URUGUAYAN EXPORTS AND SECTORAL REAL EXCHANGE RATE

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Abstract

This paper analyzes the relationship between exports and real exchange rate (RER) of six export products: beef, leather, dairy, chemical, metallurgical and plastics, selected for their importance in total exports during 1993-2011. We considered the sectoral RER and used the Johansen cointegration methodology to adjust the models. No evidence was found of a long-term relationship between sectoral exports and its sectoral RER. However, we found a long-term relationship between beef exports and cattle slaughter, which shows the high supply dependence of these exports, with an elasticity of 2.7. We also found a long-term relationship between dairy exports and the international price of skim milk, with a price-elasticity close to one. For metallurgical industry exports, the results show a long-term relationship with Argentinean GDP - main destination of those sales - with an income-elasticity of 1.7. In the case of the chemical industry, we found and elasticity near to one in relation to chemical imports, due to the fact that Uruguay must import the raw material for this industry. Finally, for plastic exports we found a cointegration vector with plastic imports and the sectoral RER, showing the importance of relative prices between exports and imports, and not only for exports.

Key words: exports, sectoral real exchange rate, cointegration

JEL: C22, F31, F41

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1. Introduction

Uruguay is a small open economy where exports have always played an important role in economic growth. Foreign sales have increased their participation in the Gross Domestic Product (GDP), from 20% in 1997 to 27% in 2011. The share of goods in total exports has grown from 60% in 1997 to 73% in the last year of our sample. This happened in a scenario of strong economic growth, often led by good exports, and real exchange rate (RER) appreciation driven by economic growth and reinforced by the strong capital inflows (Benítez and Mordecki, 2012). Consequently, a great debate has emerged regarding the importance of the RER on export performance..

According to the Keynesian open economy model (IS-LM-BP), developed by Mundell-Fleming, the RER appears as one of the determinants of aggregate demand, through its impact on exports. Based on this, several studies have analyzed the link between exports and the RER at an aggregate level. In general, these studies found a significant link between exports and RER. However, this paper aims to go further in the analysis and introduces a sectoral level, based on some studies that focus on the differences between the kind of goods analyzed and their price formation. On the one hand, RER affects differently each sector, and on the other hand, a relevant RER for one sector may not be relevant for others.

Taking this into account, the goal of this research is to provide evidence about the link between sectoral exports and sectoral RER. Considering RER affects differentially sectoral exports, and the fact that relevant RER varies among sectors, we built sectoral indicators of RER for each one of the six sectors analyzed. To perform this analysis, we use Johansen cointegration methodology (1988). As estimators of sectoral competitiveness we developed effective sectoral RER (SRER) indicators following the methodology developed by the *Instituto de Pesquisa Económica Aplicada* (IPEA) from Brazil. The SRER construction was made by weighting prices according to countries share in bilateral trade of each sector (exports plus imports), for the average of the 2006-2009 period.

Then, we analyze the possible link between some sectors' exports and its sectoral RER. Sectors were chosen taking into account two factors: on the one hand, its weight in total exports, and on the other, the export category to which they belong. Six products were chosen: beef, leather, dairy, chemical, metallurgical and plastic.

Chapter 2 outlines the theoretical basis of this work, first analyzing the theoretical framework of the relationship between real exchange rate and exports and second, introducing a background review. Chapter 3 presents the objectives of this research. Chapter 4 discusses the methodology, explaining first the Johansen cointegration method, then the data sources and the construction of the sectoral real exchange rates, and afterwards detailing the empirical analysis for the six sectors analyzed. Finally, Chapter 5 presents some concluding remarks.

2. Theoretical basis

2.1 Theoretical framework

According to Dornbusch (1980, 1988), in a two goods model - one tradable and one non-tradable- assuming a small open economy, external demand is a function of the real exchange rate, which represents the relative price of domestic prices relative to international prices.

$e = \frac{E \times P^*}{P}$, where

E = nominal exchange rate

P^*= international prices

P= domestic prices

Considerthe sectoral real exchange rate (e_s), including w_{si} weights, representing each industry trade weight (exports plus imports) of sector s and country i, as shown in the next formula:

$$e_s = \frac{E}{P} \sum_{i=1}^{n} w_{si} \times \frac{P_i^*}{E_i^*}$$

Where E is the nominal exchange rate of the domestic economy, P is the domestic country price, P_i^* are the prices of country i, E_i^* is the nominal exchange rate of country *i.*

External demand is:

M = M * (e)

The export supply (X) is equal to the excess of domestic production of exportable goods (Y_X) over these goods demand (D_X). Domestic demand is a function of international and domestic prices, the nominal exchange rate and domestic income (Y):

$$X(P^*, P, E, Y) = M^*(e)$$

$$X = Y_X(P^*, P, E) - D_X(P^*, P, E, Y) = X(P^*, P, E, Y)$$

Then, the balance in export market will be supply equal to demand:

$$X(P^*, P, E, Y) = M^*(e)$$

In this model, the real exchange rate is considered an endogenous variable, which adjusts to allow the export market equilibrium.

2.2 Background

The theoretical relationship between exports and the RER has been widely studied by empirical analysis.

Rodrick (2008) provides evidence for the fact that a higher RER stimulates economic growth, mainly in developing countries. Moreover, evidence suggests that the channel through which this relationship would be made effective is the tradable sector size, mainly the industrial one.

There are reasons to consider that exports of a particular sector are conditioned by the sector relative prices rather than the overall RER, and several studies had investigated this relationship.

Kannebley (2002) investigates the relationship between alternative measures of the real exchange rate and the evolution of the volume of exports for thirteen Brazilian export sectors, in the period 1985-1998. Results show that there is not a stable long-run relationship between those variables for most of the sectors analyzed, being the inertial or structural factors those which mainly determine exports volume evolution. The author states that a constant real exchange rate that allows preserving export sectors profitability and/or competitiveness is a necessary but not sufficient condition for exports growth.

Bragança and Recupero (2008) analyze the existence of a long-term relationship between automobiles exports and the real effective exchange rate in Brazil during the period 1990-2005. They show that there is no cointegration relationship between those variables for the analyzed period, nor for a subdivision into two sub-periods under different exchange rate regimes (1990-1998 and 1999-2005). Therefore, the authors conclude that automobile exports evolution is mainly explained by other factors, such as firm's strategy and institutional and/or structural factors related to the sector.

Meanwhile, Rostán, Troncoso and Vázquez (2001) question the sectoral competitiveness analysis using economic indicators for the overall economy such as the real exchange rate. They construct an agricultural RER which evolution shows several differences with the global RER. Not only the sectoral competitiveness is more fluctuant than the global RER, but their evolution and measurement differ in each stage of the period considered.

Martínez (2006) explores the relationship between net exports as a share of GDP and RER level (using the Big Mac value as a sui generis indicator) for major exporting countries worldwide. The paper observes that there is a very weak relationship between a high RER in a given country (a low price of Big Mac in dollars) and a high share of net goods exports in the GDP for that country. The author therefore concludes that an undervalued currency is not sufficient to have export dynamism. By contrast, the adoption of long-term policies designed to achieve productivity improvements is an alternative decision and represents a suitable framework for international local industry inclusion and for a better standard of living.

Cerimedo, Salim, Sánchez and Otero (2005) estimate time-series regressions for exports by product, real exchange rate, nominal exchange rate volatility (measured as the nominal exchange rate variation coefficient for monthly periods) and world imports. For the real exchange rate they found that, though it is correlated with exports, the degree of correlation is heterogeneous across sectors. They also found that variations in exports due to changes in real exchange rate are higher for labor-intensive sectors than for capital-intensive ones.

Finally, Valdés (2008) studies the relationship between real exchange rate and bilateral exports from Chile to the United States, concluding that price elasticity is different among sectors. They also found that the higher the export diversification, the lower the bilateral real exchange rate effect on them.

For Uruguay, Mordecki (2006) analyzes the determinants of Uruguayan exports to Argentina, Brazil and the rest of the world, between 1980 and 2005. The variables considered were the real exchange rate and the demand for imports of each country or region. Using a Vector Error Correction Model (VECM) the analysis reveals that Uruguayan exports react similarly to shocks in the real exchange rate than to demand shocks (represented by imports from each country). Neither the MERCOSUR creation nor the effective protection, were significant factors in the model.

