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ENDOGENOUS PROTECTION IN IMPERFECT COMPETITIVE MARKETS: AN EMPIRICAL ANALYSIS FOR MERCOSUR COUNTRIES

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Endogenous protection in imperfect competitive markets: an empirical analysis for Mercosur countries

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Resumen

Este trabajo busca estudiar la estructura endógena de los aranceles para un grupo de países que pertenecen al Mercosur. El análisis empírico es llevado adelante a partir de una extensión del enfoque de Grossman y Helpman (1994) para el caso de competencia monopolística. El modelo es respaldado por la evidencia empírica. Las regresiones de la ecuación del arancel endógeno muestran que los coeficientes estimados presentan el signo esperado. Los resultados sugieren que los gobiernos del Mercosur, en promedio, valorarían un 25 por ciento más a los individuos que pertenecen a grupos de interés que a los individuos no organizados.

Clasificación classification: F12, F13, F14
Palabras Clave: Protección Endógena, Mercosur, Aranceles.

Abstract

This paper aims to study the endogenous structure of tariffs for a sample of Mercosur countries. The empirical analysis is carried out by taking into account an extended version of Grossman and Helpman's (1994) approach to the case of monopolistic competition. The theoretical model is supported by the empirical evidence. Estimations of the endogenous tariff regression show that estimated coefficients present the expected sign. The approximated inferred value of the general welfare weight suggests that Mercosur governments, in average, would attach a weight to those individuals belonging to an interest group that is approximately 25 percent above the weight given to non-organized individuals.

JEL classification: F12, F13, F14
Keywords: Endogenous protection, Mercosur, Tariffs.

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I. Introduction

During the 1990s countries of the Southern Cone Common Market – Mercosur- followed the world trend of increasing their trade integration both within the bloc and with the rest of the world. As it is well documented by Olarreaga and Soloaga (1998), during the first four years of the agreement, founder members showed a rate of integration with the world that was 10 times larger than that evidenced during the 1980s.[1] Without doubts, the trade integration process was the outcome of an important diminishment of trade restrictions; particularly countries of the region made a *volte-face* in trade policy.

Albeit efforts in terms of trade policy were made during the first years of Mercosur, after twenty years of its foundation, countries of the region still apply relatively high trade barriers in comparison to those implemented by other countries or economic blocs. For instance, in 2010, the simple averages of Most Favor Nation (MFN) applied duties of Argentina, Brazil Paraguay and Uruguay were 12.6%, 13.7%, ,10.2% and 10.5%, while those of Australia, Canada, the European Union (27) and the United States were 2.8%, 3.7%, 5.1% and 3.5% respectively.[2] Nowadays countries make use of a wide range of non-tariff policies to build trade barriers. As it is well known, Mercosur members are not the exception to the rule. Trade policy seems to be used as an instrument *at hands* to protect domestic productive sectors and, as a consequence, to transfer income among individuals of their societies.

Political economy views of trade policy may help to understand why countries maintain such level of trade barriers. Theoretical literature has nicely grown in this arena and empirical studies of endogenous protection have been carried out for different countries in the world.[3] For countries of the region, several empirical analyses have been performed. The first study that aimed to empirically explain the structure of endogenous protection in Mercosur was conducted by Olarreaga and Soloaga (1998). In a partial equilibrium analysis, authors checked whether the Mercosur common external tariff (CET) as well as deviations from it and from internal free trade could be explained from the perspective of different theoretical and empirical predictions on endogenous protection. The empirical results confirmed the main hypothesis; the structure of the CET and its "deviations" can be explained by sector lobbying.

Alternatively, Calfat *et al.* (2003) considered general equilibrium formulations in order to analyze the structure of protection in Mercosur. Based on different theoretical models developed by Grossman and Helpman (1994, 1995a, 1995b, 1996), the authors extended the specification of endogenous tariff to the Mercosur case. The general conclusion of the econometric analysis is in line with Olarreaga and Soloaga (1998); the estimations suggest that some sectors receive protection both through the CET structure and its "deviations".

Recently, Facchini *et al.* (2010) have extended the protection for sale model of Grossman and Helpman (1994) in order to account for imperfect substitutability between domestic and imported varieties of a good and to explore whether Latin American countries protect more the domestic productive sectors from those import competitive goods that come from China

[1] The rate of integration is measured by the difference between the growth rate of total trade and the rate of growth of gross domestic product (GDP), The rate of integration within the bloc was also 10 time higher in 1991-1995 than the one experienced during the 1980s, (Olarreaga and Soloaga, 1998).

[2] In 2010, for instance, the simple averages of MFN applied duties for other members of Mercosur were Bolivia (11.2%), Chile (6%), Colombia (12.5%), Peru (5.4%) and Venezuela (12.5%), (World Trade Organization Statistics Database).

[3] Some of the empirical studies that have been carried out in order to check for endogenous protection were Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Chang and Lee (2006), Gawande *et al.* (2006), Facchini *et al.* (2006) and Bombardini (2008) for the United Stated; Mitra *et al.* (2002) for the case of Turkey; Mitra *et al.* (2006) for the cases of Turkey and United State and McCalman (2004) for Australia. Gawande and Krishna (2005) and Imai et al. (2009) review the empirical studies in this arena.

and India. The estimation of the extended model provides evidence about the trade policy response of Latin American governments; the authors conclude that, as imports from China are closer substitutes to domestically produced goods than those that come from the rest of the world, governments set higher tariff in those sectors where Chinese imports are more important. The evidence for India is mixed. In addition, as imperfect competition is taken into account, authors remark that the extended model provides more realistic estimates of structural parameters and, as a consequence, outperforms the traditional Grossman and Helpman's framework.

This paper also aims to study the endogenous structure of tariffs for a sample of countries that belong to Mercosur. The sample considers three of the four countries that are founder and full members, i.e. Argentina, Brazil and Uruguay, as well as some of the countries that have signed a Free Trade Area with Mercosur and, thus, are called associated members, i.e. Bolivia, Colombia, Peru and Venezuela.[4] The empirical study is carried out by taking into account the model presented by Gáname (2010), which is also an extension of Grossman and Helpman's (1994) political-support approach in order to consider monopolistic competitive markets.

One of the main results from the empirical analysis in this paper is that the insights of the extended model presented in Gáname (2010) are corroborated by the empirical evidence. Also, the general conclusion is in line with that remarked by previous empirical studies for the case of Mercosur countries. Regressions of the endogenous tariff equation show that estimated coefficients present the expected sign, i.e. the interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity, and the effect of the ratio of quantity imports to import price are positive. The statistically significance of such parameters depend on the method used in estimations; though, for the case of the interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity, the estimated parameters are statistically significant at 5 percent or 10 percent. The F-tests indicate that regression equations as a whole are significant. Almost all statistics tests that were performed in order to check the robustness of instrumental variables and the endogenous regressor suggest instruments are suitable and the endogenous regressor is relevant in the estimated endogenous protection equations. The approximated value of the general welfare weight suggests that government would attach a different weight to individuals; those who belong to an interest group would receive a weight that is approximately 25 percent above the weight given to non-organized individuals.

This paper is structured as follows. Section II briefly describes the formal background presented in Gáname (2010) and introduces an alternative theoretical specification of the endogenous tariff formation in order to clarify the relationships between the tariff and its determinants. Section III shows a simplified econometric specification of the ad-valorem endogenous tariff and depicts the methodology applied in the econometric analysis. Section IV presents a description of the database and the econometric results. Finally, section V gives some concluding remarks.

