Proliferation of Preferential Trade Agreements: Quantifying its Welfare Impact and Preference Erosion

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Literature has frequently evaluated the proliferation of preferential trade agreement (PTAs) by counting the number of PTAs or the share of international trade covered by these agreements. But these indicators have been recently criticized. This article, using a Computable General Equilibrium (CGE) model, attempts to quantify the economic impact (measured by its welfare effect) of the proliferation of PTAs. Results show that the welfare impact is limited and often vanishes quickly because preferences are eroded by the proliferation of PTAs. This contrasts with the gains from non-discriminatory liberalization. Therefore, proliferation of PTAs is unlikely to continue. This article also has methodological implications for CGE modelling: ignoring the proliferation of PTA significantly bias the results; and the bias is not only potentially large but also its direction is a priori uncertain.

I   INTRODUCTION

Preferential trade agreements (PTAs) have proliferated. As indicated in Figure 1, the number of active PTAs is increasing at an exponential rate despite the enlargement of the EU from fifteen to twenty-five members in 2004, which has considerably reduced the number of active agreements. At the end of 2006, the World Trade Organization (WTO) identified more than 214 active PTAs notified to the organization. To this number, one should add about seventy agreements that have not been notified and about thirty that have been signed but not yet implemented (Fiorentino et al., 2007).

However, Pomfret (2006) argued that this increase in the number of PTAs as well as in the proportion of world trade which takes place between signatories of PTA are 'meaningless measures of the extent of regionalism'. Messerlin (2007) pointed that the number of PTAs 'strongly exaggerates and distorts the true importance of the rise of regionalism'. Moreover these indicators, although frequently used, do not provide any insight on the economic impact of the proliferation of PTAs. This article tries to move the debate forward by providing a sense of the economic impact of the proliferation of PTAs by estimating its welfare impact, using a Computable General Equilibrium (CGE) model.

The CGE simulations depend crucially on their database. Constructing a global database is a daunting task and delays between the reference year of the database and the time of its release are unavoidable. This time lag would not be a problem for estimating the impact of regional trade liberalization if PTAs were rare and if the database includes preferences. But this is not the case and this article argues that overlooking the
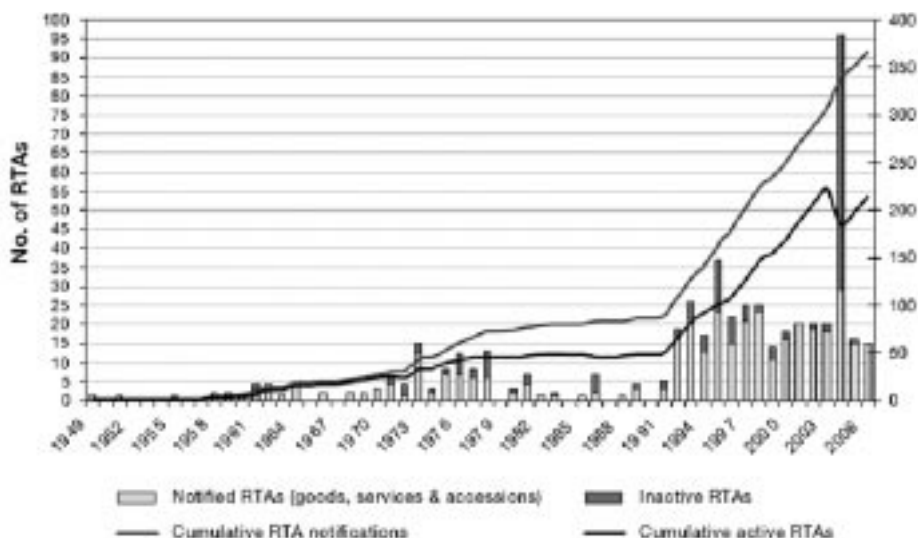
FIGURE 1: PTAs NOTIFIED TO THE GATT/WTO BY YEAR OF ENTRY INTO FORCE (1949-2006)

Source: Fiorentino, Verjeda, and Toqueboeuf (2007).

proliferation of PTAs biases simulation results because it ignores the impact of preference erosion.

The Korea-US Free Trade Agreement (FTA) is a benchmark in this article for several reasons. First, it was signed recently but six years after the reference year of the most commonly used CGE database. In the meantime, both the Republic of Korea (hereafter Korea) and the United States have multiplied bilateral trade agreements.

Second, the Korea-US FTA might prompt more preferential agreements. Shortly after the agreement was announced in April 2007, Japan expressed its interest in reviving its suspended PTA talks with Korea, and China indicated its intention to speed up the feasibility study of a PTA with Korea. Negotiations with Mexico were revived in August 2007. Canada and the EU, both of which had not negotiated new PTAs for several years, have changed their policy. In May 2007, the European Commission announced it has launched negotiations with Korea and the Association of South East Nations (ASEAN). In June 2007, after reaching an agreement with EFTA, the Canadian trade minister claimed that his country was 'back in the game'.

Third, the Korea-US FTA is systematically important. It involves two large trading nations. According to the WTO (2006b), in 2005, the United States and Korea were respectively the largest and the eleventh largest trading countries. The United States is Korea's second largest trading partner, while Korea is the US' seventh largest partner for trade in goods.

Finally, the Korea-US FTA share the characteristics that Fiorentino et al. (2007) identified as the most distinctive features of the current wave of PTAs:

–   Unlike most PTAs of previous waves, it is not an agreement between neighbours but a cross-regional agreement.

- It is a bilateral FTA, increasingly most-favoured form of PTA.[1]
- It has been negotiated in only fourteen months[2] providing support to the fact that 'the timing from the launching of the negotiations to their conclusion has been shrinking in recent years' (Fiorentino et al., 2007).

Section II reviews the literature on CGE simulations of the Korea-US FTA and shows that the proliferation of PTAs is overlooked. Section III summarizes the aspects of the theoretical literature on PTAs that are relevant for this article. Section IV describes the model and the methodology used. Finally, the core of the article is section V, in which results are detailed.

II   CGE LITERATURE ON THE KOREA-US FTA IGNORES PROLIFERATION OF PTAs

On 30 June 2007, the United States and Korea signed a FTA. This agreement is the most significant PTA signed by the United States since North American Free Trade Agreement (NAFTA) and the most significant ever for Korea. How large will be its impact? This question has stimulated a substantial CGE literature trying to quantify the impact of the agreement before it was signed or even before negotiations were officially launched.

All CGE simulations of the Korea–US FTA rely at least partially on various versions of the GTAP database (see Table 1). The latest version is benchmarked to the global economy in 2001 and is the only version to include preferences.[3] At that time, the United States had only three active PTAs: with Mexico and Canada (NAFTA), with Israel, and with Jordan[4] (WTO, 2006a). Korea had no active PTA, although its government had decided as early as 1998 to negotiate them (WTO, 2004).

