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## The Non-MFN Effects of MFN Specific Tariffs

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### Abstract

This paper explores the sources, extent and two consequences of the non-MFN effects of US MFN specific tariffs resulting from within-commodity cross-exporter variation in f.o.b prices. The first consequence is the bias against the developing countries exporting to the US, which is a result of these countries exporting low quality and low priced varieties (Schott, 2004). This bias is measured as the additional loss in imports faced by these countries, from US MFN specific tariffs as opposed to from a benchmark tariff vector defined as the average Advalorem Equivalent (AVE) of the MFN specific tariffs. For fixed world prices, my results using the Anderson-Neary Mercantilist Trade Restrictiveness Index (MTRI) suggest that doubling per capita GDP reduces AVEs by 14%<sup>§</sup>. This is equivalent to an additional import loss of 5-8% or 60-80 million dollars, from the group of 120 developing countries exporting to the US. This value is as high as 15-24%, equivalent to 13-20 million dollars for a subsample of the 48 low income countries which export to the US. Another consequence of the Non-MFN effects of MFN specific tariffs is the additional deadweight losses (DWL) accruing to the US on account of US MFN specific tariffs. Since the DWL is proportional to the *squares* of tariffs, the AVEs of MFN specific tariffs being non-MFN, have an additional cross-country level of variation associated with them, inducing greater welfare losses. With fixed world prices, my results using the Anderson-Neary Trade Restrictiveness Index (TRI) suggest that levying MFN specific tariffs as opposed to the benchmark tariffs, increases the US trade restrictiveness and DWL by an additional 6% and 12% respectively. All my results are robust to five alternative specifications of AVEs, each of which control for the measurement and reporting errors in unit values to various degrees.

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<sup>§</sup> ‘%’ denotes percentage, and not percentage points

## 1. Motivation

Specific tariffs are fixed tariffs levied per unit of the commodity. Their incidence is highest in the agricultural sector where they are used as the main instrument of protection. An analysis of the US tariff structure in 2001 shows the dairy sector (HTS2= 04) is protected by the highest specific tariffs (Figure 1). Although the WTO member countries impose MFN specific tariffs in compliance with the WTO's non-discriminatory policies, their effects are still discriminatory. My paper looks at the sources, extent and two consequences of these non-MFN effects.

Specific tariffs are expressed in terms of quantities. As an example, the US in 2001 imposed a specific tariff of \$0.0435 per Kg on the imports of sauces and mixed condiments (HTS6 = 210390)<sup>1</sup>. To make them comparable to other forms of trade barriers, they are converted into their Advalorem Equivalents (AVEs) by expressing them as a proportion of the fob price of the commodity. More formally, the AVE of specific tariff  $s_{ij}^k$ , imposed by importer  $i$  on imports of good  $k$  from exporter  $j$ , with  $p_j^k$  as the fob price (exclusive of all trade costs) of good  $k$  in  $j$  is given by

$$AVE_{ij}^k = s_{ij}^k / p_j^k \quad (1)$$

(1) shows that for a good  $k$  facing a MFN specific tariff  $s_i^k$ ,  $AVE_{ij}^k = s_{ij}^k / p_j^k$  will vary across  $j$  whenever  $p_j^k$  varies across  $j$ . This means that the AVEs of MFN specific tariffs will be non-MFN whenever there is 'within-commodity' variation in the fob prices across exporters.

My paper assumes that fob prices are in fact proportional to exporter per capita GDP, explained by rich countries utilizing their comparative advantage in skill and capital to supply vertically superior and higher priced varieties (Schott, 2004). Schott showed the empirical existence of an inverse relationship between unit values and per-capita income in the

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<sup>1</sup> obtained by a simple aggregation over the HTS8 tariff lines from the Romalis constructed US tariff data set

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. My paper shows the existence of a weaker version of this inverse relationship for agricultural goods too (HTS 01-24, shown in Table 6 in the appendix) meaning, the effects of MFN specific tariffs are not only non-MFN, but are also systematically biased against the exporters of low quality products - the developing countries. One purpose of my paper is to measure the extent of this bias against the developing country trading partners of the US generated by US MFN specific tariffs, in terms of the additional loss in import volumes. Using the Anderson and Neary (2003) Mercantilist Trade Restrictiveness Index (MTRI) which assumes constant world prices, I find that in 2001, the 120 developing country<sup>2</sup> trading partners of the US lost an additional 5-8% of their imports to the US from US MFN specific tariffs on all goods. The comparison is made with respect to the benchmark tariffs which are equivalent to the average AVEs of the MFN specific tariffs. The additional loss in imports on account of US specific tariffs was even higher (15-24%) for the sample of the 48 low income countries<sup>3</sup>. These results are robust to five different specifications of unit values which control for measurement and reporting errors to various degrees.

The other purpose of my paper is to measure the additional welfare losses that the US faces from MFN specific tariffs when compared to the benchmark tariffs. I use the Anderson and Neary (1994) Trade Restrictiveness Index (TRI) to measure this loss. The idea here is that the cumulative deadweight loss (DWL) from tariffs is proportional to the *squares* of tariffs since a more dispersed tariff schedule generates larger distortion effects through greater substitution between goods. This says that comparing two tariff schedules with the same import weighted average; the schedule having higher variance generates more DWL. With constant world prices, I find that the US MFN

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<sup>2</sup> World Bank 2001 country classification

<sup>3</sup> World Bank 2001 country classification

specific tariffs when compared to the benchmark, generate an additional restrictiveness of 6% and an additional DWL of 12%, All my results are robust to four alternative specifications of AVEs, each of which control for the measurement and reporting errors in unit values to varying degrees.

