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The Impact of the Real Exchange Rate on Non-Traditional Chilean and Peruvian Exports: Evidence using Microdata

Renzo Castellares Añazco

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The Impact of the Real Exchange Rate on Non-Traditional Chilean and Peruvian Exports: Evidence using Microdata

Renzo Castellares Añazco*

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Abstract

This study estimates the Bilateral Real Exchange Rate (BRER) impact on Non-Traditional Exports (NTX) of Chilean and Peruvian firms. Different from previous works about Chile and Peru, this paper considers a heterogeneous impact of the BRER on firm's exports, depending on firm's productivity. In addition, we estimate the impact of the real exchange rate of countries whose exports compete against Peruvian and Chilean exports in third markets. This variable has been barely used in the literature and its omission causes a downward bias on the estimation of the BRER elasticity on exports. To do this, we use detailed firm-level information of products and destinations of Chilean exports from 2004 to 2011, and Peruvian exports from 2007 to 2014.

JEL Codes: F12, F14, F31

Keywords: Bilateral real exchange rate, productivity, exports, competitors, Peru, Chile.

*Central Bank of Peru, Deputy of Economic Policy. Email: renzo.castellares@bcrp.gob.pe

1 Introduction

Latin American commodity exporters as Chile, Colombia and Peru had a deep increase in their terms of trade from 2003 to the onset of this decade. These episodes were characterized by current account surpluses, capital inflows and a significant appreciation of the real exchange rate. In this situation, a common concern among policy makers is the loss of competitiveness of manufacturing exports after the real exchange rate appreciation. Figure 1 depicts the recent evolution of the terms of trade and the real exchange rate of Chile, Colombia, Mexico and Peru. In all the cases, the inverse relationship between these variables is straighforward.

In this paper we estimate the impact of the real exchange rate on Chilean and Peruvian Non-Traditional Exports (NTX), those which exclude commodity products from total exports, from 2004 to 2011 (Chile) and from 2007 to 2014 (Peru). During this period, both the terms of trade and the real exchange rate went through significant ups and downs.[1] The use of real exchange rates instead of terms of trade allow us to calculate Bilateral Real Exchange Rates (BRER) to exploit the variability across trade partners. Different from previous studies for Chile and Peru, we use firm productivity heterogeneity to evaluate differentiated effects of real exchange rate movements on non-traditional exports.

This work follows closely the empirical strategy of Berman et al. (2012) and Berthou et al. (2015), who evaluate the impact of the real exchange rate on export prices and volumes, and the value of exports, respectively. Nevertheless, different from these papers, we also analyse the impact of the real exchange rate of Chilean and Peruvian competitors (CRER) on NTX. Velasquez (2015), using a measure of real exchange rate of Peruvian competitors, finds that the negative impact of the CRER on Peruvian exports is smaller when competitors' productivity is higher.[2] Different from Velasquez (2015), we evaluate heterogeneous impacts of the real exchange rate of Peruvian (Chilean) competitors depending on Peruvian (Chilean) firms' productivity. Also, different from Berthou et al. (2015), we exploit detailed data of exports by destination at 8-digit product level.

There are different theories that explain the heterogeneous effect of the real exchange rate on exporting firm's mark ups and prices. Berman et al. (2012) introduce heterogeneous firms on

[1] Non-traditional exports share on total exports is around 25 to 35 percent for both countries.
[2] The measure of real exchange rate of Peruvian competitors is taken from Cuba and Ferreyra (2011).

Corsetti and Dedola (2005). In this model, the margin increases in response to a real exchange depreciation, but the effect is proportionally larger on more productive firms.[3] As a second extension, Berman et al. (2012) introduce real exchange rates on Melitz and Ottaviano (2008) model. In this setup, the price invoiced on exporter (importer) currency increases (decreases) more (less) in more productive firms when the real exchange rate increases. This is due to more productive firms having a less elastic demand.[4] This also implies that the number of units sold increases more in less productive firms. Based on this model, equation 5 of appendix A.1 shows that the export value - real exchange rate elasticity is positive and larger in less productive firms.[5]

There is empirical evidence of heterogeneous effect of real exchange rate variations on firms' exports. Berthou et al. (2015), using information of aggregated exports by sector at the firm level for 11 countries from 2001-2008, find that the real exchange rate elasticity is two or three times larger on less productive firms.[6] Cheung and Sengupta (2013), using a data panel of exports of Indian firms, find that a real exchange rate reduction reduces Indian firms' market share. In the case of Peru, Barco et al. (2008), using firm-level data of Peruvian exporters from 2002 to 2007, do not find evidence that real exchange rate affects significantly on exports, with a exception of fishing and basic metal sectors.[7] We, also using firm-level information on Peruvian exports, find initial evidence that less productive firms are more sensitive to the BRER.

This paper is organized in eight sections after the introduction. Section 2 presents the empirical specification. Section 3 describes the data on Chilean and Peruvian NTX. Section 4 presents initial estimates of the BRER elasticity. Section 5 analyses the impact of bilateral real exchange rate of Chilean and Peruvian competitors on NTX. Section 6 propose some additional exercises as robustness check. In section 7 we evaluate the effect of the BRER on firm's probability of continuing exporting. Section 8 reports BRER and CRER elasticity estimates at the sector level. Finally, section 9 concludes.

[3] Berman et al. (2012) also propose a model that includes firms producing goods with different types of quality.

[4] The demand function faced by firms is linear in this model and then more productive firms sell their varieties at lower prices. This implies that the point elasticity is lower when firm's productivity is higher.

[5] Berman et al. (2012) estimate the effects of real exchange rates on export prices and volumes, which have opposite effects. They conclude that the overall effect in the export value in undetermined. However, equation 5 of appendix A.1 shows that the overall impact of the real exchange rate on firm's export value is decreasing on firm's productivity.

[6] The list of countries includes Belgium, Estonia, Finland, France, Hungary, Italy, Lithuania, Poland, Portugal, Slovakia y Slovenia.

[7] Barco et al. (2008) construct a measure of real effective exchange rate by firm, using firm's exports by destination as weights of bilateral real exchange rates of Peru and each trade partner

2 Specification

We estimate the following equation to calculate the heterogeneous impact of the BRER on non-traditional exports:

$$\begin{aligned} ln(Exports_{fpdt}) = \alpha_1 ln(BRER_{dt}) + \alpha_2 ln(BRER_{dt}) \times FirmSize_f \\ +\beta_1 \Gamma_{dt} + \beta_2 \Upsilon_{fdt} + \delta_{fpd} + \delta_t + e_{fpdt}, \end{aligned} \tag{1}$$

where $Exports_{fpdt}$ represents the value of product p exported by firm f to destination d in year t. The $BRER_{dt}$ is the bilateral real exchange rate index between country x (x = Chile, Peru) and its trade partner which is defined as follow:

$$BRER_{dt} = \frac{CPI_{dt} \times ERI_{dt}}{CPI_{x,t}}, \tag{2}$$

where ERI_{dt} is the nominal exchange rate index of exporter x and its trade partner (destination country) currency; CPI_{dt} is the destination country consumer price index; and $CPI_{x,t}$ is the consumer price index of exporter x. $FirmSize_f$ is our proxy for firm's productivity. We calculate this variable using firm's total exports and it is expressed in logs. We give a detailed explanation of how we construct this variable in section 3. According to the theory discussed in section 1, a higher $BRER_{dt}$ increases firm's exports ($\alpha_1 > 0$), although this effect is proportionally lower as firm's productivity increases ($\alpha_2 < 0$).

Otherwise, Γ_{dt} includes usual controls such as the destination country's GDP, GDP_{dt}, and $Trade\ \ Agreement_{dt}$, which takes the value of 1 if exporter x has a free trade agreement with the destination country and 0 if not. Υ_{fdt} includes the total intermediate inputs imported by firm f, from the destination country d, in period t. We include this variable to capture the fact that an increase in the real exchange rate of exporter x and the destination country d also rises firm's intermediate inputs cost from that country. Therefore, we expect that the positive effect of a real exchange rate depreciation on exports is lower in those firms that also import inputs from the same destination country.

We include δ_{fpd} and δ_t fixed effects to control for unobserved heterogeneity at the firm, product and destination level, and year, respectively. The inclusion of δ_{fpd} fixed effects let us to identify α_2 without including $FirmSize_f$ as a regressor in equation 1.

3 Data

We use information of exports and imports of Chilean and Peruvian firms provided by Legiscomex and *Superintendencia Nacional de Administracion Tributaria* (SUNAT), respectively.[8] Each observation in the raw data contains information on the exporting/importing firm and the f.o.b. value by product and the destination country at 8-digit level of the Harmonized System (HS) for Chilean data, and at 8-digit level of Nandina Classification and 6-digit level of the Harmonized System (HS) for Peruvian data.[9] The export values are deflated by the price index of each exporting sector.[10] Those products that could not be classified in any sector were deflated using the export price index of non-traditional exports. Intermediate inputs are deflated using the import price index. Country information on consumer price index, exchange rates, and gross domestic product is taken from the World Development Indicators (WDI) and the World Economic Outlook (WEO) databases. Finally, information on Regional and Bilateral Agreements is taken from De Sousa (2012).

Chile's and Peru's trade policy of subscription to Free Trade Agreements (FTA) that started in the middle of 90s (Chile) and 2000s (Peru), and the introduction of new products and firms on export markets, let both countries to increase significantly their non-traditional exports (Mincentur, 2015).[11] In fact, Chilean NTX increased from US$12 billions to US$19 billions from 2004 to 2011. Similarly, Peruvian non-traditional exports increased on average by 5.6 percent per year from 2007 to 2014, reaching US$11 billions in 2014 (figure 2). According to table 1, the number of Chilean and Peruvian firms and products increased 10 and 24 percent, and 16 and 30 percent, respectively, during the sample period. In the case of Peru, figure 3 shows that agriculture, fishing, and chemical sectors were the most important sectors that contributed to the NTX growth. Different from these sectors, textile products suffered a contraction during the same period mainly due to a tougher competition of Asian and Central American textiles.

