The Joint Impact of Specific Tariffs and Preferential Trade Agreements: Do Low Income Countries Gain or Lose?†

Sohini Chowdhury*

April 2009

My paper attempts to measure the distortionary effects of specific tariffs in agriculture, in the presence of Preferential Trade Agreements (PTAs). The goal is to analyze whether the preferential trade benefits extended to Low Income Countries (LICs) result in 'real' gains in market access and welfare for LICs, or whether they simply neutralize the losses from specific tariffs faced by LICs on account of their lower export prices. The results from my analysis indicate the latter, implying that specific tariffs in agriculture completely erode away the welfare and market access benefits accruing to LICs from preferential tariffs in agriculture. This calls for a shift in focus in future WTO ministerial meetings; with greater emphasis on converting specific tariffs in agriculture into advalorem tariffs rather than on increasing preferential treatments to LICs.

* Ph.D. Candidate, Department of Economics, Purdue University. Email: schowdhu@purdue.edu
† Comments and suggestions provided by Chong Xiang, Tom Hertel, David Hummels, Luca Salvatici, David Laborde, Badri Narayanan Gopalakrishnan, Anca Cristea and Tasneem Mirza are greatly appreciated.

1. Introduction

Specific tariffs are fixed tariffs levied per unit of the commodity. Their incidence is highest in the agricultural sector worldwide where they are used as the main instrument of protection (see Section 3). To make them comparable to advalorem tariffs, they are converted into their advalorem equivalents (AVEs) by dividing by the f.o.b price of exports. Since low income countries (LICs) export lower quality and lower priced varieties (Schott 2004), they end up facing higher AVEs from the same MFN specific tariff rates vis-à-vis rich countries. This means that although WTO member countries are bound by contract to apply MFN tariff rates - either advalorem, specific or both, on all trading partners, the presence of specific tariffs makes the AVEs of the applied tariff rates non-MFN. The other source of non-MFNness in applied tariff rates is the existence of preferential trade agreements (PTAs) between countries. A large number of LICs benefit from these trade agreement which consequently lower the effective tariff rates faced by them vis-à-vis the developed countries. In a nutshell, this means that the effective tariff rates faced by LICs vis-à-vis developed countries are governed by two opposite forces - specific tariffs which raise their AVEs, and PTAs which lower their AVEs. The purpose of this paper is to determine the joint impact of PTAs and specific tariffs on welfare and market access in LICs. This is achieved through a stage-wise elimination of each effect followed by a results analysis at each stage.

My paper also studies the welfare impact of specific tariffs and PTAs on the developed importing countries. This is based on the premise that MFN specific tariffs having a cross-exporter level of variation are more distortionary than MFN advalorem tariffs and may generate a greater deadweight loss (DWL) in the importing country. On the other hand, levying lower tariffs on LICs through PTAs might successfully counter this additional DWL through a lower allocative efficiency loss, but might also erode away some of the TOT gains for the importer.

To summarize therefore, my paper attempts to answer the following question – Are the losses from specific tariffs in agriculture high enough to completely erode away the gains from preferential tariffs in agriculture, for both LICs and developed countries?

2. Literature Review

My paper relates to three strands of literature – PTAs, specific tariffs and the Global Trade Analysis Project (GTAP) model.

PTAs have been the subject of countless studies since the late 80s – a period which witnessed a domino-effect-induced sharp rise in their proliferation rates. Viner's 1950 classic paper was a watershed in the study of the welfare effects of PTAs. His paper showed that a customs union might not necessarily be welfare improving for its members. Viner argued that whether or not a customs union is welfare improving for its members and for the world as a whole depends on whether it is trade diverting or trade creating. Bhagwati and Panagariya (1996) show that even PTAs among "natural trading partners" are not necessarily trade creating as believed earlier (Krugman, 1991; Summers, 1991; Lutz, 1989). Trade diversion, in the sense of diverting away imports from a more efficient non-member to a less efficient member, is a result of the 'beggar-thy-neighbor' discriminatory nature of PTAs. Moreover, the uncontrolled proliferation of PTAs the world over (the number of Regional Trade Agreements in the world is estimated to be around 400 by 2010; Lamy, 2006) has created a 'spaghetti bowl" of trade deals that actually hinder world trade (Bhagwati, 1996). Of even greater concern is the belief that this spaghetti bowl falls much harder on the small and poor countries of the world which lack the resources and negotiating leverage to navigate against the tangled weave of rules and regulations (Baldwin, 2008). This is consistent with the findings of Stibora and Vaal (2006) that joining a PTA does not guarantee welfare gains for the low income country, unless it's so poor that it cannot import the higher-ranked goods that rich countries produce. Baldwin (2008) believes that the inefficiency costs of regionalism have increased with the internationalism of manufacturing.

Specific tariffs, being fixed tariffs per unit of the commodity discriminate against exporters of low quality varieties. Since the exporters of low quality varieties are the low income countries (Schott, 2004), MFN specific tariffs generate a higher AVE for LICs.

3. Data Sources and Aggregation Issues

The partial equilibrium analysis requires highly disaggregated US bilateral import and tariff data. These data are sourced from the Feenstra compiled NBER data set and the MAcMap-HS6v2.02 data set respectively. While the trade data corresponds to year 2001, the tariff data is for year 2004. The Feenstra dataset contains bilateral US import values and import quantities at the HS10 level of commodity disaggregation. The MAcMap-HS6 database provides information on the advalorem and specific components to the MFN and preferential tariff rates, for a set of x importers, y exporters and z hs6 commodities. The dataset also contains different unit values – bilateral, importer, exporter and exporter reference group (ERGUV). The sensitivity of my results to the choice of unit values used in computing the AVEs of specific tariffs is discussed in section 5.1.5. Finally, data on US elasticity of substitution for import demand and export supply, by hs8 commodity category is from the Broda-Weinstein dataset. The US GDP for 2001 is taken from the World Development Report to be equal to $10082 billion.

The data used for the general equilibrium analysis is taken from the GTAP version 7 database containing trade and tariff data for goods and services for the year 2001. The trade data for the 96 regions and 57 commodities is taken from Comtrade and the tariff data is taken from MAcMap-HS6. To facilitate analysis, the data is further aggregated to just 2 commodities – AGRI (agriculture: HS01-24) and NAGRI (non-agriculture), and 5 regions – USACAN (USA+Canada), EU27 (27 EU countries), JPNSEA (Japan and South East Asia), LIC (Low Income Countries) and ROW. A detailed list of the countries and commodities in each region is provided in the appendix. The GTAP database contains only the preferential applied tariff rates from MAcMap, aggregated to the GTAP level. To obtain the MFN applied tariff rates at the GTAP level of aggregation, the MFN applied tariff rates at the HS6 level from MAcMap are aggregated through simple unweighted means using the SAS program.

