The Mexican Manufacturing Industry and its heterogeneous integration in Global Value Chains

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Abstract.

This paper studies the value added contribution from foreign producers in major regions and local producers in the final output produced by Mexico. We perform this analysis for the two components of the Mexican manufacturing industry; the foreign assembly plants producing for exports (Maquiladora industry) and, the rest of manufacturing firms mainly sourcing the domestic market (Domestic Economy of Mexico). To this endeavor, Mexico (Maquiladora) and Mexico (Domestic Economy) are separately included into the set-up of the World Input Output Tables from 1998 to 2011. Our results indicate that the value added structure from Mexico (Domestic) has remained unaltered, while that of Mexico (Maquiladora) has been drastically modified over time. On the one hand, Mexico (Domestic) has the largest share of value added in their own final output with very few increases in the individual value added contribution from foreign producers (notably, the US). On the other hand, Mexico (Maquiladora) shifted from the dominance of US value added in all the manufacturing sectors (70% in 1998) to a much diversified value added structure. By 2011, the East Asian value added is the largest in Electrical and Optical equipment sector, Mexico (Domestic) and Mexico (Maquiladora) in the Transport Equipment sector and the US in the textile industry. To our view, those differences in the value added structure are related the reallocation decisions from US producers that took into account type of production (exports, domestic use), NAFTA benefits, technical considerations and other cost (mainly labor).

JEL Codes: C67, L6

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Introduction.

In the last two decades, Mexico's manufacturing production has substantially increased. According to De La Cruz et al. (2011), Mexico's international trade (exports plus imports of goods) grew from $82.3 million in 1990 to $553.8 billion in 2007, representing 56% of the GDP during that same year. Moreover, this remarkable outcome is further confirmed by the current position of the Mexican manufacturing industry. According to the Mexican Ministry of Economy, by 2014 Mexico produces more manufacturing goods than all Latin American countries put together; it is the World's largest provider of flat screen televisions and the largest recipient of FDI in the Aerospace sector.

Assessing the domestic and foreign value added content of Mexican manufacturing production has been the main concern among scholars. Those scholars, however, have reached different conclusions when analyzing different components of the Mexican industry. For instance, when considering the production from the whole universe of manufacturing firms in Mexico, it has been concluded that the domestic value added content is remarkably higher than the foreign one. According to the Trade in Value Added initiative (OECD/WTO, 2013) Mexico's domestic value added content of its exports in 2009 was 70% and it had remained relatively stable since 1995. A similar conclusion is reached when the manufacturing firms that source both the domestic and foreign market (i.e. the Domestic economy of Mexico) are separately taken into account. In line with the estimates provided by De La Cruz et al. (2011) and Koopman et al. (2014), the domestic value added contribution in the exports of Mexico-Normal is of more than 70% for 2004. On the other hand, when analyzing the firms that solely produce for the foreign market (Maquiladora industry) a rather different conclusion is obtained. In this case, it is argued that the firms in the Maquiladora industry have been unable to steadily increase the domestic content of its exports (lower than 25%) when compared to its rather large foreign content (Castillo & De Vries, 2014, De La Cruz et al., 2011; Koopman et al.,2014).

This research provides a single framework to analyze the value added trends in the Maquiladora and in the Domestic economy of Mexico in order to understand the extent by which they interact to impact the aggregate value added from the total Mexican manufacturing production. Such single framework will be a Global Value Chain perspective. This means that we will quantify the value added contribution from each local and foreign producer (by country of origin) that participate in the production for exports (Maquiladora), as well as the value added contribution in the production that sources both the domestic and foreign market (Domestic Economy of Mexico). By providing a Global Value Chain perspective, we aim to understand to what extent foreign producers in major regions (US/Canada, East Asia and Europe) interact with each component from the Mexican manufacturing production, as well as the extent by which such regional interaction within each manufacturing component drives the foreign value added results for the total manufacturing production in Mexico. Similarly, we will understand how local producers in the Maquiladora and in the Domestic Economy of Mexico interact in order to produce their own manufacturing goods and the extent by which their own value added drives the results for the total domestic value added in the whole Mexican manufacturing production

In order to meet those objectives, our research constructed a new data set where the Maquiladora and the Domestic Economy of Mexico are included into the World Input Output Tables (WIOT) from 1998 to 2011. With such tables, and by implementing a new measure of fragmentation that is extended to a multy-country setting (Los et al., 2014), our research identifies that each component from the Mexican manufacturing production has had an heterogeneous pattern of integration in Global Value Chains.

