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THE COMPETITION BETWEEN CHINA AND KOREA FOR EXPORT MARKETS IN LATIN AMERICA: AN ANALYSIS BY TECHNOLOGICAL CATEGORIES

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THE COMPETITION BETWEEN CHINA AND KOREA FOR EXPORT MARKETS IN LATIN AMERICA: AN ANALYSIS BY TECHNOLOGICAL CATEGORIES[*]

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SUMÁRIO

ABSTRACT

Taking into account the increasing competition between Korea and China in international markets, the proposed study aims to investigate the competition between the two countries for export markets in Latin America, between 2001 and 2019. The paper builds an index of exports quality, based on the classification of exports by technological intensity: primary products, resource-based manufactures, low-tech, medium-tech and high-tech manufactures. Besides that, we calculate an index of competition between Korea and China in Latin American markets, for the period. Then, we estimate an exports function for Korean exports to Latin America by using dynamic panel-data analysis, taking the index of competition, the Chinese exchange rate, and Latin American GDP as explanatory variables. The results suggest a negative impact of the Chinese exchange rate and of competition between China and Korea on Korean exports and a positive impact of the Latin American countries' GDP on Korean exports.

Keywords: exports, exchange rate, China, Korea, panel data.

JEL classification: F14; O33

RESUMO

Considerando a crescente competição entre a China e a Coreia no mercado internacional, o presente estudo tem como objetivo investigar a competição entre os dois países por mercados de exportação na América Latina, durante o período entre 2001 e 2019. Para isso, o trabalho constrói um índice de qualidade das exportações, agregando os produtos em cinco grupos, segundo intensidade tecnológica: produtos primários, manufaturas baseadas em recursos naturais, manufaturas de baixa, média e alta tecnologia. Além disso, calcula-se um índice de competição entre a China e a Coreia nos mercados latino-americanos, durante o período. Em seguida, estimamos a relação entre as exportações coreanas para a América Latina, o índice de competição com a China e a taxa de câmbio chinesa, usando um modelo de dados em painel dinâmico. O resultado da estimação sugere um impacto negativo da taxa de câmbio chinesa e da competição entre a China e a Coreia sobre as exportações coreanas e um impacto positivo do PIB dos países da América Latina sobre as exportações da Coreia.

Palavras-chave: exportações, taxa de câmbio, China, Coreia, dados em painel.

Classificação JEL: F14; O33

1. INTRODUCTION

Trade between Korea and Latin American countries have grown at an average annual rate of 13% between 2000 and 2013. In 2013, the region absorbed 6% of Korean exports and originated 3.5% of its imports (ECLAC, 2015). In absolute terms, Korea exported approximately U$ 27 billion to Latin America in 2018. Also, Korea presents a growing trade surplus with the region over the last two decades.

There is large potential for increasing cooperation and trade between Korea and Latin America, given the complementarity between their economies. Thus, there are many opportunities for the diversification of bilateral trade in the coming years. As an initial effort in that direction, free trade agreements have been signed between the Republic of Korea and three countries in the region: Chile, Peru and Colombia (ECLAC, 2015).

On the other hand, China has increased its role in international trade over the last two decades, and has also changed its exports profile towards more technologically sophisticated goods (Naughton, 2018). As a consequence of such developments, China has increased its competition with Korea's exports in third markets. According to the Korea Institute for Industrial Economics & Trade (KIET), 37 percent of South Korea's and China's export items are currently overlapping with each other as China's export industry structure shifts toward capital- and technology-intensive sectors. In particular, China has increased its share of exports and imports in Latin America, and it is now the main trade partner for several countries in the region.

Taking into account the increasing competition between Korea and China in third markets, the proposed study aims to investigate the competition between the two countries for export markets in Latin America. In particular, it examines the evolution of exports from Korea and from China to twelve major Latin American countries between 2001 and 2019, in order to estimate the impact of China's competition in Korea's exports to the region. The twelve countries in our sample are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela, and they represent 93% of the total GDP in the Latin America in 2019 (according to the ECLAC database).

The main questions this paper aims to address are: do Korea and China have similar sectoral composition of exports to Latin America? How has this similarity evolved over time? How have Korean exports to Latin America been impacted by the increasing competition from China in the last two decades? What is the impact of changes in the Chinese exchange rate in the value of Korean exports to Latin America?

The remainder of the paper is organized as follows. Next section presents a brief literature review about the competition between Korea and China for export markets in Latin America. Section three describes the data, and presents the classification of exports by technological intensity, the index of competition between Korea and China, and the methodology used for estimating the exports function. In section four, we calculate the export quality index for Korea and China between 2001 and 2019, the index of export competition between these two countries over time, and present the estimated effects of the China-Korea competition and of the Chinese exchange rate on the value of Korean exports to Latin America. In the last section, we present the conclusions and policy implications of the study.

2. LITERATURE REVIEW

In this section, we provide a brief review of the related literature that emphasizes the impacts of China's expansion in international trade, especially in Latin America and the competition between Korea and China for export markets.

Lall (2000) examines the evolution of manufactured exports from developing countries, using a detailed classification by technological levels. The classification proposed by Lall (2000) divides exports into five groups of products, namely: (i) Primary products (PP): little or no processing; (ii) Resource-based manufactures (RB): generally simple, labor-intensive products, but there are also segments that use capital-, scale-, and skill-intensive technologies; (iii) Low-technology manufactures (LT): products that use stable and well-diffused technology, usually embodied in capital equipment; (iv) Medium-technology manufactures (MT): it represents a crucial segment of the industrial activity in developed economies, and comprises the majority of skill- and scale-intensive technologies in intermediate and capital goods; (v) High-technology manufactures (HT): advanced technology products in rapid evolution, characterized by high R&D investments and emphasis on product design.

Blazquez-Lidoy *et al* (2006) analyze China's trade impact on Latin American countries. They use two indices of trade competition to compare the impact of China on 15 Latin American countries during the period 1998-2004. In general terms, the results suggest that there is no relevant trade competition between China and Latin America in the United States market.

Gallagher and Porzecanski (2009) analyze the extent to which Chinese demand enhanced the performance of Latin American economies in the 2000s. Their findings suggest that China had a significant direct and indirect impact on Latin American exports, but only in a handful of countries and sectors.

Libanio (2012) examines the impacts, on Brazilian states, of China's expansion in international trade. First, the pattern of export specialization of Brazilian states was analyzed in comparison to the one of China, by calculating coefficients of specialization (Blazquez-Lidoy *et al*., 2006). Then, the correlation between these coefficients and economic growth rates for the period 1996-2009 was investigated. Results suggest that economic growth in Brazilian states has been strongly influenced by the degree of complementarity in relation to the Chinese exports, and its growing demand of agricultural and mineral commodities. Thus, states that produce and export raw materials tended to grow above the national average between 2000 and 2009.

Medeiros and Cintra (2015) analyze the presence of China and the influence of its recent economic growth in selected countries in Latin America in the last decade. The paper focuses on different Chinese interests for Latin America, on the analysis of trade flows between China and selected L.A. countries, in the influence China has had on the commodity global price increases and on Chinese investments and loans to the region, in order to clarify which Latin American countries and sectors benefit or lose with the increasing presence of China in Latin America.

Greenaway, Mahabir and Milner (2010) explored whether and how the growth of China's exports displaced exports of other Asian countries to third markets over the period 1990–2003. Over this period, China's surge in exports did appear to displace its neighbors' exports to third markets, with

a 1% increase leading to 0.07% drop in Asian countries' exports. The results provide evidence of displacement of Asian countries exports to third markets, although to a relatively small order of magnitude overall. The effect is increasing over time and greater in more industrialized country markets.

ECLAC (2015) describes Korea's development process and provides a detailed account of the trade relations between Korea and Latin American countries from 2000 to 2013. The report finds that Korea has been able to expand its exports to Latin America during the period, and also that Latin American exports to Korea are highly concentrated in a few countries, products and companies, and are chiefly made up of primary goods.

Baak (2014) examines the competition between Chinese and Korean machinery exports in the Japanese market, by employing a structural model and panel data of 16 machinery products from 2000 to 2012. His findings suggest that China and Korea compete in exporting higher technology goods.

Mattoo, Mishra and Subramanian (2017) investigate how China's exchange rate affects the exports of developing countries to third markets. They included product- and destination-specific indices of competition between China and developing country competitors over the 2000-2014 period and reported that a country's exports of products that compete with China increase when the Renminbi appreciates.

Thorbecke (2017) examines whether Korea and China compete in exporting lower-technology goods, and the impact of exchange rate shocks. His results indicate that a depreciation of the Renminbi leads to a large decrease in Korean lower-technology exports.

Eum (2019) examines the impact of changes in Chinese exchange rate on Korean exports taking into account the characteristics of the exported products. The empirical evidence provided in the paper is based on import data of OECD countries from 2002 to 2014. Eum uses three different indices to measure the substitutability and complementarity between products from Korea and China. The results suggest that Korea's exports to OECD countries of the products that have a greater degree of competition fall more as the Renminbi depreciates. However, once quality differences between Korean and Chinese products are considered in the estimation, the negative impact from the depreciation of the Chinese Renminbi turns out to be negligible.

La and Shin (2019) investigate the competition effect of the exports between Korea and China in their common-export markets considering market sophistication. Using an empirical analysis to identify the demand for product quality across countries, the paper estimates the effects of market sophistication on the competition between Korean exports and Chinese products. They consider 61 common markets for Korea and China during the period 2003–2010. Their main findings can be summarized as follows: the negative effects of the competition between Korea and China on Korea's exports to third markets are stronger where consumers are less sophisticated. On the other hand, the negative effects diminish when a third market possesses a high demand for quality, novelty, design, brand or eco-friendliness.

