



WORKING PAPER 99.02

**THE BENEFITS OF AGRICULTURAL LIBERALIZATION
IN ASIA PACIFIC**

**Tubagus Feridhanusetyawan, Mari Pangestu
and Erwidodo**

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A joint research project on

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between

CASER (Bogor) • CIES (Adelaide) • CSIS (Jakarta) • RSPAS (ANU, Canberra)

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**CASER/CSIS/CIES/ANU
joint research project on**



**Policy analysis of linkages between
Indonesia's agricultural production, trade and
environment**

Rapid economic growth in Indonesia has been accompanied by significant structural changes, including for its agricultural sector and its unique natural environment. Recently questions have been raised about the impact of Indonesia's agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the environment are such that an intersectoral, system-wide perspective is essential for assessing them. An international perspective also is needed to assess the impact on Indonesia of major shocks abroad, such as the implementation of the Uruguay Round agreements, APEC initiatives, or reforms in former centrally planned economies. There is increasing pressure on supporters of liberal trade to demonstrate that trade reforms at home or abroad affecting countries such as Indonesia will not add to global environmental problems (e.g., deforestation, reduced biodiversity). Again, this requires system-wide quantitative models of the economy and ecology, because typically there are both positive and negative effects at work, so the sign of the net effects ultimately has to be determined empirically.

To begin to address these issues, the Australian Centre for International Agricultural Research (ACIAR) has generously provided funds for a collaborative 3-year project (to mid-1999) involving the University of Adelaide's Centre for International Economic Studies (CIES) as the lead institution, Bogor's Centre for Agro-Socioeconomic Research (CASER) which is affiliated with the Ministry of Agriculture, Jakarta's independent Centre for Strategic and International Studies (CSIS), and the Economics Division of the Research School of Pacific and Asian Studies (RSPAS) at the Australian National University in Canberra. Being based on Indonesia with its rich diversity of environmental resources (and on which there are relatively good data) and its rapid economic growth, the project could also serve as a prototype for similar studies of other developing countries in Southeast Asia and elsewhere.

The key objective of the project is to assess the production, consumption, trade, income distributional, regional, environmental, and welfare effects of structural and policy changes at home and abroad particularly as they will or could affect Indonesia's agricultural sector over the next 5-10 years. Among other things, the analysis will focus both on the effects of economic changes on the environment, and on the impacts on Indonesia's agricultural production and trade of resource and environmental policy changes. The implications of regional and multilateral trade liberalization initiatives and Indonesia's ongoing unilateral trade reforms will be analysed, along with other potential domestic policy changes and significant external shocks such as the entry of China and Taiwan into the World Trade Organization. The analysis will draw on and adapt computable general equilibrium (CGE) models such as the national INDOGEM Model (built as part of an earlier ACIAR project) and the global GTAP Model.

The project is being undertaken in close collaboration with the Indonesian Ministry of Agriculture and ministries involved in trade, planning, and the environment. A Research Advisory Committee has been established to encourage close collaboration of representatives from those and other ministries.

ACIAR INDONESIA RESEARCH PROJECT

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THE BENEFIT OF AGRICULTURAL LIBERALIZATION IN ASIA PACIFIC¹

Tubagus Feridhanusetyawan, Mari Pangestu, Erwidodo²

The member economies of Asia Pacific Economic Cooperation (APEC) have determined to liberalize trade and investment in the Asia Pacific region. In the meeting in Bogor, Indonesia, in 1994, they set the long-term goal of free and open trade and investment in the Asia Pacific. The Bogor Declaration hoped to realize the goal in 2010 for the developed economies and 2020 for the developing economies. Furthermore, the Bogor meeting clarified the three pillars on which APEC would be based, namely, (1) Trade and Investment Liberalization and Facilitation (TILF); (2) Economic and Technical Cooperation (ECOTECH); and (3) Development Cooperation. Import tariffs have been cut unilaterally in APEC member economies, and further tariff cuts are expected to implement the Bogor goal consistently.

While tariff reduction has been implemented in APEC, there has not been much discussion on the agricultural liberalization. This is different from the WTO/UR liberalization scheme which is more explicit in specifying the reduction of import tariff, domestic distortion, and export intervention of agricultural commodities. In APEC, the tariff reduction is generally measured based on the average tariff level, meaning that sectoral classification becomes less relevant. It was only recently that sectoral approach of tariff reduction, the so called EVSL (early Voluntary Sectoral Liberalization), was set in Vancouver meeting in 1997. But in Kuala Lumpur meeting in 1998, there was disagreement among APEC member economies on the liberalization of some sensitive agricultural sectors. As a result, APEC had to submit its EVSL problems to the WTO for resolution. It was clear that agriculture remains a sensitive sector in APEC.

This paper is a preliminary report of a study on the impact of progressive agricultural liberalization through APEC. The objective is to measure the potential gain or loss for each APEC member economy, and to predict the changing trade patterns and resource reallocation as a result of the liberalization. This study considers several liberalization scenarios, and compares the impact of the liberalization among APEC member economies.

This empirical study uses a Global Computable General Equilibrium (CGE) Modeling to measure the structural changes in the economy. The use of Global or Multi-regional General Equilibrium modeling would allow us to trace the impact of trade liberalization in an interdependent world through flows of goods and services across sectors and countries or economies. In a Global CGE framework, the world economy is classified into several regions and sectors, where quantity and prices adjust to the changing supply and demand that form

¹ Paper presented in the 49th Australian Agriculture and Resource Economics society Conference in Christchurch, New Zealand, January 20-23, 1999. Part of the paper is taken from Feridhanusetyawan, Tubagus, Charles W. Stahl, and M. Hadi Soesastro (1999). "The Impact of Trade Liberalization on Labor Markets in the Asia Pacific Region." Preliminary Report to the APEC-HRD working group.

² Tubagus Feridhanusetyawan and Mari Pangestu are economists at the Center for Strategic and International Studies (CSIS), Jakarta. Erwidodo is researcher at the Centre for Agricultural Socio-Economic Research, Bogor. Jose Rizal and Arya B. Gaduh from the CSIS provided valuable research assistance.

the equilibrium conditions in every market. Policy changes, such as reduction in import tariffs, would lead to changing equilibrium market conditions in every sector and region involved in the model. The CGE model could measure precisely the impact of the policy changes on the changing prices and quantities, structural resource reallocation, as well as the potential welfare gain or loss.

This report is organized as follows. The first section will present the progress of APEC liberalization, especially in relation to the WTO/UR liberalization scheme. The second part will present the modeling framework to measure the benefit of liberalization using a Computable General Equilibrium Modeling. This section discusses the model, data, and simulation scenarios that are used in the study. The third part presents the preliminary results of the simulation, by focusing on the impact of liberalization on welfare and changing trade patterns. Finally the final section presents the preliminary conclusion.

APEC, WTO AND THE RATE OF LIBERALIZATION

The 1994 Bogor Declaration set the goal of free and open trade – both in goods and services – and investment by 2010 for developed economies, and 2020 for developing economies. In pursuing the goal, APEC has adopted a unique mechanism of implementing liberalization and facilitation, to wit, “concerted unilateral liberalization.” In contrast to the more western approach of GATT and the WTO, in which a liberalization agreement is legally binding and the signatories will be punished and sanctioned if they fail to implement their commitments, this APEC mechanism is much less legalistic. That is, individual members announce their liberalization plans, known as Individual Action Plans (IAPs), unilaterally and implement them according to their domestic rules. APEC members will then review the IAPs and their implementations jointly in order to encourage all members to achieve the target agreed upon in Bogor.

