OECD Economics Department Working Papers No. 197

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https://dx.doi.org/10.1787/754552062461

OECD

Unclassified **ECO/WKP(98)10**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 15-May-1998
Dist. : 26-May-1998

English text only

ECONOMICS DEPARTMENT

ECO/WKP(98)10
Unclassified

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ABSTRACT/RÉSUMÉ

APEC Trade Liberalisation: Its Implications

Over the past decade, globalisation has been a pervasive trend in almost all economies. The world economy is becoming increasingly interdependent, deepening and intensifying international linkages, most notably in trade. As trade expands among nations throughout the world, integration of the Organisation for Economic Co-operation and Development (OECD) economies with non-OECD economies has become a salient feature of the global economy.

This study identified the possible long-term effect of APEC's trade liberalisation commitments on real GDP and trade across regions, both inside and outside the APEC area, and on employment by production sector in each region, using a multiregion, multisector, computational general equilibrium (CGE) model.

One of the key findings from our empirical work is the impacts of trade liberalisation and facilitation measures in the APEC region have turned out to be significant at least in direction if not in magnitude, throughout OECD as well as non-OECD economies. In particular, because agricultural liberalisation and trade facilitation are incorporated in our experiment, the impact stemming from liberalisation in these areas turned out to be substantially important.

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Au cours de la dernière décennie, la tendance à la mondialisation s'est développée dans presque toutes les économies. L'économie mondiale se caractérise par une interdépendance croissante, avec un approfondissement et une intensification des liens internationaux, plus particulièrement dans le domaine commercial. Avec l'extension des échanges entre nations à travers le monde, l'intégration des économies Membres de l'Organisation de Coopération et de Développement Economiques (OCDE) et des économies non membres est devenue un trait marquant de l'économie mondiale.

Cette étude examine, à l'aide d'un modèle d'équilibre général calculable, multisectoriel et multirégional, l'effet à long terme possible des engagements de libéralisation des échanges au sein de l'APEC sur le PIB réel et sur le commerce d'une région à l'autre, à l'intérieur comme à l'extérieur de la zone de l'APEC, et sur l'emploi par secteur productif dans chaque région.

L'une des principales conclusions de nos travaux empiriques est que les effets des mesures de libéralisation et de facilitation des échanges dans la région de l'APEC se sont révélés significatifs du point de vue de leur orientation, sinon de leur ampleur, dans toute la zone de l'OCDE ainsi que dans les économies non membres. En particulier, la libéralisation et la facilitation des échanges dans le secteur agricole étant incorporées dans notre exercice, l'impact de la libéralisation dans ces domaines s'est avéré très important.

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I. Introduction

1. Over the past decade, globalisation has been a pervasive trend in almost all economies. With the launch of the World Trade Organisation (WTO), more than one hundred nations committed themselves to open markets for goods and services in a manner compatible with multilateral trading principles[4]. About 90 per cent of these nations[5] are involved in regional economic arrangement such as the European Union (EU), the North American Free Trade Agreement (NAFTA), and the Asia-Pacific Economic Co-operation (APEC). The world economy is becoming increasingly interdependent, deepening and intensifying international linkages, most notably in trade. The integration[6] of individual economies into the world economy has progressed, forming new links between developed and developing economies. The ratio of world trade to GDP in nominal terms has been on a steady rise since 1987.

2. As trade expands among nations throughout the world, integration of the Organisation for Economic Co-operation and Development (OECD) economies with non-OECD economies has become a salient feature of the global economy. Indeed, recent decades have shown a growing trend towards globalisation, with non-OECD economies being a propelling force, through their linkages with OECD economies. An improved economic situation in non-OECD areas would signify a large shift in the global

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1. The authors wish to thank Paul Atkinson for helpful comments on early drafts, and special thanks go to Anne Eggimann for technical preparation.

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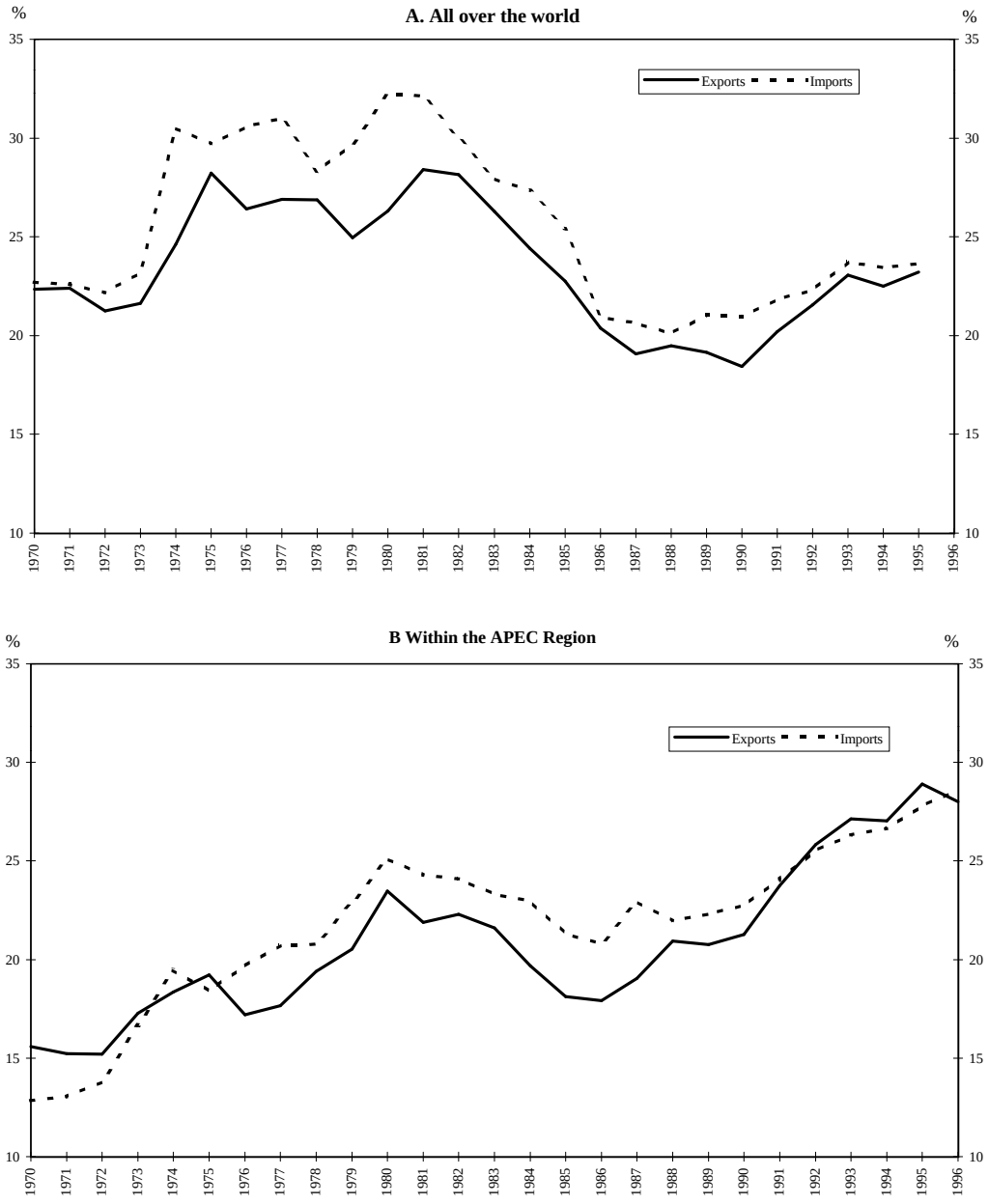
3. During the preparation of this paper, Mr Han worked as a Principal Administrator in the Economics Department of the OECD while on secondment from Korea's Ministry of Finance and Economy, and Mr Cheong was a research fellow at the Korea Institute for International Economic Policy (KIEP). Mr Han is the principal author of the paper, apart from the simulation work, which was conducted by Mr Cheong. Any questions on the simulation work in this study should be directed to Mr Cheong.

4. Initiated by Viner (1950), there has been a long-lasting debate over whether globalisation and regionalism are complementary or conflicting developments. Some people like Bhagwati (1992) and Bhagwati and Krueger (1995) raise a concern that the rule-based multilateral trading system under the GATT will be weakened and undermined as regionalisation develops. Nevertheless, in-depth discussion of this debate is beyond the scope of this study.

5. See Lawrence (1996, p. 1).

6. The term 'integration', as defined by economic textbooks, implies extending the market limits for products and factors of production beyond national boundaries. Naturally, reductions on traditional market impediments, namely, tariffs and quota restrictions, are mainly considered as such extensions of market limits. See Machlup (1976) for more details. On the other hand, Das (1996) states that 'economic co-operation' can range from consultation process concerning trade issues to collusion in non-competitive market behaviour within a specific but extended boundaries.

Figure 1. **OECD trade with non-OECD economies by region**
(percent of trade with non-OECD economies)



Source: OECD

economic balance. The rapid economic growth and trade liberalisation of many non-OECD economies has made them increasingly important as OECD trading partners. While the world economy is largely dominated by OECD economies, many emerging economies will have significant effects on OECD economies at large. OECD economies are increasingly affected by the policies and performance of such emerging economies. In this regard, the OECD has deepened its partnerships with major non-OECD economies through the OECD's growing role as a catalyst for international economic co-operation. The OECD examined prospective economic developments in many developing economies and their linkages with OECD economies, focusing on a time horizon of 2020. Major findings, summarised in "The World in 2020: Towards a New Global Age", indicate that the rapid growth of non-OECD countries will importantly affect world trade and production, thereby adding significant net gains to the OECD as well as to non-OECD economies.

3. Given the growing linkages between OECD and non-OECD economies, APEC is one of the regional economic arrangements in which OECD has become increasingly interested. With a combined income of more than 16 trillion US dollars and about one-half of the world's population, APEC economies accounted for about 55 per cent of the total global income and 40 per cent of global trade in 1995. Notably, seven out of seventeen APEC members are OECD members, while many of the other APEC nations are so-called "emerging economies", with which OECD economies maintain close linkages. In this light, Yamazawa (1996) asserts that APEC can be described as another OECD, only based in the Asia-Pacific region. He also states that APEC will supplement the OECD in the Asia-Pacific with its dynamic developing economy members[7].

4. APEC's trade liberalisation commitments and its implications for the world economy is the underlying theme of this paper. More specifically, this study reviews the progress made to date and considers some of the issues APEC members will face as they attempt to extend this progress. It also attempts to identify the possible long-term effect of liberalisation commitments on real GDP and trade across regions, both inside and outside the APEC area, and on employment by production sector in each region, by surveying the existing literature and by extending it using a multiregion, applied general equilibrium model[8]. To our knowledge, this study is the first to examine the economic impact of the APEC initiatives on OECD economies.

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7. See Yamazawa (1996, pp. 114-115).

8 The computational, general equilibrium (CGE) model used in the paper is a perfectly-competitive one, which is similar to that of Ballard and Cheong (1997) and Cheong (1995, 1997). The CGE model addresses private household behaviour, international trade, global saving and investment relationships. Further, the GTAP version 3 database, used in this study, includes bilateral trade, transport, and protection data characterising economic linkages *among regions*, together with an individual country-specific database that accounts for international distinctions *within regions*. There are several virtues in using the CGE model and GTAP database: first, the model, in its nature of a general equilibrium model, could capture more extensive economic linkages than partial equilibrium or macro-econometric models; second, the GTAP database covers well the countries involved, and the different types of trade agreements by APEC economies. Economic impacts of the free trade commitments will be assessed using empirical and simulation methods. In so doing, we consider APEC trade liberalisation scenarios in various ways. Comparison of the results by scenario provides possible directions for further trade liberalisation. This study will improve upon the existing literature in several ways. First, the study comprehensively includes non-tariff barriers, as well as tariffs, within a variety of scenarios. We take into account trade facilitation, barriers to services trade, agricultural protection, as well as merchandise trade barriers. Despite its significance in the APEC liberalisation framework, paucity of data on capital mobility does not permit us to consider liberalisation of capital markets. The GTAP database does neglect financial aspects by simply measuring value of international trade in the U.S. dollar terms without incorporating the corresponding foreign exchange rates.

5. As this paper was being finalised, the financial turbulence which began in Thailand during early 1997 spread more widely to a number of APEC countries in Asia. The adjustments that will be required in these countries are likely to involve a difficult period of slower growth, but they should not have an adverse impact on the longer-term prospects of the affected countries. Nor should they imply any retreat from liberalisation commitments undertaken in the APEC context. Indeed, they may involve an acceleration of structural reforms and liberalisation measures which could, in turn, prove to have a positive effect on the longer-term outlook. At this stage, however, it would be premature to make any judgements about the ultimate impact of any reforms, and no attempt has been made in the analysis that follows to incorporate any effects of these developments.