Prazeres, Bohl and Zhang (2021) aims to answer some questions like: What will China-LAC trade look like in 2035? How important will China be for LAC exports and imports? How will the sectoral composition of China-LAC trade evolve in fifteen years' time? For this, the report explores four alternative scenarios of China-LAC trade out to 2035, highlighting the most interesting outcomes and

implications. A key finding of the research is that China is still gaining ground in LAC trade, and is likely to continue to do so through 2035. The scenarios estimate that, by then, China's participation in overall LAC trade may range from 15 to 24 percent. In many cases, increased trade dependence on China could translate into reduced dependence on the United States. Across all four scenarios, the United States relevance as a destination of LAC exports declines.

In broad lines, an overview of the literature shows some relevant elements for the analysis proposed here. First, it is clear that China has increased its role as an exporter of goods to Latin America in the past two decades – not only in terms of the total value of exports, but also in terms of its composition, towards more sophisticated sectors. Second, the literature suggests that competition between Korea and China has increased as a consequence of the Chinese expansion. Third, exchange rates have a role to play in terms of competitiveness. And last, but not least, the role of exchange rate is less important when there is larger product differentiation – which is expected considering the importance of non-price competitiveness. The following sections of this paper will address some of these issues for the case of Latin America between 2001 and 2019.

3. DATA, MODEL AND ESTIMATION METHODOLOGY

The first goal of this research is to provide a detailed description of Korea's and China's exports to Latin American countries between 2001 and 2019. In this case, data on exports has been collected from the UN-Comtrade database, and classified in five groups, according to the categories proposed by Lall (2000): primary products, resource based manufactures, low-tech, medium-tech and high-tech manufactures. The classification adopted in this paper follows the three-digit SITC, revision 2.

Following this classification, exports were divided into two large groups, X1 and X2. The first group comprises products classified as primary products, resource-based and low-technology manufactures (PP, RB and LT, respectively). This means that X1 represents exports with lower technological content. The second group, named X2, includes medium- and high-technology manufactures (MT and HT), which correspond to products with higher technological intensity (Libanio, 2012). Then, export quality index EQI_{it} was defined as:

$$EQI_{it} = \frac{X2_{it} - X1_{it}}{Total\ exports_{it}} \quad (1)$$

This index ranges from -1 to +1. Lower values are associated with lower technological content of exports. The extreme cases are: a country exports only PP, RB and LT (EQI = -1); or a country exports only MT and HT (EQI = +1). Therefore, according to the terminology adopted here, the higher the EQI, the better is the quality (in terms of technological contents) of exports from country i in period t.

Next, an index of competition between Korea and China in Latin American markets have been calculated, for the period 2001-2019. The calculation of these indexes follows two different methodologies proposed by Blazquez-Lidoy *et al* (2006):

$$CS = 1 - \frac{1}{2}\sum_{n} | a_{it}^{n} - a_{jt}^{n}| \quad (2)$$

$$CC = \frac{\sum_n a_{it}^{n} a_{jt}^{n}}{\sqrt{\sum_n (a_{it}^{n})^2 \sum_n (a_{jt}^{n})^2}} \quad (3)$$

where a_{it} and a_{jt} represent the share of good n in exports of country i to Latin America in period t. In this case, country i would be Korea, whereas j would refer to China. If two countries have the same export profile, the CS and CC indexes would equal 1. On the other extreme, if there are no similarities between exports from the two countries, the coefficients would approach zero. In the first case, the competition for Latin American markets would be stiff between the two countries, while in the latter case there would be no competition.

Finally, the research aims to estimate the impact of the increasing competition with China as well as of real exchange rate shocks on Korea's exports to Latin America. In this case, export functions have been estimated, including competition indexes as explanatory variables:

$$X_{it} = \alpha_0 X_{it-1} + \alpha_1 RER_t + \alpha_2 CI_{it} + \alpha_3 Y_{it}^{*} + u_i + \varepsilon_{it} \quad (4)$$

where X_{it} represents Korean exports to Latin American countries, RER_t refers to the real exchange rate of the Chinese Renminbi, CI_{it} represents the index of export competition between China and Korea in Latin American markets (arithmetic mean of the terms CS and CC defined above), and Y_{it}^{*} represents real gross domestic product of the importing country. The term u_i is the unobserved heterogeneity or time invariant variables and ε_{it} is the vector of iid errors. GDP is measured in constant US dollars and the source of the GDP data is ECLAC (https://www.cepal.org/pt-br/datos-y-estadisticas). The data on real effective exchange rate is from database World Development Indicators (https://databank.worldbank.org/source/world-development-indicators).

The estimation requires an initial transformation in first differences to eliminate the individual effects u_i and a subsequent estimation by GMM (Generalized Method of Moments) with appropriate instruments to mitigate the correlation between X_{it-1} and ε_{it}.

The use of GMM methods in analysis of dynamic panels was refined by Arellano and Bond (1991), Arellano and Bover (1995) and Blundel and Bond (1998). There are at least two major variants of these estimators for dynamic panels, the GMM in first differences (Arelano and Bond, 1991; Arelano & Bover, 1995) and the GMM system estimation (Blundel and Bond, 1995). The first consists of an estimation in first differences, using as instruments the lags of the lagged term and the lags of the exogenous and pre-determined explanatory variables in level.

In this paper, we performed initially OLS levels and Within-Groups (Fixed Effects) estimations of the coefficients. Both estimators for ρ are biased, the OLS upward and the Within Groups downward. Thus, the coefficient value obtained from the OLS estimation is usually seen as an approximate upper bound whereas the coefficient obtained from the Within Group estimation is regarded as a lower bound

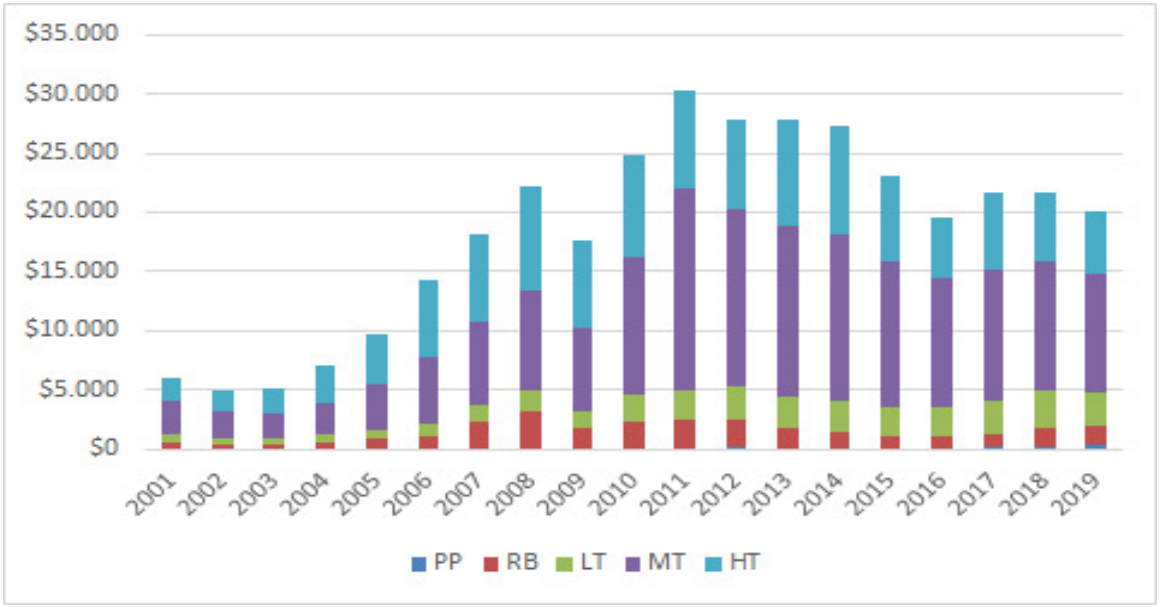
(HOEFFLER, 2002; ROODMAN, 2006). Also, we performed GMM first-difference and the System GMM. Because the coefficient value of System GMM showed that there is unit root, we choose the GMM first-difference (FD-GMM) of Arellano & Bond (1991) as the most adequate estimation method.

4. RESULTS AND INTERPRETATION

Figures 1 and 2 show the evolution of exports from Korea and from China, respectively, to Latin America between 2001 and 2019[1]. For the case of Korea, the data indicates that the total value of Korean exports have increased during the 2000's, reached a peak between 2011-2014, and have declined in recent years. Also, the figure shows that medium- and high-technology goods have been the main components of exports to Latin America during the entire period of analysis.

In the case of China, there are two important elements to be mentioned. Firstly, it should be noted that total Chinese exports to Latin America have increased substantially over the period – the value of exports in 2019 was 22 times larger than in 2001. Secondly, there has been a relevant change in the composition of Chinese exports over time, with an increase in the share of medium- and high-technology manufactures, and a decline in the other categories – low-tech manufactures, in particular. This move of Chinese exports towards a more sophisticated export profile is the most important aspect to explain the increase in the competition with Korea in Latin American markets.