This voluntary mechanism is a practical approach to promote liberalization without losing the momentum provided by the Bogor Declaration. It would take several years to change APEC into a negotiating body such as the WTO. Moreover, at the initial stage, the more legalistic approach cannot be accepted by Asian members – as expressed in the original understanding not to institutionalize APEC into a negotiating body like the WTO. Nevertheless, this should not be perceived as hesitance in the part of the Asian members. After all, they have been so far implementing trade and investment liberalization unilaterally and, through the voluntary mechanism of IAP, are perennially liberalizing towards the Bogor target.

As an effort to accelerate trade liberalization towards the Bogor goal, in November 1997, APEC ministers agreed in Vancouver to implement the Early Voluntary Sectoral Liberalization (EVSL) program. The idea behind it was to realize liberalization earlier than the Bogor goal for a number of sectors. Fifteen candidate sectors were agreed upon – nine of which were planned to commence in 1999. Currently, the EVSL program includes tariff reductions, some with specific targets (e.g., 0-5% by a certain year), while others without. In some sectors, such as chemicals, the program does not aim for tariff reduction but tariff harmonization. In the telecommunications sector, the program is in the form of an agreement to accept each other’s standard. To be consistent with APEC’s principle of “open regionalism”— i.e., that the role of APEC is in encouraging multilateral liberalization, and not in realizing a regional free trade area in the Asia-Pacific – most of the liberalization agreements will also be expected to apply to non-APEC economies. Meanwhile, as the outcome of this year’s Kuala Lumpur meeting, the proposed sectors will be submitted to the WTO for negotiation.

So, what is the relation between the Bogor goal and the Uruguay Round (UR)? In terms of average tariff, the Bogor goal has allowed a more rapid tariff reduction than the UR commitments among APEC member economies. A comparison of individual members' tariff reduction (based on simple averages of tariffs) committed in the IAPs with the UR commitments as well as the reference line connecting the current applied tariff rate with 0% (Bogor line) by 2010 and 2020 will show the linkage of the two.³ As such, all individual APEC economies are well on track of going towards the Bogor goal. Their tariff reductions are, for the most part, faster and deeper than their UR commitments. However, for some economies, there are needs to further accelerate their liberalization plans. The following are a summary of the relations between the UR commitments and the Bogor goal.

Table 1
Comparing APEC and WTO

	WTO	APEC
Nature of the agreement	<ul style="list-style-type: none"> • Involuntary • Binding commitments 	<ul style="list-style-type: none"> • Voluntary • Concerted unilateral liberalization
Regional Coverage	<ul style="list-style-type: none"> • Multilateral, worldwide 	<ul style="list-style-type: none"> • Regional (18 original economies, plus 3 new members)
Sectoral Coverage	<ul style="list-style-type: none"> • Explicit on sectors such as Agriculture and Services 	<ul style="list-style-type: none"> • The Bogor goal is not sector specific.
Trade Liberalization Measures	<ul style="list-style-type: none"> • Tariff measure reductions • Export subsidies and domestic support reductions • Tariffication of NTBs, especially for the agricultural and the textiles and clothing sectors. 	<ul style="list-style-type: none"> • Average tariff measure reductions only. On the most part, the Bogor goal is more progressive than the UR.

Australia and New Zealand still keep their UR bound rates over 10% but they reduced their applied tariffs unilaterally during the UR negotiation. In its IAP, New Zealand committed to reduce its applied tariff to 0 percent by 2010, in accordance to the Bogor target. This is a much bolder target than its UR commitment. Meanwhile, Australia's IAP line lies above the Bogor line, suggesting that Australia will need to accelerate its liberalization to reach the Bogor line.

³ The following analysis is based on PECC (1996) "Perspectives on the Manila Action Plan for APEC." Edited by Mari Pangestu, Christopher Findlay, Ponciano Intal, Jr. and Stephen Parker. See also Yamazawa, Ipeei. (1997) APEC's Progress Toward the Bogor Target: A Quantitative Assessment of Individual Action Plans. Japan National Committee for Pacific Economic Cooperation, 1997.

The US IAP is the same as its UR commitment of reducing its average tariff from 6.4% to 4.6% by 2000. Given that the UR ends on 2000, there is yet no further commitment for the US to liberalize. As shown in the study, this UR line coincides with the Bogor line. This implies that for US to achieve its Bogor goal, it needs to continue its liberalization at the same speed of tariff reduction after 2000.

In the mean time, Japan will have to strengthen its tariff reduction beyond the UR commitment in order to achieve the Bogor goal. Japan's IAP will decrease average tariff from 9.0 to 7.9% while its UR bound rate decreases from 10.3% to 8.3% by the year 2000. Both of Japan's IAP line and UR line are above the Bogor line. This poor performance is mainly caused by its high tariffs on agricultural products after, in 1995, Japan has to convert its import quota into tariffs as part of the UR agreement. This has caused an increased average of around 2%. As far as the trade weighted average tariff of industrial products is concerned, it is as low as 2 to 4% and the Japan's IAP commitment is sufficient to achieve the Bogor target. As such, this implies that Japan will need to work on strengthening its efforts to reduce tariffs on agricultural products.

On the other hand, China, Chile, Philippines, and Indonesia committed to big liberalization packages in their IAPs in addition to their unilateral reduction in the preceding years. China will reduce its average tariff from 23% to 15% by 2000. Chile reduces its average from 11% to 0% by 2010. Philippines committed to the reduction from 15.6% to 7.8% by 2000 and to 5% by 2003, while Indonesia committed to the reduction from 16% to 8% by 2003. Meanwhile, Malaysia and Korea are well on track towards the Bogor goal. Both have an average tariff of between 6 and 9% with IAPs that liberalize much deeper than their UR commitments. As for Mexico, Thailand, and PNG, even though their current average tariffs – Mexico, 12%; Thailand, 23%; and PNG, 23% – are higher than others, they also have good record of unilateral reduction in the past. Their IAPs go well beyond the UR commitments. If they keep up their rate of liberalization, all of them will be able to achieve the Bogor goal by the specified time.

As for Hong Kong and Singapore, their applied tariffs have been reduced to 0%. Brunei's applied tariff is also as low as below 2%. They do not need to worry about the Bogor goal. Chinese Taipei committed its reduction from 8.6% in 1996 to 6% by 2010, which is above the Bogor goal of reaching 0% by 2020. Canada might need to slightly accelerate its liberalization effort to reach the Bogor goal, even though its IAP has gone deeper than the UR commitment.

Liberalizing Trade in Agriculture

In the agricultural sector, liberalization efforts have been mainly pushed forward by the UR. While APEC has pushed for border tariff reduction on the manufacturing sector, it lacks any program in the agricultural sector. Indeed, the Bogor declaration does not explicitly set a goal for specific sectors. Instead, it is targeted at reductions of average tariff. As such, the efficiency gains from agriculture was mainly due to the success of the Uruguay Round in bringing trade in agricultural products under normal GATT rules. Prior to it, agricultural trade had been effectively excluded from GATT disciplines, which had enabled inefficient and costly barriers to be put into place in nearly all-trading economies.

Table 2.
Uruguay Round Agreement on Agriculture: A Summary

	Developed Economies	Developing Economies
A. Market Access		
1. Tarrification of all NTMs	Yes	Yes
2. Reduction of tariffs	<ul style="list-style-type: none"> • By 36% over 6 years • By 15% on each tariff item 	<ul style="list-style-type: none"> • By 24% over 10 years • By 10% on each tariff item
3. Minimum access through tariff quotas.	Yes, at the level of 3%	Yes, at the level of 3%
B. Domestic Support		
1. Reduction of support to agricultural production	<ul style="list-style-type: none"> • By 20% over 6 years 	<ul style="list-style-type: none"> • By 13% over 10 years
C. Export Subsidies		
1. Reduction in value of export subsidies	<ul style="list-style-type: none"> • By 36% over 6 years 	<ul style="list-style-type: none"> • By 24% over 10 years
2. Reduction in volume of export subsidies	<ul style="list-style-type: none"> • By 21% over 6 years 	<ul style="list-style-type: none"> • By 14% over 10 years

Note: a) This applies to products previously subject to quantitative restrictions and for which current access is less than 3% of domestic consumption. Such access should be expanded to 5% during the implementation period.

