REAL EXCHANGE RATE AND TRADABLE PERFORMANCE IN A DEVELOPING ECONOMY: HETEROGENEOUS EFFECTS AND STRUCTURAL BIAS[1]

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1. Introduction

Conventional macroeconomic models establish that exports and imports depend on the real exchange rate (RER) and the domestic and foreign aggregate demand[3]. However, the relevance of the real exchange rate has been questioned in the empirical ground -given rise giving rise to the term "elasticity pessimism" (Orcutt, 1950)- and in the theoretical grounds -for example, the Presbisch-Singer hypothesis where the exchange rate is considered an irrelevant variable for developing economies specialized in primary products export (Presbich, 1950; Singer, 1950). The puzzle was even more enigmatic when a growing body of empirical studies began to consistently show a positive correlation between real exchange rate levels and economic growth (Hausmann et al., 2007; Rodrik, 2008; Eichengreen, 2007; Frenkel et al., 2004; Rapetti et al., 2012; Rapetti, 2020; Demir & Razmi, 2021). One of the main theoretical hypotheses in this literature suggests that a higher RER level positively influences the profitability and rate of investment in modern tradable sectors and, through this channel, fosters economic growth. In this article, we summarize the empirical evidence from three different papers to help build a bridge between these two conflicting views and unpack the role of the real exchange rate in the tradable performance of a developing country specialized in primary and homogenous products[4].

The three papers use the Argentine case as a typical case of a country specializing in exploiting natural resources. The three papers focus on the heterogeneous effects of the real exchange rate on different products or tradable sectors. While the first paper estimates the magnitude of long-run RER-elasticities (Palazzo & Rapetti, 2023), the other two focus on remarkable breaks in the trends of exports and imports at a disaggregated level (Palazzo, 2022, 2023). To put it simply, the first paper examines how the exchange rate affects trade flows incrementally. However, the second and third papers explore whether a period of stable and competitive real exchange rate (SCRER) can stimulate the emergence of new export sectors (Palazzo, 2022) or lead to import substitution episodes at the sectoral level (Palazzo, 2023). Such events are defined with an algorithm that ensures whether the change in trade flows is sufficiently remarkable to assume that a new productive capability has been developed.

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3 We define the exchange rate as the domestic price of a foreign currency. Consequently, a rise (fall) in the nominal/real exchange rate implies a nominal/real depreciation (appreciation) of the domestic currency. The RER is the relative price between tradable and non-tradable goods and services.

4 All these papers are part of my doctoral thesis. One of them is co-authored with Martín Rapetti.

The Argentine economy is also an interesting case since it provides us with a real exchange rate dynamic that is sufficiently volatile to investigate the effects of this variable on tradable performance. This fact helped us to estimate the RER-elasticities of exports and imports and calculate their marginal impact at a very granular level. At the same time, the large devaluation that occurred in 2002 marks the beginning of the SCRER period that lasted at least six years (2003-2008), which helped us to test its role in the take-off of new tradable sectors in the second (exporters) and third (import competitors) papers in the face of a long-lasting change in tradable sectors' profitability. In all three papers, we use the SITC classification, revision 2, analysing trade flows at 4-digit disaggregation. The period covered is from 1980 to 2015.

The main conclusions of these papers, taken as a whole, are the following:

1. Regarding the marginal effects of the RER on tradable flows, we find a wide range of heterogeneity in the RER-elasticities. Their simple average reaches 0.86 for exports and -1.04 for imports in our preferred regressions. However, the estimation range goes from -10 to 10 approximately, at the product level.
2. Given that the impact of the RER is heterogeneous and the sectors most sensitive to the exchange rate are manufacturing sectors, it is expected that aggregate RER-elasticities of exports are low in economies whose export baskets are concentrated in primary and homogeneous products. Indeed, if we weigh individual elasticities by their share in Argentina's trade basket, exports accumulate an RER--elasticity of 0.27 and imports of -0.84.
3. However, if we weigh the RER-elasticities of exports by the share of each product in the worldwide trade basket, the aggregate elasticity reaches 0.73, tripling the value reached when using the weights from Argentina's trade basket. This result shows that the lower RER-elasticity of Argentina's aggregate exports is due to a composition effect explained by the country's productive specialization in homogeneous and primary products.
4. Regarding the development of tradable sectors, we found that SCRER periods encourage the development of new export sectors and the growth of import-competing domestic sectors. This occurs mainly in labour-intensive manufacturing sectors and in sectors related to those sectors where the economy already has productive capabilities. This last finding indicates that not all sectors can take advantage of the exchange rate stimulus, but mostly those where the current productive structure assures some degree of prior capabilities (Hidalgo et al., 2007).
5. Moreover, in the case of exports, we find that the new level of exports reached in sectors with export surges lasts after the loss of RER competitiveness. This fact is relevant for those who support currency undervaluation policy as a driver of tradable-led growth since it would undermine the criticism that denies the possibility of keeping for long periods an undervalued currency.
6. Finally, it is found that the sectors with substitution episodes and those with export surges are related to each other in productive terms. This correlation suggests that no tension exists between sectors with good domestic performance and those that manage to internationalize.

