Flooding of Chinese Goods and its Impacts in Other Countries' Exports: A Firm-Level Investigation

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Abstract

China's accession to the WTO has shifted international trade and the literature on its impact in other countries' exports is still scant. This paper aims to contribute to this literature by investigating the impact of Chinese expansion in the international trade in the exports of three Latin American (LA) countries: Brazil, Mexico and Peru. Considering developed and developing countries as destinations from these LA countries, results suggest that these three countries were affected by the insertion of China in the international trade. Overall, firms of these three countries lost 5.7% of their exports to the US and 7.2% to the EU due to China expansion. In terms of volume, these three countries lost USD 9 billion dollars of exports just in the US market. Comparing the outcomes between countries, Brazil seems to be the most affected compared to Mexico and Peru in relative terms. Looking at the margins and types of goods, final goods suffered more from the Chinese competition compared to intermediaries, yet it is not feasible to distinguish which margin, intensive or extensive, was mostly affected.

Resumo

A entrada da China à OMC mudou o comércio mundial e a literatura sobre seus impactos permanece escassa. Esse artigo visa contribuir para essa literatura ao investigar o impacto da expansão chinesa no comércio internacional nas exportações de três países da América Latina: Brasil, México e Peru. Considerando países desenvolvidos e em desenvolvimento como destinos das exportações desses três países, os resultados sugerem que os mesmos foram impactados negativamente pela entrada da China no comércio mundial. De uma forma geral, as firmas desses três países perderam 5,7% de suas exportações para os EUA e 7,2% para a União Europeia por conta da expansão da China. Em termos de volume, esses três países deixaram de exportar US$ 9 bilhões somente para o mercado americano. Comparando os resultados entre os países, o Brasil apresenta ser o mais afetado comparado a México e Perú em termos relativos. Olhando as margens e os tipos de produtos, os produtos finais sofreram mais com a competição chinesa em comparação aos produtos intermediários, porém não é factível distinguir qual margem, intensiva ou extensiva, foi a mais afetada.

JEL Codes: F14, F61 & L25
Keywords: China, Export & Firm Level
Palavras-chave: China, Exportações e Nível da Firma

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Introduction

Trade policies (such as trade liberalization, trade agreements and so forth) have dominated to international trade literature as the main economic shock to affect trade. However, this emphasis began to be questioned by some scholars. For instance, Goldberg and Pavcnik (2016) argues that other economic shocks, such as Chinese productivity growth and its entrance to the WTO in 2001, became more relevant to affect international trade than trade policies per se. Different scholars have already started to investigate the impacts of China in developed and developing countries [see Acemoglu et al (2016), Autor et al (2013) and Pierce and Schott (2016) for the USA, Mion and Zhu (2013) for Belgium, Utar and Ruiz (2013) and Blyde et al (2017) for Mexico, Costa et al (2016), Moreira and Lage de Sousa (2017) and Paz (2017) for Brazil]. Majority of these papers focuses on labor market adjustments and some on firm's efficiency.[1] Although Chinese import penetration has displaced some domestic producers, it has also substitute imports from other countries in a diverse range of markets. While the effects on the former are widely explored, the impacts on the latter are still scant. Closer to the spirit of this paper is Bas and Bombarda (2012), since it investigates the liberalization occurred in Asian countries on the French exports. This paper tries to fill out the gap in the literature on how exports from other developing countries have been affected by the entrance of China in the WTO using export micro data from three developing countries: Brazil, Mexico and Peru.

This paper contributes to that literature on the effects of trade on the extensive margin. A part of the literature investigates the impact of trade in general on the extensive margin, such as Feenstra (1994) and Broda and Weinstein (2006) and their results suggest a substantial impact of trade on the extensive margin. Another part assess the impact of trade policies on the extensive margin either new variety or new destination [Klenow and Rodriguez-Clare (1997), Arkolakis et al (2008) and Goldberg et al (2010)], while another on the extensive margin of entry [see Caliendo et al (2015) as an example]. Klenow and Rodriguez-Clare (1997) and Arkolakis et al (2008) found limited impact of trade policy on the extensive margins in Costa Rica, yet these results are not corroborated in Goldberg et al (2010) in India since their results suggest an impact in new products. Moreover, Caliendo et al (2015) evidences infer that trade policy has a large impact on firm entry and the effect is more pronounced in developed than in developing countries. Therefore, much more work in this area should be pursued in order to have a general assessment of the effects of trade on the extensive margins, as pointed by Goldberg and Pavcnik (2016).

Given this background, this paper adds in the literature in two fronts. First, it assesses the impact of an economic shock, China shock, more relevant to international trade than a trade policy per se. Moreover, it was a shock at international scale which has affected a diverse range of countries not only inward their economies but also outward. Second, it contributes to the recent investigation on the margins of trade, which has received increasingly attention by the literature.

In order to investigate this issue, this paper uses export firm-level data from three Latin American (LA) countries representing three different economic trade blocks: Brazil (Mercosur); Peru (Andean Community); Mexico (NAFTA).[2] Using a detailed firm-level data, this investigation evaluates how much firms from these countries have reduced their exports to relevant markets, such as the United States and European Union, and to other developing countries, which is represented by the bilateral trade between them. Additionally, differences between intensive and extensive margins are explored as well as products classification between final and intermediate goods. Results suggest that firms in these countries were negatively affected by the expansion of Chinese goods in any kind of markets. Moreover,

[1] Only Blyde et al (2017) and Moreira and Lage de Sousa (2017) investigate the effect on other firms' performance, for example productivity. All other papers listed investigate only labor outcomes.

[2] For analysis on how China has impacted the export performance in Latin America using aggregate data, see Jenkins et al (2008), Machado e Ferraz (2006) and Pereira (2014).

final goods suffered more from the Chinese competition compared to intermediaries, yet it is not clear which margin, intensive or extensive, was mostly affected by the China shock. Although it is not distinguishable between intensive and extensive margins, outcomes are robust to find an impact of a trade shock in the margins, which is contribution to the literature which was controversial as described in Goldberg and Pavcnik (2016).