Source: GATT Secretariat, 1994

The UR set an ambitious agenda of reform in the agricultural sector, and the commitments agreed upon are broad ranging. The final UR Agreement consists of two parts: a set of general commitments which specify the new GATT rules to apply to agriculture; and a series of country schedules that contain the commitments of each participant on tariffs, maximum access, domestic support measures and export subsidy reduction.

The three different areas of obligations in the Agreement on Agriculture⁴ includes:

Improvement in Market Access

- All existing NTBs to be converted into tariff equivalents, to be added to the existing level of tariffs.

⁴ PECC (1995) Milestones in APEC Liberalization: A Map of Market Opening Measures by APEC Economies, 57 - 59.

- Import duties to be cut by an unweighted average of 36 % in equal installments over six years for developed economies, and by 24 % over ten years for developing economies (from a base of 1986 - 88)
- Each individual tariff line to be reduced by a minimum of 15% by developed economies and 10% by developing economies.
- “Minimum access” import quotas to be established for products where imports have faces prohibitive barriers in the past, equal to 3% of domestic consumption and rising to 5% at the end of six years.

There are a few exemptions from the tariffication commitments (such as utilized by Japan for rice). In this case, 4% of domestic consumption in the 1986-88 base period will represent a minimum access guarantee that must increase by 0.8 % annually to reach 8% by the end of the implementation period.

Reduction in Domestic Support to Agriculture

- There is an obligation to reduce the Aggregate Measure of Support (AMS) or the total amount of government aid to the agricultural sector by 20% over six years, in equal annual installments for developed economies (from base level 1986-88) and by 13% for over ten years for developing economies.
- Support policies which have a minimal impact on trade may be excluded from the AMS calculation. These “Green Box” policies include: research services, pest and disease control, inspection services, environmental and conservation programs, stockholding for food security, domestic food aid, crop insurance, disaster relief, regional and structural investment aid.
- Direct payments to farmers (such as deficiency payments) are not considered part of the AMS and do not have to be reduced if they are made under production-limiting programs.

Reduction in Export Subsidies

- Developed economies are required to reduce export subsidies by 36% in value terms (nominal) over six years, in equal annual installments (from an 1986-90 base level) and by 21% in volume terms. Developing economies must carry out these reductions in the order of 24% and 14%, respectively, in equal installments over an longer period of ten years.

The GATT Secretariat estimates that as a result of UR reforms, the total level of support to agricultural producers will decline by 18% by the end of the transition period, from US\$197 billion to US\$162 billion. In addition, the cost of protection in the agricultural sector will become much more transparent for all WTO members. However, it appears that the actual level of protection after the tariffication of NTBs will remain quite high for the products currently subject to non-tariff measures.

Although actual trade liberalization in agriculture resulting from the UR appears to be limited, the Round did achieve significant reforms in the rules covering agricultural trade. On the whole, it would appear that the major positive contribution of the Agreement on Agriculture, to be implemented following the UR, lies in the fact that agricultural products have finally been made subject to multilateral trading rules, and that protection used in this area has been shifted from covert, non-transparent measures (quantitative restrictions, variable levies, price support scheme, and the like) to transparent, price-based measures

(tariffs). Moreover, a commitment to further negotiations in five years' time will ensure that the liberalization process in agriculture continues to move forward.

MODELING THE AGRICULTURAL LIBERALIZATION IN APEC

The impact of trade liberalization on the economy of the Asia Pacific region is modeled using a Computable General Equilibrium (CGE) approach. The CGE model is an analytical approach, which looks at the economy as a complete system of interdependent components where prices and quantities for goods and factors adjust to equate supply and demand based on Walrasian general equilibrium theory. Different from regular CGE, which focuses on domestic economy and analyzes the relation between sectors within one economy or one country, and assumes foreign variables as exogenous components, this study uses a Global CGE, or a multi regional CGE, which captures the world economy on regional and sectoral classification. The relations between regions or economies are well represented by the flow of international trade and the relation between sectors are captured by the production process well presented in the input-output table.

The use of a multi-region CGE and the general equilibrium framework is important to be able to observe and understand the linkage between policy changes at a global scale to individual economies at a local scale. It is also possible to analyze how policy changes in local scale could led to significant changes in global scale. A multi-region CGE models can show the interconnectedness of economies and how policy changes in one economy will benefit (or cost) other economies as well as the global economy.

Global Trade Analysis Project (GTAP)

This study utilizes the well-known Global Trade Analysis Project (GTAP) model to measure the impact of EVSL. Previous study on the benefit of trade liberalization conducted by the Economic Committee of APEC has also used the similar GTAP model⁵. Different from the previous study, this study uses a newer version of the GTAP database, different regional and sectoral classifications, and clearly different liberalization scenarios.

The GTAP is a CGE model founded upon the Australian Industrial Commission's SALTER project, and was further developed and improved at its home in the Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University, Indiana.⁶ Unlike most standard CGE models which are designed as a single country model, GTAP is a multi-country model. Hence, it simulates the effects brought about by the changes of policies in some countries or sectors to the other countries or sectors.

There are three major components of the GTAP. The first is the model itself, which is made up of regional sub-models that describe the economic activities and behaviors of firms, households, and governments. The central feature of the model is the input-output structure that links industries together in a value added chain starting from primary goods and moving up to intermediate processing and to the final consumer goods for households and governments. Prices and quantities supplied are then determined simultaneously in all primary factor markets and in domestic and international commodity markets.

⁵ Economic Committee of APEC (1997). The Impact of Trade Liberalization in APEC. Apec Secretariat. November 1997.

⁶ Hertel, Thomas (1997). Global Trade Analysis, Modeling and Applications, Cambridge University Press.

The second major component of the GTAP is its database. The centerpiece of the database consists of bilateral trade, transport, and protection matrices that link individual countries' economic databases.⁷ This database is derived from the individual countries' input-output tables. The third component of the GTAP is its behavioral parameters, consisting of four types: elasticities of substitution (in both consumption and production), transformation elasticities that determine the degree of mobility of the primary factors across sectors, the flexibility of regional investment allocation, and consumer demand elasticities.⁸

The Structure of GTAP⁹

The production structure is governed by a separable, constant return to scale technologies. The output is derived from primary and intermediary inputs. Previous versions of the GTAP database classify the primary inputs into three categories: capital, labor and land. Version 4, the most current version, adds another category, namely specific natural resources and splits labor into skilled labor and unskilled labor. The intermediary inputs can be produced domestically or imported from abroad. In determining the amount of intermediate inputs that are imported, GTAP uses an Armington structure for imports.

Meanwhile, the behavior of the regional household is determined by an aggregate utility function specified over composite government purchase, private consumption, and savings. In a standard closure, constant budget shares of these forms of final demands are allocated to each category using the regional household's Cobb-Douglas utility function – although, if required, real government purchases and savings can also be dictated exogenously (i.e., fixed or shocked), in which case the private expenditure will adjust to satisfy the regional household's budget constraint. Once the government spending is determined, the allocation of this spending across composite goods is determined once again using the Cobb-Douglas assumption of constant budget shares.