6. The next section outlines the evolution of APEC's trade reform initiatives and explores some challenges which might lie ahead. After a brief review of the literature in Section III, we present the framework for analysis in Section IV. While the structure of the applied general equilibrium model underlying the analysis is further outlined in the Appendix, the concept of equilibrium and data calibration for this study will be described briefly. The experimental designs will then be categorised and defined. Section V will discuss the simulation results. The results of this study are evaluated in Section VI.

II. Progress in APEC and some challenges

1. The APEC initiatives

Overview

7. Since its inception in 1989[9], APEC has aimed at promoting the development and growth of its members through trade liberalisation in a manner consistent with the principles embedded in the multilateral trading system. In the Seoul APEC Declaration of 1991, APEC adopted the principle of open regionalism, namely, regional integration without trade discrimination against other economies. This open regionalism contrasts sharply with the approach taken in most regional co-operation agreements including the EU and the NAFTA. As Drysdale *et al*. (1997) put it[10], APEC is

> "characterised by market-driven integration, rather than institutional integration[11]; involving economies at different stages of economic development rather than economies with similar income levels[12]; and outwardly oriented rather than inward-looking".

Second, this study assesses the consequences of APEC's initiatives for OECD economies. To this end, we aggregate regions in the GTAP database to varying degrees, which reveals possible development directions for the linkages between OECD and non-OECD economies. A third contribution of this study is an examination of the structural adjustment in each production sector. In this vein, we investigate changes in the sectoral output incurred from APEC's free trade commitment by production sector in each region.

9. APEC was inaugurated in 1989 in its first Ministerial Meeting in Canberra, Australia.

10 See Drysdale *et al*. (1997, p. 4).

11. APEC is distinguished from other regional economic arrangements in several aspects. APEC does not form any supranational body, but simply operates a secretariat. It is not characterised as customs union like the EU nor as free trade area like the NAFTA.

12. For example, per capita GDP among APEC economies ranges from close to 40 000 US dollars for Japan to less than 1 000 US dollars for China and Indonesia.

8. APEC has since grown in scope and liberalisation commitments, and has held annual summit meetings of heads of state[13]. The first summit was held in Seattle, the United States, in 1993, where they adopted a broad vision of regional free trade and investment[14]. At the second summit in Bogor, Indonesia, in 1994, APEC economies set target dates for achieving the long-term goal of free and open trade and investment, no later than the year 2010 in the case of developed APEC countries and 2020 in the case of developing countries. The APEC Action Agenda was adopted at the Osaka, Japan summit in 1995; APEC member countries during this summit agreed to further develop their detailed action plans by the summit of 1996. The fourth APEC summit of Manila, Philippines, took another step toward the goal of regional free trade by approving an action plan for implementing trade and investment liberalisation in the region. While the first three APEC summits of Seattle, Bogor and Osaka shaped APEC's vision and objectives, the fourth summit marked the beginning of the action phase by adopting the Manila Action Plan for APEC (MAPA). APEC member nations have reinforced their liberalisation commitments through MAPA, which details country-by-country commitments to free trade and investment in the region, effective as of 1 January 1997.

9. The primary focus of the MAPA commitments relates to trade liberalisation, trade facilitation (e.g. co-operation on standards, improving customs procedures, co-ordinating competition policies and dispute mediation), and economic and technical co-operation (e.g. development assistance and co-operation projects in the areas of infrastructure, energy and environment). MAPA comprises three parts, namely, Individual Action Plans (IAPs), Collective Action Plans (CAPs), and Economic and Technical Co-operation (ECOTECH). In formulating and implementing IAPs and CAPs, all APEC economies have been encouraged to observe the principles of comprehensiveness, WTO-consistency, comparability, non-discrimination, transparency, standstill, simultaneous start, continuous process and differentiated timetables, flexibility and co-operation.

Individual Action Plans (IAPs)

10. IAPs are voluntary commitments submitted by each member economy to liberalise and facilitate trade -- primarily through a lowering of tariffs and other barriers -- and liberalise rules for foreign investment. To a large degree, IAPs might be deemed a reiteration or extension of each economy's liberalisation plans which had been carried out in their own economic context even before APEC was established. A Pacific Economic Co-operation Council (PECC)'s study[15] reports that the unweighted average tariff level in the APEC region has already been lowered from 15 per cent in 1988 to 9 per cent in 1996, and asserts that the IAPs will further accelerate tariff reduction in the region.

11. The IAPs in MAPA are summarised in Table 1. Noteworthy is the extent to which IAPs differ across APEC members. For instance, the United States' action plan is not well-defined and does not appear to involve any specific commitments, and many East Asian economies appear to be reaffirming

13. For a comprehensive survey on the progress in APEC, see Drysdale *et al*. (1997).

14. The practical matters agreed upon among the leaders through the summit include : convening of the APEC Financial Ministerial Meeting to discuss common economic issues such as lowering trade barriers among member countries, and enhancing co-operation in the areas of transportation and telecommunications, and education. The leaders at the meeting also agreed to expand co-operation in technology transfer and exchange in arts and science.

15. See PECC (1996).

Table 1**. A summary of individual action plans in MAPA**

Country	IAPs
1) Australia	Generally goes beyond WTO commitments. Plans to reduce tariffs, currently averaging 6.1 per cent compared to 18.2 per cent in 1988, to between zero and 5 per cent by 2000.
2) Brunei	Plans to fix total tariff levels at 5.0 per cent, going beyond its WTO commitments. Aims for zero tariffs by 2020.
3) Canada	Strongly supports Information Technology Agreement to remove tariffs on these products by 2000 and is prepared to discuss similar arrangements on oilseeds, non-ferrous metals, wood products, fish products and electronics.
4) Chile	Exceeds WTO commitments on tariff reductions and envisages completing most trade and investment liberalisation by 2010 rather than APEC's 2020 deadline for developing countries.
5) China	Plans to reduce average tariff to 15 per cent by 2000 from the current 23 per cent. Aims to promote foreign participation in banking, insurance, transport, telecommunications and retailing.
6) Hong Kong, China	All Hong Kong's commitments go beyond WTO. Aims for zero tariffs by 2010. Also plans to consider introducing business travel pass scheme by 1997-98.
7) Indonesia	Plans to lower tariffs to a zero to 10 per cent range by 2003. Also aims to privatise state enterprises covering the steel industry, services, shipping and railways.
8) Japan	Plans to align product standards with the rest of the world and to speed up its quarantine control procedures for animal and plant product imports. Also determined to introduce a wide-range of deregulatory measures for structural reform, with a view to realising an economic society which is open to the world.
9) Korea	Plans to remove all non-tariff barriers on all items, except rice, by 2001 and to open up more sectors to foreign involvement.
10) Malaysia	Foreign equity of up to 49 per cent to be permitted in domestic brokerages.
11) Mexico	To speed up tariff reductions if other member countries agree to do so. Plans to eliminate the 49 per cent ceiling on foreign direct investment in the automobile industry by 1999, permitting 100 per cent foreign ownership of international land transport by 2004.
12) New Zealand	Already exceeds WTO commitments and pledges further liberalisation.
13) Papua New Guinea	Aims to simplify cumbersome procedures for approving foreign investments.
14) Philippines	Aims to reduce tariffs to uniform 5.0 per cent by 2004, except for sensitive agricultural products. Plans to eliminate some remaining restrictions on foreign ownership in the financial sector.
15) Singapore	To remove all tariffs by 2010. Plans to expedite liberalisation of basic telecommunications sector and to meet other commitments ahead of schedule.
16) Chinese Taipei	To reduce tariffs to an average 6.0 per cent by 2010. Plans to lift barriers to some agricultural imports when it accedes to WTO.
17) Thailand	Goes beyond its WTO commitments in most sectors and in the rest fully complies with its earlier APEC commitments. To allow privately-owned ports, higher foreign participation in the insurance industry and to liberalise natural gas and power generation.
18) United States	Plans to set the pace in any areas where it has not already met or exceeded its APEC and WTO commitments.

their existing trade reform schedules[16]. Furthermore, some economies make their liberalisation schemes conditional on other APEC members' declarations (e.g. Mexico seeks to speed up tariff reductions if other member economies agree to do so.).

12. On the other hand, there are some examples where IAPs goes beyond existing commitments. A number of economies including China, Korea, the Philippines and Thailand envisage a substantive tariff reduction, while some members -- Singapore, Hong Kong, China, New Zealand, Chile by 2010, and Brunei by 2020 -- declared a target of zero tariffs on all or most imports. At the same time, through IAPs, most APEC economies unveil the schedules to streamline their non-tariff barriers in conformity to WTO rules, and commit themselves to undertake specific liberalisation measures to promote investment. As regards liberalisation in services trade, APEC economies, in principle, aim at following the line of the WTO negotiating process. Under MAPA, APEC member economies should be subject to their unilateral commitments, in that their liberalisation process will remain to be consulted, reviewed and revised within the APEC framework. Such surveillance mechanism will likely contribute towards ensuring the effectiveness of each member economy's commitments.

Collective Action Plans (CAPs)

13. CAPs addresses 15 issue areas, which were agreed upon by APEC member economies to facilitate trade and investment and to build up more favourable business climate in which business can be conducted in an easier, cheaper, more transparent way. In particular, the Manila summit in 1996 held a group discussion session with major business representatives from all APEC economies, promoting partnerships between the public and private sectors. The joint declaration adopted at the Manila summit states that they would "intensify work in 1997 on the simplification of customs clearance procedures, effective implementation of intellectual property rights commitments, harmonisation of customs variation, facilitation of comprehensive trade in services and enhancing the environment for investments". Some areas such as customs, standards and conformance, and investment were dealt with in some detail through a series of comprehensive works among APEC member economies. Tariff nomenclature was harmonised among APEC members in 1996, and further systematic efforts will be exerted to establish information infrastructure on customs procedure by the year 2000. Special emphasis has been placed on the alignment of APEC members' standards, in such area as electrical and electronic appliances, with international standards. The APEC investment guide activities were also promoted. By contrast, during 1996, other issues such as tariffs, non-tariff measures and rules of origin were newly introduced. An example of major programmes includes the establishment of an APEC database containing information on customs, tariffs and non-tariff measures over the immediate and medium term. However, it appears that more concrete programmes or timetable for implementation of CAPs after the year 2001 and onwards remain to be developed. Most of CAPs measures are to be rolled over annually through the monitoring and reporting process among APEC economies.

Economic and Technical Co-operation (ECOTECH)

14. ECOTECH forms the third component of MAPA. The APEC leaders felt it essential to smooth out divergences in economic development, technological capability and standards of living among APEC economies in order to deepen the spirit of the community in the Asia-Pacific region. They reached a consensus that ECOTECH could serve as a key role for reducing such disparities, and formulated progress reports on more than 350 joint activities in economic and technical co-operation.

16. See Drysdale *et al*. (1997).

2. Issues and prospects

15. Enhanced economic integration in the APEC region would bring both opportunities and risks. The opportunities might lie in achieving improved market access beyond WTO commitments, while prompting outsiders into further liberalisation. In reality, protection rates in terms of tariffs set up by some APEC economies already stand at a fairly low level, or even at zero, and this would probably give rise to significant pressures, not only on other APEC economies but on outsiders to accompany their parallel reduction in border barriers. Indeed, the APEC action plans will likely have considerable effects on the world economy at large as well as APEC economies, by providing opportunities for substantial gains stemming from full materialisation of APEC's free and open trade goal. APEC holds promise as long as it seeks a trading agreement which reflects fully liberalised and facilitated trade rules. For example, the trade environment could be substantially improved through simplified customs procedures and more transparent trade practices, as well as through tariff reductions. Such improved procedures and practices should then reinforce market forces and benefit both insiders and outsiders in APEC, while creating rather than diverting trade[17].

16. Nevertheless, some risks and challenges might also be foreseen both internally and externally. From an *internal* standpoint, consensus in the form of binding agreements, which can be applied region-wide, might not be easily achieved; while individual APEC economies, despite their formal espousal of "open regionalism" at the Seoul meetings in 1991, might face a problem of whether they can apply their free and open trade provisions effectively to *external* trading partners.

17. In broad terms, there are three types of internal challenges. First, the enormous diversity of the APEC region in political, economic and cultural milieus may make it difficult to reach agreements among its member states.

18. Not all countries in the APEC region have adopted pluralistic democracy, and some concerns about "imperialism" and economic domination by more advanced countries remain. This could limit the cohesion of APEC economies, and adversely affect formation of a purely free trade arrangement in the region. In addition, current United States legislation does not permit the nation to treat China on a unconditional 'most-favoured-nation' (MFN) basis. This situation may be difficult to reverse without further progress in resolving differences about a number of issues not directly related to trade or economics.