One major drawback of using the GTAP database to run tariff scenarios is that since there are literally hundreds of tariff lines within each GTAP sector, there is substantial loss of information from aggregation. An ideal tool in such a case is to use the TASTE (The Tariff Analytical and Simulation Tool for Economists) program. The TASTE program allows the user to translate a scenario of changes in bound tariff rates, described in the HS6, 200-country level of detail into a matrix of changes in applied tariff rates which are averaged to the user level of detail (Horridge and Laborde, 2008). This matrix contains percentage changes in the power of tariff which can be used directly to shock the GTAP model. TASTE is not used in the current version of my paper because of the following problem: in TASTE, tariff scenario changes can only be specified through changes in the bound tariff rates. These user-specified changes in bound tariff rates are then converted into equivalent changes in MFN applied rates and preferential applied rates using information on the binding overhang in TASTE. The results of the tariff scenario change are presented as a matrix showing the old and new bound and applied tariff rates for each commodity-importer-exporter combination. Since my theory relies on changing the final applied rates directly, TASTE can only be applied in my case after calculating the equivalent % changes in bound tariff rates required to generate the necessary % changes in applied tariff rates. This would require detailed information the binding overhang for each commodity-importer pair. The current version of my paper therefore doesn't apply TASTE and instead applies the tariff changes on final applied tariffs directly as shocks in GTAP as discussed in details in section. The drawback of applying the tariff shocks directly in GTAP is that the tariff changes are no longer applied at the tariff line level but are aggregated to a very broad level and therefore result in significant loss of information. Till the methodology in my paper is modified to run tariff scenarios using TASTE, we have to rely on the results obtained from directly shocking the GTAP model.

4. Summary Statistics

4.1 US Imports

Analyzing the data for only US imports, figures 1.1 and 1.2 show the incidence of MFN specific tariffs and MFN advalorem tariffs as separate components of the applied MFN tariff schedule in the US in 2001, in each of the hs2 categories (obtained by a simple average over all the hs6 products within each hs2 category) imported by the US. The figures indicate that while MFN advalorem tariffs are distributed uniformly across product groups (the outlier being the exceptionally high tariffs on hs2=24 which is the category of tobacco and substitutes), MFN specific tariffs are concentrated mainly in the agricultural sectors, with the sectors facing high (>=100 USD per ton) MFN specific tariffs being dairy produce (04), vegetable plaiting materials (14), sugar and confectionary (17), cereals, flour, starch, milk (18), cocoa and its preparations

(19), miscellaneous edible preparations (21), tobacco and its substitutes (24), footwear, gaiters (64), headgear (65), clocks and watches (91).

Schott showed the empirical existence of a significant positive relationship between unit values and per-capita income in the manufacturing industry, which when compared to agriculture is characterized by greater quality differentiation and a stronger correlation between the exporter's level of quality supply and his endowment of skill and capital. I test the strength of this relation in the agriculture sector where specific tariff tariffs are predominant. My results in table 1 show that the positive relationship carries over to the agricultural sector also, though in a diluted but significant strength. I estimate the following regression pooling across all j's and all k's which fall under hs2<=24 (agricultural goods), with hs6 commodity fixed effects

$$\ln ave_{jk} = \alpha_k + \beta \ln percapitaGDP_j + \xi_k \quad (5)$$

I get a $\hat{\beta} = -0.14$ which is highly significant with pretty low standard errors equal to 0.016, suggesting that doubling per capita GDP lowers the AVEs (corresponding to the base specification) of specific tariffs on agricultural goods by 14% on an average. As an additional exercise, I rerun the above regression separately for those hs2 commodities which show high incidence of specific tariffs, pooling over all varieties with hs6 commodity fixed effects. The significant negative relation between the AVEs and exporter percapita GDP establishes that MFN specific tariffs have non-MFN AVEs systematically biased against the exporters of low quality varieties – the developing countries. Plotting the coefficient of variation of unit values for each hs6 commodity in Fig3 shows the extent of dispersion of unit values within each hs6 commodity which confirms that unlike MFN advalorem tariffs, MFN specific tariffs have an additional tier of cross exporter variation associated with them.

4.2 World Imports

Figures 3.1 and 3.2 compare the distribution of MFN and preferential specific and advalorem tariffs across all agricultural commodities, by all importers. The figures do not show significant differences between the MFN and preferential tariffs. The specific tariffs for tobacco (hs2 =24) are a very large number (>7000 USD per ton) and has therefore not been shown in Fig. 3.2 for fear of dwarfing all the other values. Figure 4 shows the distribution of MFN tariffs across all importers and figure 5 shows the distribution of the AVEs of MFN specific tariffs across all exporters. Table 3.1 shows the pre-simulation import tariffs rates by region obtained from the GTAP database.

The following observations are made from table 3.1:

1. Tariffs on agricultural goods (AGRI) are on average higher than tariffs on non-agricultural goods (NAGRI).
2. On an average, agricultural imports face the highest tariff barriers in the LICs and the lowest tariff barriers in the US-Canada region.
3. The average tariffs faced by the LICs in agriculture are lower than the average tariffs faced by all other regions. This is most likely a result of the numerous trade benefits granted to the LICs in agricultural trade.

5. Research Methodology

A sequential two-stage procedure is applied to obtain results. In the first stage, all preferential trade agreements in agriculture offered by rich countries are eliminated by forcing rich countries to move from preferential tariffs *tp* to MFN tariffs *tm*. In the second stage, starting from the updated data from the first stage, specific tariffs in agriculture are eliminated by forcing rich countries to move from MFN tariffs *tm* to the constructed MFN AVE tariffs *tc*. The resulting cumulative change in welfare and market access for the LICs and rich countries shows the joint effect of specific tariffs and PTAs. The MFN AVE tc corresponding to the importer i - commodity k pair is constructed as the trade weighted mean of the AVEs over all exporters *j* exporting commodity *k* to importer *i*.

Formally, *tc* for a particular importer *i* is defined as

$$tc_i = \{tc_{ik(1)}, tc_{ik(2)}, \dots, tc_{ik(K)}\} \tag{6}$$

Where, $k(1), k(2), \dots, k(K)$ are the K hs6 commodities imported by importer i and

$$tc_{ik} = tradewtdmean\left(\frac{s_{ik}}{p_{ijk}}\right),\ averaged\ over\ all\ j \tag{7}$$

Comparing the three tariff schedules we see that while *tp* is non-MFN due to the presence of both PTAs and specific tariffs, *tm* is non-MFN from the non-MFN AVEs of the specific tariffs. *tc* on the other hand is pure MFN, having replaced all specific tariffs with their trade weighted mean AVEs.

There are two separate sections to this paper. The first section discusses three partial equilibrium models with increasing levels of complexities. Each model considers the US as the only importer. Starting from a basic benchmark model, the limitations of each model are discussed paving the way for the next more complex model. But the biggest drawback of each of these PE models is that they ignore the sequential nature of the solution procedure through failure to update the data after the first step. So in each of these models, the two-step solution procedure essentially reduces to a single step comparing the scenarios corresponding to the initial tariffs *tp* and the final tariffs *tc*. To overcome this shortcoming, the problem is finally analyzed using a full blown general equilibrium model with multiple importers described in section 5.2.

5.1 Partial Equilibrium Models

5.1.1 Model 1: small country linear model

In this model, the import demand and export supply curves are assumed to be linear. Also, the importing country is assumed to be significantly ‘small’, facing horizontal export supply curves. After normalizing world prices to unity, the analytical expression for the DWL faced by the US and the import volume loss faced by the all LIC exporters in this case is given by

$$DWL_{US}(t) = \frac{1}{2}\sum_j \sum_k q_{jk}\sigma_k t_{jk}^2 \qquad (9)$$

$$\Delta M_{LIC}(t) = \sum_j \sum_k q_{jk}\sigma_k t_{jk} \qquad (11)$$

where $j \in$ {all developing country exporters of the US}, q_{jk} is the quantity of imports of commodity k from exporter j and σ_k is the import demand elasticity of substitution between the j-armington varieties of good k.