However, the non-homothetic nature of private household demands require a different treatment. A homothetic utility function, such as the CES function, implies that average household budget shares spent on various commodities are independent of total expenditure.¹⁰ Given the empirical evidence showing that private household demands cannot be explained with a homothetic utility function – as exemplified in the falling budget shares on food as income increases – , the Cobb-Douglas or the CES function is insufficient to capture the household preference over private commodities. Hence, in GTAP, household preference is represented by a Constant Difference of Elasticities (CDE) functional forms which lies midway between the CES and more flexible functional form such as translog.¹¹

Given the static nature of the model, where simulation is modeled as a comparative static analysis, a proper treatment of savings-investment link is required to complete the global system. The GTAP specifies an equality of global savings and global investment in both the initial and new equilibrium. The allocation on investment across region can be modeled by assuming a fixed and equal return to investment across region.

⁷ Gelhar, Mark et. al., *Overview of the GTAP data base*, in Hertel (1997)

⁸ Huff, Hanslow, Hertel, and Tsigas, *GTAP Behavioral Parameters*, in Hertel (1997)

⁹ Most of the information in this section is derived from Hertel and Tsigas, *Structure of GTAP*, in Hertel (1997).

¹⁰ Huff, Hanslow, Hertel and Tsigas, *GTAP Behavioral Parameters*, in Hertel (1997).

¹¹ The name Constant Difference in Elasticities arise due to the fact that the NxN matrix of elasticities of substitution dependent only on N parameters, so that the difference between the elasticities of substitution σ_{ij} and σ_{ih} is invariant to index i (Hertel, 1997).

The GTAP Database¹²

The second major component of the GTAP is its database. The database consists of detailed bilateral trade, transport and protection data that characterizes economic linkages among regions, as well as individual country IO (Input-Output) databases which accounts for intersectoral linkages within regions. Until now, the GTAP has released four versions of its database. The GTAP data is updated on an 18-month cycle.

For the bilateral trade data, GTAP relies on the publicly available data. Currently, its primary source of bilateral trade data is the COMTRADE database that is maintained by the United Nations Statistical Office. The construction of the tariff database benefited a great deal from the culmination of the UR in which individual countries submitted tariff schedules to the WTO. Version 2 of the database were built on this data. In version 3, the protection database incorporates a work done for the World Bank which compiles the pre- and post-UR protection based on the WTO's database as well as other sources. Since the effort by the World Bank was not continued, the version 4 of the database utilized a different source of tariff information, to wit the UNCTAD Trains database provided by the United Nations.

As for the IO data for the regions, since GTAP builds very heavily on the Australian Industry Commission's SALTER project, the IO data in the first versions of the database has relied on the data provided by the Australian Industry Commission. Version 1 of the database used the original SALTER fifteen source-IO tables, while version 2 and 3 added new regions and updated the original SALTER IO tables. In version 4, however, almost all of the original SALTER database has been replaced and many more regions have been added. Members of the GTAP network have provided the data for this latest version of the database.

This paper uses the version 4 of the GTAP database. The latest version of the database is used to find a more accurate description of the current conditions since this latest version has been much improved from version 3, particularly in relation to the agriculture sector. There are other several new features of the database. First, the base year for its data is 1995, while the previous version uses 1992. In this new version, the data for trade protection have even been updated up to 1996 for some countries. The IO tables have also been added to include more regions and sectors. The number of regions has increased from 30 regions in version 3 to 45 regions in version four. The sectors have also been further disaggregated from the original 37 sectors to the level of 50 sectors – much of which is provided for agriculture and food.

Another new feature of the latest version is its protection database. The version 4 database has three main components. First, is the tariff information, sourced from the UNCTAD Trains Database. The second component is the database related to agriculture. Here, market price support and subsidy information is integrated into the database, based on the OECD's Producer Subsidy Equivalents (PSEs) database. The third component relates to the non-tariff barriers for non-agricultural sectors.

Finally, version 4 also makes significant changes in the types of primary factors. It breaks the category of natural resources into specific natural resources and calibrates the cost share of these specific natural resources to replicate the target elasticity of supply for each resource-constrained sector. In other words, it means that the supply response of a specific natural resource will depend on the supply elasticity of the sector that utilizes the specific resource

¹² Hertel in McDougall, R.A., A. Elbehri, and T.P. Truong (1998). Global Trade Assistance and Protection: The GTAP 4 Data Base, Center for Global Trade Analysis, Purdue University

(e.g., coal for manufacturing, land for agriculture).¹³ Meanwhile, the second significant change is the split of primary labor payments into the skilled and unskilled components for each sectors and regions.

Aggregation

This study classifies the world economy into 19 regions or economies and 12 sectors. Because the focus of this study is on the Asia Pacific region, we try to represent the Asia Pacific economies as much as possible in the regional aggregation. Data for Brunei and Papua New Guinea are not available in the GTAP database so that those two countries could not be represented in the modeling exercise. This study does not include the new member of APEC that recently joined the cooperation such as Vietnam in the model. In terms of sectoral aggregation, we classified the 50 available sectors in the version 4 of the GTAP database into 12 sectors. Table 3 below presents the aggregated region and sector in this study in more detail.

Table 3. SECTORAL AND REGIONAL AGGREGATION

Name	Description	In GTAP Database
SECTORAL AGGREGATION		
AGR	Agriculture	Paddy rice; Wheat; Cereal grains; Vegetables, fruit, nuts; OilSeeds; Sugar cane, sugar beet; Plant-fibers; Other Crops; Bovine cattle, sheep and horses; Animal products; Raw milk; Wool silk-cocoons
	based	
	goats,	
	worm	
FOR	Forestry	Forestry
FIS	Fisheries	Fishing
MNG	Mining	Coal, Oil, Gas, Minerals
PFD	Processed Food and Beverages	Bovine cattle, sheep and goat, horse meat products; Meat Products; Vegetable oils and fats; Dairy
	products;	Processed rice; Sugar; Food products; Beverages
	and	tobacco products
TXL	Textile and Apparel	Textiles, Wearing apparel
PCM	Petroleum, Chemical,	Petroleum, coal products; Chemical, rubber, plastic
	products;	products; Metal Products; Other mineral
		Ferrous metals; Other metal Products;
MTE	Motor Vehicles, Transport	Motor vehicles and parts; Transport equipment; Electronic
		Electronic equipment; Other Machinery
OMF	Other Manufacturing	Leather products; Wood Products; Paper Products; Other Manufacturing
CON	Construction	Construction
T_T	Trade and Transport	Trade, transport

¹³ For a detailed treatment on the specific natural resources, see Hertel and Tsigas, *Primary Factor Shares and Supply Response in the Natural Resource-based Industries*, in McDougall, R.A., A. Elbehri, and T.P. Truong (1998).

SER	Other Services	Electricity; Gas manufacture, distribution; Water; Financial, business, recreational services; Public and defence, education, health; Dwellings
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REGIONAL AGGREGATION

AUS	Australia	Australia
NZL	New Zealand	New Zealand
JPN	Japan	Japan
KOR	Republic of Korea	Republic of Korea
IDN	Indonesia	Indonesia
MYS	Malaysia	Malaysia
PHL	Philippines	Philippines
SGP	Singapore	Singapore
THA	Thailand	Thailand
CHN	China	China
HKG	Hong Kong	Hong Kong
CHT	Chinese Taipei	Chinese Taipei
USA	United States of America	United States of America
CAN	Canada	Canada
MEX	Mexico	Mexico
CHL	Chile	Chile
LAM	Rest of Latin America	Central America and Caribbean; Venezuela; Colombia; Rest of Andean Pact; Argentina; Brazil; Uruguay; Rest of South America
WEU	Western Europe	United Kingdom; Germany; Denmark; Sweden;
	Finland;	Rest of European Union; European Free Trade Area
ROW	Rest of The World	India; Sri Lanka; Rest of South Asia; Viet Nam; Central European Associates; Former Soviet Union; Turkey; Rest of Middle East; Morocco; Rest of North Africa; South African Customs Union; Rest of Southern Africa; Rest of Sub Saharan Africa; Rest of World

Simulation Scenarios

The main objective of the liberalization scenario is to simulate the impact of trade liberalization by focusing on the process of trade liberalization through APEC. But trade liberalization through the APEC action plans, from the Bogor goal to Manila Action Plan, and then the Kuala Lumpur results, could not be separated from the process of international trade liberalization through the Uruguay Round or the WTO. In fact the disputes over the Early Voluntary Sector Liberalization schemes in the very last APEC meeting in Kuala Lumpur would also be sent to the WTO for resolution. Most of APEC member economies are also member of the WTO so that they have certain commitments to follow the WTO trade liberalization schemes. Therefore this study will also consider the impact of trade liberalization through the pure WTO processes, and compare the result with that of the APEC liberalization processes.

