A POTENTIAL PREFERENTIAL TRADE AGREEMENT INVOLVING CHINA, JAPAN AND KOREA AND ITS IMPLICATIONS FOR AGRICULTURAL TRADE

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Abstract
With the failure of the WTO Ministerial Conference at Cancún, trade liberalisation now appears to be dependent upon the proliferation of preferential trade agreements (PTAs). In this paper we explore the effects of a potential preferential trade agreement between China, Japan and Korea on international trade in agricultural products. By using the GTAP computable general equilibrium model, we are able to assess in particular the effects of such a PTA on the direction and composition of Australia's agricultural exports to that region. We also identify the welfare changes for the members and for the excluded regions.

Key words: Preferential Trade Agreement, China, Japan, Korea, agricultural trade

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A Potential Free Trade Agreement involving China, Japan and Korea and its Implications for Agricultural Trade

Donald MacLaren and Xiaohe Liu

1. Introduction

Preferential trade agreements (PTAs) have become an increasingly common feature of the international trading system.[1] By their very nature, they are discriminatory and yet the countries which have entered into PTAs or which are negotiating to form such agreements are also members of the World Trade Organization (WTO). In the Marrakesh Agreement of 1994, which established the WTO, it is stated that Members are to contribute, *inter alia,* to raising living standards through 'the substantial reduction of tariffs and other barriers to trade *and to the elimination of discriminatory treatment in international relations*' (emphasis added) (WTO 1995, p. 6).

This objective was not new: a similar statement was contained in the preamble to the GATT 1947 (WTO 1995, p. 486). Nevertheless, various forms of preferential trading agreements already existed in 1947 and they were permitted to continue, although constrained by the restrictions imposed upon them by Article XXIV of GATT 1947. It was probably envisaged that PTAs would be a rare exception to most favoured nation (MFN) treatment (Article I). However, the current rush to create PTAs, and particularly those taking the form of plurilateral hub and spokes (see Lloyd and MacLaren 2003), is clearly incompatible with the stated desire to reduce discrimination in international trade. It represents a serious failure of the WTO. Of particular concern, given the development objective of the Doha Round, is the potential for PTAs amongst developed countries to cause economic harm to the developing and least-developed countries which, typically, continue to be excluded from such agreements. The position of agriculture in these agreements, whether included or excluded, may also be of significance in determining the amount of harm inflicted.

Discrimination also arises from the choice of commodity coverage to be included in a PTA. According to Article XXIV:8 of GATT 1994, for both customs unions and for free trade areas, any agreement is supposed to cover 'substantially all trade between the constituent territories' (WTO 1995, p. 524). Moreover, the formation of a PTA amongst Members of the WTO should be notified to the WTO in order to ensure that its provisions are satisfactory to the excluded Members. Neither of these elements of Article XXIV appears to have been recognised by Members in some recently negotiated PTAs, including the (partial) exclusion of agriculture.

The economic theory of PTAs has evolved considerably since Viner (1950) introduced the concepts of trade creation and trade diversion.[2] In contradiction of Viner's prediction,[3] it turns out that measuring changes in trade flows alone does not enable predictions to be made about the change in welfare of the included countries. This

[1] The term 'preferential' is used deliberately rather than the misleading term 'free' (see Bhagwati (2002, pp. 106-111) for a discussion).

[2] For a recent summary of some of these developments, see Lloyd and MacLaren (2003).

[3] Viner's prediction was that 'where the trade-diverting effect is predominant, one at least of the member countries is bound to be injured, the two combined will suffer a net injury, and there will be injury to the outside world and to the world at large' (p. 44).

inadequacy can be derived from the following equation of a country's trade expenditure function which is based on assumptions of perfect competition and constant returns to scale (see Lloyd and Schweinberger 1988, and Lloyd and MacLaren 2003):

$$B = e(p,u) - g(p,v) - (p - p^*)m$$

where: e is the expenditure necessary to achieve a given level of household utility at domestic prices, p; g is national product which depends on resource endowments, v, and domestic prices; m is a vector of traded quantities (with $m_i > 0$ if good i is imported and $m_i < 0$ if exported); and p^* is the vector of international prices. The third term is the value of trade tax revenue. Hence, B is the compensation that is needed to allow households to reach a given level of utility after they have received income from national production and tariff revenue (Lloyd and MacLaren 2003).