In order to explore this issue, this paper is structure as follows apart from this introduction. Section 1 provides an economic background of these countries export performance after the emergence of China in the international trade market. Methodology is described in Section 2 followed by data description in the next section. Section 4 provides the results in different markets. Different angles of exports are explored in Section 5, such as intensive versus extensive margins as well as distinct types of goods. Last section provides the concluding remarks.

Economic Background

The three countries investigated in this paper have close ties to the United States (US) and European Union (EU). For instance, nearly 90% of Mexican and a quarter of the Brazilian and Peruvian exports were destined to the US market in 2000. After 13 years, their export shares to the US have reduced to 78.8% for Mexico, 10.2% for Brazil and 18.3% for Peru. One part is explained by the increase importance of China in the export basket from these LA countries, but another is their loss of market share in the US market. In order to have an idea on how much these countries have lost market share in the US and European market, Graph 1 presents the share of these three countries in both markets from 90's until 2013.[3] As shown, similarities between these two destinations exist, but also there are distinct patterns. One different fact is that China already had a larger share of the EU imports compared to these three countries in the 90's, but the opposite occurs in the US market. Another distinction between these the US and EU markets is that the shares of Chinese exports and the share of these three LA countries were stable in the EU market in the 90's, yet an upward trend in the US market is perceived for both (China and LA countries) during the same period. The path changes completely after 2000 for China and these three LA countries. On one hand, China remains acquiring market share in the US, reaching 20% of total US imports. On the other hand, these LA countries stalled completely around 12.5% in the twenty first century. In the EU market, China shares jumped to over 10% while imports from these three LA countries remained less than 2%.

INSERT GRAPH 1 HERE

Overall, China gained substantial market share in the US and EU markets since their ascension in the WTO (10.6 p.p. and 6.7 p.p., respectively), while these three LA countries stagnated. The increased participation of Chinese goods in these markets enhanced the competition for exporters from those three LA countries.

Chinese export success is not restricted to the main markets, US and EU; thus it is also interesting to consider the impact of China in the exports from these three LA countries to other developing countries. As Brazil, Mexico and Peru are considered similar in terms of their export performance, according to the World Bank, considering each of them as a destination from another one seems reasonable. In other words, how much was lost from Brazilian exporters due to the imports of Chinese products in Mexico and Peru is considered in this investigation. This might be important for Brazil and to a less extent to Mexico and Peru, since Brazil manufacturing exports to Latin America is a relevant share of its total exports.

Methodology

Our empirical strategy begins by pooling all export information from three origin countries (Brazil, Mexico and Peru) to five destinations: USA, European Union and the other two Latin American

[3] The share of these LA countries is the total US or EU imports from these three countries divided by the total imports from the US and EU.

countries. For instance, Mexico and Peru are the destinations considered in the Brazilian exports, and so forth. For econometric specification, this paper follows the commonly empirical trade literature which works with firm-level data, sometimes named "shift-share" analysis. While the dependent variable is at firm level, the main important independent variable is aggregated at product level, which provides an exogenous measure for the referred investigation. In summary, basic econometric specification utilized in this paper is described by equation 1.

$$Log(Y_{iodp,t+1}) = c + \gamma\, log(ChinaShare_{dp,t}) + \alpha\, V'_{iodp,t} + \mu_{iodp} + \vartheta_t + \varepsilon_{iodp,t} \quad (1)$$

$Y_{iodp,t+1}$ is the export value of firm i from country o to destination d of product p in time $t+1$, $ChinaShare_{dp,t}$ is the Chinese export share in destination d of product p in time t, $V'_{iodp,t}$ is a vector of controls, μ_{iodp} is the firm-origin-destination-product fixed effect, ϑ_t is the year fixed effect and $\varepsilon_{iodp,t}$ is the error term. In other words, the estimations consider fixed effects in terms of firm, product, origin, destination and year. Therefore, all time-invariant characteristics which could explain any of these dimension, such as country's geographical location, natural comparative advantage to produce a certain product, bilateral trade advantage, or even firm's location close to good infrastructure, are captured by these fixed effects.

Moreover, the specification has one-year lag between the independent and dependent variable to provide a more exogenous independent variable, which is commonly used in the literature, see Bas and Bombarda (2012) as an example. As the main variables are in logs, the coefficient gamma (γ) is the elasticity between the import share of Chinese goods and firm's export of the referred product.

For controls, aside the fixed effects, a combination of time-variant characteristics is also considered. First, total exports of the firm to the world is utilized to capture any size variation at firm level. Since the independent variable is lagged one-year, then the total amount exported in the previous year is utilized as a measure of firms' size. As there are other factors at firm level that varies over time, such as efficiency measured by productivity, firm-year fixed effect is included to capture the entire time-varying characteristic at firm level that affects firms' capability to export.

Other two extra controls are considered at product level. First, goods exported from these countries face different import tariffs in distinct destinations. Therefore, effective import tariffs faced by each product at HS 4 level in each destination is included to absorb that, as used in Li and Moreira (2018). Products from these countries might have a different performance over the years, for example a policy aiming to improve the productivity of specifics products, thus share of each product for each country in the world market is calculated to capture any kind of improve of comparative advantage obtained during the period or even any kind of change bilateral trade agreement.

After having the full picture of the exports of all three investigated countries in four markets, being two developed markets and other two developing countries, it is interesting to break down the sample in order to investigate the effects in each market. First, effects in the EU and US markets should be investigated. Therefore, all the firm-level database from Brazil, Mexico and Peru are pooled to see if the Chinese share in the American and European market have reduced level of exports of these three Latin American countries as a whole. In order to estimate this, one fixed effect should be discarded as only one destination for all countries is considered, therefore fixed effect shifts from firm-product-origin-destination to firm-product-origin only. However, firms in each country face different market access, for instance, Mexican firms have NAFTA yet Brazilian and Peruvian not, yet when estimating by country, it is relevant to remove another fixed effect (origin), therefore fixed effect remains solely as firm-product.

Aside time-invariant characteristics, this paper estimate the model combining some characteristics with year to control for any characteristic-year fixed effects to capture any kind of time variant characteristics which might interfere the export performance of a product from a firm originated from one of those three countries to the investigated destinations, such as any change in the trade policy that might have benefited specific firms to export a particular good originated from one LA country to one of the four destinations considered. As described in the time-invariant fixed effects, each data used will require a

different characteristic-year fixed effect, ranging from firm-product-origin-destination-year fixed effect to only firm-product-year fixed effect depending on which data is considered.