To be more specific, there are four different simulations used in this study. The first is to measure the impact of trade liberalization from the pure WTO/Uruguay Round liberalization schedules. The second is the pure APEC trade liberalization by simulating the Bogor Goal to form free trade areas in the Asia Pacific region. But because there has not been any

significant commitment within APEC to liberalize agriculture, tariff reduction in the agricultural sector follows the UR target for the second scenario. The third scenario is the complete APEC liberalization where tariff in all sectors would be cut to 0 and 5 percent in 2010. The fourth scenario is a combination between the UR and the complete APEC scenarios, to measure the additional impact of one liberalization scheme to another. Table 4 presents the detailed comparison between all scenarios used in this study.

Table 4. Scenarios for Trade Liberalization: Targeted Final Tariff Rates

Country	Sectors	Uruguay Round (Scenario 1)	APEC without Agriculture (Scenario 2)	APEC Complete (with agriculture) (Scenario 3)	Uruguay Round & APEC Complete (Scenario 4)
APEC Member					
- Developing Countries	Agriculture				
	- Tariff	UR target	UR target	5%	5%
	- Domestic Distortion	UR target	--	--	UR target
	- Export Tax & Subsidy	UR target	--	--	UR target
	Non Agriculture				
	- Tariff	UR target	5%	5%	5%
	- Developed Countries	Agriculture			
- Tariff	UR target	UR target	0%	0%	
- Domestic Distortion	UR target	--	--	UR target	
- Export Tax & Subsidy	UR target	--	--	UR target	
	Non Agriculture				
- Tariff	UR target	0%	0%	0%	
Non APEC					
	Agriculture				
- Tariff	UR target	UR Target	UR Target	UR Target	
- Domestic Distortion	UR target	--	--	UR Target	
- Export Tax & Subsidy	UR target	--	--	UR Target	
	Non Agriculture				
- Tariff	UR target	UR Target	UR Target	UR Target	

Uruguay Round Scenario

The first scenario is the base scenario, which is solely based on the WTO/UR liberalization schemes. Under this first scenario, trade liberalization took place not only on the removal of import tariffs and tariff equivalents of non-tariff barriers (NTBs) for all commodities, but also on the reduction of export taxes and subsidies in agricultural sectors. Another specific agenda of the WTO is the removal of domestic distortion and export taxes and subsidies for agriculture.

To simulate the WTO/UR trade liberalization, we need to calculate the further tariff reduction needed from the actual tariff level in the version 4 of the database (1995 base year on average) to the post WTO/UR tariff. This can be done by comparing the actual 1995 tariff level in the database to the post UR tariff rates. But because the post UR tariffs are not available in the database version 4, we used the post UR tariff level calculated in the version 3 of the database¹⁴. The calculation of the tariff is based on bilateral tariff, and it is likely to get significant differences in aggregated tariff rates for the same commodity that is imported from different sources. It is interesting to note that in some sectors and some economies, the actual tariff rates in 1995/96 was already lower than the post UR tariff rates targeted by the WTO. It means that the commitment to the WTO/UR is already fulfilled only within less than two years after the WTO was launched in 1994. When the commitment to the WTO is already fulfilled, the further tariff reduction needed is set to zero.

The same techniques are applied for calculating the tariff reduction needed for domestic distortion and export tax and subsidies in agricultural sectors under Uruguay Round liberalization scheme. We had to develop the post UR target rate for the domestic production tax/subsidy as well as export tax/subsidy. Based on the commitment to the WTO discussed in previous section, the domestic tax and subsidy on food and agriculture production are cut by 20 percent in developed countries and 13 percent in developing countries from 1994 data. Export tax and subsidy on agricultural exports are also cut from the 1994 level by 36 percent and 24 percent for developed and developing countries respectively. Again, we used the version 3 of the GTAP database, which were based on 1994 protection data, to calculate these post-UR targets. By comparing the post-UR rates and the actual 1995 tax and subsidy rates in the version 4 of GTAP database, we could then calculate the further liberalization needed to simulate the impact of the UR trade liberalization.

APEC Scenario

The second and the third scenarios simulate APEC trade liberalization that is developed based on the Bogor Goal and implemented by Individual Action Plan (IAP) submitted by each APEC member economy. For the time being, APEC-IAP covers mainly import tariff reduction, with no commitment on the removal of any domestic distortion and export tax/subsidy. These two APEC scenarios, therefore, only reduce import tariffs and do not include any reduction in any other distortions. Because of its voluntary nature, tariff reduction that follows the APEC-IAP varies between countries. This study simulates APEC 2010, when the targeted average tariff rate is assumed to be 0 percent for developed countries and 5 percent for developing countries. For non-APEC member economies, trade liberalization is implemented by following the WTO/UR scheme.

¹⁴ This alternative procedure is used in this preliminary result while we are waiting for the availability of post UR tariff rates for the version 4 of the GTAP database.

Since tariff reductions through APEC processed have not explicitly covered trade liberalization in the agricultural sector, this second scenario followed the WTO/UR targets in reducing import tariff in the agricultural sector. It is important to note that the final tariff rates of the WTO/UR targets are generally higher than the Bogor goal at 0 to 5 percent, and therefore trade liberalization in this second scenario is considered less progressive than the complete APEC liberalization scenario developed in the next scenario.

The third scenario is the extension of the second scenario, where the treatment for the agricultural sector is similar to that of other sectors. The average import tariff for agriculture commodities in 2010 is expected to be 0 percent for developed and 5 percent for developing economies in APEC. Similar to the second scenario, non-APEC member economies are assumed to follow their Uruguay Round commitments. In these second and third scenarios, domestic distortion and export tax or subsidy in the agricultural sectors are not reduced.

WTO and APEC

The fourth scenario is the combination between the WTO/UR and APEC liberalization that captures the additional benefits of one scenario the another. This combination scenario captures not only the more progressive import tariff reduction following the APEC liberalization including agricultural sector as in the scenario, but also the removal of domestic distortion in agriculture and export tax following the UR commitment.

PRELIMINARY RESULTS

This section presents the preliminary results of the modeling exercise that simulates trade liberalization under several scenarios discussed previously. The first part of this section presents the welfare impact of trade liberalization by comparing the impact of several liberalization scenarios. The second part will discuss in more detail the impact of trade liberalization on changing patterns of output and exports.

The Impact of Trade Liberalization on Welfare

The results presented in Table 5 show that trade liberalization through APEC schemes (Bogor Goal) would lead to larger welfare gain for APEC member economies compared to the benefit of liberalization through the pure WTO/UR schemes. The welfare gain from trade liberalization should be interpreted to mean that the welfare would be higher than otherwise would have been if the trade liberalization measures had not been implemented. It is estimated that the Uruguay Round liberalization (scenario 1) would increase the welfare of APEC member economies by around US\$ 119 billion in total. The partial liberalization though APEC (scenario 2), where the agricultural liberalization still follows the modest WTO/UR scheme, would lead to around US\$ 266 billion additional welfare gain in total. Furthermore, the complete APEC liberalization (scenario 3), where tariffs in the agricultural sectors are reduced as progressive as that of the manufacturing sector, the welfare gain would be more than US \$ 355 billion.