II. Theoretical background

Gáname (2010) endogenizes the tariff formation by considering a setting that takes as based-models the Protection for Sale and the Linear Footloose Capital models[5]. The theoretical framework takes into account a small open economy, which chooses the trade policy, and the rest of the world. These regions have similar tastes and technologies; in each

[4] Paraguay, which is the other founder of Mercosur, has not been introduced in the analysis due to data availability problem. Chile, the first associated member that enters in 1996, has not been considered since it presents a uniform tariff structure. Finally, Venezuela is a process of becoming full member.
[5] These models were developed in Grossman and Helpman (1994) and Baldwin *et. al.* (2003) respectively.

economy, there are two productive sectors, one monopolistic competitive sector that produces differentiated goods under increasing returns to scale, and a perfect competitive sector which produces a homogeneous good under constant returns to scale. A monopolistic firm requires fixed-capital (*F* units), and mobile-labor (the labor-output coefficient is a_{mc}) factors to produce a differentiated good *i*; while a perfect competitive firm uses only labor to produce the *numeraire* good (the labor-output coefficient is $a_A = 1$). Differentiated goods are traded with the rest of the world with frictions; particularly a variety produced in the foreign economy faces a domestic tariff; for simplicity, the homogeneous good is traded between regions without friction. [6]

The home country is populated by *M* individuals who have identical preferences though they may be owners of different endowments.[7] The typical consumer of the small economy maximizes the following quasi-linear quadratic utility function:

$$U = c_A + \alpha\int_{i=0}^{N} c_i d_i - \frac{\beta-\delta}{2}\int_{i=0}^{N} c_i^2 d_i - \frac{\delta}{2}\left[\int_{i=0}^{N} c_i\right]^2; \quad \alpha > 0 \quad and \quad 0 < \delta < \beta \quad (1)$$

where c_i is the consumption of variety *i*, c_A is the consumption of the *numeraire* good. Parameter α measures the intensity of preferences for differentiated goods; $\beta > \delta$ expresses the *love for varieties* assumption and δ represents the degree of substitutability between varieties; high values of δ denote that varieties are closer substitutes. $N = n + n^*$ is the total number of differentiated goods, for which n-goods are produced domestically and n^*-goods are produce abroad. The optimal demand function of a variety is independent of the level of income and is given by $c_i = a + c\int_{j=0}^{N} p_j d_j - (b + cN)p_i$.[8] As it is expected, demand functions of varieties depend on the degree of product differentiation (i.e. high values of *c* account for a low degree of product differentiation), as wells as on the own price, not only in absolute terms- parameter *b*- but also in relatively terms -(*cN*)- With an individual spending equals to E, the optimal consumption choice for the numeraire good is $c_A = E - \int_{i=0}^{N} c_i p_i d_i$.[9]

The consumer surplus that a typical individual derived from the consumption of goods is given by:

$$S(p) = \frac{a^2 N}{2b} - a\int_{i=0}^{N} p_i d_i - \frac{c}{2}\left[\int_{i=0}^{N} p_i d_i\right]^2 + \frac{(b+cN)}{2}\int_{i=0}^{N} p_i^2 d_i \quad (2)$$

On the production side, the manufacturing market is assumed to be segmented; a typical firm maximizes operating profits neglecting its impact on the market but being aware that the market as a whole has a nonnegligible impact on its behavior.[10] The profit maximization problem for local and foreign firms, gives the equilibrium prices of differentiated goods. The equilibrium prices prevailing at the small open economy are given by:

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[6] As a consequence, the wage equals one.

[7] This section describes only the economic structure of the home economy; variables of the foreign economy are denoted by (*).

[8] Where $a \equiv \alpha/\left[\beta + (N-1)\delta\right]$, $b \equiv 1/\left[\beta + (N-1)\delta\right]$ and $c \equiv \delta/(\beta-\delta)\left[\beta + (N-1)\delta\right]$.

[9] It is assumed that individuals spend all their incomes.

[10] Prices must satisfy price indices definitions, P and P*, which prevail at the home and foreign economies respectively.

$$p_i = \frac{2\left[a + a_{mc}\left(b + cN\right)\right] + cn^{*}\tau}{2\left(2b + cN\right)} \text{ and } \bar{p}_i^{*} = p_i + \frac{\tau}{2} \quad (3)$$

where p_i denotes the domestic price of a differentiated good that is produced at home, while $\bar{p}_i^{*}$ represents the domestic price of a variety which is produced abroad. Equation (3) reveals that prices of differentiated goods are positively affected by the domestic specific tariff, τ; on the one hand, domestic firms may charge higher prices when the tariff is high; on the other hand, the domestic price of the foreign varieties is more affected by changes in the domestic tariff, in fact foreign firms have to absorb part of the tariff since the difference between the price of a variety produced at home and that of a variety produced abroad is lower than the tariff (i.e. the difference is just half of the tariff).

Operating profits of domestic firms comprise benefits that are derived from the local market and those of that are earned at the rest of the world. The rental rent earned by capital owners is obtained by evaluating operating benefits at equilibrium prices:

$$\begin{aligned}\pi &= \left(p_i - a_{mc}\right)c_i\left(M\right) + \left(\bar{p}_i - \tau^{*} - a_{mc}\right)\bar{c}_i\left(M^{*}\right)/F \\ &= \left(b + cN\right)\left[\left(p_i\left(\tau\right) - a_{mc}\right)^2 M + \left(\bar{p}_i\left(\tau^{*}\right) - \tau^{*} - a_{mc}\right)^2 M^{*}\right]/F \end{aligned} \quad (4)$$

where $\bar{p}_i$ is the price of a domestic variety that prevails at the foreign market; τ^{*} is the foreign trade barrier that faces a local firm when it sells abroad and $\bar{c}_i$ is the demand of a foreign consumer for a domestic differentiated product.

As it was mentioned above, the government of the home economy charges a tariff to those imports of differentiated goods that come from the rest of the world. The revenue derived from this policy, in per-capita terms, amounts to:

$$r\left(p\right) = \tau\int_i \bar{c}_i^{*} d_i \quad (5)$$

where $\bar{c}_i^{*}$ denotes the individual demand of a foreign variety. As in Grossman and Helpman (1994), it is assumed that the local government redistributes uniformly among individuals the revenue that collects from the tariff imposition.

In this setting, like in Grossman and Helpman (1994), it is assumed that all individuals are endowed with labor; however only some individuals are owners of capital; hence individuals perceive different level of incomes according to different sources. Besides, each individual receives an equal fraction of tariff revenue from government redistribution. In the small economy, aggregate gross welfare equals the sum of aggregate income, tariff revenue and total consumer surplus:

$$W\left(p\right) = I + K\pi_i + M\left[r\left(p\right) + S\left(p\right)\right] \quad (6)$$

where I is the total labor income of the population and $\prod = K\pi_i$ is the total capital rent, in which K amounts for the total capital stock of the home economy.

In this background, since individuals obtain their incomes from different sources, they have different incentives. In fact, capital owners, who perceive that their incomes are positively affected by the domestic tariff, share a common interest in obtaining protection from the incumbent. Capital owners, which are involved with the manufacturing sector, join to do

political activity. It is assumed that they succeed in dealing with the free rider problem and organize themselves into an interest group. The interest group makes political contributions contingent on the tariff imposed by the government. The lobby chooses the optimal level of the contribution maximizing its total net welfare, $V_{IG} = W_{IG}(p) - C_{IG}(p)$, where $C_{IG}(p)$ is the contribution schedule offered by the lobby and the interest group's gross welfare is equal to:

$$W_{IG}(p) = I_{IG} + K\pi_i + \alpha_{IG} M\left[r(p) + S(p)\right] \quad (7)$$

I_{IG} denotes the total labor supply of capital owners, α_{IG} is the share of the voting population that owns capital and belongs to the interest group; hence $\alpha_{IG} M\left[r(p) + S(p)\right]$ accounts for the tariff revenue that capital owners receive from the government and the total consumer surplus they derive.

As in Grossman and Helpman (1994), the government is interested in both the level of contributions and in the well being of the society. The incumbent officeholder cares about the total amount of contributions because they are a potential source of economic funds to finance campaign spending or they may provide other sort benefits. Also the well being of the society is of government's concern due to the fact that individuals, as voters, are more likely to re-elect a government that has taken actions to improve their standard of living. The linear objective function that reveals these preferences is $G = C_{IG}(p) + \theta W(p)$, where $\theta \geq 0$ denotes the weight that government attaches to the society's well being, $W(p)$, relative to the amount of lobby's contributions.

