Latin America and the Machinery Production Networks

Mateus Silva Chang
Graduate School of Economics
Keio University, Japan

Abstract

Employing disaggregated trade data obtained from the UN Comtrade, the present paper analyzes the evolution of the machinery sector trade in Latin America. Sharing the machinery data in final products and parts and components, it compares the evolution of the Latin American trade patterns with the one in other regions of the world. The objective is to examine whether the development of production networks in Latin America follows the tendency of other regions or not. As Latin America is a heterogeneous region, in a second moment the analysis focused on the performance of its main economies: Brazil and Mexico. Although both countries have a developed industrial park, Mexico’s one is more integrated with the machinery production networks than the Brazilian one.


Key words: machinery trade, fragmentation, the second unbundling, international production networks, Latin America.

1 Preliminary draft
1. Introduction

The fragmentation of production was one of the elements that boosted the development of the international trade in the last decades. In order to be more competitive, many firms expanded their plants to third countries and/or split their activities aiming to have access to cheaper factors of production. There are also cases in which a firm outsourced some steps of the production process to firms localized in different regions or countries. This fragmentation promoted an increase in global integration, driven by what Grossman and Rossi-Hansberg (2006) called “trade in tasks”, and the creation of a web of economical interactions called international production networks.

In a first moment, this movement involved mostly the trade among rich nations, but the real “revolution started when supply chain trade gained importance between high-tech and low-wage nations between 1985 and 1990” (Baldwin and Lopez-Gonzalez, 2013, p. 2). In other words, the fragmentation of the production caused a revolution, because it opened new possibilities to the developing countries, permitting their participation in the production process of manufactured goods that they did not produced before, leading to expansions in their economies. As showed in Figure 1, this fact promoted a big change in the distribution of the world export and GDP shares, resulting in a fast decrease in the shares of the developed countries in the international trade and world GDP, a reflection of the fast increase in the developing countries` shares.

== Figure 1 ==

The expansion of production networks changed the rules of the economic development game, facilitating the developing countries` access to networks, global
markets, capital, knowledge, and technology (OECD, 2013). Previously, a country had to climb every single step in the industrial development ladder, but the advent of the production networks offered the possibility of skipping steps in the catch-up process through the acquisition of knowledge and technology from third countries. Consequently, the understanding of this process and its implications is very important to the developing countries in order to draw more efficient policies that promote a sustainable economic growth and development, benefiting from this new opportunities.

Considering this context of changes in the production process, the purpose of this paper is to analyze how the Latin America (LA) is dealing with it. In order to do so, we compare the performance of Latin America’s machinery trade with other regions, in special the East Asia (EA) given that both regions are composed mainly by developing countries. As Latin America is a heterogeneous region, in a second moment the analysis focus on the performance of its main economies, Brazil and Mexico, in order to take some lessons from their policies.

The study will be organized as follows. Section 2 includes a descriptive analysis of the international machinery trade data, classifying the trade according to origin and destiny region, if it is final product or parts and components, and type of machinery. In section 3 the study will focus in the Brazilian and Mexican cases. Section 4 presents the final considerations of the paper.
2. The machinery trade in Latin America

According to Baldwin (2011), the international division of labor was driven by the globalization process that can be separated in two unbundlings. Before the first Industrial Revolution, production and consumption was geographically bundled given the cost and time constraints imposed by the available transport. At the end of 19th century, the invention and diffusion of the railroads and steamships allowed for the first time a considerable decrease in the transport cost, leading to the first unbundling. Consequently, the consumption and production of a given product was dispersed internationally, but the production process was still clustered locally. In order to compete in the international market, the scale economies assumed an important role, fostering the local clustering. According to Baldwin (p. 2, 2011) the production “clustered locally because proximity lowered the cost of the two-way flows. A new distance-linked cost became important – what might be called “coordination glue””.

The second unbundling was possible given the information and communication technology (ICT) revolution that made cheaper, easier, faster and safer the coordination of complex activities at distance. According to Fujita, Krugman and Venables (1999), another force that also pushed for the decentralization was the congestion costs that resulted from the excessive concentration of production in one region. Consequently, the production process that once was locally clustered was broken in production stages, leading to the creation of the networks of production.