On the one hand, the Domestic Economy of Mexico only suffered minor changes in terms of the country/ regional value added embodied on its final output. From 1998 to 2011, local producers in the Domestic economy of Mexico accounted for the largest value added share (74% of total final output by 2011) while the share from US/Canada and East Asia in the same final output only show minor changes in their value added share (16% and 3% respectively by 2011). This tendency where local producers in the Domestic Economy of Mexico have the largest value added share embodied on its own final manufacturing output was observed in every single manufacturing sector with very few changes over time.

On the other hand, the Maquiladora presented major changes on its country/ regional value added. The US/Canada value added share embodied in the total maquiladora final output dramatically decreased from 68% in 1998 to 29% in 2011 while, during the same period of time, the correspondent East Asian and Mexican value added in final maquiladora output moved from 6% to 23% and from 20% to 33%, respectively. This tendency, however, largely differs across key maquiladora manufacturing sectors. While by 1998 US/Canada had the largest share of value added in the final output from every single manufacturing sector in the Maquiladora, by 2011 East Asia had the largest share in Electronic Equipment (40%), local producers in Mexico had the lion's share in Transportation Equipment (49%) and the US/Canada the one in Textiles and Textile products (39%).

We find that the aforementioned value added tendencies from the Maquiladora and from the Domestic Economy are offset when combined to describe the aggregate value added trend from the total manufacturing production in Mexico. Nevertheless, our results show that the aggregate domestic value added trend from the whole universe of local producers in Mexico is largely driven by the manufacturing producers in the Domestic economy of Mexico. Likewise, the shift in the composition of maquiladora foreign value added is the main responsible for a continuous decline in the aggregate US/Canada value added (from 29% in 1998 to 19% in 2011) and for a steady increase of aggregate East Asian value added (3% in 1998 and 9% in 2011).

This research is organized as follows. Section 1 describes the main characteristics in the production of Maquiladora and in the Domestic Economy of Mexico, as well as some considerations about the key features of manufacturing production in Mexico. Furthermore, this section describes the new concept of “Manufactura Global” (introduced by the Mexican statistical office) which as of 2007 substituted the concept of Maquiladora in the national accounting system from Mexico. Section 2 described our method. Section 3 presents our data construction strategy to divide Mexico (as presented by WIOD) into Mexico (Maquiladora/Manufactura Global) and Mexico (Domestic Economy) from 1998 to 2011. Section 4 presents our data requirements and section 5 introduces relevant descriptive statistics. Finally, section 6 presents our main results while section 7 provides conclusions along with policy implications for Mexican manufacturing producers.

1. An overview of the Mexican manufacturing industry.

The firms in the Mexican manufacturing industry can be classified in two categories. On the one hand, the manufacturing firms that send their entire production to foreign markets (Maquiladora industry) and, on the other hand, the manufacturing firms that source both the domestic and foreign market (Domestic economy of Mexico). In the forthcoming lines, we will further explain each of those components.

1.1 Export promoting Programs and the Production for Global Production Networks.

The Maquila industry, officially known as "Industria Maquiladora de Exportación", is mainly consistent of foreign firms that are located at the northern part of Mexico right next to the border with the United States. Most of the intermediate inputs used by this industry come from the United States (and progressively more from East Asia), and its entire gross production is exported (mainly to the United States). Provided that such conditions are met (most of their intermediate inputs are imported and that their entire production is exported), firms under the Maquiladora industry receive significant tariff exemptions.

According to official statistics, firms under the Maquiladora industry do not produce intermediate goods. The domestic intermediate goods used by the Maquiladora are completely sourced by local manufacturing producers in the rest of the economy (i.e. local producers in the Domestic Economy of Mexico). Despite continuous attempts from the Mexican Government to promote increasing domestic intermediate sourcing from local producers to the Maquiladora, the domestic content of aggregate Maquila exports has remained relatively low over time. Castillo & De Vries (2014) identified a long run decline in the domestic value added content of maquiladora exports (from 31% in 1981 to 22% in 2006) which appear mainly related to external and internal shocks in the Mexican economy (signing of NAFTA , industrial emergence of China) and not to changes in the regulatory environment.

Given the importance of the Maquiladora industry for the Mexican manufacturing industry, the Mexican government has implemented other similar export promoting programs. In 1990, the "Programas de Importación Temporal para Producir Articulos de Exportación" (PITEX) came into effect with the intention of permitting firms to import intermediate inputs and machinery free of duty as long as 30% of their total sales were exported. The difference between the firms under PITEX and the maquiladora program lies in the fact that the industries under the latter program were exempted to a bigger amount of taxes. Similarly, unlike maquiladoras, PITEX firms were mainly located in the interior of Mexico as most of their production was destined for domestic consumption (De la Cruz et al., 2011).