The article is structured as follows. After this introduction, in sections 2, 3, and 4, we summarized the main findings of the three papers mentioned above and briefly discussed their methodology. Unfortunately, due to a matter of space, we will only show some econometric results from the work of Palazzo & Rapetti (2023) in section 2, while sections 3 and 4 will focus on discussing the main findings of the corresponding papers and justifying how they complement the relevant literature. However, all our results point in the same direction, highlighting the hete-

rogeneous effect of the RER level on the tradable performance in a developing economy and relevant macro-micro interactions. Finally, in section 5, we conclude.

2. First Paper: *From macro to micro and macro back: macroeconomic trade elasticities in a developing economy*

This paper is already published in the Journal of Structural Change and Economic Dynamics (Palazzo & Rapetti, 2023). We estimate the marginal effect of RER on exports and imports. We use the Mean Group (MG) method, which estimates the RER-elasticities for each product using time series techniques and allows all the coefficients of the variables to vary in each individual estimate (Pesaran, 2015). Then, this method calculates the arithmetical simple average of the estimated coefficients and calculates their variance to perform the statistical inference over the simple average estimator. By doing this, we get a simple average RER-elasticity, and we can analyze the heterogeneous effect of RER in trade flows of different kinds of products. Moreover, we can calculate the aggregate RER-elasticity –weighing by Argentina's or the worldwide trade basket – identifying if exist any structural bias that may alter the *aggregate* RER-elasticity because of the trade specialization of Argentina.

2.1. Exports

In our specification, the main explanatory variables for the logarithm of exports are foreign demand and the real effective exchange rate (REER). The foreign demand index uses trading partners' GDP in constant dollars at the product level. The REER is calculated using bilateral nominal exchange rates, trading partners' consumer price indices, and Argentina's consumer price index.

Table 1 shows the results of our preferred estimation, both for the total number of products analyzed and for subsamples of different product categories. Thus, column (1) shows the simple average of the elasticities for the 502 products analyzed; columns (2)-(6) show the simple average for the elasticities of primary products (2), natural resource-related manufactures (3), and manufactures with low (4), medium (5) and high (6) technological content (Lall, 2000). Columns 7 to 9, on the other hand, use the Rauch (1999) classification and show the simple average elasticities for differentiated goods (7), products with world reference prices (8), and homogeneous goods (9).

Although we have done a lot of robustness tests in the paper, the table shows only the long-run elasticities when controlling for the REER, trading partners' GDP, and the nominal exchange rate stability. Including nominal exchange rate stability as a critical control variable is justified by the mechanism through which we expect the RER operates. Since export prices are invoiced in USD, a nominal depreciation does not lower their prices (Gopinath, 2015). Instead, what it does is reduce non-tradable costs measured in USD. Thus, the mechanism by which exports are affected is through an increase in profitability, with the resulting incentive being to invest and expand the supply. However, increased profitability must be perceived as stable to foster investment plans. Conversely, if an increase in the real exchange rate takes place within contexts of high nominal instability, the positive effect of the RER would be reduced. With this in mind, we use an indicator of the nominal stability of the exchange rate provided by Aizenman et al. (2013).