The fragmentation of the production process brought new possibilities for all players, especially for the developing countries that increased their participation in the world exports and GDP, promoting a considerable change in the global economy. This evolution of the production networks is still happening and deserves being analyzed. In
order to do so, the present paper will focus on the international trade of the machinery industry. The reason for this delimitation is based on the fact that this industry presents a high level of complexity and use of parts and components, being one of the most suitable to the analysis of the evolution of the production networks.

2.1 – Data set

It is employed international trade data classified following the Harmonized System, disaggregated to the six-digit level, from the United Nations Commodity Trade Statistics Database (UN Comtrade). The machinery industry is comprised by all the goods classified as part of general machinery (HS84), electric machinery (HS85), transport equipment (HS86-89), and precision machinery sectors (HS90-92). The machinery data are grouped into parts and components and final products, using the classification presented in Kimura and Obashi (2010).

The countries are classified in five main regions in order to facilitate a comparison of the trade patterns among these blocs. The blocs are composed by: the countries from the East Asian region (EA)\(^2\); the countries from the European Union (EU27)\(^3\), the countries that are members of North American Free Trade Agreement (NAFTA), the countries from Latin America (LA)\(^4\), and the rest of the world (ROW).

---

\(^2\) The EA region is composed by the ASEAN countries plus Australia, China, India, Japan, New Zealand, and Republic of Korea. However, given a lack of data Brunei, Cambodia, Laos, Myanmar, and Vietnam were not included in the analysis. On the other hand, according to UN Comtrade’s definition, Hong Kong and China were considered as different destinations.

\(^3\) Given the fact that in 1996 Belgium and Luxembourg data were treated as Benelux, while in 2011 they were treated as individual countries, these two countries were not included in the analysis.

\(^4\) As Mexico is part of the NAFTA it is not counted again in the LA bloc. This bloc is composed by: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.
2.2 – Descriptive analysis

As mentioned before, the production fragmentation process started to affect the developing countries in the end of the 1980s beginning of the 1990s. Aiming evaluate the evolution of this process in the machinery sector, we observe the data of the total exports and imports deflated value (in million US$) per region. Given a restriction imposed by the availability of data, this first exercise is restricted to two points in time: the year 1996 and the year 2011.

The first evidence from the data is that the international machinery trade presented a sharp increase in terms of the value in the period from 1996 to 2011. Figure 2 shows that the machinery trade in the world is basically concentrated in three regions: EA, EU27, and NAFTA. The exports from these regions account for more than 88% of world’s exports in both periods, while the imports account for more than 79%. Consequently, the LA and the ROW are almost marginalized from the machinery trade. This possibly reflects a lack of integration of the LA region in the machinery production network.

== Figure 2 ==

Another important detail is that the import values are higher than the export ones for the LA, and the amplitude increases from 1996 to 2011. On the opposite hand, observing the data for the EA, a region that is also composed by developing countries, we identify an opposite pattern, with exports prevailing over the imports. Once again, the amplitude increases from 1996 to 2011.

Figure 3 illustrates per region share of the machinery trade over total merchandise trade. It shows that, differently from the three main regions where the machinery trade is
concentrated, in LA the participation of machinery in exports is very low. On the opposite hand, the participation of machinery in the region imports is similar to the other regions. However, considering the difference between parts and components and final products, it is important to notice that the imports of final products is predominant during the period and there is almost no changes in the proportion. These results indicate that the region is mainly characterized as an exporter of commodity products and an importer of final machinery products. The low share of imports of machinery parts and components, around 15%, corroborates the idea that the countries in LA are not promoting an integration in the production networks. On the other hand, the data for the EA presents a different pattern. The machinery import and export shares are both higher than the LA one, indicating the importance of the machinery trade in this region. Another important detail is that, although from 1996 to 2011 there was a decrease in the share of machinery trade over total trade, the share of parts and components, that were already higher than 20%, proportionally to the share of final products increased for exports and imports, demonstrating an integration in the production networks.