19. From an economic point of view, individual APEC countries differ in their policy stance as well as economic structures. Developing APEC countries might be obliged to pursue more severe and costly structural adjustments in the wake of the APEC initiatives. While the APEC region at large remains heavily dependent on overseas markets, many economies in the region compete with each other. Any developing economies -- who simultaneously seek to pursue outward-looking economic strategy, while nurturing the domestic infant industries -- would hold back the pace of their liberalisation schemes. Similarly, the United States textile producers would not welcome a complete trade liberalisation by their government *vis-à-vis* the corresponding Chinese low-cost producers. As some East Asian economies demonstrated during the Uruguay Round negotiations, agricultural market opening would also be difficult in so far as farmers hold a significant share of the population in a nation. These reflect the domestic political economy of industrial policy in some APEC economies, and raise a concern that political resistance to full liberalisation in APEC would come from many quarters including the agricultural and

17. See Lawrence (1996).

textile sectors. Consequently, barriers to trade should be first removed in sectors with the least political resistance. In addition, services trade will likely face some obstacles to international competition, and, in turn, realisation of free trade. While some services *per se* can be traded internationally to facilitate trade in goods without imposing serious concerns, many services industries raise difficult issues where they take the form of government monopoly (e.g. telecommunication), are subject to government controls on entry or capacity (e.g. aviation), or raise questions about consistency with nation-specific cultural standards (e.g. mass media and cinema). Extensive international agreements may be required if meaningful liberalisation is to be achieved. Then restrictions on trade in these services industry may be difficult to eliminate. Furthermore, maintaining such agreements and insuring compliance might not be easy to arrange.

20. Challenges might also be posed to another important area of APEC trade initiatives, namely, trade facilitation. A free trade agreement in APEC could lead to reduction in tariffs in the region, but it will remain difficult for outsiders to enter the market of a specific region if that region's regulations are obscure, or if favour is given to that region's products/producers. For instance, the United States has maintained that the Japanese market is, at least in part, heavily influenced by private practices whose effect is virtually to close the market to outsiders[18], although formal rules on trade liberalisation presented by the Japanese government may exist. Thus, a more substantial agreement in the area of trade facilitation would be important in order to render an APEC agreement politically acceptable in individual APEC economies. That is, trading systems and practices in individual APEC economies also should be transparent and non-discriminatory. This is the very reason why trade facilitation measures are vital to expansion in trade, and require more economy-wide, concerted arrangements by the participants. However, we note that some trade facilitation items contained in the APEC initiatives would be relatively easy to arrange. For example, in the area of customs clearance procedure, participants can reap the benefits to the maximum extent possible with involvement of more nations. In order to reduce costs and curtail unnecessary red-tape in customs administration, APEC economies have already been implementing the electronic data interchange programme for more efficient customs clearance procedure. In general, accession to such trade facilitation infrastructure could be extended to would-be participants without serious resistance from the existing participants, since exports to, as well as imports from, prospective participants can be facilitated therewith. Consequently, special efforts to search for such areas and develop them are deemed very important.

21. A second concern relates to APEC's voluntary and flexible nature. Unlike the EU, for example, APEC does not resort to any uniform negotiation schedules among its member economies. Although there may exist peer pressure to encourage all APEC governments to make more extensive commitments, APEC economies are, in principle, to commit themselves unilaterally to reducing or eliminating border barriers. Then individual APEC nations' implementation remains to be reviewed and monitored within APEC. The mechanism of such consultation, review and revision is expected to operate adequately. It would then be pivotal for APEC members to cope with such challenges in a more concerted manner. Further, in the trade of agricultural products, the principle of "flexibility" was adopted, which means endorsement of exceptions in politically sensitive areas. This would offer countries with less developed agricultural sectors more time to restructure the industry. Yet while APEC economies are not required to liberalise existing border barriers in a uniform way, some governments may be reluctant to step up the pace of their liberalisation, or to broaden its scope, if other economies are proceeding slowly. Certainly, this would discourage many APEC nations from reaching a consensus toward fully liberalised trade.

18. *Ibid.*

22. Third, various and overlapping preferential subregional trading arrangements within the APEC region could serve as a source of tension. To date, many subregional liberalisation initiatives within the region (Table 2) have confined all liberalisation benefits to insiders only. For instance, NAFTA members are not likely to extend their liberalisation provisions to non-NAFTA economies at least until the year 2010, which might not be compatible with the interests of APEC nations. This problem may worsen and become more complicated, if some South American countries join NAFTA at some stage in the future. Thus, to solidify cohesion among APEC members, it will be important that any new liberalisation arrangements by the subregional economies within APEC do not create any new sources of trade distortion, and that the interests of other economies in APEC are duly considered.

Table 2. **Major regional economic arrangements in the Pacific rim**

Name	Main features
APEC (18)	Promotion of member countries' economic development. Diverse members including NAFTA, AFTA, ANZCERTA, NIEs, Japan, Papua New Guinea.
AFTA (6)	Free trade area to be achieved by 2008. ASEAN Free Trade Agreement comprising Thailand, Malaysia, Indonesia, the Philippines, Singapore, Brunei.
ANZCERTA (2)	Closer economic relations. Harmonisation of business law and co-operation in the areas of standards and customs procedures. (Australia and New Zealand).
EAEC (10)	Economic co-operation with some emphasis on political as well as economic agenda (Brunei, China, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Chinese Taipei, Thailand).
NAFTA (3)	Free trade area aiming at phased reduction of tariffs and quotas with liberalisation of investment flows (the United States, Canada, Mexico).

23. Even if all APEC economies can manage to build up a consensus on trade reform *internally*, a question still remains on the *external* front : On what basis they should treat outsiders? There would appear to be three main options: *(i)* preferential trading arrangement (i.e. closed regionalism), *(ii)* unconditional MFN (i.e. open regionalism), and *(iii)* conditional MFN. That is, considering its nature of the current international trading system, a range of policy options are allowed for APEC's member governments, which encompass the full gamut from *unconditional,* national treatment to discrimination *vis-à-vis* outsiders. Indeed, while APEC is a regional arrangement, APEC economies are committed to the multilateral trading system[19]. In practice, not all APEC nations appear to hold a shared view on the APEC's guideline. There is a range of views on the APEC guideline, namely, "open regionalism". For instance, given their limited political bargaining power, many Asian economies are likely to welcome the current multilateral trading system, and thus have a clear preference for 'open' regionalism. By contrast, many observers feel that the United States may take a 'conditional' approach to MFN treatment, applying its liberalisation provisions only to those economies who reciprocate. The view held by some that the so-called "unconditional" MFN treatment of non-member economies would weaken the incentives for such non-members to reduce their border barriers would reinforce such an approach. Accordingly, many

19. It is recalled that APEC has shaped its guiding principle as "open regionalism". In line with this, the Eminent Persons Group, which is APEC senior advisers' meeting, has strongly suggested that individual APEC nations adopt a unilateral liberalisation approach, namely, unconditional MFN treatment. Nevertheless, the spirit of "open regionalism" might be challenged, especially in the sense that a regional economic arrangement would inevitably involve discrimination against outsiders.

people appear to be sceptical about the validity of the "open regionalism" especially in case when any large economic entity like the EU does not reciprocate fully *vis-à-vis* the APEC initiatives.

24. In theory, such 'free riding' could be of little importance to APEC economies since it is the 'free riders' themselves that incur the main costs of market protection. However, this line of argument might be politically unrealistic because inside protectionists within APEC would hardly accept it. Under such circumstances, co-operative arrangements among APEC members could easily serve as a means to keep the liberalisation benefits 'closed' to themselves exclusively. Thus, an alternative and more realistic approach would be for APEC economies to opt for extension of its free trade provisions to all nations that are prepared to reciprocate. In particular, we note that the so-called "conditional" MFN principle has been increasingly adopted in a range of WTO negotiations, going back to the Tokyo Round in the late 1970s. The GATT/WTO Articles stipulate that MFN treatment should apply at least to merchandise trade originated from its member economies, but they allow for excepting some special circumstances. Viewed in this way, a "conditional" MFN rule looks viable to at least some APEC nations in that it would avoid 'free riding' by outsiders.

III. Literature review[20]

25. The computational, general equilibrium approach (CGE)[21] has increasingly been adopted as a tool of investigating the effects of APEC's trade liberalisation commitments. Indeed, many empirical studies have attempted to estimate the quantitative economic impacts of the APEC's commitments when they are realised. Yet the applied general equilibrium models used in previous studies[22] differ from one another, especially in their treatment of trade-protection data and policy scenarios. Most models incorporate tariffs, but varying attempts have been made to incorporate non-tariff barriers. In what follows, we review some of the literature which employs CGE models to analyse the impacts of APEC initiatives.

26. Inada (1996) uses the so-called ICSEAD World Link Model to examine the effects of the APEC's liberalisation schemes for the year 1995 through 2003. Several findings are obtained from the simulation of APEC schemes such as front-loaded tariff reduction, and tariff reduction plus foreign direct investment (FDI) inflow. In the first scenario, tariff reduction only throughout the APEC region slightly raises the region's GDP growth rate, and increases its real exports more rapidly than real imports.

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20. There exists a wide range of literature on economic co-operation issues within the Asia-Pacific region using either a descriptive approach or economic modelling. For a descriptive analysis of economic co-operation in the Asia-Pacific region, see Hufbauer (1995), Yamazawa (1996), and Young (1993a, 1993b, 1996). Those studies which are based on economic modelling approach are indeed numerous : Among others, Ballard and Cheong (1997), Lewis *et al.*(1995), Inada (1996), Anderson *et al.* (1997) and Dee *et al.* (1996) examine the economic effects of preferential trading blocs in the Asia-Pacific region; while Cheong (1997a; 1997b), Martin *et al.*(1994), McKibbin (1996), and Young and Huff (1996), and Lee *et al.* (1997) examine the welfare effects of trade liberalisation on a Most Favoured Nation (MFN) basis vs. discriminatory trade liberalisation in the region. We confine ourselves here to reviewing some of the most important work which adopts an economic modelling approach.

21. Discussion on the principles of the general equilibrium modelling can be found in many works including Dixon *et al*. (1992) and Shoven and Whalley (1992), as well as Hertel (1997).

22. The general equilibrium model has been used extensively in different studies on trade liberalisation. However, examination of all previous literature is beyond the scope of this study. For more detailed survey, see Shoven and Whalley (1992).

However, according to his simulation results, the benefits of tariff reduction are not equally shared by every member country or region. For instance, the economic growth of Japan and Korea accelerates, whereas the other APEC members' growth slows. He claims that such unequal merits have arisen not only from the different rate of tariff reduction in member countries, which in turn triggers unequal changes in relative price and uneven price elasticities in his model, but also from each country's different share of imports with corresponding trade partners. Second, tariff reduction with FDI inflow encourages higher growth in the Association of South-East Asian Nations (ASEAN) and China, as well as in Japan and Korea. In this regard, he reaches a conclusion that FDI flow in all APEC member countries, including China and ASEAN, is important to maximise the benefits of APEC's liberalisation schemes.

27. Nevertheless, Inada (1996) remains open to some criticism. Without disaggregating commodities, he aggregates 18 APEC member countries into eight countries or regions, thereby losing information on characteristics of individual industries. In his model, neither production technology nor consumers' preferences are explicitly addressed. Furthermore, non-tariff barriers such as agricultural protection and antidumping duties have not been incorporated. Tariffs of individual countries or regions are assumed to decline linearly to zero by 2003. Thus, the time horizon, which stretches to 2003 in his study, might lack reality in that APEC member countries, through the Bogor Declaration in 1994, have envisaged implementing their liberalisation schemes until 2010/2020.

28. More recently, Anderson *et al.* (1997) also examine the impacts of major trade reforms likely to affect the APEC region over the next decade, based on GTAP model. To be specific, in so doing, they make several assumptions : First, China joins the WTO and the Uruguay Round (UR) agreements are fully implemented by 2005. Second, all APEC economies liberalise trade beyond their UR commitments to the extent of a further 50 per cent reduction in import tariffs or tariff equivalents by 2005. One of their key findings is that MFN trade liberalisation by APEC member countries could add to substantial gains of real output and structural changes in the region. Further, their study shows that such benefits depend heavily upon the inclusion of agriculture in the APEC reform.

29. Notably, they take into account the agricultural reform in the APEC region, and thus this is deemed a further step toward more in-depth assessment of the APEC initiatives. As in the Inada (1996) study, however, the time horizon in their empirical analysis is confined only to 2005, thereby lacking reality. Furthermore, non-tariff barriers are not addressed well in their study.

