

Tariff Reforms and Trade Restrictiveness

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Abstract

The aggregate analysis of tariff reforms usually sacrifices essential general equilibrium effects for the sake of simplicity. The aim of this paper is to integrate recent theoretical indicators of trade restrictiveness built in a general equilibrium framework into a growth of trade approach derived from the gravity model in order to evaluate the effect of tariff reforms on aggregate market access. The estimation of our integrated model allows us to compute the change in a country's uniform tariff and to decompose it into the average tariff and a tariff dispersion effects, capturing the tariffs own and cross-product import restrictiveness arising from trade negotiations at the tariff line. The evidence for a sample of 97 countries over the period 2001-2009 is that the progress in market access achieved by the erosion of mean tariffs has been counteracted in some years and countries by a selective protection which restricts imports. The analysis performed in this paper reveals the prominent role of tariff dispersion in measuring the progress in market access and may be a tool to evaluate tariff policies and the aggregate trade effects of negotiations at the tariff line.

Keywords: Trade restrictiveness; tariff structure; gravity model; growth of trade; market access.

JEL classification: F13, F14, F15

1. Introduction

Tariff liberalization is often considered to be reflected in a reduction of the existing average tariffs, but the proliferation of other protection instruments, a large number of preferential agreements and practices such as “dirty tariffication”, as well as the existence of tariff peaks and escalation, far from reducing some countries’ tariff dispersion, bring a very strong disparity of tariff levels and the spread of tariff peaks. It is well known that “the distribution of tariff matters a lot” (Bouet, et al. 2004). The use of different tariffs for different products, besides other non-tariff barriers (NTBs) and agreements, lead to tariff averages misrepresenting the prohibitive and restrictive nature of tariff protection. For this reason, especially in less developed countries, declining protection may be more a fiction than a fact (Milner, 2013). Indeed, there is evidence of protectionist movements in recent years in which tariffs are still used for different reasons, including balance of payments problems and reactions to the financial crisis. Considering only tariff measures, international negotiations have established each country’s tariff structure which performs two possible roles: in some countries it can contribute to a progress in their market access, but in others it plays a protectionist role which is worth to unravel from the apparent growth in trade and globalization. Protection in less developed countries, more than that in developed countries, is a major problem for the former when they try to access international markets (Michalopoulos and Ng, 2013; Kee, Neagu and Nicita, 2013; Francois, van Meijl and van Tongeren, 2011). Therefore, a quantitative assessment of the aggregate effects of their tariff policies and, in particular, of their tariff structures on market integration is needed.

Empirical analysis on measuring protection seems to be a “mission impossible”, although important advances have been made¹. Most of them supplement averages of tariff rates with different measures of tariff dispersion, which

¹A survey of the main approaches with their advantages and disadvantages can be found in Cipollina and Salvatici (2008). Relevant efforts have continued after this survey, most of them in a partial equilibrium analysis.

can be misleading when trade restrictiveness is to be measured and difficult to interpret and compare across countries. Partial equilibrium theoretical and empirical approximations of the equivalent tariff protection are based on simple functional forms and *ad hoc* elasticities of substitution. Theoretical indexes based on a general equilibrium approach are able to consider the tariff dispersion, although they are difficult to implement and need very detailed information. However, if they have a good theoretical basis, they can provide a benchmark to evaluate policies (Cipollina and Salvatici, 2008). As Anderson and Neary (2005), there is no satisfactory rule to combine the measures of tariff average and dispersion in a scalar measure, particularly when they move in opposite directions, as is the case in their effect on trade.

In a number of relevant contributions, Anderson and Neary (2004, 2005) manage to combine *changes in both average and variance* to analyze the aggregate effects of tariff reforms in a general equilibrium model and, thus, overcome the limitations of partial equilibrium approaches in capturing important effects of tariff wedges on trade volume. These effects act directly through the substitution effect and indirectly through the income effect and might yield a substantial difference between a consistent aggregator and standard aggregates, resulting from tariff dispersion (Anderson, 2009). Anderson and Neary compute consistent indexes of the aggregate effects on welfare and volume of imports known as the Trade Restrictiveness Index (TRI) and the Merchantilist Restrictiveness Index (MTRI), respectively. Both indexes are a *uniform tariff* which, applied to imports instead of the current structures of protection, would leave home welfare, in the case of the TRI, and the volume of imports in the case of the MTRI, unchanged. As Anderson and Neary demonstrate, the effects of tariff reforms can be expressed in terms of changes in the generalized mean and generalized variance, which are weighted moments that allow for substitution in import demand, and general-equilibrium indexes which correctly account for tariff revenue. Moreover, they show that, the generalized moments can be directly related to the observable trade-weighted average tariff (w.a.t.) and the standard deviation of tariffs.

This paper deals with the effects of tariff reforms on trade volume and focuses on estimating *changes* in the MTRI as an aggregate measure of progress in domestic market access from negotiations at the tariff-line level. It combines the theoretical advances of Anderson and Neary on the consistent aggregate effects of tariffs reforms on trade volume with the widely-accepted analysis of gravity models. Gravity models are widely used to estimate the effect of trade costs, and converge with Anderson and Neary's results when it is adopted an approach of growth of trade related to tariff reforms. A novelty in this paper is that *changes in the MTRI* are estimated, and this needs a *growth of trade gravity* model. This dynamic approach has previously been used in few works, for example, by Bayumi and Eichengreen (1997), to assess the diversion effect of preferential arrangements on trade, by Baier and Bergstrand (2001), to disentangle the relative effects of transport costs reductions, tariff liberalization and income convergence on the growth of trade in the OECD, and by Novy (2012) to decompose the growth of trade into three driving forces, namely, the partner's growth, the change in bilateral trade costs and changes in the two countries' multilateral trade barriers.