Model 1 has two major limitations. Firstly, comparisons of DWL_{US} and for the three different tariff scenarios is only made possible by assuming that the import demand substitution elasticities corresponding to the tariff schedules tp, tm and tc are the same. This is because we observe elasticities only for the actual case of $t = tp$. The other two scenarios are counterfactuals with the import demand elasticities non-computable since counterfactual quantities are not observed. Secondly, the small country assumption of the US facing infinite export supply elasticities, removes the possibility of the countries exporting to the US facing a DWL from US tariffs and also the possibility of the US and its exporters facing TOT gains/losses. Since a crucial point of this paper is to analyze the DWLs faced by the developing countries exporting to the US, this is a major limitation of this model.

In order to counter the first problem, we propose a CES model of import demand in the following section which ensures constant import demand substitution elasticities throughout a demand curve. In order to counter the second problem, we propose a model with the US facing positively sloped CES export supply curves in section 5.1.3.

5.1.2 Model 2: small country model with CES import demand

Import demand curves are CES, export supply curves are flat

$$q_{jk} = a_{jk} p_{jk}^{-\sigma_k}$$

With data on q_{jk} and p_{jk}, a_{jk} is estimated as

$$\widehat{a_{jk}} = q_{jk} p_{jk}^{\sigma_k}$$

After normalizing world prices to unity, the aggregate DWL faced by US is

$$DWL_{USA}(t) = \sum_j \sum_k \frac{\widehat{a_{jk}}}{\sigma_k - 1} \{1 - (1 + t_{jk})^{-\sigma_k} (1 + t_{jk}\sigma_k)\}$$

The aggregate loss in imports from all developing country exporters is

$$\Delta M_{LIC}(t) = \sum_j \sum_k \widehat{a_{jk}} - \sum_j \sum_k \widehat{a_{jk}} (1 + t_{jk})^{1-\sigma_k}$$

Where j = {all developing countries}

The DWL and import loss corresponding to each tariff scenario is obtained by replacing t with tp, tm and tc in the above expressions, while keeping unchanged all other parameters of the model including the σ_k's since the model is CES. The results from the model and explained in section 5.1.4

Although the CES import demand functional form permits counterfactual exercises it does not permit the analysis of the exporters DWL since by the small country assumption, the export supply curves faced by the US are horizontal. This problem is solved using a model with both CES import demand and export supply curves as discussed in the following section.

5.1.3 Model 3: large country model with CES import demand and CES export supply

The model assumes the US as the only importer, facing CES import demand and export supply curves.

This import demand curves for US imports are given by

$$q_{jk} = a_{djk} p_{jk}^{-\sigma_{dk}} \quad (1)$$

The export supply curves faced by the US are given by

$$q_{jk} = a_{sjk} p_{jk}^{\sigma_{sk}} \quad (2)$$

Where, j is an exporter index, k is a good index, σ_{dk} is the import demand elasticity of substitution between the various armington import varieties of good k, and σ_{sk} is the price elasticity of supply of exports of good k from the rest of the world as faced by the US. a_{djk} and a_{sjk} are the shift parameters corresponding to the import demand and export supply curves respectively. The values of $a_{djk}$are estimated from (1) using information on the bilateral import quantities, prices and the import demand elasticities of substitution.

$$\widehat{a_{djk}} = q_{jk} p_{jk}^{\sigma_{dk}} \quad (3)$$

All other variables are endogenously determined. An assumption which is made to facilitate the analysis of the counterfactual tariff scenario is that the domestic observed prices in the US are independent of the tariff levels. These prices are normalized to unity. This means that while the supply prices received by the exporters are determined by the tariff levels as $\frac{1}{1+t_{jk}}$, the distribution of this tariff between the US importer and LIC exporter is determined by the import demand and export supply elasticities σ_{dk} and σ_{sk}.

Solving the model generates analytical expressions for the aggregate deadweight losses faced by the US from levying import tariffs on agricultural commodities and the aggregate deadweight losses and import value losses accruing to all LICs from these import tariffs, all as functions of the tariff rate *t*.

The aggregate DWL faced by US is given by the expression

$$DWL_{US} = \underbrace{\sum_j \sum_k \left[\frac{\widehat{a_{djk}}}{\sigma_{dk}-1}(1+t_{jk})^{\frac{\sigma_{sk}(1-\sigma_{dk})}{\sigma_{dk}+\sigma_{sk}}} - \frac{\widehat{a_{djk}}\sigma_{dk}}{\sigma_{dk}-1} + \widehat{a_{djk}}(1+t_{jk})^{\frac{-\sigma_{sk}}{\sigma_{dk}+\sigma_{sk}}}\right]}_{Allocative\ Efficiency\ Loss} \tag{4}$$

$$- \underbrace{\sum_j \sum_k \left[\frac{(1+t_{jk})^{\frac{\sigma_{dk}}{\sigma_{dk}+\sigma_{sk}}}}{1+t_{jk}}\right]}_{TOT\ Loss} \widehat{a_{djk}}$$

The combined aggregate DWL of all LICs exporters is given by

$$DWL_{LIC} = \underbrace{\sum_j \sum_k \left[\frac{\widehat{a_{djk}}}{\sigma_{sk}+1}(1+t_{jk})^{\frac{\sigma_{sk}(\sigma_{dk}-1)}{\sigma_{sk}+\sigma_{dk}}} + \frac{\widehat{a_{djk}}\sigma_{sk}}{(1+t_{jk})(\sigma_{sk}+1)} - \widehat{a_{djk}}(1+t_{jk})^{\frac{-\sigma_{sk}}{\sigma_{dk}+\sigma_{sk}}}\right]}_{Allocative\ Efficiency\ Loss} \tag{5}$$

$$+ \underbrace{\sum_j \sum_k \left[\frac{(1+t_{jk})^{\frac{\sigma_{dk}}{\sigma_{dk}+\sigma_{sk}}}}{1+t_{jk}}\right]}_{TOT\ Loss} \widehat{a_{djk}}$$

The combined aggregate import value loss faced by all LICs is given by

$$\Delta M = \sum_j \sum_k \left[\frac{1-(1+t_{jk})^{\frac{\sigma_{dk}(\sigma_{sk}+1)}{\sigma_{sk}+\sigma_{dk}}}}{1+t_{jk}}\right] \widehat{a_{djk}} \tag{6}$$

The following special cases are observed from (4) and (5) and (6):

1. When $t_{jk} = 0$, for all j, k

   TOT loss and allocative efficiency loss for both the US and each LIC exporter is 0. That is, DWL for both importers and exporters is 0. Although DWL = 0, welfare is not optimum for the US since DWL can be positive from positive TOT gains. Import value loss for each LIC is also 0.

2. When $\sigma_{sk} = \infty$, for all k, indicating a flat export supply curve faced by the US,

   The TOT gains for the US and TOT losses for each LIC are 0

3. When $\sigma_{dk} = \infty$, for all k, indicating a flat import demand curve faced by the US,

   The allocative efficiency losses for the US are 0

5.1.4 Results

Table 2.1 compares the US welfare and LIC market access losses corresponding to the different tariff schedules obtained from the three different models. Table 2.2 shows the decomposition of the DWLs accruing to the US and its LIC exporters as obtained from model 3. The results are consistent with the theory. The results show that the DWL faced by the US decreases from model 1 to model 2 to model 3. This is because the area of the harberger triangle is the largest in model 1 owing to the linear import demand curve. This area decreases in model 2 owing to the convex CES import demand curve. The allocative efficiency loss is further smaller in model 3, because in this model a part of the loss is borne by the exporters too. Moreover, the TOT gains in model 3 further reduce the overall DWL faced by the US. Comparing the import value losses, they are the same for model 1and 2 but are lower in model 3 because in model 3, the domestic prices in the US do not rise by the full extent of the import taxes owing to the positively sloped export supply curves faced by the US.