30. A more rigorous approach, proposed in Dee *et al*. (1996), Young and Huff (1997), and Lee *et al*. (1997), attempts to incorporate a range of non-tariff barriers with disaggregation of production sectors to varying degrees. Dee *et al*. (1996) employ a multiregion, multisector model called IC95 to present a long-run impact of APEC's free trade commitment, netting out the impact of the NAFTA and UR agreements. They incorporate APEC non-tariff barriers as well as tariffs in a more extensive manner : services and agricultural trade liberalisation, trade facilitation measures, and liberalisation of merchandise trade. Their key findings reveal that the benefits from both services trade liberalisation and trade facilitation measures are sizeable, not less than those from merchandise trade liberalisation alone. In particular, they report that trade facilitation measures equivalent to 5 per cent of the import values[23] would yield real income gains which would be as great as or greater than those from trade liberalisation. In so doing, they adopt two alternative estimates of the direct cost savings from facilitation measures, namely, 5 per cent and 10 per

23. Dee *et al*. (1996) assert that "a direct cost saving equivalent to 5 per cent of the value of trade seems an upper limit to the potential gains from a relatively narrow set of trade and investment facilitation measures." They further posit that the cost savings would rise to as much as 10 per cent of the trade values with the broader consideration of standards, competition policy, procurement and regulation.

cent of the import values, using the results of Cecchini (1988) and the United Nations Conference on Trade and Development (UNCTAD; 1992) studies. Further, their analysis suggests that a dismantling of agricultural protection could additionally bring 35 per cent of the real income gains from liberalisation in traded goods and services, and save 10 US billion dollars of annual free rider gains which otherwise would accrue to the EU. APEC's move toward free trade, however, would pose a structural adjustment problem in the agricultural sector by causing significant agricultural unemployment in Japan and Korea among others, but would raise the real disposable income per head of those remaining in agriculture.

31. Their incorporation of a wide range of non-tariff barriers is an important step toward improving the analysis on the impact of APEC's liberalisation reform. The Dee *et al*. paper is also unique because it is the only study which considers APEC's trade facilitation to date. Nevertheless, the commodities in their study are highly aggregated, thereby ignoring industry-specific characteristics and limiting the analysis of some important production sectors. Accordingly, more detailed classification of the production sector would be desirable.

32. Some recent studies, Young and Huff (1997) and Lee *et al*. (1997), examine whether APEC's open regionalism would gain more advantage over preferential free trade within the region. Young and Huff (1997) conduct a simulation with the GTAP model, assuming that APEC, through its free trade commitment, would completely remove *ad valorem* import tariffs and tariff equivalents of non-tariff barriers over time. They find that the APEC region would be better off under open regionalism than a preferential agreement, provided that non-APEC regions implement matching trade liberalisation measures, and that North America might gain little from the APEC membership.

33. Nevertheless, as indicated in their study[24], their simulation results could be understated since their analysis does not adequately cover trade protection data. In other words, they do not take into account export subsidies and taxes, asserting that such barriers as MFA and agricultural export subsidies have been addressed in the Uruguay Round agreements, and that the United States is hardly expected to participate in the liberalisation of agricultural export subsidies unless the EU is involved in. However, they suggest that complete incorporation of non-tariff barriers including MFA, and agricultural protection would yield improved results by conceding that the GTAP version 2 database, used in their study, does not fully cover many important non-tariff barriers that exist.

34. Lee *et al*. (1997) continues this line of research by investigating winners and losers from the implementation of APEC's free trade commitment, and the extent of induced sectoral adjustment in the APEC region. They construct two experimental designs: The first policy scenario postulates that APEC member economies applies free trade policy internally, with discrimination against non-APEC regions. The second scenario is the same as the first except that the benefits of APEC's free trade scheme are applied to outsiders, irrespective of their tallying reciprocity toward APEC's liberalisation. In both cases, they find that benefits in real GDP terms would accrue more in developing APEC economies than in developed economies. Every developed APEC member would undergo a contraction in the apparel sector, while the ASEAN countries would experience expansion in such manufacturing industries as apparel and machinery.

24. They acknowledge that "studies examining the impact of eliminating *export restraints*, like ... MFA, show significant gains accruing to the North American region". See Young and Huff (1997, p. 248).

Table 3. **Major findings from previous studies**

Authors	Model	Countries and Production Sectors	Policy Conclusions
Inada (1996)	The ICSEAD Model	8 groups of countries (no production sectors considered)	Tariff reduction with FDI flow would involve 3 per cent of real GDP growth for the 1993-2003 period for all APEC, which is by 0.1 percent point higher than that without FDI. In particular, China and ASEAN's gains would be remarkable, implying the significance of FDI inflow in those regions.
Anderson *et al.* (1997)	GTAP Model	15 groups of countries, 5 aggregated production sectors	The real welfare gains in 2005 for the world when agriculture is included would add to US$81 billion, which is 65 per cent greater than otherwise. Inclusion of agriculture would also boost world trade by US$370.6 billion at constant 1992 prices, which is 18 per cent greater than otherwise.
Dee *et al.* (1996)	IC95 Model	14 groups of countries, 3 aggregated production sectors	Elimination of all trade barriers would yield real income gains of US$303 billion for all APEC economies. Incorporation of a range of trade facilitation measures would add up to US$745 billion. Exclusion of agriculture would bring down US$106 billion, which amounts to 35 per cent of total trade liberalisation benefits of US$303 billion.
Young and Huff (1997)	GTAP Model	10 groups of countries, 2 aggregated production sectors	All APEC members are better off under MFN principles with outsiders' reciprocity than under the preferential trade reform. MFN rules with the reciprocity would generate a welfare gain of US$71.8 billion, which is greater than the US$65.3 billion under MFN without the reciprocity, and the US$49.8 billion under the preferential arrangement.
Lee *et al.* (1997)	The APEC Model, based on OECD's Linkage Model	20 groups of countries, 19 production sectors	The 'open regionalism' case would result in almost US$300 billion of output gains to all APEC economies, which is by US$55 billion greater than the 'closed' case. Every developed country would suffer a contraction in the apparel sector, while some countries such as Japan and Korea would experience some difficulty in the agricultural sector. (All in all, however, such costs would be dominated by the benefits of trade liberalisation).

35. Indeed, their discussion of the sectoral adjustments under the two experimental designs would bring much attention to a more appropriate policy agenda in each country in the face of APEC's liberalisation measures. Nevertheless, they appear to neglect a range of trade barriers such as trade facilitation, liberalisation of service trade, the removal of export restraints, and agricultural trade liberalisation, thereby underestimating the full impact of APEC's free trade commitment [25].

36. Overall, empirical findings from previous studies can be features in several ways. First, the benefits of APEC's trade liberalisation would be large both within and outside the APEC region, although they are not evenly distributed among countries. In particular, the gains for China and ASEAN countries -- whose protection rates are relatively high -- would be remarkable, as their economies became increasingly integrated into the global economy.

37. Second, incorporation of trade facilitation and agricultural liberalisation measures bring forth additional, sizeable benefits to the whole region. Of course, it should be stressed that reform in the agricultural sector is frequently demanded by the APEC food-exporting countries, which would be likely to require difficult adjustments in APEC economies in the Northeast Asian region. Meanwhile, every developed nation would suffer a contraction in the apparel sector. All in all, as Lee *et al.* (1997) reports, such adjustment costs in the agricultural and apparel sectors would be dominated by the benefits of trade liberalisation.

38. Consequently, more comprehensive coverage of trade barriers would be pivotal in capturing the full efficiency gains achieved through APEC's move to free trade. As is widely accepted, benefits of trade liberalisation are expected to accrue primarily through efficiency gains associated with reallocating existing resources to better uses; whereas the benefits of trade facilitation are assumed to accrue by having more resources available through directly economising existing resources.

39. Third, all APEC members would be better off under MFN principles with outsiders' reciprocity than under the preferential trade reform. This suggests that empirical analysis must find ways to take into consideration the extent of the liberalisation measures are applied. The results would be very useful in assessing whether APEC's reform scenario should be geared toward open regionalism. In so doing, one may have to examine the consequences of the preferential elimination of trade barriers within the APEC region, and compare the results to free trade arrangements based on open regionalism treatment, both with and without reciprocity of non-APEC regions. Indeed, it remains to be investigated empirically whether trade creation can dominate trade diversion in the wake of a regional trade arrangement.

40. However, it should be stressed that none of the previous studies addresses trade expansion of OECD economies and non-OECD economies expected under APEC's trade liberalisation. This is a point that differentiates our study from previous ones. Given the estimates for sectoral production and consumption by region, as well as real GDP and trade patterns from using a CGE model, most of our simulation work will focus on finding changes in the OECD vs. non-OECD's real GDP, trade expansion and structural adjustments.

25. Lee *et al*. (1997) report that the United States gains would be negligible, mainly due to the exclusion of service trade liberalisation from their experiments.

IV. The framework for analysis

1. Equilibrium concept and data aggregation

41. We employ a multiregion, multisector, computational general equilibrium (CGE) model. As is widely acknowledged, a CGE model is a simplified computer representation of one or more economies. Each economy in the model includes activities by consumers and producers. The model used in this study is a static, Walrasian general equilibrium model that endogenously determines quantities and prices, by using a descendant of the Johansen (1960) simulation approach.

42. As in other standard approaches, demand and production functions are specified for each region. Regions are linked together through the trade of goods and services[26], which in turn are affected by trade protection regime such as tariffs and non-tariff barriers. In the benchmark equilibrium, by assumption, a set of equilibrium conditions[27] hold: demand-supply equalities for all products and factors, utility maximisation of domestic consumers -- including the government[28] -- within their budget sets, non-positive-profit conditions for each production sector[29], and external trade account of each region in balance. Changes in the trade protection regime in any or all regions should affect the benchmark equilibrium across all regions. Such new equilibrium driven by the regime changes is usually called "counterfactual" equilibrium; and pairwise comparison of counterfactual with benchmark equilibria enables one to assess the impacts of APEC's trade reform measures.

43. For such comparison of equilibria, we conduct a simulation by aggregating region and production sector based on the GTAP version 3 database, whose base year is 1992. This identifies 30 regions and 37 production sectors in each region, although to reduce costs in terms of computation and manipulation, and to focus on those regions and sectors in which liberalisation is assumed to be accomplished significantly, we aggregate these into 12 regions and 7 production sectors, as listed in Table 4.

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26. Investment and other capital-account transactions may also connect the regions. Yet such factors are excluded in this study, as the GTAP database does not provide adequate information on them in such a way that they can fit into our model.

27. These conditions are not all satisfied in intermediate transactions accounts, and data sets from different sources may not be always consistent with each other. For example, data on consumers' expenditure from family expenditure surveys may be incomparable with that from industrial production data from the national account which is an aggregation of consumer expenditures on the production side. Thus, adjustments are necessary for each block of data across sources, and the GTAP database, which is used in this study, is known to well address this issue.

28. The consolidation of the government and private agents into consumers suppresses distributional effects between the government and private sectors in the national economy. That is, any income transfers from the government or a government deficit are deemed private spending or borrowing.

29. The non positive-profit assumption renders the rate of return on capital to be identical, in equilibrium, across all production sectors and regions.

Table 4. **Aggregation of regions and production sectors**

Region			Production Sector	
(1)	ASEAN	APEC	(1) AGR:	agriculture, forestry and fishery
(2)	Chile	APEC	(2) MNG:	coal, oil, gas and other materials
(3)	China and Hong Kong, China	APEC	(3) TXL:	textiles and apparel
(4)	Asian NIEs (excluding Korea)	APEC	(4) TRN:	transportation products
(5)	Australia and New Zealand	APEC, OECD	(5) OME:	machinery and other equipment
(6)	Japan	APEC, OECD	(6) OMF:	leather, lumber, wood products and other manufacturing
(7)	Korea	APEC, OECD	(7) SVC:	services
(8)	Canada	APEC, OECD		
(9)	Mexico	APEC, OECD		
(10)	USA	APEC, OECD		
(11)	ROW	non-APEC, non-OECD		
(12)	EU	OECD		

44. The world economy is aggregated into 12 regions of 10 APEC economies and 2 non-APEC economies of European Union (EU) and the rest of the world (ROW). European Union includes the 12 nations of EU 1992, namely, member nations of the European regional free trading arrangement, as well as three nations of Austria, Finland and Sweden[30]. In an effort to better reflect the APEC's trade liberalisation schemes in simulations, we treat each APEC economy as a single nation except ASEAN and Australia/New Zealand, although very small countries such as Brunei and Papua New Guinea are excluded due to paucity of the reliable data on them. All OECD economies are treated as developed nations, with the remaining ones being developing nations.[31] Furthermore, each economy is assumed to hold seven industries which comprise one primary industry (agriculture, forestry and fishery), five manufacturing sectors, and one services sectors. These industries are classified based on similarities of production characteristics such as requirements in intermediate goods and primary production factors.

2. Calibration of behavioural parameters

45. Behavioural parameter values for the functional forms are taken from the SALTER model of Jomini *et al*. (1991)[32]. The SALTER parameters are based on a review of international cross-section studies for the parameter estimation by production sector and by a wide range of countries. Where any country-specific parameters are available and reliable, these are used. Otherwise the parameter values were calculated from the GTAP database based on the respective trade shares, and are applied commonly to all nations in this study. Table 5 presents three sets of elasticities of substitution used in this study,

30. GTAP database used in this study treats Switzerland and Norway as the rest of the world, and thus these two countries are not included in EU of our study.

31. Although Korea and Mexico were classified as developing countries at the APEC Bogor meetings in 1994, we treat them as developed countries since this study aims at analysing the trade expansion effects for OECD and non-OECD economies under the APEC trade initiatives.