Table 5. The Impact of Trade Liberalization on Welfare
(Change in Equivalent Variation, US\$ Million)

Regions	Uruguay Round (Scenario 1)		APEC without Agriculture (Scenario 2)		APEC Complete (with Agriculture) (Scenario 3)		Uruguay Round & APEC Complete (Scenario 4)	
	US\$ Mill	% of 1996 GNP	US\$ Mill	% of 1996 GNP	US\$ Mill	% of 1996 GNP	US\$ Mill	% of 1996 GNP
AUS	4362	1.2	11871	3.2	11916	3.2	12148	3.3
NZL	697	1.2	1953	3.4	1763	3.1	2328	4.1
JPN	45249	0.9	85352	1.7	125102	2.4	126819	2.5
KOR	9469	2.0	20440	4.2	48102	10.0	48713	10.1
IDN	2893	1.4	2322	1.1	8747	4.1	9446	4.4
MYS	2871	3.2	7302	8.1	8027	8.9	8215	9.1
PHL	2963	3.6	16893	20.3	18425	22.1	18616	22.3
SGP	7227	7.8	11982	12.9	12655	13.6	12814	13.8
THA	4428	2.5	6571	3.7	8268	4.7	8319	4.7
CHN	22505	2.5	83099	9.2	76696	8.5	73580	8.1
HKG	2192	1.4	20361	13.3	20345	13.3	20454	13.3
CHT	1268	0.5	10493	3.9	22813	8.6	22997	8.6
USA	15466	0.2	-2655	0.0	2839	0.0	3457	0.0
CAN	-2431	-0.4	-6511	-1.1	-6523	-1.1	-7360	-1.3
MEX	-1478	-0.4	-2921	-0.9	-3197	-0.9	-3733	-1.1
CHL	1126	1.6	-218	-0.3	-372	-0.5	-368	-0.5
APEC Total	118807	0.7	266334	1.6	355606	2.2	356445	2.2
LAM	8954		17022		16894		16852	
WEU	6230		31499		28568		33282	
ROW	29931		32734		34341		39383	
World Total	163922		347589		435409		445962	

While the contribution of APEC to the WTO/UR is expected to be large in terms of additional welfare gain, the results also show that the contribution of the WTO/UR to APEC would not be significant. Additional liberalization measures in the form of the removal of domestic distortions as well as reduction in export tax and subsidy through the WTO/UR scheme does not lead to significant additional benefit to APEC. The welfare gain from the combination of WTO/UR and APEC trade liberalization is estimated around US \$ 356, similar to the result of pure but complete APEC liberalization at US\$ 355. Measured as percentage of nominal GDP in 1996, the welfare gain of APEC liberalization is expected to be around 2.2 percent of total GDP in APEC economies. This is much larger than the benefit

of WTO/UR at around 0.7 percent. This results show that additional reduction in domestic distortion and export tax/subsidy in agriculture would not increase the benefit of APEC trade liberalization, which is mainly based on import tariff reduction.

The superiority of APEC to the WTO/UR liberalization is not surprising, even though these results are different from the result of the previous study using the older version of the GTAP data set¹⁵. There are several reasons for this. First, many APEC economies have fulfilled their commitments to the WTO/UR round trade liberalization in 1995-1996, the base year of the database in this study. Therefore, further tariff reduction to meet the WTO/UR target would be minimal. Second, the APEC trade liberalization based on Bogor goal itself is much more progressive than that of the WTO/UR target.

The results in Table 5 also show that the benefit from having more progressive agricultural liberalization in APEC is expected to be large. Based on simulation scenario 2, where agricultural liberalization in APEC follows the WTO/UR target, the additional welfare gain from APEC trade liberalization would be US\$ 266 billion. When the agricultural sector is liberalized by following the Bogor goal and treated similarly as the manufacturing sector, the welfare gain increases up to US\$ 355 billion. Large additional welfare gain can be found in the case of Korea, Japan, and Chinese Taipei because of their currently high average tariff in agriculture.

In terms of regional distribution, the Philippines is expected to be the big winner from the APEC trade liberalization as the increase in welfare in 2010 is expected to be more than 20 percent of its 1996 GNP. Hong Kong and Singapore, two economies that have continuously followed a free trade regime also take much benefit from the liberalization. Welfare in those two economies will increase by more than 13 percent of their 1996 GDP. Korea, China, Chinese Taipei, and Malaysia will also benefit from trade liberalization as their welfare is expected to increase by around 8 to 10 percent of their 1996 GNP. Other Asian economies, such as Thailand, Indonesia, Australia, New Zealand belong to the next group, in which the welfare increase is expected to be around 2.5 to 5 percent of their 1996 GNP.

It is interesting to note how all economies in the American continent, the United States, Mexico, Canada, and Chile would not get much benefit from APEC trade liberalization. It needs further analysis to determine the reason for this phenomenon, but early findings suggest that the negative impact of trade diversion would dominate the positive impact of trade creation as a result of trade liberalization. It is clear that major trading partners for those economies are mostly the Latin American economies, so that market opening in Asia would lead to minimal impact and even potentially to trade diversion. Another possibility is due to the fact that the United States, Canada, and Mexico already formed and benefited the formation of NAFTA (North American Free Trade Agreement), so that additional trade liberalization within APEC would lead to small additional benefit.

¹⁵ Feridhanusetyawan, Tubagus. (1998). "The Impact of Trade Liberalization on Welfare and Employment in ASEAN." PECC Human Resource Development Outlook. 1998-1999.

Table 6. The Decomposition of Welfare Effects
(Change in Equivalent Variation, US\$ Million)

Regions	Uruguay Round (Scenario 1)			APEC Without Agriculture (Scenario 2)			APEC Complete (with Agriculture) (Scenario 3)			Uruguay Round and APEC Complete (Scenario 4)		
	MU of Income Effects	Allocative Effects	TOT Effects	MU of Income Effects	Allocative Effects	TOT Effects	MU of Income Effects	Allocative Effects	TOT Effects	MU of Income Effects	Allocative Effects	TOT Effects
AUS	3491	266	605	9600	1121	1151	9647	1119	1151	9870	1118	1160
NZL	581	92	25	1492	175	286	1358	199	205	1847	274	207
JPN	31621	15268	-1640	53636	20583	11133	81510	32521	11071	82754	32908	11157
KOR	8400	651	417	16888	2613	938	42290	4599	1213	42829	4637	1247
IDN	2659	229	5	1820	904	-402	8109	1218	-580	8790	1228	-571
MYS	2587	736	-451	6473	1436	-607	7246	1726	-946	7386	1784	-956
PHL	2719	318	-74	15324	2295	-726	16738	2458	-770	16911	2473	-768
SGP	5889	259	1079	9643	334	2005	10262	360	2033	10396	361	2057
THA	4666	2190	-2427	7655	7641	-8725	9292	7879	-8903	9369	7851	-8901
CHN	18782	1323	2400	72692	19562	-9155	66536	19235	-9076	63590	19197	-9207
HKG	1943	-13	262	17937	113	2311	17920	112	2313	18016	113	2325
CHT	928	63	277	7245	754	2493	18328	2280	2204	18484	2308	2205
USA	11623	1034	2808	-329	3712	-6038	3842	3823	-4827	4539	3909	-4991
CAN	-1951	-121	-359	-4417	505	-2599	-4485	402	-2441	-5135	140	-2365
MEX	-1210	-105	-163	-2267	432	-1086	-2491	447	-1153	-2881	287	-1138
CHL	896	39	191	-152	173	-239	-262	177	-287	-251	181	-299
LAM	7149	1130	674	13821	1084	2118	13626	1054	2214	13376	1391	2085
WEU	6594	4076	-4440	23008	3328	5163	20874	3176	4518	24580	4220	4481
ROW	26743	2377	811	27794	2958	1981	29149	3132	2060	33955	3156	2272