== Figure 3 ==

Composed by countries that followed an export-oriented industrialization policy, the East Asian region has increased its participation in machinery production networks leading to an increase in the trade in this sector and consequently an increase in the regional GDP. Figure 4 shows the share attributed to each of the five region in the imports of a base region. The inside circle represents the shares in 1996, while the outside circle represents the ones in 2011. It is clear that the East Asia increased its exports to all the regions, becoming the main exporter in three of them: NAFTA, LA, and EA. On the
opposite side, the data showed that Latin America was the region with the smallest share in all regions, but LA. In other words, the data showed that LA had almost no exports to other regions, corroborating its position as an importer region.

== Figure 4 ==

Defining Latin America as the base region and considering the heterogeneity of the machinery sector, Table 1 captures the characteristics of different types of machinery, covering the exports and imports value data of all machinery sectors, electric machinery sector, and transport equipment sector. The first interesting finding is that in the period analyzed, for all machinery the trade with the EA increased faster than the average trade with the whole world, especially for parts and components. On the other hand, the imports from NAFTA and EU27 presented growth rates smaller than the world ones.

== Table 1 ==

Observing the shares for all machinery products, in 1996 the main exporter to the region was NAFTA, but in 2011 the import share from EA more than doubled, becoming the greatest provider to LA. On the export side, with exception of exports of parts and components in 2011, the main receiver of LA machinery products was the LA region. Considering that the Latin American production is mainly consumed inside the region and that the region imports is still dominated by the products from EA, EU27, and NAFTA, one can assume that the regional machinery production is small and/or not competitive in the international market.

In order to capture different patterns depending on the type of machinery, we
observe the data for the electric machinery sector and the transport equipment. The results for the electric machinery sector indicates that the main exporter to LA in 1996 was the NAFTA, however during the period analyzed the EA exports to LA presented a growth rate superior to the NAFTA one. Consequently, in 2011 the EA controlled more than 50% of the LA imports of parts and components and final products, consolidating as its main provider of electric products. Observing the export side, in 1996 the intraregional exports were dominant, but in 2011 the NAFTA became the main receptor of parts and components produced in the LA, being followed by the East Asia region, with 48.8% and 33.5%, respectively. Although the total value traded is not that big, this seems to be a first sign of movement towards an integration in production networks.

The data for the transport equipment reveals a more balanced import pattern. Although the LA is not the main provider of transport equipment, it retains the second biggest share in almost all categories for 1996 and 2011. Other important feature is the entry of the EA transport equipment parts and components in the LA market, ascending from a share of 9.4% in 1996 to 26.8 % in 2011. Considering the export side, the main destiny of the transport equipment produced LA is the internal market, with export shares higher than 50% in 1996 and higher than 67% in 2011.

Another important feature is that in terms of values the transport equipment trade is bigger than the electric machinery, demonstrating the importance of this sector to the Latin American economy. In the EA case it is the opposite, the trade values of the electric machinery sector are more than two times higher than the transport equipment ones.

3. The Brazilian and the Mexican case

The aggregated data for the LA region indicated that its participation in the
international trade of machinery is very small and that it is predominantly an importer of final products. However, as the LA bloc is composed by countries that are very heterogeneous, there is a possibility that some countries are more prone to participate in the production networks while others are not. In order to check this hypothesis Figure 5 shows the machinery trade value by countries for 1996 and 2011, while Figure 6 shows the share of final machinery and parts and components over the total trade of each country for the same years. Observing Figure 5 it is clear that the machinery trade values for the majority of Latin American countries are low. As expected, the two biggest economies in the region have the highest trade values in machinery, however Mexican trade values in both periods are around three times higher than the Brazilian ones. Another interesting discovery is that Mexico is the only country to present a surplus in the machinery trade, exporting more than importing. Considering a 20% share of machinery parts and components trade flow over the total trade as a threshold to the establishment of production networks, Figure 6 shows that in 1996 Mexico was the only country where the machinery parts and components trade share was higher than 20% of the total trade of the country. In 2011 the machinery parts and components imports share for Brazil and Argentina were a little bit higher than 20%, while Costa Rica exports also achieved more than 20%. For the same period, Mexico’s export share was a little bit lower than 20%, while the import share was higher than 35%. The rest of the countries presented percentages far from this threshold.