TABLE 1. DATABASE USED IN CGE SIMULATIONS OF THE KOREA-US FTA

	Database	Reference Year
Cheong and Wang (1999)	GTAP	1995
Choi and Schott (2001)	GTAP	1995
USITC (2001)	GTAP	1995
Choi and Schott (2004)	GTAP	1997
Lee and Lee (2005)	GTAP	2001
Schott, Bradford and Moll (2006)	GTAP	2001
Kiyota and Stern (2007)	GTAP	2001
USITC (2007)	GTAP	2001
Zhuang and Koo (2007)	GTAP	2001

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[1] Other forms are customs unions and partial scope agreement. Messerlin (2007) points that moving from regional to bilateral agreements whose impact is more limited is one of the reason why counting the number of PTAs overstate the impact of regionalism.

[2] The expiration of the Trade Promotion Authority implied a rapid negotiation but this was also true for other FTAs negotiated by the United States, which did not meet the deadline. Moreover, Korea appears familiar with quick negotiations: its FTA with EFTA countries was negotiated in one year.

[3] A description of the various versions of the GTAP databases is available at: <www.gtap.agecon.purdue.edu/databases/default.asp>.

[4] The US-Jordan FTA entered into force in December 2001.

The landscape has changed dramatically since 2001. Both the United States and Korea have multiplied PTAs. As of end 2007, the United States had fourteen FTA's and the US Congress is considering four more (including the agreement with Korea). Korea does not rely any more exclusively on multilateral liberalization and has implemented three FTAs since 2004 (Table 2). Both countries are also negotiating or contemplating many other PTAs.[5]

Despite this activity, the first four CGE studies listed in Table 1 do not take into account preferences and all the studies (except, partially, the United States International Trade Commission (USITC) studies), in this table have estimated the impact of the Korea-US FTA as if no PTA had been signed since the reference year of their database. This is likely to bias the simulation results. Before trying to measure the extent of this bias, the next section shows that ignoring the proliferation of PTAs is akin to overlooking some potentially important economic mechanisms.

III THEORETICAL CONSIDERATIONS ON THE PROLIFERATION OF PTAs

Following Jacob Viner (1950) and James Meade (1955), the static global welfare impact of PTAs is measured by the gains from trade creation (the improvement in allocative efficiency due to the replacement of production and consumption of domestic goods with imports from more efficient partner countries) net of the costs of trade diversion (the welfare cost from switching from an efficient supplier non-member of a PTA to a less efficient supplier, but partner in the PTA). In this framework, the

TABLE 2. PTAs IMPLEMENTED BY THE UNITED STATES AND KOREA SINCE END 2001 (AS OF END 2007)

United States		Republic of Korea	
Trading Partner	Implementation Date	Trading Partner	Implementation Date
Chile	January 2004	Chile	April 2004
Singapore	January 2004	Singapore	March 2006
Australia	January 2005	EFTA	September 2006
Morocco	January 2006		
El Salvador[1]	March 2006		
Honduras[1]	April 2006		
Nicaragua[1]	April 2006		
Guatemala[1]	July 2006		
Bahrain[2]	August 2006		
Costa Rica[1]	March 2007		

Source: WTO, USTR[6]

Notes: [1] Hereafter CAFTA.

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[5] The status of US FTAs is available at: <www.ustr.gov/Trade_Agreements/Bilateral/Section_Index.html>.
[6] The 2007 study includes the full implementation of NAFTA. It also includes (i) the changes from other US FTAs but not non-US FTAs, (ii) the Uruguay Round reforms not in place in 2001 including the WTO's Agreement on Textiles and Clothing, and (iii) the 2005 applied tariffs between the United States and Korea. The 2001 as well as the 2007 studies update the database (from 1995 to 2000 for the 2001study and from 2001 to 2005 for the 2007 study).

maximum net welfare gain of a PTA equals the lowest net welfare gain of a non-preferential liberalization (Cooper and Massell, 1965) because trade diversion, which is the economic cost of discrimination, affects the welfare impact of a preferential liberalization but not the welfare impact of a non-discriminatory liberalization. This conclusion depends on the assumption that the PTA does not change the terms of trade. But, if the signatories are not small countries, then a preferential agreement will affect world prices and thus the terms of trade of members and non-members.

This theoretical framework, which underpins the GTAP model, assumes perfect competition and constant return to scale. When, instead, imperfect competition and increasing return to scale are assumed, the procompetitive impact of a trade liberalization becomes substantial and leads to larger trade creation and, thus, to a larger net welfare gain or a lower net welfare loss.[7] The Michigan model of world production and trade is based on these assumptions (Kiyota and Stern, 2007).

Against this background, what is the impact of the proliferation of PTAs? Three main mechanisms are at play: preference erosion, the reversal of trade diversion, and the creation of a hub-and-spoke system.

First, proliferation of PTAs means erosion of preferences. Let us assume that two countries (A and B), which had initially no preferential agreement, conclude a bilateral PTA. Both enjoy a preferential access to their partner's market. But if A starts multiplying its PTA (with countries C, and D) then more and more countries have a preferential access to A's market. As a result, the value of the preferential access of B to A's market declines. The magnitude of this preference erosion is *a priori* uncertain. It will depend if countries C and D export or not to A the same products than country B.

Second, Wonnacott (1996) argued that an expanding PTA would generate not only new trade diversion but also would eliminate diversion of prior PTAs. He took as an example the 1994 extension of the Canada-US FTA to Mexico arguing that the Canada-US FTA may have diverted US imports from Mexico to Canada but when this agreement was extended to become NAFTA, US imports may have shifted back to Mexico, and thus reversing previous trade diversion. This argument is also valid in the case of the proliferation of PTAs. In an argument supporting US policy, the Congressional Budget Office (2003) argued that:

> as more and more FTAs are negotiated, the later agreements become less and less likely to divert trade and more and more likely to reverse the trade diversion that resulted from earlier agreements . . . if NAFTA caused a rise in imports from Mexico at the expense of imports from Chile, the subsequent free-trade agreement with Chile would reverse that diversion of trade and eliminate the resulting harm.

Nonetheless, the net global effect of new diversion and reversal of previous diversion remains ambiguous.

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[7] See, among many others, Pomfret (1988) on these developments in the context of PTAs; Grossman (1992), Helpman and Krugman (1985), and Krugman (1995) on theoretical aspects; and Richardson (1989) and Schmitt (1990) for empirical analyzes.

Third, Wonnacott (1996) also pointed that the proliferation of PTAs might create a hub-and-spoke system with a welfare effect that is unclear when compared to a corresponding full PTA. The reasons are that more trade barriers remain in hub-and-spoke systems and that the hub (the United States or the EU, for example) benefits more from the agreement than the spokes (the various US or the EU bilateral partners in a PTA). Indeed, trade between spokes is not liberalized; spokes are competing for the market of the hub (the value of their preferences is thus eroded), and investment may be diverted to the hub.