32. Once behavioural parameters are specified through a calibration procedure, a so-called benchmark equilibrium can be determined by substituting them into the model. Using the parameter values and envisaged policy shocks, one can obtain the counterfactual equilibrium which can then be compared with benchmark equilibrium in a pairwise way.

which consist of elasticities between domestically-produced commodities and import composites, elasticities of substitution between import types in import composites, and elasticities of primary production factors.

Table 5. **Elasticities of substitution**

		Domestic or Imported	Imports by Origin	Primary Factors
(1)	AGR	2.49	4.73	0.56
(2)	MNG	2.57	5.34	1.16
(3)	TXL	3.31	6.98	1.26
(4)	TRN	5.20	10.40	1.26
(5)	OME	2.80	5.60	1.26
(6)	OMF	2.27	4.61	1.22
(7)	SVC	1.94	3.80	1.40

46. As presented in Table 5, elasticities of substitution between domestic goods and composite imports fall between 1.90 and 2.80 for agriculture and most manufacturing goods, except for two outliers, namely, textiles and transportation sectors. Overall, the elasticities for imports by source are twice the elasticities for those between domestic and aggregated imports. The elasticities of primary production factors fall between 1.12 and 1.26 for the manufacturing sector, while that of the service sector take value of 1.40, with 0.56 being for the agricultural sector. The agricultural and manufacturing sectors are more inelastic than services sectors, implying that those sectors' demands for primary factors are less sensitive to changes in the production factor prices.

47. In CGE simulations, sensitivity tests are further performed to investigate the robustness of the model with respect to parameters. In so doing, two parameter sets are employed: one set of elasticities is lower than parameters in Table 5 by 20 per cent, while the other higher than parameters in Table 5 by 20 per cent.

3. Treatment of trade-protection policies

48. In treating trade-protection policies, we incorporate a range of non-tariff barriers as well as tariffs. At the same time, to single out APEC's impacts, we abstract from the changes proposed under the other major regional economic arrangements such as the Uruguay Round negotiations and the NAFTA. The APEC's trade reform areas we attempt to quantitatively assess include: *(i)* tariffs, *(ii)* export subsidy, and *(iii)* trade facilitation in such areas as customs procedures, standards and conformance. In particular, following APEC (1997), we assume that APEC's trade facilitation leads to a 2 per cent reduction in the transportation costs for international transactions.

49. As indicated earlier, many changes in non-trade sectors -- such as investment and other capital-account transactions -- will also affect the economies, with realisation of trade liberalisation and facilitation over time. Nevertheless, these other changes are ignored in this study. Accordingly, the simulation results should be interpreted as an indication of how the economies would be shaped in the future, compared to the alternative situation without implementation of such free trade evolution. In addition, we do not calculate *ad valorem* equivalents of tariff reductions proposed in MAPA, although our study envisages assessing the economic consequences of the APEC initiatives beyond MAPA. In practice, it may be somewhat difficult, albeit not impossible, to calculate the magnitude of tariff reductions in the IAPs of MAPA, since MAPA contains a fairly extensive number of trade reform

commitments by APEC economies, while net effects of trade liberalisation in MAPA are not significant, as reported by APEC (1997). Indeed, the APEC (1997) study asserts that APEC members should commit to further tariff reductions to materialise their free and open trade beyond MAPA.

4. Experimental designs

50. For the empirical analysis, we consider *three liberalisation scenarios*[33], which reflect the three broad options. Terms of trade relations with non-APEC countries were discussed in Part II. These are *(i)* promotion of APEC liberalisation in a closed manner, *(ii)* application of APEC liberalisation schemes to external trading partners by adopting open regionalism, and *(iii)* application of conditional MFN principle:

> *(i)* <u>*Experiment 1*</u>*:* All APEC's trade protection measures are lifted and its benefits are applied only within the APEC region. That is, discrimination against non-APEC countries are maintained. Although APEC declared that its free trade initiatives are directed toward open regionalism, this scenario would enable one to assess the effects of APEC trade reform in terms of the 'closed' stance, which some other regional economic arrangements like a customs union[34] may take. In conducting our simulation work, we refer to this experiment as 'preferential liberalisation'.
>
> *(ii)* <u>*Experiment 2*</u>*:* APEC extends the effects of trade liberalisation and facilitation to outsiders from the APEC region only, even if external economies do not reciprocate. Under this experiment, APEC trade reform is based on MFN principles, which might take account of its general directives of open regionalism. Throughout Part V, this experiment is labelled as 'unilateral liberalisation'.
>
> *(iii)* <u>*Experiment 3:*</u> This experiment postulates that APEC trade reform is applied to its member economies and to the external trading partners who are prepared to reciprocate. That is, this experiment is based on a conditional MFN treatment, and named as 'global liberalisation'. Given the considerations described in Part II, this experiment might, more or less, reflect reality.

51. Further, noting that the APEC community has not proclaimed further details on its trade reform beyond MAPA, we construct a variety of trade reform scenarios with respect to the trade liberalisation schedules. A simple way would be to assume that the protection rates decline linearly from a base year to 2010/2020. This is the case for Lee *et al*. (1997). Rather, we hypothesise the trade liberalisation to be accomplished in a less structured manner. That is, it is assumed that the liberalisation would be undertaken more progressively from a base year to 2010/2020. More specifically, developed APEC economies will reduce tariffs in two stages with equal reduction rates, while developing APEC economies' tariffs will be phased out in four stages. Given the assumption that tariff reductions in MAPA will be finalised by the year 2000, developed APEC economies will then cut post-MAPA tariffs by 50 per cent in 2005, and remove the other 50 per cent in 2010; while developing APEC economies will eliminate a quarter of post-MAPA tariffs in 2005, 2010, 2015, and 2020, in turn. That is, our empirical research

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33. More importantly, in so doing, we make a strong assumption that all APEC members will adequately manage the *internal* challenges and risks described in Part II, and reach a consensus toward free and open trade until the target year 2010/2020. Thus our empirical results might be biased in as much as the *internal* risks and challenges are not resolved appropriately by APEC economies.

34. A customs union applies free trade policy internally with common tariffs to outsiders. The 'closed' case could be dominated by considerations of market power rather than principles of trade liberalisation.

considers five time horizons of 2000, 2005, 2010, 2015, and 2020. Hopefully, this will help to, at least in part, capture the dynamic effects of trade liberalisation, which has been neglected in virtually all the previous literature.

V. Simulation results

52. As described in the previous part, our APEC experiment takes into account three liberalisation scenarios. Then, for each scenario, we consider three policy variables, namely, tariffs, export subsidies and trade facilitation. It is assumed that tariffs and export subsidies are completely removed with implementation of trade facilitation measures, solely among APEC economies under a preferential trading arrangement; while under a unilateral liberalisation scenario, benefits from APEC's trade liberalisation and facilitation is offered not only to APEC but also to non-APEC economies with no conditions. Global trade liberalisation requires all economies within and outside APEC to remove tariffs and export subsidies, and to take trade facilitation measures[35]. In particular, it is assumed that APEC's trade facilitation leads to a 2 per cent reduction in transportation costs for international transactions[36].

53. We begin by assessing effects on real GDP and trade expansion, followed by implications on sectoral adjustments.

1. Effects on real GDP

54. APEC's trade liberalisation effects on real GDP are reported in Table 6, and several points are featured : First, all APEC member countries are expected to undergo rises in real GDP, and a large part of welfare gains from APEC trade liberalisation originates from the removal of tariffs. Real GDP for APEC member countries are expected to increase by 0.66 per cent under a preferential trading bloc, much larger than 0.04-0.05 per cent from the removal of export subsidies and trade facilitation[37].

55. Second, welfare gains are expected to be distributed unevenly among APEC economies. Non-OECD regions are expected to collect higher welfare gains from APEC trade liberalisation than OECD member countries. It is estimated that the average non-OECD country's GDP will increase by 2.70 per cent when tariffs are removed under the unilateral trade liberalisation scenario, more than triple the increase of OECD countries'. This is not surprising since non-OECD countries generally maintain higher protection rates than OECD economies.

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35. Experiments 1 through 3 in Part IV are labelled as 'preferential liberalisation', 'unilateral liberalisation', and 'global liberalisation' throughout Part V, unless otherwise indicated.

36. APEC (1997) reviews studies on cost savings from trade facilitation and concludes that "the range of 2-3 per cent of total import values is a consensus of the potential cost savings from various trade facilitation measures". However, we think that 2-3 per cent of total import value may be too large for cost savings, and thus, 2 per cent of transportation costs is used in this paper.

37. The data for export subsidies in GTAP are less comprehensive than those for import tariffs. If more comprehensive data were available for export subsidies, the effects from the removal of export subsidies might be larger.

Table 6. **Real GDP by region and by scenario**

(percentage change compared with baseline)

Scenarios	Trade Liberalisation Measures	APEC			Non-APEC		
		OECD	Non-OECD	Total	OECD	Non-OECD	Total
Preferential Liberalisation	(1) Tariffs	0.48	2.47	0.66	-0.09	-0.21	-0.12
	(2) Export Subsidies	0.02	0.29	0.04	-0.02	-0.06	-0.03
	(3) Trade Facilitation	0.03	0.21	0.05	-0.02	-0.03	-0.03
	(1) + (2) + (3)	0.53	2.97	0.75	-0.13	-0.30	-0.18
Unilateral Liberalisation	(1) Tariffs	0.53	2.70	0.73	0.00	0.03	0.01
	(2) Export Subsidies	0.03	0.60	0.09	0.06	-0.14	0.00
	(3) Trade Facilitation	0.04	0.26	0.06	-0.02	-0.02	-0.02
	(1) + (2) + (3)	0.60	3.56	0.88	0.04	-0.13	-0.01
Global Liberalisation	(1) Tariffs	0.59	2.93	0.80	0.24	0.85	0.41
	(2) Export Subsidies	0.03	0.51	0.08	0.17	0.10	0.15
	(3) Trade Facilitation	0.04	0.27	0.06	0.02	0.15	0.05
	(1) + (2) + (3)	0.66	3.71	0.94	0.43	1.10	0.61

56. Third, the wider the coverage of trade liberalisation, the higher the welfare gains. All regions will observe total effects of three liberalisation measures to rise, as APEC adopts broader liberalisation, namely, from preferential liberalisation to global liberalisation. If the world achieves global trade liberalisation, OECD countries will increase their GDP by 0.66 per cent, higher than the gains in GDP (0.53 per cent) caused by preferential trade liberalisation.

57. Fourth, under the preferential liberalisation scenario where non-APEC countries do not liberalise, these countries are likely to face welfare losses due to the removal of export subsidies and trade facilitation. This sharply contrasts with high global welfare gains (0.02-0.17 per cent) of non-APEC countries under global trade liberalisation, revealing that most welfare gains accrue for countries that take action in removing export subsidies and trade facilitation.

58. Fifth, the estimates for real GDP changes in Table 6 show that the most beneficial scenario for both APEC and non-APEC involves the realisation of global free trade. Under this scenario, APEC countries will increase GDP by 0.94 per cent, compared to 0.61 per cent for non-APEC countries. When non-APEC regions choose to "free ride" on APEC trade liberalisation measures (unilateral liberalisation), those non-APEC economies incur opportunity costs.

59. Finally, APEC is estimated to have similar levels of GDP gains under both unilateral trade liberalisation and global liberalisation. This suggests that APEC's unilateral liberalisation captures the main part of the potential benefits for its member economies regardless of whether non-APEC regions reciprocate or not. Global trade liberalisation, though, produces the most favourable results for the world economy, as discussed above.

60. Table 7 summarises geographical GDP gains when tariffs are removed under the three liberalisation scenarios. The first ten economies in Table 7 are members of APEC, while the remaining two, EU and ROW, are non-APEC economies. Under preferential liberalisation, all APEC member economies except Chile and Canada are expected to achieve welfare gains[38], while non-APEC regions will

38. The welfare losses of Chile and Canada are due to the deterioration of the terms of trade, as APEC liberalises trade preferentially.

not benefit. The welfare losses for Chile and Canada can be attributed to the deterioration of the terms of trade. ASEAN countries and Korea seem to come out as the biggest winners, in terms of growth. The second group to benefit includes China and Asian NIEs, with real income changes ranging from 1.98 per cent to 2.32 per cent, respectively. Other regions, however, are expected to undergo low welfare changes.

Table 7. **Tariff reduction effects on regional real GDP**

(percentage change compared with baseline)

Scenario/Region	ASEAN	Chile	China/H.K.	NIEs	Austral/NZ	Japan
Preferential Liberalisation	3.51	-0.54	1.98	2.32	0.87	0.89
Unilateral Liberalisation	3.47	-0.04	2.62	2.31	0.86	0.97
Global Liberalisation	4.25	0.31	2.58	2.28	0.95	1.09

Scenario/Region	Korea	Canada	Mexico	USA	ROW	EU
Preferential Liberalisation	4.31	-0.05	0.03	0.07	-0.21	-0.09
Unilateral Liberalisation	4.55	-0.01	0.08	0.10	0.03	0.00
Global Liberalisation	4.80	0.00	0.13	0.10	0.85	0.24

61. If APEC economies adopt unilateral liberalisation, non-APEC economies will gain in real GDP, since these regions are not discriminated from the APEC market, that is, a trade diversion will not result for non-APEC regions. However, EU and ROW will face modest benefits under APEC's unilateral liberalisation. Under global liberalisation, most APEC regions will see their highest gains in real GDP[39], and non-APEC regions are expected to collect substantial welfare gains as these countries remove tariffs.