---

5 Although Mexico is a country localized the Latin America, in the previous analysis its data was included in the NAFTA.
Considering that Brazil and Mexico are the biggest economies and main traders of machinery products in the region, it is expected that they should somehow exercise some influence in the other Latin American countries, or through economic power or offering examples of economic policies that should or should not be adopted. Therefore, they were selected to a study of what kind of policies they are adopting and how the strategy of integration in production networks are being promoted or not.

3.1 – Descriptive analysis

In order to increase its participation in the international trade, in the end of 1980s the Mexican government decided to open the country’s market by joining the NAFTA. This agreement allowed the development of the trade in the region, stimulating specially the development of the maquiladoras. Bearing in mind that the labor wage in Mexico was cheaper than in the US, the companies in American soil opted for offshoring the production of some components, as well as the task of assembling the final product, to factories localized in Mexican territory. The idea was to benefit from the comparative advantages, assembling the final product in Mexican territory and dispatching it back to the American market. This back-and-forth transactions promoted the development of an agglomeration of industries along the Mexican border with US, especially the ones related to the transport equipment sector.

On the other hand, also in the end of 1980s beginning of 1990s, the replacement
of the dictatorship government to a democratic one, followed by a change in the economic policy ended up a period of economic isolation in Brazil. The new government decided to start a process of economic liberalization that was driven by the creation of the Mercosur, a customs union composed by Argentina, Brazil, Paraguay, and Uruguay\textsuperscript{6}. Although the Mercosur promoted an increase in the intrabloc trade in the first years, a series of political and economic crisis affected its members, undermining the effectiveness of the economic bloc. Besides this, the creation of the Mercosur bonded Brazil to the other members in a way that new free trade agreements (FTA) just could be negotiated with the concordance of all the members. Indeed, Brazil adopted a political stance of avoiding negotiations of FTAs, favoring multilateral negotiations in the World Trade Organization (WTO), as it expected that negotiations in this forum would be more symmetric. However, contradicting Brazilian expectations, the last decades have witnessed a series of fails in the multilateral negotiations conducted in the WTO, while the implementation of FTAs has increased all over the globe. Consequently, the maintenance of this political posture, allied to an emphasis in the development of the domestic market, has driven the country to a position of relative protectionism. If we consider Brazil and Mexico`s merchandise share in world total trade in 2012, Mexican shares are higher than Brazilian ones, although Brazil`s GDP is bigger than the Mexican one. Brazil share in world total exports is 1.32\% while Mexico`s one is 2.01\%. Considering imports the difference is even bigger, being 1.25\% and 2.04\% respectively\textsuperscript{7}.

In order to infer how the policies adopted by each country affected the machinery sector Figure 7 shows the machinery total trade value by selected regions. The first

\textsuperscript{6} The admittance of Venezuela as a full member became effective in 2012.
finding is that the value traded for both countries increased from 1996 to 2011. As expected, the main importer of Mexican machinery products was the US, while for Brazil it was the Mercosur. In 1996, the main exporter of machinery to the Mexican market was the US, while in the Brazilian case it was the European Union. Nevertheless, in 2011 the East Asia consolidated the position of main exporter to both countries.

== Figure 7 ==

As it was already mentioned, although Brazil’s economy is two times bigger than the Mexican one, a GDP of 2,248,780 US$ millions in 2012 versus a Mexican GDP of 1,186,460 US$ millions\footnote{Data obtained in World Bank Database: http://data.worldbank.org/}, regarding the machinery traded values the second one traded in general considerably more than the first one, what per se indicates a Brazilian lack of openness to trade and participation in the production networks. The trade pattern of Mexico trade with its main partner, the US, is in accordance with what is expected: higher values of parts and components imports and higher values of final product exports. On the other hand, in Brazil’s case the trade with its preferential partner, the Mercosur, is characterized by higher imports and exports values for final products, what indicates a lack of production integration with its Mercosur partners.