In CGE modeling of international trade, there are several potential sources of welfare changes from trade liberalization for each country. To understand these results, welfare changes are broken down into three components: allocative efficiency effects, terms of trade effects, and marginal utility of income effects¹⁶. Table 6 presents the decomposition of welfare gain and loss due to several liberalization scenarios in this study. In general, the allocative efficiency effects are positive showing that trade liberalization would increase resource allocation within the domestic economy. Another source of welfare gain or loss as a result of trade liberalization is due to the changes in terms of trade, or the relative price of exports over imports, which may improve or deteriorate depending on the country's own and other countries' liberalization. If the change in terms of trade is negative and large enough, then there is a possibility that welfare will decline as a result of liberalization. In other words, the loss from deteriorating terms of trade dominates the benefit from increasing efficiency in domestic resource allocation. The final contribution of welfare effects is from the change in the marginal utility of income. The assumption of non-homothetic household preference permits the changes in consumption patterns when income increases. When policy shocks lead to increases in household utility, the proportion of income spent on inferior goods reduces, implying more income available for all other goods and a positive effect on welfare.

The decomposition of welfare provides some explanation for the negative welfare impact of trade liberalization in the case of Canada, Mexico, and Chile. Based on the simulation results, trade liberalization would lead to lower prices for exported commodities and higher prices of imported commodities in those three economies. Further this would lead to decreasing welfare due to negative terms of trade and marginal utility of income effects. These negative effects are expected to dominate the positive effects from more efficient resource allocation. In the cases of Canada and Mexico, the discussion in the next section show how the reversal of structural transformation moving back to higher dependence on the agricultural sector partly explain the deterioration of terms of trade.

The important lesson from these results is the positive correlation between the magnitude and the benefit from trade liberalization. More progressive trade liberalization would lead to larger welfare benefit for APEC. Relying solely on the commitment to the WTO/UR trade liberalization would lead to minimal benefit for APEC economies.

The Changing Patterns of Trade

The simulation results presented in Table 7 show that trade liberalization would significantly increase the value of world trade. In particular, the results also show that more progressive liberalization would lead to larger increases in the value of exports and imports. With the implementation of WTO/UR commitment, the increases in world export and import are expected to increase by 1 percent at the largest for most commodities, except for agriculture by 3 percent, fisheries by 2 percent, and processed food by 1.5 percent. With APEC trade liberalization, the value of world trade increases significantly. The export and import of textile/garment and processed food products, for example, would increase by more than 11 percent and 9 percent respectively. In the manufacturing sectors, the exports and imports would increase by around 3 to 4 percent. Other natural resource based sectors, such as

¹⁶Huff, K. M. and T. W. Hertel (1996), "Decomposing Welfare Changes in the GTAP Model," *GTAP Technical Paper*, No. 5. July.

fisheries and forestry, the value of export and import are expected to increase by around 5 percent and 2 percent respectively.

The impact of agricultural liberalization through APEC on the value of trade in agriculture is significant. When the agricultural sector is liberalized through the WTO/UR scheme, the value of world export and import would increase by around 3.3 percent. Even with the implementation of APEC-partial, when the tariffs of non-agricultural commodities are reduced to 0 for developed and to 5 percent for developing member economies of APEC, the increases in export and import of agricultural commodities remain relatively constant at 3.5 percent. But when tariffs on agricultural commodities are also reduced to 0 to 5 percent, the volume of export and import would increase by around 8.5 percent.

Table 7. The Impact of Trade Liberalization on World Export
(% change in value)

Sector/ Commodity	Uruguay Round		APEC without		APEC Complete		APEC Complete	
	Scenario		Agriculture		with		and	
	1	2	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario
	Export	Import	Export	Import	Export	Import	Export	Import
AGR	3.31	3.36	3.59	3.63	8.24	8.35	8.81	8.94
FOR	0.47	0.40	2.39	2.34	2.35	2.29	2.32	2.25
FIS	1.98	1.93	4.47	4.31	5.31	5.09	5.30	5.09
MNG	0.72	0.72	1.43	1.46	1.47	1.50	1.49	1.52
PFD	1.50	1.61	9.42	9.53	8.78	8.92	8.71	8.85
TXL	0.77	0.78	11.44	11.50	11.45	11.52	11.44	11.51
PCM	0.55	0.56	3.44	3.47	3.41	3.44	3.41	3.44
MTE	0.69	0.69	4.03	4.05	4.01	4.02	4.00	4.01
OMF	0.72	0.72	4.50	4.54	4.50	4.54	4.50	4.54
CON	0.06	0.06	0.53	0.53	0.28	0.28	0.32	0.32
T_T	1.05	1.00	2.71	1.66	2.83	1.67	2.86	1.68
SER	0.63	0.63	1.42	1.42	1.46	1.46	1.46	1.46

**Table 8. The Impact of Trade Liberalization on Export (% Change in Value)
Uruguay Round and APEC Complete
(Scenario 4)**

Regions	Agriculture	Forestry	Fishery	Mining	Processed Food	Textile	Petroleum, Chemical, and Metal	Motor Vehicle and Electronics	Other Manufacture	Construction	Trade & Transport	Services
AUS	7.86	-0.48	1.06	-0.33	53.14	-21.52	-1.31	2.07	-6.16	-4.04	0.89	-3.49
NZL	-43.2	3.53	-24.01	0.6	41.35	-57.29	-3.01	-13.25	-17.92	-0.24	3.36	0.87
JPN	-52.21	11.89	11.51	2.87	34.26	38.43	9.29	7.92	10.75	-0.16	2.95	1.95
KOR	-57.75	21.2	14.57	0.95	16.82	36.85	13.91	3.66	14.27	-4.37	-0.77	-4.05
IDN	-0.04	8.88	4.05	-0.1	-11.5	30.07	7.57	14.27	1.62	-0.91	2.17	-0.53
MYS	15.55	0.5	-0.78	-0.77	20.64	26.98	15.62	-2.35	-0.99	2.12	1.85	-1.97
PHL	0.92	-26.98	-11.98	4.39	6.09	51.88	12.53	37.31	4.43	-6.44	-6.05	-11.55
SGP	3.62	14.14	7.17	6.56	66.69	19.84	6.45	-2.1	3.29	-1.43	0.62	-2.06
THA	-11.29	1.2	23.02	5.02	19.79	29.33	14.12	35.91	5.64	9.87	1.81	1.56
CHN	-17.09	-11.92	4.15	5.67	16.37	32.53	16.21	23.27	24.32	3.65	3.82	1.17
HKG	-93.44	70.18	4.08	-5.4	52.94	17.9	34.36	4.68	20.54	-3.59	-3.63	-4.53
CHT	-46.71	-7.94	-1.92	10.82	72.04	31.15	18.56	-2.54	13.4	-5.06	-2.96	-7.59
USA	37.8	4.63	15.74	0.21	16.36	-5.41	2.87	5.21	3.31	2.55	4.94	4.12
CAN	19.6	12.25	3.86	2.45	5.38	-20.6	-0.95	-0.68	-4.36	4.94	6.73	5.51
MEX	18.92	4.54	12.54	2.42	6.53	-34.16	0.01	-1.1	-6.2	4.62	6.17	4.6
CHL	-3.03	2.99	12.86	4.3	-7.3	7.04	12.14	7.87	0.79	2.33	4.42	3.54
LAM	5.71	-3.75	4.32	1.01	18.09	7.65	-0.21	-3.91	-0.45	-1.43	2.14	-1.16
WEU	-1.47	0.71	3.83	1.05	0.52	-0.67	1.71	2.08	0.71	0.68	3.13	1.1
ROW	6.94	2.03	7.78	1.7	-1.4	2.6	-0.17	2.12	2.23	1.04	4.14	1.63