The results above all correspond to fixed world prices, assuming all countries to be small. But considering the US to be a large country importer, world prices of imports and exports will no longer be fixed, but will be functions of the trade policy to be determined simultaneously from international market clearing and the US GDP maximization. We need to model the export supply curves faced by the US as upward rising, and not horizontal. This ensures that there are positive gains from TOT improvement which need to be considered while computing the cumulative DWL from import tariffs. The work on the large country is currently incomplete, but my feeling is that the results obtained will not be qualitatively different from those obtained in the small country case, though they might differ quantitatively depending on the exact model specifications.

A detailed analysis is contained in the following sections of the paper. Section 2 describes the data, Section 3 presents a summary statistics on US tariffs in 2001 and Section 4 contains the relevant literature review. Section 5 presents an initial data analysis. Sections 6 and 7 contain the methodology and results from a small country importer. Section 9 outlines the future work and section 10 concludes. This is followed by the Bibliography and Appendix.

## **2. Data**

Bilateral US import values and import quantities data for 2001 is from the Feenstra compiled NBER data set. The values are in dollar units with goods disaggregated up to the HTS10 level. MFN US advalorem and specific binding tariffs is taken from the Romalis compiled NBER data. In this data set, an advalorem tariff of 0.15 means 15% and a specific tariff of 0.15 means a tariff of \$0.15 per unit of quantity and goods are disaggregated by the tariff line (HTS8). Both data sets are aggregated to the HTS6 levels using simple unweighted averages and merged together to create

a composite imports-tariff data set. Data on the price elasticities of import demand for all HS6 goods imported by the US is from Kee *et.al.*, 2006. These elasticities are good specific and importer specific, and are constant across exporters. The US GDP in 2001, required to compute the share of imports for each good, is taken from the World Development Report to be equal to \$10082 billion. Under the base specification, unit values are computed by dividing the fob import values by the imported quantities, with the AVEs of specific tariffs computed by dividing the MFN specific tariffs by these unit values. The results from four alternative ways of calculating AVEs, each of which control for the measurement and reporting errors in unit values to various degrees, is discussed in Section 6.

### **3. Summary Statistics**

Figures 1 and 2 in the appendix show the incidence of MFN specific tariffs and MFN advalorem tariffs in the US in 2001, in each of the HTS2 categories (obtained by a simple average over all the HTS6 products within each HTS2 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 HTS2=24, tobacco and substitutes), MFN specific tariffs are concentrated mainly in the agricultural sectors, the specific sectors facing high ( $\geq \$0.1$  per quantity unit) 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), optical, cinematographic, surgical instruments (90). Table 1 in the appendix contains a relative comparison of the different tariff policies in the US.

## 4. Literature Review

### 4.1 Welfare Loss: Theory behind the TRI

An import tariff on a good generates a welfare loss in the form of a production and consumption deadweight loss (DWL) by hiking the price that domestic consumers have to pay for each unit of the good, and by reducing the consumption set by reducing imports. In the simple case where the demand and supply curves are linear and the importing country is a ‘small’ country in the sense that it cannot affect world prices, the cumulative DWL from a tariff  $t_n$  on good  $n = \{1, \dots, N\}$  is calculated as the sum of the areas of the consumption and production loss triangles given by

$$DWL = \frac{1}{2} \sum_{n=1}^N M_n \varepsilon_{n,M} t_n^2 \quad (2)$$

where  $M_n$  is the import of good  $n$  and  $\varepsilon_{n,M}$  is the elasticity of imports of good  $n$

Anderson and Neary (1994) use the DWL concept to define a measure of restrictiveness for a small country, based on the welfare loss the economy’s tariff schedule generates. The TRI as defined by Anderson and Neary (1994) is the uniform tariff across all goods which results in the same welfare loss as the actual non-uniform tariff schedule.

Mathematically, the TRI in a general equilibrium framework is implicitly defined as

$$TRI : B[p^0(1+TRI), u^0] = B[(p^0 + T), u^0] \quad (3)$$

Here the balance-of-trade function  $B[\cdot]$  shows the transfer required to maintain the same level of utility given a change in prices and is therefore a convenient measure of the compensation required to maintain national welfare at any specified level.  $p^0$  is the vector of international prices for all goods,  $(p^0 + T)$  is the vector of domestic prices for all goods inclusive of the vector of non-uniform tariffs  $T$ ,  $u^0$  is the level of utility obtained from free trade,  $B[p^0(1+TRI), u^0]$  is the welfare under a non-uniform tariff schedule,  $B[(p^0 + T), u^0]$  is the welfare under a uniform tariff  $TRI$  on all

commodities. In this form, the TRI can only be computed using a CGE analysis which requires additional assumptions on the demand and production sides (Irwin, 2007).

Feenstra (1995) suggested a simple form of the TRI for a small open economy with linear demand and supply curves, in a partial equilibrium framework. Though the TRI in a partial equilibrium framework captures at best the own tariffs effect, direct effects and first order effects, ignoring all indirect feedback effects on other sectors (cross-price effects), it is computationally simple and points out the factors contributing to the restrictiveness of a country's tariff policy. On account of its simplicity, it has since been adopted by many authors for calculating and comparing the trade restrictiveness across countries (Kee *et.al.*, 2006; Irwin 2007).