The political process consists of a two-stage non-cooperative game in which the lobby chooses its political contribution in the first stage and the government sets the trade policy in the second. The equilibrium comprises the optimal level of contribution and the optimal tariff. Following Grossman and Helpman (1994), it is assumed that the contribution function is differentiable and the equilibrium price maximizes both the welfare of the particular lobby and the government's objective function. Then, the interest group may choose a contribution that is *locally truthful*, which has the interesting property in mirroring a marginal change in the contribution with a marginal change in the lobby's welfare when both changes are caused by a marginal change in the tariff, i.e. $\partial C_{IG} / \partial\tau = \partial W_{IG} / \partial\tau$. Hence, in equilibrium, truthful contributions induce the government to behave as if it were maximizing $\theta W + W_{IG}$. In this case, the objective function of the government is characterized by a social welfare function that weights differently the members of society; lobby's members receive a weight of $(1+\theta)$, while individuals, that are not organized, receive a smaller weight of θ (Grossman and Helpman, 1994). The first order condition of this problem is given by:

$$\partial W_{IG} / \partial\tau + \theta \partial W / \partial\tau = 0 \quad (8)$$

Equation (8) characterizes the equilibrium domestic tariff, and consequently the equilibrium of domestic prices of all varieties, supported by the differentiable contribution function. Considering equations (6) and (7), taking derivatives and rearranging, one obtains the endogenous tariff:

$$\tau^o = \left[\frac{1+\theta}{\theta + \alpha_{IG}}\right] \frac{2nc_i \, \partial p_i / \partial\tau}{n^*\left(b\,\partial \bar{p}_i^{\,*} / \partial\tau + cn/2\right)} + \frac{n^* \bar{c}_i^{\,*}/2 - \Phi\,\partial p_i / \partial\tau}{n^*\left(b\,\partial \bar{p}_i^{\,*} / \partial\tau + cn/2\right)} \quad (9)$$

where $c_i = (p_i - a_{mc})(b + cN)$, $(p_i - a_{mc})$ is the difference between the price of a domestic variety set by firm *i*, and the marginal cost of producing it, i.e. the mark-up, and $\Phi = nc_i + n^* \bar{c}_i^*$ denotes a quantity index of varieties.

As Gáname (2010) has pointed out, equation (9) reveals that the equilibrium endogenous tariff depends on a set of political and economic variables. The fact that a particular tariff arises from a political process in which the incumbent cares about the social welfare and political contributions, generally results in an inefficient policy that charges imports above the level of the optimal tariff.[11] Political variables impact on the endogenous specific tariff in a similar fashion as they affect the ad-valorem tariff that emerges under perfect competition. When the government has a remarkable concern on the well-being of the society, the resultant tariff is low. Also, the optimal tariff is lower when α_{IG} is higher; at the extreme case, when all population belongs to any interest group, $\alpha_{IG} = 1$, the optimal tariff will coincide with the level of tariff that maximizes general welfare.[12]

Equation (9) also shows that there are four economic variables and parameters that play an interesting role in determining the endogenous tariff. Firstly, the government set lower a tariff for varieties that are quite sensitive to changes in own prices; that is for varieties that present a high parameter *b* in their demand functions. Secondly, the inverse of import penetration is positively related with the level of protection. When domestic consumption is relevant, the monopolistic sector have much to earn from a tariff that increases the domestic price of varieties.[13] Thirdly, there is a positive relationship between the tariff and the mark-up, $(p_i - a_{mc})$, which is a key economic variable in a monopolistic competition background. Finally, other parameter, which is relevant in a monopolistic setup and affects the tariff, is the one that account for the cross-price effects. When varieties present a low degree of product differentiation and hence, they are closer substitutes (parameter *c* is high), the tariff level, which is politically determined, is high.

To clarify the relationships described above, equation (9) can be manipulated in order to express the endogenous tariff in terms of different elasticities and other key variables. Rearranging the right hand side -RHS- of equation (9), the endogenous specific tariff can be expressed as an ad-valorem tariff by dividing it by the price of foreign variety. The clear-cut relationship becomes:[14]

$$t_i^o = \left[\frac{1+\theta}{\theta+\alpha_{IG}}\right]\frac{C_{i,d}}{C_{i,m}} \times \sigma_{d,m}\frac{(p_i - a_{mc})}{p_i} + \left[\frac{1-\alpha_{IG}}{\theta+\alpha_{IG}}\right] \times \left|\chi_{pc}\right| \times \frac{n}{n^*} \times \frac{(p_i - a_{mc})}{\bar{p}_i^*} + \frac{1}{\varepsilon_{\bar{p}^*}} \qquad (10)$$

where, $t_i^\circ = \frac{\tau^\circ}{\bar{p}_i^*}$, $\frac{C_i^d}{C_i^m} = \frac{nc_i p_i}{n^* \bar{c}_i^* \bar{p}_i^*}$ is the ratio of domestic to foreign varieties consumption; $\sigma_{d,m} = \frac{\partial c_i}{\partial \bar{c}_i^*} \times \frac{\bar{c}_i^*}{c_i}$ is the absolute value of the elasticity of substitution between domestic and

[11] The optimal tariff would emerge if the incumbent would be interested only in maximizing general welfare (see Annex B in Gáname, 2008).

[12] As α_{IG} approximates to one, the interest group faces a higher aggregate consumer loss, which starts to outweigh the gain on profits given by a higher tariff.

[13] In this paper, import penetration is defined in terms of consumption, that is, as the ratio of consumption of the foreign variety to consumption of domestic variety. As it has been remarked by Grossman and Helpman (1994), the political power that a particular sector may detain is revealed by the inverse of import penetration, which is defined by the authors as the ratio of domestic product to imports.

[14] Annex A, presents the deductions of how to obtain expression (10).

foreign varieties due to a tariff change; $\frac{(p_i - a_{mc})}{p_i}$ is the domestic mark-up in terms of the price of domestic variety; $\chi_{pc} = \frac{\partial c_i / \partial \tau_i}{\partial \bar{c}_i^* / \partial \tau_i} < 0$ accounts for the pro-competitive effect and $\varepsilon_{\bar{p}^*}$ is the import price elasticity, in absolute value.

From equation (10) one can highlight several relationships between the endogenous tariff and its determinants. As it was mentioned above, the endogenous tariff is positively affected by the ratio of domestic to foreign varieties consumption. It also reveals that the level of tariff is higher for higher elasticities of substitution; that is when domestic and foreign varieties present a low degree of product differentiation. The relative domestic mark-up, which is defined as the inverse of the own price elasticity, affects the tariff positively. Moreover, the Ramsey-rule applies; for high import demand elasticities, a government that cares on social welfare will set a low domestic tariff in order to avoid a high deadweight loss. The pro-competitive effect, χ_{pc} , impact positively on the level of the ad-valorem tariff. The reason why is that, a cut on the level of tariff diminishes both prices, p_i and $\bar{p}_i^*$; however, the diminishment of the price of foreign variety is higher, hence as the tariff decreases, the consumption of foreign variety increases and that of domestic variety diminishes. When the pro-competitive effect is important, domestic producers have much to lose, hence they are more interested in asking for higher protection.

III. The econometric specification

Although equation (10) highlights in a more suitable manner the determinants of the endogenous tariff, it requires considering data for variables such as the price of domestic variety, the mark-up of each sector and a measure for the pro-competitive effect. Unfortunately, this dataset is not available for the country sample. Moreover, equation (10) relies on estimates for import-demand elasticities, though available, the consideration of them in the econometric version of equation (10) might bring problems of measurement error. Therefore, the econometric analysis is carried out by taking into account an alternative expression of the endogenous tariff, which is an adaptable version to data availability. Annex A presents the steps to obtain the parsimonious expression (11):

$$t_i^o = \left[\frac{2+\theta}{\theta}\right]\frac{C_{i,d}}{C_{i,m}} \times \frac{1}{\varepsilon_{\bar{c}_i^*, p_i}} + \frac{1}{(b+cN)n^*}\frac{n^* \bar{c}_i^*}{\bar{p}_i^*} \qquad (11)$$

where $\varepsilon_{\bar{c}_i^*, p_i}$ is the cross price elasticity, which shows how the consumption of foreign variety changes when the price of domestic variety changes due to a tariff change. Instead of considering in RHS of the equation the import price elasticity, the second term in (11) is expressed in term of imports quantity and import prices.