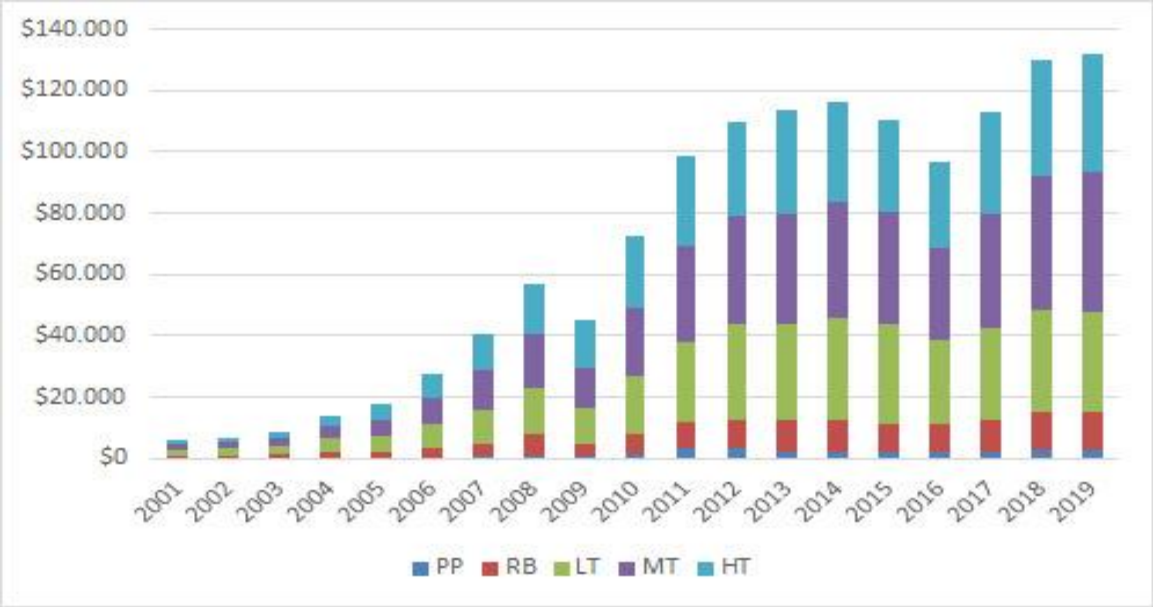
FIGURE 1
Korea: Exports to selected Latin American countries by technological classification (2001-2019)
US$ million



Source: authors' calculations using UN-Comtrade data

[1] Considering the sum of exports to the twelve countries of our sample. The data for individual countries in presented in the appendix.

FIGURE 2
China: Exports to selected Latin American countries by technological classification (2001-2019)
US$ million



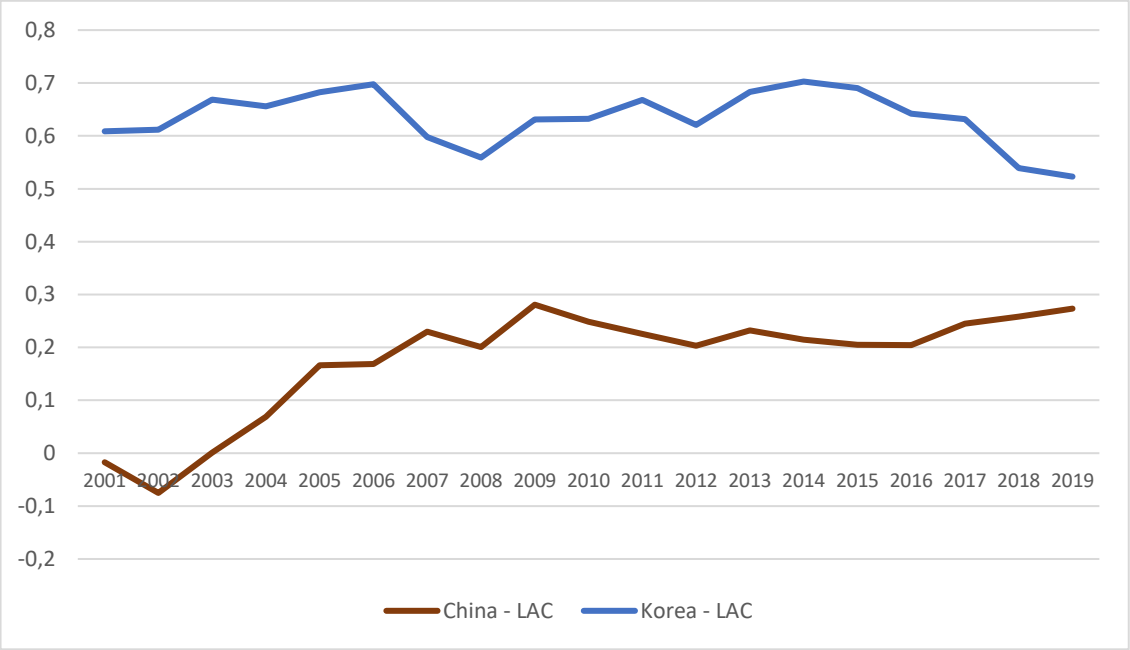
Source: authors' calculations

Lastly, it should be noted that the value of Korea's and China's exports to Latin America were similar in 2001 (around US$ 5 billion), and that in 2019 Chinese exports are 6.5 times larger than Korean exports to the region. Another interesting information is that global exports from China are 4 times larger than Korea's exports to the world. Comparing the relative export performance of both countries in Latin America to their exports to the rest of the world, one can conclude that China has a better penetration in Latin America than Korea does, in relative terms.

The export quality index (EQI) provides a measure of the changes in the composition of exports, in terms of technological content. Figure 3 shows China's and Korea's EQI to twelve Latin American countries between 2001 and 2019. In the early 2000's, China had a negative export quality index, which means lower technological content of Chinese exports, with predominance of PP, RB, and LT goods. Over time, a shift from simpler to more complex products from China explains the increase in the exports quality index. Besides that, the evolution of the EQI illustrates the fast change of the products "Made in China", which were initially associated with a lower technological content.

Korean exports to Latin America, in turn, have shown a high EQI for the entire period of analysis, ranging from +0.52 to +0.7. However, it is clear that the composition of exports from Korea and China to Latin America have become increasingly similar – as measured by the EQI – over time. This result is mainly due to the increase in the exports quality index for China, and it provides evidence of the increasing importance of the China as a competitor of Korea in international trade to Latin America.

FIGURE 3
Export quality index (EQI) for selected Latin American countries (2001-2019)

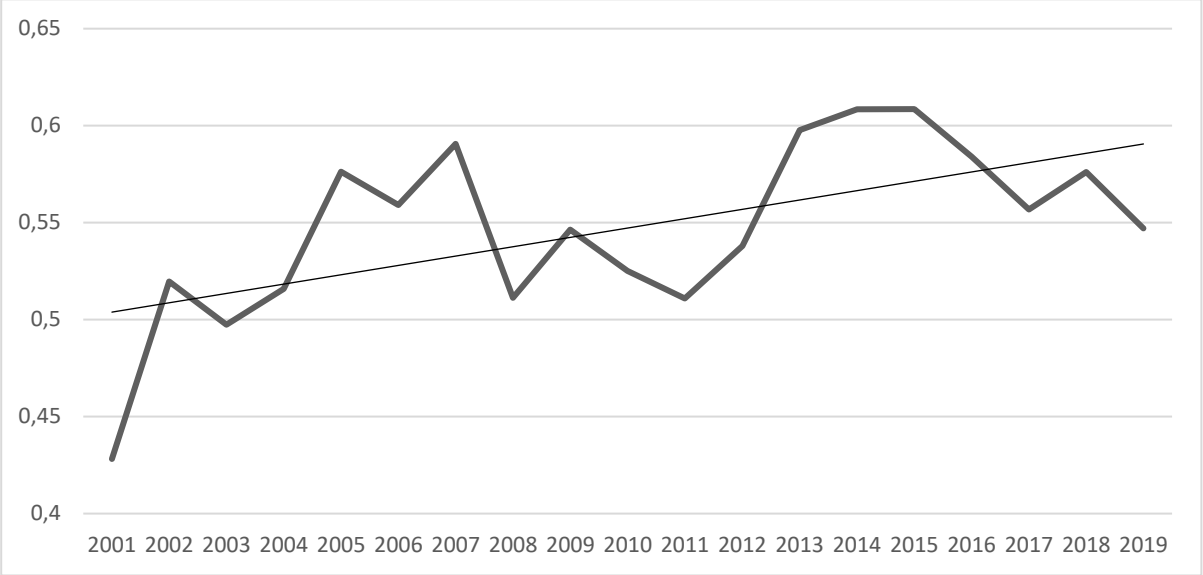


Source: authors' calculations

Figure 4 shows the index of exports competition (Blazquez-Lidoy *et al*, 2006) between Korea and China in selected Latin American countries, between 2001 and 2019. In general, the competition between both countries is increasing during the period of analysis. This means that the similarities between the structure of exports of Korea and China are increasing over time. Interestingly, the index of competition falls after reaching a peak in 2014-2015, suggesting a decline in the similarity of export composition between Korea and China.

One possible explanation for this result is the decline of Korean exports in some selected sectors or groups of products, accompanied by an increase in Chinese exports to the region, in these same sectors. In particular, Korean exports have declined whereas Chinese exports have increased in products such as passenger motor vehicles (SITC 781), heating and cooling equipment and parts (741), ships, boats and floating structures (793), optical instruments and apparatus (871), and optical goods (884).

FIGURE 4
Index of exports competition between Korea and China in Latin America (2001-2019)



Source: authors' calculations

In order to further investigate the role of the Chinese exchange rate, as well as the competition between China and Korea in exports to Latin America, we proceeded to the estimation of exports functions taking these elements as explanatory variables. Table 1 contains the results of the GMM difference estimation, selected as the most appropriate method, as presented in the previous section of this paper.