Step 1 of the analysis compares the welfare and import losses from the applied preferential tariff rates *tp* to those from the MFN applied tariff rates *tm*. The results shown in table 2 indicate that when the US removes all preferential benefits to LIC exporters in the import of agricultural goods, the LICs together incur an additional welfare loss from an increase in allocative inefficiency and a worsening of TOT. The US on the other hand faces an increase in allocative inefficiency and an improvement in its TOT. Overall, there is an improvement in US welfare indicating that the TOT gains are larger than the allocative efficiency losses. The results suggest that the while the US loses from extending preferential tariff rates to LICs in agriculture, the LICs benefit from the resulting increases in welfare and market access. The US welfare loss stems mainly from lower TOT gains.

Step 2 of the analysis compares the welfare and import losses corresponding to the MFN applied tariffs *tm* to those corresponding to the MFN AVE tariffs *tc*. The MFN AVE tariff rate for commodity *k* is constructed as the import-weighted mean of the AVEs corresponding to *k*, the mean taken over all exporters *j*. The results of the comparison shown in table 2 indicate that starting from MFN tariffs, when the US converts all specific tariffs in agriculture to advalorem tariffs, all LIC exporters together incur a welfare gain from an increase in allocative efficiency and an improvement in TOT. Additionally, there is an increase in LIC agricultural exports to the US. The US on the other hand faces an increase in allocative efficiency and a worsening of its TOT. Overall, there is an improvement in US welfare indicating that the TOT losses are smaller than the allocative efficiency gains. The results suggest that both the US and its LIC exporters stand to gain from eliminating specific tariffs in agriculture.

Finally, comparing the initial and final scenarios i.e the welfare and market access losses corresponding to *t* and *tc*, we see that US specific tariffs in agriculture generate welfare and market access losses for LICs which completely neutralize the benefits of the preferential treatment that the US extends to these countries in terms of lower tariff rates.

Clearly, moving from preferential tariffs to MFN applied tariffs generates higher import value losses for the LICs, since the latter tariffs are higher. A subsequent move to the MFN AVE tariff rates results in a gain in import values as these tariff rates are lower than the MFN applied rates. The model shows that these gains are high enough to counter the first stage losses, implying that the losses faced by LICs from specific tariffs are outweigh the gains from PTAs. The question is better addressed by a general equilibrium model described in section 5.2.

5.1.5 Sensitivity of Results

The results obtained might be highly sensitive to the choice of unit values used in computing the AVEs of specific tariffs. This is because the greater the dispersion in the within-commodity cross-exporter unit values, the greater will be the distortionary effects of specific tariffs, particularly the bias against LIC in the form of higher AVEs. Since the exporter's unit value (computed as the median unit value of worldwide exports from a particular exporter) or the exporter's reference group unit value (ERGUV, computed as the median unit value of worldwide exports from an exporter's reference group) have a lower dispersion than the bilateral unit values, using these instead of bilateral unit values will generate lower distortions from specific tariffs, especially for LICs. An alternative way of stating this is that the specific tariffs-generated welfare and trade balance losses obtained in 5.1.4 are the upper bound of losses. Using the ERGUVs would generate the lower bound of these losses.

5.2 General Equilibrium Model

5.2.1 GTAP Model and Experiment

The GTAP model of global trade (version 7) is used for the general equilibrium analysis of the joint impact of specific tariffs and PTAs. GTAP is a static, multi-region, general equilibrium model which includes explicit treatment of international trade and transport margins and a "global" bank designed to mediate between world savings and investment (Hertel, 1997). The model includes: demand for goods for final consumption (Constant Difference Elasticity form), intermediate use and government consumption, demands for factor inputs (Constant Elasticity of Substitution functional form), supplies of factor and goods and the international trade of goods and services. The model employs the simplistic but robust assumption of perfect competition and Constant Returns to Scale in production. Bilateral international trade flows are handled using the Armington assumption by which products are exogenously differentiated by origin (Armington, 1969). In the standard closure, global investment adjusts to global savings so that the national balances of payments are endogenous.

While the general equilibrium model described above respects the sequential nature of our solution method, it has many more degrees of complexities when compared to the partial equilibrium model. As an example, in the partial equilibrium model the US is treated only as an importer and the LICs only as exporters. But in the general equilibrium model, every region acts simultaneously as an importer and an exporter. The analysis is further complicated by the presence of within-region trade in the model – an outcome of aggregating regions.

An experiment with two sequential shocks is performed to analyze the joint impact of specific tariffs and PTAs. The first shock eliminates all preferential treatments given in agricultural imports. This is achieved by switching the tariffs on agricultural imports from preferential to MFN. Using the updated data after the first shock, the second shock converts all specific tariffs in agriculture into their mean AVEs. This is done by switching the tariffs imposed on agricultural imports from MFN to MFN AVE. The base tariff rates (pre-simulation) and the updates tariff rates after each shock are shown in tables 3.1 and 3.2 respectively. The changes in welfare and trade balances resulting from each shock are analyzed at depth in the following section.

5.2.2 Results: Welfare Changes

The results suggest that PTAs and specific tariffs have different welfare impacts on different regions. The cumulative effects of the two sequential simulations suggest that the world as a whole faces a welfare loss of US$855 million from the joint effect of PTAs and specific tariffs in agriculture, with LICs losing US$3117.15 million. These results are shown in tables 4.1 and 4.2.

A shock-wise analysis of the results shows that eliminating PTAs in agriculture generates an overall welfare loss for all regions excepting USACAN. Decomposing these welfare losses shows that every region (exporter and importer) faces an allocative efficiency loss since MFN tariffs are higher than preferential tariffs. EU27 faces large allocative efficiency losses since most of the within-EU27 trade benefits from various FTAs. Regarding the TOT effects, LICs face TOT losses from the removal of PTAs. This is due to the higher MFN tariffs faced by the LIC exporters instead of lower preferential tariffs. On the other hand, JPNSEA, USACAN and EU27 face TOT gains from levying these higher tariffs. Exporters of agriculture lose, whereas importers gain and LICs lose, being the major exporters of agriculture. EU27 and USCAN also have substantial exporters, but their losses are washed out by their importers' gains. JPNSEA faces the biggest TOT gain since it mainly comprises of agricultural importers. The TOT gains in EU27 from removal of PTAs are not strong enough to counter the very high allocative efficiency losses from the same. In JPNSEA and USACAN, it is the reverse. So to summarize the results of the first shock, removal of PTAs in agriculture generate welfare losses for all regions excepting USACAN and JPNSEA as shown in table 4.1. The table shows only the major and relevant effects affecting welfare, minor effects like the savings-investment changes have not been shown.