In short, proliferation of PTAs has welfare implications and therefore must be taken into account in the assessment of a particular agreement such as the Korea-US FTA. Since the welfare impact of each of the three mechanisms associated with the proliferation of PTAs is ambiguous and *a priori* uncertain, a CGE model is needed to get a sense of aggregated net welfare effect.

IV   MODEL AND METHODOLOGY

This article aims at assessing the welfare impact of the proliferation of PTAs using the GTAP model described in Appendix I. The sheer size of the proliferation of PTAs makes it impossible to incorporate in the simulations all of the PTAs that entered into force since 2001. Therefore, we simulate the impact of the Korea-US FTA taking into account the impact of all prior PTAs that both the United States and Korea have implemented (see Table 2)[8] and, in order to estimate preference erosion, other important PTAs implemented by countries that have also an agreement with Korea and the United States. This means that the impact of the eleven PTAs (counting Central America Free Trade Agreement (CAFTA) as a PTA) listed in Table 3 are considered before estimating the impact of the Korea-US FTA.

Some observers argue that because of the lack of progress in the Doha round, the proliferation of PTAs is likely to continue. In order to assess the likelihood of this view and its implications, some potential systematically important PTAs are also considered. Because the focus is on the Korea-US FTA, this exercise is limited to four PTAs currently negotiated or contemplated by Korea: with Japan, Canada, China, and the European Union.[9] The PTAs currently negotiated by the United States are ignored for three reasons. First, the systemic impact is arguably more limited. Second, in reaction to the announcement of an agreement between Korea and the United States, third countries have been more explicit on their intention to consider more actively a PTA with Korea than with the United States. Third, the Bush administration has largely lost its capacity to negotiate new agreements until the Trade Promotion Authority (TPA) that expired in July 2007 is renewed.

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[8] An exception is the US–Bahrain FTA, which entered into force in August 2006. It is not taken into account because Bahrain is not singled out in the GTAP database.
[9] India could be added to this list. It has, however, not been the case in order to limit the size of the simulations.

These considerations dictate the aggregation. Fourteen countries and regions are considered: the United States and Korea, of course, but also (i) countries with which Korea and the United States have an PTA (Australia, Canada, CAFTA, EFTA, Chile, Mexico, Morocco, Singapore), (ii) other main trading blocs with which Korea may conclude a PTA (EU, China, and Japan), and (iii) the rest of the world.[10]

Each PTA is supposed to result in an immediate and total elimination of import tariffs on goods between the partners, while tariffs levied on goods from non-member countries remain unchanged. No PTA goes that far but this is a standard assumption in most simulations of the Korea–US FTA. Therefore, these simulations can be compared with the results of previous studies. It is noteworthy that assuming a full elimination of customs tariffs is likely to lead to a larger welfare impact than a partial liberalization as evidenced by a larger welfare impact in this simulation than in the USITC (2007) estimates that simulate more closely the actual agreement (see Table 6). As a result, the

TABLE 3. PTAs CONSIDERED IN THE SIMULATIONS

Bilateral Agreement	Implementation Date
Japan–Singapore	2002 (November)
EU–Chile	2003 (February)
US–Chile	2004 (January)
US–Singapore	2004 (January)
Korea–Chile	2004 (April)
US–Australia	2005 (January)
Japan–Mexico	2005 (April)
US–Morocco	2006 (January)
Korea–Singapore	2006 (March)
US–CAFTA	2006 (from March)[1]
Korea–EFTA	2006 (September)
US–Korea	Not yet entered into force
Contemplated FTAs	
EU–Korea	
Japan–Korea	
Canada–Korea	
China–Korea	
Multilateral liberalization	
10% cut in 2001 (prior FTAs)	
10% cut (after the Korea–US FTA)	

Sources: WTO, USTR.
   [1] See Table 2 for details. The PTA with Peru approved by the US Congress in December 2007, was not implemented at the time this article was prepared.

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   [10] Two simplifications should be noted. First, the EU has expanded twice since 2001, growing from fifteen countries to twenty-five in 2004 and to twenty-seven in 2007. In this article, the EU refers to the current twenty-seven Member States. Second, due to lack of details in the database, CAFTA covers all Central American countries.

welfare impact presented in this article aims at illustrating the welfare impact of the proliferation of PTAs and not at providing precise estimates of the impact of a particular PTA.

Given the speed of the proliferation of PTAs, an agreement is often implemented before the effect of the previous agreement fully materializes. Thus, it is important to simulate the medium-term impact of the PTAs, which is based on the neoclassical assumption that prices change in response to the trade liberalization, ensuring that the full employment of productive factors is maintained. The sectoral distribution of these factors will change but not their aggregated level. The incentives to invest in response to the opportunities offered by the PTA are not taken into account (this would affect the level of the stock of capital) because they are assumed to take time and thus will take place in the long term.[11]

Consistent with the theory, the focus of this article is on the overall impact of the liberalization measured by the welfare effect. In GTAP, changes in welfare are measured as an equivalent variation in income at the base period prices.[12] The equivalent variation measures the amount that individuals would have to pay to go back to the pre-liberalization situation after it occurred.[13]

The PTAs listed in Table 3 are simulated 'in isolation' or 'sequentially'. The isolation approach is the customary approach, that is, the impact of each PTA is simulated ignoring the impact of prior PTAs. In the sequential approach, the impact of the each PTA is simulated after taking into account the impact of previous PTAs. The simulation of a PTA provides an updated database that serves as the basis for the simulation of the next PTA. For example, the effect of the US-Australia FTA, which entered into force in 2005, is simulated after updating the database in order to take into account the impact of the Japan-Singapore FTA (2002) then the EU-Chile FTA (2003) then the US-Chile and US-Singapore FTAs (2004), and then the Korea-Chile FTA (2004).

The rationale for this is double. First, there is a methodological consideration. CGE simulations of a PTA are likely to be biased if the impact of prior PTAs are not taken into account. Comparing the results of the sequential approach to the results of the isolation approach quantifies how large this bias is. Second, the sequential approach measures the preference erosion triggered by the proliferation of PTAs. Simulating simultaneously all of the PTAs would be less time-consuming than a sequential approach but results provide much less detail. Notably, it does not give any indication of the extent of preference erosion. The results of simulation are discussed in Appendix II.

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[11] The terms 'medium term' and 'long term' are standard in the literature but they might be confusing because the GTAP model has no temporal dimension. The difference relates to the response of the capital stock. It is assumed that investment in response to the trade liberalization simulated takes more time than other adjustments and therefore ignoring this dimension is called as medium term while taking it into account is called long term.

[12] This is also the case for the Michigan Model used by Kiyota and Stern (2007).

