Exploring trade flows between MERCOSUR and the EU: what does an export demand function tell us? [*]

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Resumen

Este trabajo examina la relación comercial entre el MERCOSUR y la Unión Europea a través de una función de exportación para el período 1980-2004. Mientras las exportaciones a nivel agregado reaccionan moderadamente a los precios relativos, su reacción con respecto al precio de los competidores es importante. Además, los ingresos de la UE afectan negativamente al comercio y el efecto absorción parece estar ausente. El precio y las elasticidades ingreso sugieren que la UE no es un destino atractivo para las exportaciones del MERCOSUR. La estimación del modelo de corrección de error predice algunas dificultades para un ajuste hacia el equilibrio a largo plazo.

Abstract

This paper examines the commercial relationship between MERCOSUR and the EU through an export demand function for the period 1980-2004. While at an aggregate level exports react moderately to relative prices, their reaction with respect to trade competitors' prices is important. Besides, trade partner's income adversely affects trade and the absorption effect seems to be absent. The average long-run price and income elasticities suggest that the EU is not an attractive destination for MERCOSUR exports. The estimate of the error correction model appears to predict some difficulties for a quick adjustment of variables to long run equilibrium.

1.- Introduction

The recent proliferation of regional integration agreements and the emergence of regional trade blocs that are reshaping the world economy have motivated a large amount of research in the area of international trade. Most of the existing contributions study the effects of economic integration on the volume of trade among member countries as well as the welfare effects of trade agreements on non-members. In spite of the increasing interest about the effects of regionalism, however, empirical research on the determinants of trade relationship between different areas of economic integration is rather scarce.[1]

The analysis of the determinants of trade flows between economic areas or blocs would reveal valuable information for relevant macroeconomic policy issues. In fact, when implementing a commercial or an exchange rate policy at an aggregate level, one major concern of policymakers is the response of exports to relative price changes. This examination is particularly relevant for blocs that have signed preferential agreements since changes that might occur when one of the blocs modifies its policies will certainly have a substantial effect on commercial transactions. Moreover, the potential substitutability that may exist between one of the partners and a third exporter (another bloc) may alert the policymakers about the presence of a prospective rival. The exports' reaction to own income or trade partner's income is also significant for economic policy analysis.

Given the lack of recent studies and, consequently, the scarcity of new information for policy prescriptions, this paper explores the determinants of recent trade flows between the Southern Common Market (MERCOSUR) and the European Union (EU) through an export function. The estimation of an export function between MERCOSUR and the EU is based on the interest in exploring the characteristics of the

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[1] To the authors' knowledge, only a few attempts have been made to examine bilateral trade just between the EU and MERCOSUR. See for instance Cuadros *et al.* (1999), Cantavella Jordá *et al.* (2003).

aggregate relations between two areas of economic integration that have shown a significant commercial relation over the past years.[2]

The paper seeks to determine the long-run elasticities of MERCOSUR exports to the EU for the past years and tries to find the evidence of a stable long-term balance between MERCOSUR exports to the EU and different variables of relative prices and income through an export demand function. To this end, the paper proceeds as follows. Section 2 makes some comments about the empirical studies and introduces methodological issues related to an export demand function. Section 3 presents the estimation and results. Section 4 concludes.

2.- Theoretical and methodological background[3]

The literature consistently confirms the significance of exports for the economic prosperity of a country or region, and takes into account the influence of prices and income on exports. However, depending on the country, the period under study and the model used, the importance and significance of these variables on exports may be different (Gonzalez *et al.*, 2004: 231).