Table 1 - Export Long-Run Elasticities: All Products, Lall's and Rauch's Classifications

All Products		Lall's classification					Rauch's classification		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	PP	Resource-Based	LT	MT	HT	D	RP	H
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Long Run									
ln(REER)	.8676***	.2667	.3736	1.2325***	.9832***	.7746*	.9866***	.4619*	.2085
	(.2555)	(.2281)	(.2544)	(.2073)	(.2271)	(.4470)	(.1395)	(.2578)	(.3179)
ln(trading partners' GDP)	1.7080***	.4316	2.3063***	.6210*	1.3249***	1.0624**	1.3580***	1.3242***	.2405
	(.2621)	(.3794)	(.3340)	(.3680)	(.3499)	(.5167)	(.2178)	(.3937)	(.4600)
ln(Stability)	.2746***	.1778***	.1971**	.3670***	.3358***	.5382***	.3434***	.2899***	.1192**
	(.0524)	(.0483)	(.0793)	(.0536)	(.0660)	(.1293)	(.0390)	(.0840)	(.0592)
Obs.	16432	2406	4216	3838	4384	1195	8998	4253	1783
No. of products	502	73	127	118	135	37	276	129	54
Model	mg	mg	mg	mg	mg	mg	mg	Mg	mg

Standard erros in parentheses: * p < 0.10; ** p > 0.05; *** p < 0.01

Source: own elaboration.

Column (1) shows the simple average elasticity across the 502 export products, obtaining the degree of significance by the variance between the individual estimates. The REER average elasticity reaches 0.87 and is significant at 1%. The estimate of the trading partners' GDP-elasticity is 1.04 and is statistically significant, while the estimate of nominal exchange rate stability implies that an increase of 1% in the stability variable boosts exports by 0.27%. Our estimate of the average REER-elasticity is substantially higher than those found in many previous studies but closer to the one obtained by Heymann & Navajas (1998) (0.84) for bilateral trade with Brazil and that of Catao & Falcetti (2002) for exports to MERCOSUR (1.2). This result is interesting as trade with Brazil and MERCOSUR has a larger share of manufactured products. Given that our elasticity is the simple average of the 502 products, the weight of manufacturing goods is not dwarfed by that of primary products despite Argentina's specialization on the latter.

Are there any patterns in the magnitude of the elasticities according to some observable characteristics of the products? Some interesting patterns emerge. First, results vary in magnitude and statistical significance among the different categories. When Lall's categories are used (columns 2 to 6), the low- and medium-technological content goods have the greatest REER-elasticities, followed by the high-technology manufacturing goods. Indeed, the elasticities of primary products and resource-based manufacturing goods do not obtain significant average coefficients. As to the orders of magnitude, low-technology sectors obtain an average elasticity of 1.23 (column 4), while sectors of medium-technology reach 0.98 (column 5), and high-technology manufacturing goods reach 0.77 (column 6). Another interesting and similar pattern emerges concerning the impact of nominal exchange rate stability.

When we analyze REER-elasticities by the categories proposed by Rauch, homogeneous products (column 9) do not show – on average – coefficients significantly different from 0, while the differentiated products (7) and products with reference prices (8) do. However, the differentiated products show the highest average elasticity relative to the real exchange rate. The REER-elasticity of the differentiated products reaches a value of 0.98, which doubles the associated value for products with reference prices (0.46). This pattern also repeats itself in the nominal exchange rate stability elasticities.

2.2. Imports

In the case of imports, our preferred estimation is the one that includes the REER of each imported good, Argentina's GDP at constant prices, and a variable controlling for the widespread 1990s trade opening. Table 2 shows the results of our preferred estimation using the MG method, both for the total number of products analyzed and for subsamples of different product categories. In every case, the estimate of REER-elasticities shows significant coefficients with the expected sign. The simple average of long-term REER-elasticity is -1.04 for all imported products (column 1).

Table 2 - Import Long-Run Elasticities: All Products, Lall's and Rauch's Classifications

All Products		Lall's classification					Rauch's classification		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	PP	Resource-Based	LT	MT	HT	D	RP	H
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Long Run									
ln(REER)	-1.0435***	-.6497***	-.9381***	-1.6056***	-.9311***	-.8113***	-1.2968***	-.7024***	-.4113**
	(.0647)	(.1781)	(.1229)	(.1986)	(.0754)	(.1277)	(.0927)	(.1049)	(.1646)
ln (GDP)	.8285***	-.0610	.9366***	.7958***	1.3267***	.5638	.8002***	.8117***	.3284
	(.1032)	(.3521)	(.1840)	(.2171)	(.1475)	(.4277)	(.1403)	(.2059)	(.2928)
Trade Openness (90s)	.6538***	.5329***	.6276***	1.1147***	.4839***	.2755***	.7436***	.4972***	.6947***
	(.0370)	(.0985)	(.0747)	(.0813)	(.0640)	(.0724)	(.0510)	(.0625)	(.1215)
Obs.	19652	2313	4644	4400	6128	1965	11051	5217	1871
No. of products	584	71	138	132	180	57	327	155	57
Model	mg	mg	mg	mg	mg	mg	mg	Mg	mg

Standard erros in parentheses: * p > 0,10; ** p < 0.05; *** p < 0.01

Source: own elaboration.

