The Doha Development Agenda and Preference Erosion: Modeling the Impacts

Dominique van der Mensbrugghe[†]
The World Bank

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[†] The author is with the Development Prospects Group, email: dvandermensbrugg@worldbank.org. Views expressed in this paper are those of the author and should not be attributed to the World Bank. The paper has benefited from discussions with Kym Anderson, Carlos Braga, Paul Brenton, Yvan Decreux, Will Martin, Richard Newfarmer and Hans Timmer.

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Introduction

Trade preferences and their erosion may play an important role in the evolving Doha Development Agenda round of multilateral trade negotiations. Clearly, agricultural interests in rich countries would be happy to hide behind the curtain of trade preferences granted to the lowest-income countries. This way, they can avoid any significant movement toward agricultural trade liberalization that could especially benefit such middle-income agricultural exporters as Brazil and Thailand, but also many low-income countries.

Preferences have long been viewed as a core development tool. But recent analyses have questioned—or at least severely circumscribed (Hoekman 2005a and 2005b) the validity of-- the conventional wisdom about the positive effects of preferences on growth and development).

Although preferences have been around for decades, it has been difficult to quantify their actual impact for the intended beneficiary countries because of the lack of a comprehensive and extensive database on trade preferences. Most previous analyses of multilateral trade reform have been criticized for overstating the gains to developing countries—particularly the poorest—because of the failure to take into account preferences. Some analysts have tried to overcome this criticism, but based only on partial data.[1]

[1] See, for example, Dimaranan and others (2003). Bouët et al. (2004a) is the first paper attempting to integrate more comprehensive estimates of preferential tariffs in a standard trade model.

The latest release of the database of the Global Trade Analysis Project (GTAP)[2], Version 6, overcomes some of the difficulties of dealing with preferences. Based on the Market Access Map (MAcMap)[3] database, the new GTAP release incorporates all major preferential agreements—both reciprocal and non-reciprocal—making it easier to quantify the role of preferences in multilateral efforts to reduce trade barriers. The GTAP 6 contains a default set of trade barriers that incorporates preferences, as well as an alternative set that estimates the trade barriers in the absence of preferences (ie, the *estimated* MFN rates. The estimate of the preference margin using this new database for the lowest-income countries[4] is 3.8 percent on average for merchandise imports into the European Union and 0.5-0.7 percent for imports into other rich countries.

The preferences are highest in agriculture and food but not particularly high in clothing and textiles, except for European imports of the latter. The variation across exporting countries is considerable, mostly reflecting compositional effects.[5] The relatively low preference margins in the aggregate should not be so surprising. Rich countries could easily remove preferences should imports start creating major market disruptions in local markets. Moreover, except for clothing and textiles, rich countries' import tariffs on manufactured goods are low; they are more of a nuisance factor that increases the overall cost of trading only slightly, rather than constituting an impenetrable barrier.

In this paper, we answer three questions:

1. What is the current value of preferences for low-income countries, that is, what would be their loss if their imports were taxed at MFN rates rather than preferential rates?

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2 The GTAP database is the global database representing the world economy for a given reference year—2001 for the GTAP Version 6.

3 MAcMap is a database developed jointly by ITC (UNCTAD-WTO, Geneva) and CEPII (Paris). It provides with a disaggregated, exhaustive and bilateral measurement of applied tariff duties, taking regional agreements and trade preferences exhaustively into account. See Bouët and others (2004b).

4 Equated to the World Bank's definition of low-income countries, excluding India.

5 Partial equilibrium estimates of the impacts of preferences come up with similar results,that is, preference margins are relatively low in the aggregate, with occasional exceptions for some countries with highly concentrated exports. See, for example, Alexandraki and Lankes (2004) and Subramanian (2003).

(2. How much would low-income countries potentially gain or lose from preference erosion were all high-income countries to completely liberalize merchandise trade?

(3. What is the upper bound of gains/losses to low-income countries from full global merchandise trade reform, assuming MFN rates obtain versus preferential rates. In other words, to what extent does the uncertainty regarding preference utilization rates affect the outcomes for low-income countries from global merchandise trade reform?

Our key findings are as follows:

- For developing countries combined, preferences may be worth about $8 billion in added income, or some 0.1 percent of their income. Nonetheless, the estimates below suggest that they may be worth about 0.3 percent of the income of the lowest-income countries. The preferences are estimated to boost export revenue by $4 billion for the lowest-income countries, or 2.3 percent. These estimates derive from a scenario in which preferential tariffs on developing country exports into rich countries are replaced by by MFN tariffs. In the context of the MAcMap database, this provides the upper bound on the value of preferences to developing countries because it assumes full utilization of the preferences and that the cost of regulatory requirements is zero or insignificant.[6]

- Focusing only on the non-reciprocal preferences granted to low-income countries by the high-income countries, their aggregate value may not be that large. If high-income countries were to set all tariffs to zero (setting the preference margin to zero), low-income countries would gain as the overall benefits from greater market access outweigh the loss in preferences, including the gains from products exempted by many preferential trade arrangements.

- In terms of global merchandise trade reform, ignoring preferences would lead to overestimating the income gains to developing countries from reform by about $16 billion out of a total gain of $51 billion. Preferences thus reduce the gains from global trade reform for developing countries

[6] Although ignoring the possible interactions with quota rents.

from 1.0 percent of initial income to 0.7 percent. For the lowest-income countries, the gains fall from 0.8 percent to 0.4 percent. The analysis does ignore additional complexities. As noted above, it does not factor in the underutilization of preferences nor the costs of complying with entry requirements (such as rules of origin). Nor does it include any perverse effects from rent-seeking behavior or the dynamic effects associated with a more competitive environment.

- With or without preferences, export revenue for developing countries would rise by 24-26 percent in a global reform scenario; this translates to an increase of between $390 billion and $425 billion. For the lowest-income exporters, the increase in export revenue ranges from $42billion to $47 billion. Thus, the increase in export revenue in a global reform scenario is large in either scenario, which is to say that preferences are not a major factor.
- Reforms already under way—notably the removal of the textile and clothing quotas and China's WTO accession—are playing a significant role in eroding preferences. These two factors alone account for a $1 billion loss in real income for the lowest-income countries.

In this paper, we provide a simple framework for assessing the role of preferences in determining trade outcomes. We show that the change in export revenues can be derived from a simple formula depending on existing market shares and the degree of substitutability of goods from different regions of origin. We provide a brief overview of the preference database, focusing on the European Union and the United States. We then elaborate on the quantitative impacts of preferences using the World Bank's global trade model.

The economics of Preferences

The value of preferences to exporters is typically assessed by one of three measures: the preference margin on exports, the impact of preferences on exports, and the effect of preferences on incomes. The preference margin depends only on the gap between the duty paid by the preference-receiving country

and other suppliers. The trade and income gains depend also on the effect of the preferences on the volume of exports, which, in turn, depend on the elasticity of demand for preferential imports with respect to the price of non-preferential goods.

Equation (1) describes the MFN-price elasticity for *preferential* imports, that is, the impact on the demand for *preferential* imports relative to a change in the price of MFN imports (e.g., a decline in the MFN tariff.)[7] The expression is a combination of two share parameters, s_m and s_D, and two substitution elasticities. The first share parameter(s_m) is the share of 'MFN' imports relative to total imports and the second share parameter (s_D) is the share of domestic goods in total demand. The substitution elasticity σ^w determines the degree of substitutability between domestic goods and imports (taken as a whole). The substitution elasticity σ^w determines the degree of substitutability of imports by region of origin.

$$(1) \qquad \varepsilon_{p,m} = s_m(\sigma^w - s_D\sigma^m)$$

In the following discussion, we will assume more substitution across imports by region of origin than between the domestic goods and imports. This assumption guarantees that the elasticity of demand for *preferential* imports relative to the price of 'MFN' imports is positive(i.e., if the tariff on 'MFN' imports goes up, the demand for *preferential* imports increases). The higher the substitution across imports(i.e., σ^w), the greater the increase. Similarly, the higher the share of 'MFN' imports, the greater the increase. The other factor plays a moderating role; it partly reduces the full impact of the change in the price of 'MFN' imports by increasing the size of the market as a whole when the price of non-preferential imports falls. The tariff rise increases the average price of imports and thus lowers the overall demand for imports. Thus, a lower level of import penetration (i.e., a higher domestic share) reduces the elasticity, as does a higher degree of substitution between domestic goods and imports.

[7] Annex B develops this formula and other elasticities.

Table 1 illustrates this elasticity using the base data and parameters from the modeling exercise developed in subsequent sections.[8] The first two columns of the table show, respectively, the level of imports from low-income countries excluding India (LIX) and the level of total imports.[9] The European Union imports more from the LIX countries, about 7 percent of total imports, compared with the United States, whose imports from these countries amount to just 3 percent of total imports.

The third column represents the so-called elasticity: how much the demand for imports from the LIX countries would change with respect to a change in the price of non-LIX imports (which are assumed to face the MFN tariff). It is derived from equation (1). The fourth column shows the 'preference' margin.[10] In the case of the European Union, the highest preference margins occur in five product lines: vegetables and fruits, processed meats, dairy products, beverages and tobacco, and other food. Textiles and wearing apparel also benefit from significant margins. According to the MAcMap database, the preference margins in the case of the United States are significantly less, exceed 5 percent in only three product lines(sugar, other crops, and dairy products). They are virtually insignificant in all other product lines.

Columns 5-7 indicate the partial equilibrium impacts of assuming that the preference margin is eliminated for non-LIX exporters. In the case of LIX exporters to the European Union, their total imports would decline by about $6.6 billion, or 14 percent, whereas the decline in the United States, as befits the low preference margin, would be less than $1 billion, or 2 percent. In volume terms, the greatest impact for LIX exporters to the European Union would be in other foods, textiles and wearing apparel—a

[8] The elasticity reflects the partial equilibrium point elasticity. The actual elasticity from a shock will differ for two reasons. First, there will be general equilibrium effects. For example, the change in tariffs will affect consumer prices and therefore demand, and the balance of payments closure rule plus inter-sectoral factor mobility will affect export prices. Second, a large shock, beyond having general equilibrium effects, will also affect movement along agents' demand curves and, thus, the actual percentage change in demand is likely to deviate significantly from the estimate given by the point elasticity.

[9] The EU total import column excludes intra-EU trade.