For a given country, successful negotiations on membership of a PTA will alter the elements of the vector p and the vector m for that country. If the country or the PTA is 'large' in international trade, then p^* will also change. A comparison of the pre-PTA and PTA situations can then be obtained by measuring a discrete change in the trade policy environment while holding household utility constant. Letting the pre-PTA situation be denoted by the superscript 0 and the PTA situation by 1, then:

$$\Delta B = [e(p^1,u^0) - e(p^0,u^0)] - [g(p^1,v) - g(p^0,v)] - [(p^1 - p^{*1})m^1 - (p^0 - p^{*0})m^0].$$

Hence, ΔB is the compensation necessary to leave household utility unchanged following the formation of the PTA. Now, B is an increasing function of u. Thus, if $\Delta B < 0$, the economy is better off, and if $\Delta B > 0$, the economy is worse off, from membership of the PTA.

This equation can be re-expressed to substantiate the claim made above that changes in trade flows are insufficient to enable a prediction to be made about the sign of the change in welfare for a country entering a PTA. Letting M be the set of countries which form a PTA and letting j be an individual country that is a member, then the change in a member's welfare, from the pre-PTA to the PTA situaiton, can be written as:

$$\Delta B \cong -(p^0 - p^{*0})(m^1 - m^0) + \sum_{j \in M} m_j^0 (p_j^1 - p_j^0) + \sum_{j \notin M} m_j^0 (p_j^1 - p_j^0)$$

or as ΔB = + change in the volume of trade + change in intra-union terms of trade + change in extra-union terms of trade

(see Lloyd and MacLaren 2003, pp. 4-5). The first and second terms may be of either sign while the sign of the third term, the extra-union terms of trade, will be positive. Hence, the sign of ΔB in general is ambiguous and theory alone does not provide a conclusion.[4] For the countries as a group which have been excluded from the PTA, the change in welfare will be negative, although some individual, excluded countries may gain. A natural way to generate a conclusion for both members and excluded countries is to use a computable general equilibrium model.[5]

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[4] Kemp and Wan (1976) derived conditions which ensure that the formation of a customs union benefits its members and does not harm excluded members; and a parallel result has been derived for a free trade area by Panagariya and Krishna (2002).

[5] In modern trade theory general equilibrium models, and their computable equivalents, may be classified into three generations (Baldwin and Venables 1995). In first generation models it is assumed that there are constant returns to scale, a fixed number of goods and perfectly competitive markets. In second generation models there is increasing returns to scale in some industries, the number of goods is endogenous and there

The objective in this paper is limited to evaluating the welfare effects for the included and excluded regions of a PTA formed by China, Japan and Korea. Because agriculture is unlikely to be included in the set of commodities covered by the Agreement, two sets of policy simulations are conducted. In the first simulation (PTA_1) it is assumed that bilateral tariffs on all goods and services traded amongst the three countries are removed but tariffs on imports from excluded regions remain unchanged. In the second simulation (PTA_2), it is assumed that only bilateral tariffs on non-agricultural goods and services are removed amongst members; those on imports of agricultural goods from all sources are assumed to remain unchanged at their pre-PTA rates as are all tariffs on imports from excluded regions. The structure of the paper is as follows. A summary of the discussions to date for the formation of a PTA involving China, Japan and Korea is given in section 2. The regional and commodity aggregations which are constructed for the policy simulations to be undertaken using the GTAP model (Hertel 1997) are presented in section 3. A discussion and evaluation of the results is given in section 4 and conclusions are presented in section 5.

2. The Proposed PTA

The countries of North-East Asia have been slow to participate in PTAs. For example, Japan's first agreement was with Singapore; it was signed in 2002 and it excluded agriculture. Korea signed an agreement with Chile in 2002 after four years of negotiation, and in 2004 has indicated that a PTA will be signed with Singapore by the end of this year (Bridges 2004). China has yet to negotiate an agreement but has agreed to consider thinking about a negotiation with Australia and she signed a framework agreement with ASEAN in 2002 (see http://www.aseansec.org/13999.htm for details).

Any agreement that might be negotiated between China, Japan and Korea would take some time to come to fruition because of the very different economies and the different political economies. For example, for both Japan and Korea agriculture is an extremely sensitive sector and it would be difficult for either to liberalise imports of agricultural products from China. Yet, China would want such liberalisation, even although Japan and Korea currently account for over 40 per cent of China's agricultural exports (Ministry of Commerce 2003). Korea would be in the most difficult position, fearing imports of labour-intensive products from China and technology-intensive products from Japan. Japan would welcome increased market access to China for technology-intensive manufactures but the *quid pro quo* would be liberalisation of agricultural imports.