The patterns that emerge for each subcategory of import goods are similar to the case of exports, especially for the REER-elasticities. If we focus on Lall's categories (columns 2 to 6), primary products (2) show the lowest average REER-elasticity in absolute terms. In contrast, the low-technology manufacturing goods (column 4) show the highest REER-elasticity as in the case of export goods. They reach a value of -1.6 and double the elasticity of the medium and high-technology manufacturing goods and natural resource-based manufacturing goods. In the case of Rauch's categories, the pattern is even more evident. The differentiated goods reach a REER-elasticity of -1.29 (column 7), followed by goods with reference prices (-0.7, column 8) and homogeneous goods (-0.41 reported in column 9).

In short, we observe rich heterogeneity in estimating the REER-elasticity both in exports and imports. Moreover, this heterogeneity shows different patterns by types of goods analyzed. The main conclusions are that the differentiated products and manufacturing goods tend to show higher REER-elasticities than the homogeneous products and primary products. On the other hand, in exports, the nominal stability of the exchange rate is relevant mainly for high-technology manufacturing goods and differentiated products. Overall, we find evidence favoring the adoption of a stable and competitive real exchange rate. This macro-micro interaction means that such an exchange regime works as an incentive to make the tradable supply of the economy more complex and diverse and could be a facilitator of structural change and a higher economic growth rate. This evidence supports the development channel proposed by Frenkel & Ros (2006), Rodrik (2008), Rapetti et al. (2012), and Razmi et al. (2012). Additionally, it is in line with Cimoli et al. (2013) and the empirical results provided by Caglayan & Demir (2019).

2.3. Aggregate REER-elasticities: the missing link between pessimists and optimists

The previous subsection dealt with macroeconomic trade elasticities from a development economics standpoint. The focus was on understanding the heterogeneity impacts of changes in macroeconomic variables on different kinds of products. Here, we attempt to walk the path from the microeconomic impact to the analysis of the aggregate macroeconomic implications. In other words, once we avoid the heterogeneity biases found in the literature (Imbs & Mejean, 2015) and properly estimate individual elasticities, we can explore the magnitude of macroeconomic trade elasticities of imports and exports but in aggregate terms. In this case, the elasticity of interest will be an average of the individual elasticities but weighted according to their share in Argentina's import or export basket. Thus, it is possible to break down another fundamental macro-micro interaction: the productive structure determines the aggregate macroeconomic trade elasticities that are important elements for the overall performance of an economy.

Table 3 shows the different estimated elasticities weighed by Argentina's basket of imports and exports. Additionally, the table recalculates the aggregate elasticities, also weighted, but for the share of each product in world international trade. These calculations show what Argentina's macroeconomic trade elasticities would be like if the country had a basket of exports and imports similar to the world's trade basket. The left panel of the table shows the weighted averages for the main estimated elasticities in the case of imports, while the right panel does the same for exports.

Given a matter of space, we will only focus on RERR-elasticities. To provide robustness to the analysis, we show the results using some of our main regression models calculated in the paper. However, we concentrate the analyses on the first line of each quadrant in which the results of the preferred models are explained. In the case of imports, the preferred model is the one controlling for the trade opening in the 1990s, while for exports, it is the one controlling for the nominal exchange rate stability.