Although the main variable is lagged in time and aggregated at product level, it remains endogenous since an exogenous demand shock might be correlated to the participation of China in the total import from each country. Following Autor, Dorn and Hanson (2013) methodology, the share of China in a similar region lagged another three years is used as instrument. For example, if when investigating the effects of China imports in the US market on the Brazilian exports, the share of Chinese imports in the European Union market is used as an instrument lagged in time, and vice-versa. For exports to other LA countries, information between them is triangulated. Since these countries are similar in terms of export performance, using the remaining country as instrument seems reasonable. For instance, the share of Chinese imports in Peru as the instrument lagged in time is used when estimating the impact of Chinese goods in the exports of Brazilian firms to Mexico, and so forth.

Data

To implement this investigation, export firm-level dataset from the three countries mentioned previously is utilized: Brazil, Mexico and Peru. Peruvian and Mexican datasets are from the Export Dynamic Database created by the World Bank, see Fernandes, Freund and Pierola (2016) for further information. While the Brazilian export data was provided by the Brazilian Trade Secretary (*Secretaria de Comercio Exterior* – SECEX). All these data are disaggregated as firm-year-product-destination.

Different HS classification occurred in the investigated period. Cebeci (2015) is used as a guide to create a homogenous product classification over the years. The period available differs from each country, while Peruvian data is from 1993 until 2007, the Mexican ranges from 2000 until 2007 and the Brazilian, from 1997 until 2010. Therefore, the common period for this investigation is from 2000 until 2007, which is the base period for this paper.[4]

Our independent variable is constructed by using the UNCOMTRADE product-year level dataset from the following economic regions: European Union, United States, Brazil, Mexico and Peru. Chinese import shares in the European Union and United States are used for the three countries investigated. The information on the Chinese import share in each of the investigated country is used in triangular way between them, as explained in the empirical strategy.

Controls measured at product level have two different sources. Tariffs are extracted mainly from WITS, but some more detailed information are obtained from the Latin-American Integration Association (its acronym ALADI in Spanish) or Central American Common Market (CACM). The value of the tariff represents the preferential tariff which each product of these countries face in each market. For the share of each product from each particular country, trade information from the UNCOMTRADE dataset is utilized.

Results

First results are presented in Table 1 and they are based on estimating equation 1 using the firm-level data from the three countries pooled together to all destinations considered in this investigation. The first three columns present the outcomes using only fixed-effects approach, while the last three columns show the results using IV approach, where the share of Chinese goods in the other market lagged three years is utilized as instrument. The first columns of each method (columns 1 and 4) present results using only the time-invariant FE at firm, product, origin and destination level as well as year FE. The second columns (2 and 5) incorporate the firm-year FE. The last columns (3 and 6) is the most complete specification since it considers firm-origin-destination-year FE.

Considering controls used, they all present the expected outcomes, which is larger firms and those exporting products with higher comparative advantage (measured by the product share in total exports

[4] Brazilian and Peruvian datasets are also explored using the full period and results are similar to those shown in this paper and available upon request.

averaged at firm-level) tend to export more, while those facing larger barriers by import tariffs appears to export less. Focusing on the main investigated variable, results back up the idea that Chinese penetration in the international trade has reduced the exports of LA firms, since it is negative despite which approach is considered. Although negative, some results seem to be elastic while others not much. Using the IV estimation with all the controls available, for every 1% increase of Chinese exports to US, a firm in these countries diminishes its export of that good by 0.9%. It is important to mention that instrument used shows reasonable first-stage evidence.

INSERT TABLE 1 HERE

Estimating the effects in the US market is important because it was the market which Chinese goods had an incredible growth reaching nearly 1 in every 5 dollars imported from Americans. Then, focus on this market to evaluate what was the impact of Chinese imports is relevant. Table 2 shows the results in the USA market following the same structure from Table 1.

INSERT TABLE 2 HERE

Results on the US market remain similar to those presented in Table 1. For controls, the only difference occurs in the tariffs which become non-significant in most cases, including the most complete one. The main reason might be that existent trade agreements have removed the explanation power of tariffs in firms' export performance, especially considering that most of the observations are from Mexico which signed NAFTA in the 90s. Looking at the main investigated variable, China Share, it is easy to observe that the Chinese expansion has reduced the level of exports from each firm; however, at a lower magnitude. In the most complete model, the elasticity is 0.75 which means that any 1% increase in imports from China would reduce the export from Latin American firms by 0.75%.

Another important market for Latin American countries is the European Union. Table 3 presents the results considering only this destination as a market for LA goods. Results become even more similar to Table 1, since the parameter for tariffs shift back to negative consistently. The China Share persists negative across specifications as in previous results. However, the magnitude is larger in all specifications, which means that the elasticity regarding the European market is higher. Considering the most reliable estimate, column 6, an increase of 1% of Chinese exports to the European Union reduces the exports by 1.6% from firms of these three LA countries. In other words, the effects on the European market is twice more intense than in the US market. This might indicate that the commercial ties between US and these Latin American countries are stronger than those with European Union.

INSERT TABLE 3 HERE

Analysis shifts to how Chinese import penetration in the US and EU markets has impacted each of these three countries individually. Although these three countries are similar in terms of export performance, they still have their own particularity, especially in terms of their export destination. Table 4 shows the estimation of equation 1 for each of these three countries and the US as a destination of their exports. The first 6 columns show the estimation without instruments and the last 6 columns, using an IV approach. Each country has two columns. Those with odd numbers does not contemplate the firm-year FE, but it includes size as a control. Columns with even numbers includes the firm-year FE, which drops the size as control.