The results from Shock 2 show that starting from MFN applied tariffs, only USACAN and LIC face an allocative efficiency gain from replacing specific tariffs with advalorem tariffs. The primary reason behind EU27, JPNSEA and ROW facing allocative efficiency losses are because the MFN tariffs on exports from these regions are too low to begin with, with EU27 and JPNSEA exporters facing the lowest MFN tariff rates in agriculture. So these regions lose when they are faced with the MFN AVE tariffs which are higher compared to the MFN applied tariffs they face. These allocative efficiency losses are high enough to wash out the allocative efficiency gains from a more uniform and less dispersed MFN AVE tariff rate. Considering the TOT effects, LICs face a TOT gain from eliminating specific tariffs since they now face lower AVEs. All other regions, specially the EU and JPNSEA face TOT losses from the higher AVEs they now face. These countries also face TOT losses as importers because they import agriculture primarily from LICs which gain TOT. Table 6 summarizes the results from Shock 2, where starting from MFN applied tariffs, only USACAN and LICs gain from replacing specific tariffs with advalorem tariffs.

Finally, comparing the gains/losses from the two simulations we see that for USACAN and LICs, the losses from specific tariffs in agriculture exceed the gains from PTAs in agriculture. But for all other regions it's the reverse. The results obtained for USCAN and LIC are consistent with the results from the partial equilibrium model in section 5.1 which considers the US to be the only importer and the LICs to be the only exporters.

5.2.3 Results: Trade Balance Changes

We also analyze the region-wise changes in trade balance corresponding to agriculture. The results from shock 1 show that the combined effect of all PTAs in agriculture is to create an overall trade balance loss by all countries in the trade of agricultural goods. This suggests that the PTAs in agriculture generate more trade diversion than trade creation. Table 4.3 shows that the PTAs in agriculture benefit LIC, EU27 and JPNSEA by increasing their exports relative to imports. The results from Shock 2 show that in the absence of preferential tariffs, specific tariffs in agriculture generate greater import losses relative to export gains in agricultural trade for JPNSEA, LIC and ROW. The trade balance losses are highest for LIC since they face the highest AVEs of tariff. Finally, considering the cumulative effects of the two shocks, it is seen that specific tariffs and PTAs together generate a trade balance loss of US$ 3704.16 million in agriculture for the world as a whole.

5.2.4 Sensitivity of Results

The first check of robustness would be with the use of different unit values as described in section 5.1.5. I haven't yet computed the results from this test.

The sensitivity of my results is also checked with respect to the values of the elasticity of substitution between the various imported armington varieties (ESUBM) and between the domestic and composite imported varieties in agriculture (ESUBD). This is done through a

Systematic Sensitivity Analysis Test on the parameters ESUBD (AGRI) and ESUBM (AGRI). But since in the GTAP model ESUBM is derived from ESUBD as twice the value of ESUBD, a x% change in ESUBD is equivalent to a x% change in ESUBM. So we perform the SSA analysis only w.r.t to ESUBD (AGRI). The results presented in table 5 shows that for the first shock, with the exception of JPNSEA, the equivalent variation results for all other regions are robust to a 10% change in the ESUBD or ESUBM values for AGRI at the 95% confidence interval. This means that that we cannot predict with 95% certainty whether JPNSEA will gain or lose from the removal of PTAs in agriculture. This will depend on the value of the elasticity of substitution between the domestic and composite imported varieties of agriculture. In particular, the higher is the value of ESUBD (greater substitutability between domestic and composite imported varieties), the less will be the effect of PTAs on welfare. For the second shock, equivalent variation results for all regions are robust to the ESUBD (AGRI) values at the 95% confidence interval. The trade balance changes are also robust to the elasticity parameters.

6. Conclusions

The results of my analysis suggest that the WTO ministerial meetings in future should lay greater emphasis on converting specific tariffs in agriculture into advalorem tariffs rather than on increasing preferential treatments to LICs. This is because in the trade of agricultural goods, for almost every region of the world, the losses from specific tariffs outweigh the gains from the various preferential trade agreements.

7. References

- Bhagwati, J. and Panagariya, A. "The Theory of Preferential Trade Agreements: Historical Evolution and Current Trends", *AER 1996*
- Bouet, Antoine et al "A consistent, Advalorem Equivalent measure of Applied Protection across the world: The MAcMap-HS6 database", *CEPII, working Paper no. 2004-22(2004)*
- Boumellassa, H; Laborde, D; Mitaritonna, C. "A Consistent Picture of the Protection across the World in 2004: MAcMapHS6" *New Issues in Agricultural, Food and Bioenergy Trade, Working Paper, 2009*
- Broda, C. & Weinstein, D.E. " Globalization and the Gains from Variety", *QJE, May 2006*
- Bureau, J. & Salvatici, L. "Agricultural Trade Restrictiveness in the EU and US", *IIIS Discussion Paper No. 59, Jan 2005*
- Feenstra, Robert "Estimating the Effects of Trade Policy" *Working Paper no. 5051 (1995)*
- Gibson et al "Profiles of Tariffs in Global Agricultural markets "*USDA, Agricultural Economic Report 796 (2001)*
- Hertel, T., "Global Trade Analysis: Modeling and Applications", *Cambridge University Press*, 1997
- Horridge, J.M. and Laborde, D., "TASTE: a program to adapt detailed trade and tariff data to GTAP-related purposes", *GTAP Technical Paper*, Centre for Global Trade Analysis, Purdue University, 2008
- Krugman, P. "The Move Towards Free Trade Zone", Economic Review, 1996
- Lamy, Pascal "Gabriel Silver Memorial Lecture", Columbia University, 2006

- Schott, Peter "Across-Product versus Within-Product Specialization in International Trade", *QJE, 119(2), 2004*
- Stibora, J. and De Vaal, A. "Does Preferential Trade Benefit Poor Countries? A General Equilibrium Assessment with Nonhomothetic Preferences", *QJE, 119(2), 2004*
- Summers, L. "Regionalism and the World Trading System", *Policy implications of trade and currency zones, 1991*
- Viner, J. "The Customs Union Issue ", New York Press, 1950