Table 3 - Aggregate Macroeconomic Trade Elasticities: Using Argentina's and the World's Trade Basket as Weights

Imports				***Exports***			
Long-term elasticities	Estimated regressions	Weights		Long-term elasticities	Estimated regressions	Weights	
		Argentina	World			Argentina	World
REER - Imports	Trade Openness (2)	-0.841	-0.949	REER - Exports	Stability (2)	0.273	0.731
	Mercosur (3)	-1.173	-1.305		Output gap (3)	0.233	0.524
	Baseline (1)	-1.273	-1.397		Mercosur (4)	0.187	0.577
GDP ARG	Trade Openness (2)	1.388	1.334	Trade partners' GDP	Stability (2)	1.645	2.232
	Mercosur (3)	1.021	1.045		Output gap (3)	1.201	1.494
	Baseline (1)	2.093	2.209		Mercosur (4)	1.013	1.425

Source: own elaboration.

The preferred regression for imports shows an aggregate REER-elasticity of -0.841, while the REER-elasticity for exports reaches 0.273. These elasticity coefficients imply that the sum of their absolute values is around 1.11. That is, weighting the individual estimates by their shares, we can conclude that the imported volumes fall by 0.84%, and the exports increase by 0.3% in the face of a 1% depreciation. As a result, net exports would improve by 1.1%. Notwithstanding, the most significant part of the adjustment is on the imports side, while aggregate exports hardly respond to the exchange rate level. In this sense, pessimists are right to point out that the aggregate adjustment of exports is scarce.

This result, however, depends on the structural bias caused by the productive specialization of a country like Argentina, where homogeneous products are overrepresented in its export basket while modern tradable sectors and manufacturing are underrepresented. For this reason, the low level of aggregate elasticity fades when we use the world's trade shares of each good as a weighing factor instead of each good shares in the Argentine basket. As a result, the REER-elasticity moves from 0.273 to 0.731 in the preferred regression of exports, multiplying the elasticity by 2.6 times. The three regression models reported show similar increments in the magnitude of REER-elasticities when using the world's trade basket, which gives robustness to our finding. Interestingly, on the imports side, this difference is virtually insignificant in economic and statistical terms. This result does not undermine the positive role that an undervalued RER level could play as a facilitator of structural change and economic growth. Indeed, it highlights the underdevelopment of modern tradable activity in this semi-industrialized economy.

3. Second Paper: *Real Exchange Rate and Export Surge Episodes*

In the previous paper, we studied the marginal contribution of a change in the real exchange rate level on exports and imports. However, it would be possible to argue, given the characteristics of the estimated regressions, that the exported amounts would return to previous levels as soon as the real exchange rate appreciates. This will leave no role to the RER as a development policy to foster structural change. This issue leads us to ask another question: Could a period of a competitive and stable real exchange rate lead to the development of new export sectors that persist after the exchange rate becomes uncompetitive? If so, what are the characteristics of these sectors that take off during the SCRER period? Does it depend on the countries' previous productive capabilities? Palazzo (2022) aimed to answer these questions by examining an interesting case study of a developing country that experienced a large change in the level of the RER over a long (enough) period to take place the take-off of new export sectors.

Argentina's real effective exchange rate (REER) depreciated 57% at the beginning of 2002, during the currency and financial crisis that put the end of a decade of the currency board regime. More importantly and in contrast to other currency devaluation events, the new real exchange rate level remained stable until 2008. On average, between 2003 and 2008, the REER was depreciated by 53% compared to 2001. The magnitude and persistence of this new RER level is an excellent natural experiment to study the connection between the exchange rate and the development of tradable sectors. Since -in this case- our focus is not on the marginal effect of RER on exports, we take advantage of previous work done by Palazzo & Rapetti (2017) and analyze the cross-section characteristics of export surges episodes that occurred during this period. The so-called export surges capture those episodes in which sectoral exports experience a pronounced change in their growth trends, accelerate their export growth rates, and increase their international market share. In other words, they are episodes where these sectors developed capabilities and expanded their production capacity, increasing the country's tradable supply. The authors find that during the six years from 2003 to 2008, Argentina shows the highest peak of export surge episodes from 1980 onwards.

Our empirical strategy aimed to test and isolate some of the main theoretical channels through which the RER level might favor export surges episodes. Since in developing countries exports are invoiced in US dollars (Gopinath, 2015), a more depreciated RER level only changes the profitability rate for exporters and, under some conditions, might encourage the expansion of tradable supply. As a result, the net exposure of an exporting firm to changes in the RER is given by the share that non-tradable goods represent in their costs. Since labor is the most important non-tradable cost of most production functions, the RER should affect sectors differently depending on their labor intensity (Frenkel & Ros, 2006). In addition, we argue that the likelihood of new export sectors taking off also depends on the existing capabilities of the economy. This means that RER should foster the occurrence of export surge episodes in those sectors close to already competitive sectors, showing path dependence in the country's productive structure (Hidalgo et al., 2007; Hausmann & Klinger, 2006; Bahar et al., 2019).