The results show that both values of the lagged terms of exports are highly significant. This is the reason to consider two lags of the Korean exports. For the real exchange rate, the negative sign suggests a negative impact from the Chinese exchange rate on Korean exports. This result means that depreciation of the Renminbi lowers export prices for products from China, improving its price competitiveness, and eventually brings about a decline in the share of other exporters (including Korea) in Latin American market. Our results can be associated with Eum (2019), whose main findings are that a depreciation of the Chinese Renminbi reduces Korean exports to OECD member countries. In addition, Eum (2019) finds that the negative spillover effects from a depreciation of the Renminbi are larger when we consider how well Chinese export product quality meets the needs of importers. In our case, as Chinese exchange rate is associated with a negative impact on Korean exports, this means that differences in the quality of products between both countries are not large enough to cancel out the effects of the currency depreciation.

Regarding the index of competition, it was negative but not statistically significant in the estimation. The negative sign confirms what is expected by theory, because it suggests that higher degree of competition with China have brought about negative effects on Korean exports during this period.

As for the GDP of selected Latin American countries, the estimated coefficient is positive and highly significant. This result suggests that Korean exports have benefited from higher growth rates in the region, which is expected by theory.

TABLE 01
Estimation of exports function, Korea to Latin America (2001-2019)

Dependent variable: Korean exports to Latin America N=192; T=19		
	GMM diff	
Independent variables	**Coef**	**Prob>z**
Korean exports_{t-1}	.8562258	0.000
Korean exports_{t-2}	-.133288	0.000
Real exchange rate	-1.15e+07	0.000
Index of competition	-2.21e+08	0.224
GDP	3303.486	0.000
Instruments		140

Source: Authors' calculation.

In sum, our estimation results are for the most part in line with the literature. Firstly, they confirm the relevance of the Chinese exchange rate, as in Mattoo, Mishra, and Subramanian (2017). In addition, the literature points out that exchange rate shocks tend to have smaller impacts when there is quality differentiation. In our case, the significant exchange rate effects may be associated with the increasing proximity of the composition of exports between China and Korea, as presented by our export quality index and by the index of exports competition.

5. CONCLUDING REMARKS

This paper aimed to examine the competition between China and Korea for export markets in Latin America, from 2001 to 2019. The paper built an index of exports quality, based on the classification by technological intensity (Lall, 2000): primary products, resource-based manufactures, low-tech, medium-tech and high-tech manufactures. Besides that, we calculated an index of competition between Korea and China in Latin American markets, for the period. Then, we estimated an exports function for Korean exports to Latin America by using panel data analysis, in order to further investigate the role of China-Korea competition and the Chinese exchange rate.

Trade between Korea and Latin American countries have grown at an average annual rate of 13% between 2000 and 2013. In 2013, the region absorbed 6% of Korean exports and originated 3.5% of its imports (ECLAC, 2015). In absolute terms, Korea exported approximately U$ 20 billion to Latin America in 2019. Also, Korea presents a growing trade surplus with the region over the last two decades. On the other hand, China has increased its role in international trade over the last two decades, and has also changed its exports profile towards more technologically sophisticated goods. As a consequence of such developments, China has increased its competition with Korea's exports in Latin American markets.

The main results of this paper are confirm the growing importance of China as a competitor for Korea in Latin America, given China's move towards a more sophisticated export basket, which was captured by the EQI over time. In addition, our estimation results suggest a depreciation of the Chinese

exchange rate and the increase of the competition between China and Korea reduces Korean exports to Latin American countries. On the other hand, the impact of Latin American countries' GDP on Korean exports is positive.

Finally, our research leads to some important economic policy implications for improving Korean exports to Latin America. First, product differentiation, based on innovation and product quality, must be pursued in order to lower the effects of a devalued Chinese exchange rate. In the current scenario, price-competitiveness is still relevant for the region. Second, bilateral trade agreements between Korea and Latin American countries may give Korea additional competitive advantages considering the growing similarity between China's and Korea's export profiles.

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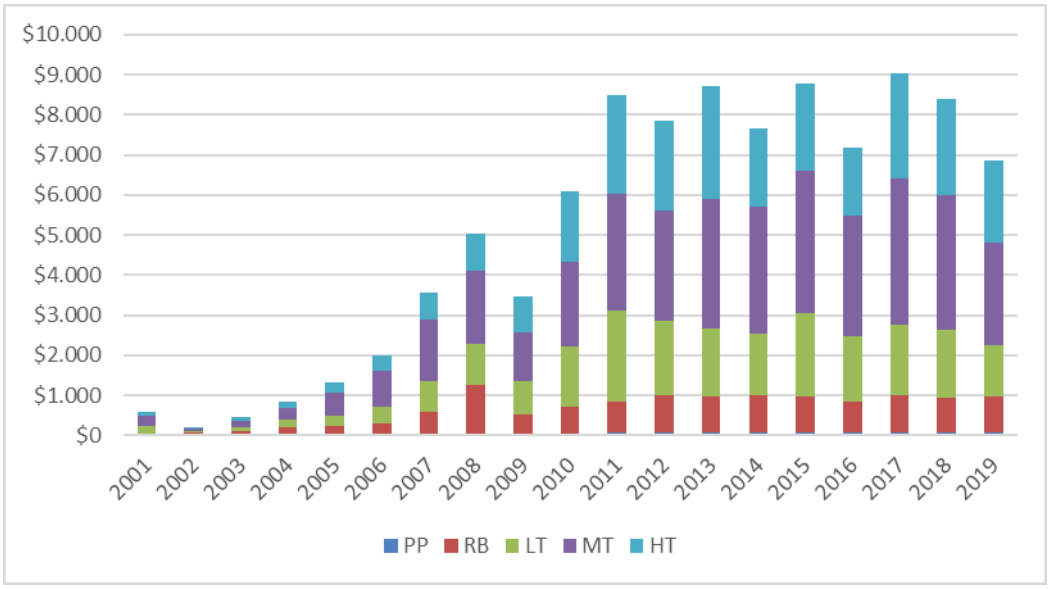
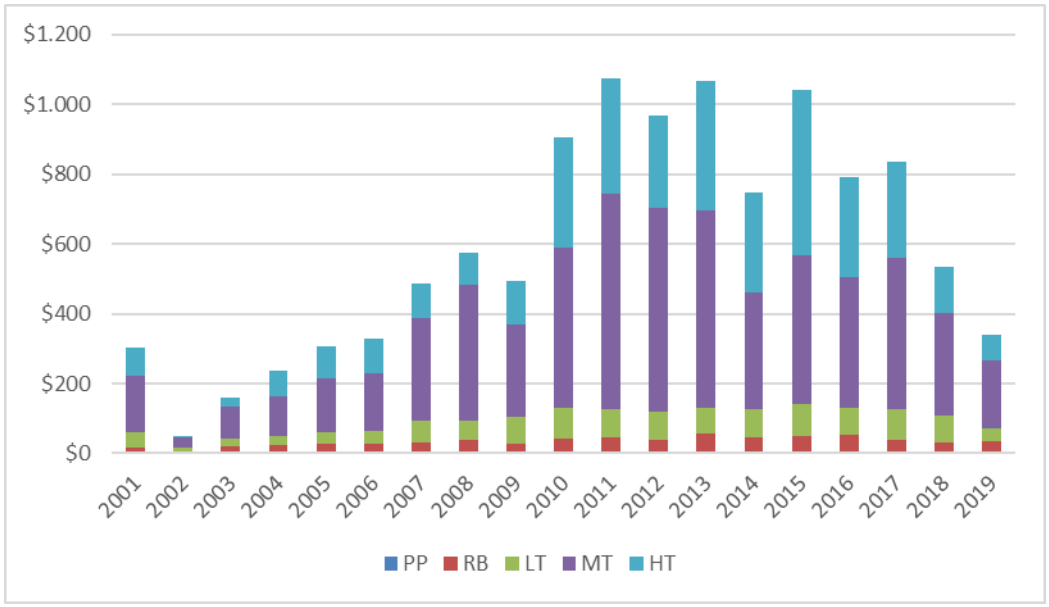
APPENDIX

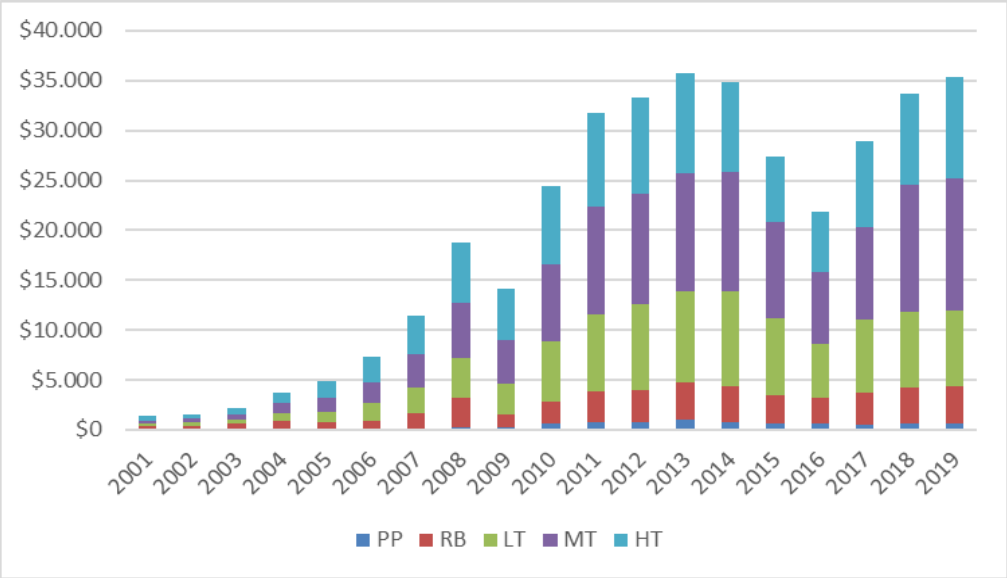
Exports by technological intensity, from China to Argentina