Given these difficulties, it is unlikely that these three countries will form a PTA in the near future. It has been mooted that Japan and Korea might form one first of all and then this PTA would negotiate with China. In the remainder of the paper it is assumed that all three countries form a PTA in a single negotiation.

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is imperfect competition. In third generation models allowance is made for investment and growth effects. The results from simulating the same PTA with these three, different sets of assumptions can be quite different. In addition to the assumptions about market structure and dynamics, there is also the issue of the elasticities used in the CGE model and the way in which they are derived. For a discussion about these parameters and their implications for measuring the effects of the formation of free trade areas, see Hertel *et al.* (2003).

3. The Simulation Model

The GTAP model with version 5 of the data base (see Dimararan *et al.* 2002) was used to evaluate the welfare effects for the member and excluded countries of the proposed PTA. The 66 regions specified in the GTAP data base were aggregated to the nine shown in Table 1 and the composition of each of these regions is given in the Appendix. The 57 sectors were aggregated into 10 sectors, as shown in Table 1, and their composition is given in the Appendix. The time period to which the base data relate is 1997. No attempt was made to update these data from which the simulations were conducted. For example, the base data have not incorporated the effects of China's membership of the WTO. This means that the results from the simulations are not intended to be forecasts of what would happen if the PTA were implemented today. Instead, the results give an indication only of the effects of the formation of the PTA with and without agriculture on 1997 data and they illustrate the importance of commodity coverage in a PTA for the welfare of both members and excluded countries.

The pre-PTA tariff rates for the three countries forming the PTA are given in Table 1. What is very noticeable is that the tariff equivalent rates vary substantially by source of imports and across commodities, as well as across the three importing regions (Tables 1(a), 1(b) and 1(c)). It should also be noted that the presence of zeros in the services row indicates only that there are no data in the protection data base. It does not mean that there are no barriers to trade. This absence of data may or may not be a serious problem in a trade liberalisation experiment but the measurement of protection in the services sector is a well-known difficulty and limitation.

4. The Simulation Results

The first policy simulation (PTA_1) was conducted by setting the bilateral tariff rates from each of the member countries for all 10 commodities to zero while leaving unchanged rates on imports from excluded regions. The resulting changes in intra-PTA trade when measured from the pre-PTA base are given in Table 2. China's imports from all sources increase for all commodities except for natural resources which experience a very small decrease. Japan's rice imports from all sources increase substantially while imports of other grains and other animal products fall slightly. For Korea, there is a large increase in fruits and vegetable imports with smaller yet important increases in imports of rice and of other grains. For all three countries there are modest increases in imports of manufactures.

For CER, exports of rice to China rise (Table 3(a)), to Japan they fall substantially (Table 3(b)) and to Korea they rise (Table 3(c)). Exports to China of the six remaining agricultural commodities rise but to Japan and Korea they fall. This pattern is repeated for the other regions with the exception of EU exports to Japan of manufactures which fall.

For the second policy simulation (PTA_2) only bilateral tariffs for natural resources, manufactures and services were set to zero amongst PTA members. All rates on the agricultural commodities remained at the levels shown in Table 1 for the members; and tariff rates on all commodities imported by members from excluded regions remained unchanged.

Comparing the two policy simulations for the differing effects on exports from the excluded regions to each of the member countries is instructive. Begin with China (Table 3(a)). For the CER region, the percentage increase in export volumes of all commodities,

except manufactures, is greater under full liberalisation (PTA_1), as would be expected. The loss of export volume of manufactures is larger under PTA_2. A similar pattern to that of CER emerges for the other regions. For most of the agricultural commodities, the percentage changes for CER are amongst the largest of the regions'. Overall, as might be expected, the size of the percentage changes for complete trade liberalisation within the PTA (PTA_1) are substantially larger than those for partial liberalisation (PTA_2).