In fact, substantial empirical literature exists on the estimation of price and income elasticities in international trade, but the values of price elasticities vary considerably. For illustrative purposes only, Marquez and McNeilly (1988) find that both income and price elasticities play a significant role in the determination of trade flows for developing and developed countries, whereas Bahmani-Oskooee and Niroomand (1998) find that this result holds only for less developed countries. However, Rose (1990,1991), Ostry and Rose (1992) and Bahmani-Oskooee and Alse (1994) find that a real devaluation has generally no significant impact on the trade balance, but Reinhart (1995) provides, instead, strong support to the view that depreciations improve the trade balance. Likewise, Senhadji and Montenegro (1999) show that exports react to both relative prices and the trade partner's income in a large sample of both developing and industrial countries, while Hooper *et al.* (2000) find that the price channel is weak

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[2] The investment relation has also been an important one.
[3] For further details see Barraud and Jacobo (2009).

with respect to continental European countries and that the income variable becomes more important when explaining the trade balance of this nations.[4]

Despite some methodological aspects and other minor differences that may exist, the studies confirm the influence of prices and income on UE exports to MERCOSUR (Cantavella Jordá *et al.* 2003; Cuadros *et al.* (1999); Balaguer Franch and Martínez Zarzoso, 2000).[5] More specifically, with respect to MERCOSUR-to-EU exports, there is no study on this direction of trade flows, but instead there exists a preliminary estimate of an export demand function by Barraud and Jacobo (2008).[6]

In spite of the fact that, as mentioned above, the results obtained for the different variables are diverse, in the methodological aspects most of the studies that estimate export demand functions are based on the elasticities approach, adopting a partial equilibrium framework where the determinants of exports are exogenous (González *et al.*, op. cit.: 235). In fact, from a methodological point of view, the theoretical foundation of the empirical analysis is the Imperfect Substitutes Model (Goldstein and Kahn, 1985). The basic assumption of the model is that neither imports nor exports are perfect substitutes for domestic products. Such a hypothesis is confirmed by empirical evidence: if domestic and foreign goods were perfect substitutes, a given country would be either an exporter or an importer. Since the world market is characterized by the presence of bilateral trade and the coexistence of imports and domestic production, the hypothesis of perfect substitution can be easily rejected.

The main features of the imperfect substitutes model can be summed up as follows. Along with the standard demand theory, it is supposed that the representative

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[4] See Barraud and Jacobo (2009).

[5] According to Cantavella *et al.* (2003), any variations in relative prices that might occur in the trade or exchange rate policies of either MERCOSUR or the EU will probably have a substantial effect on commercial transactions, but, in contrast, for the EU-NAFTA, price seems to have a lower influence and probably other aspects such as product differentiation may play a more relevant role on their flows of trade. Besides, for these authors, EU exports appear to be sensitive to changes in income in both MERCOSUR and NAFTA countries, although the estimate for NAFTA is larger as this is a greater market in both qualitative and quantitative terms; thus this variable becomes and engine of export growth for EU exports towards NAFTA (Cantavella *et al.*, 2003: 15).

[6] The studies do not use recent statistics. As consequence, valuable information for economic policy recommendations is omitted. See Barraud and Jacobo (2008).

agent maximizes his utility subject to a budget constraint. The resulting demand functions for exports therefore describe the demand (X) as a function of the prices of the exporter relative to the imported product's own price (PR) and of the level of monetary income in the importing country (Y*). Assuming homogeneity of zero degree, a log linear relationship between variables, and the presence of omitted factors (μ), the coefficients imply elasticities and the previously introduced function is then formulated as follows:

$$LNX_t = \alpha_0 + \alpha_1 LNPR_t + \alpha_2 LNY *_t + \mu_t$$

However, as in many other cases, MERCOSUR exports face competition not only from domestic producers in the importing region but also from third area exporters. Therefore, other prices should be introduced in order to capture the substitutability between MERCOSUR exports and the production from competing areas. This equation can be expanded in order to capture both the effect caused by the movement of prices of countries or blocs that compete with exportable products of the exporting region and the impact of domestic demand on national exports.[7] More specifically, the structure of the demand function for exports is:

$$LNX_t = \alpha_0 + \alpha_1 LNPRMEU_t + \alpha_2 LNPRMUSA_t + \alpha_t LNPRMLA_t + \alpha_3 LNYEU_t + \alpha_4 LNYM_t + \mu_t,$$

where, X represents the exports from MERCOSUR to the EU, PRMEU the relative prices between MERCOSUR and the EU, PRMUSA the relative prices of MERCOSUR and the United States, PRMLA the relative prices of MERCOSUR and Latin American countries, YEU the EU income, YM the MERCOSUR income, and   the error term.[8]