The fourth Uruguay XXI Export Report analyzes the evolution of the RER and exports for countries as Argentina and Brazil, among others. Its conclusion is that exporters are not guided by the existence of trade agreements or high levels of competitiveness, mentioning as an explanation to such behavior the pursuit of more dynamic markets or of best prices, such as those of developed countries.

Finally, Mordecki and Piaggio (2008) analyze the determinants of Uruguayan exports of industrial goods without agricultural origin-based inputs to Argentina and Brazil (the main destinations). The study was developed using Vector Error Correction Model, including variables such as exports to the mentioned countries, foreign demand and real bilateral exchange rate. The empirical analysis suggests that external demand is the main driver for non agricultural origin-based inputs for regional industrial exports. This means that industrial exports depend, in the long run, on Argentina and Brazil growth.

3. Methodology

3.1 Johansen cointegration method

Following Enders (1994), cointegration analysis is based on a vector autoregressive model with Vector Error Correction Model specification for an endogenous variable vector.

$$\Delta X_{it} = A_1 \Delta X_{it-1} + \cdots + A_k \Delta X_{it-k+1} + \prod X_{it-k} + \mu + \boldsymbol{\Gamma} D_t + \xi_t \qquad \text{t=1, \dots , T}$$

Where $\xi_t \sim N(0, \sigma^2)$

μ is a vector of constants and D_t contains a set of dummies (seasonal and interventions).

Information about long-term relationships is included in the $\prod = \alpha\beta'$ matrix. β is the coefficients vector for the existing equilibrium relationships, and α is the vector for long-term adjustment mechanism coefficients. The identification of the matrix $\prod$ range determines the total cointegration relationships existing among the variables.

Once examined the long-term relationship, we proceed to the short-term analysis, which shows different adjustment mechanisms of the variables to the long-run equilibrium. The short-term dynamics are represented by the A_i matrices in the above equation.

3.2 Data and construction of sectoral real exchange rates

The data includes the period January 1993 - December 2011, using monthly series of effective RER for the six chosen sectors. This index was calculated as a weighted average rate of purchasing power parity of the major trading partners, ensuring coverage of 80% of bilateral trade in each sector. The purchasing power parity was defined as the ratio between nominal exchange rate (defined as national currency / foreign currency) and the relationship between the consumer price index for the specific country and consumer price index for Uruguay. Weights used were defined according to the average share of each country in Uruguayan bilateral trade (exports plus imports) for each sector considering the period 2006 to 2009.

Information on exchange rate and prices were taken from International Monetary Fund (IMF). Regarding Argentinean prices, from 2007 on, we used the series developed by the Santa Fe Province.2

For export and import data, we used Uruguayan Central Bank (BCU) series in current dollars and deflated then by the United States consumer price index, calculated by the Bureau of Labor Statistics (BLS) of that country. For Argentina's GDP we used the series calculated by the Institute of Statistics and Census of Argentina whereas for the international price of skim milk we use data from the United States Department of Agriculture (USDA) publications. Series for cattle slaughter are monthly and they were taken from the National Institute of Beef (INCA).

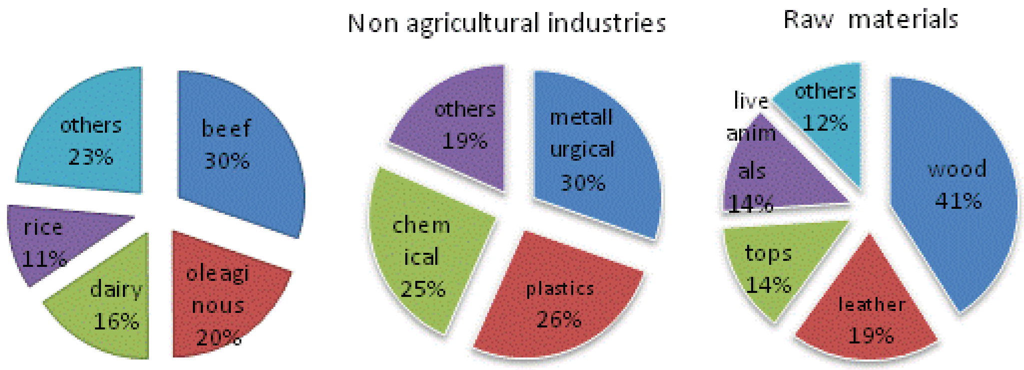
4. Empirical Analysis

4.1 Selected sectors

Sectors were chosen taking into account, firstly, the sector share in total exports, and secondly, the sectors' degree of industrialization and the nature of raw materials used (see Figure 1 and Figure 2). In the case of food, the main sectors were chosen (beef and dairy), leaving out oleaginous because these products does not have an industrial transformation. In addition, we included the three most important industries that process raw materials without agricultural origin: metallurgical, chemical and plastic industries. Finally, from the raw materials sectors, we chose the leather sector. Wood sector was excluded due to the fact that a significant percentage of its exports are sold to a free trade zone, where they are processed and re-exported as paper pulp, but there are no monthly statistics of these exports.

[2] Argentinean official statistics have had some credibility problems since 2007, so we decided to consider an alternative prices measure, the prices index of Provincia de Santa Fe, nearby Buenos Aires, Argentinean capital city.

FIGURE 1 - SELECTED SECTORS
Participation in division sector. 2011

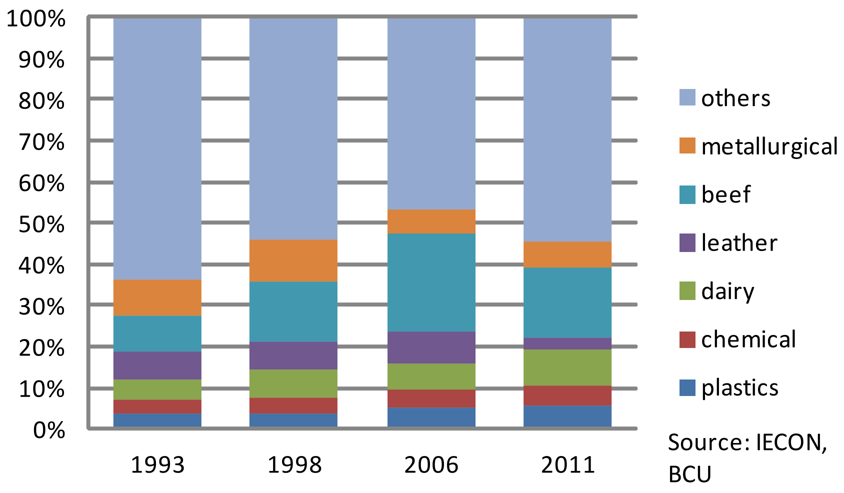


Source: IECON, BCU

Beef is the main export sector, accounting for 30% of total food exports and 17% of global exports in 2011. It is important to note that, whereas the share of beef in total exports doubled between 1993 and 2011, the amount of those exports increased ten times in the same period (see Annex). Within beef category, the main export products throughout the reporting period are: frozen beef (with an average of 65%) and fresh or chilled beef (with an average of 30%).

Regarding beef export destinations in recent years, United States reduced its participation as a result of the international crisis, suffering its main drop in 2008 (decreasing from 34.6% in 2007 to 7.7% in 2008). Meanwhile, the Russian Federation appears as a recent destination market (since 2006), being the second export destination after the United States until 2008 since when it became the main market destination of Uruguayan beef exports Analyzing the evolution throughout the period, the diversification of destinations stands out. Indeed, while in 1993 80% of exports were sold only to five countries, in 2011 at least ten countries had to be considered to explain a similar share of beef exports. Finally, it is important to note that the MERCOSUR lost participation as a Uruguayan beef buyer, representing about 30% of exports in the second half of the 90s, and only 6% in the first decade of the XXI century.

FIGURE 2 - SELECTED SECTORS
Participation in total exports. 1993-2011



The dairy industry ranks third in food exports, representing 15% of total exports in 1993 and around 7% nowadays. Powdered milk is the main export product of this sector, growing steadily throughout the studied period. Meanwhile, cheese and curd are also important products representing a third of the total sector exports, while butter maintains an average share of 10%. It should be noted that yogurt is a new export product, so it does not appear as an export product during the 90s. However, in 2011 it represented 4.5% of the sector exports while in 2008 it reached a share of 12%. Finally, it is observed that not concentrated milk without added sugar and cream, have decreased significantly in recent years, accounting for only a 3% of dairy exports in the last five years while in the nineties represented a 25%.