2. Export expansion

62. Tables 6 and 8 show distinctly different patterns: first, exports are expected to grow quite substantially when APEC liberalises trade, compared with minor changes in real GDP, as reported in Table 6; second, while non-APEC regions' GDP are expected to lose under preferential trade liberalisation regardless of OECD membership, non-APEC regions will expand exports even under APEC's preferential liberalisation.

63. Although removal of export subsidies and trade facilitation will have substantial effects on export expansion, removal of tariffs seems to be most effective among the three liberalisation measures. Under the preferential trade liberalisation scenario, APEC economies increase exports by 20.39 per cent when tariffs are removed, and 1.25 per cent when export subsidies are removed. However, the effects of trade facilitation on exports do not seem to be substantial.

39. Exceptionally, Asian NIEs are expected to face the highest GDP increase under preferential trade liberalisation than under other two liberalisation scenarios.

Table 8. **Export expansion by region and by scenario**

(percentage change compared with baseline)

Scenarios	Trade Liberalisation Measures	APEC			Non-APEC		
		OECD	Non-OECD	Total	OECD	Non-OECD	Total
Preferential Liberalisation	(1) Tariffs	14.91	29.25	18.60	1.96	-0.22	1.20
	(2) Export Subsidies	0.94	2.12	1.25	0.29	-0.02	0.18
	(3) Trade Facilitation	0.55	0.51	0.54	0.34	0.01	0.22
	(1) + (2) + (3)	16.40	31.88	20.39	2.59	-0.23	1.60
Unilateral Liberalisation	(1) Tariffs	22.89	18.90	21.92	2.30	1.64	2.07
	(2) Export Subsidies	0.09	4.43	1.22	3.35	0.04	2.20
	(3) Trade Facilitation	0.27	0.51	0.33	1.08	0.39	0.84
	(1) + (2) + (3)	23.25	23.84	23.47	6.73	2.07	5.11
Global Liberalisation	(1) Tariffs	18.44	31.65	21.85	16.57	37.55	23.78
	(2) Export Subsidies	-0.01	4.16	1.07	2.85	6.10	3.97
	(3) Trade Facilitation	1.16	0.82	1.07	1.89	1.72	1.83
	(1) + (2) + (3)	19.59	36.63	23.99	21.31	45.37	29.58

64. APEC's tariff reduction under unilateral trade liberalisation provides several interesting results on the trade: First, under preferential trade liberalisation and global trade liberalisation scenarios, the effects on export expansion are higher for non-OECD countries of APEC than OECD countries, while OECD countries are expected to have higher export expansion than non-OECD countries under unilateral trade liberalisation; Second, OECD economies of non-APEC are expected to see greater effects on export expansion under unilateral trade liberalisation than non-OECD economies. However, non-OECD countries will collect higher gains in export expansion under global trade liberalisation than under unilateral liberalisation. This implies that APEC countries collect substantial gains in export expansion under open trade liberalisation, as those countries are expected to see the increase in the real GDP. Lastly, unlike in changes in real GDP, global trade liberalisation seems to affect non-APEC's exports more favourably than APEC's exports.

65. When the world liberalises international trade by removing tariffs, exports will increase by 21.85 per cent and 23.78 per cent for APEC countries and non-APEC countries, respectively. As non-APEC economies facilitate trade by reducing trade-related costs, OECD and non-OECD countries of non-APEC will experience trade expansion by 1.89 per cent and 1.72 per cent, respectively.

66. Importantly, two points are noteworthy from our APEC experiment: first, although high gains in real GDP and export expansion are expected from APEC trade liberalisation, export expansion is likely to be more substantial; second, in case when the world liberalises trade, both OECD and non-OECD members are expected to have the highest growth rates in real GDP and trade expansion.

3. Structural adjustments

67. Table 9 reports the effects of removing tariffs on sectoral output when trade is liberalised according to the three scenarios of preferential liberalisation, unilateral liberalisation, and global trade liberalisation. When APEC removes tariffs under preferential trade liberalisation, substantial structural adjustments are expected for both APEC and non-APEC countries. Out of seven production sectors, textiles/apparel, transportation, and agricultural sectors are likely to be affected the most. In particular, APEC countries are expected to experience substantial changes in sectoral output. These countries will

produce more output in textiles/apparel by 8.31 per cent, and reduce production of transportation vehicles by 2.32 per cent.

68. Greater structural adjustment is likely to be realised for non-OECD countries rather than OECD countries in the case of preferential trade liberalisation. For example, non-OECD regions of APEC will increase their output in textiles/apparel by 27.06 per cent, and reduce agricultural products by 4.30 per cent. However, OECD countries will increase output moderately in agriculture, textiles, and services.

Table 9. **Structural adjustments by sector with the removal of tariffs**

(percentage change compared with baseline)

		AGR	MNG	TXL	TRN	OME	OMF	SVC
Preferential Liberalisation								
APEC	OECD	1.45	-1.74	0.61	-1.49	-0.08	0.84	0.23
	Non-OECD	-4.30	-3.50	27.06	-19.04	-1.45	7.74	-1.80
	Sum	-0.45	-2.06	8.31	-2.32	-0.23	1.68	0.09
Non-APEC	OECD	-2.11	-0.52	-5.94	2.96	0.45	-1.99	0.42
	Non-OECD	-2.33	2.14	-6.24	2.82	0.88	-1.69	0.69
	Sum	-2.25	0.55	-6.08	2.93	0.53	-1.90	0.48
Unilateral Liberalisation								
		AGR	MNG	TXL	TRN	OME	OMF	SVC
APEC	OECD	1.10	0.68	1.06	1.68	0.62	0.63	0.01
	Non-OECD	-3.36	-6.89	21.56	-26.15	-7.53	9.08	-0.37
	Sum	-0.38	-0.70	7.07	0.40	-0.27	1.65	-0.02
Non-APEC	OECD	0.61	0.46	-2.22	-0.54	-0.82	0.42	0.03
	Non-OECD	0.64	1.05	-2.19	-3.35	-1.51	-0.45	0.04
	Sum	0.63	0.69	-2.21	-1.13	-0.95	0.15	0.03
Global Liberalisation								
		AGR	MNG	TXL	TRN	OME	OMF	SVC
APEC	OECD	0.92	-2.46	-0.81	-2.20	-0.24	0.79	0.36
	Non-OECD	-4.33	-5.46	28.90	-14.56	-0.85	6.58	-1.48
	Sum	-0.82	-3.01	7.81	-2.78	-0.30	1.49	0.23
Non-APEC	OECD	-8.77	0.06	-5.03	5.43	1.43	-0.05	0.25
	Non-OECD	1.36	2.18	0.33	-3.98	-8.33	-3.02	0.49
	Sum	-2.07	0.91	-2.50	3.49	-0.38	-0.97	0.31

69. As APEC extends its trade liberalisation into non-APEC regions, production sectors of OECD countries are likely to be affected differently. For example, OECD countries of APEC will produce more in all sectors, while those of non-APEC will reduce the production of output in textiles, transportation, and machinery/equipment.

70. It is estimated that non-OECD countries are affected more under unilateral tariff reductions than OECD countries. The biggest change for non-OECD countries is in the transportation sector, reducing non-OECD's output in the sector by 8.33 per cent.

71. Under global trade liberalisation, production sectors of OECD are expected to have different directions of production, depending on the membership of APEC. OECD countries of non-APEC are expected to increase output in the sectors of mining, transportation vehicle, and machinery/equipment,

while those of APEC producing more in the other sectors. The textiles/apparel industry will experience the largest increase within the non-OECD regions of APEC.

72. The effects of the removal of export subsidies differ across sectors and liberalisation scenarios. APEC's preferential removal of export subsidies seems to reduce APEC's output of all sectors except mining and services. As in the case of the removal of tariffs, the textiles/apparel industry of non-OECD regions will benefit the most from the removal of export subsidies. However, transportation industry for non-OECD economies will also face the highest reduction in output. Simulation results from unilateral liberalisation are similar with those from preferential liberalisation. Under unilateral liberalisation, the agricultural sector will produce less in both APEC and the world than under preferential liberalisation. However, the absolute sizes of the percent changes for the sector are larger under unilateral liberalisation than under preferential liberalisation. Global removal of export subsidies is expected to bring substantial changes in output levels, as shown in the bottom part of Table 10.

Table 10. **Structural adjustments with the removal of export subsidies**

(percentage change compared with baseline)

		AGR	MNG	TXL	TRN	OME	OMF	SVC
Preferential Liberalisation								
APEC	OECD	-0.11	0.18	-2.16	-0.03	-0.20	0.00	0.05
	Non-OECD	-0.10	-2.16	9.67	-4.54	0.74	-0.52	-0.40
	Sum	-0.11	-0.25	1.31	-0.25	-0.10	-0.06	0.02
Non-APEC	OECD	-0.06	-0.12	-0.71	-0.42	0.28	-0.12	0.03
	Non-OECD	-0.07	0.20	-1.57	0.45	0.22	-0.03	0.05
	Sum	-0.07	0.01	-1.12	-0.24	0.27	-0.09	0.03
Unilateral Liberalisation								
APEC	OECD	-0.78	-0.48	-1.96	-1.09	0.32	-0.0	0.09
	Non-OECD	-0.17	-4.50	18.48	-8.33	2.47	-0.88	-0.85
	Sum	-0.58	-1.22	3.98	-1.44	0.56	-0.14	0.03
Non-APEC	OECD	0.02	-0.06	-4.01	1.46	-1.58	-0.36	0.25
	Non-OECD	-0.16	0.90	-4.24	1.63	-0.44	-0.33	0.17
	Sum	-0.10	0.32	-4.12	1.49	-1.36	-0.35	0.23
Global Liberalisation								
APEC	OECD	0.18	-0.87	-3.54	-1.34	0.06	0.18	0.10
	Non-OECD	0.17	-3.99	14.24	-8.13	2.50	-0.32	-0.80
	Sum	0.18	-1.44	1.62	-1.67	0.33	0.11	0.04
Non-APEC	OECD	-4.58	-1.80	-4.49	3.29	-0.40	-1.08	0.53
	Non-OECD	1.39	3.10	1.59	-4.97	-4.29	0.05	-0.62
	Sum	-0.89	0.15	-1.62	1.54	-1.14	-0.73	0.26

73. Although the CGE model predicts that trade facilitation will affect output levels of sectors differently across liberalisation scenarios, estimates for output changes in Table 11 are relatively similar to those in Table 10.

74. Table 11 summarises regional output changes when APEC facilitates trade. As in real GDP and export expansion, the removal of tariffs will have the largest effect on the overall output level, followed next by the removal of export subsidies. Trade facilitation will affect sectoral output levels the least.

Table 11. **Structural adjustments by sector with trade facilitation**

(percentage change compared with baseline)

		AGR	MNG	TXL	TRN	OME	OMF	SVC
Preferential Liberalisation								
APEC	OECD	0.15	-0.09	0.07	-0.18	-0.28	0.19	0.01
	Non-OECD	0.50	-0.43	0.80	-2.34	0.61	0.32	-0.33
	Sum	0.27	-0.15	0.29	-0.29	-0.18	0.21	-0.02
Non-APEC	OECD	0.02	-0.05	-0.01	0.39	0.23	-0.08	-0.02
	Non-OECD	-0.04	0.13	-0.02	0.55	0.17	-0.04	-0.03
	Sum	-0.02	0.02	-0.02	0.42	0.22	-0.07	-0.02
Unilateral Liberalisation								
		AGR	MNG	TXL	TRN	OME	OMF	SVC
APEC	OECD	0.35	-0.23	0.27	-0.33	-0.38	0.30	0.00
	Non-OECD	0.78	-0.80	1.44	-2.46	0.85	0.54	-0.53
	Sum	0.49	-0.33	0.62	-0.43	-0.24	0.33	-0.04
Non-APEC	OECD	-0.24	-0.16	-0.39	0.59	0.28	-0.26	0.02
	Non-OECD	-0.19	0.35	-0.30	0.27	-0.11	-0.18	0.03
	Sum	-0.21	0.05	-0.34	0.53	0.21	-0.23	0.02
Global Liberalisation								
		AGR	MNG	TXL	TRN	OME	OMF	SVC
APEC	OECD	0.36	-0.23	0.12	0.26	0.11	0.25	-0.44
	Non-OECD	0.65	-0.89	1.46	-2.23	1.03	0.44	-0.46
	Sum	0.46	-0.35	0.52	0.14	0.02	0.27	-0.07
Non-APEC	OECD	0.22	0.00	0.56	0.37	0.14	0.36	-0.1à
	Non-OECD	0.33	0.64	0.68	-1.40	-1.14	0.09	-0.15
	Sum	0.29	0.26	0.62	0.00	-0.10	0.28	-0.11

VI. Conclusion

75. One of the key findings from our empirical work is that the impacts of trade liberalisation and facilitation measures in the APEC region have turned out to be significant at least in direction if not in magnitude, throughout OECD as well as non-OECD economies. In particular, because agricultural liberalisation and trade facilitation are incorporated in our experiment, the impact stemming from liberalisation in these areas turned out to be substantially important.