On the other hand, figure 4 shows the evolution of Chile's and Peru's BRER in the main markets of the NTX during the sample period. In the case of Chile there was an appreciation

[8]Legiscomex processes the raw data reported by Chilean customs

[9]We exclude from the data any reported export/import value which is less than US$ 5000.

[10]Peruvian exporting sectors are agriculture, fishing, textiles, non-metallic mining (MNM), chemical and basic metals, whereas Chilean exporting sectors are agriculture/fishing, food and beverages, manufacturing, forest, paper and cellulose

[11]Chile subscribed FTA with more than 45 countries from 1999 to 2013, whereas Peru did it with more than 40 countries from 2006 to 2014, which include agreements with the US, China and the European Union.

of the BRER with respect to Mexico, United States and Japan, and a BRER depreciation with Brazil. In the case of Peru, there was an appreciation of the BRER during the first five years due to a nominal exchange rate appreciation and its strong inverse relationship with Peru's terms of trade. The BRER trend was reverted during the last two years of the sample period, in response to lower terms of trade associated with lower metal prices and capital inflows.

Firm's Productivity Proxy

Product per worker and total factor productivity (TFP) are typical measures for productivity in the literature. Olley and Pakes (1996) developed one of the most standard methodologies to calculate firm's TFP. Unfortunately, our data only contains information on exports and imports by firm, so we can not use any of these common measures of productivity. However, previous studies report evidence that more productive firms usually export more products to more countries and have higher revenues (Bernard and Jensen, 2004; Bernard et al., 2011). Then, we use information of total exports by firm as a proxy for firm's productivity. Appendix A.2 gives a detailed explanation of our methodology.

4 Results

Table 2 reports the estimates of equation 1. According to columns 1 and 4 the elasticity of non-traditional exports to the bilateral real exchange rate (BRER-NTX) elasticity is positive but not statistically different from zero either for Peru and Chile. However, when firm's productivity heterogeneity is included in equation 1, the estimated BRER-NTX elasticity, reported in columns 2 and 5, is positive but it decreases as firm's productivity increases. This result is consistent with Berman et al. (2012) for export volumes, and Berthou et al. (2015) for export values. Similarly, the positive effect of the BRER on exports is smaller on Peruvian firms which source inputs from the same country they export (column 3). In this case, an exchange rate depreciation increases the cost of inputs in domestic currency, reducing the positive effect of the depreciation. Finally, usual controls such as the destination country's GDP and being subscribed to a FTA have both the expected positive signs.

Based on the results of the columns 3 and 6 of table 2, figure 5 reports the elasticity of non-traditional exports to the BRER and its 90 percent confidence interval, for different firm sizes. According to this graph, Peruvian firms that exports more than US$ 500 thousand annually are not sensitive to real exchange rate movements, whereas Chilean firms that export more than US$ 5 million would not be statistically sensitive to movements of the real exchange rate.

5 Bilateral Real Exchange Rate of Competitors

In order to compare the level of competitiveness of Peruvian products with those exported by other countries to the same destination markets, Cuba and Ferreyra (2011) propose an index of real exchange rate of Peruvian competitors (CRER). This index is the weighted average of the bilateral real exchange rate of each competing country of Peruvian exporters. The use of this variable as a determinant of Peruvian non-traditional exports considers that the demand for Peruvian products does not only depend on the relative prices of Peru and the destination country, but also on the price of the same product which is imported in the destination country from other countries. Then, a raise of the CRER increases the quantity demanded of those varieties exported by competing countries, reducing the demand for Peruvian varieties. Velasquez (2015) finds, using aggregated data from COMTRADE, that a higher CRER reduces Peruvian exports and this effect is larger when competing countries' productivity is smaller. Different from Velasquez (2015), we evaluate a heterogeneous impact of the CRER, considering differences in Peruvian exporters' productivity.

Even though the effect of the real exchange rate of competitors (CRER) is not explicitly included in the extension of Berman et al. (2012) to Melitz and Ottaviano (2008), an increase in the CRER is equivalent to an increase in shipping costs or an appreciation of the BRER. Therefore, an increase of any of these three variables reduces firm exports, but the impact is proportionately lower in the more productive firms.

For our empirical procedure, the set of competing countries varies by product and destination country. This set is made up by countries that export product p in destination d and whose price is "close" to the median price of the same product exported from Peru to the same destination.[12] To do that, we calculate the price deviation of each country with respect to the average Peruvian price (by product and destination), classifying as competing countries to all whose deviations are in the closest 75 percentile of those deviations. Countries that are outside

[12]We calculate the median price for each product, destination and exporting country from 2007 to 2014 to avoid outliers and to keep constant the set of competitors for each product-destination pair.

of that percentile are not considered competitors in product p and destination d. In addition, we also exclude competitors whose price deviations are greater than one standard deviation of the price of product p in destination d. As a robustness check we use the 25^{th} and 50^{th} percentiles and the results do not change significantly. To calculate the CRER we use information from COMTRADE, which contains export values and quantities at 6-digit level of the Harmonized System (HS). Figure 6 shows histograms of competing countries of Peruvian firms in two of the main Peruvian export markets: US and Chile.

Once we define the set of competing countries by product, we use equation 3 to calculate the real exchange rate of competitors by product, destination and year, $CRER_{pdt}$.

$$CRER_{pdt} = \sum_{c=1}^{C} w_{cpd} \times BRER_{cdt}, \tag{3}$$

where, w_{cpd} is the share in total imports of product p in destination country d of each competing country, and $BRER_{cdt}$ is the competitor's bilateral real exchange rate with respect to the destination country. [13]

Figure 7 shows the bilateral real exchange rates of some competitors of Peruvian exporters in the US. As noted, some countries such as China and Colombia experienced larger real exchange rate appreciations than Peru whereas others like Mexico had an increase in its bilateral real exchange rate with the US during the sample period. Figure 8 shows Peru's bilateral real exchange rate in five different destinations (right) and the real exchange rate of Peruvian competitors that export asparagus to the same destinations (left). According to this figure, there is significant variation of the CRER across destinations. In fact, the BRER of Peru and the US appreciated from 2005 to 2014 more than the Peru's CRER, whereas the opposite happened in the Spanish market. Finally, figure 9, similar to figure 8, depicts Peru's and Peruvian competitors' real exchange rate of those firms exporting avocado. Looking at both figures, it is worth noting that CRER also varies by products even exported to the same destination. For example, the change in the CRER of Peruvian exporters of avocado to Spain was almost null from 2005 to 2014, whereas the CRER of Peruvian exporters of asparagus increased by around 10 percent.

[13] We exclude Peru's exports to each destination when we calculate the market share of each competitor.

5.1 CRER Results

Columns 2 and 4 of table 3 report the estimated elasticity of CRER and non-traditional exports. The results confirm a negative, but decreasing on firm's productivity (in absolute value), impact of the CRER on Chilean and Peruvian exports. Additionally, figure 10 shows the estimated elasticity for different firm sizes. Also, this figure suggests that the CRER elasticity is statistically significant for Peruvian firms that export less than $10 thousand dollars, and for Chilean firms that exports less than US$ 1.1 billions per year.[14]

Finally, based on the estimates of table 3, figure 11 shows that the inclusion of the CRER in equation 5 increases the estimates of the BRER elasticity.[15] In particular, the bias for omitting the CRER is greater for Chilean than Peruvian exporters and for small firms. In fact, this bias is almost 50 percent for firms exporting less than US$ 10,000 dollars, result that is consistent with the estimates of the CRER elasticity reported in figure 10, which shows the statistical significance of the impact of the CRER on NTXs.

5.2 Impact at the Intensive Margin

Even though the results of the table 3 and the figure 11 indicate that there is a heterogeneous and statistically significant impact of the BRER on the NTXs, it is crucial to know the relevance of this impact on the total NTXs. Therefore, using the estimates of figure 11 and the distribution of firm sizes of each country, we calculate the share in the total exports affected by changes in the BRER. Table 4 indicates that conditioning on the destination country, around 17 to 31 percent of firm-product pairs are sensitive to BRER fluctuations in Chile, whereas in the case of Peru this percentage varies from 30 and 45 percent. However, exports of these firms explain only 1.4 to 5.1 percent of Chilean NTXs, and around 5 to 11 percent of Peruvian NTXs.

[14] A tentative explanation (out of the scope of this work) for the greater sensitivity of Chilean exports to the CRER fluctuations would be the composition of its export supply. As long as exports are composed for more homogeneous products, variations variations of competitors' prices may have a greater impact on the exported volumes.

[15] Intuitively, the effect of BRER depreciations on exporters' shipments is lower, anything else constant, when CRER also depreciates than when CRER does not. If the BRER and CRER are positively correlated, the omission of the CRER will cause a downward biased estimate of the BRER in equation 1.

6 Robustness

6.1 Firms exporting only one product per destination

The existence of multi-product firms can cause potential problems in the identification of the parameters of equation 1. Berman et al. (2012) point out that a multi-product firm that has an easier access to some markets, due to an exchange rate depreciation or a tariff reduction, tends to increase the number of products it exports (extensive margin) to reduce its sales volatility. The latter attenuates an increase in exports of those goods that were already exported (intensive margin). Then, similar to Berman et al. (2012), we estimate equation 1 using a sub-sample of firms that export only one product per each destination country.[16] Figure 12 shows that the new estimates, "only one-product-destination firms", are slightly larger relative to those which are estimated using the full sample, but still the BRER elasticity is decreasing on firm's size.