A growth of trade gravity model, together with a well-founded measure of aggregate change in trade restrictiveness, can yield an interesting tool to estimate past effects of tariff reforms and to simulate possible alternatives in a country's trade negotiations. The estimated growth in the MTRI is an internationally comparable measure of advances in market access, and the role of the tariff structure can show how it can be used with different policy goals with the same change in average tariff levels. This method can be implemented relatively simply from data about imports, GDP size, trade-weighted mean and variance and other standard controls. It is useful for analyzing long-term periods with the data already available with no additional intense computation. Working with trade in growth rates avoids the necessity of choosing a good benchmark to compare levels. Furthermore, it can be implemented as a theory - grounded tool to estimate the effects of changing the tariff level and the tariff structure in advance and to provide a benchmark to evaluate negotiations at the tariff - line level in the framework of the aggregate goals of trade policy. Recent research shows the non-uniqueness of partial equilibrium TRIs calculations (Costinot

and Rodríguez-Clare 2013), highlighting the importance of general equilibrium effects and supporting the aim of this paper of using the full structure of the general equilibrium model. This work is a first estimation with a cross-country perspective, although with longer country time series it could provide more precise individual estimations to get a more complete picture of changes in trade restrictiveness with individual policy reforms.

The estimation of the MTRI growth and its mean and variance components has been implemented for the widest available sample, 97 countries, during the period 2001-2009, which comprises the years from the launch of the Doha Round until the fall in trade the current economic crisis. The results are robust to different specifications of the growth of gravity and they yield a significant effect of changes in tariff level and structure on market access. This paper also illustrates the achievements in market access in the Latin American and Caribbean region and South Asia, two groups of countries with very different structures. These examples reveal not only the size of reductions in the average level of protection, but also the different use of tariff dispersion. In a context of trade globalization and erosion of average tariff levels, a selective protection can be used for widening or limiting market access. The evidence of these behaviors in the sample shows that there is still a big scope for negotiating advances in market access that can contribute to the globalization of trade.

The paper presents the gravity approach for the growth of trade in Section 2, integrating the growth of the MTRI to estimate the effects of tariff average and dispersion on market access. The empirical estimations of the gravity model and the variation in the equivalent tariffs from average and dispersion changes are explained in Section 3. The role of tariff structure is illustrated in Section 4, with the different uses of tariff structure in the Latin American and Caribbean region and in South Asia. The conclusions are summarized in Section 5.

2. The growth of trade model

Our gravity model is based on individual trade flows at product level k , with each product defined at the tariff line, which is the usual level in trade negotiations.

Tariff information is available for each importer (j) and by exporter(i)-product(k), so that ik labels an exporter-product individual trade flow. This means that it is possible to assume a demand function which differentiates both by product and country of origin. The individual gravity equation for each tariff line at the exporter-product level (ik) for each importer j can be derived as follows:

$$M_{ijk} = \frac{y_i^k y_j}{y^w} \left(\frac{t_{ijk}}{\pi_i^k P_j^k} \right)^{1-\sigma} \quad (1)$$

where M_{ijk} are the total imports for country j from exporter-product (ik); y_i^k is the production in country i devoted to good k, that is, income generated by product k; y_j is the income of importer country j; t_{ijk} are the bilateral transport costs with exporter i for product k; σ is the elasticity of substitution; and π_i^k, P_j^k are the multilateral resistance terms (MR) for product k.

Taking logs in equation (1), differentiating and aggregating over products and exporters, yields our growth of trade model, as an approximation to the growth rates g of individual imports at the exporter-product level ik and where superindex w indicates import weighted growth rates g .

$$gM_j = g y_i^k + g y_j - g y^w - (1 - \sigma) (g \pi_i^w + g P_j^w) + (1 - \sigma) g \tau \quad (2)$$

The year index t is omitted for simplicity, and $g y_i^k$ is the import weighted growth rate of the exporter's income. The expression $(g \pi_i^w + g P_j^w)$ is equivalent to the growth of the Baier and Bergstrand (2009) term to estimate the MR terms, and it will be referred as GMR.

In equation (2), we obtain an aggregator of individual trade costs τ_j which, if such costs are tariffs, will take into account the cross-prices effects derived from changes in individual tariffs. This is the important drawback of standard measures, such as the w.a.t. and other partial equilibrium approximations, in the calculation of aggregate trade restrictiveness. This aggregator considers all the distortion imposed by

a country's trade policies on its import bundle and equation (2) allows us to estimate the growth in the ideal aggregator which would yield the same change in country j imports $g\tau_j$.