The econometric version of equation (11) is specified by considering the fact that the analysis aims to check the presence of endogenous protection for productive sectors within MERCOSUR's countries over the time period 1991-2004. Particularly, the database includes some piece of information for individuals *j,* that couples industry *i* with country *c*, over time *t.* Hence, the econometric expression takes the natural form of one for panel analysis, that is:

$$t_{j,t} = \beta_j + \beta_1 \frac{C_{j,t}^d}{C_{j,t}^m} \times \frac{1}{\varepsilon_{\bar{c}_j^*, p_j}} + \beta_2 \frac{n^* \bar{c}_{j,t}^*}{\bar{p}_{j,t}^*} + \mu_{j,t} \qquad (12)$$

where $t_{j,t}$ denotes the endogenous ad-valorem tariff for individual *j,* which couples industry *i* (disaggregated at three-digit of the International Standard Industrial Classification –ISIC- level) with county *c* = {Argentina, Bolivia, Brazil, Colombia, Peru, Uruguay and Venezuela} at time *t*.[15] As it was mentioned above, $\frac{C_{j,t}^{d}}{C_{j,t}^{m}}$ is the ratio of domestic to foreign varieties consumption for *j* ; $\frac{1}{\varepsilon_{\bar{c}_j^*,p_j}}$ denotes the inverse of cross-price elasticity and $\frac{n^* \bar{c}_{j,t}^{*}}{\bar{p}_{j,t}^{*}}$ equals the ratio of imports quantities of foreign varieties for *j* to foreign variety price of *j*. Parameters to be estimated are β_j , which is the individual *j* fixed effect, $\beta_1 = \frac{2+\theta}{\theta}$ and $\beta_2 = \frac{1}{(b+cN)n^*}$. Finally, $\mu_{j,t}$ is the idiosyncratic error term.

Equation (12) controls for fixed effects of individuals in order to consistently estimate parameters β_1 and β_2. As it s well known, the fixed effect model allows that regressors could be correlated with fixed effects, which means that some kind of endogeneity is permitted. In this particular case, for example, it is assumed that if the ratio of domestic to foreign varieties consumption for *j* is correlated with unobserved characteristic of the market and/ or industry *i* in country *c* (i.e. the scale of the industry in that country), they are correlated only with the time-invariant component of such a characteristic. The reasoning is applicable also to regressor $\frac{n^* \bar{c}_{j,t}^{*}}{\bar{p}_{j,t}^{*}}$, which could be correlated with an unobserved time-invariant component for which the fixed effect may controls for.

Also, the estimation is carried out by being aware that explanatory variables in equation (12) may be correlated with the time-variable component of the error term. In order to check whether the endogeneity problem of regressors arises, endogeneity tests are performed.[16] After some evidence of the presence of endogeneity regressor, instrumental variable procedure is applied. Hence, parameters of the panel data equation (12) are estimated using two methods: the Instrumental Variable-Two-Stage Least Square (2SLS) estimation, which assumes that disturbances are *i.i.d* and the Instrumental Variable-Generalized Method of Moments (2SGMM), which provides consistent estimates in case that the disturbances were heteroskedastic.

IV. The empirical results

IV.1 Description of the data

The data needed to perform the estimation of the endogenous protection equation (12) is obtained from Nicita and Olarreaga (2007). The database nicely provided by these authors contains annual data on trade flows, domestic production and trade protection for 28 manufacturing sectors, which correspond to the disaggregation at the three-digit level of

[15] The econometric specification assumes that all sectors form part of an interest group. As Mitra *et al.* (2006) and Facchini *et al.* (2010) have remarked, at this level of sector aggregation, one can consider that all sectors are politically organized.

[16] Baum *et al.,* 2007, present an endogeneity test, which is distributed as χ^2 with degrees of freedom equal to the number of regressors tested. The null hypothesis states that the specified endogenous regressor can be treated as exogenous. The statistic test is robust to various violations of conditional homoskedasticity.

ISIC. The main contribution of this database is that joins data from different sources into a common classification. [17]

As it was mentioned above, the country sample comprises those countries which are Mercosur members during the period 1991-2004, i.e. Argentina, Bolivia, Brazil, Colombia, Peru, Uruguay and Venezuela.[18] Some of the variables, which are needed to estimate equation (12), are available in the database of Nicita and Olarreaga (2007), while other few variables are constructed from using data of this database.

Specifically, the ad-valorem tariffs considered in the left hand side –LHS- of equation (12) are those import weighted average *applied* tariff rates reported in the database.[19] For the RHS variables of (12), firstly, the ratio of domestic to foreign varieties consumption, $\frac{C_{j,t}^{d}}{C_{j,t}^{m}}$, is constructed by calculating the domestic consumption of a good that is produced at home. Specifically, $C_{j,t}^{d}$ equals the value of goods that are produced in a particular country by a sector during a year (called variable output in the database) minus the value of its exports.[20] The denominator of the ratio is the imports variable, which is available in the database for each country and by sectors. Both, the numerator and the denominator are variables reported in values (in thousand dollars). Secondly, the ratio of imports quantities of a foreign variety to the price of such a good, $\frac{n * \bar{c}_{j,t}^{*}}{\bar{p}_{j,t}^{*}}$, is built by considering the import quantity, reported in kilograms, in the numerator and the import unit value, reported in dollars per kilogram, in the denominator.[21]

Also, the data for instrumental variables that are used in the econometric analysis are available by country and for the 28 manufacturing sector in Nicita and Olarreaga (2007). In each regression, the instrumental variables considered were number of employees, who worked in or for an establishment during a year, and the wage bill variable, which comprises all payments in cash or in kind paid to employees during the reference year in relation to work done for the establishment (Nicita and Olarreaga, 2007).[22]

Finally, in order to compute the inverse of cross-price elasticities, $\frac{1}{\varepsilon_{\bar{c}_j^{*},p_j}}$,a proxy variable is taken into account since, as it is well known, estimated cross-price elasticities disaggregated at the three-digit level of ISIC are not available. Shiells *et al*. (1986) provide estimates of the elasticity of substitution between imports and home good for the United States. Authors estimate, for the 122-three digit Standard Industrial Classification industries, the elasticities of substitution as a function of cross-price and expenditure elasticities and aggregate them into

[17] The database is freely available in the World Bank Trade website: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21085384~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

[18] As it was remarked above, Paraguay is one of the founder members of MERCOSUR; however, as reliable data is not available, it is not considered in the sample. Chile is an associated member since 1996, but as it has a uniform tariff structure. Following the criterion of Facchini *et al.* (2010), also it is not in the country sample.

[19] These tariffs are applied when goods enter into the country; as authors remark, they take in to account the available, thought not complete, data for preferential schemes.

[20] For few sectors of the sample, this operation is negative; therefore as consumption cannot be negative, for these sectors, it is considered that domestic consumption of the good produced at home is zero.

[21] As it has well noticed in the literature, the use of unit value as a proxy of import prices results in errors of measurement; however data on import prices at disaggregated level is not available,

[22] Authors remark that payments include direct wages and salaries, remuneration for time not worked, bonuses and gratuities, housing allowances and family allowances paid directly by the employer and other payments in kind.

the three-digit ISIC level. These elasticities are borrowed from Shiells et al. (1986) and they are used as an invariant variable among countries and year.

