's demand for domestic goods and imports will be

$$d_{zr}^{ji} = z_r^{ji} + \sigma \left| p_r^{ji} - p_{zr}^{dji} \right| \quad \text{and} \quad (6)$$

$$m_{zr}^{ji} = z_r^{ji} + \sigma \left| p_r^{ji} - p_{zr}^{mji} \right|, \quad (7)$$

where P_r^{ji} is firm j 's price index for composite intermediate good i in region r . p_{zr}^{dji} (p_{zr}^{mji}) is the price which firm j in region r pays for domestically-produced (imported) intermediate good i . σ is firm's elasticity of substitution between the domestically-produced intermediate and the imported intermediate. Note that the elasticity is assumed to be equal across all regions for the same intermediate input.

This paper uses a simple regional investment function, which is compatible to the static CGE model. Household decision determines the share of saving from regional income. In this model, regional saving will be realized by purchasing capital goods produced during a period, based on the expectation of the future rate of return to capital.⁶⁾ The model is simulated in a simple static setting because of technical difficulty in performing simulations with a dynamic CGE

6) Because the model in this paper is static, this paper adopts this specification for saving. For full specification of saving, dynamic modeling will be required.

model with multi-sectors and multi-regions. The model can be simulated with two alternative specifications of the regional investment function : The first alternative is that the regional shares of global capital stock (which is the sum of regional capital stock) are assumed to remain constant during the simulation in order to simplify the regional capital formation and investment of each region. The other specification is to assume that regional investment will be adjusted, such that the regional rates of returns on capital are equal across all regions. The simulation results performed on the first specification of the regional investment function are reported.

3. Relationships between Price and Policy Variables

Most policy changes will be performed with the policy variables of imports and exports, and thus, it is necessary to specify how these policy variables are related to the price variables. The price of import, p_{rs}^i , is the sum of *c.i.f.* price, p_{rs}^{ci} and import tariff, t_{rs}^i , and the price of export (*f.o.b.* price), p_{rs}^{fi} , is the domestic market price, p_r^{mi} , minus the export subsidy, s_{rs}^i , as defined below,

$$p_{rs}^i = p_{rs}^{ci} + t_{rs}^i, \text{ and} \quad (8)$$

$$p_{rs}^{fi} = p_r^{mi} - s_{rs}^i, \quad (9)$$

where the variables are percentage changes, and the subscript rs stands for "from country r to country s ." s_{rs}^i represents the export tax, if it is negative. Data for regional imports and exports are available with the clarifications of sources and destinations, upon which equations 8

and 9 are based. But generally, it is not easy to collect import and export data for consumers and producers with the sources for each commodity. Thus, import prices with the sources of the good will be aggregated into composite import price index, \bar{p}_r^i .

$$\bar{p}_r^i = \sum_s \xi_{sr}^i * p_{sr}^i, \quad (10)$$

where ξ_{sr}^i is region r 's share of import i by source (from region s).

The import price in equation 8 will be channeled into the consumers' price, p_{cr}^{mi} , (equation 11) and the producers' price, p_{zr}^{mji} , (equation 12), through the next two equations,

$$p_{cr}^{mi} = \bar{p}_r^i + t_{cr}^{mi} \text{ and} \quad (11)$$

$$p_{zr}^{mji} = \bar{p}_r^i + t_{zr}^{mji}, \quad (12)$$

where t_{cr}^{mi} (t_{zr}^{mji}) is the tax on imported good i charged on consumer (producer) in region r . Import tariff cuts will reduce the import price in equation 8. Reduced import price will be reflected in the composite import price, via equation 10. In equations 11 and 12, consumers and producers will face lower import prices, and they will demand more imports, for which the channels are equations 4 and 7. For domestically-produced goods, similar equations, such as equations 11 and 12, will be specified with domestic taxes charged on the consumers and the producers.

4. Market Clearing Conditions

The model is completed with market-clearing conditions. First, the market-clearing conditions for labor and capital in each region are :

$$\bar{l}_r = \sum_j l_r^j \text{ and} \quad (13)$$

$$\bar{k}_r = \sum_j k_r^j, \quad (14)$$

where \bar{l}_r (\bar{k}_r) represents the total supply of labor (capital) in region r . l_r^j (k_r^j) is the labor (capital) employed for production sector j in region r . Equations 13 and 14 imply that the entire supply of endowment factors should be employed in the production sector, in order to clear the endowment markets.

For each region in the model, the domestically-produced commodity, q_r^i , should be equal to the sum of the domestic use and region r 's sales of that commodity, so that

$$q_r^i = d_{cr}^i + \sum_j d_{zr}^{ji} + \sum_s x_{sr}^i, \quad (15)$$

where x_{sr}^i is region s 's export of commodity i to region r . The first part of the right hand side of the equation represents the final private household consumption demand for that good, and the middle portion represents the intermediate inputs across all the production sectors. The last part represents the total export amount of that commodity.

As it is shown in equation 16, imports of good i in region r will be disposed into final consumption and intermediate inputs.

$$m_r^i = m_{cr}^i + \sum_j m_{zr}^{ji}. \quad (16)$$

The model will divide regional output into domestic usage and export, maintaining equation 15 for clearing output market. The market for imports will be cleared via equation 16.