6.2 Other Productivity Measures and Lagged Real Exchange Rate.

In this subsection we use a measure of firm size that varies across years as a proxy for firm's productivity. To do this, we follow the same procedure described in appendix A.2, but using the available information until each period t and not the full sample. As an additional exercise we use a measure of a firm size that also varies by product to capture the fact that firm's productivity can vary across products. The estimated elasticities of these exercises and the one using a lagged value of BRER (not reported, but available upon request) confirm our previous findings.[17]

7 Probability of Continuing Exporting

In this section, we estimate the impact of the BRER on firm's probability of continuing exporting. In the extension of Berman et al. (2012) to Melitz and Ottaviano (2008), only firms whose productivity level is greater than the minimum productivity threshold are able to export. In this model, a lower BRER increases the minimum productivity threshold, forcing less productive

[16] The cost of using this sub-sample is to reduce the representativeness of the sample.

[17] To calculate the firm size at firm-product level we use the same procedure described in A.2, but including a firm-product fixed effect, α_{fp}, instead of a firm fixed effect, α_f, and using total exports at firm-product level.

firms to stop exporting (see appendix A.1, equation 6). To test this hypothesis we estimate the following equation using a linear probability model:

$$\begin{aligned} Continue\ Exporting_{fpdt} = {} & \alpha_1 ln(BRER_{dt}) + \\ & \alpha_2 ln(BRER_{dt}) \times FirmSize_f \\ & + \beta_1 \Gamma_{dt} + \beta_2 \Upsilon_{fdt} + \delta_{fpd} + \delta_t + e_{fpdt}, \end{aligned} \tag{4}$$

where variable $Continue\ Exporting_{fpdt}$ in equation 4 takes the value of 1 if the firm f continue exporting product p to destination d in year t, and 0 otherwise. In addition to the BRER and the interaction of the BRER with firm size, we also include the set of controls we use in the estimation of equation 1, Γ_{dt} and Υ_{fdt}; and δ_{fpd} and δ_t fixed effects .

The results reported in table 5 confirm that small firms, those which exports are low, are more sensitive to real exchange rates fluctuations. Table 6 shows the percentage of firm-product pairs which are significantly affected by a 10 percent real exchange rate appreciation on the top five destination countries of Chilean and Peruvian NTXs. Approximately, around 2 to 4 percent (Chile) and 3 to 4.5 percent (Peru) of firm-product pairs would stop being sold in the destination countries. Nevertheless, these products only explains around 0.1 to 0.3 percent (Chile) and 0.5 to 1.1 percent (Peru) of the total value of NTX to each of these destination countries.

8 BRER: Results by sectors

Table 7 reports the estimated coefficients of equation 1 by sector. These results confirm that the statistically and significant positive effect of a real exchange rate depreciation is larger on less productive firms in agriculture, textile, and fishing sectors. For the remaining sectors, even though the estimated coefficients of the real exchange rate have the expected signs, these are not statistically significant. Table 8 shows, using the estimated BRER elasticities in figure 5, the proportion of firm-product pairs by sector and destination that are sensitive to BRER fluctuations. In fact, around 58 to 73 percent of firm-product pairs in the fishing sector are exposed to BRER fluctuations, whereas this range is around 19 to 33 percent in the agriculture sector. In terms of the relevance of these firms in total NTX, according to table 9, the share of these firms represents around 30 to 65 percent of the exported value in the fishing sector, and around 1 to 4 percent in the agriculture sector.

On the other hand, figure 10 depicts the estimated CRER elasticities for the main four sectors of non-traditional exports. According to this figure, fishing and agriculture sectors are sensitive to variations of the CRER.

9 Conclusions

This paper reports evidence of heterogeneous effects of the real exchange rate on non-traditional Chilean and Peruvian exports (NTX). Using detailed information of exports at the firm-level from 2004 to 2011 (Chile) and from 2007 to 2014 (Peru), we find that less productive firms are more sensitive to bilateral real exchange rate fluctuations. Particularly, the total value of exports which is sensitive to real exchange rate fluctuations represents on average less than 5 and 6 percent of the Chilean and Peruvian non-traditional exports, respectively. However, we must emphasize that it does not imply that firms' mark ups are not affected significantly by real exchange rate fluctuations.

In addition, we also find evidence that the real exchange rate of Chilean and Peruvian exporters' competitors (CRER) reduces firm's exports in a heterogeneous way. Less productive firms are proportionally more affected than more productive firms when CRER increases. The omission of this variable on regressions evaluating the effect of bilateral real exchange rates on exports, causes an underestimation of the real exchange rate elasticity. In particular, for the Chilean case this bias could be up to 50 percent for small firms.

Finally, we find evidence that an appreciation of the bilateral real exchange reduces the firm's probability of continue exporting and this effect is even larger on less productive firms. Particularly, a 10 percent drop of Peru's bilateral real exchange rate with the US would take out 4 percent of Peruvian product-firm pairs from the US market. Nevertheless, the value of these product-firm pairs represents only 0.6 percent of the total non-traditional exports sold to the US during 2014. In the case of Chile, and using export data of 2011, these percentages would be 3.8 and 0.2 percent, respectively.

In light of these results, even though aggregate NTX do not respond largely to RER movements, shipments of small firms do. This could have contractionary effects on employment and income distribution in case of a large RER appreciation, considering that small firms are more labor intensive than large firms. Policies oriented to increase firm's productivity, rather than a higher BRER, might be preferable to make firms' survival in the export markets sustainable.

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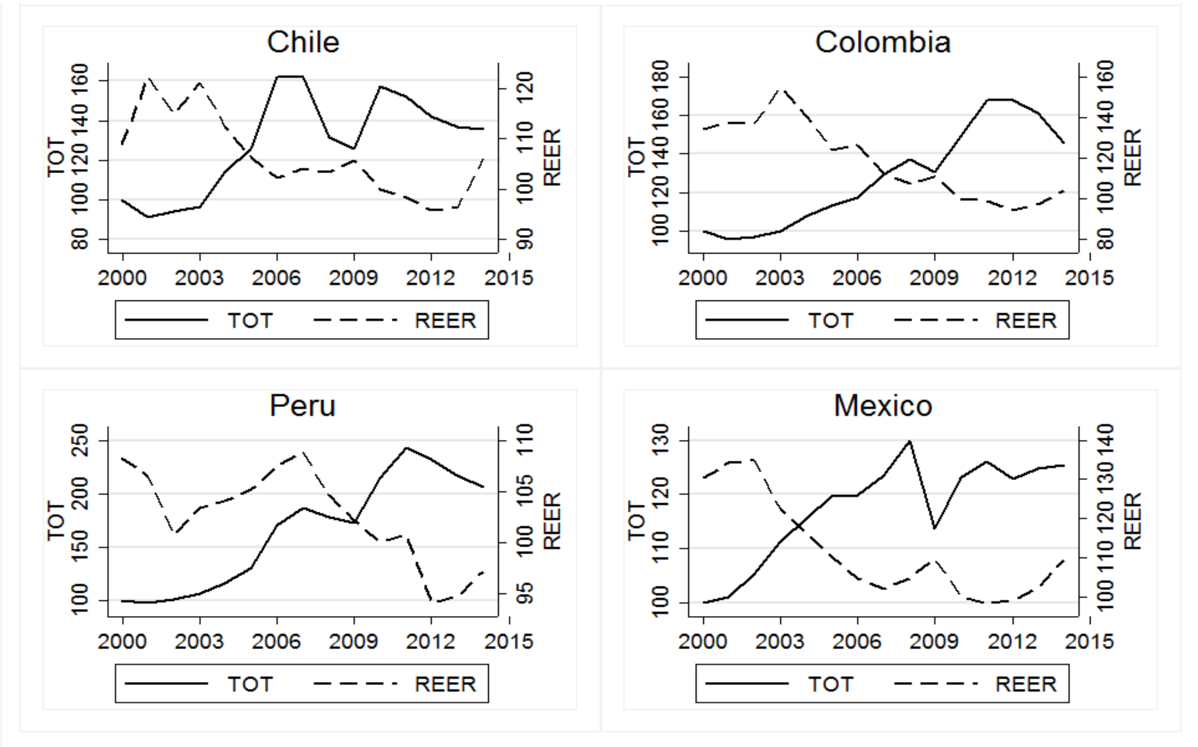
Figure 1: **Terms of Trade (ToT) & Real Exchange Rate (RER)**



Source: World Economic Outlook (WEO) and World Development Indicators (WDI).