INSERT TABLE 4 HERE

Results remain consistent with all the countries pooled together, which means: Chinese penetration in the US market has reduced the exports of firms in these three LA countries. Using or not instrument, firms in Brazil, Peru and Mexico have their exports reduced to the US due to the increase competition of China goods. However, countries differ in term of the effects. Looking at the IV results using firm-year FE, Brazil and Peru show elasticity equal to one, while Mexico show a lower magnitude. For every 1% increase of Chinese imports in the US market reduced the export volume of a Brazilian or Peruvian firms by around 1%, but only 0.65% from a Mexican firm. These results may suggest that countries with a trade agreement tend to suffer much less than others. For instance, Mexico has a trade agreement with

the US since 1994 and the effect of Chinese goods on Mexican exports was inelastic and around a third lower of what Brazilian and Peruvian firms suffered.

As described previously, it is relevant to investigate the effects in the EU market. Table 5 presents the outcomes on how these three LA countries were affected by the import of Chinese goods from the EU market following the structure of Table 4. Results remain similar to those from Table 4, since the main estimated parameters, China Share, are negative in most specifications. For comparison between countries, the most reliable result is considered, which contain the IV estimation and controls for firm-year FE (columns 8, 10 and 12). Looking at these results, it is feasible to conclude that Brazil and Mexico were more impacted than Peru, around 10 times. For every 1% growth of Chinese imported goods in the EU market, exports from Brazilian and Mexican firms are dropped by 2% yet from Peruvian firms, only 0.2%. This evidence confirms that Chinese goods tend to be more substitutes of Brazilian and Mexican goods compared to Peruvians, which seems plausible as the economies of Brazil and Mexico are more diverse than from Peru.

INSERT TABLE 5 HERE

Another interesting comparison is in which market these countries were most affected by the increase competition of Chinese goods in the US and EU markets. Peru seems to be less impacted in its exports to EU market than to US market, because results are more robust across specifications in the later than in the former. Moreover, the elasticity in the US market is five times higher in magnitude than the same for the EU market. In this regard, results suggest that Peruvian exports tend to be more similar to Chinese goods in the US market than in the EU market.

Brazil and Mexico suffered more from the competition of Chinese goods in the EU market than in the US market, yet these two countries differ substantially in terms of their intensity in each market. While Mexican firms were affected nearly four times in EU (2.3/0.6) than in the US, Brazilian firms less than double (1.9/0.9). For Mexico, one possible explanation might be the length of time of Mexican trade agreement with these two destinations. Mexico has signed a NAFTA free trade agreement in 1994 and with EU six years later; therefore, trade relationships between Mexico and the USA seem more resistant that those between Mexico and EU to an exogenous shock (the emergence of China). This evidence suggests that the length of a trade agreement might attenuate the effects of the China shock.

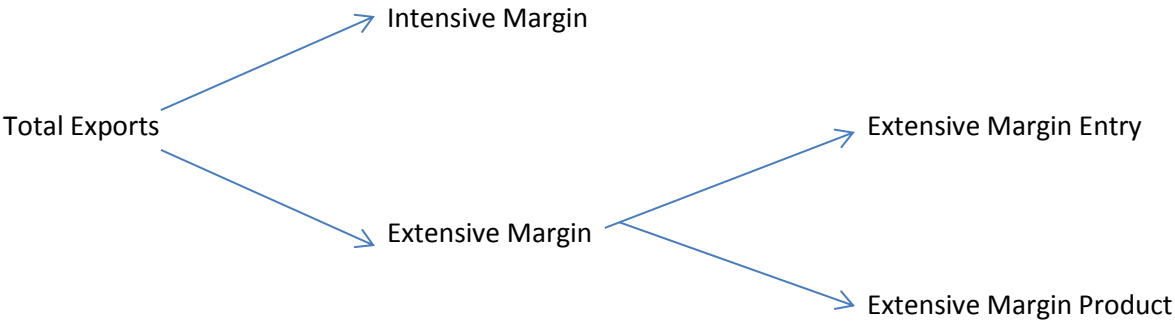
The impact of Chinese goods is not restricted to the main markets, such as the US and EU, but rather all other destinations. In order to evaluate the impact of the Chinese expansion in developing world, the impact on the export of these countries to each other is estimated, as explained in the empirical strategy section. Table 6 shows the results using the most complete method, which is the IV approach using firm-year FE (last columns from each case in previous tables).

INSERT TABLE 6 HERE

Brazil and Mexico are the countries which have a larger export base than Peru to developing countries, especially in terms of manufacturing goods. As a consequence, these two countries were the most affected by the Chinese import penetration while exporting to other LA countries. The elasticity from these two countries ranges from 1.5 to 2, which means that every 1% increase in imports from China reduces the export of Brazilian and Mexican firms by nearly from 1.5% to 2%. Peruvian exporters were the only ones not affected by the competition of Chinese goods in the Brazilian and Mexican markets, since the elasticity estimated is non-significant. Overall, it is feasible to infer that Peruvian goods are not competitors of Chinese goods in developing countries, while Brazilian and Mexican are. Moreover, these results suggest that the loss derived by the Chinese competition for Brazilian and Mexican exports to developing countries are similar to those observed in EU. Therefore, firms from Brazil and Mexico compete with similar Chinese products in developing countries as in the European market. Therefore, a policy recommendation might be the expansion of trade agreements within LA countries in order to mitigate the impact of China expansion in these markets.

Further Results

Outcomes from this paper have shown that Brazilian, Mexican and Peruvian exporters were affected by the Chinese penetration in a diverse range of markets, but so far, they are silent in what type of exports has been mostly affected, such as by intensive versus extensive margins and by product type (final versus intermediary).[5] In this section, these possibilities are explored. Initially, intensive versus extensive margins is assessed by dividing the sample into these two categories. In sequence, extensive margin is split into entry in the investigated market and exporting a new product to this aforementioned market. Every export belonging to the intensive margin means that a firm has exported the same good to the same destination in a previous year. If they have started to export to the investigated destination or a new product to the designated destination, then it is considered an extensive margin.[6] Basically, data is divided according to the diagram below:



Outcomes for intensive and extensive margins are presented in Table 6 for all three LA countries investigated in this paper to all destinations considered: developed region (US and EU) and developing countries (Brazil, Mexico and Peru). The table is structured as follows, the first four columns show the results in the US market, followed by other four columns on the EU market and the last six columns to the LA countries as destinations. The first four lines show the results on intensive margin, followed by other four lines on the extensive margin, another four lines for extensive margin entry and the last four lines, extensive margin product. All results are based on the most reliable result as shown in Table 6: IV approach with firm-year FE for countries individually and firm-origin-year FE when pooling Brazil, Mexico and Peru together (columns 1 and 5). Contrary to the existent literature on the effects of trade shocks on the margins, our results suggest robust evidence that China shock has impacted negatively on any kind of margin.