[13] For more details on the welfare calculation in GTAP, see Huff and Hertel (2001), and McDougall (2003).

V   RESULTS

A   THE PROLIFERATION OF PTAS AFFECTS SIGNIFICANTLY WELFARE ESTIMATES

The proliferation of PTAs has substantial consequences for CGE modelling. Estimates of the welfare impact of each PTA are significantly different if the proliferation of PTAs is ignored (Appendix III) or is considered (Appendix IV). Four main points emerge:

First, the difference is frequent and large. In 71% of the cases,[14] the difference in the estimated welfare impact of a PTA between the two simulations is larger than 0.5%. The 0.5% threshold may appear too low to be meaningful, but the bias remains significant if other thresholds are considered: almost one-half of the cases (48%) show a difference in the predicted welfare effect of more than 5% and more than one-third of the cases (36%) exhibit a difference larger than 10%.

Second, the magnitude of the bias is *a priori* uncertain. Only in 29% of cases the two approaches gives a similar estimated welfare impact (difference below 1%). In 44% of cases, the welfare impact is larger in isolation than in the sequential approach, in 22% it is lower.

Third, the sign of the estimated welfare impact is unstable. In 5% of cases, taking into account previous PTA, changes predicted welfare impact of an agreement from a gain to a loss or from a loss to a gain. For example, simulating the US-Chile and US-Singapore FTAs without updating the database, leads to the conclusion that Chile will suffer from a welfare loss of USD 16 million (Appendix III), while if the database is updated to take into account the Japan-Singapore and EU-Chile FTAs, which were implemented before, Chile is predicted to enjoy a welfare gain of USD 14 million (see Appendix IV).

Fourth, the bigger the number of ignored prior PTAs, the larger the difference in the magnitude of the estimated losses and gains between the isolation and the sequential approaches. And sign reversals become more frequent. The reason is that each PTA modifies world trade structure and country protection. Proliferation of PTAs multiplies these changes. The larger the size of (ignored) changes in world trade and in protection, the larger is the bias in the estimated welfare effect of the simulation 'in isolation'.

In sum, taking into account previous PTAs is crucial because of the frequency of the bias, its magnitude, and the impossibility to identify *a priori* its direction.

B   PREFERENCES ARE ERODING FAST WHEN PTAS ARE PROLIFERATING

As usual in the literature, simulations point to a small static gain from PTAs. The welfare impact of the PTAs considered in this article is lower than 0.5% of GDP for

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[14] A case is defined as the impact of a simulation on the regions/countries considered (including the world as a whole). However, there are not 240 cases (15 regions × 16 PTAs) because (i) there is no difference in the two approaches for the first FTA considered chronologically and (ii) the US–Chile FTA and the US–Singapore FTA are considered simultaneously (they entered into force the same day). Thus, there are 210 cases (15 × 14).

each region. The only exceptions are Central American countries with CAFTA and a 2% of GDP gain for Korea if a PTA with China is ever signed.

Moreover, this limited economic gain tends to be eroded by the proliferation of PTAs leaving only marginal gains, if any (see Table 4 and Appendix IV). For example, the US welfare gain from the six FTAs it has implemented since 2001 is estimated USD 4 billion (0.04% of US GDP). But, many other countries have also sign PTAs. The US net gain from its PTAs is cut by about 25% (USD 3.2 billion) when the impact of the six non-US PTAs considered in this article are taken into account. The decline would be even dramatic if more non-US PTAs were considered.

TABLE 4. THE PROLIFERATION OF PTAS HAS A LIMITED ECONOMIC IMPACT
(WELFARE CHANGES IN PERCENT OF INITIAL GDP, SEQUENTIAL APPROACH)

	12 PTAs	16 PTAs	Multilateral liberalization[1]
United States	0.03	0.00	0.00
Korea	0.19	2.74	0.17
Mexico	−0.03	−0.03	0.02
Canada	−0.08	−0.06	−0.02
Chile	0.06	0.01	0.00
Singapore	0.46	0.26	0.07
Australia	−0.05	−0.10	0.02
Morocco	−0.28	−0.31	0.23
CAFTA	1.59	1.43	0.03
EFTA	−0.01	−0.02	0.07
EU	−0.02	−0.02	0.01
China	−0.04	−0.11	0.12
Japan	0.00	0.01	0.03
Rest of the World	−0.03	−0.08	0.04
World	0.00	0.02	0.02

[1] 10% cut after the Korea-US FTA.

Sequential simulations summarized in Appendix IV provide details on the mechanism of preference erosion. For example, the US-Chile and US-Singapore FTAs brought the United States a welfare gain of USD 151 million. This offset the USD 81 million welfare loss it experienced from the Japan-Singapore and EU-Chile FTAs signed about a year before. But the US gain from the agreements with Chile and Singapore has been eroded by the Korea-Chile (USD 16 million welfare loss) and then the Korea-Singapore (USD 13 million welfare loss). Moreover, the three FTAs that Korea has implemented so far reduced US welfare by USD 43 million. This US welfare loss would be, of course, more than offset by the gains of the Korea-US FTA of about USD 3 billion. But if the race to PTAs continues, PTAs contemplated by Korea would reduce preferences that the United States has negotiated with Korea and reduce its welfare by USD 3 billion, leaving it with no net gain but a more distorted trade regime. Besides Korea, many other major trading nations intend to sign PTAs with non-US

partners. This would leave the United States with a negative net welfare impact of the proliferation of PTAs.

That the proliferation of PTAs erodes preferences is not a new phenomenon. At the end of the nineteenth century, trade officials realized that the multiplication of bilateral agreements led to preference erosion and thus 'nearly all European countries began using most favoured nation (MFN) clauses in their bilateral agreements'. The United States reached the same conclusion in the 1920s (Krueger, 1999), and despite the move to regional blocks in the 1930s, MFN treatment became the cornerstone of the GATT/WTO system. This historical lesson may have been forgotten but is likely to be rediscovered soon.

Many developing countries have invoked preference erosion to justify their reluctance to agree on multilateral tariff cuts in the Doha Round. But as is clear from our results, preference erosion is already taking place. US preferences to Africa under the African Growth and Opportunity Act (AGOA) are eroded by the United States PTAs. EU preferences to Least Developed Countries (LDCs) and African, Caribbean and Pacific (ACP) countries will be eroded when the EU will conclude new PTAs. Proliferation of PTAs leads to welfare losses to poor countries (that are part of the rest of the world in Table 4), while multilateral liberalization would bring some gains.