A CGE model has three components: data, a set of parameters, and a system of equations for defining productions, consumption, exports, *etc.* Three sets of elasticity of substitution are required for the CGE model in this paper, as given in Table 2. The first set of elasticities is a set of parameters for the Armington assumption between domestically-produced goods and imports (σ_d), the second is for imports from different sources (σ_m), and the final is for primary production factors, labor and capital (σ_{va}).

These are the elasticities taken from the GTAP database⁷⁾ and aggregated with weights of trade shares, using the aggregation facility

Table 2. Elasticities of Substitution

	σ_d	σ_m	σ_{va}
<i>AGR</i>	2.33	4.59	0.74
<i>MIN</i>	2.80	5.60	1.12
<i>TEXT</i>	2.20	4.40	1.26
<i>APPL</i>	4.40	8.80	1.26
<i>PWP</i>	2.17	4.47	1.26
<i>PCHM</i>	1.90	3.80	1.26
<i>PRST</i>	2.80	5.60	1.26
<i>NFM</i>	2.80	5.60	1.26
<i>FBMT</i>	2.80	5.60	1.26
<i>TREQ</i>	5.20	10.40	1.26
<i>O_MC</i>	2.80	5.60	1.26
<i>O_MN</i>	2.92	5.74	1.21
<i>SVC</i>	1.94	3.81	1.39

of the GTAP. In this paper, the GTAP elasticities are used as a central case. These parameters are carefully selected because the sizes of the parameters will affect the simulation results. One thing to note is that these parameters are commonly applied to all nations in this study. If the information about these parameters for each country is available and reliable, different parameters can be specified for different nations to reflect each country's economic characteristics.

Armington elasticities are 2.3–2.9 for agriculture, mining, textiles, paper and pulp products, primary steel, non-ferrous metals, machinery and other manufacturing; 1.9 for chemical products and service; and 5.2 for the transportation industry (including the auto industry). Overall, the elasticities for imports are twice the elasticities for the Armington parameters. The elasticities for labor and capital is between 1.21–1.26 for manufacturing sectors; 1.39 for the service sector; and 0.74 for the agricultural sector. The agricultural sector is more inelastic than other sectors, implying that the sector's demand for primary production factors is less sensitive to the price changes of the production factors.

In CGE simulations, sensitivity tests are performed to test the robustness of the model with respect to parameters. For these tests, a couple sets of parameters are prepared with one set containing slightly lower elasticities and the other set containing slightly higher elasticities (not shown in Table 2).

7) See Hertel (1997) for detailed discussion on the GTAP database.



V. The Interpretation of the Simulation Results

In chapter III, three scenarios for APEC's tariff reductions were discussed. These partial trade liberalization scenarios seem to be more realistic than complete elimination of tariffs because of the fact that nations are unwilling to reduce tariffs. Thus, APEC should follow one of the five cases for regionalism as described below. The first case is all tariffs are removed within APEC, but maintained between APEC and non-APEC regions (EU and ROW). This is called a closed FTA. This possibility is considered, in spite of APEC's non-discrimination principle, because a closed APEC FTA may be realized in the early stages of establishing an FTA in the region. In addition, there is a need to compare the results from this case with those from other cases. The second case is that tariffs within APEC are removed and APEC offers lowered tariffs to non-APEC nations without any condition. This case is called unconditional open regionalism. That is, non-APEC nations are not required to reciprocate to take advantage of APEC's lowered trade barriers. The third case is conditional open regionalism, with a reciprocal relationship with the EU – Under conditional open regionalism, APEC offers lowered tariffs to nations which reciprocally offer lower tariffs. In this case, only the EU is assumed to reciprocate. The fourth case is conditional open Regionalism, with a reciprocal relationship with the ROW – Only the ROW reciprocates. Finally, we consider a case that both the EU and the ROW reciprocate, which is global trade liberalization.

The objective of this paper is to analyze the economic effects of APEC tariff reductions under these five cases, as well as to study how

welfare changes as APEC adopts open regionalism, as discussed earlier. Thus, a major part of this chapter will be dedicated to discussing the changes of welfare resulting from the simulations under the five cases of regionalism discussed above.

Table 3 reports the percentage changes of welfare. The numbers in the parentheses (in the first row) represent types of regionalism APEC may seek, and each type of regionalism will be simulated with three scenarios of tariff reductions. Table 4 (using 1992 US million dollars) reports incomes necessary for the percentage changes of regional welfare in Table 3, which are based on equivalent variations.

If APEC chooses the path of a closed FTA in the region, all of the APEC member nations, except Canada, are expected to improve their welfare substantially. As APEC reduces tariffs by higher rates, APEC nations will realize higher welfare gains. For example, Malaysia (MYS) will improve its welfare by 1.17% under the '50/33' scenario, but the nation can double welfare gains when developing nations increase the rates of tariff reductions from 33% ('50/33' scenario) to 66% ('75/66' scenario). These annual welfare gains are equivalent to 0.68 billion dollars (1.17%) and 1.49 billion dollars (2.55%), respectively, as shown in Table 4. Most APEC nations are expected to improve their welfare by less than a percent, while some ASEAN nations are estimated to have a welfare gain of 1.17% to 4.43%. Under the closed APEC FTA, the Philippines are likely to be the biggest winner, followed by Malaysia and Thailand. These welfare gains can be explained by the enhancement of efficiency from tariff reductions. Regional economies impose tariffs on imports, protecting domestic industries from competing imports. Thus, economies suffer welfare losses from inefficient allocation of resources. Another source of welfare gains is the increase of real income due to the decrease in the price of imported

goods (refer to equation 8 in Chapter IV). The rise in real income will improve the welfare in equation 1.