Figure 8 illustrates the weight of the machinery trade over the total trade with the selected regions. Bearing in mind that shares of 20\% of parts and components trade is the minimum threshold to the development of a production network, we identify that Mexico could possibly integrate a production network with EA, EU, and US. Nonetheless, to verify the existence of production networks it is also important to verify the traded value, since high shares of parts and components in small trade flows cannot be considered as a
sign of development of production networks. Considering both information, it is possible to say that Mexico integrates a network of production with US and East Asia. Observing just the weight of the machinery parts and components in the Brazilian import, it is possible to consider the existence of a production network involving the EA, EU, and US, since they are bigger than 20%. However, when we observe the traded values they are very small, the exception is the import from East Asia in the year 2011, what reduces the possibility of an existence of a production network.

== Figure 8 ==

Another possible approach to capture evidences that indicates a participation in production networks is the use of the international input-output table data. Using the available data base from the OECD-WTO Trade in Value Added (TiVA) it is possible to access the total domestic value added of gross exports for the machinery sector. According to OECD (2013), the idea of using the valued added instead of the current gross trade flow is to avoid double counting of the intermediate products. In other words, when a country A exports parts and components to country B for a price X, and country B uses it to manufacture a final product and sell it to country C for a price Y, this final price Y contains the value of the intermediate good (X) and the value that was added in country B. If we consider that a final machinery product is composed by a series of parts and components, the current gross trade value of a final product can be a result of multiple counting of the intermediate goods. In order to produce new estimates of international trade, including the calculation of a value added index, the World Trade Organization (WTO) joined forces with the OECD, and produced global IO tables. These global IO tables are composed by 57 countries and cover 18 sectors. Although the use of a global
IO table has some drawbacks, like the fact that the data is too aggregated and that it accounts for more steps than are covered by the concept of production network (it accounts for all steps from the extraction of the raw material until the constitution of the final product, while a machinery production network accounts just for machinery parts and components and final products) it offers a good comparison between the level of value added by Mexican and Brazilian machinery exports. The higher the value added the smaller is the integration of the country in machinery production networks, since it will be a reflection of a lower use of intermediate goods produced in third countries. Figure 9 exposes this data for the Brazilian and the Mexican exports of machinery, electric machinery, and transport equipment, in five available years. The data reveals that more than 30% of the value added in the machineries exported by Mexico are correspondent to third countries, while in Brazil it is less than 20%. Mexico results are at similar levels as the world average or lower, like in the electric machinery case. This is another sign that Brazil does not take part in the machinery production networks, while Mexico does. The machinery products exported by Brazil use mainly intermediate products produced in the domestic market.

== Figure 9 ==

Considering the differences in the machinery trade composition between Mexico and Brazil, Figure 10 presents the export values for the parts and components and the final products of the transport equipment sector and the electric machinery sector. In the beginning of the period, Mexico presented a slight higher value for the exports of final transport equipment, while the other ones had smaller and similar values. As the time passed the export values increased for the Mexican exports at higher rates than the
Brazilian ones. In the end of the period, Mexico exported almost three times more final transport equipment than Brazil, while in the other categories the differences were even higher. The export of final transport equipment was the most important machinery flow for Mexico and Brazil in the end of the period. Actually, in the Brazilian case it was the most important one since the beginning of the period, but in Mexico’s it was surpassed by the electric machinery in the years 2000. However the final transport machinery started a recovery in 2009, regaining the first position from 2011. Another important detail is that Brazilian exports of electric machinery and transport parts and components are very small and stable along the whole period, demonstrating that the country or ignored or failed in the adoption of policies to promote an increase in the exports of these products.

Figure 10 presents the same type of data, but for the import side. Once again both countries present similar values in the beginning of the period and in the end Mexico has higher values. This time Mexico’s electric machinery parts and components followed by electric machinery final products and transport equipment parts and components have higher values than the Brazilian ones. It is interesting to notice that Mexico exports higher values for final products and imports higher values of parts and components for both types of machinery, indicating a possible participation in a production network. In other words, Mexico receives more parts and components that are used in the production of final products that are then exported. However, in Brazil’s case the higher values of export and import for the most important machinery sector, the transport equipment, are concentrated in the final products. Indeed, compared to Mexico, Brazilian imports of parts and components are very low for both types of machinery. A cautious analysis of the data
reveals that actually Brazilian exports of electric machineries are stable during the period, while the imports of electric machinery parts and components increases, showing that possibly Brazil is using this parts and components to produce final electric products that will be consumed domestically.