C   PREFERENTIAL VERSUS MULTILATERAL LIBERALIZATION

If both multilateral and preferential liberalizations erode preferences, there is a key difference between them: the distribution of welfare gains. Tables 4 and 5 show that the gains from PTAs are limited to signatories and tend to come at the expense of the rest of the world. If PTAs benefit members at the expense of non-members, this may trigger reactions. Non-members have incentives to try to offset the loss they experience by negotiating their own PTAs and thus eroding preferences granted to their partners in PTAs and accelerating proliferation of PTAs. This explains partly why Japan and Korea, which until the end of the 1990s were only 'multilateralists', became 'active regionalists' in the 2000s.[15]

In contrast, virtually all countries gain from multilateral liberalization. Like several other CGE simulations (see, e.g., DeRosa and Gilbert, 2004), results presented in Table 4 and Appendix IV suggest that the United States and Canada are two exceptions. They would lose from a multilateral liberalization of trade in goods. But their loss is negligible and, actually, less than the GDP measurement error. At most, the US loss would amount to 0.005% of its initial GDP and Canada 0.03%. Moreover, this loss may be overestimated since the simulation ignores the services sector, in which the United States is expected to be a major winner from multilateral liberalization. Finally,

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[15] Korea entered PTAs only in 2004 and Japan in 2002. In 2006, Japan had three active agreements and signed another one. In the eight months of 2007 alone, it signed four additional agreements and the Japanese government plans to sign about 12 new agreements by 2009 (IMF, 2007).

the welfare impact of trade liberalization, which can be decomposed into allocative efficiency and terms of trade, depends on the model assumptions. In GTAP, trade liberalization usually results in large change in terms of trade because it erodes countries' monopoly power (Appendix I). In the case of the United States and Canada, changes in the terms of trade resulting from a multilateral liberalization are large and outweigh the gains from allocative efficiency. Other models, such as the Michigan model used by Kiyota and Stern (2007), in which predicted changes in terms of trade are more limited, reach a different conclusion: the US welfare is expected to benefit from multilateral trade liberalization.

TABLE 5. DISTRIBUTION OF GAINS (WELFARE IMPACT, 2001 USD MILLIONS)[1]

	Members	Non-members
Japan–Singapore	104	−151
EU–Chile	165	−192
US–Chile and US–Singapore	313	−346
Korea–Chile	47	−65
US–Australia	382	−440
Japan–Mexico	850	−883
US–Morocco	71	−130
Korea–Singapore	53	−78
US–CAFTA	1,644	−1,541
Korea–EFTA	81	−74
Korea–US	3,888	−2,589
Korea–EU	1,514	−1,250
Korea–Japan	1,356	−1,344
Korea–Canada	165	−155
Korea–China	8,674	−4,233

[1] Results from the sequential approach. Results are not significantly different for the simulation 'in isolation'.

In order to illustrate how proliferation of PTAs also affects the expected gains from multilateral liberalization such as the Doha Round, the impact of a small cut of 10% in applied tariffs by all countries is simulated. If undertaken in 2001, when the Doha Round was launched, the tariff cut would have boosted world welfare by USD 6 billion. This gain dwarfs the USD 1 billion total welfare gain from the 12 PTAs considered in this article (Appendix IV and Table 4).[16] What would be the impact of the same (limited) multilateral tariff cut if implemented after the Korea–US FTA enters into force? At USD 5.7 billion, the global welfare gain would remain almost unchanged.

[16] This conclusion on the larger benefit of a multilateral liberalization is shared by DeRosa and Gilbert (2004) and Kiyota and Stern (2007).

D WHAT IF PROLIFERATION CONTINUES?

Some observers argue that, because of the lack of progress in the Doha Round, PTAs are likely to continue to proliferate. What is the cost of such a scenario? The answer will vary depending on expectations on how many and which PTAs would be implemented. The simulation undertaken here show that if Korea alone implements the four PTAs it contemplates with major trading countries, the gains from a multilateral liberalization (still defined by a multilateral 10% cut of applied tariff) may fall dramatically from USD 6 billion to USD 2.2 billion. This is still more than the gains of the PTAs implemented so far but much less than the gain from the four Korean PTAs that amounts to USD 4.7 billion. However, this result should be interpreted with caution. The welfare gains of the four PTAs are almost entirely due to the bilateral agreement with China (excluding it the gain drop from USD 4.7 billion to USD 0.3 billion). But this particular agreement is at best uncertain, facing huge political obstacles. These obstacles are such that chances may be better to liberalize the Korea-China trade under the Doha Round than through bilateral discussions.

Moreover, a continued proliferation of PTAs may affect significantly the United States providing incentives to drop its 'competitive liberalization' strategy for multilateral liberalization. So far (including the US-Korea FTA), the United States appears to have benefited from PTAs: simulations estimate this gain at USD 3 billion. However, this gain is marginal accounting for only 0.03% of US GDP and the 'competitive liberalization' strategy has limits. If PTAs continue to proliferate and do not include the United States, then the United States will experience welfare losses as Europe recently did. In 1997, the European Commission decided to stop launching new bilateral negotiations because there were few new potential partners and because of the political strain of numerous bilateral PTAs signed with central European countries in the early 1990s was too onerous. With the hub of new PTAs shifting from Europe to North America, Europe has experienced welfare losses as indicated in Appendixes III and IV. The United States may face the same fate because the centre of new PTAs is shifting again, this time toward Asia, while, with the expiration of the TPA in July 2007, the administration has effectively lost the possibility of negotiating new trade agreements in the short term or even medium term.

This scenario appears to have been considered by the Bush administration. In June 2007, Susan Schwab, the US Trade Representative, wrote in a letter to the House Ways and Means Commission Committee Chairman, 'More than 100 bilateral trade negotiations are currently underway among our trading partners. . . . It is important that the United States not sit on the sidelines as other countries lock in new preferential trading arrangements with our competitors.'

If, despite major political hurdles, Korea successfully concludes PTAs with the EU, Canada, Japan, and China, the United States would see 85% of the welfare gains of

its recent PTAs disappear. And this is only the impact of Korea's PTAs ignoring those of other major trading partners. Indeed, the EU has changed its policy and intends to negotiate PTAs with ASEAN, Korea, India, Russia,[17] and potentially in the longer run with China (European Commission, 2006). Australia, China, Japan, Canada have all expressed interest in new PTAs. In such a scenario, proliferation of PTAs would affect so much the United States that a multilateral liberalization, by eroding discrimination and reversing some trade diversion would then bring not anymore losses to the United States but gains (Appendixes III and IV).

In sum, the gains of a continued proliferation rely on agreements that are very unlikely for political reasons, are prone to rapid erosion, and, would provide smaller gains than even small multilateral liberalization. In addition, a continued proliferation of PTAs would provide incentives to the United States to put more emphasis on multilateral rather than preferential liberalization. Therefore, the scenario of a continued proliferation appears unlikely for both political and economic reasons.