Appendix

Fig. 1.1: Incidence of MFN Advalorem Tariffs in US imports

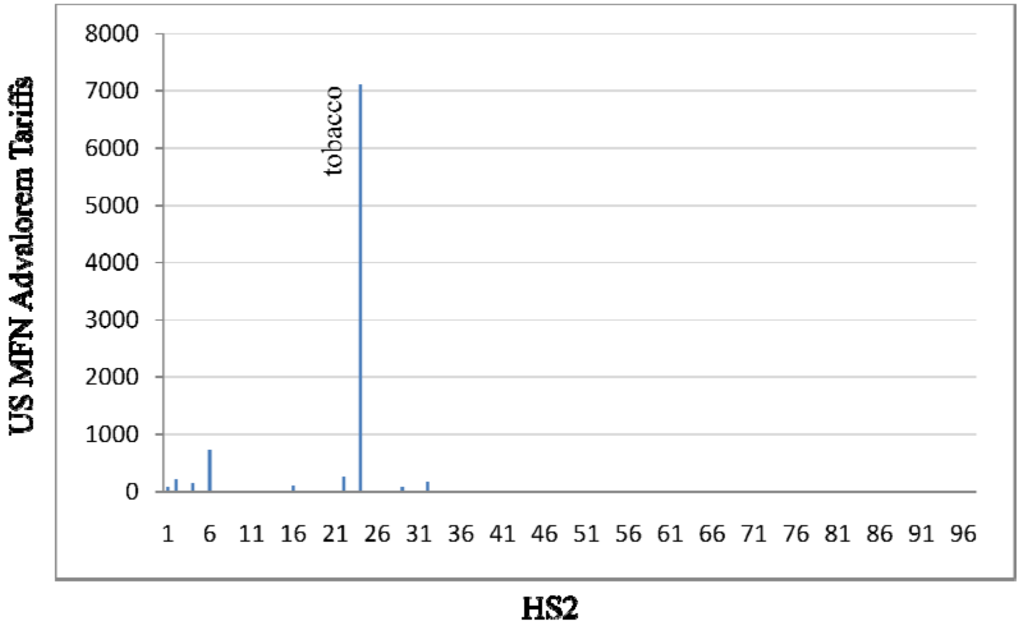


Fig. 1.2: Incidence of MFN Specific Tariffs in US imports

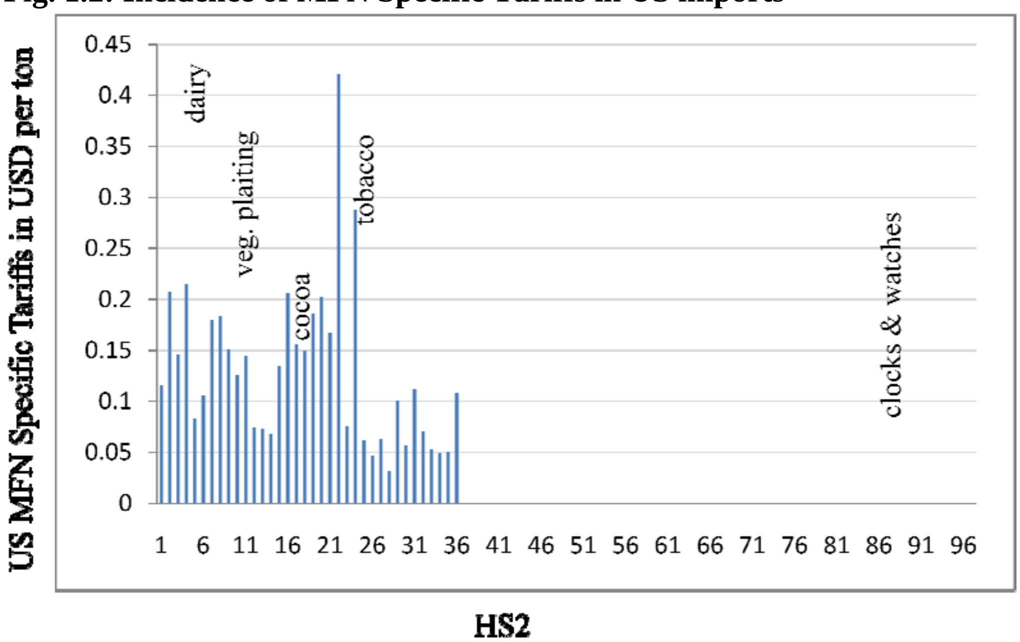


Table 1: Results from the fixed effects regression of ln(unit values) and ln(AVEs) separately, on ln(percapita GDP), pooling across all exporters of the US, with hs6-product fixed effects, for selected commodity groups.

Commodity group	Coefficient on percapita GDP	
	Dependent variable = ln(unit values)	Dependent variable = ln(AVEs)
Hs2 < = 24 (agri)	0.15 (0.0108, 0.00)	-0.14 (0.0160774 , 0.00)
Hs2 > = 24 (non-agri)	0.31 (0.0061463, 0.00)	-0.33 (0.0198125 , 0.00)
Hs2 > = 60 (mnfcs)	0.348 (0.0080642, 0.00)	-.373 (.0218037, 0.00)
Hs2 = 04 (dairy)	0.062 (0.0595999, 0.30)	-0.092 (0.0544869, 0.092)
Hs2 = 14 (veg. plaiting)	0.24 (0.155545, 0.126)	Insufficient observations
Hs2 = 17 (sugar &confec.)	0.16 (0.057994, 0.006)	-0.159 (0.062975, 0.012)
Hs2 = 18 (cereals, flour)	0.164 (0.0366882 , 0.00)	-0.116 (0.0512963, 0.024)
Hs2 = 21 (misc. edibles)	0.252 (0.0576489 , 0.00)	-0.306 (0.794627 , 0.00)
Hs2 = 22 (beverages)	0.133 (0.0464268, 0.004)	-0.125 (0.0471548, 0.008)
Hs2 = 24 (tobacco & subs.)	0.109 (0.0801113, 0.176)	-0.109 (0.0801113, 0.176)

N.B: The table shows that the relationship observed by Schott between unit values and exporter per capita GDP of manufactured goods, is also seen in agricultural goods, but to a weaker extent. The bolded entries show the commodity groups showing a statistically significant relationship. The numbers within the parenthesis are the standard errors and the p-values respectively.

Figure 2: Plot showing the dispersion of the AVEs of MFN specific tariffs within each agricultural hs6 commodity group (hs2 01-24)

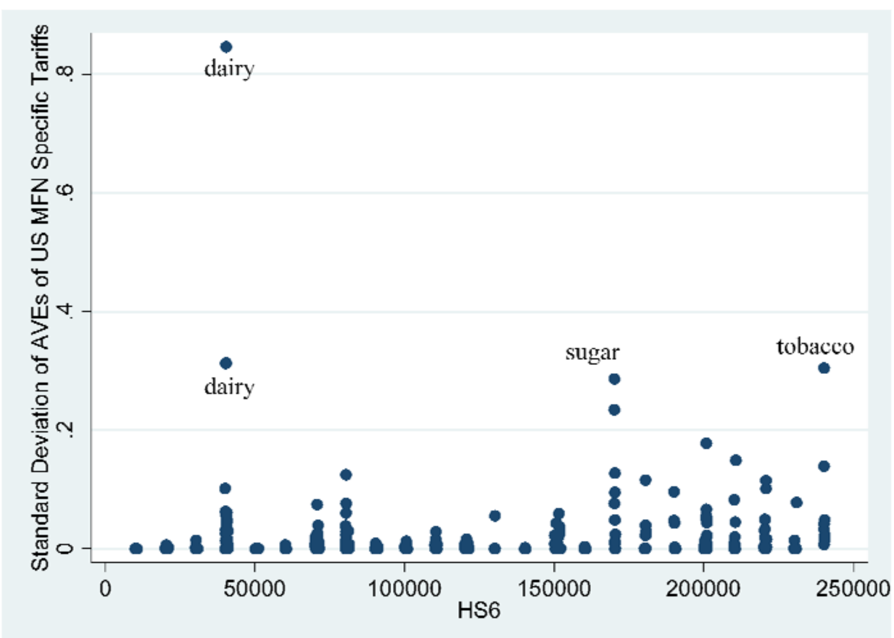


Figure 3.1: World Incidence of MFN and Preferential Advalorem Tariffs by Agricultural Commodities