== Figure 11 ==

The vehicle data seems to give a right measure of the difference between Brazil and Mexico. Figure 12 illustrates the vehicle production, sales, exports and imports per year. Observing the curves we can identify that Brazil produced more vehicles than Mexico. It also consumed more vehicles than Mexico. On the opposite hand, Mexico exported more than two times the number of vehicles exported from Brazil. Brazil is the fourth biggest consumer of vehicles and its production is mainly sold in the domestic market. On the other hand, one third of the Mexican production is exported to other markets, in special the American one. Consequently, for both countries the vehicle production is an important sector in their economy, but the difference is that in Mexico’s case it integrates a network of production, while in the Brazilian one the production and consumption is more constrained to the domestic market.

== Figure 12 ==

3.2 – Extensive Margin Analysis

As observed in Figure 5, during the analyzed period there was an increase in the machinery value traded by both countries. The increase in the trade flow can be a

\footnote{Given a lack of data was not possible to identify the number of vehicles imported by Mexico.}
consequence of an intensive margin growth, that is the change in the value traded in already existent country-product relations, and/or a consequence of an extensive margin, that is the change of trade value resultant from the establishment of new country-product relations and the extinction of old ones. According to Kehoe and Ruhl (2013) and Hummels and Klenow (2005) a growth in trade in general leads to an increase in the extensive margin trade. An analysis of the evolution of the active country-product trade links during the period studied can indicate how both countries are promoting the diversification and integration in the international trade. Considering two types of machinery, electric machinery and transport equipment, discriminated in final products or parts and components, Figures 13 and 14 present the active links for Brazil and Mexico’s exports and imports.

== Figure 13 ==

== Figure 14 ==

The first interesting finding is that Mexico has higher active country-product links for exports and imports to NAFTA, indicating the importance of the intraregional trade. In Brazilian case, imports curves from NAFTA and exports of parts and components are higher than the other ones, although not as high as in the Mexican case, while the export curves of final products to Latin America are as high or higher than NAFTA ones. The curves for imports from Latina America is very low for both countries, while the East Asia ones are the second higher. In general Mexico imports more from LA than Brazil. Comparing the evolution of the active links for Brazilian and Mexican exports, another outstanding characteristic is that Mexico export curves are steeper than the Brazilian ones.
Mexico ended up the period with higher curves than Brazil, being the exports to Latin America of transport equipment, in special parts and components, the exception. This indicates although both countries diversified their trade along the period, Mexico still has a more diversified trade than Brazil.

4. Final Considerations

Bearing in mind the advent of the production fragmentation and its importance for the developing countries, this paper investigated the position of Latin America in the global machinery trade. The descriptive analyses showed that the machinery trade concentrates inside three regions: ASEAN+6, EU27, and NAFTA. Additionally to the lower participation in the global machinery trade, the data also reveals that the Latin American share of machinery exports over the total exports is relatively low, while the machinery imports share over the total imports is similar to the other regions. Considering the difference between parts and components and final products, the imports of final products is predominant. These results corroborates the idea that the region is not integrated in the machinery production networks.

Given the heterogeneity of the countries that compose the Latin America, we observe the machinery trade data per country and select the two biggest economies in the region, Brazil and Mexico, for a closer analysis. Mexico is more prone to participate in the production networks, importing higher values of parts and components and exporting higher values of final products. On the opposite side, Brazil trade is more concentrated in final products, especially in the transport equipment sector. Furthermore, although the Brazilian economy is bigger than the Mexican one, Brazil’s machinery trade values are less than half of the Mexican ones. The lack of free trade agreements and the protectionist
tendency of the Brazilian market could be one of the possible reasons for the low level of use of imported parts and components in the domestic machinery industry. The lack of competitiveness of Brazilian products and the domestic oriented production of Brazilian machinery industries could be one of the explanations for the low level of exports in this sector. These facts demonstrate that Brazil and the other countries in Latin America are not exploring all their potential as participants of a machinery production network.
Figure 1 – G7 share of world income, trade and manufacturing

G7 world export share

G7 world GDP share


Figure 2 – Total values of exports and imports per region in 1996 and 2011 (in million US$)

Source: Author’s calculation, using data available from the UN Comtrade.
**Figure 3 – Shares of machinery trade over total trade in each region in 1996 and 2011**

Source: Author’s calculation, using data available from the UN Comtrade.