E   THE CASE OF THE KOREA-US FTA

The Korea-US FTA being our benchmark PTA, it is worth checking if our simulations results are in line with those of other studies. In Table 6, column (a) summarizes the result of the isolation scenario, which is the type of simulation undertaken by eight other studies (columns (b) to (i)). It is not unusual for a study to present several scenarios. In that case, Table 6 reports the result of the scenario the closest to the one we have (full liberalization of both agricultural and non-agricultural goods). Nonetheless, differences in both specifications (described in the notes to the Table 6) and results remain large because reference years are different (thus elasticities, trade structure, and trade policies are different), but also because models differ as well as scenarios (notably inclusion or exclusion of agriculture or services, short term or long-term effect).

Because they assume increasing return to scale, three studies stand out as predicting a very large impact of the Korea-US FTA (columns (g) to (i)). In such a framework, the procompetitive effect of trade liberalization and the exploitation of economies of scale tend to yield significantly larger welfare gains. That explains why Zhuang and Koo (2007), who introduce increasing return to scale in the high-tech sector in the GTAP model, find a larger welfare effect than other GTAP simulations. Kyota and Stern (2007) and Schott, Bradford, and Moll (2006) do not use the GTAP model. The impact is larger in Kyota and Stern (2007) than in Schott, Bradford, and Moll (2006) for two main reasons. First, unlike Schott, Bradford, and

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[17] FTA negotiations started in May 2007 with Korea and in June 2007 with India. For an analysis of this strategy, see Messerlin (2007).

TABLE 6. SURVEY OF LITERATURE ESTIMATES OF KOREA-US FTA (NET WELFARE IMPACT IN USD MILLIONS)[1]

	Isolation	Cheong and Wang[1] (1999)	Choi and Schott[3] (2001)	Choi and Schott[4] (2004)	Lee and Lee[5] (2005)	USITC (2007)[6]	Schott, Bradford and Moll[3] (2006)	Kiyota and Stern[8] (2007)	Zhuang and Koo[9] (2007)
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
World	1,236	–	1,426	–	–	–	25,871	41,040	21,250
US	2,897	3,700	3,783	2,694	–	2,070	766	25,120	22,330
Korea	950	4,800	4,100	1,638	2,374	–	27,582	9,280	4,150
Canada and Mexico	–490	–	–432	–	–	–	–	450	–
Japan	–290	–	–2,232	–	–	–	1,676	970	–1,380
Model	GTAP	GTAP[2]	GTAP	GTAP	GTAP	GTAP	Other	Michigan model	GTAP
Base year	2001	1995	1995	1997	2001	2008[7]	2001	2001	2001

[1] Scenario: full liberalization of all sectors;

[2] The description of the model suggests it is either the GTAP model or a GTAP-like model;

[3] Scenario: full liberalization of goods, services excluded;

[4] Scenario: full liberalization of goods, services excluded. Simulation results are from the technical appendix by DeRosa and Gilbert (2004);

[5] Scenario: 80% liberalization of agriculture, full liberalization of other goods, and 20% liberalization of services. The results are sensitive to the assumption on services liberalization: if the liberalization of the sector is assumed at 50% instead of 20%, Korea's welfare gain increases by more than 14% to USD 2.7 billion.

[6] Scenario: Elimination of tariffs and tariff rates quotas on goods (in 2005 USD). USITC (2001) is not presented because it does not provide an estimate of the welfare impact;

[7] The 2001 GTAP database is updated to 2005 to take into account the full implementation of NAFTA, the changes from other US FTAs but not non-US FTAs, the Uruguay Round reforms not in place in 2001 including the ATC, the 2005 applied tariffs between the United States and Korea, and changes in US trade flows with major partners and in GDP;

[8] Scenario: Services included;

[9] Scenario: Full elimination of tariff except for rice and 1% increase in the productivity of the high-tech sector in the United States and Korea.

Moll, Kyota and Stern do not limit their simulation to trade in goods but include also trade in services. Second, as in Schott, Bradford and Moll (2006),[18] their model assumes imperfect competition but, in addition, considers welfare impact of a greater product variety. Therefore, the predicted welfare impact of trade liberalization is larger because import competition benefits consumers and firms not only through lower prices but also through greater choice.

Despite the differences in base years and scenarios, our results appear in line with other studies (columns (b) to (f)), in particular the 2004 version of the Choi and Schott

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[18] The authors give very few details on their assumptions and model but refer to Bradford and Lawrence (2004) and Bradford, Grieco, and Hufbauer (2005). They explicitly mention that the model has scale economies features and assumes monopolistic competition for some sectors. This contrasts with the Schott, Bradford and Moll (2006) statement that perfect competition and constant return to scale are assumed. Moreover, they change the elasticities of substitution of the GTAP database.

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analysis and more interestingly, since it is the only study is simulating the actual agreement, the 2007 version of the USITC investigation. The larger impact reported by Cheong and Wang (1999) and Choi and Schott (2001) appear in part due to an database benchmarked on 1995 when trade policies were more restrictive because it does not incorporate the liberalization impact of the Uruguay Round and because no bilateral or regional preference was included in the database they use. A good illustration of the importance of the change of the database is the comparison of the two versions of the Choi and Schott study. The initial study (2001) was based on a GTAP database benchmarked on 1995 and predicted a larger effect than the updated study (2004), which was based on a GTAP database benchmarked on 1997.

TABLE 7. THE WELFARE IMPACT OF THE KOREA-US FTA (2001 USD MILLIONS)

	Isolation	Sequential	Difference in percent
United States	2,897	2,876	−1
Korea	950	1,012	7
Canada	−331	−328	−1
Mexico	−158	−161	2
Chile	−15	−23	53
Singapore	−20	−41	105
Australia	−169	−163	−4
Morocco	−3	−2	−33
CAFTA	−38	−30	−21
EFTA	−64	−69	8
EU	−694	−685	−1
China	−200	−200	0
Japan	−290	−272	−6
Rest of the World	−626	−615	−2
World	1,236	1,299	5

Table 6 reports the expected impact of the Korea-US FTAS ignoring the proliferation of PTAs. Table 7 summarizes how the predicted impact of the Korea–US FTA changes if they are taken into account. Again, results show that there is a bias and the direction of the bias is unpredictable. Differences between the two scenario is only 1% for the United States but can reach 7% for Korea and, in the most extreme case, the welfare loss of Singapore can be twice as large.

As expected, Table 7 also shows that: (i) the larger an economy, the larger are the expected terms of trade changes, and (ii) the larger the distortions in an economy, the larger the potential gains from allocative efficiency. Indeed, the US welfare gains come from the changes in terms of trade, while the impact of the allocative efficiency is smaller and negative. In contrast, Korea would experience a negative impact of the terms of trade but a larger gain due to improved allocative efficiency. Choi and Schott (2004) as well as USITC (2007) reach the same conclusion. Even Kiyota and Stern

(2007), although using a model that by construction result in much smaller changes in the terms of trade than GTAP, also found that changes in the terms of trade would benefit the United States but affect negatively Korea.