As regards dairy exports destinations, in recent years the most important buyers have been Mexico, Venezuela, Brazil and Cuba, although with some changes in relative share among them. In particular, Mexico´s participation decreased while Brazil increased significantly as a destination market. Comparing to the 90s, the main difference lies on a decreasing importance of the region, although with an increasing importance of Brazil at the expense of a reduction in Argentina´s participation.

Leather industry is one of the key sectors within Uruguayan commodity exports, although its importance has fallen over time. While at the beginning of the 90s the leather export accounted for a 7% of total exports, their importance in 2011 fell to 3%. With respect to sector products, during the 90's tanned leather and skins without preparation represented almost the total of exports. Later, hides and skins tanned and prepared started to gain importance, achieving a share of 70% of leather industry exports between 2006 and 2008. Nowadays, those articles accounts for the 43% of the total sector exports, while tanned hides and skins unprepared represent 50%.

Regarding leather exports destinations, data from recent years reveals that these products are allocated to different markets. This is noted by the fact that, in seeking to explain at least 80% of exports in this sector, it is necessary to consider at least eight different countries, located at various regions. Between 2006 and 2011, the main two markets have been Germany and Thailand, which differs greatly with the nineties, when the main buyers were represented by the United States and Hong Kong.

Among industrial products without agricultural origin, the chemical ones account for 25% of these exports in the considered period, which implies an increase of ten percentage points during the period. The main export products from this sector have not changed substantially, being the most important the pharmaceuticals (30%), soap, waxes, cleaning products and similar (20%), miscellaneous products (17%), and inks, paints and varnishes (10%). However, it is important to mention the increasing evolution of pharmaceuticals and soap, waxes, cleaning products and similar: the first ones represented 21% in 1993 and 29% in 2011, while the last ones increased from 10% to 19% in the same period. Organic and inorganic chemicals, such as inks, paints and varnishes reduced its participation to half in all cases.

It is noteworthy that chemicals exports are sold almost entirely to Latin American countries, where those belonging to MERCOSUR represent 60% of those exports. Even though MERCOSUR participation is still relevant, it has fallen with respect to the beginning of the period, when its participation was 80%.

The plastics industry remains in second place in exports of industrial products without agricultural origin throughout the period of analysis. This industry also presents an increasing share, rising from 17% in 1993 to 27% in 2011. It is necessary to clarify that this sector includes both manufacturing plastic and rubber, representing 81% and 19% respectively. The main export items of the plastic division are plastics for transportation or packing, while the unvulcanized rubber is the main one in the other division. Analyzing the evolution between 1993 and 2011, it is highlighted the disappearance of products such as polymers of vinyl chloride, vinyl acetate, polyacetals and tires (in 1993 each polymer represented 10% while tires represented 20%). What stands out is its dependence on the region. Brazil and Argentina have represented about 90% of the sector exports throughout the whole period; being Brazil the main buyer (it represents a range from 65 to 75%).

TABLE 1
Economic Activity Survey

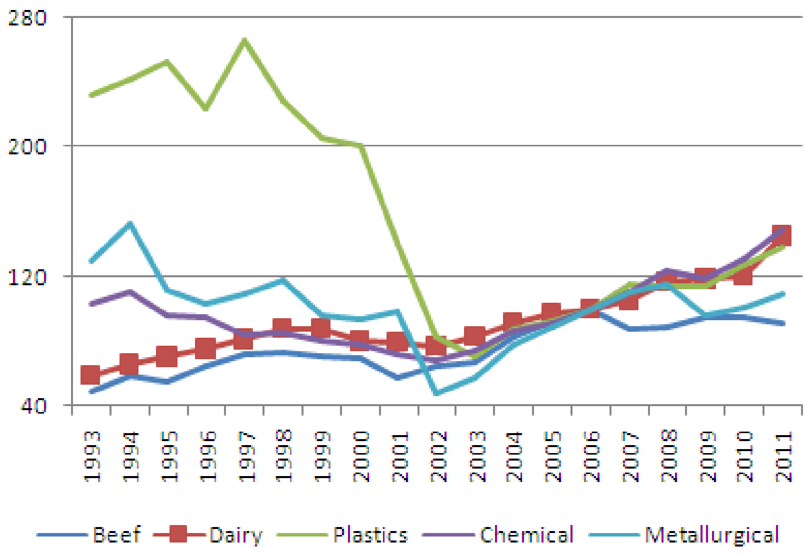
ISIC	Sector	Employment	GVA/GVP
1011	Beef	12987	15%
22	Plastics	4802	25%
1050	Dairy	5397	22%
20 y 21	Chemicals	7407	35%
24 a 30	Metallurgical	9605	33%

SOURCE: IECON, INE

Finally, metallurgical sector is the main one in terms of industrial products without agricultural origin exports, placing first both at the beginning and at the end of the period, although with a greater importance in 1993 than in 2011 (42% and 30% respectively). Vehicles and other land vehicles and parts and accessories account currently for 60% of total sector exports. Regarding changes in destinations, three main phenomena are highlighted: loss in the importance of Argentinean participation (78% in 1993 vs. 46% in

2011), growing although volatile participation of Brazil (14% in 1993 vs. 36% in 2011), and the emergence of new markets such as the US, China, Paraguay and Venezuela, although Argentina and Brazil still account for 82% of, metallurgical exports. We also analyzed data from the Industrial Survey for five of the six chosen sectors (data for leather is not available). These sectors represent 39% of total industrial employment, standing out the beef industry with 12,987 jobs. The average ratio between gross value added and gross value of production for the total industry (GVA/GVP) is 30%, while chosen sectors have ratios between 15% (beef) and 35% (chemicals). Therefore, among chosen sectors, there are low value-added as well as high-value-added cases.

FIGURE 3 - VOLUME INDEX
1993 - 2011. 2006=100



Source: INE, FCS

Figure 3 shows the evolution of the volume index (VI) for the five selected sectors. Based on the results, we could divide the period into two sub periods, one from 1993 to 2002, and the other one from 2002 to 2011. In the first sub period there is a stagnation or drop of the VI, where plastics and metallurgical industries have the worst performance. In the second sub-period there is a positive development of all sectors, consistent with the global performance of the manufacturing sector after the 2002 economic crisis.

4.2 Description of the series used

The period analyzed in this paper goes from January 1993 to December 2011. Exports series values are in constant dollars, deflated by the U.S. Consumer Price Index (CPI). The period was defined taking into account the availability of data in order to calculate the SRER. To construct the SRER we used the average of 2005 as the base period. All series are in logs, in order to avoid scale of values problems, so that the resulting coefficients of the models can be interpreted as elasticities. Series used for exports can be observed in figures 4-9 while figures from 10 to 15 show SRER ones.

Almost all series changed its behavior between the nineties and the 2000s, after the 2002 crisis. In general, during the nineties the export series maintain certain stability with little fluctuations, while since 2003 there is a strong growing tendency, although there are some exceptions. This pattern is verified in the exports of beef, dairy, chemicals and transport equipment. With regard to leather exports, they remain fairly stable until 2007, and then they suffer a significant decrease due to the global crisis of 2008-2009. Although they start to recover in 2010, they do not reach the pre-crisis levels. The impact of the crisis in this sector is due to the fall of world demand for products related to the automobile industry. Regarding plastics, a stability pattern is observed during the nineties with strong growth after 2003. There is also a decrease in plastic sales in 2008-2009 linked with the economic crisis, after which the sector recovered. However, as the plastic sales are allocated mainly in regional markets, the strong contraction of exports in 2009 also included those to Argentina and Brazil.

The most important difference between the SRER series is observed during the nineties, depending on the destination market (the region or the rest of the world). During the nineties, exports allocated to regional countries had a higher average level for the SRER than those placed outside the region, with the exception of leather, which during the nineties maintained a level of SRER close to 100. Among the exports destined to the region, there are also differences depending on whether Argentina or Brazil was the main market destination. In the case of chemicals, the impact of the Brazilian devaluation in January 1999 stands out. Regarding plastics and metallurgical exports, both have had a similar SRER evolution: a fall is highlighted due to Brazilian devaluation in 1999, the subsequent relinquishment of convertibility by Argentina in the early 2002 and then they show a recovery due to the Uruguayan peso devaluation in mid-year. The Uruguayan devaluation is noticeable in all SRERs series, but it is especially notorious in the exports of beef, dairy and chemical products, appearing also in leather ones but less evidently. The fact that stands out in all the series is the appreciation of the Uruguayan peso which accompanied the strong growth experienced by the Uruguayan economy since 2004. This phenomenon is especially evident in the SRERs of products directed out of the region, where the effect of currency appreciation was more important. In the remaining cases (chemicals, plastics and metallurgical industry) competitiveness remained above 100 until the 2008-2009 crisis, when the Brazilian currency was strongly affected by the crisis and depreciated further than the Uruguayan peso, generating a significant drop in the SRER.