[10] It is only an approximation of the true preference margin, which must be measured at the tariff-line level, and it is not the margin with respect to the non-LIX exporters. Instead, it measures what the tariff would be on the LIX exporters should they face MFN tariff levels.

combination of relatively high preferential access as well as relatively high export volumes. Processed meats, with the highest preference margin, represents only a small share of total exports from LIX countries to the European Union. Somewhat surprisingly in the U.S. case, the losses to other manufacturing—both intermediate and capital goods—are more important than the losses in the textile and wearing apparel sectors[11] because the preference margins, though low, are still many times the level in the latter two sectors.

In conclusion, LIX exporters to the EU are poised to lose significant market share as their preference margins are eroded, but the impact on LIX exporters to the United States could be relatively limited. In subsequent sections, we will turn our attention to the general equilibrium effects—where both producers and consumers react to the changes in incentives—and assess both trade and welfare impacts.

Preferences from a Global Point of View

How important are preference margins at the global level? From the point of view of global trade models, this was a particularly difficult question to answer until recently. Virtually all previous work using global computable general equilibrium models--essentially based on Version 5 and earlier releases of the GTAP dataset--relied on imperfect estimates of preferential trade margins.[12] The GTAP 5 dataset only included the best known preferential agreements, notably the North American Free Trade Agreement (NAFTA) and the European Union, leaving out many others—both reciprocal (such as Mercosur) and non-reciprocal. By and large, most trade in the GTAP 5 dataset occurred under MFN tariff rates.

The work of CEPII[13] and the International Trade Commission (ITC) in creating the MAcMap database on bilateral tariffs has greatly expanded the scope for assessing the role of preferences.[14] The database

[11] This partial equilibrium analysis ignores the role of the removal of the Multi-Fiber Arrangement (MFA) quota system.

[12] See, for example, Dimaranan et al (2003).

[13] The French research center on international economics.

incorporates virtually all preferential arrangements (at the detailed bilateral and HS-6 level)—including a quantification of both the ad valorem and specific tariffs. The database has been aggregated to the 87 region, 57-sector level of GTAP using trade weights.[15] The database comes in two variations. The first, the default used for the GTAP database itself, uses the actual tariffs including the preferential arrangements. The second gives the level of tariffs assuming imports are taxed at MFN rates. The difference between the two provides the preference margin (the 'own' preference margin, as opposed to the margin with respect to competing imports).

In this paper, we look only at the preferential margins on trade flows from developing to developed countries—excluding Mexico and the countries in Europe and Central Asia (ECA). Virtually all of the preferences we consider are measures such as the Generalized System of Preferences—non-reciprocal preferences constituting assistance for development. In other words, the 'non-preferential' database uses the same level of tariffs (i.e., the actual tariffs, including any preferences) for all North/North and South/South trade, for all North/South trade, and for trade between Mexico and ECA and the North.[16]

Table 2 provides the relevant summary data for imports into the European Union and the United States, with the caveat that these are aggregate trade-weighted numbers. The left panel shows the actual applied tariffs for the modeled developing regions for broad sectoral aggregates—agriculture (AGR), processed foods (PFD), textile, wearing apparel and footwear (TWP), intermediate manufactured goods (NTM), and capital goods or equipment (EQP). The final column (MRT) shows the weighted average for all merchandise trade. The right-side panel shows the 'own' preference margin, that is, the *additional* amount the relevant country/region imports would pay if MFN tariff rate applied.

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[14] See Bouët and others (2004b).

[15] Trade weights are not always ideal, although such alternatives as using regional trade weights are also problematic.

[16] This implies that reciprocal agreements between the North and South (excluding Mexico and ECA) are treated asymmetrically.

As these tables show, imports into the European Union benefit significantly more from preferential access than imports into the United States. The average preference margin is 3.8 percent on imports from LIX countries, with significant margins on imports of agriculture, food, and textiles and wearing apparel. The average for imports from LIX into the United States is only 0.5, some seven times lower, with only agricultural imports benefiting from any significant preferential margin. Any significant variations over regions of origin can be attributed to the different nature of certain non-reciprocal agreements, but are most likely to be the result of composition effects. The averages can nonetheless obscure the importance of preferences for certain countries, particularly those with exports concentrated in a handful of sectors (e.g., banana, sugar, or certain apparel lines).

The tables also show that the preferences are not exclusively enjoyed by low-income countries. In the case of Europe, exporters from Latin America enjoy a margin ranging from 3.3 percent to 5.2 percent on average (excluding Mexico); even the middle-income countries of East Asia (including China) have an average preference margin of 1.6 percent. The United States tends to proffer larger preferences to its immediate neighbors in Central and South America. Preferences here are higher than average for low-income countries-- including 1.9 percent on exports from Central America. Otherwise, U.S. preferences tend to be concentrated in sub-Saharan Africa.

Our focus has been on the European Union and the United States. While the other high-income countries provide some preferential access, the preference margins and the associated trade volumes are both small. The preference margin for the LIX countries proffered by Canada and high-income Asia are 0.7 percent and 0.6 percent, respectively, about the same as from the United States.[17] Canada's preferences

[17] Further details are available from the author.

show almost no sectoral bias. But in high-income Asia, the preference in agriculture is nearly 6 percent, compared with less than 1 percent in all other broad categories.

Assessing the Impacts of Preferences from a General Equilibrium Perspective

We now provide quantitative assessment of the impacts of preferences using the World Bank's global trade model, "LINKAGE." The version of the model used here has been geared to the low-income countries presumably benefiting the most from preferential access. The GTAP 6 database has been aggregated into 33 countries/regions (focusing on low-income countries) and 21 sectors, emphasizing agriculture, food, and textiles and clothing.[18] These sectors were chosen because they encounter the highest trade barriers in the rich countries, but also because they are the sectors in which developing countries have a presumed comparative advantage.

We use t he comparative static version of the model for this paper. Although the dynamic version of the model is able to track future changes in the global economy, it also complicates the analysis. The comparative static version of the model enables us to keep the focus on the role of preferences.[19] In what follows, the baseline of analysis is the situation in 2001.[20] We will discuss the role of the removal of the textile and clothing quotas and China's WTO accession toward the end of the section.

The analysis is based on two scenarios for evaluating the impacts of preferences, but neither of which reflects the ongoing Doha Round discussions. The first simply looks at moving from the initial situation with preferences to a situation where preferential tariffs are replaced by MFN tariffs for developing country imports into rich countries (except for Mexico and the ECA countries). The second looks at the

[18] Annex A provides a brief model description and details on model aggregation.
[19] Anderson et al. (2006a and 2006b) provide more detailed analysis of global trade policy scenarios.
[20] The standard pre-simulation exercise includes completion of the Uruguay Round commitments (including abolition of the quotas on textile and clothing), EU expansion, and China's WTO accession.

impact of full global trade reform. We do two simulations. The first, the default, has the preferential tariffs in place. The second assumes the MFN tariffs hold. The difference between the two provides a range of the possible outcomes from global trade reform with and without preferences.

The first simulation simply assesses the impact of moving from the actual preferential tariffs to MFN tariffs, that is, removing the 'own' preference margins. Table 3 presents the key results. For developing countries as a whole, the value of the preferences is estimated at about $8 billion in income terms. Several important caveats apply. First, the estimate may overstate the potential gains from preferences since it is assumed that the utilization rate of the preferential access is 100 percent. The analysis also ignores the potentially high cost of meeting entry requirements, such as restrictive rules of origins (ROO).[21] Given the low average level of preferential margins, many exporters may prefer to export at the MFN rate rather than bother with the added burden of exporting at the preferential rate. One factor--the potential income accruing from quota rents--may lead to underestimating the benefits of the preferences.. The extent to which these rents are captured by agents in the exporting country is still an open question, requiring further empirical analysis.[22]

On a percentage basis, the LIX countries are the biggest losers from the elimination of preferential access;they lose up to 0.3 percent of income, whereas developing countries as a whole lose only 0.1 percent. At the country level, rather large losses are possible—Malawi (1.8 percent), Mozambique (1.2 percent), Zimbabwe (0.7 percent), Madagascar (0.8 percent), Bangladesh (0.8 percent) and Vietnam (0.7 percent). A good portion of the losses stems from a negative terms-of-trade shock. Removal of preferences reduces the demand for exports from preference-receiving countries and thus leads directly to a deterioration in their terms of trade. The restrictions imposed by the general equilibrium nature of the model typically causes a further deterioration, assuming a fixed trade balance. Assuming imports into

[21] See, for example, Brenton (2003).
[22] See, for example, Olarreaga and others (2005).

preference-giving countries [?] from LIX countries are relatively unchanged in this shock(so as to maintain market share, or make up for lost export revenue), countries facing higher tariff barriers undergo a real exchange rate depreciation that expands exports and leads to an additional, negative terms-of-trade shock. For the LIX countries, the burden through the terms of trade is some $1.2 billion, compared with a total income loss of $1.6 billion. The overall loss in export revenue for the LIX countries is $4 billion, smaller than the partial equilibrium result of $7.3 billion (Table 1). General equilibrium factors moderate the overall loss in export revenue. As noted earlier, countries adapt their real exchange rate to make up for some of the lost market share in order to maintain their given trade balance. World trade (imports) declines by about $34 billion, or some 0.5 percent of its baseline level.

The next two simulations assess the importance of preferences though a different lens—global merchandise trade reform. Through this lens, preferences will eventually be completely eroded. In the first global merchandise trade reform scenario, all tariffs are reduced to zero from the 2001 baseline that assumes preferences are fully utilized (ie, this is a global reform scenario from the standard GTAP 6 data base). The reform scenario also includes the removal of domestic agricultural protection and the elimination of the textile and clothing quotas. The second global reform scenario is the result of an adjusted database. Instead of the default preferential import tariffs, the database is adjusted so that the MFN tariffs are binding.[23] Again, this only affects tariffs on imports from developing countries to rich countries, except for Mexico and the ECA countries (whose imports enter under reciprocal preferential tariffs). The global gains from reform would be expected to be higher in this second scenario since import barriers will be higher on average.

Table 4 summarizes the results. The first part of the table provides the impacts in terms of changes in billions of dollars relative to the baseline. The second part shows the deviation in percentage terms. Each

[23] The adjustment procedure uses a variation of the 'Altertax' procedure described in Malcolm (1998).

part has two panels. The left panel shows the impact from the default tariff rates (i.e., those incorporating preferences) . The right panel shows the impact when all developing country imports are taxed at MFN rates, with the aforementioned exceptions.