Our main results confirm these hypotheses. First, export surge episodes are more likely to occur in sectors with a higher share of non-tradable costs during the SCRER period. More precisely, the probability of an export surge episode increases by 2.5% by each standard deviation of a higher labor intensity index during the six years 2003-2008. These effects are significant and economically relevant, given that the unconditional probability of export surges is only 9.1% from 1980 to 2015. Second, export surge episodes are also more likely to occur in sectors related to other already existing competitive sectors during this period (2003-2008). A standard deviation in the sector's agnostic relatedness density index increases the probability of an export surge by 4%[5]. This finding indicates that not all sectors can take advantage of the exchange rate stimulus, but mostly those where the current productive structure assures some degree of prior capabilities (Hidalgo et al., 2007). If we evaluate the specific connection channels to competitive sectors, we find that only upstream sectors of competitive ones manage to take advantage of the exchange rate impulse. There is no positive effect for downstream sectors, sectors that share similar workforce characteristics, or sectors that use or provide similar technology to competitive sectors. This finding is compatible with the hypothesis of Hirschman (1958, 1977).

Finally, we show evidence of hysteresis effects in sectors with export surges. The sectors with export surges keep the export level gap over the rest of the exporting sectors once the currency undervaluation period is over. This finding justifies our focus on export surges and not on the marginal effects of RER on exports.

4. Third Paper: *Real Exchange Rate and Import Substitution Episodes*

In this -yet unpublished- paper (Palazzo, 2023), we studied which sectors manage to substitute imports by taking advantage of the same natural quasi-experiment offered by Argentina's macroeconomic history used in the previous paper. The RER acts as the first transmission channel for competition between domestic production and import goods and services. A competitive exchange rate level could be considered a horizontal policy that impacts the cost level in dollars and, therefore, defines the productivity threshold necessary for domestic firms to compete with imported goods. A rise in the RER level shifts the balance towards the local production of importable goods. At the same time, its appreciation, on the contrary, acts as a generalized trade opening. Therefore, the higher profitability of the tradable sector should also be reflected in an increase in the number of sectors with import substitution episodes and not only in export performance. Palazzo (2023) seeks to provide new evidence on how the RER level impacts the performance of tradable sectors, avoiding restricting the analysis only to short-term adjustments or to the performance of export sectors.

We make three main contributions. First, we propose a methodology for detecting sectors that substituted imports during the SCRER period. In this way, we offer a quantitative and potentially replicable approach to studying the development of domestic tradable sectors. Once this group of sectors has been identified, we analyze their characteristics to test both the theoretical transmission mechanisms that link currency depreciation with import substitution and to understand the role of the economy's productive structure in the probability that a sector shows an episode of import substitution. Finally, we analyze whether there is complementarity or potential conflict between sectors with import substitution and those sectors that were identified as *export surges* during the same period. By doing this, we inquired whether import substitution generates an export disincentive or, on the contrary, is related to sectors with good export performance.

5 The agnostic relatedness density index is provided by the product-space built by Hidalgo et al. (2007), measuring how likely is to be competitive in one sector if the economy is competitive in other related sectors. We called it agnostic since we do not identify the particular linkage (upstream, downstream, common labor skills, technology, among others) that relates the sectors.

We identify sectors with import substitution episodes through a quantitative method that captures those imported products that showed marked changes concerning their previous trends, once controlled for the performance of domestic aggregate demand. To this end, and as other works did for the identification of export surges (Freund & Pierola, 2012; Palazzo & Rapetti, 2017; Palazzo, 2022), we establish a series of requirements to reveal the existence of import substitution episode by sectors disaggregated at four digits of SITC classification. Then, we estimate a series of linear probability and probit models to analyze the heterogeneity of the sectors that showed import substitution episodes and test the theoretical links between RER and tradable growth.