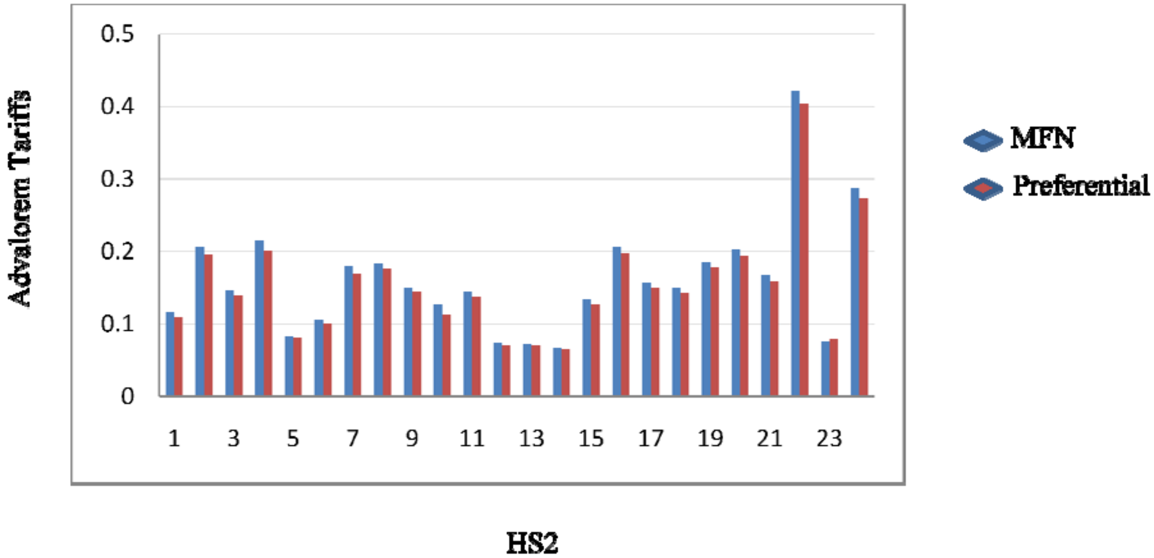
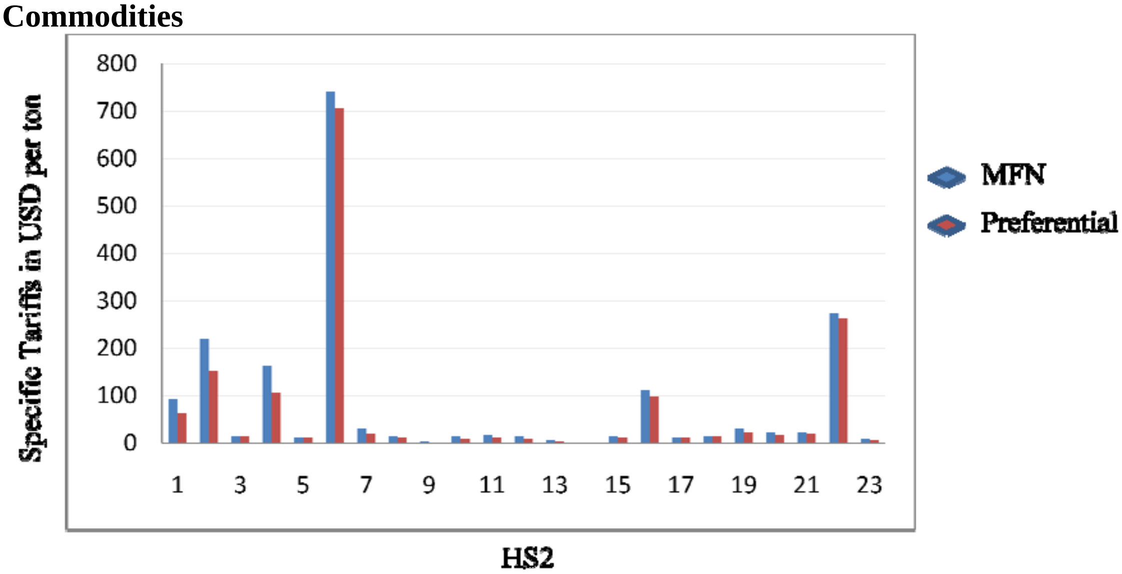


Figure 3.2: World Incidence of MFN and Preferential Specific Tariffs by Agricultural Commodities



Note: The specific tariffs in tobacco (hs2 =24) are equal to 7240 USD per ton. This is an unusually high value and has not been shown in the graph above because it would dwarf all the other values.

Figure 4: Distribution of MFN Specific tariffs in Agriculture across Importers

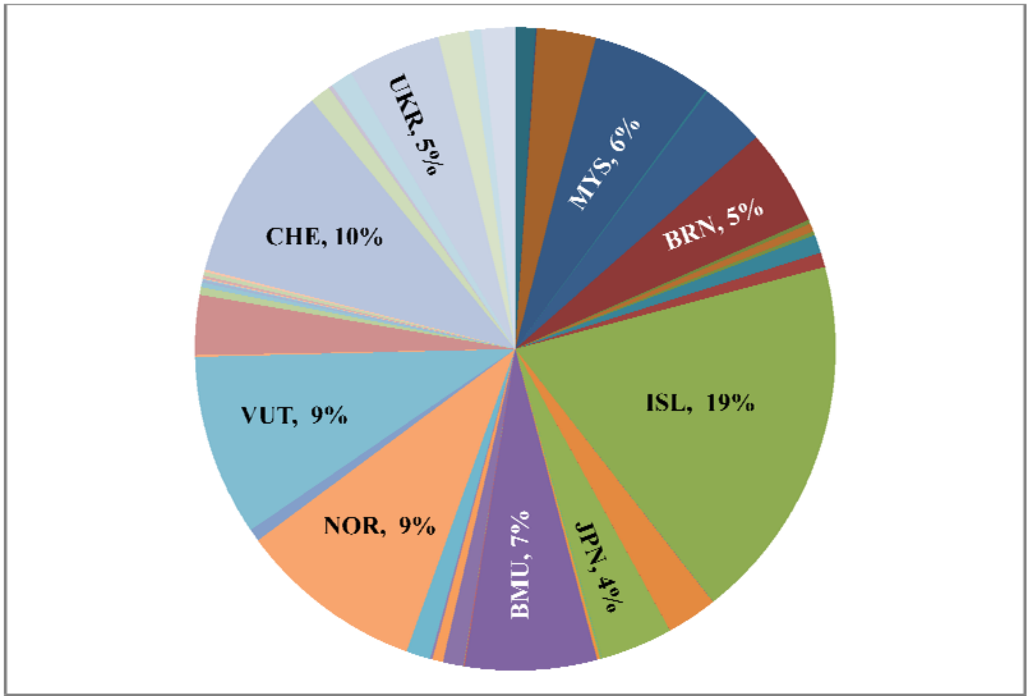


Figure 5: Bilateral Specific tariffs vs MFN Specific tariffs in Agriculture by Importers

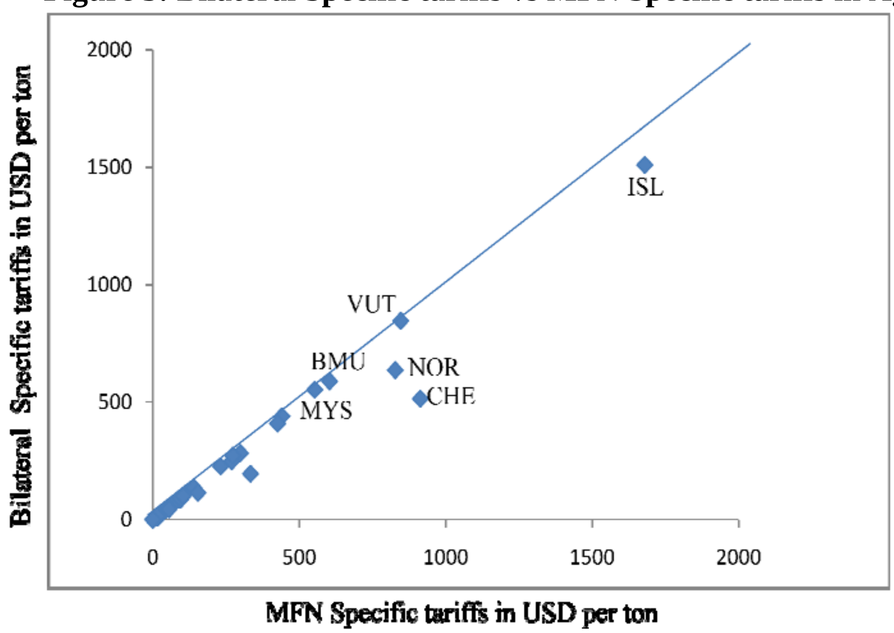


Figure 6: AVE of MFN Specific Tariffs vs AVE of Bilateral Specific Tariffs in Agriculture by Exporter