Table 3. Percentage Changes of Regional Welfare

	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(3)	(3)	(4)	(4)	(4)	(5)	(5)	(5)
	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66
<i>AUS</i>	0.35	0.45	0.50	0.39	0.50	0.56	0.38	0.49	0.55	0.39	0.50	0.58	0.40	0.52	0.59
<i>CAN</i>	0.03	0.02	0.01	0.06	0.07	0.06	0.04	0.04	0.03	0.04	0.04	0.03	0.06	0.07	0.07
<i>CHK</i>	0.62	0.85	0.99	0.75	1.07	1.31	0.92	1.29	1.54	0.60	0.84	0.99	0.83	1.17	1.41
<i>CHL</i>	0.13	0.15	0.14	0.25	0.35	0.43	0.24	0.32	0.35	0.25	0.35	0.41	0.34	0.48	0.58
<i>EU</i>	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.08	0.09	0.09	-0.03	-0.04	-0.05	0.08	0.08	0.07
<i>IDN</i>	0.23	0.31	0.36	0.34	0.49	0.60	0.45	0.64	0.76	0.26	0.36	0.44	0.41	0.59	0.72
<i>JPN</i>	0.36	0.47	0.53	0.40	0.51	0.57	0.49	0.64	0.72	0.37	0.48	0.54	0.50	0.66	0.74
<i>MXC</i>	0.18	0.24	0.27	0.18	0.25	0.30	0.19	0.26	0.31	0.19	0.26	0.30	0.21	0.29	0.35
<i>MYS</i>	1.17	1.86	2.55	1.24	1.97	2.70	1.36	2.13	2.89	1.26	2.00	2.74	1.38	2.17	2.94
<i>NZL</i>	0.33	0.42	0.47	0.35	0.45	0.51	0.55	0.75	0.88	0.40	0.53	0.63	0.54	0.73	0.86
<i>PHL</i>	2.20	3.37	4.43	2.29	3.53	4.69	2.55	3.88	5.09	2.12	3.26	4.32	2.36	3.61	4.76
<i>ROK</i>	0.85	1.27	1.64	0.89	1.33	1.73	0.95	1.42	1.82	0.91	1.37	1.78	0.99	1.48	1.91
<i>ROW</i>	-0.06	-0.08	-0.09	0.03	0.05	0.05	-0.12	-0.16	-0.18	0.29	0.39	0.46	0.35	0.50	0.61
<i>SGP</i>	0.40	0.57	0.70	0.35	0.50	0.62	0.67	0.93	1.11	0.49	0.76	1.02	0.69	1.01	1.28
<i>THA</i>	1.24	1.77	2.20	1.47	2.16	2.76	1.44	2.09	2.62	1.39	2.03	2.56	1.55	2.27	2.90
<i>TWN</i>	0.81	1.21	1.54	0.80	1.21	1.54	0.84	1.25	1.59	0.79	1.20	1.54	0.82	1.23	1.57
<i>USA</i>	0.15	0.18	0.19	0.17	0.21	0.22	0.15	0.19	0.20	0.17	0.21	0.22	0.18	0.22	0.24

It seems that Canada will experience very minor welfare changes in the three closed APEC FTA tariff reduction scenarios. Though several factors may work against Canada, the most important factor for Canada's insignificant results may be Canada's trade structure with the US. That is, Canada's trade activities are highly concentrated on the US, while trading relatively less with other nations. The trade barrier reductions in APEC will put Canada in a worse position, by having to compete with other APEC nations in the US market—a

market that could have been otherwise advantageous for Canadian industries. This is supported in the simulation results, as can be seen by Canada's decreased market share in the US under an APEC FTA.

Non-APEC nations, the EU and the ROW are expected to suffer welfare losses when import tariffs are reduced within the 15 APEC regions in this paper, but maintained between the ROW and APEC. Welfare losses are not likely to be large for the EU (0.4 billion dollars to 0.7 billion dollars in Table 4), but the ROW will face substantial welfare losses of 1.98 billion to 3.06 billion dollars.

Table 5 estimates the changes of trade balances. The EU and the ROW's trade balances are projected to be substantially worse. Under the '75/66' scenario, the EU and the ROW are subject to increasing trade balance deficits by 13.23 billion and 7.0 billion dollars, respectively. Canada's trade balance is expected to worsen under case 1, while Japan is likely to improve its trade balance by 12.9 billion dollars under the '75/66' scenario, presenting the biggest change of trade balance.

The fifth to seventh columns of Table 3 represent the welfare changes expected when APEC adopts unconditional open regionalism. Under this case, we can expect two major effects relative to the closed APEC FTA. First, as discussed before, APEC nations would not have welfare losses from trade diversion, and would enjoy higher welfare under case 2 (unconditional open regionalism) than under case 1 (closed FTA). Second, non-APEC nations would improve welfare under case 2, since these nations would be able to access APEC markets without any discrimination in tariffs. While the ROW is expected to improve welfare by 0.03% (which is equivalent to 1.16 billion dollars) to 0.05% (1.86 billion dollars), the EU is not likely to be affected much (less than 0.5 billion dollars). Why does the EU

experience little change under APEC's unconditional open regionalism? One answer for this could be that the EU has already formed an economic union⁸⁾, and thus, the EU has a large market inside the union. With APEC's lowered tariffs, their exports to APEC would not be likely to increase substantially.