IV.2 The econometric outcomes

Estimation of equation (12) is performed for two groups of the country sample; the first group comprises all countries of the sample, those which are full and associate members of Mercosur (Argentina, Bolivia, Brazil, Colombia, Peru, Venezuela and Uruguay), and the second group consists of only full members of the sample, those which are also founder members (Argentina, Brazil and Uruguay). Tables 1 and 2 present the econometric results of the reduced equation (12) for all countries of the sample and Tables 3 and 4 give the econometric outcomes of endogenous protection for the founder members.[23]

Table 1: Results of the endogenous protection regression -Fixed effect-2SLS estimation[(a)]

Mercosur (all members)

Tariff $t_{j,t}$	Coefficient	z-value	P > l z l	Interval confidence at 95%
$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	0.37 (0.15)	2.41	0.02	[0.07 0.67]
$x_{2jt} = \frac{n * \bar{c}^*_{j,t}}{\bar{p}^*_{j,t}}$	2.95e-11 (2.63e-11)	1.12	0.26	[-2.20e-11 8.11e-11]
Number of observations	875			
F (11,713)	6.00			
Prob. > F	0.00			
Anderson canonical correlation LM test [(b)] χ^2 (2)	22.59			
P-value	0.00			
Anderson-Rubin Wald test [(c)] F(2,712)	6.95			
P-value	0.00			
Sargan statistic [(d)] χ^2 (1)	0.53			
P-value	0.47			

Note: (a) The regression includes year dummies. (b) The Anderson canonical correlation test is used to check for underidentification problem; the null hypothesis that matrix of reduced form coefficients has deficient rank is strongly rejected. (c)The Anderson-Rubin Wald test serves to check the significance of the endogenous regressors in the structural equation; the rejection of the null hypothesis indicates that the endogenous regressor is relevant. (d) The Sargan statistic checks for overidentification of all instruments; the no rejection of the null indicates that instruments are appropriate.

Table 1 presents estimated coefficients by using the Instrumental Variable-Two-Stage Least Square (2SLS) method. For the case of all Mercosur members, the estimated parameters

[23] Annex B presents the first stage regressions of Tables 1, 2, 3 and 4.

show the expected sign. The interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity is positive and statistically significant at 5 percent level, while the effect of the ratio of quantity imports to import price, though positive, is not statistically significant. The F-test indicates that the regression equation as a whole is significant; the null hypothesis that all coefficients are zero is strongly rejected, as one can see in Table 1.

As it was mentioned in section III, both regressors in equation (12) might be endogenous; the interaction between the ratio of domestic to foreign varieties and cross price elasticity as well as the import quantity of a variety may depend on variables that are not considered explicitly and therefore these regressors could be correlated with the error term of equation (12).

In order to know how these variables should be introduced in the econometric analysis, endogeneity tests are implemented. When the endogenous test is performed individually for each regressor, the null hypothesis that such a regressor can be treated as exogenous is rejected at 1 percent significant level. Hence, both regressors are instrumented and the endogenous test is carried out again. In this step, when one performs the test for one of the regressors, i.e. the ratio of import quantity to import price of the variety; one cannot reject the null that this ratio could be treated at exogenous.[24] Therefore, Table 1 presents the results when only the first regressor, i.e. the interaction between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity, is instrumented. Particularly, both available instruments are used, the wage bill paid by sectors and the number of employees employed in each of the 28 manufacturing sectors. The idea behind is that both variables affect the production of domestic varieties and hence the consumption levels of such a variety at home markets as well as those of the imported one.

Table 1 also presents several statistic tests that hand an inspection on the validity of instruments as well as the performance of the endogenous regressor considered in the econometric analysis.[25] Firstly, the Anderson canonical correlation test serves to check whether instruments are significantly correlated with the endogenous regressor, i.e. the interaction between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity; under the null hypothesis canonical correlations are zero. The test statistic, which is presented in this table, indicates that the null hypothesis is strongly rejected. Secondly, the Anderson-Rubin test checks the significance of the endogenous regressor in the structural equation; the null hypothesis that $\beta_1 = 0$ is strongly rejected, indicating that the endogenous regressor is relevant.[26] Finally, The Sargan statistic tests for overidentifying restrictions; the no rejection of the joint null hypothesis indicates that instruments are valid in the sense that they are uncorrelated with the error term and the excluded instruments, i.e. the wage bill and number of employees, are correctly excluded from the estimated equation (12).

Table 2 presents the outcome of the estimation when the Instrumental Variable-Generalized Method of Moments (2SGMM) is used. The advantage of applying the 2SGMM is that in the presence of heteroskedasticity problem, the estimated coefficients are efficient and the statistics are robust to heteroskedasticity. As it is expected, Table 2 shows that for the case of all Mercosur members, the estimated parameters also present the expected sign though

[24] When the endogeneity test is carried out for the ratio of import quantity to import price of the variety, the statistic test χ^2 (1) equals to 0,53 and the probability associated is 0,47; hence one cannot reject the null hypothesis of treating this regressor as exogenous at conventional levels of significance.

[25] Baum *et al.* (2007), present some statistical tests, which are needed to consider when the instrumental variable procedure is used and GMM estimation is carried out. They also provide enhanced routines for Stata program.

[26] Tables 1 and 2 present the F-statistic version of the Anderson and Rubin Test. There is a χ^2 statictis version of the test, which also indicates that endogenous regressor is relevant at the conventional level of significance. The Stock-Wright LM test also provides evidence in favor of the regressor relevancy.

their level of significance worsen. The interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity is positive and statistically significant only at 10 percent level, while the effect of the ratio of quantity imports to import price is still not statistically significant. The first coefficient estimated by 2SLS is only 8,9 percent higher than that estimated by 2SGMM, while the second coefficient, which is not statistically significant in any estimation, is 4,8 percent lower than the one estimated by 2SGMM. Again, the F-statistic test indicates that the regression equation as a whole is significant.

Table 2: Results of the endogenous protection regression -Fixed effect- 2SGMM estimation [(a)(b)]

Mercosur (all members)

Tariff $t_{j,t}$	Coefficient	z-value	P > l z l	Interval confidence at 95%
$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	0.34 (0.19)	1.82	0.07	[-0.03 0.70]
$x_{2jt} = \frac{n * \bar{c}^*_{j,t}}{\bar{p}^*_{j,t}}$	3.10e-11 (2.83e-11)	1.09	0.27	[-2.45e-11 8.64e-11]
Number of observations	875			
F (11, 713)	5.68			
Prob. > F	0.00			
Kleibergen-Paap rk LM statistic [(c)] χ^2 (2)	7.62			
P-value	0.02			
Anderson-Rubin Wald test [(d)] F(2, 712)	11.68			
P-value	0.00			
Hansen J statistic[(e)] χ^2 (1)	0.64			
P-value	0.42			

Note: (a) The regression includes year dummies. (b) Estimates are efficient for arbitrary heteroskedasticity and statistics are robust to heteroskedasticity. (c) The Kleibergen-Paap test is a generalization of the Anderson canonical correlation test to the non-*i.i.d.* case; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level. (d) The Anderson-Rubin Wald test, which serves to check the significance of the endogenous regressors in the structural equation, is robust to heteroskedasticity; the rejection of the null hypothesis indicates that the endogenous regressor is relevant. (e) The Hansen J statistic checks for overidentification of all instruments for the non-*i.i.d.* case; the no rejection of the null indicates that instruments are appropriate.

Table 2 presents the results when the interaction between the ratio of domestic to foreign varieties consumption and cross price elasticity is considered endogenous.[27] Now, the statistic tests that serve to inspect the validity of instruments are robust to the possible case

[27] As previously, the endogenous test for the ratio of import quantity to import price of the variety when 2SGMM estimation is carried out, indicates that this variable can actually be treated as exogenous; the statistic test χ^2 (1) equals to 0,64 and the probability associated is 0,42. Also, in this case, the instruments used are the wage bill and the number of employees.

of non-*i.d.d.* errors in equation (12). The Kleibergen-Paap test indicates that canonical correlations between the instruments and the endogenous regressor are statistically significant; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level. Again, the Anderson-Rubin Wald test suggests that the endogenous regressor is relevant.[28] Finally, the Hansen J statistic, which tests for overidentification of all instruments when errors are non-*i.i.d*.; infers that instruments are uncorrelated with the error term and those of who are excluded, are correctly kept out from the estimated equation.