The formula for the TRI for  $n$  imported goods  $n=\{1,2, \dots, N\}$ , as suggested by Feenstra is

$$TRI = \left[ \frac{\sum_n s_n \varepsilon_n t_n^2}{\sum_n s_n \varepsilon_n} \right]^{1/2} \quad (4)$$

Where

$$\frac{DWL}{GDP} = \frac{1}{2} \sum_n s_n \varepsilon_n t_n^2 \quad (5)$$

And so,

$$DWL = \frac{1}{2} TRI^2 \cdot GDP \cdot \sum_n s_n \varepsilon_n \quad (6)$$

Where,  $s_n$  is the share of imports of commodity  $n$  in the importing country's GDP and  $\varepsilon_n$  is the elasticity of import demand for commodity  $n$ . (4) shows that the square of the TRI is just a weighted average of the squares of the tariff rates, the weights being the slope of the import demand curve or the product of the share of imports and the import demand elasticity. This says that comparing two tariff structures having the same weighted average, weights being the TRI weights (slope of the demand curve), the schedule having greater dispersion will generate a higher TRI. This is consistent with the theory that a more non-uniform tariff structure distorts relative prices to a greater extent and so generates greater DWL (as DWL is proportional to the squares of tariffs, by (2)).

The core concept of this paper - that a MFN specific tariff generates an additional DWL through a more dispersed AVE schedule, has been explored in Boorstein and Feenstra (1991) in the case of quality upgrading resulting from import quotas. They show that since an import quota or a Voluntary Export Restriction (as in the case of the US auto, steel and cheese industry in the seventies and eighties) causes the same specific or dollar increase in all varieties of the import (Falvey, 1979), it results in a higher relative price increase for varieties with initial low prices (low quality varieties), and vice versa. This shifts the composition of imports away from the low priced varieties towards the high priced varieties, resulting in an overall quality upgrading. They focus on the “excess cost” of the quota due to this quality upgrading relative to a uniform advalorem tariff equal to the trade weighted average of the dispersed tariff equivalents.

#### 4.2 Import Volume Loss: Theory behind the MTRI

Another way of calculating the restrictiveness of a tariff schedule is to calculate its MTRI (The Mercantilist Trade Restrictiveness Index). The MTRI first proposed by Anderson and Neary (2003) is the import volume analogue of the TRI, which takes import volumes instead of welfare as the metric of trade restrictiveness. The MTRI for a importing country corresponding to a non-uniform tariff schedule is defined as that uniform tariff, which if imposed on the country’s imports would generate the same loss in import volume as the existing non-uniform tariff schedule. In a general equilibrium framework, the MTRI for a small country, with fixed world prices is implicitly defined as follows:

$$MTRI : M[p^0(1 + MTRI), b^0] = M[(p^0 + T), b^0] \quad (7)$$

where  $M(\cdot)$  is the import volume function,  $p^0$  is the world price vector,  $b^0$  is the trade balance and  $T$  is the vector of non-uniform tariffs. Similar to the partial equilibrium-linear demand curve analog of the TRI as suggested by Feenstra (1995), Kee, *et al* (2006) expressed the MTRI for a small

country with  $n$  imported goods and linear demand and supply curves as a weighted average of the individual tariffs-the weights being the slopes of the import demand curve.

$$MTRI = \left( \sum_n s_n \varepsilon_n t_n \Big/ \sum_n s_n \varepsilon_n \right) \quad (8)$$

#### 4.4 Empirical Literature: Comparison of Methodologies across different studies

Assuming fixed world prices, there have been quite a few studies which have computed the TRI and DWL for the U.S. The point of all these studies is to compare the overall trade restrictiveness across a group of countries, taking into account all tariffs (both advalorem and specific) and NTBs. There is no study which focuses on the TRI from specific tariffs particularly. A relative comparison of their methodologies with mine is presented in Table 2 in the appendix. My own methodology, in bold is discussed in further details in Section 5.

To the best of my knowledge, there are no empirical studies which have calculated the TRI or MTRI with endogenous prices for a large country importer.

#### 5. Initial Data Analysis

Throughout my paper, a ‘good’ refers to a HTS6 commodity category, an example being Red wine. Within each good, ‘varieties’ are differentiated according to their country of origin, an example being French Red wine and German Red wine. This is the commonly used Armington classification with the implicit assumption that there are no within-country varieties of the same good.

As a formal exercise, I estimate the following regression pooling across all  $j$ ’s and all  $k$ ’s which fall under HTS2<=24 (agricultural goods)

$$\ln ave_j^k = \alpha^k + \beta \ln per capita GDP_j + \xi^k \quad (9)$$

I get a  $\hat{\beta} = -0.14$  which is highly significant with pretty low standard errors equal to 0.016 (Table 6) 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 HTS2 commodity categories which show high incidence of specific tariffs, pooling over all varieties with HTS6-good-specific-fixed effects. The results of the regression are presented in Table 3 in the appendix. The significant negative relation between the AVEs and exporter per capita GDP establishes that MFN specific tariffs have non-MFN AVEs systematically biased against the exporters of low quality varieties – the developing countries.

Apart from being biased against developing country exporters, non-MFN AVEs of MFN specific tariffs have another feature too – they have an additional level of cross-country variation associated with them, along with a cross commodity level of variation which characterizes MFN advalorem tariffs. Since the DWL from tariffs is proportional to the squares of tariffs, the additional dispersion associated with MFN specific tariffs results in a greater DWL for the tariff imposing country. I measure the additional welfare losses and additional import volume losses against a benchmark tariff vector which is a MFN advalorem tariff vector constructed as the trade weighted average of all AVEs over all varieties  $j$  within each good  $k$ .