**Figure 4 – Shares of machinery import by each region in 1996 and 2011**

Source: Author’s calculation, using data available from the UN Comtrade.
Table 1 – Latin America machinery trade by destination

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>World</td>
<td>61,090</td>
<td>22,869</td>
<td>18.0</td>
</tr>
<tr>
<td>2011</td>
<td>World</td>
<td>167,809</td>
<td>63,662</td>
<td>12.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>EAST ASIA</td>
<td>18.0</td>
<td>17.1</td>
<td>26.7</td>
</tr>
<tr>
<td>2011</td>
<td>EAST ASIA</td>
<td>20.1</td>
<td>18.5</td>
<td>28.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>EU27</td>
<td>29.9</td>
<td>32.9</td>
<td>24.3</td>
</tr>
<tr>
<td>2011</td>
<td>EU27</td>
<td>20.1</td>
<td>18.5</td>
<td>21.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>LA</td>
<td>12.5</td>
<td>12.9</td>
<td>12.5</td>
</tr>
<tr>
<td>2011</td>
<td>LA</td>
<td>14.6</td>
<td>15.9</td>
<td>9.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>NAFTA</td>
<td>3.2</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>2011</td>
<td>NAFTA</td>
<td>1.5</td>
<td>1.8</td>
<td>1.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>EAST ASIA</td>
<td>5.7</td>
<td>5.5</td>
<td>5.7</td>
</tr>
<tr>
<td>2011</td>
<td>EAST ASIA</td>
<td>20.1</td>
<td>18.5</td>
<td>20.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>EU27</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>2011</td>
<td>EU27</td>
<td>1.5</td>
<td>1.3</td>
<td>1.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>LA</td>
<td>3.2</td>
<td>3.5</td>
<td>3.2</td>
</tr>
<tr>
<td>2011</td>
<td>LA</td>
<td>1.5</td>
<td>1.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>NAFTA</td>
<td>3.2</td>
<td>3.5</td>
<td>3.2</td>
</tr>
<tr>
<td>2011</td>
<td>NAFTA</td>
<td>1.5</td>
<td>1.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Origin/ Destination</th>
<th>Value (millions US$)</th>
<th>Value Index (1996=1)</th>
<th>Share (in total (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>EAST ASIA</td>
<td>12.5</td>
<td>12.9</td>
<td>12.5</td>
</tr>
<tr>
<td>2011</td>
<td>EAST ASIA</td>
<td>14.6</td>
<td>15.9</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Source: Author’s calculation, using data available from the UN Comtrade.
Figure 5 – Total machinery trade value per country in US$ million

Source: Author’s calculation, using data available from the UN Comtrade.
Figure 6 – Machinery goods and machinery parts and components: shares in total exports and imports

Source: Author’s calculation, using data available from the UN Comtrade.
Figure 7 – Brazil and Mexico’s machinery trade value per region

Source: Author’s calculation, using data available from the UN Comtrade.

Figure 8 – Brazil and Mexico’s machinery share over total trade

Source: Author’s calculation, using data available from the UN Comtrade.
Figure 9 – Value Added Export Ratio - total domestic value added share of gross exports, %

Source: Author’s calculation, using data available from the OECD-WTO Trade in Value Added (TiVA).

Figure 10 – Brazil and Mexico’s export value by machinery sector in US$ million

Source: Author’s calculation, using data available from the UN Comtrade.
Figure 11 – Brazil and Mexico’s import value by machinery sector in US$ million

Source: Author’s calculation, using data available from the UN Comtrade.

Figure 12 – Brazil and Mexico’s vehicle production, sales, exports, and imports per year

Source: Author’s calculation, using data available from the WARD and JAMA.
Figure 13 – The share of active country-product links: Brazil’s exports and imports

Source: Author’s calculation, using data available from the UN Comtrade.

Figure 13 – The share of active country-product links: Mexico’s exports and imports

Source: Author’s calculation, using data available from the UN Comtrade.
Reference


United Nations Commodity Trade Statistics Database. UN COMTRADE.