In our main exercises, we apply these regression models to the cross-section of -approximately- 450 importing sectors for the period 2003-2008, for which we have complete data. The dependent variable is the dichotomous indicator (0 or 1) of an import substitution episode that occurred during the six-year period 2003-2008. Here, as in the case of export surges, we evaluate the same two hypotheses: (1) a higher level of the RER should show a greater impulse to substitute imports in labour-intensive sectors. As explained before, tradable activities where the costs of non-tradable productive factors -mainly labor- predominate would have a more remarkable improvement in their profitability with the new exchange rate level; (2) The higher level of the RER should show a greater impact on import substitution episodes in sectors where similar productive capabilities already exist in the economy. Finally, we add a third hypothesis: (3) given that the higher profitability granted by the exchange rate does not cause distortions in the prices of importable goods as opposed to exportable goods, there should be no contradiction between the development of exporting sectors and import substitution.

The main findings can be summarized as follows. First, in the SCRER period (2003-2008), the sectors identified with import substitution episodes reached 29.9% of the total number of sectors. Second, the probability of occurrence of an import substitution episode during this period increases by 3.89% for each standard deviation of the higher labor intensity of the sector. The effect is significant and economically relevant, given that the unconditional probability of substitution episodes from 1980 to 2015 is only 14.6 percent. Third, as for the relatedness to other already competitive sectors, we find that this variable increases the probability of an import substitution episode during the SCRER period. A standard deviation of greater relatedness to competitive sectors increases the probability of substitution episodes by 11%. This fact indicates that not all sectors can take advantage of the exchange rate incentive, but only those where the productive structure has previous capabilities. Finally, it is found that the sectors with substitution episodes and those with export surges are close to each other in productive terms. This correlation suggests no tension existed between sectors with good domestic performance and those that managed to internationalize during the SCRER period.

5. What Have We Learned?

The three papers summarized in this article attempted to understand the role of the RER in the development and performance of the tradable sectors of a small economy specialized in exporting primary and homogeneous products. The main lessons obtained point in the same direction and can be synthesized in two concepts: heterogeneity and structural productive bias.

At this point in the article, the reference to heterogeneity should be evident. Both the calculation of sectoral RER-elasticities and the cross-sectional analysis of the export surge and import substitution episodes showed that not all sectors benefit and can take advantage of the higher profitability offered by a competitive exchange rate in the same way. In particular, we find that labor-intensive manufacturing sectors and differentiated products benefit more from higher profitability, increasing their incentives to invest and expand tradable supply.

Regarding the productive structure, its role is central for several reasons. First, we find that the aggregate RER-elasticity depends on the productive structure of the economy in question. In this sense, an economy specialized in primary and homogeneous products will have a *low* aggregate elasticity because of a structural bias due to its current international insertion. Given this, we cannot expect strong growth of aggregate exports after a RER devaluation, and most of the adjustment will come from imports. However, a competitive real exchange rate would favor the development of labor-intensive manufacturing sectors and differentiated products, helping -although not guaranteeing- the structural change of the economy. This reflects several macro-micro interactions that must be considered in the design of a country's macroeconomic and productive policy.

Secondly, and also related to structural factors, the sectors that manage to take off in the SCRER period are related to already competitive sectors. In other words, both the episodes of export surges and import substitution occur in sectors where the economy already has some of the productive capabilities required. In particular, the linkage channel seems to be upstream of the already competitive sectors. This finding would again suggest a role for the productive structure in determining which sectors a competitive real exchange rate policy could promote.

Last but not least, we evaluated the subsequent performance of the sectors with an export surge episode during the SCRER once the exchange rate stimulus ended. We find evidence of persistence in their export levels compared to the rest of the export sectors, favoring the hypothesis of sunk costs or learning by exporting effects that generate hysteresis in trade. With these findings, only transitory SCRER periods would be needed to achieve permanent effects on export development (Rapetti, 2013).

We believe the three papers build a bridge between the literature arguing that an undervalued RER is a facilitator of structural change and economic growth and the literature skeptical of its benefits due to elasticity pessimism. We hope it contributes to the academic and policy debate.

References

Aizenman, J., Chinn, M. D., & Ito, H. (2013). The "impossible trinity" hypothesis in an era of global imbalances: Measurement and testing. Review of International Economics, 21(3), 447–458.

Bahar, D., Rosenow, S., Stein, E., & Wagner, R. (2019). Export take-offs and acceleration: Unpacking cross-sector linkages in the evolution of comparative advantage. World Development, 117, 48–60.