FIGURE 4 - BEEF EXPORTS
Monthly amounts in constant dollars

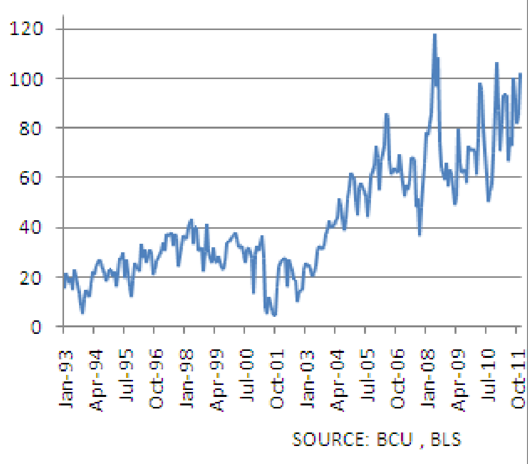


FIGURE 5 - DAIRY PRODUCTS EXPORTS
Monthly amounts in constant dollars

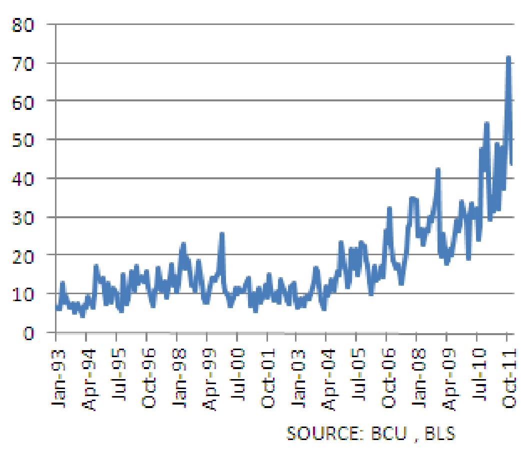


FIGURE 6 - LEATHER EXPORTS
Monthly amounts in constant dollars

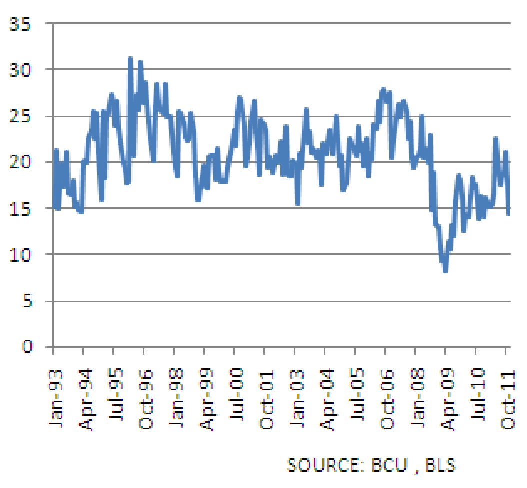


FIGURE 7 - PLASTIC EXPORTS
Monthly amounts in constant dollars

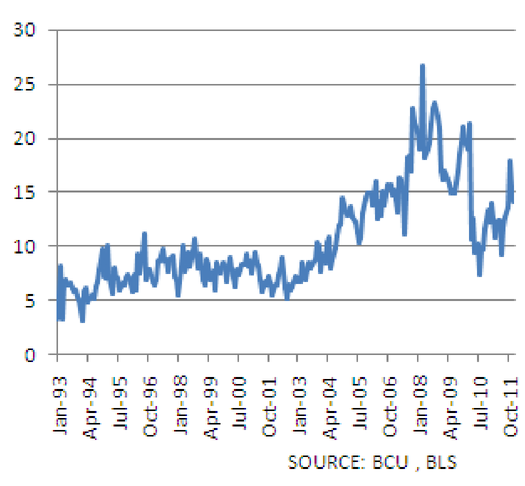


FIGURE 8 - CHEMICAL PRODUCTS EXPORTS
Monthly amounts in constant dollars

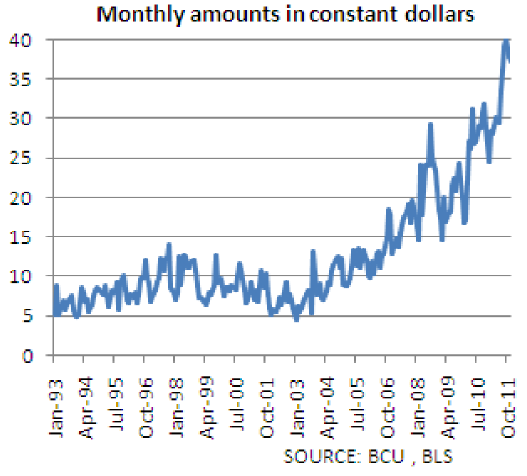


FIGURE 9 - EXPORTS FROM METALLURGICAL INDUSTRY
Monthly amounts in constant dollars

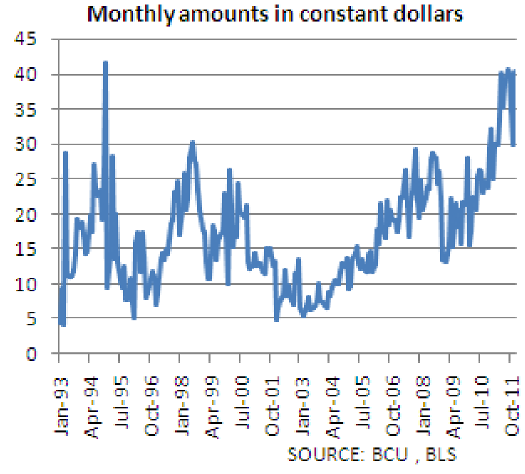
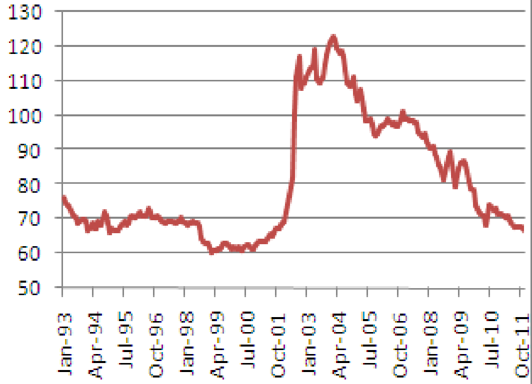