Exports by technological intensity, from Korea to Argentina



Exports by technological intensity, from China to Brazil



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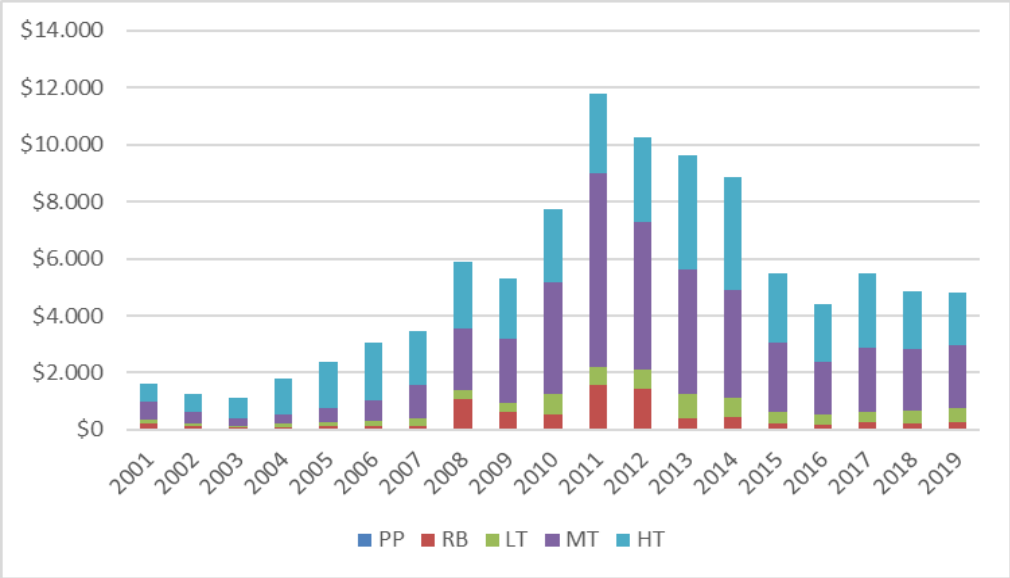
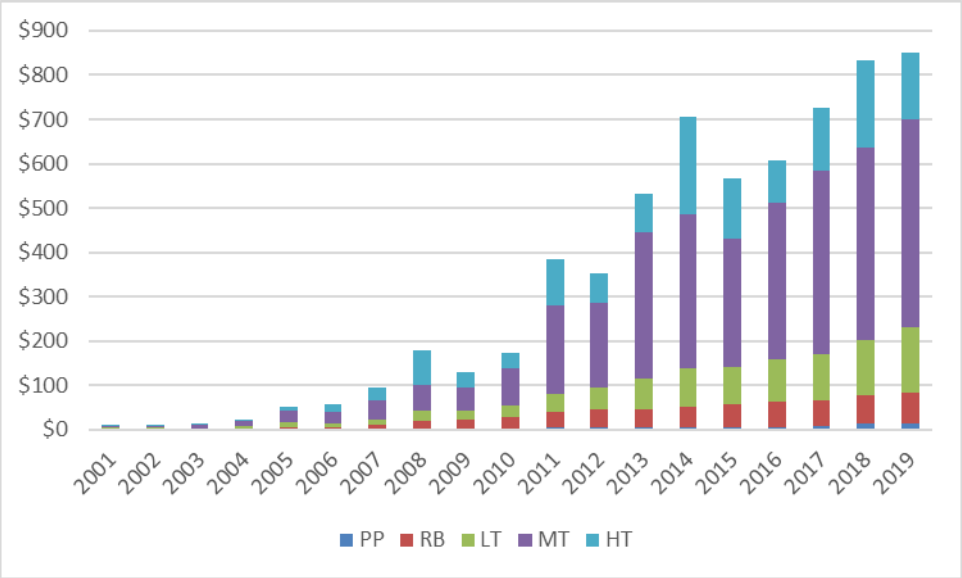


Exports by technological intensity, from China to Bolivia



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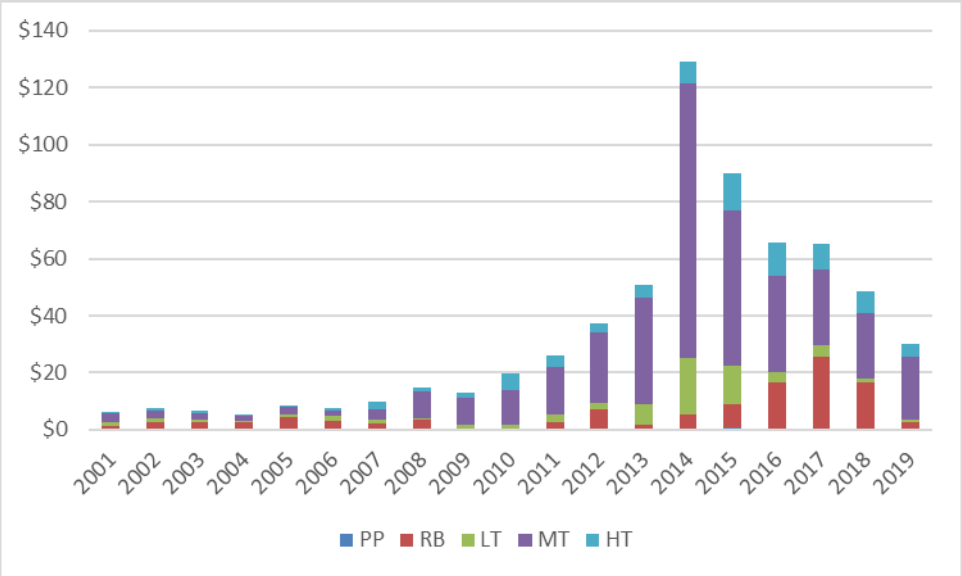
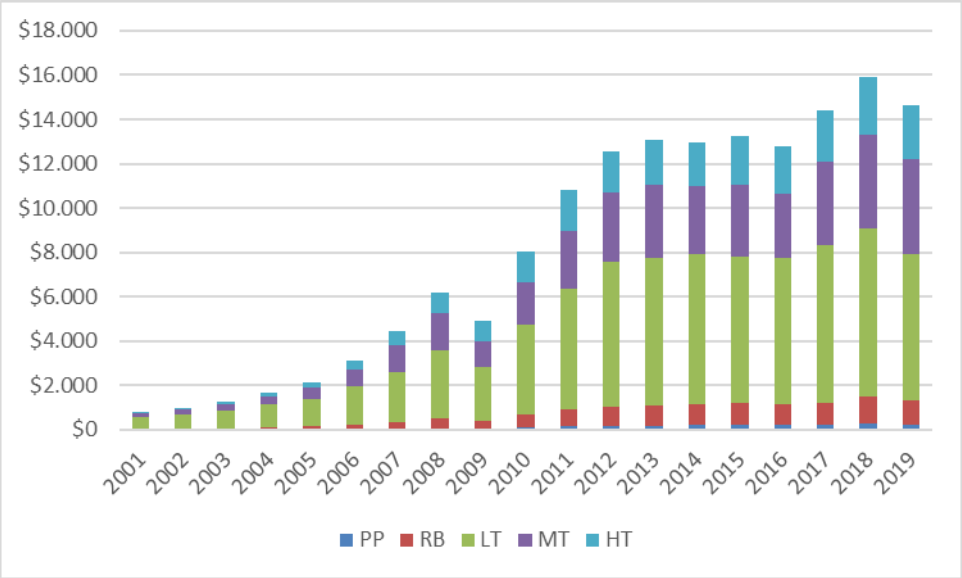
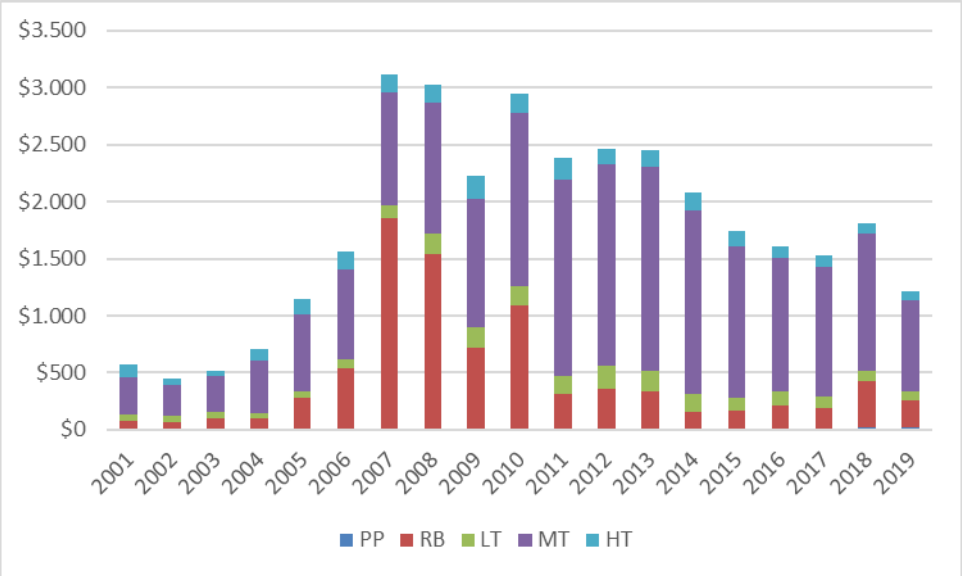