Figure 2: **Non-Traditional Real Exports**

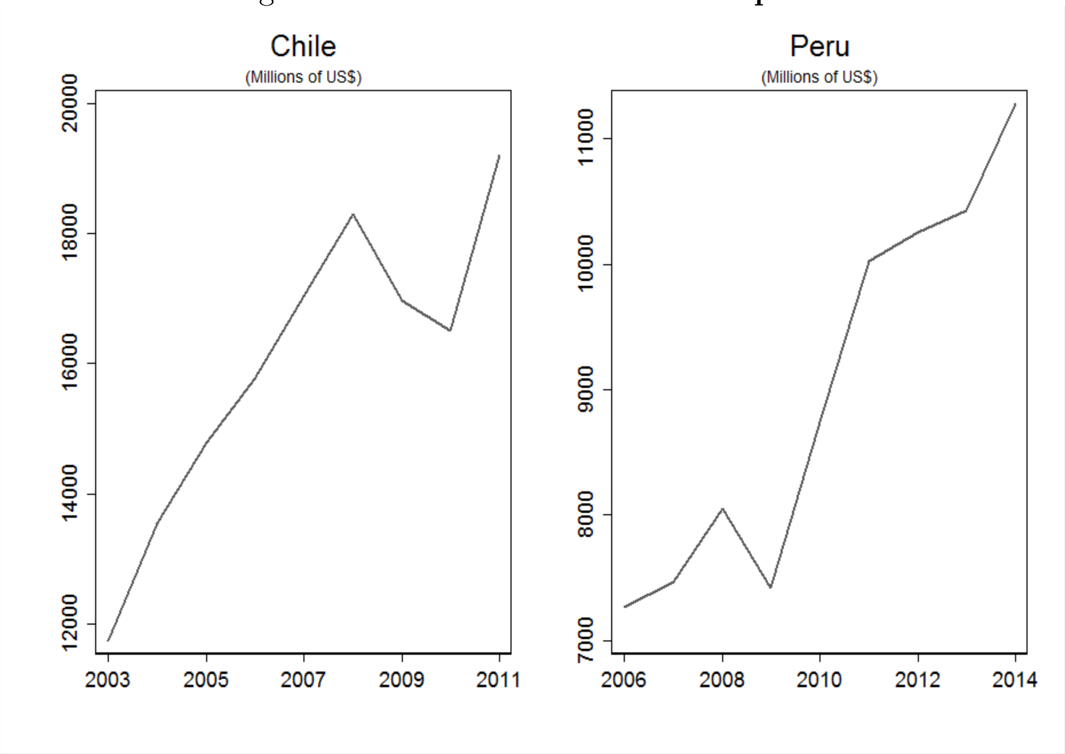


Figure 3: **Non-Traditional Real Exports by Sector (share)**

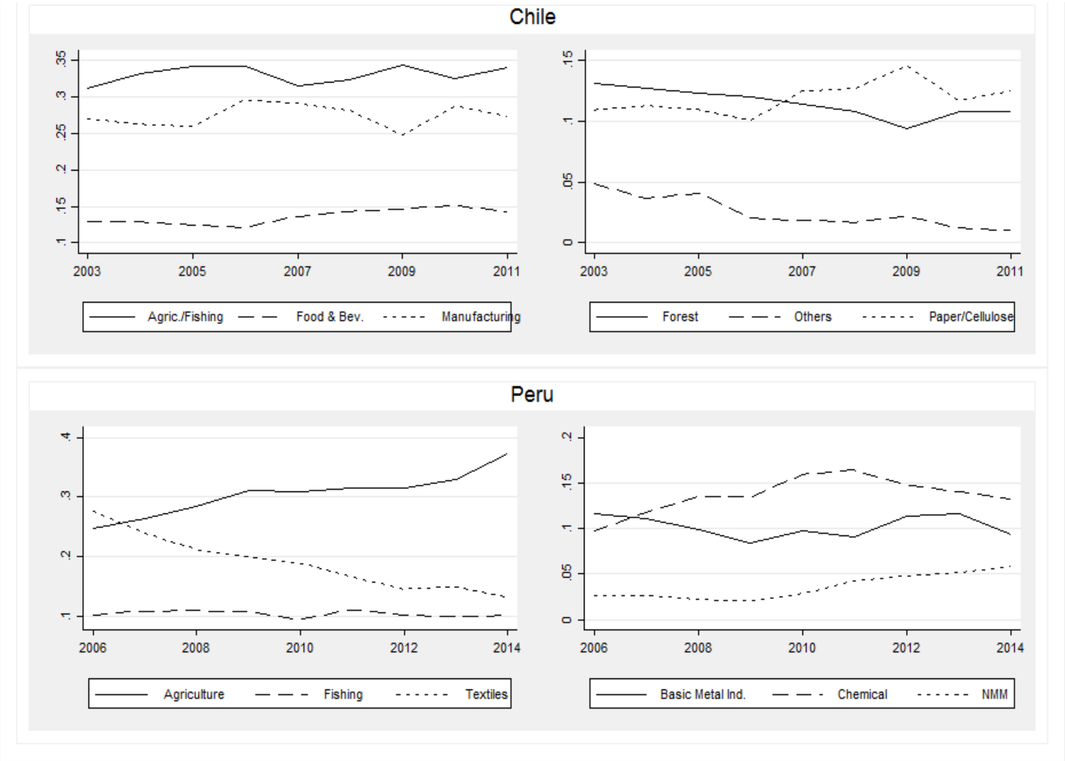


Figure 4: **Bilateral Real Exchange Rate (BRER)**

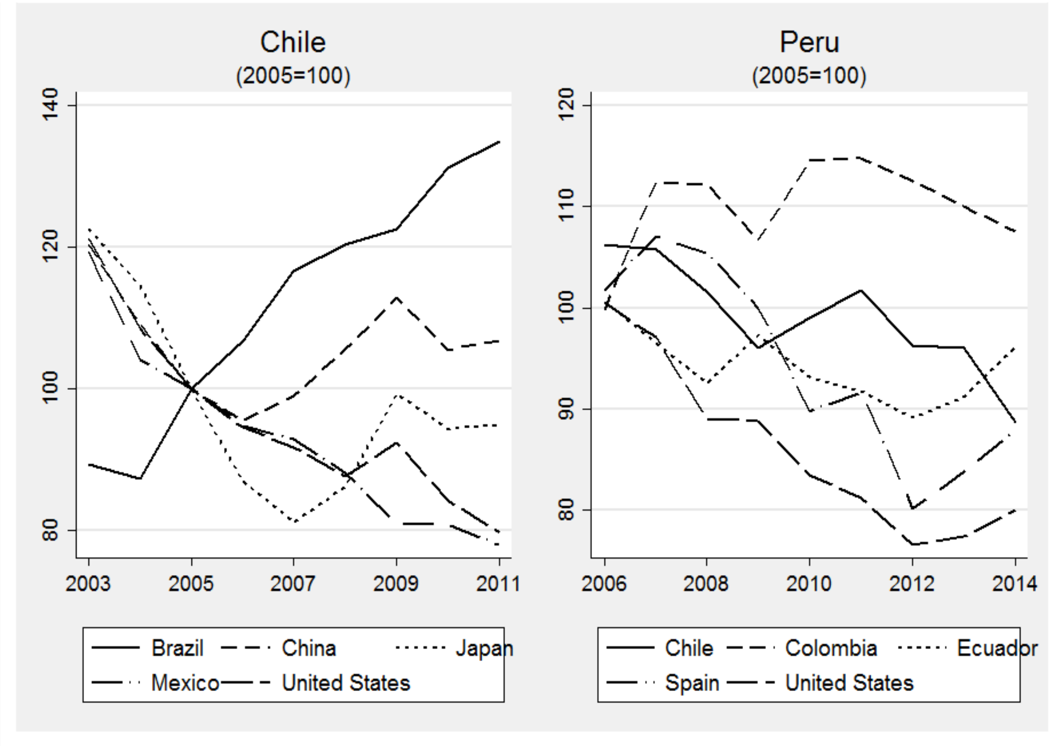
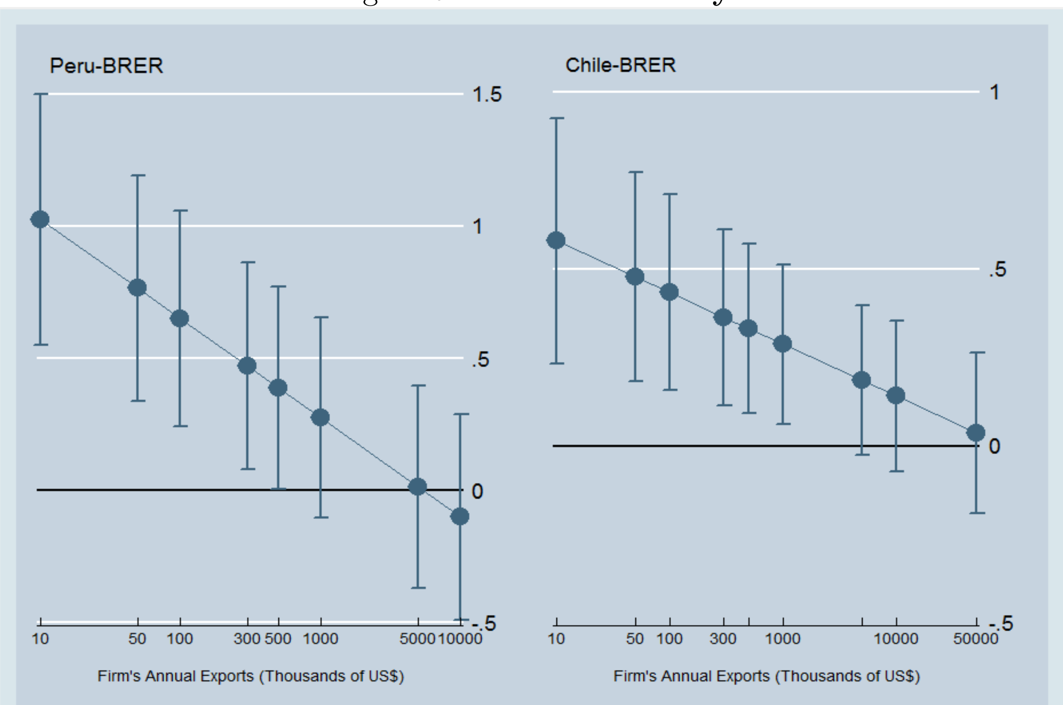


Figure 5: **BRER Elasticity**



Note: point estimates are reported with a 90 percent confidence interval.