Globally, the real income gains are $165 billion with preferences and $190 billion without preferences—equivalent to an increase of 0.6 percent and 0.7 percent, respectively, of global income.[24] The difference for the low-income excluding India (LIX countries) is particularly sharp. With preferences incorporated, their gains amount to only $1.8 billion, or 0.4 percent of initial income. Without preferences, their gain would more than double to $3.8 billion. With the same caveats as above--that is, assuming preferences are fully utilized and ignoring any cost of compliance by ignoring preferences--gains to the low-income countries would be overestimated by some 100 percent.

For developing countries as a whole, the income gains from global merchandise trade reform in the absence of preferences would be about $50 billion, as opposed to $35 billion if preferences are taken into account (i.e., an overestimation of some 31 percent). The impacts on the rich countries are much less, with only a $8 billion differential from a $130 billion baseline gain.

The differential impacts on trade are less dramatic than the impacts on real income. Global imports increase by 10 percent in the standard case including preferences, and by 11 percent when preferences are excluded. The relevant numbers for developing country exports are 23.5 percent (with preferences) and 26.0 percent (without preferences). Thus, preferences do not play a major role in the growth in trade. One of the key reasons for this is that a significant contribution to the rise in trade will be generated by freeing South/South and North/South {?] trade where barriers are highest and where preferences (at least as defined here) play no role. Focusing on the LIX countries, imports increase by 24 percent when

[24] In the final part of this section, we discuss how these results compare with other estimates of global merchandise trade reform using the same model and methodology.

preferences are considered and rise to 27 percent when preferences are ignored—not a significant difference. Part of the difference in the welfare impact can be seen in the changes in the net trade revenue implications (i.e., the terms of trade). The LIX countries suffer a greater terms-of-trade shock when preferences are incorporated. Maintaining market share in the countries where preferences are given will require greater effort as preferences are completely eroded—if they face tariffs of 10 percent and their competitor's face 20 percent, when tariffs drop to 0, the competitors (assuming fixed costs) will get a much larger price boost than those with the preferential tariffs. If both face a tariff of 20 percent, the price boost will be identical. Thus, for countries with preferences, the negative terms-of-trade shock is some $1.5 billion. Without preferences, this negative shock drops to $0.6 billion. Nonetheless, export revenues for the LIX countries would increase by more than $40 billion in either scenario—and by $21 billion for sub-Saharan Africa.

Focusing on some individual countries, the impacts of preferences vary significantly—if not dramatically. Malawi is one extreme. It gains 3 percent in real income when preferences are considered but 10 percent when preferences are ignored. Preferences seem to matter little for the rest of Oceania and the rest of the Southern Africa Customs Union (SACU), and for both of these regions the gains from global reform would be substantial.[25] Mozambique and Madagascar are examples of countries that would gains if preferences ignored but lose otherwise.

We will now decompose the impact of reforms on the trading system into its components. The intention is to isolate the potential consequences of ongoing reforms—such as the removal of the quotas on textiles and clothing and China's WTO accession commitments—from global free trade. The purpose is twofold:

[25] These gains may be overestimated to the extent that the model allows for a relatively significant supply response, particularly in terms of land use.

it shows the relative importance of these two significant changes to the world trading system and it allows for easier comparability with other studies.[26]

The basic idea is to run a pre-simulation where reforms that will occur whether or not a Doha agreement is reached are imposed on the model to obtain a baseline against which the results of the Doha experiments can be compared. Anderson and others impose four reforms in this pre-experiment: full removal of the quotas on textiles and clothing,[27] final commitments under the Uruguay Round Agreement, China's WTO accession commitments, and EU expansion. Only two of these are implemented below—the removal of the quotas and China's commitments.[28]

Table 5 summarizes the key welfare results. The left panel shows the scenarios with the default tariffs (i.e., the preferential tariffs). The right panel shows the scenarios where MFN tariffs are imposed. Each panel has three columns. The first column shows the real income gains from full merchandise trade reform from the baseline data (it replicates the same real income gains from Table 4). The second column shows the real income gains from global merchandise trade reform after implementing the two pre-simulation reforms. In other words, it shows the gains from global reform after having implemented the removal of the textile and clothing quotas and China's accession agreement. The third column shows the difference between the two and represents the real income gain of the pre-simulation itself.

Several observations emerge from these results:

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[26] For example, Anderson and others (2005b). See also Grynberg and Silva (2004), who include losses attributable to abolition of textile quotas as part of the potential losses from multilateral reform.

[27] These are modeled using export tax equivalents, that is, the embodied rents are captured entirely by the exporting country. Preferences will be reflected in the export tax rate. Countries benefiting from preferential access will tend to have a lower export tax rate than countries with highly binding quotas.

[28] The others are more difficult to implement in the scenario where MFN tariffs are assumed to hold. This is because the reforms are based on the existing system of tariffs—not the fictitious system of assuming MFN tariffs obtain. The other two reforms are largely the same in either tariff system.

- The pre-simulation is positive on a global basis, although most of the gains accrue to the high-income countries—$29 billion out of $32 billion. The lowest-income countries lose about $1 billion. Thus, any gains they may achieve from the lowering of China's tariffs are clearly outweighed by the removal of the clothing and textile quotas.

- The existence or not of preferential tariffs has only a marginal impact on the gains or losses from the pre-simulation reforms (i.e., the "differences" columns for both panels are [?] largely identical).

- The relative error in assuming MFN tariffs is lower once the pre-simulation reform is taken into account for the lowest-income countries. Without the pre-simulation, the relative error in using MFN tariffs is 108 percent ($3.8 billion versus $1.8 billion). With the pre-simulation, the relative error is 69 percent ($4.8 billion versus $2.8 billion).

- The global gain of $134 billion using the base tariffs with the pre-simulation reforms is broadly the same as the equivalent figure of $127 billion cited in Anderson and others (2005b). The distribution between developing and high-income countries is also largely the same. This accords largely with the conclusion from the Anderson paper that most of the pre-simulation gains owed to the removal of the textile and clothing quotas and to China's WTO accession. The other reforms were of relatively minor importance quantitatively. Other differences may arise from a different level of regional and sectoral aggregation—with more (small) countries and less manufactured goods.

The simulations described so far compare the impacts of full merchandise trade reform by using two estimates of applied tariffs—one that assumes that all imports are taxed at applied MFN rates, and one that assumes that imports enter with full use of applied preferential rates. One potential drawback in comparing these two simulations is that the definition of preferences is rather broad and includes all preferential and non-preferential trade regimes—both reciprocal (e.g., the Southern Common Market, or Mercosur) and non-reciprocal--and also contains the feedback from liberalizing all merchandise trade including South/South and the South/North.

Alternatively, one could take the preferential-based database and ask what happens to low-income countries if the rich countries reform unilaterally vis-à-vis all countries, that is, the preference margin for low-income imports drops to zero in rich countries with no other changes to tariffs. This is a narrower definition of the value of preferences, but it may more accurately describe the impacts of preferential access for low-income countries. Table 6 shows the results from three simulations. The left-panel shows the impacts in millions of dollars and the right-panel, as a percent of baseline income. The three columns in each panel reflect the respective impacts of EU unilateral trade reform, other high-income unilateral trade reform, and all high-income countries simultaneously cutting their merchandise trade barriers to zero. For the low-income countries—those supposedly benefiting from preference margins in high-income countries-- the overall gains are positive in all three scenarios, with or without India. The gains are small—0.2- 0.3 percent of initial income and lower than the gains for the middle-income countries. Looking at individual countries, some could lose by the greater opening of European markets—for example, Bangladesh, Madagascar, Tanzania and Uganda—but they can recoup some of the losses by the opening of markets in other high-income countries. Some countries—such as Mozambique and Zambia--would lose in both markets.

We can conclude from these results that the preference erosion for low-income countries in high-income markets appears to be limited—although obviously not without consequences for specific countries and/or

sectors within those countries. These estimates should also be considered upper-bound estimates, to the extent that they assume that preferences are fully utilized. While trade constitutes a potentially valuable development vehicle for many low-income countries, they should be urging high-income countries to remove remaining high barriers in products for which they have a comparative advantage (e.g., sugar and rice).Low-income countries should also be accelerating investment in high-yield supply-side projects such as roads and ports infrastructure that will better enable them to exploit existing and future trade opportunities.

Conclusions

Preferences will likely remain a sensitive topic in multilateral trade negotiations. Even though tariffs on most manufactured products have declined dramatically over the last two to three decades in rich countries, trade barriers remain stubbornly high in many sectors of particular importance to developing countries--especially agriculture, food, and textiles and clothing. Developing countries thus have a strong incentive to get and keep preferential access in these sectors. Some countries have undoubtedly benefited from preferences, or at least some sectors and/or agents in these countries. More doubtful, however, is how beneficial preferences have been as development policy tools, and whether policies should continue to be oriented to maintaining the complex preferences system, particularly knowing that as progress is made to reduce barriers through bilateral, regional, or multilateral accords, preference erosion is inevitable.

This paper uses access to a new global database to assess quantitatively the broad role of preferences in international trade. The default version of the database incorporates most preferential agreements—both reciprocal and non-reciprocal, and North/North, North/ South and South/South. The alternative database also provides an estimate of the trade barriers exporters would be subject to in the absence of preferences (i.e., by paying the MFN tariff rate). From these two different databases, we constructed a mixed scenario in which the preferences accorded by the North to the South were eliminated (except for Mexico and the

ECA countries), thus permitting us to isolate the impacts of trade preferences. Comparing the two scenarios—the default with preferences and the alternative without preferences—suggests that preferences as currently configured are worth about $8 billion to developing countries in the aggregate. This equates to just 0.2 percent of developing countries' income but to a more significant 0.3 percent of the income of the low-income countries excluding India. Moreover, preferences raise export revenues of these same countries by some $4 billion.

Most previous analyses of global trade reform largely ignored the role of preferences owing to the paucity of reliable and comprehensive data. Out results in this paper suggest that the global impact of ignoring preferences amounts to about 0.1 percent of global income, that is, the global gains from full trade reform are 0.6 percent of initial income compared with 0.7 percent when preferences are ignored. But for developing countries, the overestimation would be about 0.3 percentage points of initial income, or gains of just 0.7 percent instead of 1.0 percent when preferences are ignored and a somewhat larger overestimation for the lowest income countries. Nonetheless, the impacts of global reform on export revenue are only modestly affected by the inclusion or exclusion of preferences.