Tables 3 and 4 show the econometric outcomes of the endogenous protection for MERCOSUR's founder members. Also the estimation is carried out by 2SLS and 2SGMM procedures. Following similar steps in the econometric analysis, the endogeneity issue of regressors is inquired; hence the appropriate tests are performed. As before, when one checks about the endogeneity nature of the ratio of import quantity to import price of the variety, the endogeneity test suggests that this variable actually can be treated as exogenous.[29] Similarly, in this case, the available instruments for the endogenous regressor are the wage bill and numbers of employees.

In Table 3 both estimated coefficients present the expected signs and are statistically significant at the 5 percent level. Interestingly, one can expect that the interval [0.06, 1.89] contains the true parameter β_1 (i.e. the interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity) at 95 percent confidence level. The F-statistic suggests that the endogenous protection regression for MERCOSUR's founder members is significant.

The several statistics tests suggest that instruments are suitable and that the endogenous regressor is relevant in the estimated endogenous protection equation. Particularly, the Anderson canonical correlation test indicates that the correlation between instruments and the endogenous regressor is significant; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level. As one can see in Table 3, the Anderson-Rubin Wald statistic equals 12.06, which means that the endogenous regressor is significant in the endogenous protection equation (12).[30] Again, the Sargan statistic is far from the rejection of its null, giving confidence that all instruments are suitable.

Finally, Table 4 shows the estimated coefficients and statistics tests when the endogenous protection regression is estimated by 2SGMM.[31] The statistical significance of both estimated coefficients diminishes; now $\hat{\beta}_1$ is significant only at 10 percent level, while $\hat{\beta}_2$ is not sadistically significant.

[28] The χ^2 statictis version of the test and the Stock-Wright LM test also provide evidence in favor of the regressor relevancy.

[29] In this case, the statistic test χ^2 (1) equals to 1,21 and the probability associated is 0,27.

[30] The χ^2 statictis version of the test and the Stock-Wright LM test also confirm this hypothesis.

[31] Similar to the others, the regression considers the interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity as endogenous, while the ratio of import quantity to import price of the variety as exogenous. The endogenous statistic for the second regressor equals to 1,41 and the probability associated is 0,24.

Table 3: Results of the endogenous protection regression -Fixed effect- 2SLS estimations[(a)]

Mercosur (full members)

Tariff $t_{j,t}$	Coefficient	z-value	P > l z l	Interval confidence at 95%
$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	0.97 (0.47)	2.08	0.04	[0.06 1.89]
$x_{2jt} = \frac{n * \bar{c}^*_{j,t}}{\bar{p}^*_{j,t}}$	2.40e-09 (1.23e-09)	1.95	0.05	[-1.75e-11 4.81e-09]
Number of observations	359			
F (7, 284)	3,93			
Prob. > F	0.00			
Anderson canonical correlation LM test [(b)] Chi-sq(2) P-value	7.15 0.03			
Anderson-Rubin Wald test [(c)] F(2,283) P-value	12.06 0.00			
Sargan statistic [(d)] χ^2 (1) P-value	1.21 0.27			

Note: (a) The regression includes year dummies. (b) The Anderson canonical correlation test is used to check for underidentification problem; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level. (c)The Anderson-Rubin Wald test serves to check the significance of the endogenous regressors in the structural equation; the rejection of the null hypothesis indicates that the endogenous regressor is relevant. (d) The Sargan statistic checks for overidentification of all instruments; the no rejection of the null indicates that instruments are appropriate.

Comparing the estimated coefficients, $\hat{\beta}_1^{2SLS}$ and $\hat{\beta}_1^{2GMM}$, the first coefficient is just 3 percent higher than that estimated by the 2SGMM, while $\hat{\beta}_2^{2SLS}$ is only 2,56 percent higher than $\hat{\beta}_2^{2GMM}$. However, the second coefficient, $\hat{\beta}_2$, is only statistically significant when is the estimation is carried out by the 2SLS method.

Now, as one can see in Table 4, some statistic tests give less confidence about instruments. The Kleibergen-Paap test rejects its null only at 10 percent significant level. Moreover, as one can see in Table 4C of the Annex B, the F-tests of excluded instruments cannot reject its null that coefficients were zero at the conventional levels of significance. In contrast, the Hansen J statistic gives a signal of confidence for all instruments since one cannot reject its null. Finally, the Anderson-Rubin Wald statistic suggests that the endogenous regressor is significant in the endogenous protection equation of MERCOSUR's full members.

Interestingly, Tables 1 to 4 show estimated coefficients, $\hat{\beta}_1$ that are lower than one, and confidence intervals for such parameters that, in the case of full members, are [0.07 0.67]

and [-0.03 0.70] and, for founder members are [0.06 1.89] and [-0.15 2.05] respectively. As it was explained in section III, when the government attaches a higher weight to the social welfare, θ, the optimal tariff will be lower. Since, $\beta_1 = \frac{2+\theta}{\theta}$, the lower β_1 the higher the weigh on social welfare, i.e. $\theta = \frac{2}{\beta_1 - 1}$. At the limit, when β_1 tends to one, the weight on social welfare tends to infinite and the tariff chosen will be equal to the one government would choose if it only were maximizing the general welfare. For $\beta_1 < 1$, θ will be negative, a result that is odd from the theoretical point of view.

Table 4: Results of the endogenous protection regression -Fixed effect - 2SGMM estimation[(a)(b)]

Mercosur (full members)

Tariff $t_{j,t}$	Coefficient	z-value	P > l z l	Interval confidence at 95%
$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	0.95 (0.56)	1.69	0.09	[-0.15 2.05]
$x_{2jt} = \frac{n * \bar{c}^*_{j,t}}{\bar{p}^*_{j,t}}$	2.34e-09 (1.59e-09)	1.47	0.14	[-7.79e-10 5.45e-09]
Number of observations	359			
F (7, 284)	4.93			
Prob. > F	0.00			
Kleibergen-Paap rk LM statistic [(c)] χ^2 (2)	5.02			
P-value	0.08			
Anderson-Rubin Wald test [(d)] F(2,283)	21.68			
P-value	0.00			
Hansen J statistic[(e)] χ^2 (1)	1.41			
P-value	0.24			

Note: (a) The regression includes year dummies. (b) Estimates are efficient for arbitrary heteroskedasticity and statistics are robust to heteroskedasticity. (c) The Kleibergen-Paap test is a generalization of the Anderson canonical correlation test to the non-*i.i.d* case; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected only at 10 percent significant level. (d)The Anderson-Rubin Wald test, which serves to check the significance of the endogenous regressors in the structural equation, is robust to heteroskedasticity; the rejection of the null hypothesis indicates that the endogenous regressor is relevant. (e) The Hansen J statistic checks for overidentification of all instruments for the non-*i.i.d.* case; the no rejection of the null indicates that instruments are appropriate.

In order to roughly inspect about the probable weighs that government put on social welfare, Wald tests are performed for $\hat{\beta}_1^{2SLS}$ and $\hat{\beta}_1^{2GMM}$ for the two group of country sample. Table 5 presents the tests which their null hypothesis takes into account three potential values of β_1.