Mathematically, the benchmark tariff for good  $k$  is defined as (considering the US as the only importer)

$$\bar{t}^k = \text{mean} \left( \frac{s^k}{p_j^k} \right)$$

Now, the TRI corresponding to a non-uniform tariff vector shows the uniform tariff vector which results in the same level of restrictiveness as the non-uniform tariff vector. So, in order to measure the additional restrictiveness and welfare loss corresponding to the MFN specific tariff vector

relative to the benchmark tariff vector, I compute the differences between the TRI and DWL corresponding to the actual MFN tariff vector ( $TRI^a$  and  $DWL^a$  respectively) and the TRI and DWL corresponding to the counterfactual benchmark tariff vector ( $TRI^b$  and  $DWL^b$  respectively). Similarly, the MTRI corresponding to a non-uniform tariff gives the uniform tariff which generates the same import loss as the non-uniform tariffs. So the MTRI calculated for the US, for only the varieties imported from the developing countries, shows the trade restrictiveness with respect to the developing country exporters. So, the difference between  $MTRI^a$  and  $MTRI^b$ , and the difference between the import losses ( $\Delta m$ ), summed over all developing country varieties only, shows the additional trade restrictiveness faced by the US and the additional loss imports faced by all developing countries exporting to the US, from US MFN specific tariffs as compared to the benchmark tariffs.

## 6. Methodology

### 6.1 Computing the additional welfare loss to the US, associated with US MFN specific tariffs

The additional trade restrictiveness in terms of welfare generated by the non-MFN AVEs of the MFN specific tariffs relative to the benchmark MFN advalorem tariffs is

$$\Delta TRI = TRI^a - TRI^c = \left( \frac{\sum_j \sum_k s_j^k \varepsilon^k (t_j^k)^2}{\sum_j \sum_k s_j^k \varepsilon^k} \right)^{\frac{1}{2}} - \left( \frac{\sum_j \sum_k s_j^{ck} \varepsilon^{ck} (\bar{t}^k)^2}{\sum_j \sum_k s_j^{ck} \varepsilon^{ck}} \right)^{\frac{1}{2}} \quad (10)$$

The additional deadweight loss generated by the non-MFN AVEs of the MFN specific tariffs relative to the benchmark MFN advalorem tariffs is

$$\Delta DWL = \frac{1}{2} (GDP) X \left[ \sum_j \sum_k s_j^k \varepsilon^k \{ TRI^a \}^2 - \sum_j \sum_k s_j^{ck} \varepsilon^{ck} \{ TRI^c \}^2 \right] \quad (11)$$

Here,  $t_j^k$  is the AVE of the actual MFN specific tariff on good  $k$  on exporter  $j$ ,  $\bar{t}^k$  is the benchmark advalorem MFN tariff on good  $k$ . Corresponding to the actual point on the linear demand curve,  $\varepsilon^k$  is the import demand elasticity of good  $k$  in the US and  $s_j^k$  is the share of imports of good  $k$  from exporter  $j$  in US GDP. Corresponding to the counterfactual point on the demand curve, these values are  $\varepsilon^{ck}$  and  $s_j^{ck}$ . By the properties of a linear demand curve, the elasticities at the two different points on the demand curve - corresponding to the actual tariffs and the counterfactual tariffs will be different. And, as long as these elasticities are not equal to unity, the output shares corresponding to the two different points will also be different. As illustrated in appendix A.1, the properties of a linear demand curve are used to calculate  $\varepsilon^{ck}$  and  $s_j^{ck}$  from  $q^a$ ,  $p^a$ , and  $p^c$ .

## 6.2 Computing the additional loss in imports from all developing countries

Following the same notation as above, this value is exactly equivalent to the additional loss in US imports from all developing countries on account of the US imposing MFN specific tariffs, instead of the benchmark tariffs.

Additional restrictiveness (in terms of imports) for the US is

$$\Delta MTRI = MTRI^a - MTRI^c = \frac{\sum_j \sum_k s_j^k \varepsilon^k (t_j^k)}{\sum_j \sum_k s_j^k \varepsilon^k} - \frac{\sum_j \sum_k s_j^{ck} \varepsilon^{ck} (\bar{t}^k)}{\sum_j \sum_k s_j^{ck} \varepsilon^{ck}} \quad (12)$$

Additional loss in imports for  $i$  is,

$$\Delta m = GDPX \left[ \sum_j \sum_k s_j^k \varepsilon^k MTRI^a - \sum_j \sum_k s_j^{ck} \varepsilon^{ck} MTRI^c \right] \quad (13)$$

where  $j \in \{\text{developing country exporters of the US}\}$ ,

## 7. Results

The AVEs of specific tariffs are obtained by dividing the specific tariff by the fob price of the commodity. Depending on the definition of unit values used, we can construct four alternative specifications of AVEs, in addition to the base specification which uses raw unit values. Each of these specification controls for the measurement and reporting errors in unitvalues to various degrees. The five different specifications and the results corresponding to each of them are detailed in the following section.

1. The **First specification (the base specification)** uses raw unit values for 2001
2. The **Second specification** uses 3-years-averaged unit values, averaged over the years 1999, 2000 and 2001 to control for any year-specific error.
3. The **Third specification** uses predicted 3-years-averaged unit values. The predicted unit values are obtained by running a fixed effects regression of the 3-years-averaged unit values on exporters per capita GDP, by each HTS2 commodity level, with HTS6 product fixed effects as follows:

$$\ln \text{unitvalues}_j^k = \alpha^k + \beta \ln \text{percapitaGDP}_j + \xi^k$$

The reason why we run these regressions by HTS2 and not HTS4 is because a large number of HTS4 product categories have either no observations, or very few observations, which would generate biased results.