In Table 3, most APEC nations, except Singapore, are estimated to have higher welfare levels under unconditional open regionalism than under a closed FTA. Even though Singapore is expected to experience substantial welfare gains under case 2, her welfare levels under case 2 are slightly lower than under case 1. But comparing the results from the two cases, generally, it can be said that all nations can expect higher welfare levels if APEC adopts unconditional open regionalism. The exception of Singapore seems to come from lower growth rates of exports under case 2 than under case 1 (not reported in this paper), which yields lower growth rates for Singapore's nominal income (not reported in this paper). It should be understood that Singapore's products would lose market share, only when the APEC region in this paper removes tariffs for all regions, including the EU and the ROW, and when non-APEC regions do not reciprocate.

The simulation results show that higher welfare gains are expected under unconditional open regionalism than under the closed FTA that most regional agreements have adopted. This result contrasts the analysis in Young and Huff (1997), which showed that APEC nations were to have lower welfare gains under unconditional open regionalism than under a closed APEC FTA. How can the contradicting conclusions between this paper and Young and Huff's paper be explained? While Young and Huff used the GTAP model⁹⁾, this study

8) The GTAP database reflects this.

9) See Hertel (1997).

uses Cheong (1996)'s model as described in the Chapter III, while both studies use the GTAP database in Hertel (1997). However, use of a different CGE model does not seem to produce opposite results, since the GTAP model and the model used for this paper are typical CGE models with the assumption of perfect competition. A fundamental source for producing contradictory results may be the so called aggregation problem. That is, the smaller the numbers of sectors and economies the world economy is aggregated into, the more likely the effects of trade liberalization will be underestimated.¹⁰⁾ Young and Huff aggregated the world economy into three regions: APEC, EU, and

Table 4. Equivalent Variation

(1992 US million dollars)

	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(3)	(3)	(4)	(4)	(4)	(5)	(5)	(5)
	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66
AUS	898	1,154	1,292	996	1,283	1,440	973	1,254	1,408	993	1,293	1,476	1,026	1,330	1,508
CAN	132	98	50	310	339	330	201	183	141	207	203	178	318	346	337
CHK	2,559	3,494	4,044	3,090	4,404	5,369	3,789	5,302	6,325	2,469	3,428	4,051	3,395	4,794	5,777
CHL	49	57	52	94	133	162	91	120	131	95	132	155	126	179	219
EU	-433	-626	-746	195	289	514	4,726	5,507	5,828	-1,791	-2,566	-3,149	5,060	5,084	4,232
IDN	272	368	422	397	571	708	535	750	899	303	430	523	486	695	853
JPN	11,532	14,984	16,794	12,594	16,308	18,213	15,436	20,180	22,701	11,585	15,195	17,177	15,940	20,866	23,474
MXC	511	682	783	516	720	867	553	757	891	537	736	872	594	828	995
MYS	680	1,085	1,489	724	1,150	1,575	791	1,244	1,685	738	1,169	1,600	807	1,267	1,716
NZL	112	143	160	121	155	173	188	257	300	136	182	216	184	250	293
PHL	1,035	1,585	2,083	1,074	1,660	2,205	1,196	1,825	2,389	994	1,532	2,027	1,106	1,697	2,235
ROK	2,375	3,549	4,585	2,481	3,728	4,856	2,665	3,961	5,094	2,546	3,827	4,976	2,781	4,150	5,358
ROW	-1,984	-2,643	-3,066	1,161	1,580	1,855	4,205	-5,582	-6,404	10,013	13,780	16,159	12,408	17,542	21,355
SGP	140	201	245	122	176	219	235	329	391	172	267	360	243	355	450
THA	1,250	1,795	2,229	1,484	2,187	2,792	1,456	2,112	2,649	1,411	2,055	2,589	1,565	2,303	2,932
TWN	1,576	2,368	3,013	1,565	2,359	3,024	1,638	2,451	3,118	1,554	2,347	3,006	1,606	2,415	3,081
USA	7,841	9,480	10,103	8,899	10,982	11,896	8,068	9,846	10,585	8,795	10,873	11,884	9,567	11,733	12,697
World	8,552	37,779	43,538	35,830	48,032	56,206	38,341	50,502	58,138	40,762	54,880	64,108	57,221	75,841	87,519

ROW; while this paper has aggregated the world economy into 17 regions. Moreover, the aggregation problem can be more serious when the economies concerned have non-uniform tariff structures, such as those of APEC economies.

In the cases of welfare losses from the formation of an FTA, the deterioration of the terms of trade may play an important role. Generally, if a country imposes tariffs, the domestic consumers will bear some of the tariff burden, rather than the foreign exporters reducing the price of exports by the full amount. On the contrary, if tariffs are reduced, exporters will increase the net price of their exports (by less than the reduction of tariffs depending on the size of elasticity). In this case, if there are no changes in APEC's export prices, APEC's terms of trade would deteriorate more than it would in a closed APEC FTA. Relating the terms of trade to Young and Huff's results, APEC nations might have greater welfare losses from the deterioration of the terms of trade, which exceeds the welfare gains from the reduction of trade diversion under unconditional open regionalism. Even though the terms of trade may deteriorate, the welfare gains from the removal of trade diversion exceeds any losses from such deterioration.