76. More specifically, two things can be featured from our APEC experiment : First, although APEC trade reform is expected to generate both high gains in both real GDP and exports, effects on export expansion appears to be more remarkable than gains in real GDP. Second, in case when all regions in the world liberalise trade, both OECD and non-OECD economies are expected to have the highest gains in real GDP and trade expansion. In other words, APEC's open regionalism with the reciprocity of outsiders would deliver highest benefits for the world economy as well as APEC economies, which is in line with the Young and Huff study (1997).

77. However, gains in real GDP are not distributed uniformly among regions. Considering the case of tariff removal, we found that both preferential and unilateral liberalisation scenarios brought the real GDP gains to all APEC economies except Chile and Canada; while non-APEC economies are expected to suffer losses. In particular, ASEAN countries and Korea seem to come out as the biggest winners, since those regions would experience the highest real GDP gains therewith. If APEC economies, however, adopt the conditional MFN principle, gains in real GDP will likely be more pronounced in both non-APEC and APEC economies, as non-APEC countries also eliminate their tariffs.

78. While the results described in the above refer to economy-wide efficiency gains, our further analysis on sectoral output gains identified some adversely affected production sectors, and thus any possible opposition from specific production sectors against trade reform. APEC's removal of tariffs under the preferential trading arrangement is expected to entail more substantial structural adjustments in non-OECD than OECD countries. Unilateral tariff removal by APEC economies is also expected to deliver more significant structural adjustment in non-OECD economies. Under global trade liberalisation OECD countries will experience rises in output, especially for transportation products (TRN), machinery and other equipment (OME), other manufacturing (OMF), and services (SVC) sectors. APEC's removal of export subsidies under preferential liberalisation scenario will carry benefits to manufacturing and services sectors, while unilateral removal of export subsidies delivers gains in services sector only. Global removal of export subsidies is expected to bring substantial changes in output of all production sectors in OECD economies, compared to the unilateral liberalisation case. Structural adjustment results from our trade facilitation experiment were similar to the case of export subsidy removal. All in all, our empirical results suggest that the use of 'conditional MFN' could provide more negotiating leverage available to APEC member countries, thereby realising maximum liberalisation throughout the world.

79. However, it should be noted that stronger commitments by each APEC member economy will *first* be needed to deal with the internal and external challenge of dismantling remaining border barriers to trade in the APEC region, and thus to achieve improved market access beyond WTO commitments[40]. Indeed, the proliferation of exclusive or preferential trading arrangements could also pose some challenges for the APEC's principle of trade reform. The diversity of APEC economies also suggests that not all governments in the APEC region are likely to implement trade liberalisation and facilitation measures at the same pace. Consequently, addressing the challenge and seizing the opportunity will require a positive response by each of APEC economies to its free and open trade initiatives.

80. So long as APEC economies can fully implement their trade reform scenario, APEC will be well placed to set an example of co-ordinated unilateral trade liberalisation among the world economies, as improved trade environment would reinforce market forces and benefit both insiders and outsiders in APEC, while creating rather than diverting trade, although there are likely to be some losers among OECD countries from the APEC trade liberalisation. This would, in turn, increasingly place APEC participants in a position to exert more powerful influence over their outsiders in the future, thereby leading the way to shape a new international economic order.

81. The most pressing issue for further analysis is to evaluate the extent by incorporating investment liberalisation by APEC countries. Inclusion of FDI flow in our experiments would enable some OECD economies to capture a larger gain through GDP expansion, and perhaps, through export expansion as well, given that many developing APEC countries increasingly become the most significant destinations for FDI by some OECD countries including the United States, Japan and the EU. There is also scope for relaxing the model's relatively constrained treatment of capital mobility and dynamic effects from trade liberalisation. Indeed, as is pointed out by Young and Huff (1997), the benefits of increased competition, potential economies of scale, and the incentives for investment will be fully realised only in the long run, which requires a dynamic modelling rather than a static one. Future APEC experiment will benefit from these improvements.

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40. Yet, it should be stressed that our APEC experiment assumed that APEC's free and open trade goal would be fully materialised up to 2010/2020 based on the three liberalisation policy scenarios. Given this, we found that substantial gains in real GDP and trade expansion will likely accrue to the world economy as well as APEC economies. Thus, our empirical findings should be interpreted with caution.

Appendix
Basic structure of the model

In this appendix, we envisage outlining the basic structure of the model used for this study, which is a perfectly-competitive CGE model. We begin by considering two types of agents -- consumers and producers. In our multiregion, multisector model, demand and production parameters are assumed to be heterogeneous rather than identical. Contrary to a single-country model, trade is determined by more than just factor intensities. We describe the behaviour of each in turn, and the equilibrium conditions which close the model.

1. Consumption

Consumer behaviour in each region is governed by an aggregate utility function. A regional representative consumer, including the government agent, has a consumption function and a system of market demand equations. These are derived from solving the usual utility maximisation problem. We assume the distortions in the economy stem from tariffs, non-tariff barriers and domestic taxes[41]. As widely employed in many applied general equilibrium models, we use nested utility functions, which form the basis of our demand equation system. In other words, the substitution possibilities on the demand side are represented in terms of several-hierarchical-level utility functions. More specifically, four levels of hierarchy are employed in our model. The first three levels are associated with intermediate-demands, and the fourth one relates to final-demand behaviour.

At the three-intermediate-demand-stages, substitution first occurs between commodities imported from a region and from elsewhere, thereby constituting a Hicksian composite import for each product type in the importing region and determining the export-price elasticities of that region's imports. The next substitution takes place between import composites and domestic products, determining the price elasticity of demand for imports and the so-called "Armington" elasticities of substitution. That is, for import demands, we maintain the "Armington" assumption[42] under which products are treated as heterogeneous by geographic point of production[43], even though they may have similar characteristics. The third-level chooses consumption goods among different groups of composite products. Given the utility function and the consumers' budget constraint, the intermediate-level demand equation systems can be obtained by solving the usual optimisation problem. The nesting structure on the demand side is presented in Figure A.1.

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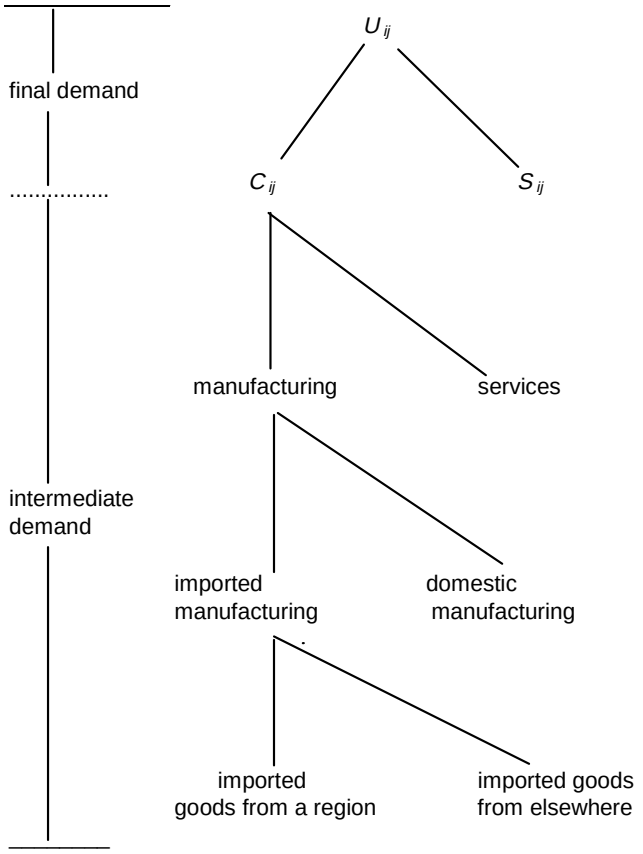
41. The difference between domestic market (consumer) prices and world prices in the value of a product results from the distortions due to such government intervention.

42. The Armington assumption has been sometimes criticised especially by the literature on industrial organisation, imperfect competition and trade, in which product differentiation is *endogenous*. See, for example, Spence (1976), Dixit and Stiglitz (1979), and Brown and Stern (1989). Nevertheless, use of the Armington assumption would render calibration of empirical parameters such as import- and export-demand elasticities tractable, and that *does* permit one to explain cross-hauling of similar products and to trace trade flows between each country. Furthermore, even the studies dealing with imperfect competition are forced to adopt *aggregated* version of the database, due to paucity of data on industry concentration and scale economies. Such examples can be found in Harrison, Rutherford and Tarr (1995), and Francois, McDonald and Nordstrom (1995).

43. As assumed in many previous studies, exports are not differentiated by country of destination in our model. That is, a product sold for exports from a region is not differentiated from the product sold at home. One exception to this is Beghin *et al*. (1996)'s study.

Figure A.1. **The nesting structure of consumer behaviour**



Fourth level (*final demand*) : Utility U_{ij} is a function of composite consumption (Cij) and savings (Sij).

Third level : Substitution among different groups of composite products (e.g. wine vs. other products)

Second level : Substitution between import composites and domestic products (e.g, domestic vs. French wine)

First level : Substitution between import types in import composites (e.g. French vs. Californian wine)

The utility function at the fourth (i.e. final-demand) level has as arguments composite consumption including both private *and* government purchases, as well as savings. Final demands in the *j*th. region are then determined formally by solving the consumer problem which chooses the path of consumption and savings, as follows :

$$\text{maximise } U_j = U_j\left(\sum_{j=1}^{r}\sum_{i=1}^{n} C_{ij}, S_j; \alpha_{ij}\right) \quad \text{.....(A.1)}$$

$$\text{subject to } \sum_{j=1}^{r}\sum_{i=1}^{n} P_{ij}C_{ij} + S_j = I_j \quad \text{.....(A.2)}$$

where U_j is the *well-defined* utility function of the agents (consumers) in the *j*th. region; C_{ij} is the consumption of commodity *i* originated from region *j*[44]; S_j is consumers' savings in region *j*; P_{ij} is consumer price for commodity *i* sourced from region *j*[45]; and α_{ij} is a vector of taste shifters. I_j is disposable income of the agents in the *j*th. region, and defined as income from ownership of factors, plus transfers received from governments, less taxes paid :

$$I_j = P_j^K K_j + P_j^T T_j + P_j^L L_j + \mu_j - \tau_j \quad \text{.....(A.3)}$$

The variables P_j^K, P_j^T and P_j^L denote selling prices of capital, land and labour in region *j*, respectively; K_j, T_j and L_j are endowments of capital, land and labour to the representative consumer in the *j*th. region, and assumed to be fixed and non-productive[46]. Primary factors are assumed to be mobile across sectors within a region, but immobile among regions. μ_j represents transfers received by the consumer from region *j*; and τ_j is direct taxes paid by the consumer in region *j*[47]. Solving the optimisation problem -- which consists of equations (A.1) through (A.3) -- we obtain a system of demand equations for C_{ij}^* and S_j^*:

$$\sum_{j=1}^{r}\sum_{i=1}^{n} C_{ij}^* = U_j^{-1}\Big(\sum_{j=1}^{r}\sum_{i,k=1(i\neq k)}^{n} P_{ij} / P_{kj}, I_j; \alpha_{ij}, \bar{U}_j\Big), \quad \text{.....(A.4)}$$

$$S_j^* = U_j^{-1}\Big(\sum_{j=1}^{r}\sum_{i,k=1(i\neq k)}^{n} P_{ij} / P_{kj}, I_j; \alpha_{ij}, \bar{U}_j\Big), \quad \text{.....(A.5)}$$

where all notations are as described earlier.

2. Production

In each region the production function at the final-stage consists of value-added and intermediate products as inputs, and forms the nesting structure as on the consumption side. One of the inputs, namely, value-added is determined by a combination of primary factors, namely, capital, land and labour. In tandem with this, intermediate-requirement functions operate in two-hierarchical-levels. Firms first substitute imported intermediate inputs among their countries of origin, and then, at the next stage, the firms' choice is undertaken over domestically produced and imported intermediate inputs. Substitution

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44. Following the Armington assumption, we treat any consumption goods, which were produced at home, as different from the same type of imports produced abroad.