The closest approximation to the aggregator in equation (2) is Anderson and Neary's Merchantilist Trade Restrictiveness Index (MTRI), although theirs is computed from bundles of imports at world prices. In consequence, the estimation of equation (2) yields the growth rate of a compensated MTRI, a concept used in Anderson and Neary (2005) when they refer to the estimation of a uniform border barrier in the context of structural gravity. Although it is not easy to estimate a theoretically consistent level of the MTRI, Anderson and Neary demonstrate that a change in the aggregate volume of imports is fully determined by the changes in the two generalized moments; more precisely, the volume of imports is decreasing in the generalized mean of tariffs and increasing in the generalized variance, for a given level of the generalized mean. From this, it follows that a tariff reform will change the generalized mean and variance, thus implying a change in aggregate imports. These changes in tariffs and aggregate imports yield a change in the MTRI uniform tariff, which is completely defined by the generalized moments:

$$gMTRI_j = \frac{d\tau_j^\mu}{1 + \tau_j^\mu} = \varphi^\mu \left[d\bar{\tau}_j - \frac{\frac{1}{2} (1 - M_b) dV_j}{1 - (1 - M_b)\bar{\tau}_j} \right] \quad (3)$$

where $gMTRI_j$ is the growth rate of the MTRI for importer j , $\bar{\tau}$ is the generalized average tariff and V is the generalized variance. φ is a positive parameter, probably close to unity². M_j is the marginal propensity to spend on imports. Thus, the MTRI uniform tariff is increasing in the generalized average tariff but decreasing in the generalized variance, and both generalized mean and variance can be proxied by their imports-weighted moments.

²As Anderson and Neary state "it is reasonable to assume that it will be close to unity in many applications" (Anderson and Neary, 2005, p.98).

Substituting Anderson and Neary's solution for the MTRI growth defined in equation (3) in equation (2), our growth of trade model, with a statistical error term ε_{ijk} , becomes:

$$gMj = g y_i^k + g y_j - g y^w - (1 - \sigma) \text{GMR} + (1 - \sigma) \varphi^\mu \left[d\bar{T}_j - \frac{\frac{1}{2} (1 - M_b) dV_j}{1 - (1 - M_b) \bar{T}_j} \right] + \varepsilon_{ijk} \quad (4)$$

Equation (4) is an estimable non-linear expression. The estimated parameters can then be used to compute the progress in market access, given that any change in an importer average tariff and tariff dispersion will determine the change in the aggregate imports restrictiveness.

3. Sample, model estimation and results

The *UNCTAD TRAINS* database provides the applied tariffs and import shares for all imported products and from all country sources. These have been used to compute the imports-weighted mean and variance for each importer. The level of aggregation is the most detailed available. Tariffs for the same product often differ across sources and this means that the most detailed data is that at exporter-product tariff-line level for each importer. Baier and Bergstrand's term of growth in MR (*GMR*) is computed from PPP-GDP shares and from the tariffs applied by each partner at the tariff line. GDP are calculated using the data of the exporter and importer incomes and world income data, from the *World Development Indicators* database, with incomes in PPP exchange rates. Imports data are taken from the *COMTRADE* database.

Equation (4) is first rewritten leaving only the terms with the parameters to be estimated on the RHS, computing the growth of imports minus the terms for importer j and world income growth rates on the LHS. Reparametrizing equation (4) and working with year differences in the term including changes in tariffs, $\Delta \bar{T}_j$ and $\Delta \bar{V}_j$, we obtain:

$$\begin{aligned}
& gM_j - \Delta \log y_j + g \Delta \log y^w - g y_i^k = \\
& = -(1 - \sigma)GMR + (1 - \sigma) \varphi^\mu \left[\Delta \bar{T}_j - \frac{b \Delta V_j}{1 - 2b \bar{T}_j} \right] + \varepsilon_{ijk}
\end{aligned}
\tag{5}$$

Equation (5) can be estimated with NLS for the widest sample of importers with all the required data that are available: tariffs by tariff line and exporter, import shares at the same level, GDP and GDP world shares. The period of analysis comprises about a decade, from 2001 to 2009, stopping with the severe changes in world trade after the financial crisis. The whole sample forms an unbalanced panel data with 97 countries as importers, for which all partners with their applied tariffs are used to calculate their import weighted tariff and variance, for the available years during the decade. In the sample, 17 countries are developed countries and, among the developing countries, 8 are Arab countries, 8 are from East Asia-Pacific, 11 are European or Central Asian, 26 are Latin American or Caribbean, 7 are South Asian and 19 are South African countries. Table 1 shows descriptive statistics of the data by year, such as the growth of imports (gM), the w.a.t. (\bar{T}), the change in the w.a.t. in percentage points (ΔT) and the change in the imports-weighted variance (ΔV). During the period 2001-2009, the w.a.t. ranges from 5 to 9 in the sample, with 7.27 on average. There is a reduction of 0.52 percentage points per year on average too, with a 12.28% of imports growth per year, and the maximum growth and tariff cuts around 2004. But the variance undergoes wide changes from a maximum increase in 2005 to big decreases such as the ones in 2002 and 2008.