The next two cases are the welfare effects of APEC's conditional regionalism. Under case 3, only the EU reciprocates, while only the ROW reciprocates in case 4. It should be noted that the region that reciprocates would have an opportunity to substantially improve its welfare. That is, the EU would increase her welfare by a remarkable 0.08% (4.73 billion dollars) to 0.09% (5.83 billion dollars) if the EU reduces tariffs by the same rates as APEC does. This represents

10) The aggregation problem was discussed in Corden (1975), Arceand Reinert (1994), and Wigle (1988).

substantial change in comparison to negative welfare changes under a closed APEC FTA. On the other hand, the ROW, which would not reciprocate under this scenario, would face welfare losses equivalent to 4.21 billion to 6.4 billion dollars. In case 4, the opposite scenario would seem to result, where the ROW could improve its welfare by 0.46% (16.2 billion dollars) in the '75/66' tariff reduction scenario, while the EU could lose up to 31.5 billion dollars.

The opportunity costs for the EU's refusal of APEC's conditional open regionalism may grow to be substantial, from 6.52 billion to 8.98 billion dollars per year. The opportunity costs for ROW are expected to be even higher. From these results for welfare changes under cases

Table 5. Changes of Trade Balances

(1992 US million dollars)

	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(3)	(3)	(4)	(4)	(4)	(5)	(5)	(5)
	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66	50/33	66/50	75/66
AUS	485	739	930	400	610	764	419	641	806	522	806	1,033	374	592	765
CAN	-376	-508	-569	-581	-781	-889	-563	-757	-858	-495	-678	-785	-864	-1,185	-1,391
CHK	327	289	164	-279	-476	-663	398	433	381	27	-78	-204	-664	-1,021	-1,319
CHL	5	6	2	-27	-34	-40	71	105	123	31	60	93	22	48	77
EU	-7,839	-11,009	-13,231	-4,877	-6,809	-8,051	-3,995	-5,722	-6,817	-13,799	-19,853	-24,664	-4,298	-6,234	-7,059
IDN	9	-17	-68	-163	-246	-331	79	82	48	-5	-1	8	-166	-236	-294
JPN	7,891	10,969	12,944	6,033	8,235	9,464	8,402	11,438	13,177	7,376	10,255	12,080	6,134	8,219	9,174
MXC	41	29	-12	-86	-141	-207	-95	-149	-215	-65	-130	-216	-282	-421	-554
MYS	-20	14	53	-185	-204	-199	42	111	172	43	143	269	-80	-39	25
NZL	74	102	122	39	55	67	218	325	399	101	152	200	180	270	339
PHL	6	-6	-34	-54	-82	-116	16	12	-8	-38	-63	-94	-71	-104	-138
ROK	427	588	711	0	26	72	251	353	439	572	887	1,215	-85	-45	69
ROW	-4,247	-5,883	-7,007	-2,567	-3,635	-4,396	-7,853	-10,719	-12,611	1,210	1,714	2,145	-2,103	-3,090	-3,975
SGP	390	614	851	257	425	614	393	611	831	689	1,111	1,566	596	960	1,355
THA	222	230	179	133	159	161	357	465	506	265	347	403	109	160	208
TWN	1,234	1,780	2,197	803	1,189	1,499	997	1,445	1,791	1,104	1,630	2,061	668	1,009	1,295
USA	1,368	2,058	2,768	1,155	1,711	2,253	860	1,322	1,833	2,457	3,697	4,887	530	917	1,422

3 and 4, non-APEC regions of the EU and the ROW seem to have some economic incentives to reduce tariffs if APEC adopts conditional open regionalism. If non-APEC regions reduce tariffs, APEC nations are likely to experience greater welfare gains than under cases 1 and 2, since APEC nations can export more to non-APEC regions.

In the case that APEC offers lowered tariffs to the EU and the ROW unconditionally, these non-APEC regions are estimated to have slightly better changes of trade balances, compared to the results under a closed APEC FTA in Table 5. With only the EU reciprocating, the EU's incremental trade deficits are expected to be less than half of those under a closed APEC FTA. But with only the ROW reciprocating, the EU's incremental trade deficits are likely to reach almost two times those under a closed APEC FTA. Similar patterns are expected for the ROW, except that the ROW is expected to improve its trade balance by 1.2 billion to 2.1 billion dollars. Japan and the US, which are expected to substantially improve their trade balances, would experience less trade surpluses than under case 1.

Under the final case, APEC would reduce tariffs and both the EU and the ROW would reciprocate. That is, all the regions covered in the paper would reduce tariffs (i.e. global trade liberalization). All regions are expected to improve welfare levels, resulting in the highest welfare gains among the 5 cases evaluated. This is, because the world is expected to experience greater trade creation than it would in other cases without trade diversions. Under this case, global welfare gains are expected to increase by 57.22 billion to 87.52 billion dollars, as developed and developing nations reduce tariffs by 33% to 66% and 50% to 75%, respectively. In comparing the benefits from global trade liberalization, the welfare gains of the UR trade liberalization range from 40 billion to 96 billion dollars, based on a static and competitive

model. These gains include all the economic effects expected from most of the trade liberalization measures agreed upon in the UR, while only tariff reductions are considered in this paper. Thus, the estimated welfare gains for global trade liberalization seem to be in reasonable range.