Table 5: Wald Tests for estimates of β_1

	$H_0 : \beta = 1$ $H_1 : \beta \neq 1$	$H_0 : \beta = 1.5$ $H_1 : \beta \neq 1.5$	$H_0 : \beta = 2$ $H_1 : \beta \neq 2$
$\hat{\beta}^{2SLS}_{1,all\ members} = 0,37$	$\chi^2(1)$=16.77 Prob. > χ^2=0.00	$\chi^2(1)$=54.02 Prob. > χ^2=0.00	$\chi^2(1)$=112.45 Prob. > χ^2=0.00
$\hat{\beta}^{2GMM}_{1,all\ members} = 0,34$	$\chi^2(1)$=12.68 Prob. > χ^2=0.00	$\chi^2(1)$=39.07 Prob. > χ^2=0.00	$\chi^2(1)$=79.92 Prob. > χ^2=0.00
$\hat{\beta}^{2SLS}_{1,founder\ members} = 0,97$	$\chi^2(1)$=0.00 Prob. > χ^2=0.95	$\chi^2(1)$=1.29 Prob. > χ^2=0.26	$\chi^2(1)$=4.86 Prob. > χ^2=0.03
$\hat{\beta}^{2GMM}_{1,founder\ members} = 0,95$	$\chi^2(1)$=0.01 Prob. > χ^2=0.93	$\chi^2(1)$=0.97 Prob. > χ^2=0.32	$\chi^2(1)$=3.53 Prob. > χ^2=0.00

The null hypotheses of $\beta_1 = 1$ and $\beta_1 = 1.5$ cannot be rejected at conventional levels of significance for founder members of Mercosur. The null hypothesis of $\beta_1 = 2$ is rejected in all cases. Hence, for a $\beta_1 = 1.5$, the roughly implied, $\theta = 4$. As it was mentioned in section II, the government behaves as if it were maximizing a social welfare function that weights members of the society differently; lobby's members receive a weight of $(1+\theta)$, while individuals, that are not organized, receive the smaller weight of θ. Hence, for the approximated value of $\theta = 4$, one might infer that governments of Mercosur full members, in average, would weigh approximately 25 percent above individuals belonging to an interest group.

V. Concluding remarks

Still now, after twenty years of Mercosur genesis, member countries apply relatively high trade barriers in comparison to those implemented by other countries or economic blocs. Their trade policy seems to be used as an instrument *at hands* to protect domestic productive sectors and, as a consequence, to transfer income among individuals of their societies.

The empirical evidence provided by several studies that aim to analyze Mercosur trade policy structure, confirms that one can understand it from political economy point of views. This paper is in line of this general conclusion; it provides an empirical analysis that supports the insights of an extended version of the political-support approach of Grossman and Helpman (1994) to the case of monopolistic competition markets.

Particularly, Tables 1 to 4 show that estimated coefficients present the expected sign, i.e. the interactive effect between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity and the effect of the ratio of quantity imports to import price are positive. The statistically significance of such parameters depend on the estimation method used, though, for the case of the interactive between the ratio of domestic to foreign varieties consumption and the inverse of cross price elasticity, the estimated parameters are statistically significant at 5 percent or 10 percent. The F-tests indicate that regression equations as a whole are significant. Almost all statistics tests that were performed in order to check the robustness of instrument variables and the endogenous regressor suggest that instruments are suitable and that the endogenous regressor is relevant in the estimated endogenous protection equations.

The estimations carried out also show that the estimated coefficients, $\hat{\beta}_1$ are lower than one, and that confidence intervals for such parameters are, in the case of full members, [0.07 0.67] and [-0.03 0.70] and, for founder members [0.06 1.89] and [-0.15 2.05] respectively. From the estimated parameters of β_1 , one may derive the approximated weights that governments would attach to different individuals. Unfortunately, for those values that are lower than one, the resultant θ will be negative, which is odd from the theoretical point of view. At the limit, when β_1 tends to one, the weight on social welfare tends to infinite and the tariff chosen will be equal to the one government would choose if it only were maximizing the general welfare.

The Wald Tests that were carried out for $\hat{\beta}_1^{2SLS}$ and $\hat{\beta}_1^{2GMM}$ for the two groups of country sample give a roughly notion about the possible weight that government might attach to different individuals, particularly for the sample of Mercosur full members. For this country sample, the null hypothesis of $\beta_1 = 1.5$, cannot be rejected at conventional statistically significance levels. Hence, the approximated value of $\theta = 4$ would implied a weigh for individuals belonging to an interest group that is approximately 25 percent above the weigh given to non-organized individuals.

Finally, it is important to remark that this study checks the endogenous formation of a particular instrument of trade policy: applied tariffs. Nowadays countries make use of a wide range of non-tariff policies to build trade barriers. As it is well known, members of Mercosur are not the exception to the rule. Though would be interesting to take into account in the econometric analysis those instruments, unfortunately, they are not available for the entire period of the analysis. However, as the econometric study suggests, tariffs still remain as a traditional and well demanded instrument to protect domestic productive sectors.

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ANNEX A

The endogenous tariff formation is given by equation (9):

$$\tau^{o}=\left[\frac{1+\theta}{\theta+\alpha_{IG}}\right]\frac{2nc_i\,\partial p_i/\partial\tau}{n^{*}\left(b\,\partial\bar{p}_i^{*}/\partial\tau+cn/2\right)}+\frac{n^{*}\bar{c}_i^{*}/2-\square\,\partial p_i/\partial\tau}{n^{*}\left(b\,\partial\bar{p}_i^{*}/\partial\tau+cn/2\right)} \qquad \text{(A1)}$$

Equation (3) gives the equilibrium prices that prevail at the home market, which are:

$$p_i=\frac{2\left[a+a_m\left(b+cN\right)\right]+cn^{*}\tau}{2\left(2b+cN\right)} \text{ and } \bar{p}_i^{*}=\frac{2\left[a+a_m\left(b+cN\right)\right]+cn^{*}\tau}{2\left(2b+cN\right)}+\frac{\tau}{2}=p_i+\frac{\tau}{2}$$

Therefore $\partial p_i/\partial\tau=cn^{*}/2\left(2b+cN\right)$ and $\partial\bar{p}_i^{*}/\partial\tau=cn^{*}/2\left(2b+cN\right)+1/2=\partial p_i/\partial\tau+1/2$; replacing, $\partial p_i/\partial\tau$ and $\partial\bar{p}_i^{*}/\partial\tau$, taking into account that the index of quantities is defined as $\square=nc_i+n^{*}\bar{c}_i^{*}$, and rearranging in (A1), the following expression is obtained:

$$\tau^{o}=\left[\frac{2+\theta-\alpha_{IG}}{\theta+\alpha_{IG}}\right]\frac{cnc_i}{\left(2b+cn\right)\left(b+cN\right)}+\frac{\bar{c}_i^{*}}{\left(b+cN\right)} \qquad \text{(A2)}$$

Equation (A2) can be rewritten as:

$$\tau^{o}=\left[\frac{1+\theta}{\theta+\alpha_{IG}}\right]\frac{cnc_i}{\left(2b+cn\right)\left(b+cN\right)}+\left[\frac{1-\alpha_{IG}}{\theta+\alpha_{IG}}\right]\frac{cnc_i}{\left(2b+cn\right)\left(b+cN\right)}+\frac{\bar{c}_i^{*}}{\left(b+cN\right)} \qquad \text{(A3)}$$