The results for Japan (Table 3(b)) are possibly more accurate than those for China because of the more comprehensive coverage of tariff rates in the data base. In contrast with the results for China which showed largely positive changes in exports for each exporting region, those for Japan are largely negative for PTA_1. Not only are the signs negative but the sizes of the changes are substantial. For example, rice exports by each excluded region fall by almost 93 per cent, exports of meats fall by around 28 per cent and dairy products by around 20 per cent. For the second simulation (PTA_2) most export regions increase their exports for all commodities except for manufactures. CER and ROW are exceptions in that their exports increase, albeit with a percentage very close to zero. Comparing the results from these two simulations indicates that the trade diversion is much greater with PTA_1 than with PTA_2: the former causing a fall in exports to the PTA countries while the latter allows small increases in most commodities. The extent of this trade diversion contrasts with the trade creation (Table 3(a)) for China.

The results for Korea (Table 3(c)) again show considerable trade diversion under PTA_1, although exports of rice, dairy products and services by the excluded regions do increase. Again, comparing the results from the two simulations, PTA_2 generates increases in exports for the excluded regions for most commodities, although manufactures are an important exception with exports falling by around 6 per cent for each region, a greater amount than under PTA_1.

As noted in section 1 above, changes in trade flows are not sufficient to predict changes in welfare subsequent to the formation of a PTA. The welfare change for each region was calculated as equivalent variation, measured in US$ million at 1997 prices and as a percentage of the base period value of GDP. The results are given in Table 4 for both simulations. Under PTA_1 the countries forming the PTA each gain. Korea appears to gain the most in percentage terms (0.876) with China gaining the least (0.070). But this figure for China may merely reflect the incompleteness of the base period trade protection data. Each of excluded regions loses with ASEAN losing the most in percentage terms (–0.344). The losses to the developing regions of South Asia (–0.028) and ROW (–0.080) should also be noted. The percentage change in world welfare (measured as the sum of the changes in each region's EV (in US$m.) divided by base period world GDP) is slightly positive. This result is consistent with the notion that prevailed pre-Viner, namely, that a move towards free trade, however partial, would be desirable. Nevertheless, the outcome shown in both simulations does not represent a Pareto improvement because the international transfers necessary to compensate the losing countries do not occur.

The most interesting feature of PTA_2 is that China loses welfare from being a member (–0.164) because of the exclusion of agriculture (see the discussion in Section 2 above). The difference between the EVs for Japan in the two experiments is negligible while the gains for Korea are smaller under PTA_2. For the excluded regions, the losses

of welfare are smaller under PTA_2 than under PTA_1, as might be expected and the gain to the world economy is about half the size.[6]

5. Conclusions

The purpose in this paper was to investigate the trade and welfare effects of a preferential trade agreement involving China, Japan and Korea. It was shown using the trade expenditure function that changes in trade flows alone are not sufficient to enable predictions to be made about changes in welfare; and it was suggested that a CGE model was a natural way to estimate these effects. PTAs are discriminatory and are likely to reduce the welfare of excluded countries. At a time when the multilateral system, through the Doha Round in the WTO, is supposed to be focusing on what can be done to enhance the economic well-being of developing countries, the current proliferation of PTAs is not helpful.

The economic effects of a PTA involving China, Japan and Korea were simulated using the GTAP model. It was found that this PTA would indeed generate welfare outcomes which benefited the members but which harmed the excluded countries. Whether or not agriculture is included in the commodity coverage, the excluded countries lose. The only difference is the smaller loss of welfare with the exclusion of agriculture. When agriculture is included, all members gain; whereas when agriculture is excluded, as is probable, China loses but Japan and Korea gain.

On the basis of this evidence, it is difficult not to conclude that the rules of the GATT/WTO are insufficient to protect the well-being of the excluded countries. Moreover, because excluded countries lose while member countries gain, there is now increasing pressure for governments to seek out other governments with which to form a PTA. In this process, the poor countries are losing because they are not party to the formation of PTAs. Perhaps it is time for the economic theory of PTAs to underline the trade rules and to remove Article XXIV of GATT and insist on the universal application of most-favoured-nation treatment. Such a step, how ever unlikely in practice it may seem, would lead at least to removing discrimination in international commerce and to raising living standards of the developing country Members of the WTO.

[6] Scollay and Gilbert (2001) report the results of modelling a number of different PTAs in the Asia-Pacific region using the GTAP 4 data base with 22 regions and 21 sectors. For a PTA involving China, Japan and Korea and allowing for complete liberalisation of goods and services, they found that the welfare changes, in terms of EV as a percentage of base period GDP, were 2.09 for China, 0.25 for Japan, 0.80 for Korea and 0.09 for the world. They also found that the ASEAN countries lost, that NAFTA lost and that the EU gained.