We also evaluated a more narrowly based definition of the value of preferences—looking at the impacts on low-income and developing countries from unilateral merchandise trade reform by high-income countries(i.e., setting the preference margin for all countries to zero). Low-income countries on average would nonetheless benefit from removal of all tariffs in high-income markets, even assuming full preference utilization—although some countries could lose.

Our analysis portrays only part of the picture. It ignores, for example, the costs of meeting entry requirements, such as rules of origin, and the effects of possible rents arising from quotas. It is also a static picture as it ignores, for example, the potential negative externalities from rent seeking and other

distortions arising from a skewed system of incentives. As development policies go, the evidence suggests that preferential access has had only minor success. It may well be time to reorient trade policies toward sharpening the competitiveness of low-income countries' exports and improving the whole supply-side chain from farm- and factory-gate to the markets of rich and middle-income countries.

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Table 1: Impact on trade of removing preference margin for imports from low-income countries (excl. India) using a partial equilibrium framework

	Imports from LIX $ billion (1)	*Total imports*[a] $ billion (2)	*Elasticity* (3)	*Preference margin* Percent (4)	*Change in imports from LIX* $ billion (5)	*Percent change* Percent (6)	*Contribution* Percent (7)
EU-25							
Rice	97	708	5.0	6.7	22	-23.0	0.3
Wheat	5	999	6.4	1.4	0	-8.7	0.0
Other grains	31	677	5.0	4.0	5	-17.7	0.1
Oil seeds	77	4,230	6.6	0.2	1	-1.4	0.0
Sugar	436	1,149	2.7	0.5	3	-0.8	0.1
Vegetables and fruits	946	9,583	4.4	15.8	516	-54.5	7.8
Plant based fibers	379	1,385	4.7	0.0	0	0.0	0.0
Other crops	4,175	10,605	2.9	3.6	417	-10.0	6.3
Livestock	181	3,599	3.9	7.8	49	-27.2	0.7
Fossil fuels	6,174	87,710	6.1	0.0	4	-0.1	0.1
Other natural resources	2,152	10,881	2.8	0.0	1	0.0	0.0
Processed meats	183	4,391	3.9	28.2	117	-63.7	1.8
Dairy products	9	853	4.0	18.1	5	-56.6	0.1
Beverages and tobacco	78	4,090	4.0	10.0	27	-34.8	0.4
Other foods	3,108	18,764	3.5	10.4	1,007	-32.4	15.3
Textile	4,788	26,515	3.9	7.7	1,310	-27.3	19.8
Wearing apparel	5,794	35,294	4.2	6.7	1,467	-25.3	22.2
Leather	3,729	15,806	4.8	2.9	475	-12.8	7.2
Intermediate goods	7,532	138,496	4.1	1.9	575	-7.6	8.7
Equipment	9,075	337,562	4.6	1.5	597	-6.6	9.0
All merchandise trade	**48,948**	**713,298**	**4.3**	**3.8**	**6,599**	**-13.5**	**100.0**
United States							
Rice	24	288	4.6	2.1	2	-9.4	0.3
Wheat	0	325	6.5	0.0	0		0.0
Other grains	7	492	5.0	0.4	0	-2.2	0.0
Oil seeds	7	265	4.8	1.3	0	-6.0	0.1
Sugar	48	813	3.9	10.1	15	-31.1	2.1
Vegetables and fruits	84	6,546	4.9	0.3	1	-1.2	0.1
Plant based fibers	3	90	3.9	0.3	0	-1.2	0.0
Other crops	1,154	5,957	3.8	4.9	200	-17.4	28.3
Livestock	37	3,327	4.1	0.6	1	-2.3	0.1
Fossil fuels	11,984	87,066	5.5	0.0	17	-0.1	2.4
Other natural resources	177	2,651	2.8	0.1	0	-0.2	0.1
Processed meats	10	4,919	4.1	1.8	1	-6.9	0.1
Dairy products	1	1,142	4.0	11.9	0	-38.0	0.1
Beverages and tobacco	38	8,936	4.1	2.2	3	-8.7	0.5
Other foods	1,167	18,080	3.9	0.6	29	-2.5	4.1
Textile	2,838	29,561	4.3	0.0	5	-0.2	0.7
Wearing apparel	7,003	48,839	4.5	0.1	17	-0.2	2.5
Leather	1,768	20,973	7.4	0.2	27	-1.5	3.8
Intermediate goods	3,045	212,945	4.4	1.1	138	-4.5	19.5
Equipment	3,777	631,546	5.2	1.3	250	-6.6	35.3
All merchandise trade	**33,173**	**1,084,760**	**5.0**	**0.5**	**708**	**-2.1**	

Note(s): (a) Excludes intra-EU trade.

Source: GTAP release 6.05 and LINKAGE model elasticities.

Table 2: Average tariff and preference margin in the EU and the United States

	Average applied tariff						Preference margin					
	AGR	*PFD*	*TWP*	*NTM*	*EQP*	*MRT*	*AGR*	*PFD*	*TWP*	*NTM*	*EQP*	*MRT*
European Union												
Rest of Oceania	104.1	0.1	2.2	0.0	0.9	24.0	0.3	4.3	9.2	0.3	0.9	1.2
Rest of FTAA	67.3	3.2	0.4	0.0	1.0	7.2	14.7	7.4	10.4	3.4	4.5	5.7
Botswana	0.0	84.2	0.1	0.0	0.0	2.0	0.0	63.1	9.3	0.0	0.2	1.8
South Africa	9.2	11.6	2.0	0.6	1.6	2.2	2.7	4.3	4.5	1.2	1.8	1.4
Rest of SACU	143.8	19.8	0.1	0.0	0.0	21.7	0.6	19.4	5.7	1.3	0.5	5.0
Malawi	17.1				0.0	16.3	9.4				8.0	9.2
Mozambique	0.2		0.3	0.0	0.2	0.0	5.8	12.6	11.1	6.0	0.8	6.7
Tanzania	5.1	0.0	0.0	0.0	0.0	1.4	8.9	11.7	6.0	0.1	0.3	5.8
Zambia	11.7		0.1	0.0	0.0	1.1	9.2		4.6	0.2	4.4	1.4
Zimbabwe	8.9	72.1	0.1	0.0	0.1	7.8	9.9	11.5	7.3	1.7	9.4	7.5
Rest of SADC	85.1	0.3	0.2	0.0	0.0	7.6	0.6	19.6	11.7	1.4	0.8	3.9
Madagascar	2.5	0.0	0.0	0.0	0.0	0.3	3.2	14.7	11.6	2.1	2.4	9.9
Uganda	0.9	0.0	0.0	0.0	0.1	0.5	5.8	12.4	0.4	0.1	10.5	6.5
Rest of SSA	3.8	0.5	0.1	0.2	0.5	1.0	5.4	12.5	3.6	1.9	1.5	2.9
Brazil	6.1	34.2	4.3	1.5	1.0	9.3	0.9	7.6	0.5	1.6	3.9	2.9
Mexico	17.0	24.2	1.7	1.4	0.6	2.6						
Central America	27.8	4.4	0.4	0.2	0.7	16.2	4.6	13.0	8.7	2.5	4.3	5.2
Andean countries	28.1	7.1	0.2	0.2	0.1	6.7	4.9	19.3	7.0	1.1	5.1	3.9
Rest of LAC	21.0	11.4	2.8	0.5	0.8	7.1	5.2	6.5	1.6	0.9	5.0	3.7
Bangladesh	2.1	0.0	0.1	0.6	0.0	0.1	10.0	12.8	11.6	9.3	6.7	11.5
India	14.8	7.7	7.1	0.7	0.4	4.6	1.5	4.8	1.6	3.4	5.3	2.9
Vietnam	2.1	7.7	8.5	0.7	1.9	6.3	2.9	5.6	3.4	2.3	2.8	3.2
Indonesia	3.8	8.1	8.8	1.5	2.0	4.3	4.4	3.7	1.8	1.6	2.3	1.9
China	23.1	15.2	9.3	2.2	1.7	4.0	1.1	11.9	0.6	2.0	1.3	1.4
Rest of ECA	5.2	16.3	1.2	2.2	1.8	1.8						
Rest of South Asia	10.6	3.8	3.2	0.7	0.4	3.3	2.1	7.6	6.6	3.0	2.3	5.4
Rest of East Asia	22.5	14.4	8.8	1.6	1.1	3.9	4.1	2.3	2.2	1.4	1.9	1.9
North Africa	10.2	13.8	0.1	1.2	0.1	1.0	6.1	9.3	10.8	3.8	2.8	3.5
Middle East	6.4	11.6	3.8	1.2	1.1	1.0	2.0	9.7	4.8	3.3	14.4	4.1
Developing	**14.9**	**14.9**	**4.9**	**1.5**	**1.3**	**3.4**	**3.3**	**7.3**	**3.1**	**1.3**	**2.5**	**2.1**
Low-income	**9.6**	**5.0**	**5.4**	**0.7**	**0.6**	**3.4**	**4.9**	**10.6**	**4.8**	**2.3**	**2.5**	**3.6**
Low-income /x India	**8.9**	**4.6**	**4.7**	**0.7**	**0.7**	**3.1**	**5.3**	**11.4**	**6.0**	**1.9**	**1.5**	**3.8**

Table 2: Average tariff and preference margin in the EU and the United States (continued)