INSERT TABLE 7 HERE

Overall, the Chinese invasion in the US market has impacted negatively exports of intensive margin from these tree countries jointly, but this result is mostly driven by Brazil and Peru, since Mexican exports were not impacted. This is evidence that the bilateral trade developed after NAFTA came into force might have attenuated the Chinese impact. In the EU market, all countries show a negative sign in the intensive margin, not only jointly but also isolated. Brazil was the most affected as an increase of 1% from Chinese imports reduced the exports in the intensive margin of Brazilian goods by 2.5%, while the Mexican by 1.8% and Peru 0.5%. Comparing these results with the US, Brazil has suffered more in the EU market, but Peru in the US market. When estimating these elasticities in the intensive margin for the

[5] Nearly 90% of the HS products are from the manufacturing sector and estimating for manufacturing goods does not differ from the overall results.

[6] As it is investigating only one destination, it is assumed that a new country destination is considered a new entry. For instance, consider a firm which was exporting to other countries but not the US, if it starts exporting to the US, it is considered a new entry rather than a new destination. Moreover, classification of intensive and extensive margin is made on a year by year case. For instance, it is considered the previous year to establish if it is an intensive or extensive margin, as well as to classify them by entry or product.

exports to developing countries, Brazil and Mexico were also affected by the Chinese penetration in these markets; Peru does not show any effect. However, the magnitude is similar to what was observed to the European market. Comparing which markets, either from developing countries or from developed countries, only Peruvian exports shows a distinction, since only their exports to developed countries that were affected by the Chinese expansion in the international trade market.

The effect of China expansion in international trade seems to have distinct impacts in the extensive margin compared to intensive margin depending on which bilateral trade is considered. Considering the three LA countries jointly, outcomes suggest that extensive margin was more impacted in their exports to the US compared to intensive margin, yet differences in the European market does not allow us to say which margin suffered more. In the US market, Mexico is the only case which it is possible to infer that the extensive margin was more affected than intensive margin. Thus, although existent relationships between Mexico exporters and US importers appears to not be impacted by the China Shock, the possibility to enter in the US market, either by a new firm or by exporting a new product, has become harder for Mexican exporters due to the increase presence of China in the US market. In terms of exports of extensive margin to developing countries, Peru remains not being affected by the Chinese invasion in the Brazilian and Mexico markets, yet Mexico and Brazil were negatively affected in their bilateral trade.

Looking at the impacts of the two types of extensive margin, Chinese competition was fiercer in the extensive margin of entry compared to the extensive margin of products in the US market (1.1 versus 0.7), yet the opposite occurs in the EU market (1.6 versus 0.9). In other words, Chinese imports in the US makes it more difficult for LA firms to enter in this market than in the EU market, but the exports of a new product from these three LA countries to the EU become more challenging compared to the US. This suggests that once firms from LA countries are able to establish a relationship with the US, they suffer less from other competitors compared to the EU which entrance seems easier, yet difficult to export a new good. Regarding the extensive margin for entry and product to developing countries, only Brazilian exports to Mexico show robust results in the two dimensions (entry and product). Mexican exports to either Brazil or Peru were also negatively impacted at the introduction of a new product in these markets by the Chinese competition.

Evidence on extensive and intensive margin are linked with the idea that Mexican and Brazilian economies tend to export products similar to Chinese goods compared to Peru. Therefore, larger and more diversified economies in developing world tend to suffer more from the competition from Chinese goods. Moreover, the elasticities obtained in this paper are generally above one, which means that for any increase of Chinese exports, firms from those countries tend to lose much more.

Another venue which could be explored is evaluating the impact on distinct types of goods, as done in Bas and Bombarda (2012). Following this aforementioned paper methodology, products are reclassified into two categories from the BEC: final and intermediary. Following the format of Table 7, results splitting the sample into these three products categories are presented in Table 8. The only difference from Table 7 is how lines are distributed. The first lines are now for final goods, followed by lines for intermediary goods and lastly by lines for capital goods.

INSERT TABLE 8 HERE

In terms of final goods, Brazil and Mexico seem to be the most affected, since all the elasticities estimated are superior to what is encountered in Peru regardless which destination, either developed countries (EU and US) or developing countries (Mexico or Peru). According to the outcomes, Brazil appears to be mostly affected than Mexico, especially in the US and in developing countries. Moreover, most of all the significant elasticities are above one, which means that any increase of imports of Chinese final goods will reduce the export of those countries more than proportionally.

As for intermediaries, the elasticity is lower in the US market compared to EU, which is the opposite of what was found for final goods. In the US market, only Mexico seems to be affected by Chinese

imported goods and with an elasticity below one, which means that the effect in the US market was very limited. In the EU market, estimated elasticities for Brazil and Mexico are above two, and then exports of these two countries suffered more than proportionately by the import of Chinese goods. In developing market, the effect is very similar to the EU market, as the estimated elasticity was around 2 for Brazil and Mexico. Peruvian intermediary goods exported were not affected by the Chinese competition in neither market: developed and developing regions.

Conclusion

In this paper, the impact of Chinese goods in the exports of three LA countries (Brazil, Mexico and Peru) to developed and developing regions is estimated. These three countries represent different trade economic zones in LA: MERCOSUR, NAFTA and Andean Community. Results suggest that these countries were highly affected by the Chinese competition in both regions. Overall, elasticities estimated show that an increase of Chinese penetration in any market generally imposes a larger loss in these countries export, since the elasticities magnitude is over 1 in most cases. Considering the expansion of China was 7.7% in the US and 4.5% in the EU from 2000 until 2007, the loss of the exports due to the Chinese expansion in these markets was 5.7% and 7.2%, respectively.[7] This evidence contrasts with those using aggregate data, which showed a higher impact in the US rather than in the European Union, see Pereira (2014). However, results using aggregate data are based on the comparison of absolute value of the loss in USD. In this paper, just considering the US as a destination, these three countries lost USD 9 billion dollars in exports because of Chinese goods.