VI CONCLUSION

The reality and the implications of the proliferation of PTAs are debated. This article, using a CGE model, contributes to this debate by trying to quantify its welfare effect. The analysis is limited to twelve PTAs implemented since 2001, the reference year of the latest version of the widely used GTAP database. Twelve PTAs is obviously a very small subset of the actual PTAs that have been formed since 2001. Nonetheless, it provides interesting results that presumably would have been even larger if more PTAs had been considered.

First, the proliferation of PTAs has substantial implications for CGE modelling of trade liberalization. Ignoring it biases significantly results and in some cases produces estimates of the wrong sign. Moreover, it is impossible to argue that ignoring the proliferation of PTAs results in an overestimate or an underestimate of the true impact of trade liberalization because the direction of the bias is *a priori* uncertain.

Second, as in other studies, the static gains from PTAs are limited. For most countries, the welfare impact of the 12 PTAs considered is below 0.5%. This conclusion is particularly important for the United States since all the PTAs it has signed since 2001 are taken into account.

Third, the small gains from PTAs are to be rapidly eroded by the proliferation of PTAs. Preference erosion is not limited to the multilateral tariff reduction in the Doha Round and resisting a multilateral agreement in order to preserve preferences is thus an illusion. EU preferences to LDCs with the Everything but Arms or to the ACP countries under the Cotonou Convention as well as US preferences to Africa under the AGOA or preferences granted under the Generalized System of Preferences will be eroded no matter what. They will be eroded by a successful Doha Round or by PTAs. But multilateral liberalization will bring gains to developing countries while PTAs among large trading countries will bring them both the economic cost of trade diversion and the political cost of isolation.

Fourth, because proliferation of PTAs erodes preferences, the benefit of each PTA is uncertain and temporary. In such, preferential liberalization contrasts with multilateral liberalization, which even if limited, provides much larger gains and importantly do not lead to the distributional issues associated with PTAs. PTAs usually give advantages to members at the expense of non-members.

Therefore, because proliferation of PTAs brings only a few gains, which are extracted at the expense of other countries, are eroded quickly, and lead to a complex trade system due differences in the level of preferences and different and cumbersome rules of origin, it faces increasingly scepticism. Because regional discrimination fractures

its globalized production structure, the business community is increasingly calling for harmonization and a simplification of the trading system. Proliferation also carries political costs that are not offset by the limited economic gains. The political strain of large number of PTAs concluded by the EU in the 1990s led it to suspend the launch of new negotiations for ten years.

Thus, eventually, trade negotiators are likely to reach the same conclusion than their predecessors who, a century ago, realized the political and economical costs of multiplying bilateral PTAs were large and decided to focus more on the MFN liberalization that has become the cornerstone of the WTO system.

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APPENDIX I: THE GTAP MODEL[19]

The GTAP model is a comparative static, global general equilibrium model based on neoclassical theory. Firms maximize their profits while consumers maximize their utility. All markets are assumed to be perfectly competitive, and constant returns to scale prevail in all production and trading activities. It is assumed that products can be distinguished by national origin. This assumption means that countries have some monopoly power that is eroded by a tariff cut, leading to large changes in the terms of trade, which are a component of welfare changes; the focus of this article.

Firms use both a composite of primary factors and a composite of intermediates to produce their output according to Leontief production technology. The primary factor composite is a constant elasticity of substitution (CES) function of labour, capital, land and natural resources, while the intermediate composite is a Leontief function of material inputs, which are in turn CES blends of domestically produced goods and imports. Imports are sourced from all regions, with their share depending on trading prices.

On the demand side, each country or region is assumed to have a 'super' household disposing of regional income in fixed proportions in the form of private consumption, government expenditure and savings. Household consumption is assumed to be a constant difference in elasticities function of various consumer goods while government expenditure is based on a CES function of various commodities. Both household and government consumption are CES blends of domestically produced goods and imports, which are in turn sourced from all trading regions based on the Armington approach.

In closing the model, regional savings are assumed to be homogenous and contribute to a global pool of savings, which is allocated among regions for investment in response to changes in regional expected rates of return. These changes are assumed equalized across regions, thus giving rise to savings mobility across regions. This allows for greater changes in the trade balance as a result of trade liberalization. In contrast to savings, capital stocks are assumed to be immobile across regions, although they are perfectly mobile within a region, as is labour. Land and natural resources are industry-specific, and only limited transformation of their uses among industries is possible.

The GTAP model provides a unified theoretical framework and its simplicity makes its simulation results relatively easy to interpret, but limits its capacity to deal with more complex economic issues, such as long-term effects of trade policies associated with investment accumulation, technology and productivity change. Also absent in the model are adjustment costs associated with trade liberalization. These limitations and the fact that the model leads to large terms of trade effects[20] must be kept in mind when interpreting the results presented in this article.

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[19] This Appendix is partly based on the description of the GTAP model by Mlachila and Yang (2004). See Hertel (1997) for more details on the GTAP model.
[20] See Yang (2006) and for an analysis in the context of the US–Korea FTA, see Kiyota and Stern (2007), who express reservation noting, 'In our judgment, GTAP models may yield results that are not altogether plausible because of their reliance on the Armington assumption.

APPENDIX II: SIMULTANEOUS VERSUS SEQUENTIAL SIMULATIONS

Prior PTAs need to be taken into account in order to avoid potentially severe biases in the estimated impact of trade liberalization. But a sequential approach is tedious and time-consuming since it implies many simulations. Is there a shortcut? Is it possible to combine in a single simulation the liberalization considered and all the previous PTAs? Simulating simultaneously all PTAs may provide a convenient shortcut if it produces similar results than the sequential approach. However, this shortcut has a cost: many details provided by the sequential approach are lost. Importantly, the simultaneous approach does not allow an assessment of the extent of preference erosion.

DeRosa and Gilbert (2004) have simulated the simultaneous impact of fourteen PTAs that the United States could be willing to conclude. The estimated welfare gain for Korea of a PTA with the United States is 35% lower if the agreement is simulated along with other PTAs rather than in isolation. For the United States, the welfare gain is 3% larger. With a different list of PTAs we reach the same conclusion. Korea's welfare gain would be 12% lower in the simultaneous simulation and the US welfare gain 11% higher (text table). Once again it is clear that ignoring prior or other PTAs leads to a bias in the estimated impact of a PTA such as the Korea–US FTA.

	Isolation	Simultaneous	Difference in percent
United States	2,897	3,213	10.9
Korea	950	833	–12.3
World	1,236	1,111	–10.1

Source: Appendix III.