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Table 1(a): Tariff Rates in Base Data from Region *r* to CHINA

Commodity	CHINA	JAPAN	KOREA	CER	NAFTA	EU	ASEAN	S_ASIA	ROW
1 Rice	0	0	0	0.9	31.2	0	49.9	0.2	24.4
2 Other_Grains	0	53.5	35.7	94.7	106.9	97.9	0.2	0	70.9
3 Fruit_veg	0	4.2	19.7	4.6	9	2.9	10.1	15.5	12.2
4 Misc_crops	2.5	7.7	16.6	7.9	37.9	38.5	25.3	7.1	27.7
5 Meats	0.2	12.1	13.9	9.5	13.4	8.1	8.1	20.9	4.8
6 Dairy_prods	1.2	7	15.8	8.9	5.6	9	4.6	0	8.8
7 Other_animal	0	9.7	13.2	12.1	6.2	7.8	2.2	6.9	9.9
8 Nat_res	0	8.1	7.9	0.3	0.8	2	0.5	0.3	0.5
9 Mnfcs	8.2	12.5	12.2	6.9	8.2	8.9	6.6	8.3	11.5
10 Svces	0	0	0	0	0	0	0	0	0

Note: for a definition of the regions and the commodities, see the Appendix.

Source: GTAP 5 data base

Table 1(b): Tariff Rates in Bbase Data from Region *r* to JAPAN

Commodity	CHINA	JAPAN	KOREA	CER	NAFTA	EU	ASEAN	S_ASIA	ROW
1 Rice	409	0	409	409	409	409	409	409	409
2 Other_Grains	30.8	0	22	224.3	81.9	20.4	20.7	161.1	34.1
3 Fruit_veg	44.9	0	44.9	44.9	44.9	44.9	44.9	44.9	44.9
4 Misc_crops	38	0	37.9	39.8	46.3	33.2	38.6	33.3	38
5 Meats	58	0	58.1	37.7	45.4	57.4	58.1	56.4	56.7
6 Dairy_prods	287	0	287	287	287	287	287	287	287
7 Other_animal	11.9	0	13.1	32.5	40.5	46.3	6.6	7.7	13.4
8 Nat_res	-0.2	0	6.2	0.1	0.1	1.5	-0.6	0.1	-1.7
9 Mnfcs	5.6	-1.1	2.7	1	1.5	2.6	2.1	3.5	1.9
10 Svces	0	0	0	0	0	0	0	0	0

Source: GTAP 5 data base

Table 1(c): Tariff Rates in Base Data from Region *r* to KOREA

Commodity	CHINA	JAPAN	KOREA	CER	NAFTA	EU	ASEAN	S_ASIA	ROW
1 Rice	5	5	0	5	5	5	5	5	5
2 Other_Grains	303.9	304	0	5.6	171.1	8.8	303.7	193.1	222.7
3 Fruit_veg	132.1	132.1	0	132.1	132.1	132.1	132.1	132.1	132.1
4 Misc_crops	54.9	51.6	0	27.3	75.5	50.7	29.4	34.4	50
5 Meats	25.8	25.1	0	21.6	22.5	25.6	25.5	24.8	25.2
6 Dairy_prods	75	75	0	75	75	75	75	75	75
7 Other_animal	10	10.1	0	9.6	10	9.9	10	8	10.1
8 Nat_res	3.8	7.4	0	1.5	2.7	4.6	2.5	1.3	4.7
9 Mnfcs	7.8	7.8	1.7	4.7	6.9	7.8	7	7.3	5.6
10 Svces	0.1	0.1	0	0.1	0.2	0.2	0.3	0.2	0.1

Source: GTAP 5 data base

Table 2: Percentage Change in Imports from all Regions of Good *i* by Region *s*

	PTA_1			*PTA_2*		
Commodity	**CHINA**	**JAPAN**	**KOREA**	**CHINA**	**JAPAN**	**KOREA**
Rice	11.82	479.31	28.83	1.11	2.93	5.89
Other_Grains	15.3	-2.36	46.11	0.12	-0.18	-0.78
Fruit_veg	10.21	22.03	175.16	0.22	2.85	4.57
Misc_crops	8.82	13.73	9.05	0.07	1.97	2.24
Meats	6.64	12.21	2.75	0.46	1.5	3.18
Dairy_prods	2.21	6.49	10.42	0.2	1.28	3.88
Other_animal	12.11	-0.86	-2.58	0.6	1.9	1.38
Nat_res	-0.23	0.79	0.45	0.81	0.63	1.03
Mnfcs	9.53	6.58	9.34	8.73	7.36	8.84
Svces	1.37	2.95	6.91	-0.01	3.28	4.77