Table 1: Descriptive statistics. Mean values along 2001-2009

	Growth of imports (gM)	w.a.t.(\dot{T})	(ΔT)	(ΔV)
2001	1.579	8.789	-0.506	8.563
2002	4.062	8.575	-0.717	-38.635
2003	19.761	9.165	-0.162	24.353
2004	20.263	8.498	-0.747	11.603
2005	18.935	7.256	-0.864	64.711
2006	14.320	6.606	-0.587	-9.852
2007	15.832	6.440	-0.214	7.907
2008	9.189	5.080	-0.507	-78.937
2009	7.829	5.163	-0.462	-13.176
2001-2009	12.277	7.271	-0.516	-2.537

Other trade costs have been controlled as well, including changes in Non-Tariff Barriers (NTBs). NTB information is also available in the *UNCTAD TRAINS* database at the importer and product code level in HS6 nomenclature. For simplicity, the analysis is carried for their aggregate impact, without any differentiation by category. We carry out an exhaustive revision of every change in all possible categories of NTBs, taking into account both the implementation of a new NTB and the cancellation of an existing one. When a change is detected for an importer and a specific year, a country-year dummy is included in the estimation. Time year dummies are included to control for any other change by year affecting the whole sample. Following Baldwin and Taglioni's gold medal for usual errors in gravity estimations, when panel data are used, time dummies can be used to control for any additional possible bias stemming from time series correlation (Baldwin and Taglioni, 2006).

Several strategies are followed to estimate equation (5), finding robust values for the parameters needed to compute the growth of the MTRI. The theoretical value of $\varphi^H=1$ is assumed following Anderson and Neary, so that b is the main parameter to be estimated. Multilateral resistance terms have been controlled by the Baier and Bergstrand term (*GMR*). We set the typical value in the literature for the elasticity of substitution $\sigma=5$, following e.g. Costinot and Rodriguez Clare (2013), Anderson and van

Wincoop (2004) and Head and Mayer (2013). Table 2 summarizes the estimation results for the b parameter of *gMTRI*, and other controls in the growth of trade model.

Table 2: Estimated results for the gravity growth of trade model with *gMTRI*

Growth of imports(<i>gM</i>)	[1]	[2]	[3]	[4]	[5]	[6]
b	0.00255 ** [0.000]	0.00201 ** [0.001]	0.00233 ** [0.005]	0.00249 ** [0.001]	0.00234 ** [0.001]	0.00260 * [0.010]
<i>GOPEN</i>		0.86442 ** [0.000]				
<i>GPCGDP</i>			0.58101 ** [0.000]	0.55838 ** [0.000]	0.61042 ** [0.000]	0.58948 ** [0.000]
<i>GPOP</i>			1.75515 ** [0.003]	2.51218 ** [0.000]	2.12423 ** [0.000]	1.47932 ** [0.001]
<i>GTREV</i>						0.14418 ** [0.003]
Baier-Bergstrand (<i>GMR</i>)	yes	yes	yes	yes	yes	yes
<i>GNTB</i>		yes	yes	yes	yes	yes
<i>Fixed Effects</i>		yes	yes	yes	yes	yes
<i>year dummies</i>		yes	yes	yes	yes	yes
<i>WB</i>				yes		
<i>WB-year</i>					yes	yes
adj R ²	7.31%	65.94%	47.64%	45.93%	48.67%	60.51%
obs	327	327	327	327	327	327

Note: p-values in brackets. The theoretical specification assumes $\varphi^H = 1$

* and ** indicate significance at 90% and 95% confidence levels respectively, and robust p-values are in brackets.

The first column shows the estimated results with no additional controls and a significant value for $b=0.00255$. Changes in NTB (*GNTB*) are considered in column 2, where some other possible country-specific variations in the growth of trade have been controlled for by *fixed effects*, and possible time-specific variations are controlled for by *year dummies*. A major determinant of trade is the degree of openness, which has been included in the estimation, as well as in growth rates (*GOPEN*). To control for only the imports side of trade, openness is measured by the percentage of imports in a country's GDP. All parameters are significant, with a similar coefficient for b and a much better fit to the data. Nevertheless, the growth of openness may be endogenous

in this model, so column 3 proxies *GOPEN* by two of its main determinants, the growth of development (*GPCGDP*), measured by the growth of GDP per capita, and the growth of population (*GPOP*). With these controls, parameter *b* rises again to 0.00233. As robustness checks, columns 4 and 5 control possible additional geographical variations and geographical plus yearly variations, respectively. To do this, countries are identified by their World Bank regional group (*WB*) and these regional dummies have been included in the estimation in column 4. Column 5 includes regional-year dummies (*WB-year*), because group variations are possible over time. In both cases, parameter *b* is significant, again around 0.0023 and 0.0025, and about half of the imports variation is explained by the model.

Finally, column 6 includes the growth of the tariff revenue (*GTREV*) as a control. The theory of tariff protection has not yet resolved how to deal with tariff revenue and it is usually assumed to be given back to the consumers. The growth of the MTRI in Anderson and Neary's work aggregates individual tariffs and, through the substitution effects, captures the general equilibrium restrictiveness of the tariff policy. The aggregation process reveals a selective protection, perhaps to maximize the country's tariff revenue instead of restricting imports. In any case, the tariff revenue is a higher income for the importing country with the subsequent income effect on imports and, for this reason, is considered in the estimation as a control. It is a significant variable in the estimation with a positive income effect on imports and it explains about 12% of the growth of trade by itself. The value of parameter *b* is 0.0026, a little bit higher but very close to the ones obtained in the alternative estimations.