VI. Conclusion

The objective of this paper is to review APEC's regionalism and analyze the economic effects of APEC's trade liberalization. The paper examines five possible cases for APEC's regionalism. In doing so, the paper also needed to consider the reduction of tariff cuts, which should be realized no later than 2005, as one of the most important results of the UR negotiations. One of points that this paper is differentiated from previous studies on the impact of APEC's trade liberalization is that this paper examined the economic effects of trade liberalization after the full implementation of the WTO tariff reductions.

In a competitive global economy, APEC's unconditional open regionalism will maximize global welfare by eliminating the efficiency losses of the misallocation of global resources caused by "trade diversion" under a preferential FTA. This view is proven in this paper by the fact that APEC nations are expected to have greater welfare gains under unconditional open regionalism than under a closed APEC FTA. The world economy is expected to experience welfare gains of 56.2 billion dollars a year, as developed and developing nations reduce post-WTO tariffs by 75% and 66%, respectively. These gains come from greater welfare gains through trade diversion exceeding the welfare losses from the deterioration of the terms of trade, thus contradicting Young and Huff's (1997) results. In conclusion, this paper supports APEC's approach to trade liberalization.

The economic importance of APEC should not be underestimated--the forum can contribute greatly to the global integration of the world economy. Global economic integration has been the pursuit of the GATT and its successor, the WTO. The possibility of global trade

liberalization can be obtained when APEC offers tariff reductions to non-member nations on the condition that these nations reciprocate APEC's tariff cuts. By comparing welfare gains and losses when non-APEC regions do reciprocate with when they don't, it is apparent that the non-APEC regions will probably may suffer substantial welfare losses when the regions do not reciprocate. The expected global welfare gains range from 57.2 billion to 87.5 billion dollars.

As discussed in the description of the parameters used in this paper, a couple sets of sensitivity tests have been performed to examine the robustness of the results with respect to parameters and the rates of the tariff reductions which were chosen arbitrarily. The sensitivity tests have confirmed the stability of the model with respect to the parameters. A similar conclusion was reached with respect to tariff reduction scenarios, since results were consistent for the tariff reduction scenarios, presented in the chapter V.

However, there are some reservations which must also be presented. First, since the paper considers only three scenarios for import tariff cuts, a more careful analysis would be required to determine the appropriate degree of trade liberalization needed. Second, the benefits of scale economies cannot be fully captured by a static CGE model, because the regional economies will grow with the new trading order under APEC's trade liberalization. Thus, dynamic modeling is suggested for fully estimating the welfare effects of APEC's trade liberalization. Third, the CGE model used in this paper ignores the adjustment costs which will be incurred during the implementation period. Therefore, the estimates in this paper should be interpreted as the upper bounds of the economic benefits which the model sets out to predict.

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Appendix: Pre-and Post-UR Tariffs

Compared with the previous GATT rounds, the UR can be characterized as showing concern for both non-tariff problems and tariff reductions. Reduction of tariffs on industrial products is one of the most important outcomes from the UR negotiations. Unless otherwise specified in the Member's Schedule, WTO member nations agreed to implement five equal rate reductions. A timetable for successive reductions will be in effect on January 1 of each of the years following. The participating nations are supposed to achieve the agreed tariff reductions no later than the date indicated in the Uruguay Round Protocol GATT 1994. Full descriptions of new world trading rules are given in *The Results of the Uruguay Round of Multilateral Trade Negotiations --The Legal Texts and Guide to GATT Law and Practice -- Analytical Index*

Francois, McDonald, and Nordstorm (1995) calculated pre- and post-UR tariffs, as shown in the table below. A couple problems arise in using the tariffs calculated by Francois, McDonald, and Nordstorm (1995) for the simulations in this paper. One such problem is that Francois *et al* used version 2 of the GTAP database (released in 1995), and this study is based on version 3 of the database (1996). The pre-UR tariff schedules for each nation should be adjusted to reflect the changes of the database for tariffs from version 2 to version 3. The adjustments of the pre-UR tariff schedules produce some cases in which the pre-UR tariff rates are lower than the post-UR tariff rates. In these cases, it is assumed that no changes would occur to alter the tariff rates within the UR (0.0% in Table 2). The second problem is that Francois *et al* studied the UR's tariff reductions for manufactured

goods only, and their paper does not include the information about tariffs in agricultural products. The last problem is that non-WTO nations, such as China and Taiwan, exist. The WTO agreement was to cut one third of the 1986 bound tariff rates for manufactured goods of member nations.¹¹⁾ Agricultural issues have been regarded as difficult topics because of vital economic and political importance to both the exporting and importing nations of agricultural goods. In agriculture, non-tariff barrier (NTB) measures are replaced by the tariffication of substantially the same levels of protection. In the case of developed countries, the overall reduction of tariff equivalents to NTB, and other tariffs on agricultural products, were 36 per cent. This reduction plan will be undertaken over the six-year period following the establishment of the WTO. Developing nations are required to reduce tariffs on agricultural goods by two thirds of the developed nations' levels with a longer implementation period of ten years.¹²⁾

The simulation with the UR's original tariff reductions for agricultural products and manufactured goods may lead to an overestimation of the extent that trade liberalization played in the import tariffs. The UR agreements on tariff cuts were to reduce 1986 bound tariffs, but the base year of the GTAP database used in this paper is 1992. In most countries, bound tariffs are set higher than the applied tariff rates, on which the GTAP database is based. In addition to bound tariffs, the GTAP database has incorporated trade liberalization measures after 1986. The paper adopts a simple rule for calculating

11) Since 1986 data miss the evolvement of world trade and production after 1986, using 1986 trade data and applied tariff rates may not be appropriate.