The coefficient of (PRMEU) is expected to be negative, since an increase in the price of exports greater than that of the prices of products made in the importing

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[7] This function is based in a partial equilibrium model that combines the elasiticites approach of Marshall, Lerner and Robinson, with the absorption effect of Alexander (1952), accordingly with Cuadro Ramos *et al.* (1999) p. 49, and where exports can not be considered as perfect substitutes of national goods.
[8] From the above-mentioned premises, exports from MERCOSUR are the endogenous variables, while the relative prices and income are the exogenous variables.

country markets results in a relative increase in the first and discourages its demands if domestic substitutes do not exists in the importer country. The value of this parameter could be higher or lower than unity depending on the degree of substitutability.[9]

In order to capture the influence of prices of exported goods by MERCOSUR with respect to the value of substitute goods, we use the variable PRMUSA and PRMLA. The sign of the price elasticity in both cases is expected to be negative, because the exportable goods of the competing country (or countries in the case of Latin America) are very comparable and they have a similar destination. To the extent that goods are more substitutable, a greater elasticity would be expected.

The variable income (YEU) captures the budget constraint of exports' destination. An increase of the income level leads to a raise on exports if normal goods are traded, and the income elasticity is positive. However, due to the eventual consumption of either inferior or luxury goods when income increases at the destination bloc, a different result may be observed thus indicating that MERCOSUR exports do not behave as the EU income.[10]

The last variable used is MERCOSUR's income (YM). This variable is included in order to capture an eventual absorption effect, which would adversely influence exports. In fact, economic development may result in an increase in consumption and hence in domestic demand. Besides, it might be possible that this does not happen, because a greater income in the bloc means a greater activity that may in turn increase imports but this does not necessarily operate in detriment of exports.

The data used are annual, covering the 1980-2004 period, and are limited by their availability as well as by their homogeneity. In fact, in MERCOSUR countries, periods of high inflation and macroeconomic instability have hampered the availability of series for extended periods of time and have mined the consistency required for any empirical analysis.

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[9] A high positive value would be indicative of a shortage of substitutes.

[10] This would imply a remarkably high absorption when estimating a demand function for exports to the EU case by making it dependent on the income of the EU. The results of some studies seem to confirm this assumption (see for example Cuadro Ramos *et al.*1999).

Thus, it is difficult to obtain homogeneous data sets. It is a common feature to find different base years through time. Once the base year changes, the new series is not extended backwards a number of years, while the old one is officially discontinued. Due to this usual practice, one may not discover if the changes in some values are due to real changes in the series or due to changes in the statistical procedures. Because of this feature, data collection and systematization for Latin America's countries remembers the Sisyphean boulder: an inexorable quest (Mena, 1995).

In other words, this suggests that sometimes, when the series are chained, one can not distinguish whether the observed differences in growth in gross domestic product are due to changes in the structure of the economy (input-output matrix) or if they merely reflect the peculiarities of statistical processes. In any case, the chaining of the time series is adopted in this work, especially in the GDP (income) series from the Latin American economies.[11] The series constructed were checked with the information provided by Economic Studies of Latin America annual surveys, which include a brief yearly description of the performance of the economies of the region, which helps to avoid introducing any inconsistencies in the data and distortions in the series. The general procedure was to use the latest available data and to construct the series from the present to the past, with the assumption that recent data are properly elaborated.

With regards to the aggregation of variables, fifteen countries were included in the case of the UE, while the four countries that originally signed the Treaty of Asunción were considered in the case of MERCOSUR.[12] Countries included in the empirical analysis were: Austria, Argentina, Belgium-Luxembourg, Brazil, Denmark, Spain, Finland, France, Greece, Holland, Ireland, Italy, Paraguay, Portugal, United Kingdom, Sweden and Uruguay.