From the estimated *b* in Table 2, it is possible to compute the percentage change in total imports and the growth of the MTRI. The growth in the MTRI can be decomposed into two parts: the change in the MTRI due to a change in the imports w.a.t. and the change in the MTRI due to a change in the imports-weighted variance, given a w.a.t.³. Table 3 shows the set of calculations for the corresponding estimations

³ These two parts correspond to the addition terms in equation (3) for the growth in the MTRI and again, in equation (5), for the growth of trade, with the changes in the first and second moments given in percentage points.

in Table 2, identified by the number of the column in Table 2 and the value of the estimated parameter b.

Table 3: Growth in imports (%) and growth in the MTRI (%)

Model Table2	Estimated b	Growth of imports (%) due to:			<i>gMTRI (%)</i>
		ΔT_j	ΔV_j	Total	
(1)	0.00255	2.0641	-0.0259	2.0382	-0.5096
(2)	0.00201	2.0641	-0.0204	2.0437	-0.5109
(3)	0.00233	2.0641	-0.0236	2.0405	-0.5101
(4)	0.00249	2.0641	-0.0253	2.0388	-0.5097
(5)	0.00234	2.0641	-0.0237	2.0404	-0.5101
(6)	0.00260	2.0641	-0.0264	2.0377	-0.5094

The sample w.a.t. underwent a reduction of 0.5160 percentage points from 2001 to 2009, and the weighed variance also decreased by 2.5367 percentage points. From Equation (3) and the estimated growth of trade gravity equation (5), we obtain an average growth of imports of 2.0641 % due to the reduction *only* in the w.a.t.. This is the same for all models because it depends only on parameters $\sigma=5$ and $\varphi=1$. The effect of changes in the weighted variance also depends on the value of b and the value of b, which may vary depending on the controls included. Nevertheless, b yields a very robust value around 0.0026 which, together with the change in the weighted variance, results in a decrease of imports by 0.02%. The joint effect is an increase in total imports of about 2.04%. Given that the average increase in total imports during the period is 12.28%, the tariff policy generates 16.60% of the total increase in imports.

The goal of this analysis is to estimate the change in the Merchantilist Trade Restrictiveness Index (*gMTRI*), which summarizes the effects of a country's tariff reforms on its total imports. The last column in Table 3 shows the values obtained for the sample average, yielding a reduction in the uniform tariff of 0.5094 %. Compared to the reduction in the w.a.t. of 0.5160 p.p., the reduction in the MTRI is smaller because there is a selective protection that modifies tariff dispersion in a way that restricts imports. The reason is that the two weighted moments opposite results, with tariff variance playing a protective role in this liberalizing context because it restricts imports. This indicates that there is still scope for intervening in a country's market access using tariff dispersion, given an average change in tariffs.

4. The role of tariff structure on trade restrictiveness. Illustrative cases.

While the average result between 2001 and 2009 is to liberalize imports through a diminishing average tariff level, but with a selective protection that gives the dispersion in tariffs a trade restrictive role, countries have evolved at different rates of market access and with heterogeneous uses of tariff structure. In this section we show how tariff dispersion played different roles during this period and how countries or regions can use their tariff structure with very different effects on trade, sometimes giving quite different pictures of their trade reforms.

Table 4 shows the estimated changes in the growth of imports year by year and in total that are due only to tariff reforms, the other variables staying constant. Columns 2 to 4 are the percentage growth of imports due only to tariff variations and columns 5 to 7 measure this growth as a share of the total change in imports. Table 4 also shows the change in the MTRI over time in column 8 and its ratio over the change in the w.a.t. in the last column. These calculations are based on the last model (6) in Tables 2 and 3. In the total sample, the tariff reforms liberalize average tariffs and drive a growth in imports of 2.06%, but selective protection and the resulting dispersion restrict more than create imports, reducing them by 0.03 %, showing that dispersion plays a restrictive role for the whole period.

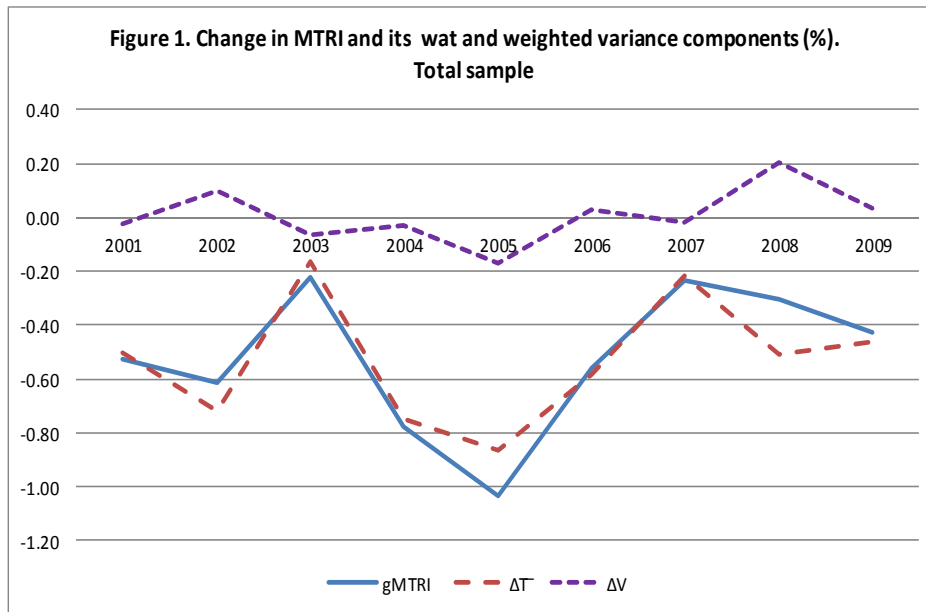
Table 4: Evolution in the growth of trade and *gMTRI* . Total sample.