4. The **Fourth specification** uses the Exporters Reference Group Unit Values (ERGUVs), where the Reference Groups (RG) refer to the MacMap reference groups (Bouet et al, 2004). Under this method, all exporters are grouped into reference groups (RG) of similar countries based on their PPP GDP and degree of openness. Then the ERGUV (Exporter Reference Group Unit Value) is calculated using weighted medians. According to Bouet *et al* (2004), this sweeps out the within-product variation in cross-country prices arising from

measurement errors, while still keeping intact the part of the variation arising from the differences in product qualities across exporting countries.

5. The **Fifth specification** uses the filtered ERGUVs, where any ratio of ERGUVs to the world median unit value outside the bracket [1/3,3] is truncated to the bottom or top limit to reduce errors from reporting and measurement. Incidentally, this is the specification which is used to compute the AVEs of applied specific tariffs contained in the MacMap database.

## 7.1 Estimates of the additional welfare loss to the US from specific tariffs

**Table 4: TRI, DWL and the % bias under various specifications of unit values**

	Model specification	TRI (in %)		DWL/GDP (in %)		% bias	
		(a)	(c)	(a')	(c')	In TRI (a-c)*100/c	In DWL/GDP (a'-c')*100/c'
1	<b>Raw unit values for 2001</b>	2.53	2.388	0.00364	0.00324	<b>5.98</b>	<b>12.33</b>
2	<b>3-years-averaged unit values</b>	2.26	2.13	0.00291	0.00259	<b>6</b>	<b>12.35</b>
3	<b>Predicted unit values</b>	0.419	0.396	0.000001	0.00000089	<b>5.8</b>	<b>11.9</b>
4	<b>ERGUVs</b>	2.15	2.129	0.00263	0.00258	<b>0.943</b>	<b>1.938</b>
5	<b>Filtered ERGUVs</b>	2.147	2.129	0.00262	0.00258	<b>0.868</b>	<b>1.55</b>

### 7.1.1 Explanation of Results

Table 4 compares the TRI, DWL and bias values corresponding to the different specifications of unit values. The TRI values depend upon both the first and second moments of the AVEs of specific tariffs. i.e, they depend on the extent of within-commodity cross-exporter variation in prices. The table shows that the bias in TRI is lesser by a magnitude for specifications 4 and 5, when compared to the other 3 specifications. This is expected since by construction, the Reference Groups (RG) sweeps out a large portion of the within-commodity cross-exporter variation in prices. In other words, using the ERGUVs reduces the difference in variation between the actual AVE schedule and the benchmark average AVE schedule, making the two schedules

very similar. This results in a very low, almost insignificant bias. According to Bouet (2004), using ERGUVs controls for only that part of the within-commodity cross-country variation which is due to measurement and reporting errors, but leaves intact all other ‘country-specific variation’. Since there is no way to test this claim, there is no way to ascertain whether the RG method actually ends up controlling for more than just the variation arising from measurement error. For eg, if in addition to controlling for the within-commodity variation in unit values arising from measurement errors, the ERGUVs also sweep out the variation in unit values arising from quality differences across exporters, then clearly the use of ERGUVs in computing AVEs underestimates the true bias in the TRIs by sweeping out the precise variation which we should be exploiting. Specification 5 uses filtered ERGUVs, which by construction is expected to have an even lesser within-product cross-country variation than unfiltered ERGUVs. This is reflected in the table which shows that the TRI and bias values in specification 5 are even smaller when compared to specification 4. Specification 3 uses predicted 3 yrs averaged UVs. The TRI values are smaller by a magnitude compared to the other specifications. This shows that this specification controls for a lot of variation. Between 1 and 2, there is no change in the variation of unit values, so there is no difference in the bias of the TRIs and DWL.

### **7.1.2 Comparison of my results with other studies**

Using both advalorem and specific tariffs, I obtain a TRI of 6.76 for the US economy. This is comparable to the TRI of 5.3 which Kee et al get for the US in 2003 using both types of tariffs. One reason why I get slightly higher TRIs is that Kee et al use applied specific tariffs and not MFN specific tariffs as used by me. Moreover, they convert these specific tariffs into their AVEs using the MacMap ERGUVs and not raw unit values. When compared to the TRI obtained by me, the TRI obtained by Kee et al is lower because the AVE vector used by Kee et al have both a lower mean (the WTO bounded MFN tariffs are the upper bound of the applied tariffs) and a lower

variance (they use the Macmap specification of AVE). MacMap data shows that the MacMap computed AVEs, which use applied specific tariffs, have a lower mean and standard deviation than the AVEs under specification 5 (Table 5 in appendix). Irwin (2007) computes a TRI value of 12.5% for the year 1961. The US tariff policy was a lot less liberal during this period, justifying the high TRI value.

## 7.2 Estimates of the additional loss in import shares from developing countries due to US specific tariffs

**Table 5: MTRI with respect to the developing and low income countries and the % bias under various specifications of unit values**

Model specification	MTRI wrt all developing countries (in %) (n=120)			MTRI wrt only low income countries (in %) (n=48)			Additional loss in imports (\$m)
	(a)	(c)	% bias = (a-c)*100/c	(a')	(c')	% bias = (a' - c')*100/c'	
<b>1 Raw unit values for 2001</b>	0.40	0.39	<b>4.47</b>	60.5	0.581	0.505	<b>15</b> 15.12
<b>2 3-years-averaged unit values</b>	0.42	0.398	<b>6.5</b>	80.6	0.557	0.486	<b>14.44</b> 13.61
<b>3 Predicted unit values</b>	0.08	0.076	<b>8.3</b>	24.2	0.086	0.069	<b>24.28</b> 3.43
<b>4 ERGUVs</b>	0.39	0.366	<b>7</b>	86.7	0.576	0.466	<b>23.63</b> 21.77
<b>5 Filtered ERGUVs</b>	0.39	0.365	<b>6.8</b>	83.6	0.566	0.465	<b>21.71</b> 19.96