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[11] The econometric testing in Latin American countries requires a detailed and specific knowledge of their economic policy during the period of research. Such information needs to be incorporated in the specification as well as in the estimation procedures. These "pressing restrictions" suggest the adoption of the second best methodology related to the chain of the series.

[12] Since the integration of the Associate States in the case of MERCOSUR is variable in nature the paper has used the foundational States to carry out the analysis.

The variables used in this study for the estimation of the equation and the construction of detailed indexes are defined as follows:

X_i: real exports of each of the member countries of MERCOSUR;

X_t: real total exports of member countries of MERCOSUR;

IPI: index of domestic prices in UE countries;

IVU: the unit value index of exports for each of the MERCOSUR countries;

PIB_i: gross domestic product of each of the countries of the EU;

PIB_t: total GDP of the UE;

PM: weighted price index of MERCOSUR;

PEU: the weighted price index calculated with the UE for domestic prices;

PRMEU: relative MERCOSUR to EU prices;

PRMUSA: relative MERCOSUR to US prices;

PRMLA: relative MERCOSUR to Latin America prices[13];

YM: income of the MERCOSUR countries (approximated by the total GDP of the four members of the common market);

YUE: income of EU countries (approximated by the total GDP of the fifteen countries considered);

The MERCOSUR prices with respect to the UE (PRMEU) are constructed from the following expression:

$$PRMEU = \frac{PM}{PEU} = \frac{\sum_{i=1}^{4} IVU_i \frac{X_i}{X_t}}{\sum_{i=1}^{15} IP_i \frac{PIB_i}{PIB_t}}$$

The relative prices of MERCOSUR to those of the United States (PRMUSA) and Latin America (PRMLA) have PM as numerator and the IUV of United States' and Latin-Americans' exports in the denominator.[14]

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[13] Latin American prices are from South-American countries, but they exclude those of MERCOSUR members.

The data series are in constant U.S. dollars. Export flows are from the World Bank database of unrestricted access (www.worldbank.org/trade) specifically from the section Data and Statistics, suitably adapted for this study. Nicita and Olarreaga have updated the database, extending the original period and improving it in various ways (Nicita and Olarreaga, 2006).[15]

The prices for MERCOSUR and EU15, and the income variable, are from World Economic Outlook.

3.- Estimation and results

In order to formally test for the presence of unit roots in the export demand function, the Augmented Dickey-Fuller test (ADF) was implemented for each variable (Dickey and Fuller, 1979). The results are reported in Table 1.

Table 1
Unit Root Test

Variables	Augmented Dickey-Fuller Test	
	levels	differences
LX	0.317	-3.373
LPRMEU	-2.543	-5.232
LPRMUSA	-4.270	.
LPRMLA	-1.083	-4.779
LYEU	-0.018	-3.175
LYM	0.325	13.545

Critical values: -3.75 (1%), -3.00 (5%)

The null hypothesis of the existence of unit roots can not be rejected for any of the variables in levels, except for the series of relative prices between MERCOSUR and the U.S. The same scenario but for the variables in differences is rejected in all

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[14] Barraud and Jacobo (2009) have tried other price variables from different countries whose products may compete with those of MERCOSUR, as in the case of Australia, Canada or China. However, they were not at all significant.
[15] See Nicita and Olarreaga (2006) for additional details.

cases at 5% level of significance.[16] One concludes, therefore, that variables in levels are not stationary and contain a unit root.

Cointegration provides an appropriate method for estimating long-run and short-run elasticities. The results of the cointegration analysis are shown in Table 2. The statistic from the maximum likelihood test (Max) test the null hypothesis of the existence of r cointegrating vectors against the alternative hypothesis of the existence of r+1 cointegrating vectors.

Table 2
Johansen's Maximum Likelihood Cointegration Test

(A) λ Max and Trace Statistics		
Number of Cointegraion Vectors	λ Max	Critical Value(*)
r = 0	67.22	40.30
r ≤ 1	18.76	34.40

Notes: r is the number of conitegrating vectors (null hypothesi
(*) Osterwald-Lenum critical values at 5 percent level.