	Growth of imports for tariff reform: (%)			Growth of imports for tariff reform : (% of total growth of imports)			<i>gMTRI</i> (%)	<i>gMTRI</i> / ΔT (%)
	total	ΔT	ΔV	total	ΔT	ΔV		
2001	2.11	2.02	0.09	133.83	128.18	5.65	-0.53	104.41
2002	2.47	2.87	-0.40	60.73	70.64	-9.91	-0.62	85.97
2003	0.90	0.65	0.25	4.56	3.28	1.28	-0.23	139.18
2004	3.11	2.99	0.12	15.35	14.75	0.60	-0.78	104.04
2005	4.13	3.46	0.67	21.81	18.25	3.56	-1.03	119.50
2006	2.25	2.35	-0.10	15.68	16.40	-0.72	-0.56	95.63
2007	0.94	0.86	0.08	5.94	5.42	0.52	-0.23	109.60
2008	1.21	2.03	-0.82	13.14	22.09	-8.95	-0.30	59.50
2009	1.71	1.85	-0.14	21.84	23.59	-1.75	-0.43	92.57
2001-2009	2.04	2.06	-0.03	16.60	16.81	-0.22	-0.51	98.72

Over time, selective protection plays different roles, both in sign and magnitude. Tariff reforms drive a growth of imports, with a maximum of 4.13% in 2005. This liberalization is certainly driven by the change in the w.a.t (ΔT) year after year, while the change in the tariff structure (ΔV) differs very much from one year to another. It causes a growth in imports, e.g. in 2005, with a growth of 0.67% only due to the dispersion component while, in other years, such as 2002 and 2008, it drives a reduction of imports by 0.40% and 0.82%, respectively. These figures may seem small but, given that the total growth in imports is 12.28%, the change in tariff dispersion is responsible for almost 10% of the total change in imports. This reduction is 9.91% of the total change in imports in 2002, and 8.95% in 2008 (column 7 in Table 4). This means that the change in tariff dispersion through selective protection can play the role of an extra uniform tax or subsidy on imports that is captured by the change in the MTRI.

Column 8 in Table 4 shows the change in the Merchantilist Trade Restrictiveness Index (*gMTRI*) over time. Figure 1 shows this evolution as well as decomposing it into the change in the uniform tariff corresponding to the change in the w.a.t (ΔT) and the change in the uniform tariff corresponding to the change in

tariff dispersion (ΔV). The maximum liberalization of tariffs takes place in 2005, with a reduction in the uniform tariff of 1.03%. That year, the tariff structure plays a liberalizing role and amplifies the changes indicated by the w.a.t. On the contrary, in 2002 and 2008, tariff dispersion plays a restrictive role, so the decrease in the MTRI is lower than that in the w.a.t.



The last column in Table 4 compares the change in the MTRI with the change in the w.a.t. The liberalizing role of tariff dispersion acts as a subsidy on imports, implying an extra reduction in the uniform tariff and yielding a change in the MTRI 20% higher than the decrease in the w.a.t. in 2005. This reduction can be even higher in years when the change in the w.a.t. is small, like 2003, when the extra liberalization is almost 40%. Furthermore the protective role of tariff dispersion imposes an additional tax on the uniform tariff, which is of about 14% of the w.a.t. in 2002 and even more than 40% in 2008, yielding a decrease in the MTRI smaller than that in the w.a.t. As these figures show, the varying sign and magnitude of the tariff dispersion effect on the restrictiveness of imports are important enough for us to adopt a comprehensive and general equilibrium approach when assessing the effects of tariff policies.

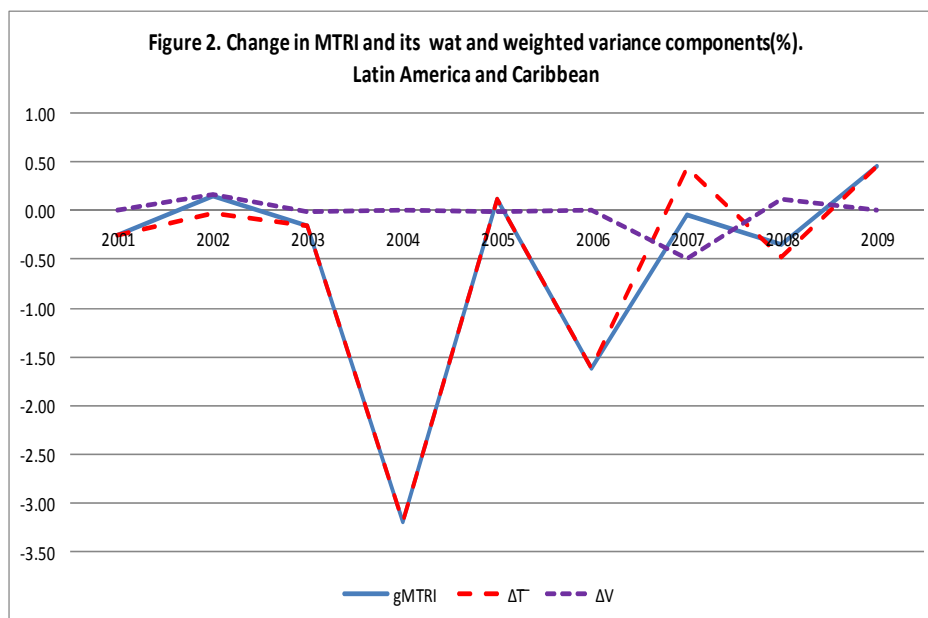
Nevertheless, these numbers hide very heterogeneous policies and THEIR consequences on the advances in market access. Two regions here, those of Latin America and the Caribbean and of South Asia, good examples of distorted trade policies, illustrate the different roles of the tariff structure and the very different pictures of its restrictiveness on imports. Table 5 and Figure 2 replicate the results in Table 2 and Figure 1 for the Latin America and Caribbean region, and Table 6 and Figure 3 do the same for South Asia.