Source: simulation results

Table 3(a): Percentage Change in Exports from Region *r* to CHINA

	CER		NAFTA		EU		ASEAN		S_ASIA		ROW	
Commodity	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*
Rice	13.92	0.59	11.17	0.36	8.75	0.38	11.95	1.25	9.71	0.46	9.67	0.83
Other_Grains	15.4	0.12	15.47	0.11	12.28	0	16.39	0.49	13.56	0.24	13.65	0.54
Fruit_veg	11.33	0.28	10.57	0.14	8.27	0.19	12.06	0.84	9.33	0.26	9.07	0.51
Misc_crops	4.19	0.68	3	0.35	2.15	0.28	4.53	1.06	3.09	0.28	2.87	0.63
Meats	8.41	0.79	7.65	0.56	6.35	0.54	8.55	1.38	7.05	0.52	7.2	0.99
Dairy_prods	2.88	0.47	1.84	0.23	0.84	0.16	2.44	0.84	1.71	0.32	1.56	0.58
Other_animal	16.49	1.21	15.36	1	12.72	1.01	17.27	2.04	14.09	1.06	13.88	1.48
Nat_res	-0.53	0.33	-0.83	0.22	-0.79	0.22	-0.04	0.9	-0.71	0.07	-0.59	0.44
Mnfcs	-12.66	-14.72	-13.92	-15.11	-14.2	-15.16	-13.76	-14.93	-13.82	-15.15	-13.71	-14.83
Svces	3.46	1.02	2.2	0.61	1.88	0.52	3.1	1.42	2.27	0.56	2.47	0.95

Source: simulation results

Table 3(b): Percentage Change in Exports from Region *r* to JAPAN

	CER		NAFTA		EU		ASEAN		S_ASIA		ROW	
Commodity	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*
Rice	-92.54	3.16	-92.71	2.94	-92.86	3	-92.65	3.88	-92.8	3.06	-92.8	3.46
Other_Grains	-2.9	0.01	-3.6	-0.21	-6.01	-0.25	-2.59	0.24	-4.94	-0.01	-5.35	-0.01
Fruit_veg	-22.45	3.1	-22.61	3.08	-24.13	3.11	-21.69	3.73	-23.17	3.35	-23.53	3.49
Misc_crops	-21.92	2.43	-22.79	2.1	-23.4	2.06	-21.44	2.96	-22.56	2.14	-22.83	2.45
Meats	-28.16	2.08	-28.72	1.82	-29.59	1.82	-28.01	2.75	-28.98	1.88	-29.09	2.21
Dairy_prods	-19.83	1.55	-21.54	0.8	-21.58	1.21	-20.07	2.07	-20.99	1.29	-21.02	1.63
Other_animal	-5.36	2.28	-6.25	2.07	-8.41	2.06	-4.83	3.07	-7.39	2.08	-7.42	2.58
Nat_res	0.82	0.42	0.39	0.19	0.57	0.32	1.26	0.94	0.57	0.11	0.78	0.55
Mnfcs	1.48	0.02	0.26	-0.3	-0.07	-0.36	0.45	-0.09	0.36	-0.36	0.56	0.09
Svces	4.49	3.74	3.21	3.32	2.88	3.22	4.12	4.15	3.28	3.27	3.49	3.67