	Average applied tariff						Preference margin					
	AGR	*PFD*	*TWP*	*NTM*	*EQP*	*MRT*	*AGR*	*PFD*	*TWP*	*NTM*	*EQP*	*MRT*
United States												
Rest of Oceania	4.1	4.3	13.1	0.1	0.1	7.1	2.1	0.6	0.0	0.2	0.4	0.5
Rest of FTAA	15.8	1.0	10.7	0.4	0.1	5.1	13.2	1.6	2.0	1.4	1.6	1.9
Botswana			11.1		2.4	3.4					0.0	0.0
South Africa	7.5	1.1	10.0	0.1	0.0	0.8	6.8	3.0	0.3	0.9	1.4	1.1
Rest of SACU	46.1		12.6			10.8	20.6	0.4	0.0	0.9	3.3	0.6
Malawi	14.8		11.2			14.0	38.2					32.6
Mozambique	19.8					19.8	8.9					8.9
Tanzania	3.7		2.8		0.0	1.5	11.6	0.0	1.8	1.0	4.6	5.3
Zambia					0.0	0.0				1.3	0.1	1.1
Zimbabwe	17.8		8.6	0.1	0.0	6.2	37.6		0.1	2.3	4.2	10.5
Rest of SADC	9.6		11.2	0.1	0.0	1.0	5.7	0.0	0.0	1.6	0.8	0.1
Madagascar	0.0		12.0			10.3	9.5		0.0	1.8	2.0	0.5
Uganda	0.0				0.1	0.0	0.4	0.4		1.0	0.3	0.4
Rest of SSA	0.2	0.6	9.7	0.0	0.1	0.1	0.4	3.8	0.2	1.2	0.7	0.1
Brazil	8.9	4.6	8.2	1.8	1.0	2.5	15.1	1.1	0.0			0.7
Mexico	0.2	0.4	0.1	0.2	0.0	0.0						
Central America	3.4	0.7	11.8	0.0	0.0	7.6	3.9	2.1	1.6	2.2	1.0	1.9
Andean countries	1.7	1.3	13.0	0.7	0.2	0.9	3.5	1.9	0.3	1.3	2.2	0.9
Rest of LAC	3.1	3.3	4.3	1.5	0.7	2.0	2.6	0.9	0.6	0.1	0.4	0.7
Bangladesh		0.0	11.6	1.7	3.7	10.3		0.0	0.0	0.4	0.3	0.0
India	1.0	1.2	9.2	1.5	0.1	3.2	1.2	1.2	0.3	1.1	1.5	1.0
Vietnam	0.2	0.8	15.9	1.4	1.3	3.5		0.0				0.0
Indonesia	1.0	1.8	13.3	0.9	0.1	5.1	2.2	0.9	0.1	1.2	1.3	0.8
China	2.1	2.8	12.3	2.2	1.6	3.8	1.0	0.6	0.0			0.0
Rest of ECA	6.0	2.3	11.4	0.7	0.5	3.0						
Rest of South Asia	1.3	1.5	11.2	3.3	1.3	10.1	1.1	1.3	0.1	0.3	1.4	0.2
Rest of East Asia	6.5	2.0	12.9	1.4	0.4	3.0	13.4	1.0	0.1	1.0	0.4	0.6
North Africa	1.9	3.2	10.5	0.3	0.1	3.0	2.0	3.1	0.0	0.4	0.5	0.2
Middle East	1.7	1.7	6.4	1.7	0.0	0.6	7.8	4.0	3.7	1.1	0.5	0.5
Developing	**2.7**	**1.7**	**10.1**	**1.2**	**0.6**	**2.3**	**3.7**	**0.9**	**0.4**	**0.4**	**0.2**	**0.3**
Low-income	**1.8**	**1.2**	**11.4**	**1.2**	**0.1**	**4.2**	**3.6**	**0.8**	**0.1**	**1.1**	**1.4**	**0.6**
Low-income /x India	**2.1**	**1.1**	**12.1**	**1.0**	**0.2**	**4.4**	**4.6**	**0.7**	**0.1**	**1.1**	**1.3**	**0.5**

Source: GTAP 6.05, MAcMap and author's calculations.

Table 3: Impact of moving from preferential tariffs to MFN tariffs on real income, imports and terms of trade

	Real income	Imports	Terms of trade	Real income	Imports	Terms of trade
		$ *billion*		*Percent deviation from baseline*		
High income Asia	0.8	-3.0	1.5	0.0	-0.3	0.1
European Union 25 with EFTA	3.4	-6.1	4.4	0.0	-0.2	0.1
United States	1.9	-1.6	2.4	0.0	-0.1	0.2
Canada	0.0	-0.6	0.0	0.0	-0.2	0.0
Rest of Oceania	0.0	-0.1	0.0	-0.2	-0.7	-0.3
Rest of Free Trade of Americas	-0.4	-0.9	-0.3	-0.4	-2.9	-1.0
Botswana	0.0	0.0	0.0	0.1	0.1	0.2
South Africa	-0.2	-0.5	-0.2	-0.2	-1.6	-0.5
Rest of SACU	0.0	-0.1	0.0	-0.4	-1.5	-0.5
Malawi	0.0	0.0	0.0	-1.8	-8.1	-3.1
Mozambique	0.0	-0.1	0.0	-1.2	-5.0	-2.6
Tanzania	0.0	-0.1	0.0	-0.4	-2.6	-1.4
Zambia	0.0	0.0	0.0	-0.1	-0.6	-0.1
Zimbabwe	0.0	-0.1	0.0	-0.7	-4.8	-1.7
Rest of SADC	-0.1	-0.2	-0.1	-0.3	-2.5	-0.8
Madagascar	0.0	-0.1	0.0	-0.8	-7.8	-2.5
Uganda	0.0	0.0	0.0	-0.4	-2.4	-1.6
Rest of Sub Saharan Africa	-0.3	-0.8	-0.3	-0.2	-1.6	-0.6
Brazil	-0.5	-1.2	-0.3	-0.1	-1.6	-0.5
Mexico	0.0	-0.2	0.0	0.0	-0.1	0.0
Central America	-0.4	-0.7	-0.2	-0.6	-1.8	-0.8
Andean countries	-0.4	-0.9	-0.3	-0.1	-1.8	-0.5
Rest of LAC	-0.5	-1.0	-0.3	-0.1	-1.4	-0.5
Bangladesh	-0.3	-0.8	-0.2	-0.8	-8.2	-2.5
India	-0.5	-1.2	-0.3	-0.1	-2.0	-0.5
Vietnam	-0.2	-0.5	-0.1	-0.7	-2.0	-0.6
Indonesia	-0.2	-0.7	-0.4	-0.2	-1.4	-0.4
China	-0.8	-3.1	-1.4	-0.1	-1.1	-0.3
Rest of ECA	-0.3	0.0	0.0	-0.1	0.0	0.0
Rest of South Asia	-0.3	-0.5	-0.1	-0.3	-2.5	-0.7
Rest of East Asia	-0.8	-2.2	-1.1	-0.2	-1.1	-0.4
North Africa	-1.0	-2.5	-0.7	-0.5	-3.9	-1.1
Middle East	-0.8	-3.6	-1.3	-0.2	-1.7	-0.6
World	-2.1	-33.5	0.6	0.0	-0.5	0.0
High-income	6.2	-11.3	8.4	0.0	-0.2	0.1
Developing	**-8.3**	**-22.2**	**-7.7**	**-0.2**	**-1.3**	**-0.4**
Middle-income	-5.7	-16.0	-5.9	-0.1	-1.2	-0.4
Low-income	-2.1	-5.2	-1.5	-0.2	-2.2	-0.6
Low-income /x India	**-1.6**	**-4.0**	**-1.2**	**-0.3**	**-2.3**	**-0.7**
East Asia & Pacific	-2.1	-6.5	-2.9	-0.1	-1.2	-0.4
South Asia	-1.2	-2.6	-0.6	-0.2	-2.8	-0.7
Mid-East & North Africa	-1.8	-6.1	-2.0	-0.3	-2.3	-0.7
Sub Saharan Africa	-0.7	-2.0	-0.7	-0.3	-1.9	-0.7
Latin America & Carib.	-1.7	-4.0	-1.2	-0.1	-1.0	-0.3

Source: World Bank LINKAGE simulations.

Table 4: Global merchandise trade reform and preferences—change from baseline in $billion

	Real income	Imports	Terms of trade	Real income	Imports	Terms of trade
	With preferences			*Without preferences*		
High income Asia	58.7	135.1	6.0	59.7	135.0	4.8
European Union 25 with EFTA	53.8	89.7	1.5	63.4	133.1	-2.5
United States	15.3	66.4	3.6	12.1	84.9	1.3
Canada	2.5	7.7	-0.4	2.8	9.1	-0.4
Rest of Oceania	2.6	3.5	0.2	2.7	3.9	0.2
Rest of Free Trade of Americas	0.6	6.7	-0.3	1.4	8.0	-0.1
Botswana	0.2	0.1	0.1	0.3	0.1	0.1
South Africa	0.8	4.6	0.1	1.4	5.6	0.3
Rest of SACU	0.5	1.2	0.2	0.5	1.2	0.2
Malawi	0.0	0.2	0.0	0.1	0.4	0.0
Mozambique	0.0	0.1	0.0	0.0	0.2	0.0
Tanzania	-0.1	0.4	0.0	0.0	0.5	0.0
Zambia	0.0	0.2	0.0	0.0	0.1	0.0
Zimbabwe	0.2	0.8	0.0	0.2	0.8	0.0
Rest of SADC	0.2	1.9	-0.2	0.4	2.2	-0.1
Madagascar	0.0	0.0	0.0	0.0	0.1	0.0
Uganda	0.0	0.0	0.0	0.0	0.1	0.0
Rest of Sub Saharan Africa	0.4	11.5	-0.9	1.0	12.9	-0.6
Brazil	4.2	23.1	1.1	3.4	22.4	0.8
Mexico	-0.6	17.9	-1.8	-0.4	17.5	-1.7
Central America	0.5	3.8	-0.1	1.0	4.5	0.0
Andean countries	1.5	10.9	-0.3	7.0	24.5	1.5
Rest of LAC	3.0	13.9	0.5	4.2	16.0	1.0
Bangladesh	-0.5	2.5	-0.4	-0.2	3.6	-0.3
India	0.8	40.8	-1.9	1.0	41.9	-1.9
Vietnam	1.2	10.3	0.0	1.5	10.9	0.1
Indonesia	0.1	7.2	0.2	0.5	7.7	0.4
China	8.0	127.9	-2.2	9.0	128.0	-1.4
Rest of ECA	1.9	26.7	-1.5	2.8	27.7	-1.4
Rest of South Asia	0.1	7.0	-0.4	0.1	7.6	-0.3
Rest of East Asia	4.6	33.9	-0.4	5.6	34.9	0.2
North Africa	1.3	14.9	-1.3	2.5	18.7	-0.8
Middle East	3.5	17.6	-1.1	5.3	24.8	0.3
World	165.5	688.4	0.2	189.2	788.8	-0.3
High-income	130.3	298.8	10.6	138.0	362.2	3.2
Developing	**35.1**	**389.5**	**-10.4**	**51.2**	**426.6**	**-3.5**
Middle-income	29.2	296.4	-6.8	42.4	325.7	-1.1
Low-income	2.7	83.0	-3.4	4.8	89.0	-2.5
Low-income /x India	**1.8**	**42.2**	**-1.5**	**3.8**	**47.2**	**-0.6**
East Asia & Pacific	14.0	179.3	-2.4	16.5	181.4	-0.7
South Asia	0.4	50.3	-2.7	0.9	53.0	-2.4
Mid-East & North Africa	4.9	32.5	-2.4	7.7	43.5	-0.5
Sub Saharan Africa	2.2	21.0	-0.8	3.9	24.2	-0.1
Latin America & Carib.	8.6	69.6	-0.5	15.2	84.9	1.6

Source: World Bank LINKAGE simulations.