Following the procedure commonly used (see, for example, Cuadros Ramos *et al.* (1999)), the nonstationary variables require the use of cointegration for the regression analysis to avoid problems arising from their non-stationarity when working with variables in levels.

The equation to estimate in levels collects the long-term relationship between MERCOSUR exports to the EU, MERCOSUR relative prices with respect to the EU, MERCOSUR relative prices with respect to the United States, the income of MERCOSUR and the EU income. If these variables are integrated, any linear combination of them will have a lower integration order. Johansen's methodology provides the right tools to work with nonstationary variables.

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[16] In some cases 1%.

The test statistic derived from maximum likelihood contrasts the existence of r cointegration vectors against the alternative hypothesis that there are exactly r+1 cointegrating relations. From the resulting integration vectors, it is advisable to use the one that had any economic sense according to the expected sign and magnitude (Cuadro Ramos *et al.* op. cit.; Muscatelli and Hurn, 1992), and is reproduced in Table 3.

Table 3 reports the coefficients for long-run relationships that have been tested in order to examine whether they are significantly different from zero or not . For the MERCOSUR-EU equation, Chi-squared statistics are greater than 95 per cent critical value, thus rejecting the null hypothesis that the coefficients are zero.

Table 3
Cointegration Vector

Variable	Coefficients	z	P>|z|
LX	1	.	.
LPRMEU	0.16	4.13	0.000
LPRMUSA	-4.61	-13.38	0.000
LPRMLA	-3.41	-19.37	0.000
LYEU	-4.85	-14.02	0.000
LYM	4.67	12.45	0.000

The results of the estimate suggest the following demand equation for MERCOSUR exports to the EU:

$$LX_t = 0.16LPRMUE_t - 4.61LPRMUSA_t - 3.41LNMLA_t - 4.85LYEU_t + 4.67LBYM_t + \mu_t$$

where the coefficients of the variables show the relevant elasticities, since the function has been estimated with variables in logarithms.

The relative price elasticity of MERCOSUR to the EU does not have the expected sign. An increase in the price of exports of goods relative to the price of the products produced in the importing bloc does not discourage its demand. It should be noted, however, that there is not much sensitivity.

In order to capture how prices of goods exported by MERCOSUR react to price movements in other markets, the studies uses a second group of relative prices variables whose sign is the expected. They suggest, for example, that any changes in prices relative to the U.S. prices can result in a significant negative effect on MERCOSUR exports to the EU.[17] The same conclusion arises in the case of Latin America.

With regards to the EU income variable, the share of luxury goods in the European consumer expenditures increases as income increases and MERCOSUR does not export such goods; not at least for Europeans consumers. In other words, income growth in the EU is not transformed into an increase in MERCOSUR exports to that destination, possibly because the EU spends its income on goods that are not those exported by MERCOSUR: goods produced in the EU or elsewhere.

Finally, with regards to the income of MERCOSUR, the coefficient does not seem to pick up an eventual absorption effect; an outcome that often goes together with economic development and a lower amount of available export products. Possibly this is due to the nature of the region's exports products (agricultural goods) and that a greater income in the bloc implies an increase in imports but it does not operate in detriment of exports. Moreover, since the MERCOSUR's GDP variable is not net of exports, a positive sign in the results for this variable was expected to the extent that exports contribute to total GDP by definition.

Once the long-run estimates were obtained, it is interesting to have detailed information on what happens in the short run. The long-run relationship is then complemented with a construction of a VAR in form of an error-correction.[18] For this purpose, we incorporate not only the variables that contain the dynamic information in the short run, but also the cointegration relation in the long-run previously estimated. The structure of this model is the following one:

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[17] This result must be interpreted with care, since it is obtained at an aggregate level.