FIGURE 10 - BEEF SECTORAL REAL EXCHANGE RATE (BSRER)
Base index 2005 = 100

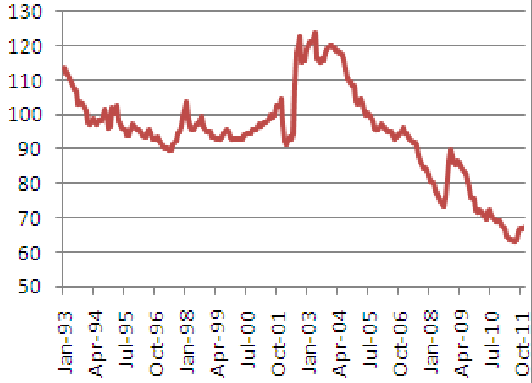


SOURCE: IECON

FIGURE 11 - DAIRY SECTORAL REAL EXCHANGE RATE (DSRER)
Base index 2005 = 100

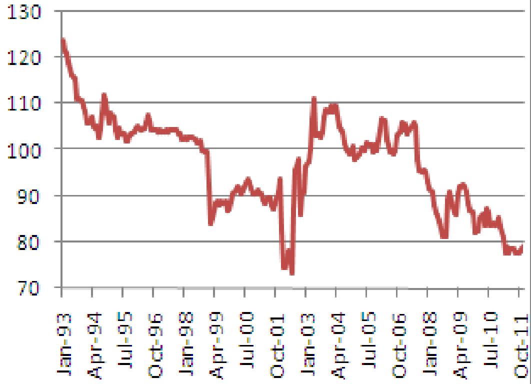
SOURCE: IECON

FIGURE 12 - LEATHER SECTORAL REAL EXCHANGE RATE (LSRER)
Base index 2005 = 100



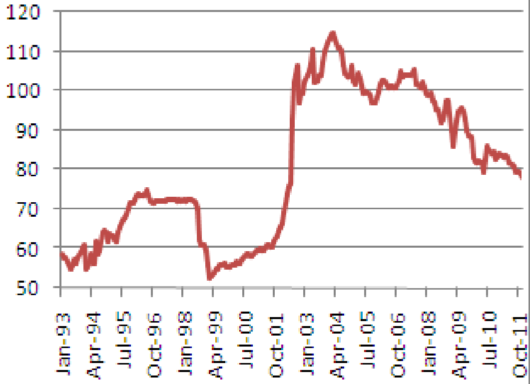
SOURCE: IECON

FIGURE 13 - PLASTICS SECTORAL REAL EXCHANGE RATE (PSRER)
Base index 2005 = 100



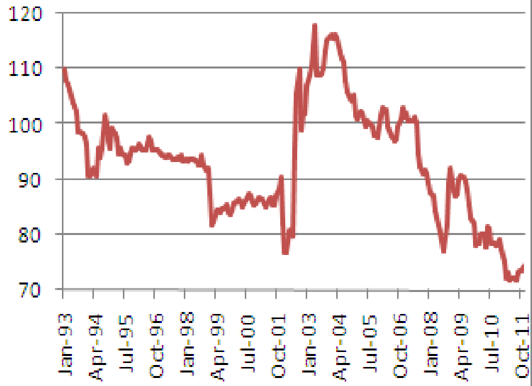
SOURCE: IECON

FIGURE 14 - CHEMICAL SECTORAL REAL EXCHANGE RATE (CHSRER)
Base index 2005 = 100



SOURCE: IECON

FIGURE 15 - METALLURGICAL SECTORAL REAL EXCHANGE RATE (MSRER)
Base index 2005 = 100



SOURCE: IECON

4.3 Unit Root Test

In order to analyze the integration degree of the series to be modeled, we applied the Augmented Dickey-Fuller (ADF) test, which results are shown in Table 2. All the cases were non-stationary series with a unit root, ie, I(1). According to the theory, this is a result generally expected for economic series, opening the possibility to analyze whether there is a cointegration vector between the exports series and their corresponding SRER, showing a long-term relationship between both variables.

TABLE 2 – UNIT ROOT TEST

Augmented Dickey-Fuller
H_0 = there is an unit root

	Statistic value of the series in levels	Rejection H0 up to 95%	Statistic value of the series in first differences	Rejection H0 up to 95%
Lc (beef in log)	0.803974	No	-7.079536	Yes
	(no constant, 11 lags)		(no constant, 10 lags)	
Ll (dairy in log)	2.189151	No	-9.085545	Yes
	(no constant, 11 lags)		(no constant, 10 lags)	
Lcu (leather in log)	-2.420501	No	-4.217773	Yes
	(no constant, 12 lags)		(no constant, 12 lags)	
Lp (plastics in log)	1.059833	No	-5.695043	Yes
	(no constant, 12 lags)		(no constant, 11 lags)	
Lq (chemicals in log)	2.643967	No	-6.008791	Yes
	(no constant, 12 lags)		(no constant, 11 lags)	
Lxm (metallurgical in log)	-0.381095	No	-15.94373	Yes
	(no constant, 2 lags)		(no constant, 1 lags)	
Bsrer (Beef-SRER in log)	-0.949459	No	-12.00086	Yes
	(no constant, 1 lags)		(no constant, 0 lags)	
Dsrer (Dairy-SRER in log)	-2.431631	No	-4.651352	Yes
	(no constant, 6 lags)		(no constant, 5 lags)	
Lsrer (Leather-SRER in log)	0.489678	No	-5.973542	Yes
	(no constant, 4 lags)		(no constant, 3 lags)	
Psrer (Plastics-SRER in log)	-0.882456	No	-5.013174	Yes
	(no constant, 8 lags)		(no constant, 7 lags)	
CHsrer (Chemicals-SRER in log)	0.489678	No	-5.973542	Yes
	(no constant, 4 lags)		(no constant, 3 lags)	
Msrer (Metallurgical-SRER in log)	0.487544	No	-10.54141	Yes
	(no constant, 5 lags)		(no constant, 3 lags)	
Lpd (skim milk international price in log)	0.503389	No	-8.476542	Yes
	(no constant, 2 lags)		(no constant, 11 lags)	
Lf (Cattle slaughter in log)	0.481014	No	-10.70185	Yes
	(no constant, 10 lags)		(no constant, 9 lags)	
Lip (plastics imports in log)	1.330930	No	-6.611109	Yes
	(no constant, 6 lags)		(no constant, 5 lags)	

Liq (chemicals imports in log)	2.206498	No	-8.383508	Yes
	(no constant, 9 lags)		(with constant, 8 lags)	

4.4 Modeling

4.4.1 Beef

For the beef sector, we find no evidence of a long-run relationship between beef exports and the beef SRER, which is in line with the shown graphics. In the evolution of beef exports we observe the impact of the crisis of the mouth disease in 2001, as well as the strong drive of international commodities prices and the subsequent crisis of September 2008. We should also bear in mind that the behavior of these exports involves institutional factors. For instance, the market is divided into those that accept exports from countries with mouth disease and those who do not, which in turn are subject to quotas in the main markets –Europe and the United States–. Moreover, the sharp increase of sales in 2005 is explained by the emergence of the mouth disease in Canada, which allowed Uruguay to export higher amounts of beef to the U.S. Once the crisis was overcome, Uruguay managed to partially replace the U.S. market which returned to the previous shares.

Therefore, it is not surprising that SRER is not a significant variable to explain the beef exports.

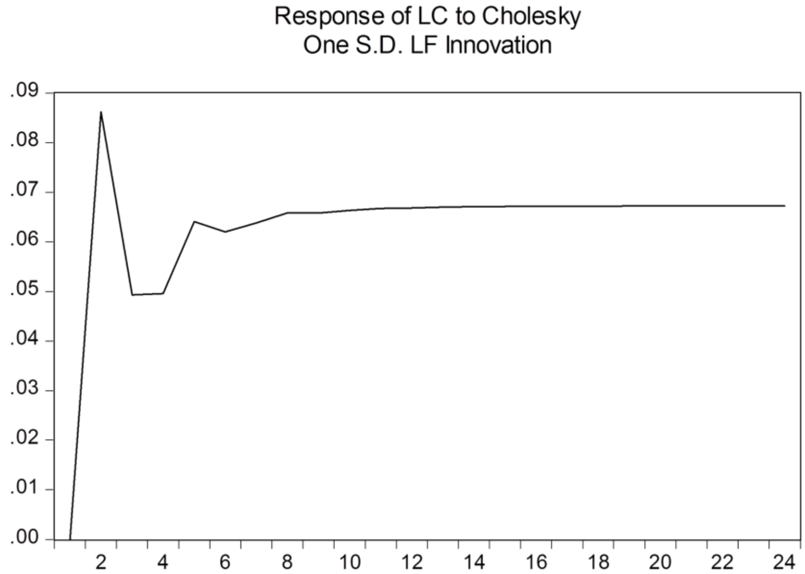
In turn, we introduced a new variable, cattle slaughter, representing the supply side, in a small economy like Uruguay which faces world's demand. We found a long term relationship between beef exports (Lc_t) and cattle slaughter (LF_t), and again SRER did not entered this vector.

$$Lc_t = -28.474 + 2.684LF_t$$

(14.37)

The impulse response function shows that a positive shock in cattle slaughter causes an over shooting in the first periods and then shows a smaller but permanent effect of about 6.5% in beef exports, which takes about twelve months to fully stabilize (Figure 16).