Figure 6: **Distribution of Countries Exporting to Peru's Export Markets**

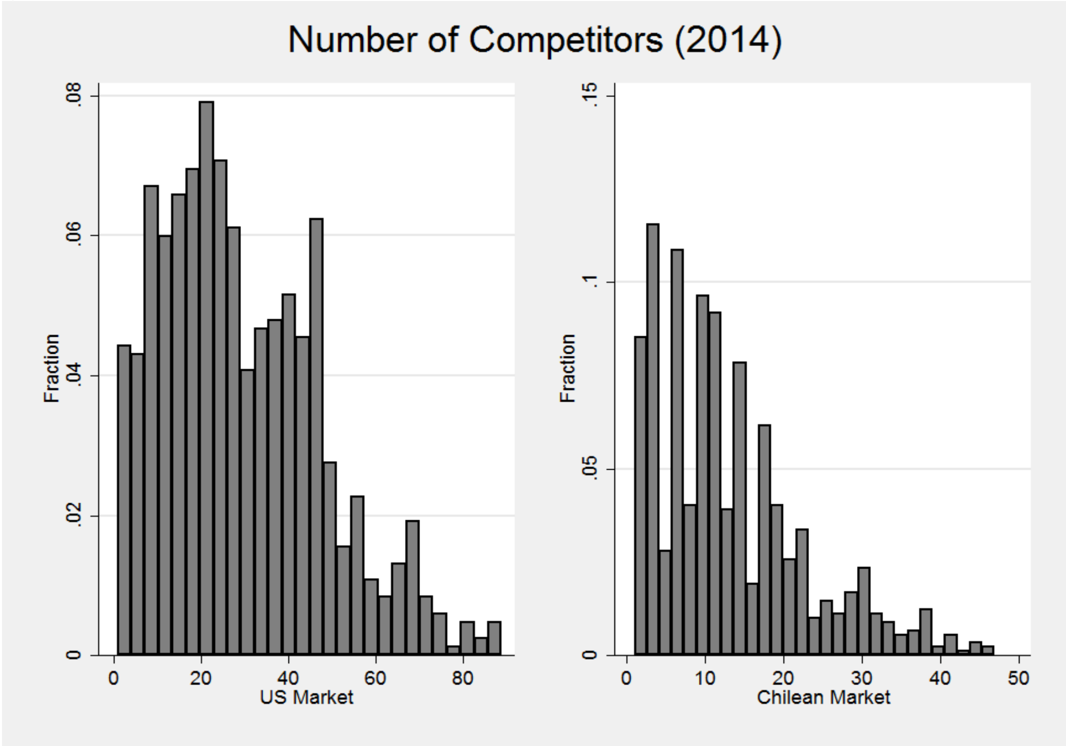


Figure 7: **Peru's BRER and Peruvian Export Competitors' Real Exchange Rate**

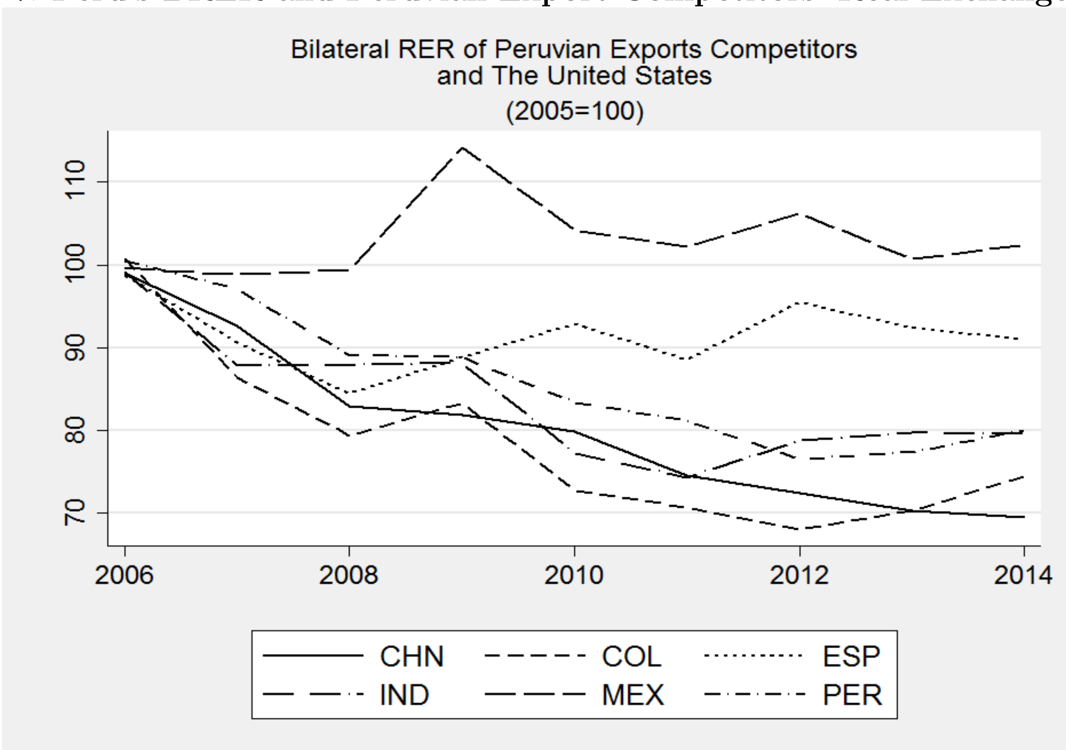


Figure 8: **Peru's BRER and Peruvian Export Competitors' RER, by Product**

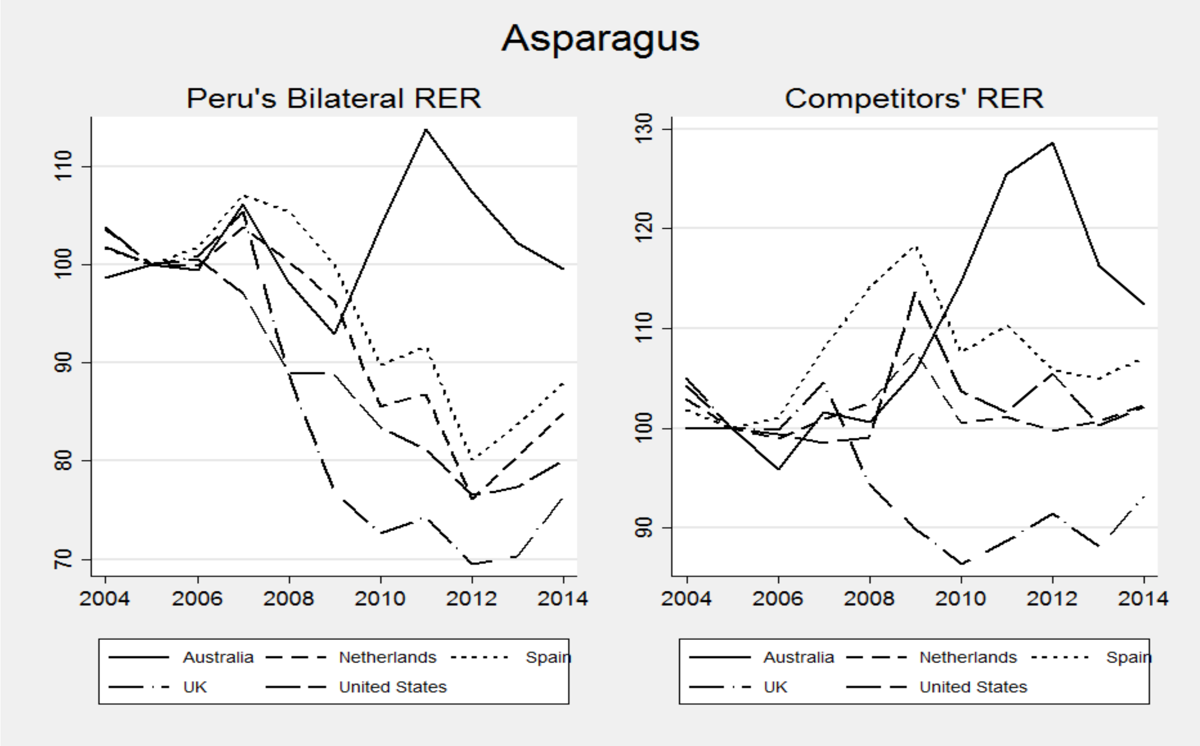


Figure 9: **Peru's BRER and Peruvian Export Competitors' RER, by Product**