12) See Hathaway and Ingco (1995).

both the UR's tariff reductions on agricultural products, which are overlooked in Francois *et al* (1995), and the tariff reductions for non-WTO member nations. Therefore, we assume that half of the original tariff reductions negotiated in UR will be realized under the WTO system. That is, developed nations cut their 1992 applied tariffs by 18% for agricultural products, and developing nations cut these tariffs by 12%. For manufactured goods, non-WTO nations are supposed to cut tariffs by 16.67% (one half of 33%).

Pre-and Post-UR Tariff Rates

	Australia (AUS)			Canada (CAN)			Chile (CHL)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	3.2	2.6	18.0	16.2	13.3	18.0	12.9	11.4	12.0
MIN	0.2	0.2	0.0	0.0	0.0	0.0	20.0	20.0	0.0
TEXT	26.7	16.1	39.7	8.7	8.7	0.0	20.0	20.0	0.0
APPL	42.4	35.0	17.5	19.7	16.6	15.7	20.0	20.0	0.0
PWP	8.8	5.0	43.2	2.3	0.4	82.6	20.0	20.0	0.0
PCHM	8.0	7.7	3.8	2.2	2.2	0.0	20.0	20.0	0.0
PRST	9.2	0.0	100.0	6.5	0.4	93.8	20.0	20.0	0.0
N_FM	6.3	3.4	46.6	4.0	2.7	32.5	20.0	20.0	0.0
FBMT	17.3	12.5	27.7	2.8	2.8	0.0	20.0	20.0	0.0
TREQ	20.2	20.2	0.0	1.9	1.9	0.0	18.1	17.7	2.2
O_MC	11.2	8.6	23.2	4.3	3.1	27.9	20.0	20.0	0.0
O_MN	11.4	6.5	43.0	4.8	3.0	37.5	20.1	19.1	4.2

	China/Hong Kong (CHK)			Indonesia (IDN)			Japan (JPN)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	2.3	2.0	12.0	27.5	24.2	12.0	85.0	69.7	18.0
MIN	1.7	1.4	16.7	1.1	1.1	0.0	2.1	0.5	76.2
TEXT	39.5	32.9	16.7	31.6	24.6	22.2	13.1	6.0	6.3
APPL	23.6	19.7	16.7	9.6	9.6	0.0	2.3	10.2	22.1
PWP	14.9	12.4	16.7	10.5	7.6	27.6	3.8	1.2	47.8
PCHM	15.4	12.8	16.7	6.0	6.0	0.0	3.7	1.6	57.9
PRST	10.5	8.7	16.7	7.8	7.7	1.3	1.5	0.6	83.8
N_FM	9.5	7.9	16.7	8.8	8.8	0.0	3.2	1.5	0.0
FBMT	27.8	23.2	16.7	23.0	21.8	5.2	1.9	0.9	71.9
TREQ	40.1	33.4	16.7	22.0	19.0	15.9	1.1	0.0	100.0
O_MC	16.4	13.7	16.7	14.5	14.2	2.0	5.6	0.1	91.0
O_MN	44.0	36.7	16.7	23.6	10.3	56.4		1.7	69.6

	Korea (ROK)			Malaysia (MYL)			Mexico (MXC)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	93.3	82.1	12.0	85.6	75.3	12.0	8.8	7.7	12.0
MIN	4.3	4.2	2.3	2.8	2.5	10.7	4.4	4.4	0.0
TEXT	19.1	15.1	21.0	24.0	18.5	22.9	14.3	14.3	0.0
APPL	22.2	18.2	18.0	27.3	24.1	11.7	17.7	17.7	0.0
PWP	11.2	11.2	0.0	9.5	5.8	38.9	4.8	4.8	0.0
PCHM	15.7	8.1	48.4	7.0	7.0	0.0	3.3	3.8	0.0
PRST	10.9	0.5	97.2	6.0	6.0	0.0	10.4	8.2	21.2
N_FM	15.7	10.6	32.5	5.1	5.1	5.6	1.9	1.9	0.0
FBMT	20.6	12.8	37.9	14.2	12.7	10.6	14.2	14.2	0.0
TREQ	7.5	5.8	22.7	14.5	14.5	0.0	12.6	12.6	0.0
O_MC	17.7	10.2	42.3	8.8	4.1	53.4	13.0	12.8	2.0
O_MN	30.2	13.8	54.3	17.4	6.9	60.3	8.5	8.5	0.0