Comparing results of which country was mostly affected, outcomes suggest that countries with a trade agreement, such as NAFTA from Mexico and the US, tend to be less impacted by the inclusion of a new competitor in relative terms, but these results need to be corroborated with other investigations since most of the effect might have taken place before signing the trade agreement.[8] Despite this discussion on trade agreements, it is evident that Brazil was the most affected by the China shock, since elasticities estimated are predominantly higher in the Brazilian case.

Impact of trade shocks on the margins is still debatable in the current trade literature [Goldberg and Pavcnik (2016)], but outcomes of this paper provide robust evidence on the effect of the China shock on the margins of trade. However, it is not clear which margin, intensive or extensive, was mostly affected by the Chinese shock, because results differ substantially across countries. However, evidence on different types of goods seems more robust as they show a higher impact on final goods compared to intermediary goods. These results on types of goods are complementary to what Bas and Bombarda (2012) found for French exporters. According to their findings, intermediary goods were more imported after the liberalization process occurred in Asian countries, especially China, which means that these countries are assembling goods in their territory to export to other countries. This is not surprising as China has become the main manufacturing country in the world.

Although this paper has shed some lights on the impacts of China in exporting firms from other developing countries, other venues should be explored. For instance, outcomes suggest that trade agreements might be an important tool to mitigate the impact in trade relations originated by an exogenous shock, especially by the increase competition from other countries. However, further research should be pursued in order to confirm this hypothesis, which may provide an additional argument to foster trade agreements between countries.

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[7] Elasticity in the US market was 0.75, while in the EU market 1.58, see Tables 2 and 3.

[8] Mexico export volume to the US is ten times larger than Brazil, for example. Therefore, the total amount lost in the Mexican case is definitely larger than the other two countries, although estimated elasticity is lower.

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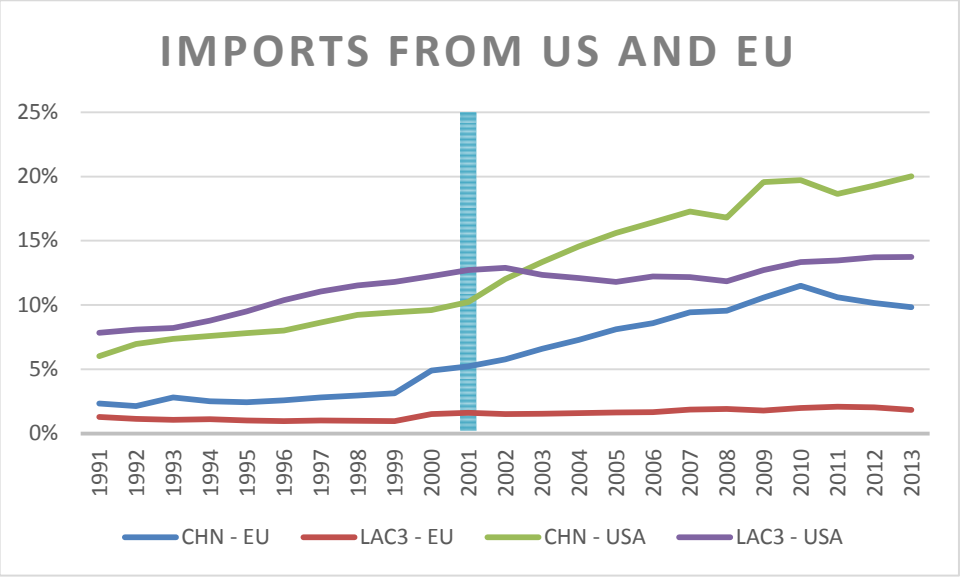
Graphs and Tables

Graph 1: Import Share of China and three Latin American Countries (Brazil, Mexico and Peru) in two markets: the US and the European Union



Source: UNCOMTRADE, author's elaboration

Table 1: China impact in the exports from Brazil, Mexico and Peru to the US, EU and each other markets

	FE			IV FE		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
China Share	-0.845***	-1.443***	-0.854***	-2.139***	-1.449***	-0.891***
	(0.061)	(0.027)	(0.029)	(0.198)	(0.028)	(0.031)
Size	0.029***	0.104***		0.029***	0.104***	
	(0.001)	(0.001)		(0.001)	(0.001)	
Country's Market Share in RoW	0.178***	0.351***	0.310***	0.175***	0.350***	0.310***
	(0.005)	(0.002)	(0.003)	(0.005)	(0.002)	(0.003)
MFN tariffs	-0.171***	-0.134***	-0.180***	-0.164***	-0.135***	-0.179***
	(0.014)	(0.008)	(0.010)	(0.014)	(0.008)	(0.010)
Observations	1,650,721	1,584,784	1,458,478	1,640,561	1,576,584	1,452,905
R-squared	0.116	0.417	0.468	0.106	0.335	0.340
Fixed Effects						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Prod-Orig-Dest FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	No	Yes	No
Firm-Orig-Dest-Year FE	No	No	Yes	No	No	Yes
First Stage Results						
R-squared				0.331	0.335	0.340
F-stat model				3.049	3.049	3.050
F-test endog var				74410	70898	61809
Prob > F endog var				0	0	0

Robust standard errors clustered at firm-product-origin-destination in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Impact of China in the exports from Brazil, Mexico and Peru in the US market

	FE			IV – EU as instrument, 3-year lag		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
China Share in US, 1-year lag	-0.543***	-1.108***	-0.814***	-1.183***	-1.106***	-0.749***
	(0.077)	(0.033)	(0.035)	(0.272)	(0.042)	(0.044)
Size	0.037***	0.108***		0.037***	0.108***	
	(0.001)	(0.002)		(0.001)	(0.002)	
Country's Market Share in RoW	0.151***	0.325***	0.307***	0.149***	0.325***	0.307***
	(0.006)	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)
Tariff	-0.000	-0.043***	-0.010	0.008	-0.042***	-0.008
	(0.026)	(0.011)	(0.013)	(0.026)	(0.011)	(0.013)
Observations	1,080,043	1,004,217	965,383	1,071,976	998,761	961,625
R-squared	0.124	0.408	0.425	0.121	0.407	0.424
Fixed Effects						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Prod-Orig FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	No	Yes	No
Firm-Orig-Year FE	No	No	Yes	No	No	Yes
First Stage Results						
R-squared				0.373	0.380	0.383
F-stat model				18.62	18.82	18.80
F-test endog var				43776	38118	36490
Prob > F endog var				0	0	0