Appendix IV shows that, when looking at past PTAs (including the Korea-US FTA), the differences in the results between simultaneous and sequential approaches are negligible overall and for each country and region. This suggests that a shortcut may exist. However, if the set of PTAs is extended from twelve to sixteen by incorporating the four PTAs considered by Korea, differences between the sequential and the simultaneous approach becomes more substantial. Although still limited (at most 6% for the countries and region but almost 9% for the global impact), this suggests that the larger the set of PTAs considered and the most significant they are in terms of the size of the trading partners, the more important it becomes to resort to the sequential approach. This result may also be due to the fact that there is substantial partner heterogeneity when looking at past PTAs while all contemplated PTAs include Korea. Indeed, most of the divergence between simultaneous and sequential simulation results is driven by the impact on Korea's welfare.

APPENDIX III: WELFARE IMPACT OF PTAs: ISOLATION AND SIMULTANEOUS APPROACHES (MILLIONS 2001 USD)

	US	Mex	CAN	Chile	Sing	Aust	Morocco	CAFTA	Korea	EFTA	EU27	China	Japan	ROW	WORLD
Japan–Singapore	-31	-1	-3	-1	208	-4	0	0	-5	-3	-29	-12	-104	-61	-47
EU–Chile	-50	-9	-3	33	2	-2	-1	-1	-6	-4	132	-11	-11	-95	-27
US–Chile and Singapore	167	-23	-34	-16	149	-4	0	-3	-12	-7	-102	-30	-32	-115	-61
Korea–Chile	-15	-2	0	20	0	-1	0	-1	24	-1	-13	-8	-4	-26	-28
US–Australia	360	-15	-38	-2	-10	23	0	-4	-16	-10	-124	-30	-82	-109	-58
Japan–Mexico	-692	138	23	-4	-13	-13	-1	-13	-33	8	-26	-47	707	-71	-35
US–Morocco	162	-3	-12	0	0	-2	-91	0	-3	-3	-58	-6	-13	-30	-59
Korea–Singapore	-14	-1	-1	0	103	-2	0	0	-50	-2	-19	-5	-12	-25	-28
US–CAFTA	480	-104	-143	-5	-5	-12	-1	1167	-62	-38	-488	-94	-238	-353	104
Korea–EFTA	-12	0	-1	0	-1	-2	0	0	-11	91	-24	0	-12	-20	7
US–Korea	2897	-158	-331	-15	-20	-169	-3	-38	950	-64	-694	-200	-290	-626	1236
Total: sum isolation	3250	-180	-543	9	414	-189	-97	1108	775	-32	-1446	-443	-90	-1532	1004
Total: simultaneous	3213	-183	-538	42	387	-182	-95	1116	833	-37	-1445	-438	-59	-1503	1111
Contemplated FTAs															
Korea–EU	-335	-17	-13	-7	-12	-47	-5	-13	441	-52	510	-153	-171	-504	-380
Korea–Japan	-414	3	2	-6	-48	-64	-1	-18	196	-6	-183	-163	1140	-473	-34
Korea–Canada	-134	0	88	0	1	-3	0	-2	-13	0	-8	-14	-4	-22	-113
Korea–China	-1068	-18	-14	-27	-97	-202	-7	-90	7318	9	-391	42	-503	-1607	3345
All contemplated: sum isolation	-1952	-32	63	-41	-157	-317	-13	-123	7942	-49	-72	-288	462	-2607	2818
All contemplated: simultaneous	-1806	-31	10	-40	-156	-298	-13	-120	8880	-37	-177	-282	275	-2528	3677
Multilateral liberalization															
10% before FTAs	-253	147	-188	0	105	53	60	105	1130	305	472	1358	1076	1702	6072
10% and actual FTAs 1/	2778	-35	-678	42	447	-102	-15	1136	1560	283	-986	956	1043	404	6833
10% and all FTAs 1/	79	-30	-569	12	299	-263	-25	1040	11000	264	-953	395	1331	-1697	10884

APPENDIX IV: WELFARE IMPACT OF PTAs: SEQUENTIAL APPROACH (MILLIONS 2001 USD)

	US	Mex	CAN	Chile	Sing	Aust	Morocco	CAFTA	Korea	EFTA	EU27	China	Japan	ROW	WORLD
Japan–Singapore	-31	-1	-3	-1	208	-4	0	0	-5	-3	-29	-12	-104	-61	-47
EU–Chile	-50	-9	-3	33	2	-2	-1	-1	-6	-4	132	-11	-11	-95	-27
US–Chile and Singapore	151	-22	-32	14	148	-3	0	-3	-11	-6	-110	-28	-29	-103	-33
Korea–Chile	-16	-2	0	30	0	-1	0	-1	16	0	-13	-6	-4	-21	-18
US–Australia	360	-15	-38	-2	-10	23	0	-4	-16	-10	-124	-30	-82	-109	-58
Japan–Mexico	-691	136	23	-3	-16	-13	-1	-13	-33	8	-27	-47	714	-70	-33
US–Morocco	162	-4	-12	0	0	-1	-91	0	-3	-3	-58	-6	-12	-30	-59
Korea–Singapore	-14	0	-1	0	101	-2	0	0	-48	-1	-18	-5	-11	-25	-25
US–CAFTA	478	-105	-143	-5	-5	-12	0	1166	-62	-38	-488	-94	-236	-353	103
Korea–EFTA	-13	0	-1	0	-1	-2	0	0	-10	91	-24	0	-11	-20	7
US–Korea	2876	-161	-328	-23	-41	-163	-2	-30	1012	-69	-685	-200	-272	-615	1299
Total isolation	3250	-180	-543	9	414	-189	-97	1108	775	-32	-1446	-443	-90	-1532	1004
Total simultaneous	3213	-183	-538	42	387	-182	-95	1116	833	-37	-1445	-438	-59	-1503	1111
Total sequential	3213	-183	-538	42	387	-182	-95	1115	833	-37	-1444	-438	-59	-1503	1110
Contemplated FTAs															
Korea–EU	-315	-13	-6	-7	-17	-32	-5	-14	1167	-47	347	-159	-162	-473	265
Korea–Japan	-372	-1	-1	-8	-50	-60	-1	-18	443	-9	-218	-161	913	-447	12
Korea–Canada	-104	-2	33	0	0	-1	0	-2	131	0	-4	-16	-3	-22	9
Korea–China	-2089	15	84	-21	-98	-84	-6	-76	9142	27	-117	-467	-456	-1411	4442
All (16) PTAs simultaneous	337	-181	-425	7	222	-359	-106	1010	11160	-64	-1425	-1191	240	-3848	5375
All (16) PTAs sequential	332	-183	-427	7	221	-360	-106	1005	11716	-65	-1437	-1241	233	-3856	5837
Multilateral liberalization															
10% before FTAs	-253	147	-188	0	105	53	60	105	1130	305	472	1358	1076	1702	6072
10% after Korea–US FTA	-480	145	-143	-1	61	76	78	19	720	304	592	1382	1083	1828	5664
10% after all FTAs	288	-1	16	-5	24	76	19	38	5	93	69	346	519	713	2201