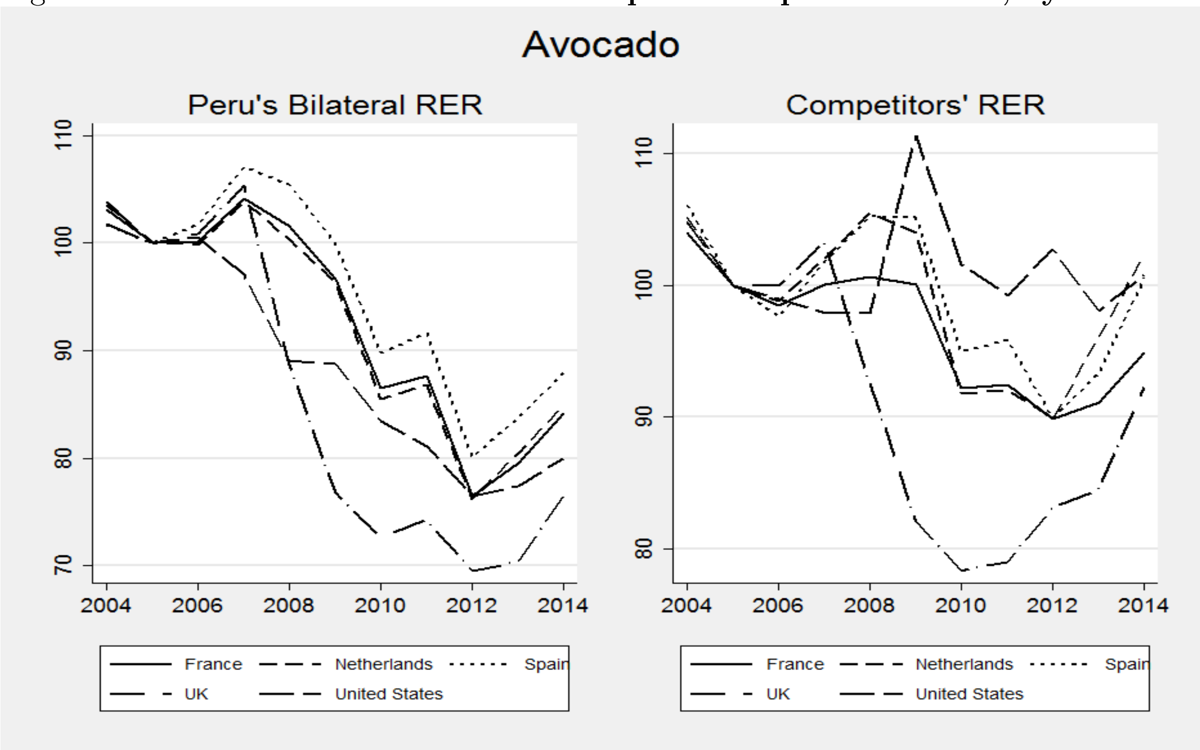
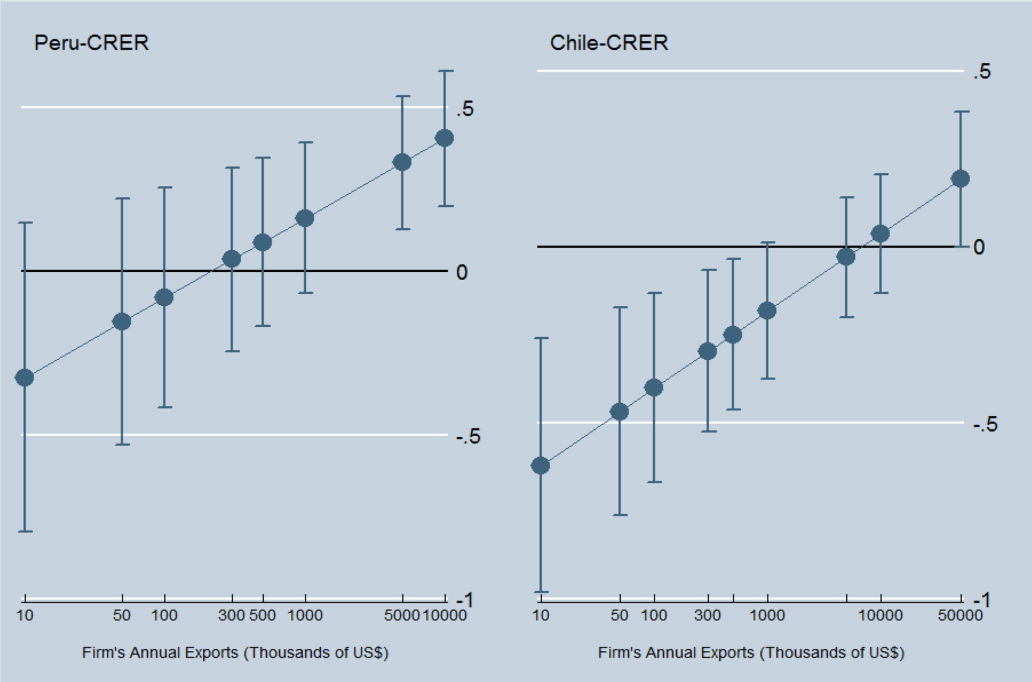
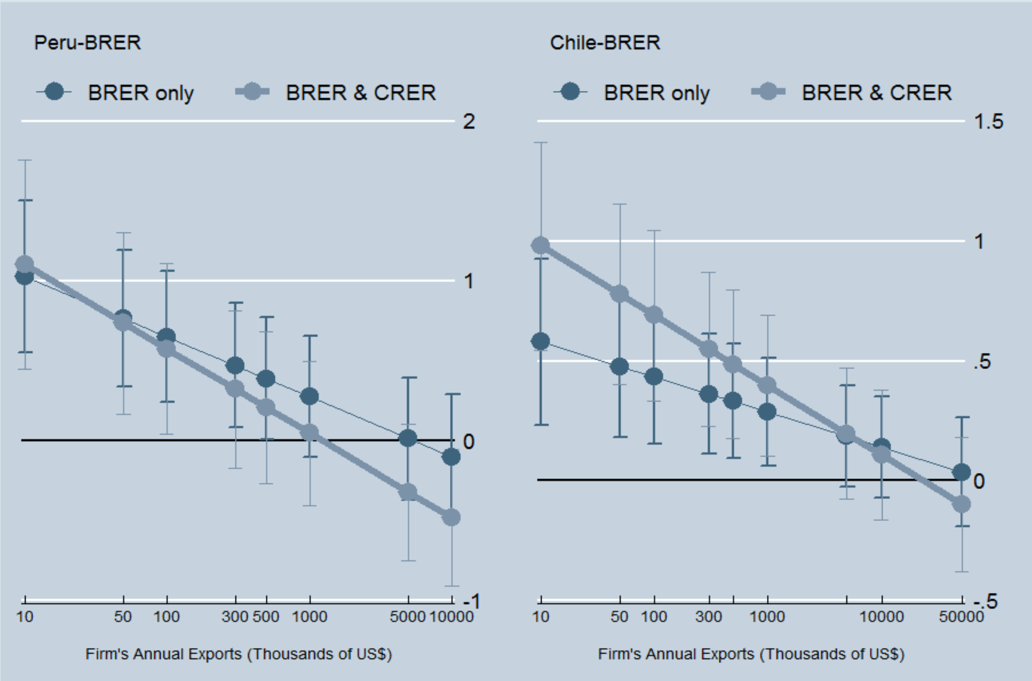


Figure 10: **Competitors' Real Exchange Rate (CRER) Elasticity**



Note: point estimates are reported with a 90 percent confidence interval.

Figure 11: **BRER Elasticity including CRER**



Note: point estimates are reported with a 90 percent confidence interval.