Table 9. The Impact of Trade Liberalization on Import (% Changes)
Uruguay Round and APEC Complete (Scenario 4)

Regions	Agriculture	Forestry	Fishery	Mining	Processed Food	Textile	Petroleum, Chemical, and Metal	Motor Vehicle and Electronics	Other Manufacture	Construction	Trade & Transport	Services
AUS	22.94	3.85	5.49	-2.76	17.39	22.24	13.93	15.96	16.75	9.44	4.57	5.55
NZL	0.48	-4.43	46.18	-1.21	11.6	9.53	3.05	6.99	11.91	2.01	2.43	2.74
JPN	33.38	0.98	6.31	1.81	30.09	20.64	5.54	6.84	7.92	-0.19	6.16	6.56
KOR	30.81	5.38	32.11	3.34	22.72	28.66	12.2	16.18	15	3.49	2.74	5.77
IDN	32.82	24.87	52.82	2.69	4.95	39.94	6.55	7.33	12.84	0.03	2.57	2.81
MYS	33.14	41.37	9.36	12.21	29.76	20.93	3.52	1.97	8.29	1.01	2.12	2.39
PHL	41.67	48.63	15.62	5.67	48.07	31.95	18.04	24.01	26.52	22.6	11.29	13.36
SGP	8.89	5.67	7.16	4.13	20.24	8.21	4.54	-0.11	4.11	5.92	4.86	4.47
THA	32.13	8.35	54.83	5.15	57.67	74.79	17.96	28.55	36.26	-4.78	1.08	-0.72
CHN	13.15	11.81	51.72	0.47	23.79	66.21	19.44	37.71	38.49	0.9	0.29	2.74
HKG	0.81	7.76	2.15	6.08	4.08	8.11	5.28	2.64	6.1	1.23	4.93	5.83
CHT	36.17	7.25	19.43	5.57	5.04	29.22	13.55	7.83	13.76	4.14	9.71	10.67
USA	17.43	0.42	1.75	-0.45	19.86	21.29	4.32	3.11	4.73	-1.05	-1.52	-1.07
CAN	-1.59	-5.89	1.11	7.41	8.97	8.43	0.29	-0.32	1.05	-2.03	-2.05	-1.72
MEX	-7.35	-3.35	11.57	-0.16	-2.22	0.96	-0.13	-0.68	0.11	-3.12	-2.01	-1.63
CHL	1.06	36.86	9.99	18.94	6.9	10.28	6.2	4.21	9.03	-0.54	0.57	0.7
LAM	9.38	3.62	5.33	6.37	3.22	4.76	1.54	2	2.67	1.73	2.16	2.34
WEU	0.94	0.02	0.7	0.93	2.29	0.77	0.64	0.71	1.14	-0.55	0.51	0.62
ROW	0.74	3.19	2.05	0.76	1.61	2.45	1.09	0.39	0.91	-0.23	1.1	1.44

The changing patterns of export and import classified by region and commodity can be seen in Table 8 and 9. In term of export of agricultural commodities, the results show that the export from the USA, Canada, Mexico, and Australia would increase significantly. The export of agricultural products from the US is expected to increase by more than 37 percent while that of Canada and Mexico would increase by around 18-90 percent. In the economies where agriculture is highly protected like Japan and Korea, the export of agricultural commodities are expected to decrease by more than 50 percent. Malaysia's agricultural export will increase by more than 15 percent, partly because of large increase in the exports of non-grain commodities such as palm oil.

The imports of agricultural commodities in most Asian economies are also expected to increase as a result of trade liberalization. The value of agricultural imports in Japan, Korea, Indonesia, Malaysia, Philippines, Thailand, and China Taipei would increase by more than 30 percent. Even the imports in the US and Australia, two countries that are expected to be large exporter in agricultural products, would also increase by 17 percent and 22 percent respectively.

There are significant changes in the value of agricultural and forestry exports from Hong Kong, but in the absolute value these changes are minimal because Hong Kong does not have agricultural and forestry sector. The GTAP database shows that the contribution of those sectors in the economy is almost zero, so that small change in absolute value would lead to large change in percent value. Similar case applies in explaining the large percent change in the export of forestry, fisheries, and mining commodities from Singapore.

Trade liberalization through APEC would also significantly increase the export and import of processed food products. In almost all countries, both the export and import of processed food products increase significantly. The export of processed food from Australia, New Zealand, Singapore, Hong Kong, Chinese Taipei would increase by more than 40 percent.

Other commodities that will benefit from trade liberalization are the textile and garment products. In this sector, the regional division between exporters and importers is clear. While all Asian countries are expected to have strong increase in their textile and garment exports, Australia, New Zealand, USA, Canada, and Mexico will experience large decrease in their exports. In all of the regions covered in the study, the import of textile and garment products will increase. These results clearly show how Asian economies in general have larger comparative advantages in producing textile and garment products than other countries.

In other manufacturing sectors in general, the export performance of Asian economy is generally stronger than that of Australia, New Zealand, Canada, USA, and Mexico. Exports of manufacturing commodities from Philippines, China, and Thailand will increase by more than 20 percent on average, while that of Japan, Korea, Chinese Taipei, in general will increase by more than 15 percent. The exports from Australia, USA, and Canada, however will decrease by around 6 to 10 percent. The export from New Zealand is expected to decrease by more than 20 percent.

PRELIMINARY CONCLUSION

Trade liberalization measures undertaken in APEC will increase welfare of APEC member economies through more efficient resource allocation in the economy. They will also increase export and import among APEC member economies by between lowering trade barriers. This study estimated that APEC liberalization (implementation of Bogor Goal) would lead to potential welfare gain of more than US \$ 355 billion or more than 2.2 percent of total 1996 GNP of APEC member economies.

In terms of regional distribution of welfare gain from trade liberalization, the Philippines is expected to receive the biggest additional welfare, followed by Hong Kong and Singapore, two economies that have continuously adopted free trade regimes. Their potential welfare gains are expected to be more than 13 percent of their 1996 GNP. Korea, China, Chinese Taipei, and Malaysia will also benefit from trade liberalization as their welfare is expected to increase by around 8 to 10 percent of their GNP. Other Asian economies, namely Thailand, Indonesia, Australia, New Zealand belong to the next group, in which the welfare increase is expected to be around 2.5 to 5 percent of their GNP. All economies in American continent, the United States, Mexico, Canada, and Chile, however, would not get additional much benefit from APEC trade liberalization. In those countries, the negative impact of the terms of trade will dominate the positive impact of more efficient resource allocation.

In terms of resource reallocation and changing patterns of trade, the simulation results show large variation between APEC member economies, partly depending on the pattern of comparative advantages in each economy. There is strong tendency for continuing process of industrialization in all Asian economies. This process is characterized by transformation of resources from the primary sectors such as agriculture to modern sectors such as manufacturing, and also by the increasing export of manufacturing commodities. This pattern looks strong in Japan, Korea, and Thailand, and to the lesser extent also takes place in Chinese Taipei, Philippines, Indonesia, Malaysia, and China. The reversal process of industrialization, where the agricultural sector expands more than the manufacturing is expected to take place in Canada, the United States, Mexico, and Australia. There is less clear pattern of resource reallocation in Chile and New Zealand. The changing patterns of trade show how Asian countries tend to have stronger comparative advantages in manufacturing sectors. In contrast, Australia, Canada, ISA and Mexico have their comparative advantages in the primary sector, especially agriculture. While the liberalization would increase the value of world trade of all commodities, the greatest impact would take place on the trade of processed food, textile and garment products.