Source: simulation results

Table 3(c): Percentage Change in Exports from Region *r* to KOREA

	CER		NAFTA		EU		ASEAN		S_ASIA		ROW	
Commodity	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*
Rice	29.18	6.85	25.69	6.54	22.89	6.55	26.94	7.63	23.9	6.6	23.87	6.99
Other_Grains	-98.75	-0.3	-98.75	-0.51	-98.79	-0.48	-98.74	-0.09	-98.78	-0.45	-98.78	-0.21
Fruit_veg	-48.31	4.67	-48.51	4.61	-49.49	4.78	-47.91	5.28	-48.99	4.83	-49.27	4.92
Misc_crops	-35.04	2.67	-35.75	2.35	-36.27	2.3	-34.73	3.13	-35.72	2.27	-35.81	2.67
Meats	-2.36	3.48	-3.08	3.23	-4.21	3.25	-2.03	4.22	-3.31	3.36	-3.5	3.68
Dairy_prods	6.75	4.28	4.42	3.48	4.45	3.94	6.38	4.78	4.63	3.7	5.26	4.42
Other_animal	-2.75	1.67	-3.69	1.46	-5.91	1.45	-2.06	2.52	-4.6	1.59	-4.91	1.95
Nat_res	-0.72	-0.32	-1.11	-0.5	-0.93	-0.37	-0.27	0.22	-0.97	-0.62	-0.74	-0.16
Mnfcs	-4.35	-5.99	-5.78	-6.43	-6.1	-6.5	-5.63	-6.26	-5.68	-6.49	-5.51	-6.08
Svces	8.65	5.48	7.32	5.06	6.99	4.96	8.27	5.9	7.4	5	7.61	5.41

Source: simulation results

Table 4: Changes in Regional Welfare (EV)

	US$ million		% of base GDP	
Region	*PTA_1*	*PTA_2*	*PTA_1*	*PTA_2*
CHINA	698	-1629	0.070	-0.164
JAPAN	8324	8396	0.196	0.197
KOREA	3903	2935	0.876	0.659
CER	-527	-264	-0.115	-0.058
NAFTA	-2971	-1931	-0.033	-0.022
EU	-1299	-1330	-0.016	-0.017
ASEAN	-2242	-1850	-0.344	-0.283
S_ASIA	-126	-59	-0.028	-0.013
ROW	-3814	-3129	-0.080	-0.065
World	1945	1140	0.007	0.004

Source: simulation results

APPENDIX

Regional Aggregation

No.	Old Code	Region Description	No.	New Code	Region Description
1	aus	Australia	4	CER	Australia + New Zealand
2	nzl	New Zealand	4	CER	
3	chn	China	1	CHINA	China + Hong Kong
4	hkg	Hong Kong	1	CHINA	
5	jpn	Japan	2	JAPAN	Japan
6	kor	Korea	3	KOREA	Korea
7	twn	Taiwan	9	ROW	All other regions
8	idn	Indonesia	7	ASEAN	Indonesia, Malaysia, Philippines,
9	mys	Malaysia	7	ASEAN	Singapore, Thailand, Vietnam
10	phl	Philippines	7	ASEAN	
11	sgp	Singapore	7	ASEAN	
12	tha	Thailand	7	ASEAN	
13	vnm	Vietnam	7	ASEAN	
14	bgd	Bangladesh	8	S_ASIA	Bangladesh, India and Sri Lanka
15	ind	India	8	S_ASIA	
16	lka	Sri Lanka	8	S_ASIA	
17	xsa	Rest of South Asia	9	ROW	
18	can	Canada	5	NAFTA	Canada, Mexico and the U.S.
19	usa	United States	5	NAFTA	
20	mex	Mexico	5	NAFTA	
21	xcm	Central America, Caribbean	9	ROW	
22	col	Colombia	9	ROW	
23	per	Peru	9	ROW	
24	ven	Venezuela	9	ROW	
25	xap	Rest of Andean Pact	9	ROW	
26	arg	Argentina	9	ROW	
27	bra	Brazil	9	ROW	
28	chl	Chile	9	ROW	
29	ury	Uruguay	9	ROW	
30	xsm	Rest of South America	9	ROW	
31	aut	Austria	6	EU	Austria, Belgium, Denmark, Finland,
32	bel	Belgium	6	EU	France, Germany, United Kingdom,
33	dnk	Denmark	6	EU	Greece, Ireland, Italy, Luxembourg,
34	fin	Finland	6	EU	Netherlands, Portugal, Spain and
35	fra	France	6	EU	Sweden
36	deu	Germany	6	EU	
37	gbr	United Kingdom	6	EU	
38	grc	Greece	6	EU	
39	irl	Ireland	6	EU	
40	ita	Italy	6	EU	
41	lux	Luxembourg	6	EU	
42	nld	Netherlands	6	EU	
43	prt	Portugal	6	EU	
44	esp	Spain	6	EU	
45	swe	Sweden	6	EU	
46	che	Switzerland	9	ROW	
47	xef	Rest of EFTA	9	ROW	
48	hun	Hungary	9	ROW	