Figure 12: **BRER Elasticity: Alternative Estimations**

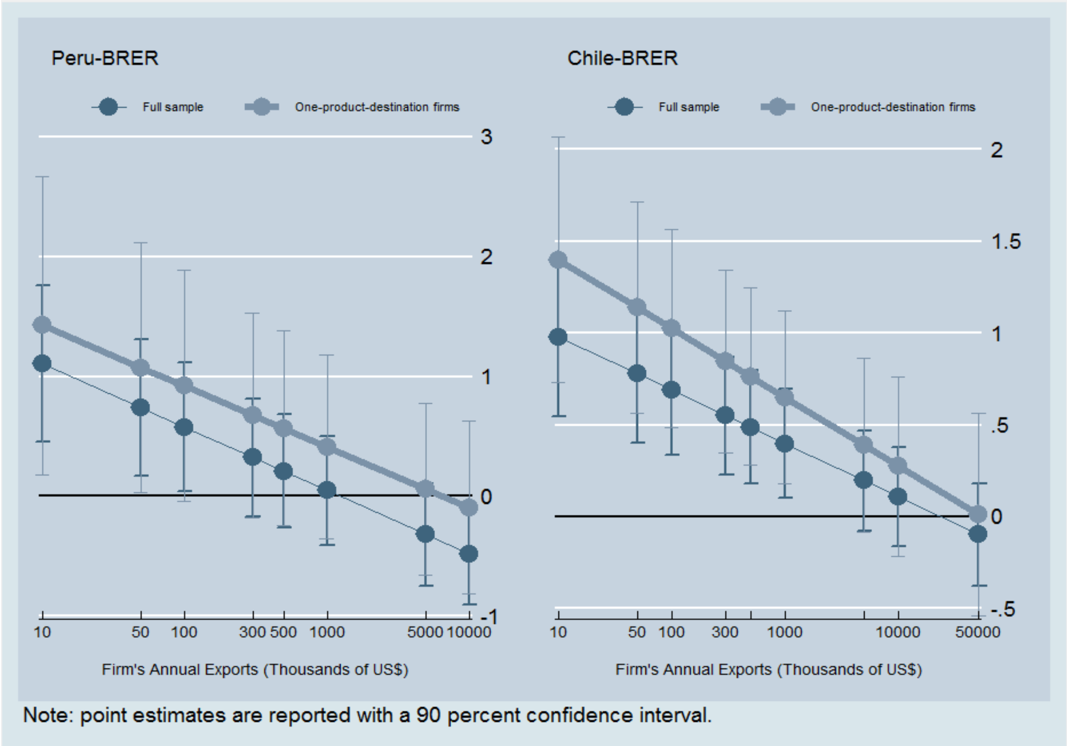


Figure 13: **BRER Elasticity on the Probability of Continue Exporting**

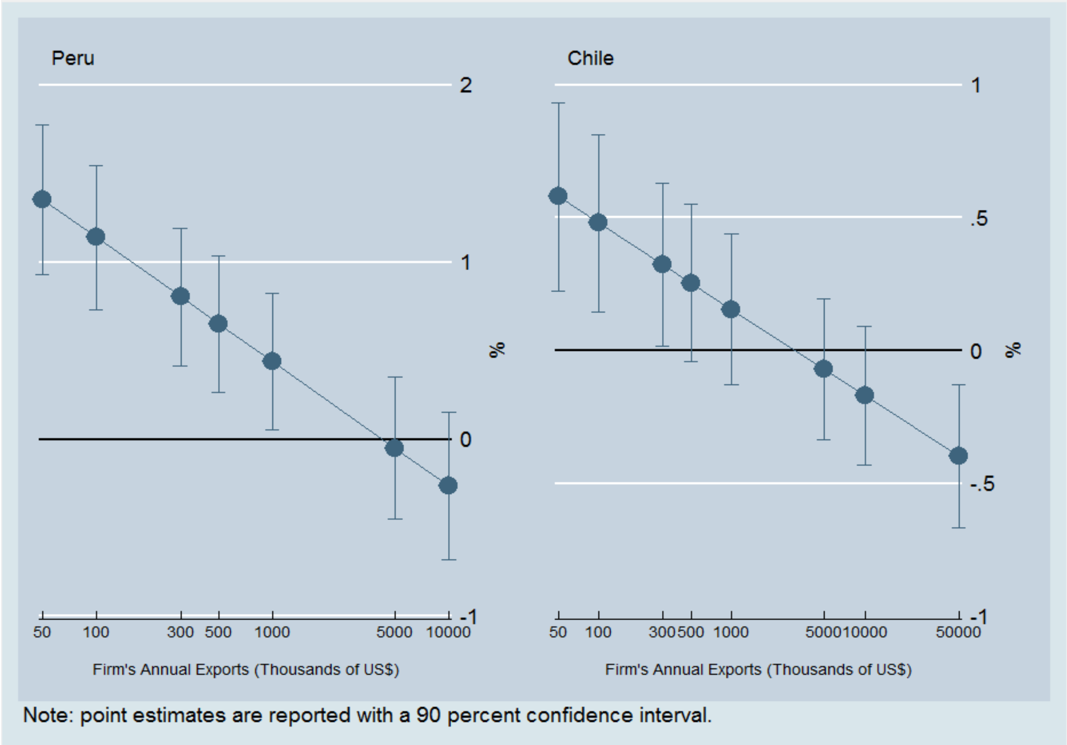


Figure 14: **BRER Elasticity by Sector**

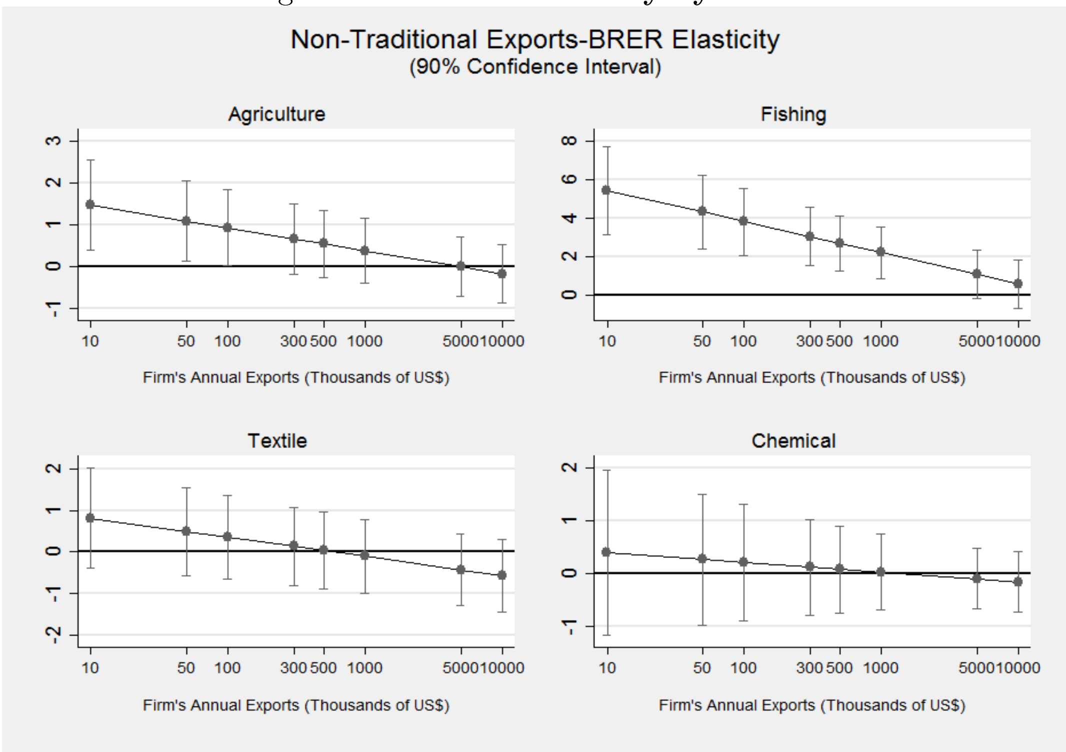


Figure 15: **CRER Elasticity by Sector**

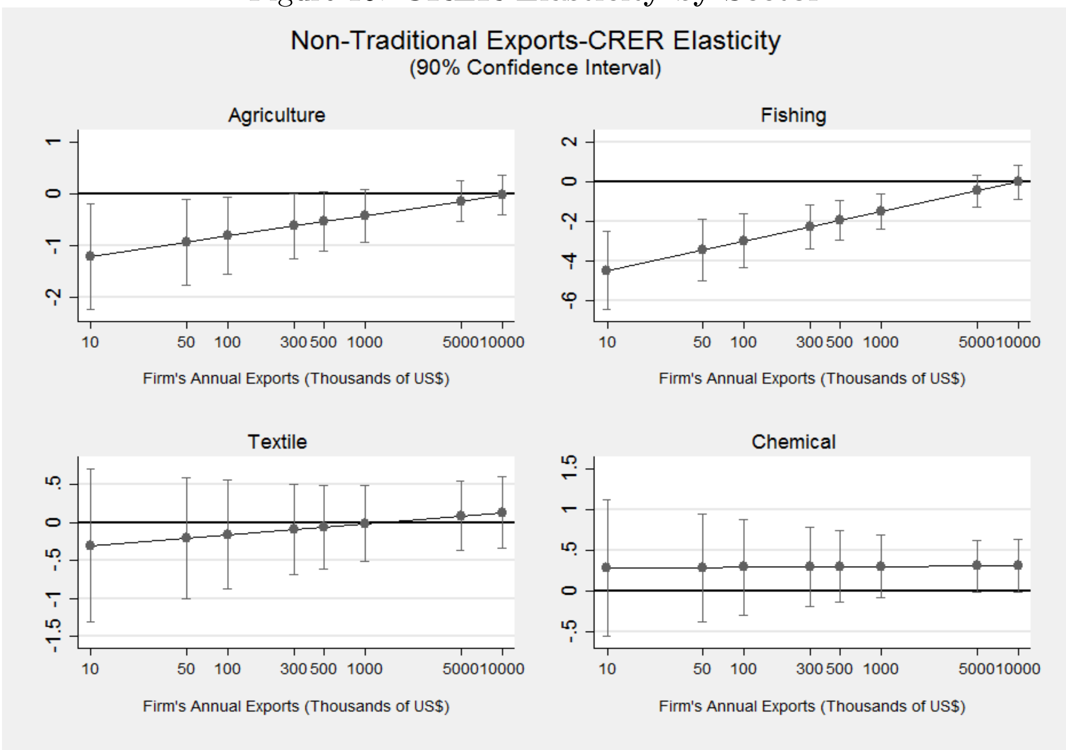


Table 1: **Descriptive Statistics: Non-Traditional Exports**

Chile				Peru			
Year	Products	Countries	Firms	Year	Products	Countries	Firms
2004	2778	98	4053	2007	2388	117	4310
2005	2806	100	4242	2008	2480	113	4718
2006	2822	105	4360	2009	2582	112	4987
2007	2965	106	4676	2010	2639	114	5109
2008	2993	107	4905	2011	2692	122	5415
2009	2995	110	5670	2012	2695	117	5542
2010	2962	113	4856	2013	2790	121	5580
2011	3053	113	5020	2014	2775	115	5640

Table 2: **Impact of the BRER on Exports**

Dep. Variable: Ln(Real Exports)

	Peru			Chile		
	(1)	(2)	(3)	(1)	(2)	(3)
$BRER_{dt}$(ln)	0.034	2.594***	2.531***	0.102	0.775**	0.824**
	(0.197)	(0.473)	(0.453)	(0.098)	(0.330)	(0.344)
$BRER_{dt}$(ln) × Firm $Size_f$		-0.167***	-0.163***		-0.043**	-0.045**
		(0.030)	(0.029)		(0.020)	(0.021)
$BRER_{dt}$(ln) × Imports of Int. $Inputs_{fpdt}$(ln)			-0.280*			0.015
			(0.161)			(0.012)
Imports of Int. $Inputs_{fpdt}$(ln)			1.414*			-0.059
			(0.735)			(0.053)
Destination Country's GDP_{dt}(ln)	0.560***	0.563***	0.561***	0.582***	0.587***	0.581***
	(0.116)	(0.117)	(0.116)	(0.072)	(0.072)	(0.072)
FTA_{dt}	0.045	0.042	0.044	0.004	0.005	0.006
	(0.029)	(0.029)	(0.029)	(0.021)	(0.022)	(0.022)
Observations	77,543	77,543	77,543	166,580	166,580	166,580
R-squared	0.821	0.821	0.822	0.828	0.828	0.828
Destination-Product-Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Multi-clustered standard errors by destination and year; and product, destination and year in parenthesis. ***,** ,* denote significance level at 1%, 5% y 10%, respectively.

Table 3: **Impact of the BRER and CRER on Exports**

Dep. Variable: Ln(Real Exports)

	Peru		Chile	
	(1)	(2)	(3)	(4)
BRER_{dt}(ln)	2.531***	3.220***	0.824**	1.647***
	(0.453)	(0.639)	(0.344)	(0.457)
BRER_{dt}(ln) × Firm Size_f	-0.163***	-0.230***	-0.045**	-0.096***
	(0.029)	(0.038)	(0.021)	(0.027)
Competitors BRER_{pdt}(ln)		-1.294**		-1.235***
		(0.547)		(0.423)
Competitors BRER_{pdt}(ln) × Firm Size_f		0.106***		0.076***
		(0.035)		(0.026)
BRER_{dt}(ln) × Imports of Int. Inputs_{fpdt}(ln)	-0.280*	-0.286*	0.015	0.015
	(0.161)	(0.156)	(0.012)	(0.011)
Imports of Int. Inputs_{fpdt}(ln)	1.414*	1.439**	-0.059	-0.059
	(0.735)	(0.712)	(0.053)	(0.052)
Destination Country's GDP_{dt}(ln)	0.561***	0.570***	0.581***	0.580***
	(0.116)	(0.115)	(0.072)	(0.072)
FTA_{dt}	0.044	0.041	0.006	0.006
	(0.029)	(0.029)	(0.022)	(0.022)
Observations	77,543	77,543	166,580	166,580
R-squared	0.822	0.822	0.828	0.828
Destination-Product-Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes: Multi-clustered standard errors by destination and year; and product, destination and year in parenthesis. ***,** ,* denote significance level at 1%, 5% y 10%, respectively.