FIGURE 16 - IMPULSE RESPONSE FUNCTION OF LC TO A LF SHOCK



SOURCE: IECON

4.4.2 Dairy

For the case of dairy products, we also estimate a model including total dairy exports (LL_t) in constant dollars, and the dairy SRER, both variables expressed in logs. We found a long-term relationship, but the sign of the coefficient was not the expected one as it was negative, which contradicts economic theory. After including in the model the skim milk international price (LPD_t) this new variable resulted significant and with the expected sign, and the SRER became no longer significant. The vector found is:

$$LL_t = -5.622 + 1.065LPD_t \tag{4.22}$$

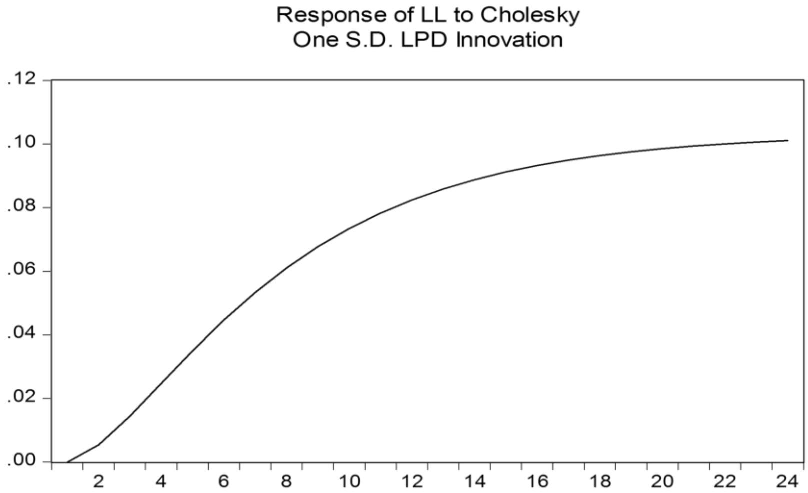
This result implies a price-elasticity close to one, where prices are represented by the powdered skim milk prices. Moreover, we included seasonal dummies and other dummies aimed to correct different atypical behavior of the series.

Particularly, dummies for Mexican crisis in 1995 and their subsequent recovery were significant, as well as the sharp increase in dairy prices in the first half of 2008, following the commodity prices positive shock in this period, its subsequent drop after August 2008 and its recovery since 2009.

After analyzing the weak exogeneity, it was found that the LPD variable does not fit in the short-term adjustment. This was an expected result, since it is a price formed in the international market. Thus, the adjustment for exports when there are mismatches in the short term is around 20% per period.

The impulse response function shows that a positive price shock causes a permanent effect of about 10% in dairy exports, which takes about twenty months to fully stabilize, although 50% of the total effect is already verified after seven months, as shown in Figure 17.

FIGURE 17 - IMPULSE RESPONSE FUNCTION OF LL TO A LPD SHOCK



SOURCE: IECON

4.4.3 Leather

In this case, leather SRER was not significant, so we can conclude that there is not a long-run relationship between these variables.

A possible explanation for this result could be associated with the nature of this market, which is basically fragmented into two: one linked to the automobile industry and the other one related to the footwear industry. These two industries have very different characteristics, with different markets and therefore different undergoing changes. The first one specializes in luxury cars and exports leather mainly to the European Union and South Africa. Meanwhile, the other sub-sector exports to China and Southeast Asia. This market segmentation makes necessary the study of both export demands separately.

4.4.4 Chemicals and plastics

In order to analyze these two sectors' exports we proceeded in the same way as the above sectors. Neither in plastics nor in the chemical industry had we found a cointegration vector that includes its respective exports (LQ_t and LP_t) and SRER ($CHSRER_t$ and $PSRER_t$). Therefore, it was not found a long-term relationship linking exports with the sectoral real exchange rate.

For these two industries we considered alternatively their imports (LIQ_t and LIP_t), as an important determinant, because they transform imported raw materials.

So, we found two long term relationships, one for each product:

$$LQ_t = -1.621 + 1.054LIQ_t$$

(17.44)

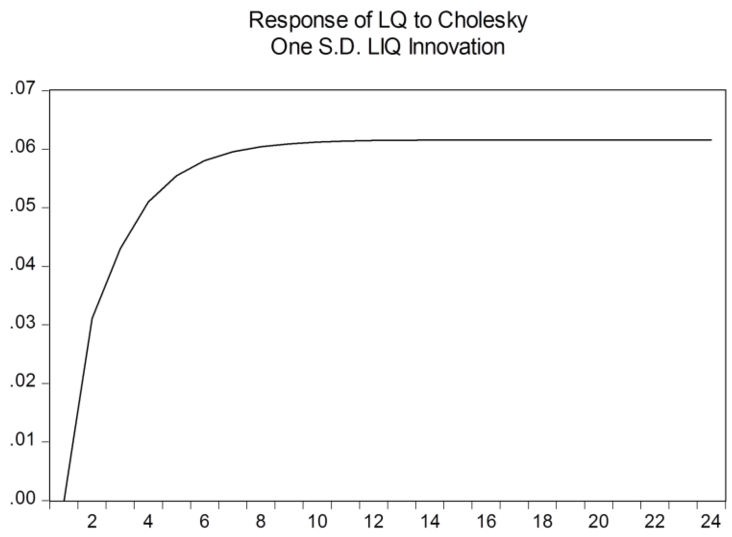
$$LP_t = -70.1 + 3.113LIP_t + 13.685PSRER_t$$

(5.98) (5.78)

In the case of the chemical industry, we found and elasticity near to one in relation to chemical imports, due to the fact that Uruguay must import the raw material for this industry. Finally, for plastic exports we found a cointegration vector with plastic imports and the sectoral RER, which shows for this last case the importance of relative prices between exports and imports, and not only with exports.

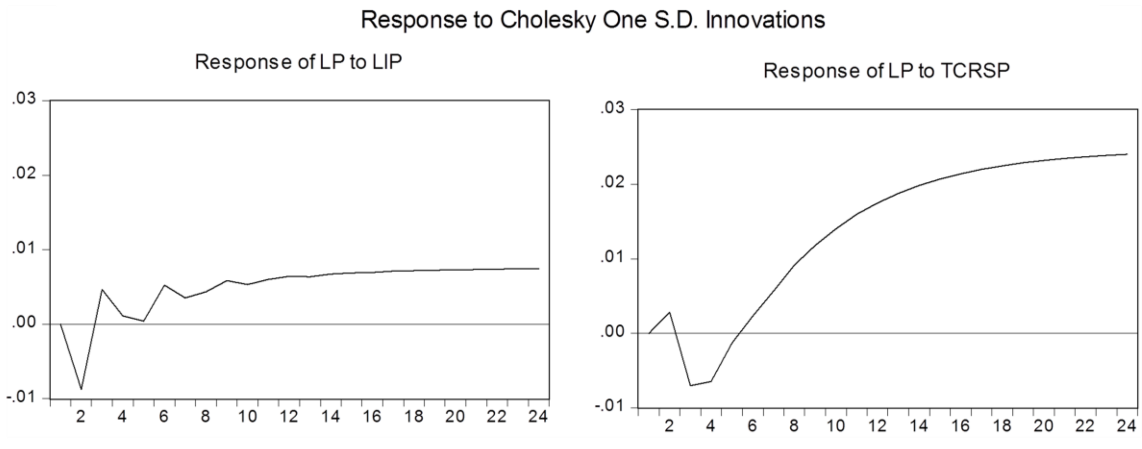
The impulse response functions show a permanent effect. For chemical exports (Figure 18) the effect is about 6% from the seventh period on. For plastics exports (Figure 19), the first period shows a negative effect, but immediately they show a positive effect for each variable, but quite small, between 1% and 2%.

FIGURE 18 IMPULSE RESPONSE FUNCTION OF LQ TO A LIQ SHOCK



SOURCE: IECON

FIGURE 19 IMPULSE RESPONSE FUNCTION OF LP TO A LIP AND PSRER SHOCKS



SOURCE: IECON

4.4.5 Metalworking

For this sector, we also conclude that there is not a long-run relationship between metallurgical industry exports and its SRER.

To deepen the analysis, we included Argentina's GDP as an explanation variable, since it is the main destination market over the period of analysis. In order to do that, we used quarterly instead of monthly data. The variables were considered in logs and both sector exports (LXM) as well as Argentina's GDP (LPA) were first-order integrated (I(1)), which was tested using the ADF test.

TABLE 3 – UNIT ROOT TEST Augmented Dickey-Fuller (ADF) H_0 = there is an unit root				
	Statistic value of the series in levels	**Rejection H0 up to 95%**	**Statistic value of the series in first differences**	**Rejection H0 up to 95%**
Lxm (quarterly metallurgical exports in log)	0.201201	No	-4.206261	Yes
	(No constant, 4 lags)		(No constant, 3 lags)	
Lpa (Argentinean GDP in log)	1.726252	No	-2.941302	Yes
	(No constant, 5 lags)		(No constant, 4 lags)	

For the new model, we found a cointegration vector between the variables, which implies a long-term relationship between metallurgical industry exports and Argentina´s level of activity. Based on this result, and taking into account that we did not found a long-run relationship with the SRER, we can conclude that Argentinean demand is basically what determines the metallurgical exports level and not the relative prices represented by the SRER.