Caglayan, M., & Demir, F. (2019). Exchange rate movements, export sophistication and direction of trade: the development channel and north–south trade flows. Cambridge Journal of Economics, 43(6), 1623–1652.

Catao, L., & Falcetti, E. (2002). Determinants of argentina's external trade. Journal of applied Economics, 5(1), 19–57.

Cimoli, M., Fleitas, S., & Porcile, G. (2013). Technological intensity of the export structure and the real exchange rate. Economics of Innovation and New Technology, 22(4), 353–372.

Demir, F., & Razmi, A. (2021). The real exchange rate and development theory, evidence, issues and challenges. Journal of Economic Surveys.

Eichengreen, B. (2007). The real exchange rate and economic growth. Social and Economic Studies, 7–20.

Frenkel, R. (2004). Real exchange rate and employment in Argentina, Brazil, Chile and Mexico. Group of 24.

Frenkel, R., & Ros, J. (2006). Unemployment and the real exchange rate in latin america. World development, 34(4), 631–646.

Freund, C., & Pierola, M. (2012). Export surges. Journal of Development Economics, 97(2), 387–395.

Gopinath, G. (2015). The international price system (Tech. Rep.). National Bureau of Economic Research.

Hausmann, R., & Klinger, B. (2006). Structural transformation and patterns of comparative advantage in the product space (Tech. Rep.). Harvard University, John F. Kennedy School of Government.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. Journal of economic growth, 12(1), 1–25.

Heymann, D., & & Navajas, F. H. (1998). La coordinacion de políticas macroeconómicas en el mercosur: algunas reflexiones. En: Ensayos sobre la insercion regional de la Argentina-LC/BUE/L, 164-1998-p. 7-39.

Hidalgo, C. A., Klinger, B., Barabasi, A.-L., & Hausmann, R. (2007). The product space conditions the development of nations. Science, 317(5837), 482–487.

Hirschman, A. O. (1958). The strategy of economic development (Tech. Rep.).

Hirschman, A. O. (1997). A generalized linkage approach to development, with special reference to staples. Economic development and cultural change, 25, 67.

Imbs, J., & Mejean, I. (2015). Elasticity optimism. American Economic Journal: Macroeconomics, 7(3), 43–83.

Lall, S. (2000). The technological structure and performance of developing country manufactured exports, 1985-98. Oxford development studies, 28(3), 337–369.

Orcutt, G. H. (1950). Measurement of price elasticities in international trade. The Review of Economics and Statistics, 117–132.

Palazzo, G. (2022). Real exchange rate and export surge episodes: What sectors take advantage of the real exchange rate stimulus?

Palazzo, G. (2023). Real exchange rate and import substitution episodes: evidence from argentina 2003-2008. Unpublished.

Palazzo, G., & Rapetti, M. (2017). Real exchange rate and export performance in argentina, 2002–2008. Journal of Post Keynesian Economics, 40(1), 75–94.

Palazzo, G., & Rapetti, M. (2023). From macro to micro and macro back: Macroeconomic trade elasticities in a developing economy. Structural Change and Economic Dynamics, 65, 223–252.

Pesaran, M. H. (2015). Time series and panel data econometrics. Oxford University Press.

Presbich, R. (1950). Crecimiento, desequilibrio y disparidades: interpretacion del proceso de desarrollo económico. Estudio Económico de América Latina,, 1949-E/CN. 12/164/Rev. 1-1950-p. 3-89.

Rapetti, M. (2013). Macroeconomic policy coordination in a competitive real exchange rate strategy for development. Journal of Globalization and Development, 3(2), 1–31.

Rapetti, M. (2020). The real exchange rate and economic growth: A survey. Journal of Globalization and Development, 11(1).

Rapetti, M., Skott, P., & Razmi, A. (2012). The real exchange rate and economic growth: are developing countries different? International Review of Applied Economics, 26(6), 735–753.

Rauch, J. E. (1999). Networks versus markets in international trade. Journal of international Economics, 48(1), 7–35.

Razmi, A., Rapetti, M., & Skott, P. (2012). The real exchange rate and economic development. Structural Change and Economic Dynamics, 23(2), 151–169.

Rodrik, D. (2008). The real exchange rate and economic growth. Brookings papers on economic activity (2), 365–412.

Singer, H. W. (1950). The distribution of gains between borrowing and investing countries. American Economic Review, 40(2), 473–485.