49	pol	Poland	9	ROW
50	xce	Rest of Central Eur. Assoc	9	ROW
51	xsu	Former Soviet Union	9	ROW
52	tur	Turkey	9	ROW
53	xme	Rest of Middle East	9	ROW
54	mar	Morocco	9	ROW
55	xnf	Rest of North Africa	9	ROW
56	bwa	Botswana	9	ROW
57	xsc	Rest of SACU (Namibia,RSA)	9	ROW
58	mwi	Malawi	9	ROW
59	moz	Mozambique	9	ROW
60	tza	Tanzania	9	ROW
61	zmb	Zambia	9	ROW
62	zwe	Zimbabwe	9	ROW
63	xsf	Other Southern Africa (Ang, Maur	9	ROW
64	uga	Uganda	9	ROW
65	xss	Rest of Sub-Saharan Africa	9	ROW
66	xrw	Rest of World	9	ROW

Source: GTAP 5 data base

Sectoral Aggregation

No.	Old Code	Sector Description	No.	New Code	Sector Description
1	pdr	Paddy rice	1	Rice	paddy + processed rice
2	wht	Wheat	2	Other_Grains	all other grains
3	gro	Cereal grains nec	2	Other_Grains	
4	v_f	Vegetables, fruit, nuts	3	Fruit_veg	fruits and vegetables
5	osd	Oil seeds	4	Misc_crops	all other crops
6	c_b	Sugar cane, sugar beet	4	Misc_crops	
7	pfb	Plant-based fibers	4	Misc_crops	
8	ocr	Crops nec	4	Misc_crops	
9	ctl	Cattle,sheep,goats,horses	7	Other_animal	all other animals and
10	oap	Animal products nec	7	Other_animal	products
11	rmk	Raw milk	7	Other_animal	
12	wol	Wool, silk-worm cocoons	7	Other_animal	
13	for	Forestry	8	Nat_res	natural resource industries
14	fsh	Fishing	8	Nat_res	
15	col	Coal	8	Nat_res	
16	oil	Oil	8	Nat_res	
17	gas	Gas	8	Nat_res	
18	omn	Minerals nec	8	Nat_res	
19	cmt	Meat: cattle,sheep,goats,horse	5	Meats	all meats
20	omt	Meat products nec	5	Meats	
21	vol	Vegetable oils and fats	4	Misc_crops	
22	mil	Dairy products	6	Dairy_prods	all dairy products
23	pcr	Processed rice	1	Rice	
24	sgr	Sugar	4	Misc_crops	
25	ofd	Food products nec	4	Misc_crops	
26	b_t	Beverages and tobacco products	9	Mnfcs	all manufacturing
27	tex	Textiles	9	Mnfcs	industries
28	wap	Wearing apparel	9	Mnfcs	
29	lea	Leather products	9	Mnfcs	
30	lum	Wood products	9	Mnfcs	
31	ppp	Paper products, publishing	9	Mnfcs	
32	p_c	Petroleum, coal products	9	Mnfcs	
33	crp	Chemical,rubber,plastic prods	9	Mnfcs	
34	nmm	Mineral products nec	9	Mnfcs	
35	i_s	Ferrous metals	9	Mnfcs	
36	nfm	Metals nec	9	Mnfcs	
37	fmp	Metal products	9	Mnfcs	
38	mvh	Motor vehicles and parts	9	Mnfcs	
39	otn	Transport equipment nec	9	Mnfcs	
40	ele	Electronic equipment	9	Mnfcs	
41	ome	Machinery and equipment nec	9	Mnfcs	
42	omf	Manufactures nec	9	Mnfcs	
43	ely	Electricity	10	Svces	all services and utilities
44	gdt	Gas manufacture, distribution	10	Svces	
45	wtr	Water	10	Svces	
46	cns	Construction	10	Svces	
47	trd	Trade	10	Svces	
48	otp	Transport nec	10	Svces	
49	wtp	Sea transport	10	Svces	

50	atp	Air transport	10	Svces
51	cmn	Communication	10	Svces
52	ofi	Financial services nec	10	Svces
53	isr	Insurance	10	Svces
54	obs	Business services nec	10	Svces
55	ros	Recreation and other services	10	Svces
56	osg	PubAdmin/Defence/Health/Educat	10	Svces
57	dwe	Dwellings	10	Svces

Source: GTAP 5 data base