The resulting equation is:

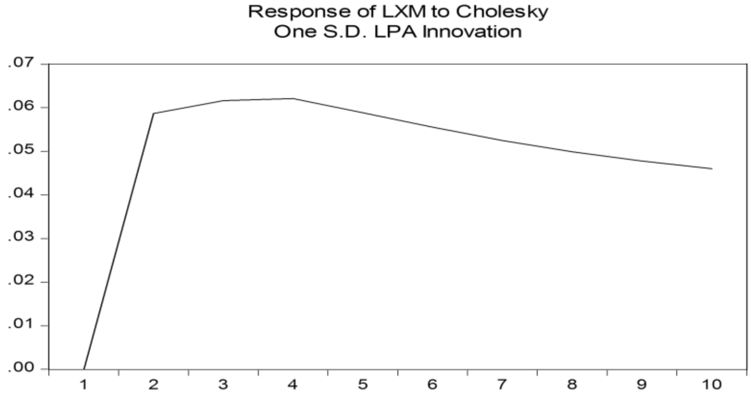
$$LXM_t = -4.082 + 1.733 LPA_t$$

(3.78)

The income coefficient is significantly higher than one. This means that exports react more than proportionally to an income increase, according to the nature of "luxury goods". As most exports of this industry are exports of automobiles and its parts, the income elasticity value is consistent with economic theory.

Based on the impulse response function, we analyzed the effect of a positive shock in Argentinean GDP on the amount of this sector exports (Figure 20).

FIGURE 20 IMPULSE RESPONSE FUNCTION OF LXM TO A LPA SHOCK



SOURCE: IECON

According to this analysis, there is an overreaction in the period following the shock, which is adjusted in subsequent periods, with a final effect of 5% after 10 quarters.

5. Final remarks

The Uruguayan economy has recently experienced a real appreciation process, driven by fast economic growth which at the same time was partly driven by exports growth.

Uruguayan exports are concentrated in few products, but they present different characteristics, because of their inputs or their destination markets. For the period of analysis, we conclude that relative prices, measured by the SRER, do not affect the long-term trajectory of the sectoral exports analyzed here.

Introducing other variables, we found some long-term relationships for each product: beef depending on cattle slaughter (sector supply), diary related with international prices of milk (a commodity for a small country), chemicals and plastics depend on imports (as they manufacture imported raw materials) and only in the case of plastics the SRER entered the long run relationship. Finally, for metalwork exports, basically destined to the region, Argentinean GDP resulted significant in the long term vector.

We conclude that in the long run sectoral RER is not relevant to explain exports of the sectors analyzed here, with the exception of those from the plastic industry. As a small open economy Uruguay is a price taker which faces international demand and for some exports depend only on the supply side. In others, demand is not so elastic and it is the principal determinant of exports. Nevertheless, RER is important for exporters' profitability and at a macroeconomic level is a variable which importance to exporters' decision making process should not be underappreciated.

6. References

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7. Annex

Beef Model

Vector Error Correction Estimates
Date: 11/29/12 Time: 16:05
Sample (adjusted): 1993M01 2010M12
Included observations: 216 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
LC(-1)	1.000000	
LF(-1)	-2.684386	
	(0.18685)	
	[-14.3668]	
C	28.47444	
Error Correction:	D(LC)	D(LF)
CointEq1	-0.102085	0.132640
	(0.04237)	(0.03133)
	[-2.40934]	[4.23423]

Johansen test

Date: 05/20/13 Time: 11:52
Sample (adjusted): 1993M01 2010M12
Included observations: 216 after adjustments
Trend assumption: Linear deterministic trend
Series: LC LF
Exogenous series: D(S1) D(S2) D(S3) D(S4) D(S5) D(S6) D(S7) D(S8) D(S9) D(S10) D(S11) D(D_AFTOSA) D(E9311) D(I0105) D(I0011) D(I079)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.158531	38.75581	15.49471	0.0000
At most 1	0.006795	1.472823	3.841466	0.2249

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.158531	37.28299	14.26460	0.0000
At most 1	0.006795	1.472823	3.841466	0.2249

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Residuals normality tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 05/20/13 Time: 11:53
Sample: 1993M01 2014M12
Included observations: 216

Component	Skewness	Chi-sq	df	Prob.
1	0.145626	0.763447	1	0.3823
2	-0.358899	4.637115	1	0.0313
Joint		5.400562	2	0.0672

Component	Kurtosis	Chi-sq	df	Prob.
1	3.374617	1.263039	1	0.2611
2	3.475173	2.032105	1	0.1540
Joint		3.295145	2	0.1925

Component	Jarque-Bera	df	Prob.
1	2.026486	2	0.3630
2	6.669221	2	0.0356
Joint	8.695707	4	0.0692

Residuals autocorrelation

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 05/20/13 Time: 11:54
Sample: 1993M01 2014M12
Included observations: 216

Lags	LM-Stat	Prob
1	7.398349	0.1163
2	11.08247	0.0257
3	5.795010	0.2150
4	3.888821	0.4213
5	6.235058	0.1823
6	1.349921	0.8529
7	5.869606	0.2091
8	17.76632	0.0014
9	1.157826	0.8850
10	9.904585	0.0421
11	7.374282	0.1174
12	6.291070	0.1784

Probs from chi-square with 4 df.

Dairy model

Vector Error CorrectionEstimates
Date: 09/25/12 Time: 16:17
Sample (adjusted): 1993M11 2010M12
Includedobservations: 206 afteradjustments
Standard errors in ( ) & t-statistics in [ ]

CointegrationRestrictions:
B(1,1)=1, A(2,1)=0
Convergenceachievedafter 4 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):

Chi-square(1)	0.959790
Probability	0.327240

CointegratingEq:	CointEq1
LL(-1)	1.000000
LPD(-1)	-1.065089
	(0.25237)
	[-4.22038]
C	5.462192

Error Correction:	D(LL)	D(LPD)
CointEq1	-0.199285	0.000000
	(0.04860)	(0.00000)
	[-4.10047]	[NA]

Johansen test

Date: 09/26/12 Time: 19:08
Sample (adjusted): 1993M11 2010M12
Includedobservations: 206 afteradjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LL LPD
Exogenous series: D(S1) D(S2) D(S3) D(S4) D(S5) D(S6) D(S7) D(S8) D(S9) D(S10) D(S11) D(I9510) D(I031) D(I962) D(I0912) D(I0212) D(E074) D(I082)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 CriticalValue	Prob.**
None *	0.088089	24.09503	20.26184	0.0141
At most 1	0.024450	5.099265	9.164546	0.2727

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 CriticalValue	Prob.**
None *	0.088089	18.99577	15.89210	0.0157
At most 1	0.024450	5.099265	9.164546	0.2727

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Residuals normality tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 09/26/12 Time: 18:45
Sample: 1993M01 2014M12
Included observations: 206

Component	Skewness	Chi-sq	df	Prob.
1	0.059085	0.119859	1	0.7292
2	-0.141641	0.688803	1	0.4066
Joint		0.808663	2	0.6674

Component	Kurtosis	Chi-sq	df	Prob.
1	2.908742	0.071482	1	0.7892
2	3.634837	3.459239	1	0.0629
Joint		3.530721	2	0.1711

Component	Jarque-Bera	df	Prob.
1	0.191341	2	0.9088
2	4.148042	2	0.1257
Joint	4.339383	4	0.3620

Residuals autocorrelation

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/26/12 Time: 18:48
Sample: 1993M01 2014M12
Included observations: 206

Lags	LM-Stat	Prob
1	18.40433	0.0010
2	4.762137	0.3126
3	8.755362	0.0675
4	5.080397	0.2791
5	4.350982	0.3606
6	3.081158	0.5443
7	4.632110	0.3272
8	1.802615	0.7720
9	6.956311	0.1382
10	3.212961	0.5228
11	4.625373	0.3279
12	2.731398	0.6037

Probs from chi-square with 4 df.