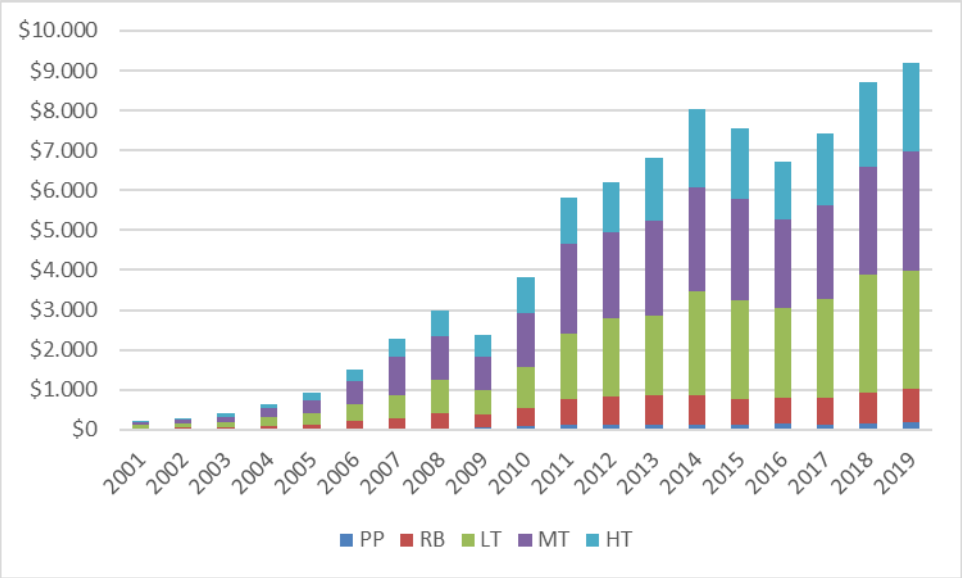
Exports by technological intensity, from China to Chile



Exports by technological intensity, from Korea to Chile



Exports by technological intensity, from China to Colombia



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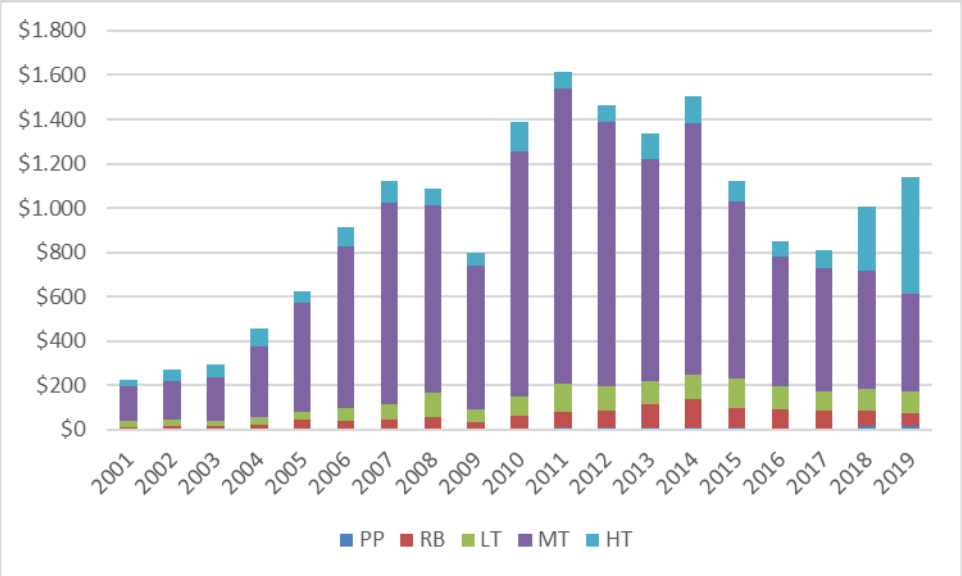
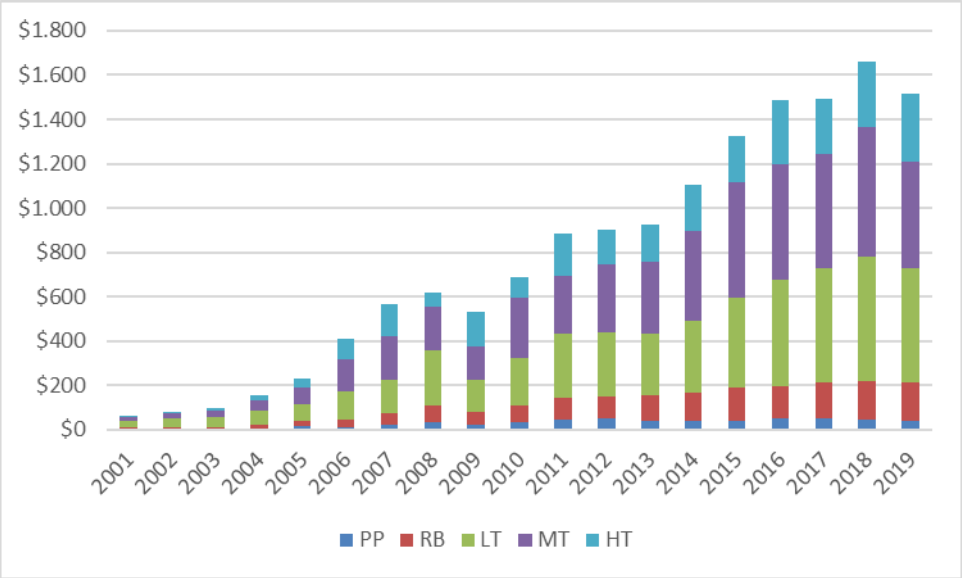


Exports by technological intensity, from China to Costa Rica



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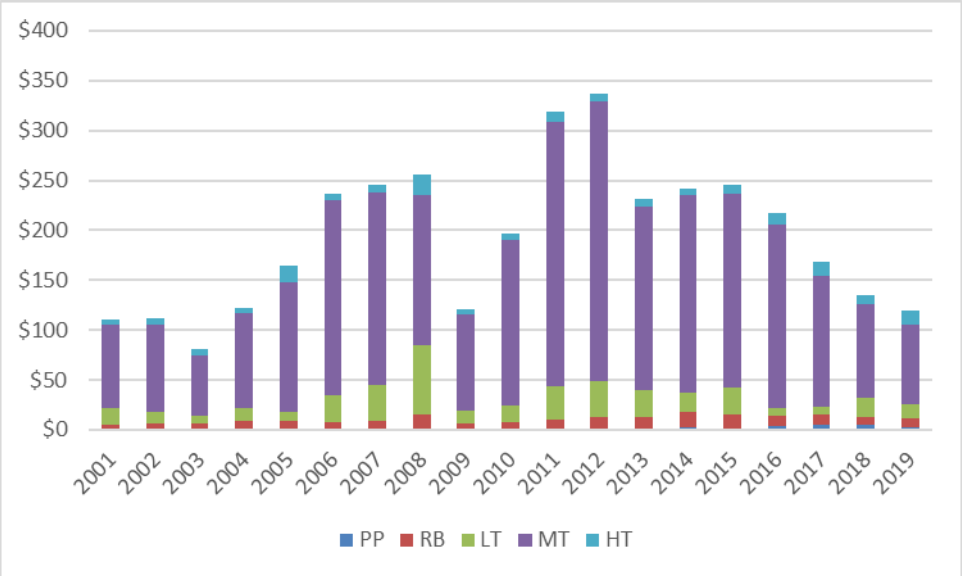
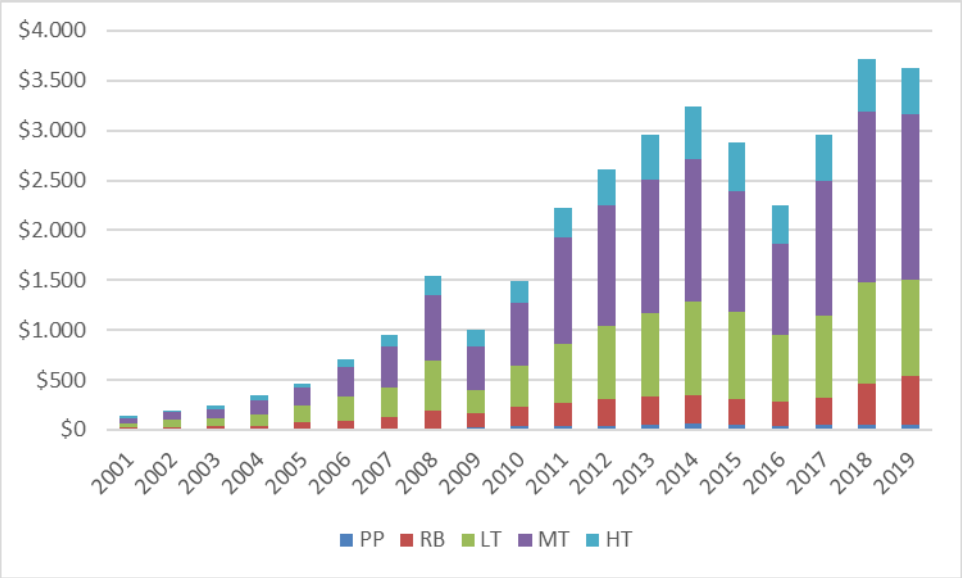
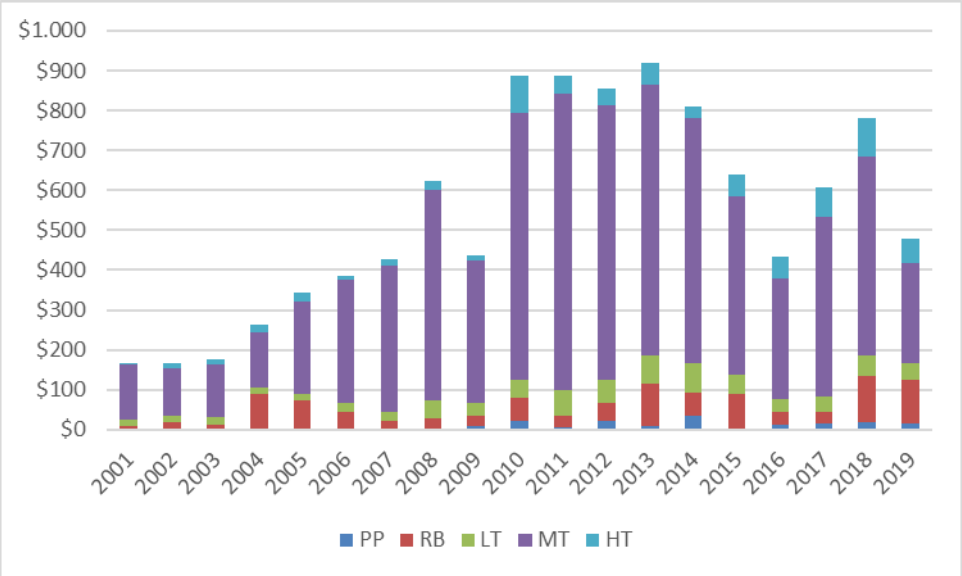