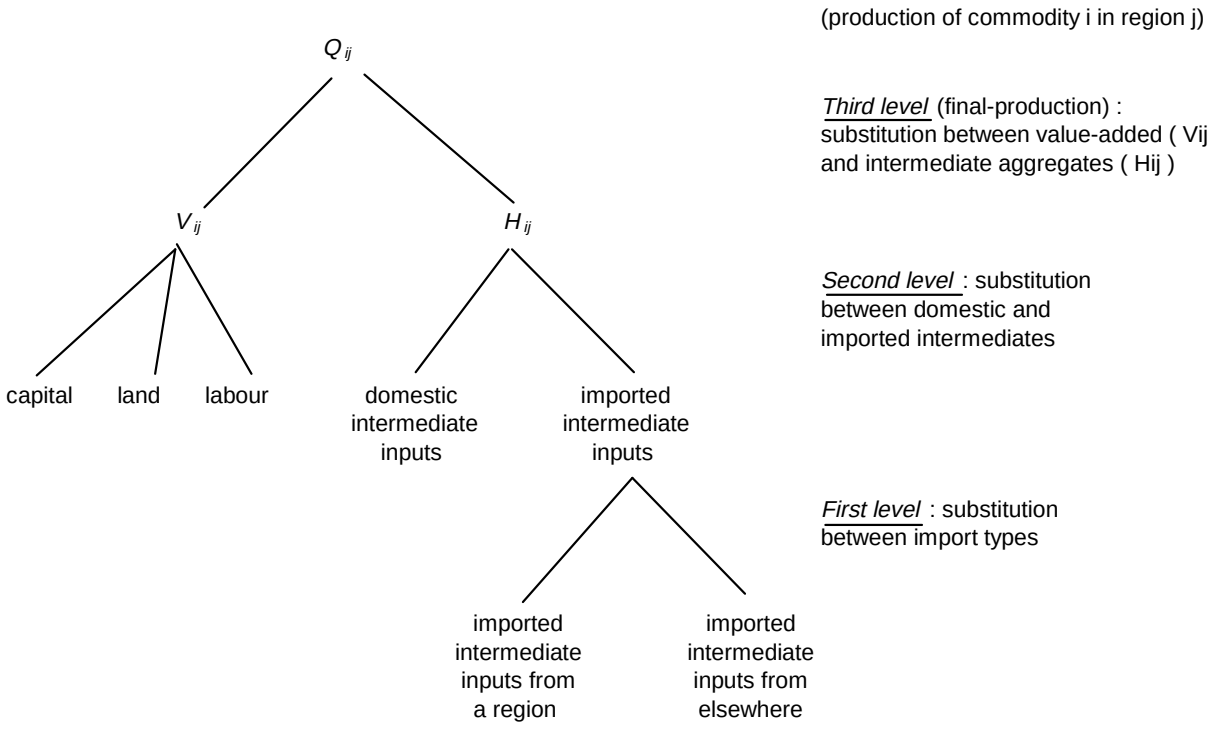
45. If we denote the world price of commodity *i* produced in region *j* as P_{ij}^W, then P_{ij} differs from P_{ij}^W by the taxes, tariffs and *ad valorem* tariff equivalent of non-tariff barriers less any import subsidy.

46. Accordingly, the Rybczynski theorem does not hold in our model. We recall that the Rybczynski theorem states if the endowment of any factor increases the production sector which uses that input more intensively will raise its output, while the other production sector will decrease its output.

47. Net transfers -- which is, by definition, transfers less the summation of taxes and tariffs paid by private agents -- is regarded as negative revenues to the government agent.

elasticities at the first-level affect exporters' price elasticities of demand; whereas the second-level substitution elasticities affect price elasticities of imported intermediates. As such, the intermediate aggregates and value-added composites are chosen or produced in a separable way, and eventually contribute to the production of a commodity *i* in region *j*. Furthermore, in our model, the final products as well as intermediate products as inputs are sold on both domestic and international markets without being treated differently each other[48].

Figure A.2. **The nesting structure of firm behaviour**



Firms in each production sector of a region are assumed to have separable, constant returns-to-scale technology. There are *n* production sectors and firms purchase intermediate inputs from abroad as well as at home. Owing to our assumption of separability in production technology, firms choose an optimal mix of primary factors independently of the prices of intermediate inputs, and vice versa. Assumption of constant returns-to-scale leaves the level of outputs irrelevant, and thus the firm's demand for value-added are expressed in terms of the relative prices of capital, land and labour.

48. We recall that, in our model, a product exported by a region is not treated differently from the product of similar characteristics sold to domestic agents. Consequently, the nesting level for substitution between exports and domestic demands is irrelevant.

We now begin by discussing the value-added and intermediate-substitution possibilities, with *implicit* functional forms:

$$V_{ij} = f_{ij}(K_{ij}, T_{ij}, L_{ij}; \xi_{ij}) \quad \text{.....(A.6)}$$

and

$$H_{ij} = g_{ij}(H_{i1}^h, H_{i2}^h, \ldots, H_{ir}^h; \zeta_{ij}) \quad \text{.....(A.7)}$$

where V_{ij} and H_{ij} are value-added and intermediate aggregates for a production sector *i* in region *j*, respectively. V_{ij} is determined by primary factors and a vector of exogenous variables, ξ_{ij}; H_{ij} is determined by each composite good of H^h in producing commodity *i* in region *j*, and a vector of exogenous variables, ζ_{ij}. A system of demand equations for inputs can then be generated by the solution of cost minimisation problem subject to equations (A.6) and (A.7), respectively, as follows:

< demand equations for primary factors >

$$K_{ij}^* = f_{ij,K}^{-1}(P_{ij}^K / P_{ij}^T, P_{ij}^T / P_{ij}^L, P_{ij}^L / P_{ij}^K; \xi_{ij}, \bar{V}_{ij}), \quad \text{.....(A.8)}$$

$$T_{ij}^* = f_{ij,T}^{-1}(P_{ij}^K / P_{ij}^T, P_{ij}^T / P_{ij}^L, P_{ij}^L / P_{ij}^K; \xi_{ij}, \bar{V}_{ij}), \quad \text{.....(A.9)}$$

$$L_{ij}^* = f_{ij,L}^{-1}(P_{ij}^K / P_{ij}^T, P_{ij}^T / P_{ij}^L, P_{ij}^L / P_{ij}^K; \xi_{ij}, \bar{V}_{ij}), \quad \text{.....(A.10)}$$

<demand equations for the representative intermediate input, H^h >

$$H_{i,1}^{h\,*} = g_{ij,1}^{-1}(P_{i1}^{H^h} / P_{i2}^{H^h}, P_{i2}^{H^h} / P_{i3}^{H^h}, \ldots, P_{ir}^{H^h} / P_{i1}^{H^h}; \zeta_{ij}, \bar{H}_{ij}), \quad \text{.....(A.11)}$$

$$H_{i,2}^{h\,*} = g_{ij,2}^{-1}(P_{i1}^{H^h} / P_{i2}^{H^h}, P_{i2}^{H^h} / P_{i3}^{H^h}, \ldots, P_{ir}^{H^h} / P_{i1}^{H^h}; \zeta_{ij}, \bar{H}_{ij}), \quad \text{.....(A.12)}$$

$$H_{i,r}^{h\,*} = g_{ij,r}^{-1}(P_{i1}^{H^h} / P_{i2}^{H^h}, P_{i2}^{H^h} / P_{i3}^{H^h}, \ldots, P_{ir}^{H^h} / P_{i1}^{H^h}; \zeta_{ij}, \bar{H}_{ij}), \quad \text{.....(A.13)}$$

where all notations, unless otherwise specified, analogously represent those in the previous equations. In particular, P_{ij}^V and P_{ij}^H are selling prices of V_{ij} and H_{ij}; $H_{i,r}^{h^*}$ represents the *j*th. region's demand for the intermediate input, H^h, purchased from region *r* which takes value from 1 to *r*. Further, we note that each demand equation for inputs is expressed in terms of their relative prices as well as parameters.

Similarly, factor input equations for the final-level production are also obtained by solving the cost minimisation problem:

$$\text{minimise } P_{ij}^{V} V_{ij} + P_{ij}^{H} H_{ij} \quad \text{.....(A.14)}$$

$$\text{subject to } Q_{ij} = h_j(V_{ij}, H_{ij}; \beta_{ij}) \quad \text{.....(A.15)}$$

Here Q_{ij} is the output of commodity *i* in region *j*, which is determined by value-added, intermediate inputs, and a vector of production technology shifters, β_{ij}. Solving equations (A.14) and (A.15), we get the following system of composite demand equations for value-added and intermediate inputs:

$$V_{ij}^{*} = h_{ij}^{-1}(P_{ij}^{V} / P_{ij}^{H}, P_{ij}^{H} / P_{ij}^{V}; \beta_{ij}, \bar{Q}_{ij}), \quad \text{.....(A.16)}$$

$$H_{ij}^{*} = h_{ij}^{-1}(P_{ij}^{V} / P_{ij}^{H}, P_{ij}^{H} / P_{ij}^{V}; \beta_{ij}, \bar{Q}_{ij}) \quad \text{.....(A.17)}$$

3. Equilibrium conditions

Producers receive world prices and consumers pay world prices plus tariffs, *ad valorem* tariff equivalent of non-tariff barriers and any domestic taxes. Under the non-positive-profit assumption, all payments received by firms in each production sector of a region must be exhausted on costs. Thus, domestic sales must be redistributed across private household, government, savings, and firms' uses. Regional consumers purchase domestic products and imported goods, while firms sell their products -- namely, final-products and/or intermediate aggregates as inputs -- on the domestic and international markets. As such, market demands and supplies within any region or all regions should satisfy Walras' law for the region or all regions.

Following Shoven and Whalley (1992)[49], we illustrate the general equilibrium conditions for our model by ignoring tariffs, *ad valorem* equivalent of non-tariff barriers, taxes, subsidy, and transfers[50]. This would provide an advantage of alleviating the burden of complicated notations in each equation. That is, for the moment, we treat the world price of commodity *i* produced in region *j*, namely, P_{ij}^{W}, to be equal to P_{ij}, for all *i* and *j*. In addition, μ_j and τ_j in Equation (A.3) are held to be zero. The equilibrium is represented by a set of product and input prices such that the set of equilibrium conditions hold. First, demand and supply are equated in product and factor markets, respectively:

$$Q_{ij} = \sum_{j=1}^{r} \sum_{i=1}^{n} H_{ij}^{h} + \sum_{j=1}^{r} \sum_{i=1}^{n} C_{ij}, \forall i, j, \quad \text{.....(A.18)}$$

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49. In a sharp contrast with Shoven and Whalley (1992), however, we allow land to enter the production function as one of the primary factors, in consideration of the agricultural sector. Furthermore, with the assumption of factor immobility across regions, we suppress both factor incomes from abroad received by a region and factor incomes paid abroad by that region in our equilibrium conditions.

50. This, of course, should apply to the case where all tax and trade distortions are incorporated into the model.

$$\sum_{i=1}^{n} K_{ij} = \sum_{i=1}^{n} \bar{K}_{ij}, \forall j, \quad \text{.....(A.19)}$$

$$\sum_{i=1}^{n} T_{ij} = \sum_{i=1}^{n} \bar{T}_{ij}, \forall j, \quad \text{.....(A.20)}$$

$$\sum_{i=1}^{n} L_{ij} = \sum_{i=1}^{n} \bar{L}_{ij}, \forall j. \quad \text{.....(A.21)}$$

Equation (A.18) posits that the total output of commodity *i* equals the summation of intermediate demands for commodity *i* and final consumption of commodity *i.* As in equations (A.19), (A.20) and (A.21), factor use by production sectors in each region should also equal the fixed and non-productive factors owned by agents in that region. Next, non-positive-profit conditions hold for all production sectors and regions:

$$P_{ij} Q_{ij} = \sum_{j=1}^{r} \sum_{i=1}^{n} P_{ij}^{H} H_{ij}^{h} + P_{ij}^{K} K_{ij} + P_{ij}^{T} T_{ij} + P_{ij}^{L} L_{ij}, \forall i, j, \quad \text{.....(A.22)}$$

which implies that value of sales of commodity *i* produced in region *j* should be equal to the summation of firms' expenditures on all intermediate and primary factor inputs for commodity *i* in that region. Finally, external trade account is maintained in balance for each region *j*:

$$\sum_{i=1}^{n} X_{ij} = \sum_{i=1}^{n} \sum_{j=1(j \neq k)}^{r} M_{i,jk} \forall j, \quad \text{.....(A.23)}$$

with

$$X_{ij} = \sum_{j=1}^{k} \sum_{i=1}^{n} P_{ij} H_{ij}^{h} + \sum_{j=1}^{k} \sum_{i=1}^{n} P_{ij} C_{ij}, \quad \text{.....(A.24)}$$

and

$$M_{i,jk} = \sum_{j=1}^{r} P_{ij}^{H} H_{ij}^{h} + \sum_{j=1}^{r-k} P_{ij} C_{ij}. \quad \text{.....(A.25)}$$

In equations (A.23), (A.24) and (A.25), *X* denotes the value of exports and, in equilibrium, should be equal to *M*, namely, the value of imports. *k*, which takes value greater than *1* and less than *r*, represents countries to which region *j* exports its products; while (*r* - *k*) stands for countries from which that region imports.

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