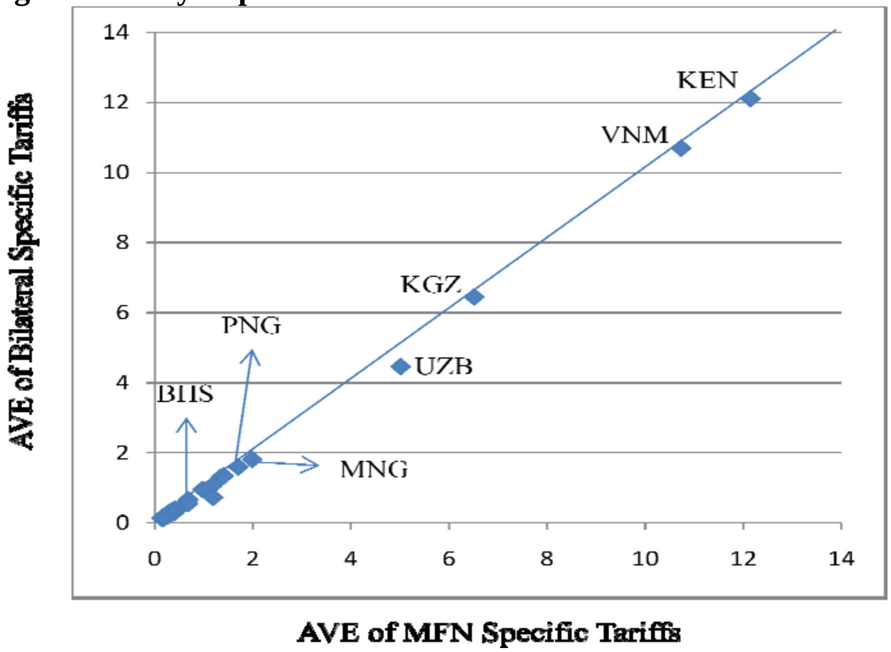


Table 2.1: The DWL (in million US$) accruing to the US and the import value loss (in million US$) accruing to all LICs, corresponding to the different tariff schedules and different models

	tp		*tm*		*tc*	
Model 1	311.21	6244.32	309.56	6246.45	307.53	6244.02
Model 2	309.67	6244.32	304.43	6246.45	303.02	6244.02
Model 3	116.43	6239.92	114.64	6241	112.07	6238.05

Table 2.2: Decomposition of the DWLs (in million US$) corresponding to the different tariff schedules from Model 3

	tp			*tm*			*tc*		
	AE Loss	TOT loss	**Total DWL**	AE loss	TOT loss	**Total DWL**	AE loss	TOT loss	**Total DWL**
USA	143.91	-27.48	116.43	143.27	-28.63	114.64	140.38	-28.31	112.07
LIC	152.22	27.48	179.7	154.55	28.63	183.18	150.06	28.31	178.37

Table 3.1: Import Tariff rates (%) by region

Importer \ Exporter	Commodity	JPNSEA	USACAN	EU27	LIC	ROW
JPNSEA	AGRI	11.248	26.468	23.543	17.932	27.903
	NAGRI	2.212	1.066	1.895	2.093	1.610
USACAN	AGRI	4.254	6.242	6.638	3.806	10.777
	NAGRI	1.696	0.000	1.255	1.991	0.699
EU27	AGRI	8.975	12.289	1.398	16.356	14.565
	NAGRI	2.199	0.997	0.004	1.288	0.234
LIC	AGRI	21.677	7.388	16.764	13.157	12.905
	NAGRI	7.093	3.619	6.698	6.292	6.802
ROW	AGRI	13.276	19.994	17.493	9.453	5.084
	NAGRI	5.363	2.342	3.872	5.127	2.224

Table 3.2: Import Tariff rates (%) on AGRI by region (post-simulation 1 and 2)

Importer \ Exporter	Commodity	JPNSEA	USACAN	EU27	LIC	ROW
JPNSEA	AGRI	23.06 **26.19**	26.98 **26.19**	23.677 **26.19**	30.160 **26.19**	27.08 **26.19**
USACAN	AGRI	5.020 **8.34**	6.630 **8.34**	7.870 **8.34**	11.16 **8.34**	11.05 **8.34**
EU27	AGRI	10.780 **13.60**	13.889 **13.60**	10.379 **13.60**	17.98 **13.60**	14.98 **13.60**
LIC	AGRI	21.89 **23.51**	21.78 **23.51**	20.37 **23.51**	31.54 **23.51**	22.00 **23.51**
ROW	AGRI	17.84 **19.89**	20.32 **19.89**	18.05 **19.89**	22.48 **19.89**	20.77 **19.89**

Note: The values in the shaded boxes are the MFN AVE tariff rates, obtained after shock 2

Table 4.1: Welfare Decomposition after Shock 1 (in million US$)

Welfare	1 alloc_A1	5 tot_E1	Total
JPNSEA	-723.644	1661.622	453.804
USACAN	-501.575	900.813	400.862
EU27	-2410.211	722.606	-1752.338
LIC	-847.623	-1321.473	-1985.89
ROW	-100.352	71.039	-32.132
TOTAL	-4583.39	2133.97	-2915.69

Table 4.2: Welfare Decomposition after Shock 2 (in million US$)

Welfare	1 alloc_A1	5 tot_E1	Total
JPNSEA	-211.601	-492.912	-711.561
USACAN	400.192	-163.062	250.304
EU27	-493.515	-254.440	-750.64
LIC	1576.827	3728.330	5103.046
ROW	-150.038	-77.868	-120.548
TOTAL	1121.8	2740.05	3770.59

Table 4.3: Changes in Trade Balance, in the trade of agricultural commodities, by region.

Shocks / Region	**Post-Shock 1**	**Post-Shock2**	**Post-(Shock1+Shock2)**
JPNSEA	-3689.78	2614.25	-1075.53
USACAN	9819.67	-1189.19	8630.48
EU27	-4232.11	-20628.47	-24860.58
LIC	-7904.14	22152.63	14248.49
ROW	6463.30	298	6761.3
Total	456.94	3247.22	3704.16

Table 5.1: Sensitivity Analysis results w.r.t ESUBD (AGRI)

	post shock1			post shock 2		
EV_ALT	Base results	ssa-means	ssa-sd	Base results	ssa-means	ssa-sd
JPNSEA	453.804	453.68	107.26	-711.561	-711.563	10.01
USACAN	400.862	401.231	57.27	250.304	250.381	16.08
EU27	-1752.338	-1752.534	101.73	-750.64	-750.62	70.54
LIC	-1985.89	-1985.13	28.15	5103.046	5102.87	81.62
ROW	-32.132	-32.032	4.66	-120.548	-120.241	4.08