Robust standard errors clustered at firm-product-origin in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Impact of China in the exports from Brazil, Mexico and Peru in the EU market

	FE			IV – US as instrument, 3-year lag		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
China Share in EU, 1-year lag	-1.372***	-1.218***	-0.858***	-3.249***	-2.045***	-1.575***
	(0.213)	(0.060)	(0.061)	(0.873)	(0.086)	(0.087)
Size	0.019***	0.104***		0.019***	0.102***	
	(0.001)	(0.004)		(0.001)	(0.004)	
Country's Market Share in RoW	0.171***	0.326***	0.305***	0.171***	0.325***	0.304***
	(0.011)	(0.005)	(0.005)	(0.010)	(0.005)	(0.005)
Tariff	0.251	-0.175***	-0.156***	0.240	-0.150***	-0.136***
	(0.173)	(0.017)	(0.018)	(0.174)	(0.018)	(0.019)
Observations	380,126	339,049	328,881	378,723	337,729	327,620
R-squared	0.114	0.553	0.566	0.123	0.550	0.564
Fixed Effects						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Prod-Orig FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	No	Yes	No
Firm-Orig-Year FE	No	No	Yes	No	No	Yes
First Stage Results						
R-squared				0.326	0.332	0.334
F-stat model				24.86	24.36	24.46
F-test endog var				10162	8062	7751
Prob > F endog var				0	0	0

Robust standard errors clustered at firm-product-origin in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Impact of China in the exports from Brazil, Mexico and Peru in the US market by country

	FE						IV - EU as instrument, 3-year lag					
	BRA		PER		MEX		IV - BRA		IV - PER		IV - MEX	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
China Share in US, 1-year lag	-0.287	-1.279***	-0.511**	-0.783***	-0.551***	-0.743***	-2.091**	-0.960***	-2.612***	-1.004***	-1.049***	-0.654***
	(0.193)	(0.092)	(0.213)	(0.077)	(0.091)	(0.041)	(0.959)	(0.120)	(0.876)	(0.104)	(0.295)	(0.053)
Size	0.015***		0.036***		0.044***		0.015***		0.037***		0.044***	
	(0.001)		(0.003)		(0.001)		(0.001)		(0.003)		(0.001)	
Country's Market Share in RoW	0.212***	0.356***	0.095***	0.284***	0.085***	0.302***	0.218***	0.356***	0.093***	0.284***	0.083***	0.302***
	(0.016)	(0.010)	(0.015)	(0.007)	(0.007)	(0.004)	(0.017)	(0.010)	(0.015)	(0.007)	(0.007)	(0.004)
Tariff	-0.031	-0.176***	0.015	-0.013	-0.148***	0.451***	-0.038	-0.173***	0.012	-0.019	-0.137***	0.460***
	(0.155)	(0.020)	(0.057)	(0.020)	(0.030)	(0.026)	(0.156)	(0.020)	(0.057)	(0.020)	(0.030)	(0.026)
Observations	161,859	137,613	88,904	81,144	829,280	746,626	161,129	137,004	88,727	80,959	822,120	743,662
R-squared	0.131	0.506	0.173	0.555	0.116	0.383	0.106	0.503	0.174	0.555	0.114	0.383
Fixed Effects												
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
First Stage Results												
R-squared							0.384	0.389	0.320	0.327	0.384	0.396
F-stat model							22.87	21.08	13.09	12.77	18.70	19.38
F-test endog var							3551	2740	2455	1940	39795	33573
Prob > F endog var							0	0	0	0	0	0

Robust standard errors clustered at firm-product in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Impact of China in the exports from Brazil, Mexico and Peru in the EU market by country

	FE						IV - US as instrument, 3-year lag					
	BRA		PER		MEX		IV - BRA		IV - PER		IV - MEX	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
China Share in EU	-1.472***	-0.713***	-1.297***	-0.341***	-1.437***	-1.551***	-3.741***	-1.931***	-0.904	-0.224*	-2.334	-2.357***
	(0.290)	(0.107)	(0.378)	(0.089)	(0.555)	(0.125)	(1.258)	(0.164)	(1.879)	(0.120)	(1.523)	(0.170)
Size	0.012***		0.030***		0.037***		0.012***		0.030***		0.037***	
	(0.001)		(0.003)		(0.003)		(0.001)		(0.003)		(0.003)	
Country's Market Share in RoW	0.174***	0.370***	0.075***	0.326***	0.096***	0.181***	0.176***	0.363***	0.071***	0.326***	0.093***	0.182***
	(0.015)	(0.009)	(0.020)	(0.007)	(0.020)	(0.008)	(0.015)	(0.009)	(0.019)	(0.007)	(0.021)	(0.008)
Tariff	-1.032***	-0.241***	0.284	0.245***	-1.102***	-0.256***	-1.016***	-0.210***	0.195	0.247***	-1.098***	-0.227***
	(0.273)	(0.027)	(0.332)	(0.037)	(0.347)	(0.033)	(0.275)	(0.028)	(0.343)	(0.037)	(0.349)	(0.034)
Observations	192,824	163,779	76,890	71,346	110,412	93,756	191,990	163,058	76,623	71,067	110,110	93,495
R-squared	0.087	0.541	0.157	0.582	0.056	0.512	0.091	0.538	0.167	0.579	0.058	0.511
Fixed Effects												
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
First Stage Results												
R-squared							0.311	0.315	0.376	0.394	0.367	0.368
F-stat model							24.51	23.88	25.61	25.56	24.52	24.81
F-test endog var							4720	3487	1467	1292	6135	4493
Prob > F endog var							0	0	0	0	0	0

Robust standard errors clustered at firm-product in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Impact of China in the exports from Brazil, Mexico and Peru in the each other market