Exports by technological intensity, from China to Ecuador



Exports by technological intensity, from Korea to Ecuador



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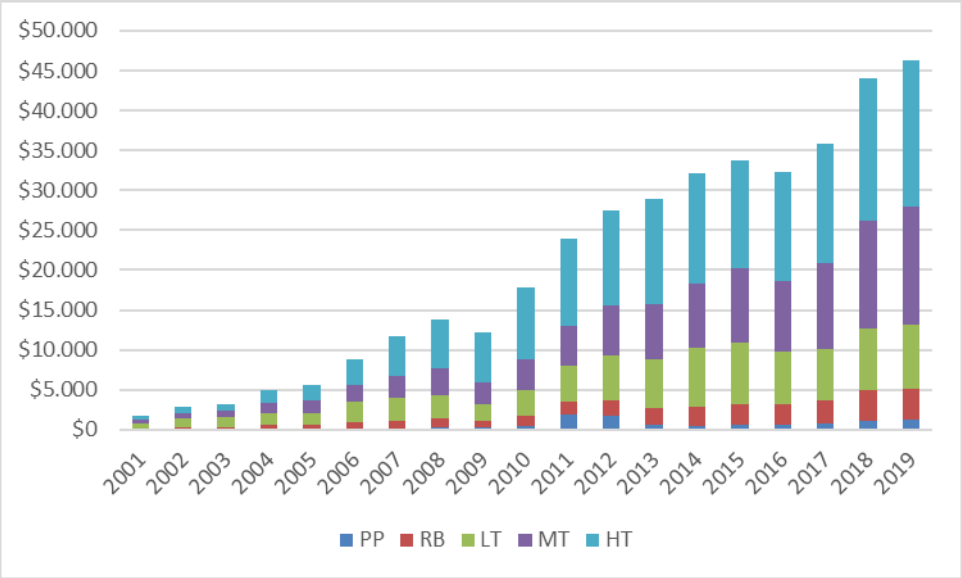
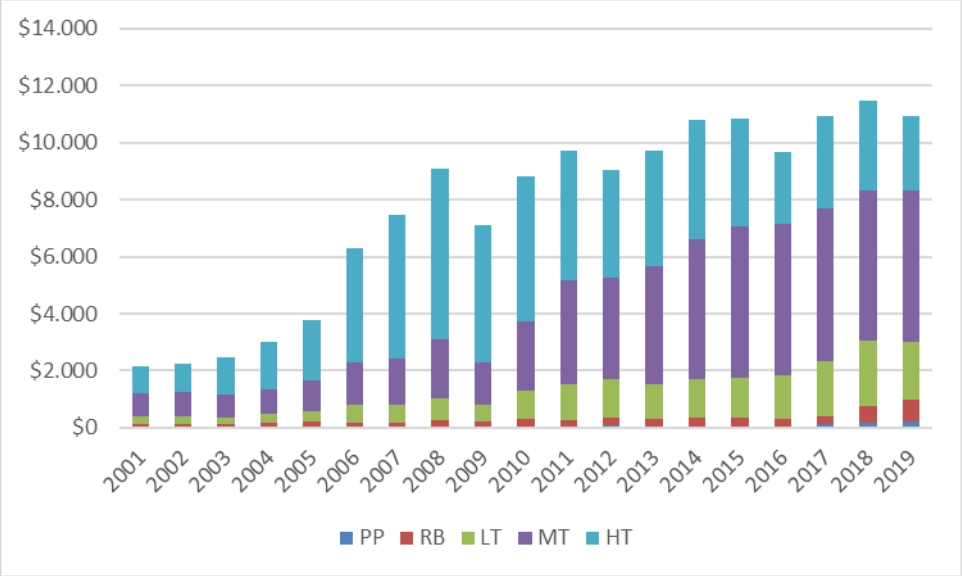
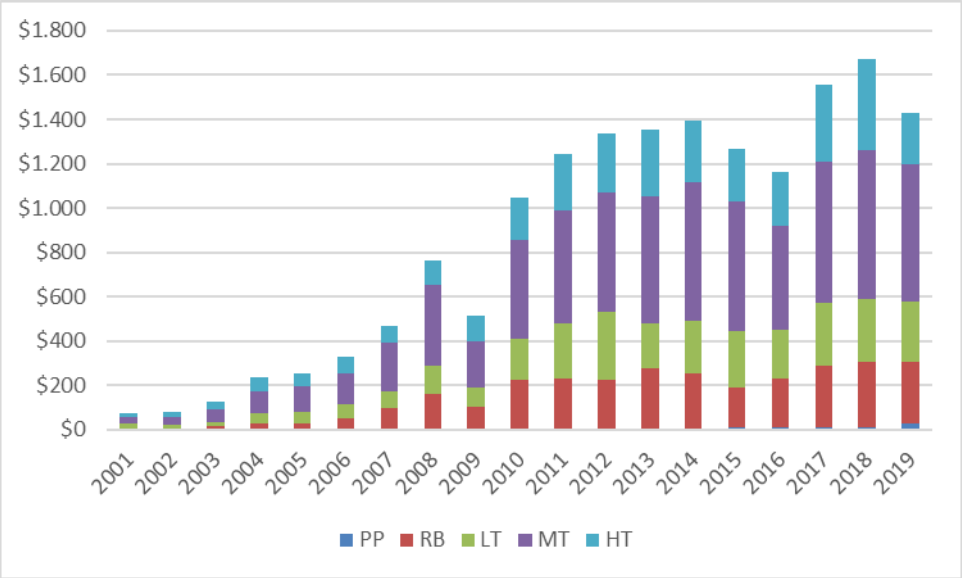


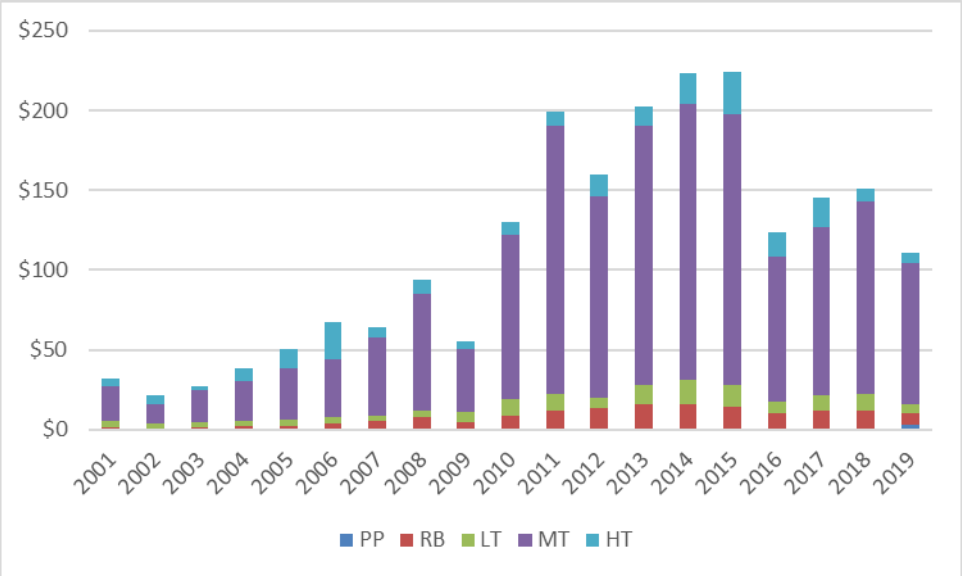
Exports by technological intensity, from Korea to Mexico