Table 4: Global merchandise trade reform and preferences—change from baseline in percent (continued)

	Real income	Imports	Terms of trade	Real income	Imports	Terms of trade
	With preferences			*Without preferences*		
High income Asia	1.3	13.1	1.1	1.3	13.3	0.9
European Union 25 with EFTA	0.8	4.1	0.5	0.9	4.6	0.0
United States	0.2	6.8	1.7	0.1	6.5	1.4
Canada	0.4	3.6	0.1	0.5	3.7	0.0
Rest of Oceania	24.4	51.7	7.9	24.8	53.4	8.3
Rest of Free Trade of Americas	0.6	20.6	-1.8	1.3	24.7	-0.2
Botswana	5.2	3.9	6.2	8.2	5.8	11.2
South Africa	0.8	15.8	0.6	1.5	19.1	1.9
Rest of SACU	13.1	33.4	9.0	14.0	35.1	10.0
Malawi	3.0	30.4	3.7	10.3	65.8	15.5
Mozambique	-0.1	7.0	-2.0	1.2	12.3	0.9
Tanzania	-0.8	18.3	-2.4	-0.3	21.5	-0.6
Zambia	-0.4	11.2	-1.3	-0.4	10.8	-1.3
Zimbabwe	2.9	40.5	3.7	3.2	43.5	4.8
Rest of SADC	1.3	19.4	-3.8	2.0	23.3	-2.4
Madagascar	-0.8	0.9	-3.4	0.1	8.7	-0.4
Uganda	-0.5	3.5	-1.5	-0.1	5.9	0.3
Rest of Sub Saharan Africa	0.3	22.8	-3.4	0.8	25.2	-2.4
Brazil	1.1	31.5	4.1	0.9	30.6	3.4
Mexico	-0.1	11.7	-1.9	-0.1	11.7	-1.8
Central America	0.8	9.6	0.3	1.6	11.7	1.5
Andean countries	0.6	20.6	-0.4	2.8	47.2	10.0
Rest of LAC	0.8	20.0	2.1	1.2	23.2	3.6
Bangladesh	-1.2	25.0	-9.0	-0.4	36.2	-6.7
India	0.2	65.8	-6.5	0.2	68.1	-6.1
Vietnam	4.0	40.9	-5.3	4.9	43.9	-4.9
Indonesia	0.1	15.6	0.3	0.3	17.1	0.8
China	0.8	44.7	-5.6	0.9	46.0	-5.1
Rest of ECA	0.3	13.5	-1.1	0.5	13.5	-1.0
Rest of South Asia	0.1	32.9	-2.9	0.1	35.2	-3.3
Rest of East Asia	1.3	16.7	-0.3	1.7	17.7	0.1
North Africa	0.7	23.9	-4.1	1.2	30.2	-3.1
Middle East	0.7	8.7	-0.6	1.1	12.0	0.7
World	0.6	10.3	0.0	0.7	11.1	0.0
High-income	0.6	6.4	0.9	0.7	6.6	0.5
Developing	**0.7**	**23.5**	**-2.1**	**1.0**	**26.0**	**-1.2**
Middle-income	0.7	21.5	-1.9	1.0	23.9	-1.0
Low-income	0.3	35.0	-3.7	0.6	37.8	-3.0
Low-income /x India	**0.4**	**24.1**	**-2.3**	**0.8**	**27.1**	**-1.5**
East Asia & Pacific	0.9	32.0	-3.4	1.1	33.3	-2.9
South Asia	0.1	53.7	-6.0	0.2	57.1	-5.6
Mid-East & North Africa	0.7	12.3	-1.5	1.1	16.2	-0.3
Sub Saharan Africa	0.8	19.9	-1.2	1.5	22.9	0.1
Latin America & Carib.	0.5	18.0	0.4	1.0	22.2	2.2

Source: World Bank LINKAGE simulations.

Table 5: Impact of removal of textile and clothing quotas and China's WTO accession on global merchandise trade reform—$ billion

	No pre-simulation	With pre-simulation	Difference	No pre-simulation	With pre-simulation	Difference
	With preferences			*Without preferences*		
High income Asia	58.7	55.3	3.5	59.7	56.2	3.4
European Union 25 with EFTA	53.8	39.1	14.7	63.4	48.6	14.7
United States	15.3	5.0	10.3	12.1	1.9	10.2
Canada	2.5	1.8	0.7	2.8	2.1	0.7
Rest of Oceania	2.6	2.7	0.0	2.7	2.7	0.0
Rest of Free Trade of Americas	0.6	0.8	-0.2	1.4	1.5	-0.2
Botswana	0.2	0.2	0.0	0.3	0.3	0.0
South Africa	0.8	0.8	0.0	1.4	1.4	0.0
Rest of SACU	0.5	0.5	0.0	0.5	0.6	0.0
Malawi	0.0	0.0	0.0	0.1	0.1	0.0
Mozambique	0.0	0.0	0.0	0.0	0.0	0.0
Tanzania	-0.1	-0.1	0.0	0.0	0.0	0.0
Zambia	0.0	0.0	0.0	0.0	0.0	0.0
Zimbabwe	0.2	0.2	0.0	0.2	0.2	0.0
Rest of SADC	0.2	0.3	0.0	0.4	0.4	0.0
Madagascar	0.0	0.0	0.0	0.0	0.0	0.0
Uganda	0.0	0.0	0.0	0.0	0.0	0.0
Rest of Sub Saharan Africa	0.4	0.4	0.0	1.0	1.0	0.0
Brazil	4.2	4.1	0.2	3.4	3.3	0.2
Mexico	-0.6	-0.2	-0.4	-0.4	0.0	-0.4
Central America	0.5	0.9	-0.4	1.0	1.4	-0.4
Andean countries	1.5	1.5	0.0	7.0	7.1	0.0
Rest of LAC	3.0	2.5	0.5	4.2	3.7	0.5
Bangladesh	-0.5	-0.1	-0.4	-0.2	0.2	-0.4
India	0.8	1.3	-0.5	1.0	1.5	-0.5
Vietnam	1.2	1.0	0.2	1.5	1.3	0.2
Indonesia	0.1	0.4	-0.3	0.5	0.8	-0.3
China	8.0	2.9	5.1	9.0	4.0	5.0
Rest of ECA	1.9	2.1	-0.2	2.8	3.1	-0.2
Rest of South Asia	0.1	0.5	-0.4	0.1	0.5	-0.4
Rest of East Asia	4.6	4.6	0.0	5.6	5.6	0.0
North Africa	1.3	1.8	-0.5	2.5	2.9	-0.4
Middle East	3.5	3.5	0.1	5.3	5.2	0.1
World	165.5	133.8	31.7	189.2	157.5	31.7
High-income	130.3	101.2	29.2	138.0	108.9	29.1
Developing	**35.1**	**32.6**	**2.5**	**51.2**	**48.6**	**2.6**
Middle-income	29.2	25.0	4.2	42.4	38.1	4.2
Low-income	2.7	4.1	-1.5	4.8	6.3	-1.4
Low-income /x India	1.8	2.8	-1.0	3.8	4.8	-0.9
East Asia & Pacific	14.0	9.0	5.0	16.5	11.6	4.9
South Asia	0.4	1.7	-1.3	0.9	2.2	-1.3
Mid-East & North Africa	4.9	5.3	-0.4	7.7	8.1	-0.4
Sub Saharan Africa	2.2	2.3	-0.1	3.9	4.0	-0.1
Latin America & Carib.	8.6	8.8	-0.2	15.2	15.5	-0.2

Source: World Bank LINKAGE simulations.

Table 6: Impact of unilateral merchandise trade reform by high-income countries

	EU-only	Other high-income	All high-income	EU-only	Other high-income	All high-income
	$ million			*percent of baseline income*		
High income Asia	3,491	38,145	41,622	0.1	0.8	0.9
European Union 25 with EFTA	13,309	3,134	16,905	0.2	0.0	0.2
United States	3,242	-5,974	-2,582	0.0	-0.1	0.0
Canada	194	1,603	1,712	0.0	0.3	0.3
Rest of Oceania	531	179	720	4.9	1.6	6.6
Rest of Free Trade of Americas	387	161	560	0.4	0.2	0.5
Botswana	145	-2	147	3.8	-0.1	3.9
South Africa	94	120	224	0.1	0.1	0.2
Rest of SACU	453	20	473	11.7	0.5	12.2
Malawi	12	22	34	0.9	1.6	2.4
Mozambique	-17	-2	-19	-0.5	-0.1	-0.6
Tanzania	-21	3	-19	-0.2	0.0	-0.2
Zambia	-11	-2	-13	-0.4	0.0	-0.4
Zimbabwe	116	14	129	1.6	0.2	1.8
Rest of SADC	-2	8	8	0.0	0.0	0.0
Madagascar	-11	3	-9	-0.3	0.1	-0.2
Uganda	-11	2	-10	-0.2	0.0	-0.2
Rest of Sub Saharan Africa	-82	8	-66	-0.1	0.0	-0.1
Brazil	4,308	608	5,032	1.1	0.2	1.3
Mexico	84	-1,296	-1,191	0.0	-0.2	-0.2
Central America	1,205	455	1,617	2.0	0.7	2.7
Andean countries	1,604	62	1,705	0.6	0.0	0.7
Rest of LAC	1,324	1,040	2,557	0.4	0.3	0.7
Bangladesh	-174	102	-70	-0.4	0.2	-0.2
India	189	178	376	0.0	0.0	0.1
Vietnam	319	310	624	1.1	1.0	2.1
Indonesia	173	106	280	0.1	0.1	0.2
China	1,520	2,620	3,982	0.1	0.3	0.4
Rest of ECA	788	59	882	0.1	0.0	0.2
Rest of South Asia	-91	659	579	-0.1	0.7	0.6
Rest of East Asia	327	552	900	0.1	0.2	0.3
North Africa	-173	11	-148	-0.1	0.0	-0.1
Middle East	73	669	729	0.0	0.1	0.1
World	33,294	43,577	77,668	0.1	0.2	0.3
High-income	20,236	36,908	57,656	0.1	0.2	0.3
Developing	13,058	6,668	20,012	0.2	0.1	0.4
Middle-income	11,606	4,920	16,761	0.3	0.1	0.4
Low-income	534	1,409	1,971	0.1	0.2	0.2
Low-income /x India	344	1,231	1,595	0.1	0.3	0.3
East Asia & Pacific	2,338	3,587	5,786	0.2	0.2	0.4
South Asia	-76	939	885	0.0	0.2	0.2
Mid-East & North Africa	-101	680	580	0.0	0.1	0.1
Sub Saharan Africa	665	194	878	0.2	0.1	0.3
Latin America & Carib.	8,525	869	9,720	0.5	0.1	0.6

Source: World Bank LINKAGE simulations.