Chemicals and plastics models

Vector Error Correction Estimates
Date: 05/20/13 Time: 12:00
Sample (adjusted): 1993M03 2010M12
Included observations: 214 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
LQ(-1)	1.000000	
LIQ(-1)	-1.056371	
	(0.06057)	
	[-17.4395]	
C	1.621078	
Error Correction:	**D(LQ)**	**D(LIQ)**
CointEq1	-0.294142	0.195553
	(0.05597)	(0.05744)
	[-5.25517]	[3.40428]

Vector Error Correction Estimates
Date: 11/29/12 Time: 18:04
Sample (adjusted): 1993M05 2010M12
Included observations: 212 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LP(-1)	1.000000		
LIP(-1)	-3.112955		
	(0.52051)		
	[-5.98061]		
TCRSP(-1)	-13.68529		
	(2.36783)		
	[-5.77969]		
C	70.10348		
Error Correction:	**D(LP)**	**D(LIP)**	**D(TCRSP)**
CointEq1	-0.011864	-0.013226	0.005873
	(0.00742)	(0.00666)	(0.00106)
	[-1.59892]	[-1.98519]	[5.55119]

Johansen test

Date: 05/20/13 Time: 12:19
Sample (adjusted): 1993M03 2010M12
Included observations: 214 after adjustments
Trend assumption: Linear deterministic trend
Series: LQ LIQ
Exogenous series: D(S1) D(S2) D(S3) D(S4) D(S5) D(S6) D(S7) D(S8) D(S9) D(S10) D(S11) D(I0310) D(I942)
Warning: Critical values assume no exogenous series

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.195143	46.53645	15.49471	0.0000
At most 1	0.000369	0.079044	3.841466	0.7786

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.195143	46.45741	14.26460	0.0000
At most 1	0.000369	0.079044	3.841466	0.7786

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Date: 05/20/13 Time: 12:16
Sample (adjusted): 1993M05 2010M12
Included observations: 212 after adjustments
Trend assumption: Linear deterministic trend
Series: LP LIP TCRSP
Exogenous series: D(S1) D(S2) D(S3) D(S4) D(S5) D(S6) D(S7) D(S8) D(S9) D(S10) D(S11) D(I103) D(E021) D(I027) D(E0210) D(TC0812) D(E0901) D(I992)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 2
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.109386	36.16989	29.79707	0.0081
At most 1	0.044518	11.61083	15.49471	0.1766
At most 2	0.009186	1.956491	3.841466	0.1619

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.109386	24.55905	21.13162	0.0158
At most 1	0.044518	9.654343	14.26460	0.2356
At most 2	0.009186	1.956491	3.841466	0.1619

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Residuals normality tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 05/20/13 Time: 12:22
Sample: 1990M01 2014M12
Included observations: 214

Component	Skewness	Chi-sq	df	Prob.
1	-0.092595	0.305802	1	0.5803
2	0.021512	0.016506	1	0.8978
Joint		0.322308	2	0.8512

Component	Kurtosis	Chi-sq	df	Prob.
1	3.308712	0.849787	1	0.3566
2	3.067612	0.040761	1	0.8400
Joint		0.890548	2	0.6406

Component	Jarque-Bera	df	Prob.
1	1.155589	2	0.5611
2	0.057267	2	0.9718
Joint	1.212856	4	0.8760

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 05/20/13 Time: 12:08
Sample: 1993M05 2014M12
Included observations: 212

Component	Skewness	Chi-sq	df	Prob.
1	-0.254265	2.284322	1	0.1307
2	-0.103907	0.381484	1	0.5368
3	0.394582	5.501219	1	0.0190
Joint		8.167025	3	0.0427

Component	Kurtosis	Chi-sq	df	Prob.
1	3.198483	0.347992	1	0.5553
2	3.339530	1.018312	1	0.3129
3	3.501441	2.221081	1	0.1361
Joint		3.587385	3	0.3096

Component	Jarque-Bera	df	Prob.
1	2.632314	2	0.2682
2	1.399796	2	0.4966
3	7.722299	2	0.0210
Joint	11.75441	6	0.0677

Residuals autocorrelation

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 05/20/13 Time: 12:23
Sample: 1990M01 2014M12
Included observations: 214

Lags	LM-Stat	Prob
1	18.90857	0.0008
2	14.07232	0.0071
3	9.373424	0.0524
4	5.585018	0.2324
5	7.230760	0.1242
6	8.620203	0.0713
7	2.473836	0.6493
8	6.738711	0.1504
9	7.723432	0.1023
10	13.46859	0.0092
11	3.768301	0.4383
12	7.941754	0.0937

Probs from chi-square with 4 df.

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 05/20/13 Time: 12:14
Sample: 1993M05 2014M12
Included observations: 212

Lags	LM-Stat	Prob
1	8.747083	0.4609
2	8.345452	0.4997
3	13.58292	0.1380
4	12.37219	0.1931
5	13.63809	0.1358
6	6.126745	0.7272
7	19.49926	0.0213
8	5.639690	0.7754
9	6.030611	0.7369
10	13.23516	0.1523
11	15.02663	0.0902
12	8.137828	0.5203

Probs from chi-square with 9 df.

Metalworking model

Vector Error CorrectionEstimates
Date: 09/26/12 Time: 15:52
Sample (adjusted): 1993Q3 2011Q4
Includedobservations: 74 afteradjustments
Standard errors in ( ) & t-statistics in [ ]

CointegratingEq:	CointEq1

LXM(-1)	1.000000	
LPA(-1)	-1.733535	
	(0.45806)	
	[-3.78452]	
C	4.081821	
Error Correction:	D(LXM)	D(LPA)
CointEq1	-0.164183	-0.024452
	(0.07526)	(0.00863)
	[-2.18168]	[-2.83383]

Johansen test

Date: 09/26/12 Time: 19:04
Sample (adjusted): 1993Q3 2011Q4
Includedobservations: 74 afteradjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LXM LPA
Exogenous series: D(S1) D(S2) D(S3) D(E013) D(I021) D(I014) D(I032)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 CriticalValue	Prob.**
None *	0.245674	25.87209	20.26184	0.0076
At most 1	0.065452	5.009239	9.164546	0.2824

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 CriticalValue	Prob.**
None *	0.245674	20.86285	15.89210	0.0076
At most 1	0.065452	5.009239	9.164546	0.2824

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Residuals normality tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 09/26/12 Time: 19:02
Sample: 1993Q1 2014Q4
Included observations: 74

Component	Skewness	Chi-sq	df	Prob.
1	-0.271089	0.906368	1	0.3411
2	-0.237816	0.697530	1	0.4036
Joint		1.603898	2	0.4485
Component	Kurtosis	Chi-sq	df	Prob.

1	2.698986	0.279380	1	0.5971
2	2.385281	1.165126	1	0.2804
Joint		1.444506	2	0.4857

Component	Jarque-Bera	df	Prob.
1	1.185747	2	0.5527
2	1.862657	2	0.3940
Joint	3.048404	4	0.5498

Residuals autocorrelation

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 09/26/12 Time: 19:03
Sample: 1993Q1 2014Q4
Included observations: 74

Lags	LM-Stat	Prob
1	6.673689	0.1542
2	5.226104	0.2649
3	7.679129	0.1041
4	9.464665	0.0505
5	9.976032	0.0408
6	3.264112	0.5146
7	2.245535	0.6907
8	6.990283	0.1364
9	6.157928	0.1877
10	7.074407	0.1320
11	6.944049	0.1389
12	6.211409	0.1839

Probs from chi-square with 4 df.

Countries weights used for the SRER construction

Country	Plastics	Dairy	Beef	Chemicals	Metallurgical
Brazil	50%	17%	5%	21%	32%
Argentina	29%	3%		30%	22%
United States	9%	4%	24%	11%	14%
China	5%			10%	18%
South Korea	4%	6%			
Chile	3%	3%	6%	2%	
Venezuela		28%			
Mexico		27%			4%
Rusia (Federación Rusa)		5%	22%	10%	
Algeria		5%			
Morocco		3%		2%	
United Kingdom			9%		
Hollande			7%		
Spain			7%	2%	
Israel			6%		
Germany			5%	5%	4%
Canadá			4%		
Italy			4%		3%
Paraguay				3%	
India				2%	
France				2%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Chosen sectors export (million dollars)

Chosen sector exports. Million dollars. 1993-2011.

	1993	1998	2006	2011
Beef	143.7	398.5	949.8	1,332.00
Dairy	81.2	180.2	257	691.4
Leather	108.4	179.2	303.2	243.8
Chemicals	58.1	116.6	179.8	412.1
Plastics	58.5	95.6	203.5	438
Metallurgical	147.6	278	237.6	504.4
Sectors subtotal	**597.5**	**1248.1**	**2130.9**	**3621.7**
Total exports	**1645**	**2724**	**3989**	**7983**