[18] The different trade variables that have been analyzed so far are not always in equilibrium. They fluctuate before attaining long-run equilibrium. The long-term relationship is therefore complemented by the construction of an error-correction model.

$$\Delta LX = \beta\Delta LX_{-1} + \gamma\Delta LPRMEU + \delta\Delta LPRMUSA + \eta\Delta PRMLA + \pi\Delta YEU + \theta\Delta YM + \delta RES_{-1}$$

where the Δ expresses the first differences of the variables and RES is the error correction term derived from the long-run equation. In order to obtain a model that explains better the dynamics, quantitative variables (dummies) were also introduced without a significant modification of the results.[19] (It should be noticed that all the variables incorporated in the error-correction model are stationary and therefore OLS can be applied).

The closer to unity the coefficient is, the greater the adjustment speed in the existing disequilibrium between MERCOSUR exports and the rest of the variables will be. This is the way these variables achieve the long-run equilibrium. The general adequacy of this model is given by specific diagnostic test on residuals such as serial correlation, functional form, normality and heteroskedasticity. No structural changes were found during the sample period according to the different stability tests. Table 4 shows the error-correction model we consider with its results.

Table 4
Error Correction Model

Variables	Coefficients (t-statistics)
ΔLX_{t-1}	0.33 (0.67)
$\Delta LPRMEU$	-0. 01 (-0.40)
$\Delta LPRMUSA$	1.04 (2.17)
$\Delta LPRMLA$	-0.41 (-0.77)
$\Delta LYEU$	4.89 (2.67)
ΔLYM	-0.45 (-0.73)
RES (-1)	-0.35 (-0.69)

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[19] See Barraud and Jacobo (2009).

Both standard statistics and diagnostic tests indicate that the constructed model can provide a valid explanation of the short-run dynamics of MERCOSUR exports to the EU. The error correction term (RES(-1)) shows a reasonable adjustment in this case and 35% of the long run adjustment occurs in each period. The significance of this variable reflects and adjustment in the EU exports towards a long-run equilibrium of 35% per cent approximately per year. This result demonstrates, at the same time, the existence of the cointegrating vector, which has been incorporated in the error correction model.

All the variables finally included in the error-correction model are jointly significant. However, in the short run equation only prices relative to the U.S. and income in the recipient bloc are statistically significant. The structure of the MERCOSUR-UE error correction model incorporates past information of exports which helps to explain part of the dynamics on trade flows towards EU.

4.- Concluding remarks

This paper analyses the aggregate commercial relationships between the MERCOSUR and the EU using an export demand function for the period 1980-2004 which considers the effects of relative prices and income variables on exports from MERCOSUR to the EU.

The long-term analysis suggests that the price elasticity of MERCOSUR-EU relationship does not have the expected sign, but is of a moderate magnitude, and that the price elasticity between MERCOSUR and the U.S. and Latin-American prices have the expected sign and a value that suggests a significant substitution effect.

With regards to the EU income variable, its increase does not raise MERCOSUR exports possibly because the EU spends this additional income on goods

other than those exported by MERCOSUR, whereas the coefficient of the income of MERCOSUR does not reveal an absorption effect.

The results show that, although the blocs maintain interesting trade exchanges, the EU is not an appealing destination for MERCOSUR exports. This circumstance is unacceptable for blocs seeking to reinforce their trade relations, as it is also the significant effect on exports that a change in the competitor's price has. This is particularly discouraging in an environment where important devaluations took place in the past.

To sum up, while exports react moderately to own relative prices, their reaction with respect to trade competitor's prices is important. Besides, trade partner's income adversely affects trade and the absorption effect, if any, seems to be absent. The average long-run price and income elasticities suggest that the EU is not an attractive destination for MERCOSUR exports, at least not yet.

Accordingly, the economic policy recommendations that can be drawn from this paper probably should consider some of these issues to ensure that business relationships thrive, and definitely strengthen trade ties.

Finally, it must be noted that this is an approximation of the many that could be undertaken and the results are limited in several aspects. Among the constraints, it should be noted that the study estimates the export demand function at an aggregate level, and if one breaks up the analysis by sectors or exports items, or even for periods of time, some variations may probably be found. Nonetheless, the paper still represents a contribution, albeit a small one, in the process of understanding how certain factors may influence the trade flows from MERCOSUR to the EU and why the EU is *not yet* an attractive destination for MERCOSUR exports.

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