Table 4: **% of Exports Sensitive to Variations of the BRER**

Chile

Partner	China	USA	Brazil	Japan	Mexico
% of Firm-Product Pairs	30.7%	31.4%	28.1%	17.7%	22.9%
% of Export Value	4.3%	5.1%	5.1%	1.4%	4.2%

Peru

Partner	China	USA	Spain	Ecuador	Colombia
% of Firm-Product Pairs	36.6%	40.2%	30.8%	45.9%	35.5%
% of Export Value	5.7%	5.3%	5.9%	11.2%	6.0%

Table 5: **Impact of the BRER on Continuing Exporting Probability**
Dependent Variable: Continuing Exporting=1|Stop Exporting=0

Estimation Method: LPM	**Peru**		**Chile**	
	(1)	(2)	(1)	(2)
BRER_{dt}(ln)	4.670***	4.618***	2.356***	2.336***
	(0.549)	(0.561)	(0.520)	(0.519)
BRER_{dt}(ln) $\times$ Firm Size_f	-0.309***	-0.306***	-0.154***	-0.153***
	(0.035)	(0.036)	(0.029)	(0.029)
Competitors RER_{pdt}(ln)	-2.040***	-2.050***	-1.994***	-1.997***
	(0.458)	(0.462)	(0.310)	(0.310)
Competitors RER_{pdt}(ln) $\times$ Firm Size_f	0.146***	0.147***	0.133***	0.134***
	(0.028)	(0.028)	(0.019)	(0.019)
Imports of Int. Inputs(ln)	0.059*	0.665*	0.005***	0.060
	(0.034)	(0.353)	(0.001)	(0.059)
BRER_{dt}(ln) $\times$ Imports of Int. Inputs_{fpdt}(ln)		-0.134*		-0.012
		(0.077)		(0.013)
Destination Country's GDP_{dt}(ln)	0.084	0.085	0.090	0.090
	(0.138)	(0.138)	(0.099)	(0.099)
FTA_{dt}	-0.019	-0.019	0.003	0.004
	(0.032)	(0.032)	(0.034)	(0.034)
Observations	65,657	65,657	190,547	190,547
R-squared	0.384	0.384	0.419	0.419
Destination-Product-Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes: Multi-clustered standard errors by destination and year; and product, destination and year in parenthesis. ***,** ,* denote significance level at 1%, 5% y 10%, respectively.

Table 6: **Effect of a 10% RER appreciation on Prob. of Stop Exporting**

Chile

Partner	% of Firm-Products	% Export Value
China	2.4%	0.2%
USA	3.8%	0.2%
Brasil	3.2%	0.3%
Japan	2.0%	0.1%
Mexico	3.1%	0.3%

Peru

Partner	% of Firm-Products	% Export Value
China	3.6%	0.6%
USA	4.0%	0.6%
Spain	3.0%	0.6%
Colombia	3.5%	0.6%
Ecuador	4.6%	1.1%

Table 7: **Impact of the BRER on Exports by Sector**

Dep. Variable: Ln(Real Exports)						
	Agriculture	NMM	Fishing	Chemicals	B. Metals	Textile
$BRER_{dt}$(ln)	3.661***	0.943	11.819***	1.138	1.459	2.674**
	(1.202)	(2.943)	(2.963)	(2.153)	(3.017)	(1.326)
$BRER_{dt}$(ln) × Firm $Size_f$	-0.239***	-0.308	-0.707***	-0.080	-0.125	-0.200**
	(0.067)	(0.204)	(0.182)	(0.135)	(0.173)	(0.078)
Competitors RER_{pdt}(ln)	-2.809**	-0.506	-10.432***	0.244	-1.882	-0.885
	(1.328)	(2.836)	(2.815)	(1.172)	(2.150)	(1.412)
Competitors RER_{pdt}(ln) × Firm $Size_f$	0.173**	0.052	0.647***	0.004	0.123	0.063
	(0.080)	(0.195)	(0.183)	(0.074)	(0.126)	(0.091)
$BRER_{dt}$(ln) × Imports of Int. $Inputs_{fpdt}$(ln)	-0.278	-3.106**	-1.462	-0.067	-0.845*	0.505*
	(0.283)	(1.506)	(3.523)	(0.251)	(0.457)	(0.258)
Imports of Int. $Inputs_{fpdt}$(ln)	1.366	14.220**	8.703	0.468	3.872*	-2.100*
	(1.302)	(6.763)	(15.969)	(1.156)	(2.043)	(1.172)
Destination Country's GDP_{dt}(ln)	0.578***	2.436***	0.228	0.491**	0.761*	0.763***
	(0.208)	(0.437)	(0.281)	(0.206)	(0.389)	(0.261)
FTA_{dt}	0.030	0.129	-0.048	-0.041	0.109	0.143***
	(0.040)	(0.100)	(0.076)	(0.053)	(0.120)	(0.041)
Observations	21,725	2,011	6,244	12,426	2,359	21,391
R-squared	0.812	0.862	0.739	0.825	0.872	0.811
Destination-Product-Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Multi-clustered standard errors by destination and year; and product, destination and year in parenthesis. ***,** ,* denote significance level at 1%, 5% y 10%, respectively.

Table 8: **% of Firm-Product pairs sensitive to BRER fluctuations by sector and country**

	China	USA	Spain	Ecuador	Colombia
Total	**23%**	**24%**	**17%**	**29%**	**20%**
Agriculture	33%	20%	20%	21%	19%
Textile	0%	0%	0%	0%	0%
Fishing	73%	60%	58%	79%	64%
Chemicals	0%	0%	0%	0%	0%
Basic metals	0%	0%	0%	0%	0%
NMM	0%	0%	0%	0%	0%

Table 9: **% of Exports (value) sensitive to BRER fluctuations by sector and country**

	China	USA	Spain	Ecuador	Colombia
Total	**2%**	**2%**	**2%**	**5%**	**2%**
Agriculture	4%	2%	3%	1%	2%
Textile	0%	0%	0%	0%	0%
Fishing	30%	32%	34%	65%	49%
Chemicals	0%	0%	0%	0%	0%
Basic metals	0%	0%	0%	0%	0%
NMM	0%	0%	0%	0%	0%

A Appendix

A.1 Berman et al. (2012)

This section takes Berman et al. (2012)'s extension to the monopolistic competition model of Melitz and Ottaviano (2008). In this model, the inverse demand function is given by:

$$\frac{p_i}{\varepsilon_i} = a - bx_i(\varphi) - dX_i.$$

where p_i is the price of a given product, imported from country i. This price is expressed in exporter's currency and ε_i is the nominal exchange rate between the exporting country and the importing country. $x_i(\varphi)$ is the quantity demanded of a variety exported by a firm with productivity (φ). X_i is the aggregated demand of the product.

From the firm maximization problem, the optimal price p_i and quantity x_i of the exporting firm are given by:

$$p_i(\varphi) = \frac{1}{2} w\tau_i(\frac{1}{\varphi^*} + \frac{1}{\varphi}),$$

$$x_i(\varphi) = \frac{1}{2} \frac{w\tau_i}{\varepsilon_i}(\frac{1}{\varphi^*} - \frac{1}{\varphi}),$$

where w is the wage paid in the exporting country and τ_i is the tariff that each exporter has to pay to sell its product in the importer country i. The minimum productivity threshold to export the variety produced to the importing country i, φ^*, is given by:

$$\frac{1}{\varphi^*} = \frac{\varepsilon_i}{w} \frac{a - dX_i}{\tau_i}.$$

The exported value of a firm with productivity $\varphi, EX_i(\varphi)$, is:

$$EX_i(\varphi) = x_i(\varphi) \times p_i(\varphi) = \frac{1}{2} \frac{w^2 \tau_i^2}{\varepsilon_i}(\frac{1}{\varphi^{*2}} - \frac{1}{\varphi^2}),$$

Therefore, defining the BRER, q_i, as:

$$q_i = \frac{w_i \varepsilon_i}{w},$$

the $EX_i(\varphi)$ elasticity to q_i is given by:

$$e_{EX_i(\varphi)} = \frac{\varphi^2 + {\varphi^*}^2}{\varphi^2 - {\varphi^*}^2}, \quad (5)$$

Which is decreasing on firm's productivity (φ).

The minimum productivity threshold to export to the importing country i, φ^*, could be also expressed as a function of q_i:

$$\frac{1}{\varphi^*} = q_i \frac{a - dX_i}{\tau_i w_i}, \quad (6)$$

where the threshold φ^*, increases when the BRER, q_i, decreases.

A.2 Firm Size Calculus

To calculate firm's size we take firm's total real exports by year, $Exports_{ft}$, and regress it on firm and year fixed effects α_f and β_t, respectively:

$$ln(Exports_{ft}) = \alpha_f + \beta_t + e_{ft},$$

getting the estimated value of α_f as an average value of firm f's size and our proxy for productivity. As a robustness we use another measure of firm's size that is time varying α_{ft-1}, which is estimated using the information available from 2007 until year $t-1$