Annex A: Model details

The model used for this analysis is the World Bank's global computable general equilibrium (CGE) model, known as LINKAGE (van der Mensbrugghe 2004). It is a relatively straightforward CGE model. The version used herein is comparative static though most often the model is used in recursive dynamic mode.

The standard version of the model has perfect competition and constant returns to scale. Producers minimize costs subject to constant returns to scale production technology, consumers maximize utility, and all markets – including for labor – are cleared with flexible prices. There are three types of production structures. Crop sectors reflect the substitution possibility between extensive and intensive farming. Livestock sectors reflect the substitution possibility between ranch versus range feeding. And all other sectors reflect the standard capital/labor substitution (with two types of labor: skilled and unskilled). There is a single representative household per modeled region, allocating income to consumption using the extended linear expenditure system. The model allows for the fact that the products produced by different countries tend to be imperfect substitutes. To capture this, trade is modeled using a nested Armington structure in which aggregate import demand is the outcome of allocating domestic absorption between domestic goods and aggregate imports, and then aggregate import demand is allocated across source countries to determine the bilateral trade flows.

There are six sources of protection in the model. The most important involves the bilateral tariffs. There are also bilateral export subsidies. Domestically, there are subsidies only in agriculture, where they apply to intermediate goods, outputs, and payments to capital and land.

Three closure rules are used. First, government fiscal balances are fixed in any given year. The fiscal objective is met by changing the level of lump sum taxes on households. This implies that losses of tariff revenues are replaced by higher direct taxes on households. Second, the current account balance is fixed.

Given that other external financial flows are fixed, this implies that ex ante changes to the trade balance are reflected in ex post changes to the real exchange rate. For example, if import tariffs are reduced, the propensity to import increases. Additional imports are financed by increasing export revenues and this is typically achieved by a real exchange rate depreciation. Finally, investment is savings driven. With fixed public and foreign saving, investment will be driven by two factors: changes in the savings behavior of households, and changes in the unit cost of investment. The latter can play an important role in a dynamic model if imported capital goods are taxed. Because the capital account is exogenous, rates of return across countries can differ over time and across simulations. The model only solves for relative prices. The numéraire, or price anchor, in the model is given by the export price index of manufactured exports from high-income countries. This price is fixed at unity in the base year and throughout time.

The newest version of the LINKAGE model, Version 6.0, is based on the latest release of the GTAP dataset, Release 6.0. Compared with Version 5 of the GTAP dataset, Version 6 has a 2001 base year instead of 1997, updated national and trade data and, importantly, a new source for the protection data. The new protection data come from a joint CEPII (Paris)/ITC (Geneva) project. The product of this joint effort, known as MAcMap, is a tariff level detailed database on bilateral protection that integrates trade preferences, specific tariffs and a partial evaluation of non-tariff barriers (NTBs), for example tariff rate quotas (TRQs).

The version of the LINKAGE model used for this study is comprised of a 33-region, 21-sector aggregation of the GTAP data set (see Annex Table A-1). There is a heavy emphasis on agriculture and food, comprising 13 of the 21 sectors, and a focus on the countries assumed to benefit the most from preferential access.

Table A-1: Regional and sectoral concordance between the LINKAGE model and the GTAP database

Modeled regions[29]

1	HYA	**High-income Asia** (anz, nzl, jpn, hkg, kor, sgp, twn)
2	EUR	**European Union-25 with EFTA** (aut, bel, dnk, fin, fra, deu, gbr, grc, irl, ita, lux, nld, prt, esp, swe, cyp, cze, hun, mlt, pol, svk, svn, est, lva, ltu, che, xef, xer, xna)
3	CAN	**Canada** (can)
4	USA	**United States** (usa)
5	XOC	**Rest of Oceania** (xoc)
6	XFA	**Rest of Free Trade of Americas** (xfa)
7	BWA	**Botswana** (bwa)
8	ZAF	**South Africa** (zaf)
9	XSC	**Rest of SACU** (xsc)
10	MWI	**Malawi** (mwi)
11	MOZ	**Mozambique** (moz)
12	TZA	**Tanzania** (tza)
13	ZMB	**Zambia** (zmb)
14	ZWE	**Zimbabwe** (zwe)
15	XSD	**Rest of Southern Africa Development Community** (xsd)
16	MDG	**Madagascar** (mdg)
17	UGA	**Uganda** (uga)
18	XSS	**Rest of Sub-Saharan Africa** (xss)
19	BRA	**Brazil** (bra)
20	MEX	**Mexico** (mex)
21	APC	**Andean Pact** (col, per, ven, xap)
22	CAM	**Central America** (xca)
23	XLC	**Rest of Latin America and the Caribbean** (arg, chl, ury, xsm, xcb)
24	BGD	**Bangladesh** (bgd)
25	IND	**India** (ind)
26	XSA	**Rest of South Asia** (lka, xsa)
27	IDN	**Indonesia** (idn)
28	VNM	**Vietnam** (vnm)
29	CHN	**China, P.R.** (chn)
30	XEA	**Rest of East Asia and Pacific** (mys, phl, tha, xea, xse)
31	XEC	**Rest of Europe and Central Asia** (alb, bgr, hrv, rom, rus, tur, xsu)
32	MDE	**Middle East** (xme)
33	NAF	**North Africa** (mar, tun, xnf)

Post-simulation aggregate regions—by income classification

1	HIY	**High-income** (usa, can, hya, e25)
2	EPA	**EPA countries/regions** (xoc, xfa, bwa, zaf, xsc, mwi, moz, tza, zmb, zwe, xsd, mdg, uga, xss)
3	EPX	**Non-EPA developing countries** (bra, mex, cam, apc, xlc, bgd, ind, idn, vnm, chn, xec, xsa, xea, naf, mde)
4	LMY	**Developing** (xoc, xfa, bwa, zaf, xsc, mwi, moz, tza, zmb, zwe, xsd, mdg, uga, xss, bra, mex, cam, apc, xlc, bgd, ind, idn, vnm, chn, xec, xsa, xea, naf, mde)
5	MIC	**Middle-income** (zaf, bra, mex, cam, apc, xlc, xec, chn, xea, naf, mde)
6	LIC	**Low-income** (xoc, xfa, bwa, xsc, mwi, moz, tza, zmb, zwe, xsd, mdg, uga, xss, bgd, ind, idn, vnm, xsa)
7	LIX	**Low-income excl India** (xoc, xfa, bwa, xsc, mwi, moz, tza, zmb, zwe, xsd, mdg, uga, xss, bgd, idn, vnm, xsa)
8	WLD	**World total** (all regions)

[29] The modeled regions are an aggregate of the 87 GTAP regions. The GTAP acronyms are in parenthesis. For details on the countries included in the GTAP aggregate regions see either the GTAP web site or van der Mensbrugghe (2004).

Table A-1: Regional and sectoral concordance between the LINKAGE model and the GTAP database (continued)

Post-simulation aggregate regions—by regional classification		
1	EAP	**East Asia and Pacific** (idn, vnm, chn, xea)
2	SAS	**South Asia** (bgd, ind, xsa)
3	MNA	**Middle East and North Africa** (mde, naf)
4	SSA	**Sub-Saharan Africa** (bwa, zaf, xsc, mwi, moz, tza, zmb, zwe, xsd, mdg, uga, xss)
5	LAC	**Latin America and the Caribbean** (bra, mex, apc, xfa, xlc)
Modeled sectors		
1	RIC	**Rice** (pdr, pcr)
2	WHT	**Wheat** (wht)
3	GRO	**Other cereals** (gro)
4	OSD	**Oil seeds** (osd)
5	SUG	**Sugar** (c b, sgr)
6	V F	**Vegetables and fruits** (v f)
7	PFB	**Plant-based fibers** (pfb)
8	OCR	**Other crops** (ocr)
9	LVS	**Livestock** (ctl, oap, rmk, wol)
10	FFL	**Fossil fuels** (coa, oil, gas, p c)
11	ONR	**Other natural resources** (frs, omn)
12	PMT	**Processed meats** (cmt, omt)
13	MIL	**Dairy products** (mil)
14	OFD	**Other food** (fsh, vol, ofd)
15	B T	**Beverages and tobacco** (b t)
16	TEX	**Textiles** (tex)
17	WAP	**Wearing apparel** (wap)
18	LEA	**Leather** (lea)
19	NTM	**Intermediate goods** (lum, ppp, crp, nmm, i s, nfm)
20	EQP	**Capital goods** (fmp, mvh, otn, ele, ome, omf)
21	NTR	**Non-traded goods** (ely, gdt, wtr, cns, trd, otp, wtp, atp, cmn, ofi, isr, obs, ros, osg, dwe)
Post-simulation aggregate sectors		
1	AGR	**Agriculture** (ric, wht, gro, osd, sug, v f, pfb, ocr, lvs)
2	PFD	**Processed food** (pmt, mil, b t, ofd)
3	TWP	**Textile and wearing apparel** (tex, wap, lea)
4	OMN	**Other manufacturing** (ntm, eqp)
5	MRT	**Merchandise trade** (All sectors except non-tradeables)
6	TOT	**All goods and non-factor services** (all sectors)

Sources: van der Mensbrugghe (2004) and www.gtap.org

Annex B: Derivation of key elasticities

The purpose of this annex is to derive the relation between the demand for imports benefiting from preferences with respect to the price of imports under an MFN regime. It uses a simple model where there are only three goods—a domestic good, a 'preferential' import and an 'MFN' import. Trade is modeled using a simple nested CES trade structure. The key idea is that goods are differentiated by region of origin so that domestic goods are different from imported goods, and the latter are differentiated according to the region of origin. The nested structure attempts to capture that the degree of differentiation (or substitutability) differs by pair of goods. In the simple two-nested structure domestic goods are assumed to be imperfect substitutes with the aggregate import good. At the next nest, the aggregate import good is assumed to be composed of imperfectly substitutable imports from different countries. For example, rich country goods tend to be more identified with well-known brands, for example Levi jeans or Coca Cola and thus are differentiated from less well-known or unbranded goods from developing countries.[30] Thus there is typically less substitution between the domestic good and imports, but a higher degree of substitution across imports by region of origin.