Exporting Country	Brazil		Mexico		Peru	
Destination Country	MEX	PER	BRA	PER	MEX	BRA
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
China Share	-1.874***	-1.429***	-2.035***	-1.985***	-0.093	-0.845
	(0.446)	(0.292)	(0.411)	(0.326)	(0.422)	(0.958)
Observations	60,867	62,378	15,511	15,532	6,979	2,393
R-squared	0.417	0.438	0.516	0.516	0.655	0.761
First Stage Results						
R-squared	0.257	0.169	0.186	0.097	0.140	0.190
F-stat model	8.955	7.062	8.095	6.040	12.05	5.720
F-test endog var	697.3	395.5	124.4	24.37	4.251	56.19
Prob > F endog var	0	0	0	8.12e-07	0.0393	0

Robust standard errors clustered at firm-product in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Impact of China in the exports from Brazil, Mexico and Peru by Distinct Margins (Intensive and Extensive)

	Intensive Margin													
Exporting Country	All	Brazil	Mexico	Peru	All	Brazil	Mexico	Peru	Brazil		Mexico		Peru	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(11)	(12)
Destination	USA				EU				MEX	PER	BRA	PER	BRA	MEX
China Share	-0.195**	-1.088***	0.142	-1.586***	-1.626***	-2.476***	-1.788***	-0.479**	-1.925**	-2.195***	-2.836***	-2.096***	-2.159	-1.050
	(0.080)	(0.252)	(0.092)	(0.198)	(0.170)	(0.339)	(0.347)	(0.209)	(0.799)	(0.494)	(0.674)	(0.500)	(1.942)	(0.697)
Observations	404,113	55,572	318,258	30,283	123,495	65,719	30,296	27,480	29,431	30,505	5,839	6,661	691	2,663
R-squared	0.432	0.525	0.388	0.604	0.582	0.552	0.494	0.659	0.422	0.460	0.540	0.543	0.825	0.658
	Extensive Margin													
China Share	-0.825***	-0.803***	-0.794***	-0.783***	-1.355***	-1.477***	-1.951***	-0.311***	-1.578***	-0.230	-0.978**	-1.386***	-0.267	0.538
	(0.032)	(0.095)	(0.037)	(0.082)	(0.070)	(0.126)	(0.134)	(0.102)	(0.376)	(0.239)	(0.413)	(0.298)	(0.801)	(0.421)
Observations	511,843	72,998	390,951	47,894	186,297	87,346	57,549	41,402	28,169	29,153	8,302	7,641	1,424	3,820
R-squared	0.520	0.530	0.501	0.550	0.596	0.567	0.584	0.546	0.501	0.502	0.575	0.594	0.714	0.665
	Extensive Margin: Entry													
China Share	-1.138***	-0.946***	-1.201***	-0.972***	-0.917***	-1.177***	-1.180***	-0.251	-1.625*	-1.807**	-1.044	0.398	-0.139	0.499
	(0.061)	(0.149)	(0.079)	(0.127)	(0.114)	(0.197)	(0.234)	(0.165)	(0.933)	(0.719)	(1.283)	(2.598)	(1.643)	(0.669)
Observations	133,597	29,385	87,502	16,710	59,157	33,440	11,690	14,027	6,812	6,106	742	598	316	1,109
R-squared	0.588	0.549	0.571	0.575	0.649	0.599	0.677	0.551	0.446	0.468	0.722	0.666	0.707	0.697
	Extensive Margin: Product													
China Share	-0.691***	-0.731***	-0.662***	-0.652***	-1.611***	-1.814***	-2.211***	-0.340**	-1.731***	0.230	-0.863*	-1.474***	0.395	0.753
	(0.038)	(0.133)	(0.042)	(0.116)	(0.095)	(0.180)	(0.176)	(0.139)	(0.443)	(0.280)	(0.486)	(0.306)	(1.482)	(0.587)
Observations	357,959	35,362	296,316	26,281	104,177	43,659	37,208	23,310	16,155	17,078	5,735	5,397	602	1,641
R-squared	0.485	0.478	0.472	0.531	0.543	0.511	0.526	0.520	0.472	0.458	0.512	0.550	0.702	0.628

Robust standard errors clustered at firm-product or at firm-product-destination in parentheses, depending on the specification

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Impact of China in the exports from Brazil, Mexico and Peru by Distinct Products Classification: Final e Intermediary

	Final Goods													
Country	All	Brazil	Mexico	Peru	All	Brazil	Mexico	Peru	Brazil		Mexico		Peru	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(11)	(12)
Destination	USA				EU				MEX	PER	BRA	PER	BRA	MEX
China Share	-2.208***	-3.069***	-2.139***	-1.860***	-2,124***	-3.367***	-3.071***	-0.439**	-5.174***	-3.184***	-2.790***	-2.932***	0.426	-0.857*
	(0.056)	(0.152)	(0.069)	(0.118)	(0.096)	(0.187)	(0.210)	(0.129)	(0.589)	(0.393)	(0.495)	(0.430)	(0.942)	(0.480)
Observations	466,962	59,578	347,197	60,187	170,297	72,836	41,847	55,614	20,093	19,320	3,902	5,548	882	4,689
R-squared	0.522	0.532	0.485	0.586	0.578	0.534	0.564	0.553	0.432	0.477	0.569	0.551	0.797	0.634
	Intermediaries Goods													
China Share	-0.501***	-0.003	-0.583***	-0.227	-2.451***	-2.228***	-3.198***	-0.490	-1.882**	-2.420***	-1.874**	-1.689***	-5.379	-1.080
	(0.092)	(0.246)	(0.103)	(0.305)	(0.264)	(0.452)	(0.398)	(0.464)	(0.907)	(0.569)	(0.949)	(0.586)	(3.989)	(1.706)
Observations	453,732	69,579	366,169	17,984	140,266	81,066	45,836	13,364	37,518	40,193	10,438	8,941	1,324	1,940
R-squared	0.425	0.564	0.385	0.616	0.612	0.614	0.532	0.734	0.484	0.481	0.528	0.560	0.766	0.738

Robust standard errors clustered at firm-product or at firm-product-destination in parentheses, depending on the specification

*** p<0.01, ** p<0.05, * p<0.1