	New Zealand (NZL)			Philippine (PHL)			Singapore (SGP)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	2.7	2.2	12.0	97.1	85.5	12.0	18.1	15.9	12.0
MIN	0.1	0.1	0.0	10.7	10.7	0.0	0.0	0.0	0.0
TEXT	6.0	6.0	0.0	38.3	28.2	26.4	0.1	0.0	100.0
APPL	25.2	25.2	0.0	39.5	35.4	10.4	3.1	3.1	0.0
PWP	6.3	0.4	93.7	30.4	26.9	11.5	0.5	0.0	100.0
PCHM	4.8	4.8	0.0	18.9	18.9	0.0	3.7	0.1	97.3
PRST	5.1	5.1	0.0	13.7	13.7	0.0	0.0	0.0	0.0
N_FM	2.6	2.6	0.0	18.4	18.4	0.0	0.0	0.0	0.0
FBMT	9.5	9.5	0.0	31.6	31.3	0.9	0.0	0.0	0.0
TREQ	9.9	9.9	0.0	19.6	18.8	4.1	3.0	3.0	0.0
O_MC	8.0	8.0	0.0	21.3	20.0	6.1	0.0	0.0	0.0
O_MN	10.1	8.3	17.8	37.4	20.3	45.7	3.5	0.1	97.1

	Taiwan (TWN)			Thailand (THA)			USA (USA)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	80.0	70.4	12.0	66.5	58.5	12.0	19.5	16.0	18.0
MIN	2.8	2.3	16.7	16.7	16.7	0.0	0.5	0.5	0.0
TEXT	6.8	5.7	16.7	61.3	28.1	54.2	10.2	7.5	26.5
APPL	7.4	6.2	16.7	47.8	30.0	37.2	16.6	15.2	8.4
PWP	3.8	3.2	16.7	25.4	17.0	33.1	1.1	0.3	72.7
PCHM	4.6	3.8	16.7	33.7	30.7	9.0	8.2	3.0	63.4
PRST	6.7	5.6	16.7	17.0	17.0	0.0	9.8	0.3	98.0
N_FM	3.2	2.7	16.7	15.7	15.7	0.0	3.4	2.6	23.5
FBMT	9.4	7.8	16.7	33.1	31.1	6.0	7.0	2.8	60.0
TREQ	15.7	13.1	16.7	55.4	46.5	16.1	2.7	2.7	0.0
O_MC	5.4	4.5	16.7	35.1	26.2	25.4	16.5	1.5	90.0
O_MN	19.2	16.0	16.7	46.0	28.1	38.9	5.9	0.2	96.9

	EU (EU)			ROW (ROW)		
	Pre-UR	Post-UR	%	Pre-UR	Post-UR	%
AGR	30.3	24.8	18.0	21.7	19.1	12.0
MIN	0.1	0.1	0.0	7.0	5.8	16.7
TEXT	10.3	6.8	34.0	29.6	25.7	16.7
APPL	10.7	10.7	0.0	18.5	15.4	16.7
PWP	1.5	0.5	66.7	10.9	9.1	16.7
PCHM	10.9	4.2	61.5	13.3	11.1	16.7
PRST	4.8	0.5	89.6	13.6	11.3	16.7
N_FM	1.0	1.0	0.0	11.8	9.8	16.7
FBMT	3.5	3.1	11.4	16.1	13.4	16.7
TREQ	5.0	5.0	0.0	16.4	13.7	16.7
O_MC	8.3	2.9	65.1	13.4	11.2	16.7
O_MN	7.8	3.1	60.3	23.3	19.4	16.7

국문요약

- 본 연구는 APEC이 보고르 APEC정상회의에서 선언한 2010/2020년 무역자유화를 달성하기 위한 방안의 하나로 3단계 무역자유화를 가정하고 이의 경제적 효과를 분석하였음.
 - 제1단계 자유화조치하에서 역내 선진국은 2005년(UR무역자유화 조치 완료시점)에 존재하는 무역장벽의 50%를 인하하고, 역내 개도국은 33% 인하하는 것임.
 - 제2단계에서는 선진국은 66%, 개도국은 50% 인하하며, 마지막으로 선진국과 개도국은 각각 75%, 66% 인하함.
- 본 연구의 특징은 'Updating'기법을 이용하여 UR에서 약속된 무역자유화조치가 실행된 이후 APEC 무역자유화의 경제적 효과를 분석한다는 점임.
 - UR 무역자유화조치 실행 이후 취해질 것으로 가정된 3단계 무역자유화 방안은 보고르 목표와 일치하도록 고안되었음.
- APEC 회원국은 역내 무역자유화조치로 후생을 향상시킬 수 있을 것으로 나타났으며, 관세인하율이 높아짐에 후생향상은 더욱 높아질 것으로 예상됨.
 - 배타적 무역자유화하에서 비APEC 회원국에게는 후생의 손실이 예상되나, APEC이 일방적 자유화 조치를 취하게 되면 이들 역외 국가의 후생은 향상될 것으로 보임.

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KIEP Working Paper 97-04

Economic Evaluation of Three-Stage
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of Trade Liberalization

1997년 12월 20일 인쇄

1997년 12월 25일 발행

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對外經濟政策研究院

발행처 서울특별시 서초구 염곡동 300-4

우편번호 137-747 전화: 3460-1208 FAX: 3460-1133

인쇄 오름시스템(주) 전화: 2273-7011 대표 이호열

등록 1990년 11월 7일 제16-375호

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ISBN 89-322-4015-9