The first node decomposes aggregate demand, *XA*, into a domestic component, *XD*, and an aggregate import component, *XMT*. The top-level substitution elasticity is given by σ^m. Equations (1) and (2) express the relevant demand equations, where the component prices are respectively *PD* and *PMT*, and *PA* represents the price of aggregate demand. It can be expressed as a non-linear aggregation of the two component prices, equation (3).

$$(1) \qquad XD = \alpha^D \left(\frac{PA}{PD} \right)^{\sigma^m} XA$$

[30] More sophisticated nests are of course possible—for example consumers may differentiate between European imports and Asian imports and then allocate across different exporters. Models with varieties will push the level of differentiation even further by allocating demand to individual firms not just countries.

$$(2) \qquad XMT = \alpha^{M}\left(\frac{PA}{PMT}\right)^{\sigma^{m}} XA$$

$$(3) \qquad PA = \left[\alpha^{D} PD^{1-\sigma^{m}} + \alpha^{M} PMT^{1-\sigma^{m}}\right]^{1/(1-\sigma^{m})}$$

In the second nest, aggregate imports are decomposed by region of origin. In this small model, there are two exporting regions represented by *p* and *m*, the former representing the region benefiting from preferences, and the latter the region paying the MFN tariff. Equations (4) and (5) represent the demand equations for imports from *p* and *m*, respectively, where the substitution elasticity is given by σ^{w}. The import prices are given by PM_p and PM_m, where, without loss of generality, we assume that PM_p represents the CIF price and there is no additional tariff, and PM_m represents the CIF price with an ad valorem tariff of τ^{m}. The aggregate price of imports is given by equation (6).

$$(4) \qquad XM_{p} = \alpha^{p}\left(\frac{PMT}{PM_{p}}\right)^{\sigma^{w}} XMT$$

$$(5) \qquad XM_{m} = \alpha^{m}\left(\frac{PMT}{PM_{m}}\right)^{\sigma^{w}} XMT$$

$$(6) \qquad PMT = \left[\alpha^{p} PM_{p}^{1-\sigma^{w}} + \alpha^{m} PM_{m}^{1-\sigma^{w}}\right]^{1/(1-\sigma^{w})}$$

Next we derive the partial equilibrium elasticities where we are most interested in the elasticity of demand for domestic goods and the preferential imports with respect to the MFN tariff rate. We start with equation (1) to derive the following:

$$
\begin{aligned}
\varepsilon_{d,m} &= \frac{\partial XD}{\partial PM_m}\frac{PM_m}{XD} \\
&= \frac{PM_m}{XD}\left[\alpha^D\left(\frac{PA}{PD}\right)^{\sigma^m}\frac{XA}{PA}\frac{\partial PA}{\partial PM_m}\sigma^m\right] \\
&= \frac{PM_m}{XD}\left[\sigma^m\frac{XD}{PA}\frac{\partial PA}{\partial PMT}\frac{\partial PMT}{\partial PM_m}\right] \\
&\quad \frac{PM_m}{XD}\left[\sigma^m\frac{XD}{PA}s_M\frac{PA}{PMT}s_m\frac{PMT}{PM_m}\right] \\
\varepsilon_{d,m} &= \sigma^m s_M s_m = \sigma^m s_{m,T}
\end{aligned}
\qquad (7)
$$

The elasticity of demand for domestic goods with respect to 'MFN' imports is equal to the top-level Armington elasticity times the share of 'MFN' imports relative to aggregate consumption. This formula holds irrespective of the value of the second level substitution elasticity (as a point elasticity). The elasticity is higher the greater the degree of substitutability between domestic goods and imported goods and the higher the share of 'MFN' imports in total demand. If the top-level Armington elasticity is 4 and the 'MFN' import share 10%, then the instantaneous elasticity is 0.4. The elasticity is unambiguously positive—an increase (decline) in the 'MFN' import price leads to an increase (decrease) in the demand for the domestic good.

The share variables are defined by equations (8) through (11) and represent respectively the share of total absorption spent on domestic goods, s_D, the share of total absorption spent on imported goods, s_M, the share of 'MFN' imports relative to aggregate imports, s_m, and the share of 'MFN' imports relative to aggregate absorption, $s_{m,T}$.

$$s_D = \frac{PD.XD}{PA.XA} \qquad (8)$$

$$s_M = \frac{PMT.XMT}{PA.XA} \qquad (9)$$

$$s_m = \frac{PM_m.XM_m}{PMT.XMT} \qquad (10)$$

$$s_{m,T} = \frac{PM_m.XM_m}{PA.XA} \qquad (11)$$

The derivations also make use of the expression in equation (12), i.e. the partial derivative of the aggregate price, for example *PA*, with respect to a component price, say P_i. The derivative is equal to the component's share in the aggregate times the ratio of the price. For example, if the prices are equal to 1 in some initial period and the component's share is 10%, an increase in the price of the component by 10% would lead to (more or less) an increase of only 1% in the price of the aggregate.

$$\frac{\partial PA}{\partial P_i} = s_i \frac{PA}{P_i} \tag{12}$$

Equation (13) shows the derivation of the demand elasticity of aggregate imports with respect to the price of 'MFN' imports. This elasticity is unambiguously negative. It increases (in absolute terms) the higher the top-level substitution elasticity, the higher the domestic share of consumption and the higher the share of the 'MFN' import relative to total imports. If the price of 'MFN' imports declines, the demand for aggregate imports will increase and the increase will be higher the greater the substitution elasticity, the share of the 'MFN' good relative to aggregate imports and the share of the domestic good in total demand.

$$\begin{aligned}
\varepsilon_{MT,m} &= \frac{\partial XMT}{\partial PM_m}\frac{PM_m}{XMT} \\
&= \frac{PM_m}{XMT}\left[\alpha^M\left(\frac{PA}{PMT}\right)^{\sigma^m}\frac{XA}{PA}\frac{\partial PA}{\partial PM_m}\sigma^m - \alpha^M\left(\frac{PA}{PMT}\right)^{\sigma^m}\frac{XA}{PMT}\frac{\partial PMT}{\partial PM_m}\sigma^m\right] \\
&= \frac{PM_m}{XMT}\left[\sigma^m\frac{XMT}{PA}\frac{\partial PA}{\partial PMT}\frac{\partial PMT}{\partial PM_m} - \sigma^m\frac{XMT}{PMT}s_m\frac{PMT}{PM_m}\right] \\
&\quad \frac{PM_m}{XMT}\left[\sigma^m\frac{XMT}{PA}s_M\frac{PA}{PMT}s_m\frac{PMT}{PM_m} - \sigma^m\frac{XMT}{PM_m}s_m\right] \\
\varepsilon_{MT,m} &= \sigma^m s_M s_m - \sigma^m s_m = \sigma^m s_{m,T} - \sigma^m s_m = -\sigma^m(s_m - s_{m,T}) = -\sigma^m s_D s_m
\end{aligned} \tag{13}$$

Equation (14) determines the demand for imports from the 'preferential' supplier with respect to the import price of the 'MFN' supplier. The elasticity has an ambiguous sign, though in most cases it will be positive, in other words, a decrease in the 'MFN' tariff will be associated with a decrease in the demand for 'preferential' imports. If the ratio of the two substitution elasticities is less than the domestic share of

absorption, then the 'income' effect dominates the 'substitution' effect, i.e. the overall increase in import demand is sufficient to increase the demand for imports from both regions. However, typically the second-level elasticity is greater than the top-level elasticity.

If we take some typical values, say σ^m set to 4 and σ^w set to 8, assume the domestic share is 75 percent and the 'MFN' share of imports is 25 percent, then the elasticity is 1.25. Therefore, a 1 percent decline in the price of 'MFN' imports would generate approximately a decline of 1.25 percent in the demand for preferential imports. A doubling of the 'MFN' share, to 50 percent of total imports, leads to a doubling of the elasticity and therefore a 1 percent decrease in the price of imports would lead to a 2.5 percent decline in the demand for 'MFN' imports. An increase in the share of domestic consumption, i.e. a decline in the aggregate import share, leads to a decline in the elasticity, but of a relatively small magnitude because the domestic share parameter is multiplied by the 'MFN' share parameter.

$$
\begin{aligned}
\varepsilon_{p,m} &= \frac{\partial XM_p}{\partial PM_m}\frac{PM_m}{XM_p} \\
&= \frac{PM_m}{XM_p}\left[\alpha^p\left(\frac{PMT}{PM_p}\right)^{\sigma^w}\frac{XMT}{PMT}\frac{\partial PMT}{\partial PM_m}\sigma^w + \alpha^p\left(\frac{PMT}{PM_p}\right)^{\sigma^w}\frac{XMT}{XMT}\frac{\partial XMT}{\partial PM_m}\right] \\
&= \sigma^w\frac{XM_p}{PMT}s_m\frac{PMT}{PM_m}\frac{PM_m}{XM_p} - \frac{XM_p}{XMT}\frac{\partial XMT}{\partial PM_m}\frac{PM_m}{XM_p} \\
&= s_m\sigma^w - s_m s_D\sigma^m \\
\varepsilon_{p,m} &= s_m(\sigma^w - \sigma^m s_D)
\end{aligned}
\qquad (14)
$$

The final expression, equation (15), shows the own-price elasticity for 'MFN' imports. It is unambiguously negative.

$$
\begin{aligned}
\varepsilon_{m,m} &= \frac{\partial XM_m}{\partial PM_m}\frac{PM_m}{XM_m} \\
&= \left[s_m\sigma^w - s_m s_D\sigma^m - \sigma^w\frac{PM_m}{XM_m}\alpha^m\left(\frac{PMT}{PM_m}\right)^{\sigma^w}\frac{XMT}{PM_m}\right] \\
&= s_m\sigma^w - s_m s_D\sigma^m - \sigma^w \\
&= -\sigma^w(1-s_m) - \sigma^m s_m s_D \\
\varepsilon_{m,m} &= -\sigma^w + s_m(\sigma^w - \sigma^m s_D)
\end{aligned}
\qquad (15)
$$