### 7.2.1 Explanation of Results

Table 5 shows the MTRI and bias values, corresponding to the different specifications of unit values. The table shows that specifications 4 and 5 yield high bias values for the low income countries. This is because although the AVEs corresponding to 4 and 5 have lower variation, MTRI values, unlike TRI values do *not* depend upon the variation of AVEs. MTRI calculations for developing countries depend upon the number of developing countries facing AVEs greater than or less than the mean AVE for each HTS6 commodity group. The fact that we get a positive

bias shows that on an average, the AVEs faced by developing countries lie above the weighted mean AVE for each HTS6 commodity group. The high values for bias in the low income countries seen in specifications 4 and 5 as compared to the values in specifications 1 and 2, indicate the presence of some developing countries having AVEs below the average AVEs for a good, and also lying below the RG median unit value. This shows that using the RG median unit value actually increases the bias against the developing countries. If measurement error is the only reason for these developing countries having AVEs lower than the average AVE for each commodity group, then the RG method corrects this problem, meaning that specifications 4 and 5 are more accurate. But, if these developing countries have AVEs lower than the average AVEs for some commodity groups not on account of measurement error, but due to the better quality of their exports, it means that in these cases the RG grouping method incorrectly assigns low unit values thereby increasing the bias. In such cases therefore, the results for specifications 4 and 5 will be biased. Unfortunately there is no way to ascertain the exact extent of the measurement errors in unit values, making it difficult to choose one specification over the other. This is why I present the results from all specifications. The table shows that from US MFN specific tariffs, the developing countries together lose around 6-8% of their import shares, relative to the developed countries. And this number is as high as 15-24% for the low income countries.

## **9. Future Extension**

It would be interesting to address the same issues while modeling the US as an importer large enough to exert market power. In such a case, the supply curves faced by the US will no longer be horizontal but will be positively sloped. In other words, the US as a large country will face positive foreign supply elasticities. A partial equilibrium analysis similar to that in the small country case will generate expressions for the DWL and import loss from tariffs, which can be evaluated with the knowledge of the import demand and export supply elasticities. The elasticities estimated by

other studies (Kee et. al, 2006a; Broda et al, 2006) are importer and commodity specific. If we can estimate bilateral elasticities corresponding to each commodity and show that developing country exporters face a higher import demand elasticities and a lower export supply elasticity for their exports into the US, then my theory about these exporters facing a greater loss in market access vis-à-vis the developed country exporters gets additional fire power.

## 10. Conclusion

This paper presents a formal analysis along with a quantitative computation of two consequences of the non-MFN effects of US MFN specific tariffs. The source of the non-MFN effects lie in the very definition of specific tariffs and their advalorem equivalents. The fact that non-uniform fob prices result in MFN specific tariffs having non-MFN AVEs suggests a cross-country level of variation associated with the AVEs, in addition to the cross-commodity level of variation already present. This results in the US MFN specific tariffs generating an additional DWL for the US, relative to the trade weighted mean AVE equivalent MFN advalorem tariffs. I find that the US loses an additional 12% in terms of welfare from levying MFN specific tariffs. I also show that not only are the MFN specific tariffs non-MFN in their effects, they are also systematically biased against the exporters of low quality varieties—the developing countries. This indicates that MFN specific tariffs generate a bias against developing countries in terms of additional loss in import shares. I obtain this bias to be between 5-8% depending on the exact definition of unit values used. For the low income countries which form the lowest strata of the developing countries, this value is as high as 15-24%. This indicates the large volumes of market shares that developing countries lose from the MFN specific tariffs of all OECD countries taken together.

## Bibliography

- Anderson, James and Neary, Peter “Measuring the Restrictiveness of Trade Policy” *World Bank Economic Review, Vol 8 (1994)*
- Anderson, James and Neary, Peter “Measuring the Restrictiveness of International Trade Policy” *MIT Press, 2005*
- Anderson, James “Trade Restrictiveness Benchmarks” *The Economic Journal 108(449), 1998*
- Anderson, James and Neary, Peter “The Mercantilist Index of Trade Policy” *International Economic Review, Vol. 44 (2003)*
- Anderson, James and Van Wincoop “Trade Costs”, *Journal of Economics Literature, Sept. 2004*
- Boorstein, Randi and Feenstra, Robert “Quality Upgrading and its welfare costs in U.S Steel Imports, 1969-1974” *NBER Working Paper no. 2452 (1987)*
- 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)*
- Broda et al “Optimal Tariffs : The Evidence” *NBER WP 12033, 2006*
- Bureau et al “Agricultural Trade Restrictiveness in the U.S and EU ” *Agricultural Economics, Vol. 33 (2005)*
- Cipollina and Salvaciti “Measuring Protection: Mission Impossible?” *Agricultural Trade Agreements, working paper # 06/07, 2007*
- Cline, William “An Index of Industrial Country Trade Policy towards Developing Countries” *Centre for Global Development, Working Paper no 14 (2002)*
- Dakhila, Sami and Temimi, Akram “ An Extension of the Trade Restrictiveness Index to Large Economies” *Review of International Economics, 14, 2006*