Table 5: Evolution in the growth of trade and *gMTRI* . Latin America and Caribbean.

	Growth of imports for tariff reform: (%)			Growth of imports for tariff reform : (% of total growth of imports)			<i>gMTRI</i> (%)	<i>gMTRI</i> / ΔT (%)
	total	ΔT	ΔV	total	ΔT	ΔV		
2001	1.02	1.03	-0.01	-73.96	-74.66	0.69	-0.26	99.07
2002	-0.58	0.09	-0.67	24.54	-3.65	28.19	0.15	-672.27
2003	0.63	0.59	0.04	3.72	3.51	0.21	-0.16	106.04
2004	12.80	12.80	0.00	38.85	38.85	-0.01	-3.20	99.99
2005	-0.48	-0.49	0.01	-2.06	-2.09	0.03	0.12	98.51
2006	6.50	6.51	0.00	30.81	30.83	-0.02	-1.63	99.94
2007	0.16	-1.78	1.94	0.88	-9.64	10.52	-0.04	-9.13
2008	1.39	1.90	-0.51	18.26	24.92	-6.66	-0.35	73.29
2009	-1.85	-1.83	-0.02	-16.36	-16.22	-0.15	0.46	100.90
2001-2009	1.22	1.13	0.09	10.45	9.67	0.78	-0.31	108.05

Tariff policies in Latin American and Caribbean countries from 2001 to 2009 generate an increase in imports of 1.22%, which is 10.45% of the total imports growth. On the whole, both the w.a.t. and the tariff dispersion have moved in the same direction to liberalize imports and the sum of their effects on imports is equivalent to a reduction in the uniform tariff of 0.31%. The additional liberalizing effect of the change in the tariff dispersion adds 8.05% to the opening to imports measured by the w.a.t. Nevertheless, over time, tariff policy varies a lot, both in average and variance, which sometimes produce opposite effects on imports. The figures in Table 5 show a quite neutral role for the tariff dispersion, with a null effect on imports, e.g. in 2004 and 2006. However, in years such as 2002, 2007 and 2008 the change in tariff variance has an important and opposite effect to that of the change in the w.a.t.. In 2002 and 2008

tariff dispersion restricts imports, while the negative sign in 2002 and 2007 indicates a predominant role of tariff variance which, furthermore, is permissive in 2007.



The negative changes in the MTRI indicate a liberalization of imports in most years, with a maximum decrease in the uniform tariff of 3.20% in 2004 and a big one of 1.63% in 2006. Moreover, as Figure 2 shows, there is an almost perfect fit of the change in the MTRI to the variations of the w.a.t between 2003 and 2006, due to the neutral role of tariff dispersion, although this is not the case in 2002, 2007 and 2008. Tariff dispersion acts as an extra uniform tariff in 2002 and 2008 and as a subsidy in 2007. The last column in Table 5 indicates this fit with values close to 100. Values higher than 100 indicate a reinforcing effect of the tariff variance component, something that only occurs in two years – 2003 and 2009. Most of the values are lower than 100, indicating the opposite effects of the tariff average and dispersion components; the negative values arise when tariff dispersion predominates, with a strong restrictive role in 2002 and a liberalizing effect in 2007.

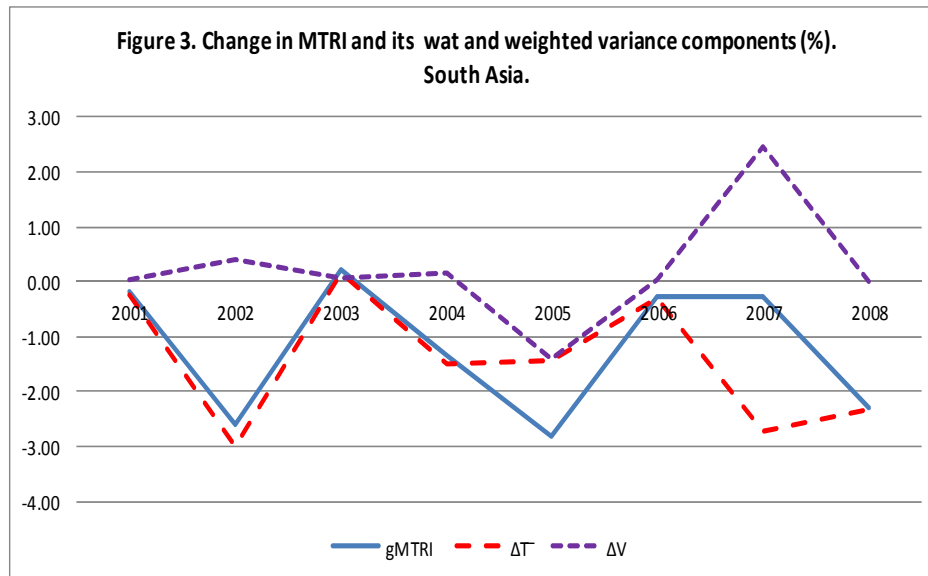
The case of South Asia presents a very different picture of the effect of the tariff structure, with a selective protection that is restrictive in a context of average