By dividing (A3) by the domestic price of the foreign variety, $\bar{p}_i^{*}$, the endogenous tariff can be expressed in ad-valorem terms, $t^{\circ}=\frac{\tau^{\circ}}{\bar{p}_i^{*}}$. Multiplying and dividing the first term by p_i, c_i, $\bar{c}_i$ and n^{*} and the second and third terms by n^{*}, the ad-valorem tariff equals to:

$$\frac{\tau^{o}}{\bar{p}_i^{*}}=\left[\frac{1+\theta}{\theta+\alpha_{IG}}\right]\frac{nc_ip_i}{n^{*}\bar{c}_i^{*}\bar{p}_i^{*}}\frac{cn^{*}\bar{c}_i^{*}}{\left(2b+cn\right)c_i}\frac{c_i}{\left(b+cN\right)p_i}+\left[\frac{1-\alpha_{IG}}{\theta+\alpha_{IG}}\right]\frac{cn^{*}}{\left(2b+cn\right)}\frac{n}{n^{*}}\frac{c_i}{\left(b+cN\right)\bar{p}_i^{*}}+\frac{n^{*}\bar{c}_i^{*}}{n^{*}\left(b+cN\right)\bar{p}_i^{*}} \qquad \text{(A4)}$$

where $\frac{nc_ip_i}{n^{*}\bar{c}_i^{*}\bar{p}_i^{*}}=\frac{C_{i,d}}{C_{i,m}}$ is the ratio of domestic to foreign varieties consumption; $\frac{cn^{*}\bar{c}_i^{*}}{\left(2b+cn\right)c_i}=\frac{\partial c_i/\partial\tau}{\partial\bar{c}_i^{*}/\partial\tau}\times\frac{\bar{c}_i^{*}}{c_i}=\sigma_{d,m}$ is the absolute value of the elasticity of substitution between domestic and foreign varieties due to a tariff change; since the equilibrium quantity of a domestic variety *i* is give by $c_i=\left(b+cN\right)\left(p_i-a_{mc}\right)$, the expression $\frac{c_i}{\left(b+cN\right)p_i}=\frac{\left(p_i-a_{mc}\right)}{p_i}$ is the marginal domestic mark-up in terms of the price of the domestic variety; $-\frac{cn^{*}}{\left(2b+cn\right)}=\frac{\partial c_i/\partial\tau_i}{\partial\bar{c}_i^{*}/\partial\tau_i}=\chi_{pc}$ accounts for the pro-competitive effect and $\frac{\bar{c}_i^{*}}{\left(b+cN\right)\bar{p}_i^{*}}=\frac{1}{\varepsilon_{\bar{p}^{*}}}$ $\varepsilon_{\bar{p}^{*}}$ is the inverse of the import price elasticity, in absolute value. Therefore, equation (A4) can be rewritten as:

$$t_i^o = \left[\frac{1+\theta}{\theta+\alpha_{IG}}\right]\frac{C_{i,d}}{C_{i,m}} \times \sigma_{d,m}\frac{(p_i - a_{mc})}{p_i} + \left[\frac{1-\alpha_{IG}}{\theta+\alpha_{IG}}\right] \times \left|\chi_{pc}\right| \times \frac{n}{n^*} \times \frac{(p_i - a_{mc})}{\bar{p}_i^*} + \frac{1}{\varepsilon_{\bar{p}^*}} \qquad \text{(A5)}$$

Alternatively, the endogenous tariff can be expressed in a simpler fashion in order to carry out the econometric analysis. Again, considering equation (A2), expressing it in ad-valorem terms and assuming that the share of the voting population that belongs to the interest group is very small, i.e. $\alpha_{IG} = 0$, ones obtains:

$$t_i^0 = \left[\frac{2+\theta}{\theta}\right]\frac{cnc_i}{(2b+cn)(b+cN)}\frac{1}{\bar{p}_i^*} + \frac{1}{(b+cN)}\frac{\bar{c}_i^*}{\bar{p}_i^*} \qquad \text{(A6)}$$

The first term of equation (A6) can be expressed in terms of the ratio of domestic to foreign varieties consumption, $\frac{C_{i,d}}{C_{i,m}}$, and the cross price elasticity, $\varepsilon_{\bar{c}_i^*, p_i}$, by multiplying and dividing by p_i, $\bar{c}_i^*$ and n^*. Similarly, the second term can be manipulated by multiplying and dividing by n^*. The final expression is:

$$t_i^o = \left[\frac{2+\theta}{\theta}\right]\frac{C_{i,d}}{C_{i,m}} \times \frac{1}{\varepsilon_{\bar{c}_i^*, p_i}} + \frac{1}{(b+cN)n^*}\frac{n^*\bar{c}_i^*}{\bar{p}_i\,^*} \qquad \text{(A7)}$$

ANNEX B

Table 1B: Results of the first-stage regression. Fixed effect-OLS estimation[a]
Mercosur (all members)

$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	Coefficient	t-value	P > I t I	Interval confidence at 95%
Wage bill	-0.000016 (5.84e-06)	-2.68	0.008	[-0.0000271 -4.16e-06]
Numbers of employees	0.0001616 (0.000098)	1.64	0.102	[-.0000321 .0003553]
Number of observations	875			
F (12, 712) Prob. > F	6.08 0.00			
F test of excluded instruments[b] F(2, 712) Prob. > F	10.08 0.00			
Anderson canonical correlation LM test[c] $\chi^2(2)$ P-value	22.59 0.00			

Note: (a) The regression includes year dummies. (b) The F-test of excluded instruments indicates that the hypothesis that both coefficients are zero is strongly rejected. (c) The Anderson canonical correlation test is used to check for underidentification problem. The null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level.

Table 2B: Results of the first-stage regression -Fixed effect -OLS estimation[(a)(b)]

Mercosur (all members)

$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\overline{c}^*_j, p_j}}$	Coefficient	t-value	P > l t l	Interval confidence at 95%
Wage bill	-.0000156 (8.08e-06)	-1.94	0.053	[-0.0000315 2.28e-07]
Numbers of employees	0.0001616 (0.000138)	1.17	0.243	[-0.0001099 0.0004331]
Number of observations	875			
F (12, 712) Prob. > F	2.42 0.00			
F test of excluded instruments[(c)] F(2, 712) Prob. > F	3.93 0.02			
Kleibergen-Paap rk LM statistic[(d)] $\chi^2(2)$ P-value	7.62 0.02			

Note: (a) The regression includes year dummies. (b) Statistics robust to heteroskedasticity. (c) The F-test of excluded instruments indicates that the hypothesis that both coefficients are zero is strongly rejected.(d) The Kleibergen-Paap test is a generalization of the Anderson canonical correlation test to the non-*i.i.d.* case; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level.

Table 3B: Results of the first-stage regression -Fixed effect-OLS estimation[a]

Mercosur (full members)

$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	Coefficient	t-value	P > l t l	Interval confidence at 95%
Wage bill	-9.35e-06 (4.92e-06)	-1.90	0.058	[-0.000019 3.22e-07]
Numbers of employees	0 .0000645 (0.000087)	0.74	0.460	[-0.000107 .0002359]
Number of observations	359			
F (8, 283) Prob. > F	2,99 0.0031			
F test of excluded instruments[b] F(2, 283) Prob. > F	3.13 0.0452			
Anderson canonical correlation LM test [c] $\chi^2(2)$ P-value	7.15 0.0280			

Note: (a) The regression includes year dummies. (b)The F-test of excluded instruments indicates that the hypothesis that both coefficients are zero is strongly rejected. (c) The Anderson canonical correlation test is used to check for underidentification problem. The null hypothesis that matrix of reduced form coefficients has deficient rank is rejected at 5 percent significant level.

Table 4B: Results of the first-stage regression -Fixed effects-OLS estimation[(a)(b)]

Mercosur (full members)

$x_{1jt} = \frac{C^d_{j,t}}{C^m_{j,t}} \times \frac{1}{\varepsilon_{\bar{c}^*_j, p_j}}$	Coefficient	t-value	P > l t l	Interval confidence at 95%
Wage bill	-9.35e-06 (6.03e-06)	-1.55	0.12	[-0.0000212 2.52e-06]
Numbers of employees	0.0000645 (0.00008)	0.77	0.44	[-0.00009 0.00022]
Number of observations	359			
F (8, 283)	8.48			
Prob. > F	0.00			
F test of excluded [(c)] instruments F(2, 283)	2.06			
Prob. > F	0.12			
Kleibergen-Paap rk LM statistic [(d)] χ^2 (2)	5.02			
P-value	0.081			

Note: (a) The regression includes year dummies. (b) Statistics robust to heteroskedasticity. (c) The F-test of excluded instruments indicates that the hypothesis that both coefficients are zero is strongly rejected (d) The Kleibergen-Paap test is a generalization of the Anderson canonical correlation test to the non-*i.i.d.* case; the null hypothesis that matrix of reduced form coefficients has deficient rank is rejected only at 10 percent significant level.