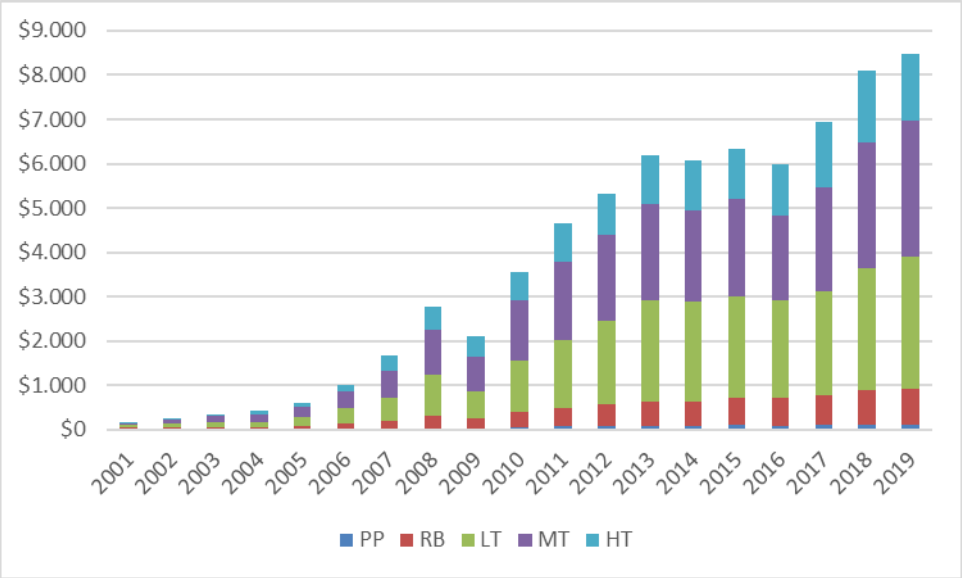
Exports by technological intensity, from China to Paraguay



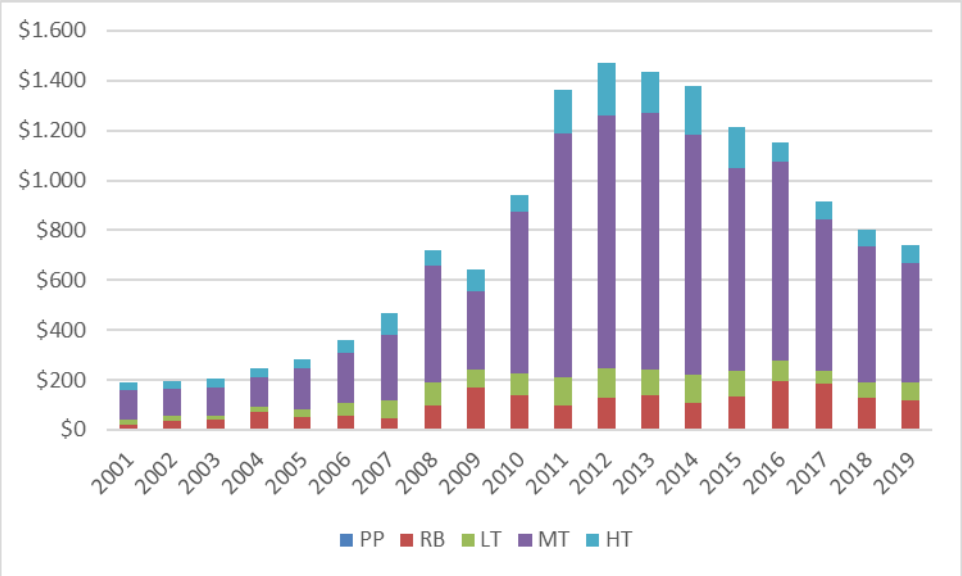
Exports by technological intensity, from Korea to Paraguay



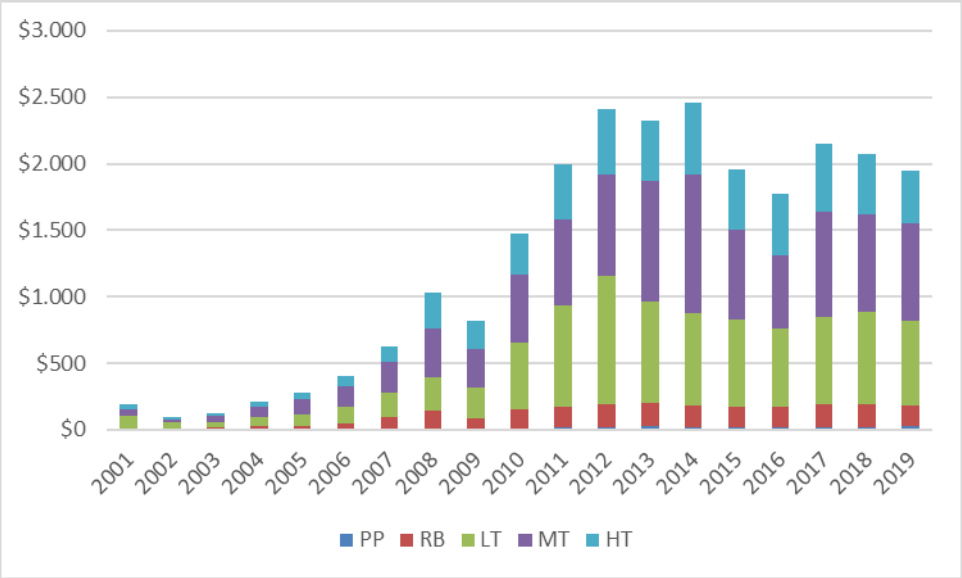
Exports by technological intensity, from China to Peru



Exports by technological intensity, from Korea to Peru



Exports by technological intensity, from China to Uruguay



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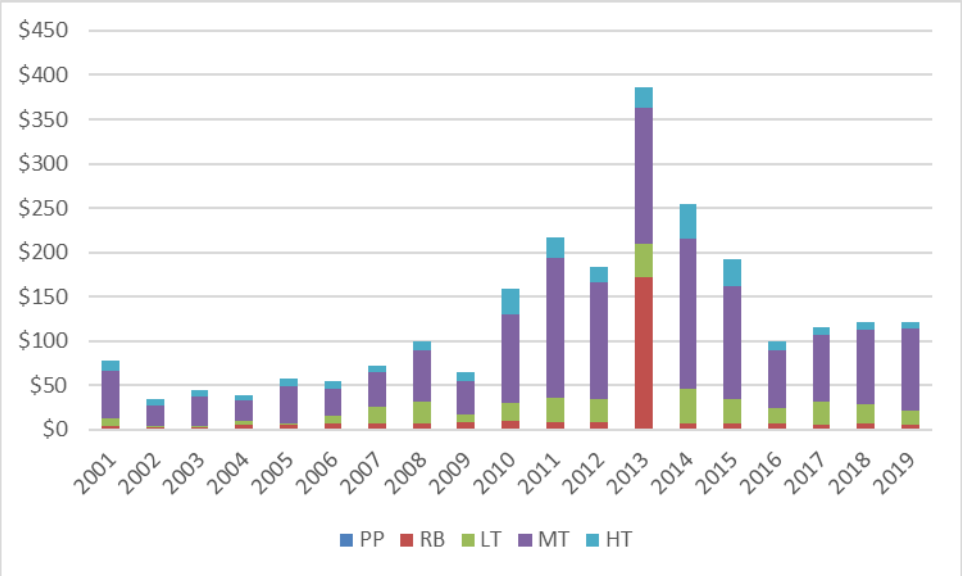

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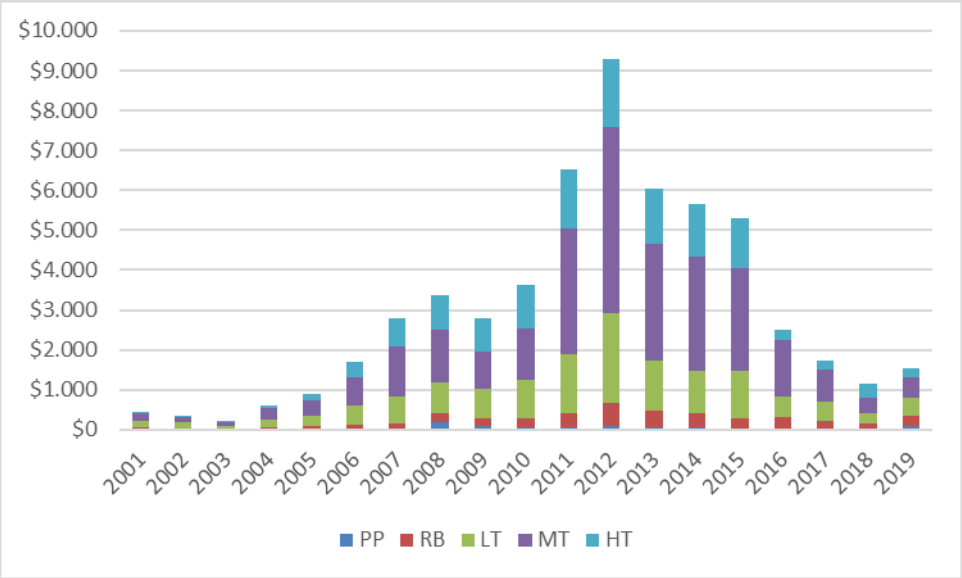

Exports by technological intensity, from Korea to Venezuela