liberalization. Table 6 shows that tariff policies drive a growth in imports of 4.63% for the whole period, because of the reduction in average tariff, but with the change in tariff variance yielding a 0.33% restriction in imports. Again, these apparently small figures mean that imports driven by tariff policy in this region represent 59% of the total growth in imports, and the tariff dispersion component implies a restriction which is 4.23% of the total change in imports.

Table 6: Evolution in the growth of trade and gMTRI . South Asia.

	Growth of imports for tariff reform: (%)			Growth of imports for tariff reform : (% of total growth of imports)			<i>gMTRI</i> (%)	<i>gMTRI</i> / ΔT (%)
	total	ΔT	ΔV	total	ΔT	ΔV		
2001	0.76	0.95	-0.20	-11.80	-14.88	3.07	-0.19	79.34
2002	10.44	12.00	-1.56	4.0E+07	4.7E+07	-6.1E+06	-2.61	86.98
2003	-0.93	-0.60	-0.32	-13.11	-8.54	-4.57	0.23	153.48
2004	5.40	6.04	-0.64	59.28	66.30	-7.01	-1.35	89.42
2005	11.30	5.70	5.60	72.16	36.42	35.74	-2.82	198.15
2006	1.02	1.17	-0.15	16.21	18.57	-2.37	-0.26	87.25
2007	1.05	10.92	-9.87	-1.5E+03	-1.6E+04	1.4E+04	-0.26	9.60
2008	9.20	9.25	-0.05	28.62	28.77	-0.16	-2.30	99.46
2001-2008	4.63	4.96	-0.33	59.00	63.22	-4.23	-1.16	93.32

The change in imports due to the tariff reform is positive every year, except in 2003, with a maximum of 11.30% in 2005. Moreover, 2005 is the only year that tariff dispersion drives a growth in imports, with a magnitude remarkably similar to the one driven by the change in the w.a.t., thus yielding a growth in the MTRI which doubles the change in the w.a.t. On the contrary, other years, such as 2007, suggest a selective protection with a restrictive effect on imports that almost counteracts the liberalization driven by the w.a.t.



The growth of the MTRI reflects a general liberalization of imports during the period, the main reduction of 2.82% in the uniform tariff occurring in 2005, when the changes in tariff average and variance reinforce their effects on imports; other years, it is smaller, such as the 0.26% decrease in 2007, due to the opposite effects of changes in the w.a.t and tariff dispersion on imports. The last column in Table 6 and Figure 3 reflects that, for all years but 2005 and 2007, the uniform tariff decreases less than the w.a.t., as a result of the opposite effects of average and variance. This means that South Asia carries out a selective protection of the most sensitive products to tariff policy. Bearing in mind this protective component behind the average tariff reductions, future tariff reforms could offer additional market access.

5. Conclusions

The aggregate analysis of tariff reforms can now use the theoretical advances in recent years that underline the role of tariff dispersion in the restrictiveness of imports. In this way, it is possible to quantitatively assess recent practices that cause strong tariff dispersion with clear effects on market access. The main channel for driving aggregate changes in imports from tariff dispersion is the substitution effect, which needs a general equilibrium approach to be captured. This paper integrates the

recent work of Anderson and Neary on tariff reforms and a growth of trade model from a gravity approach, both based on general equilibrium analysis. This growth of gravity model is used to estimate the change in Anderson and Neary's Merchantilist Trade Restrictiveness Index with the available data of the import weighted tariff moments, average and variance.

This estimation is performed for a sample of 97 countries during 2001-2009, with robust results under different controls. On average, the reduction of the uniform tariff represented by the change in the MTRI has been of 0.509% and has driven 16.60% of the total growth in imports, with variations over time. But behind this picture of advances in market access, a selective protection of a restrictive nature has been found, meaning that the tariff average and variance components move in opposite directions. Moreover, two effects of tariff dispersion changes on the aggregate change in imports have been illustrated with the calculations of the growth in the MTRI for the Latin American and Caribbean region and for South Asia. For the first group of countries, tariff dispersion has played varying roles over time, from neutral to predominant, with effects of tariff average and dispersion on aggregate imports that reinforce each other. On the contrary, South Asia has experienced an important reduction in tariff average that explains much more than half the growth in imports, but carrying out a selective protection that partially counteracts the liberalization measured by the average reduction.

Evaluating future tariff reforms with special attention to these tariff structure effects can offer important information for measuring the progress in market access. The analysis performed in this paper has the potential to be a tool with which to evaluate tariff policies and the aggregate effects of negotiations at the tariff line. Other possible uses include the international comparison of advances in market access and the simulation of alternative reform rules and of their aggregate effects from tariff-line negotiations. Moreover, it can contribute to modeling individual countries' tariff reforms and restrictiveness when time series data are available.

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