- Falvey, Rodney “The Composition of Trade within Import-restricted Product categories”  
*Journal of Political Economy 90(6), Dec (1979)*
- Feenstra, Robert “How Costly is Protectionism?” *The Journal of Economic Perspectives, 6(3), 1992*
- Feenstra, Robert “Estimating the Effects of Trade Policy” *Working Paper no. 5051 (1995)*
- Gibson et al “Profiles of Tariffs in Global Agricultural markets” *U.S Department of Agriculture, Agricultural Economic Report no. 796 (2001)*
- Irwin, Douglas “Trade restrictiveness and Deadweight losses from US Tariffs, 1859-1961”  
*Draft (June, 2007)*
- Johnson, Harry “The Cost of Protection and the Scientific Tariff” *Journal of Political Economy, 68, 1960*
- Kee et al “Import Demand Elasticities and Trade Distortions”, *World Bank Policy research paper (2006a)*
- Kee et al “Estimating Trade Restrictiveness Indices”, *World Bank Policy research paper no 5576. (2006)*
- Kreinin, Mordechai “Price Elasticities in International Trade” *The Review of Economics and Statistics, 49 (4), 1967*
- Krueger, Anne “The Political Economy of a Rent Seeking Society” *AER 64, 1974*
- Krugman, Paul “Age of Diminished Expectations” 3<sup>rd</sup> edition, Cambridge: MIT Press, 1997
- Magee, Stephen “The Welfare Effects of Restrictions on U.S Trade” *Brookings Papers on Economic Activity, 3, 1972*
- O'Rourke, Kevin “Measuring Protection: A Cautionary Tale” *Journal of Development Economics 53, 1997*

- Panagariya, Arvind “Cost of Protection: Where Do We Stand?” *AER*, 92, 2002
- Pavcnik, Nina “Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants” *Review of Economic Studies* 69, 2002
- Schott, Peter “Across-Product vs Within-Product Specialization in International Trade”, *QJE*, 119(2), 2004
- Stern, Francis and Schumacher “Price Elasticities in International Trade: An Annotated Bibliography” *London: Macmillan* (1976)
- Tokarick, Stephen “Evaluating the Robustness of the Trade Restrictiveness Indices”, *IMF papers*, 2006

## APPENDIX

### A.1 Computing $\varepsilon^{ck}$ and $s_j^{ck}$ from $\varepsilon^{ak}$ , $p_j^{ak}$ , $q_j^{ak}$ and $p_j^{ck}$

[In the following lines,  $q$  and  $p$  refer to the imported quantity and price respectively, and the superscripts  $a$  and  $c$  refer to the situation with the actual and counterfactual tariffs respectively.]

For a given commodity  $k$  and exporter  $j$ ,

$$\varepsilon^a = \frac{(q^a - q^c)/q^a}{(p^a - p^c)/p^a} \quad (1)$$

From here, obtain  $q^c$

So we get,

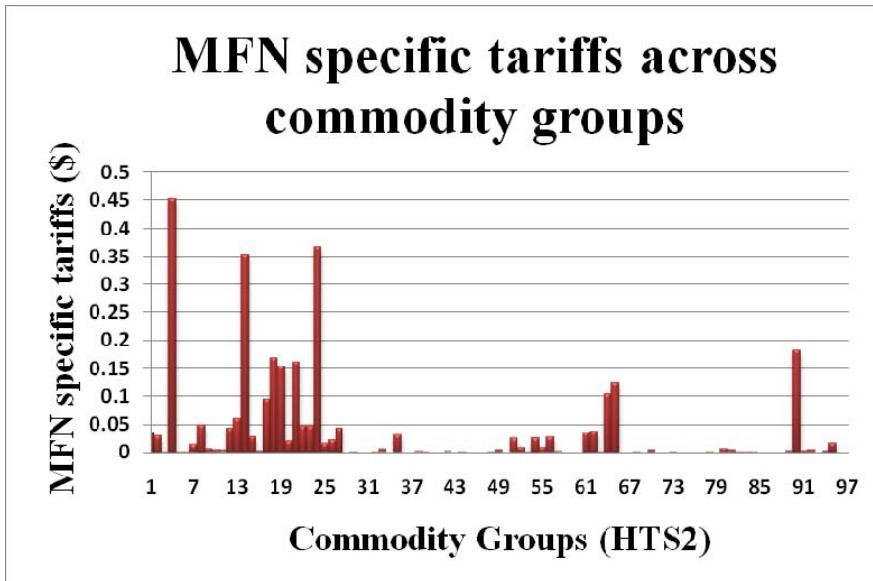
$$s^c = \frac{p^c q^c}{GDP} \quad (2)$$

From which we get,

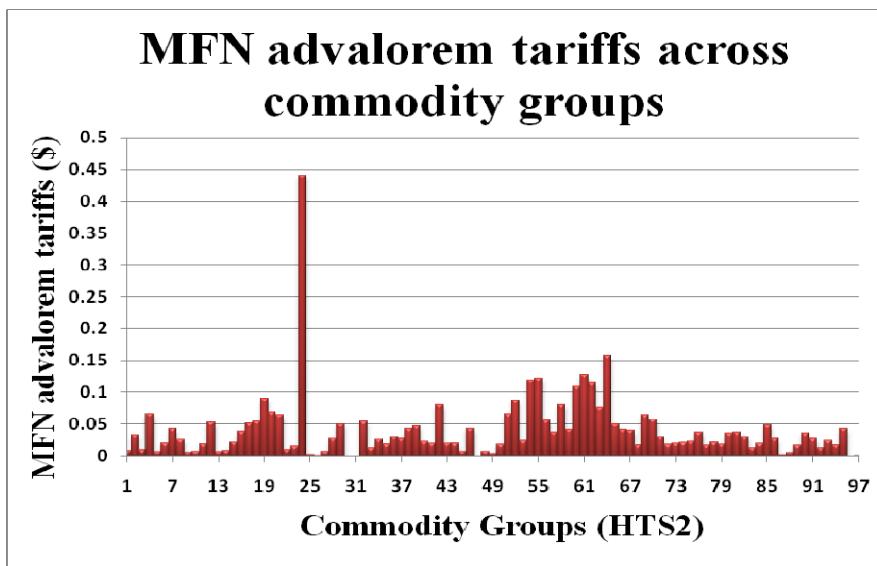
$$\varepsilon^c = \frac{(q^a - q^c)/q^c}{(p^a - p^c)/p^c} \quad (3)$$

**A.2 Distribution of MFN specific and MFN advalorem tariffs across commodity groups in the US in 2001**

**Fig. 1: Incidence of MFN specific tariffs in the US**



**Fig. 2: Incidence of MFN advalorem tariffs in the US**



**A.3**

**Table 1: Summary Statistics of Tariffs in the US economy in 2001**

Statistics \ Policy instrument	MFN advalorem tariffs	MFN specific tariffs	AVE of MFN specific tariffs (1)	AVE of MFN specific tariffs (2)	AVE of MFN specific tariffs (3)	AVE of MFN specific tariffs (4)	AVE of MFN specific tariffs (5)	AVE of Non-MFN applied specific tariffs (MacMap)
Number of Observations	114942	114942	97942	203015	247405	223032	225290	320696
Unweighted Mean	0.04272	0.01161	0.0033	0.00297	0.000730	0.003008	0.002983	0.0029952
Import weighted mean	0.028	0.0121	0.00219	0.00194	0.0005	0.001921	0.001921	0.002631
Standard Deviation	0.05385	0.07505	0.0379	0.02541	0.010739	0.024441	0.024276	0.0221896
Min	0	0	0	0	3.617533	0	0	0
Max	0.875	4.95	5.165	1.91563	.7161117	1.000067	1.000067	1.8066172

NB: In this data set, an advalorem tariff of 0.15 means 15% and a specific tariff of 0.15 means a tariff of \$0.15 per unit of quantity

**A.4 Table 3: Results from the fixed effects regression of  $\ln(\text{unit values})$  and  $\ln(\text{AVEs})$  separately, on  $\ln(\text{per capita GDP})$ , pooling across all exporters of the US, with HS6-product fixed effects, for selected commodity groups.**

Commodity group	Coefficient on per capita GDP	
	Dependent variable = $\ln(\text{unit values})$	Dependent variable = $\ln(\text{AVEs})$
<b>Hs2 &lt;= 24</b> (agricultural goods)	<b>0.15</b> (0.0107496, 0.00)	<b>-0.14</b> (0.0160774, 0.00)
<b>Hs2 &gt;= 24</b> (non-agricultural)	<b>0.31</b> (0.0061463, 0.00)	<b>-0.33</b> (0.0198125, 0.00)
<b>Hs2 &gt;= 60</b> (manufacturing)	<b>0.348</b> (0.0080642, 0.00)	<b>-0.373</b> (0.0218037, 0.00)
Hs2 = 04 (dairy produce)	0.0618 (0.0595999, 0.30)	-0.092 (0.0544869, 0.092)
Hs2 = 14 (vegetable plaiting)	0.2405 (0.155545, 0.126)	Insufficient observations
<b>Hs2 = 17</b> (sugar and confec.)	<b>0.16</b> (0.057994, 0.006)	<b>-0.159</b> (0.062975, 0.012)
<b>Hs2 = 18</b> (cereals, flour)	<b>0.164</b> (0.0366882, 0.00)	<b>-0.116</b> (0.0512963, 0.024)
<b>Hs2 = 21</b> (misc. edible preps)	<b>0.2517</b> (0.0576489, 0.00)	<b>-0.306</b> (0.794627, 0.00)
<b>Hs2 = 22</b> (beverages, spirits)	<b>0.133</b> (0.0464268, 0.004)	<b>-0.125</b> (0.0471548, 0.008)
Hs2 = 24 (tobacco and subs.)	0.1087 (0.0801113, 0.176)	-0.1087 (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.

A.5

**Table 2: Comparison of Methodologies across different studies**

	<b>Chowdhury (2007)</b>	Irwin (2007)	Kee et.al. (2006)	Anderson (1998)	Stern (1964)	Magee (1972)	Rouslang and Tokarick (1987)	USITC (2007)
Sample countries [importer(s)]	<b>Only US</b>	Only US	88 countries	27 countries	Only US	Only US	Only US	Only US
Sample years	<b>2001</b>	1859 and annually from 1867-1961	2000-2003	late 80s and early 90s	1951	1971		2005
framework	<b>Partial eq.</b>	Partial eq.	Partial eq.	General eq	Partial eq.	Partial eq.	Partial eq.	general eq., dynamic
Specification of unit values used	<b>RG filtered UVs</b>	MacMap filtered ERGUVs	MacMap filtered ERGUVs	3-years-averaged UVs	3-years-averaged UVs	3-years-averaged UVs	—	—
Forms of protection considered	<b>All tariffs (advalorem +specific)</b>	All tariffs	Tariffs +NTBs	Tariffs +NTBs	Tariffs +NTBs	Tariffs +NTBs	Tariffs +NTBs	Tariffs +NTBs
Level of disaggregation of imports	<b>4625 tariff lines at hs6</b>	17 import categories and hs6 categories separately	4625 tariff lines at hs6	1200 import categories at hs4				
Elasticities used	<b>Kee et al estimates</b>	Frances & Schumachers import demand elasticities & a uniform elasticity of -2	Estimates import demand elasticities using a GDP maximization approach	Assumes adhoc elasticities of substitution from literature	—	—	—	—

**A.6** **Figure 3: Plot of the coefficient of variation of AVEs  
for each HTS6 commodity group**