In 2007, the "Manufacturing, Maquila and Export Service Industry" (IMMEX program) was implemented. Such program allocated Maquiladora and PITEX firms in a single export promoting program. The main idea behind the IMMEX program was to integrate in a single framework all the manufacturing firms in Mexico that together represent 85% of the country's total manufacturing exports. Likewise, this program aimed at simplifying tariff procedures for Maquila and PITEX firms that were to be exempted from the payment of general import tax, value added tax and, where appropriate, countervailing duties.

Acknowledging the increasing importance from manufacturing production under Global Production Networks, in 2014 the Mexican Statistical Office (INEGI) released a new statistical tool named "Manufactura Global". The main objective behind the concept of Manufactura Global was to identify from the whole universe of manufacturing firms located in Mexico those that were highly engaged in Global Production Networks. In order to qualify as a firm under the concept of Manufactura Global, one of the following three criteria should be met: (1) their production should be for exports and most of their intermediate goods should be imported (a ratio of at least 2/3 of their imported intermediate goods with respect to their exports); (2) they should be mostly foreign owned and, (3) explicitly source (export) for the production of other Global Production Networks not located in Mexico.

By definition, firms under the concept of Manufactura Global include IMMEX firms (Maquiladora and PITEX), as well as manufacturing firms not belonging to IMMEX but located in the Domestic Economy of Mexico and that meet the aforementioned criteria of being highly engaged in Global Production Networks. According to the first estimates provided by INEGI (2014), the gross production from Manufactura Global represented 25.8% of the total manufacturing production in Mexico by 2012. This means that ¼ of the total production in Mexico participates in Global Production Networks by either assemblying/transforming domestic and foreign intermediate inputs and/or exporting final and intermediate goods.

1.2. The Domestic Economy of Mexico.

As can be seen, the rest of manufacturing firms in Mexico that do not belong to the IMMEX program or that are not highly engaged in Global Production Networks can be regarded as firms under the domestic economy of Mexico. The manufacturing firms under the Domestic economy of Mexico produce both for the foreign and the domestic market but most of their production is sourced to the Mexican market. According to the latest estimates, by 2012 the Domestic Economy of Mexico accounted for 74% of the total manufacturing production in Mexico and for 29% of the total manufacturing exports. In the same year, producers in the domestic economy consumed 90% of the total domestic intermediate goods in Mexico and 45% of the total supply of imported intermediate inputs (INEGI, 2014)

Data for the manufacturing firms under the Domestic Economy can be found in the monthly industrial survey (Encuesta Industrial Mensual) from INEGI and, as of 2014, they can be also found under the concept of "Rest of Manufacturing Production" in Mexico or "Manufactura No Global" (INEGI, 2014).

1.3 Some considerations about the key features of manufacturing production in Mexico.

The manufacturing production in Mexico enjoys significant advantages with respect to other major emerging economies. Manufacturing producers in Mexico have largely benefited from the proximity to the United States as well as from the tariff exemptions under NAFTA and/or IMMEX program. Nevertheless, some new features from the Mexican economy are expected to further boost manufacturing production. On the one hand, Mexico stands as an option given China's recent soaring wages. According to the Economist (2014), Mexican wages have grown less than 50% in dollar terms over a decade, leaving them 13% cheaper (adjusted for productivity) than China's. On the other hand, there is Mexico's new energy reform. The country's opening up to foreign investor in the oil industry, along with the discovery of new gas resources, is expected to boost production in the petro-chemical sector and, more importantly, to provide cheaper domestic energy. In this context, lower energy and labor costs will be the new advantages offered by Mexico that are complemented with its huge domestic market (120 million people by 2013) and its 44 free trade agreements.

Similarly, during the last decade, technical considerations in some key manufacturing sectors have become an important source of efficiency for Mexican producers to compete with East Asia. According to Waltkins (2007), Mexico offers significant advantages with respect to East Asia when the following technical considerations are taken into account; (1) the manufacturing production that implies a high weight to value ratio (the production of cars, flat screens and appliances of large size); (2) those goods where its quality is more important than its price (medical instruments and process control instruments); (3) the firms that implement just in time procedures and whose production is subject to frequent changes in design (auto parts) and; (4) the manufacturing goods where the protection of property right is important.

Other technical considerations, however, are less important for foreign investors when deciding where to allocate their production between Mexico and East Asia. This is the case of the manufacturing goods that imply light weight and high volume (textile industry) and the ones with a high value to weight ratio (electronic industry). When compared to Mexico, Chinese producers in those industries benefit from a well-developed chain of suppliers, abundant labor and its bigger domestic market. Furthermore, the fact that the textile and electronic industry are not subject to frequent changes in style allows producers to plan the production well in advanced. Such situation, along with its light output weight, permits shipping the production further lowering transportation and total costs.

Mexican producers enjoy NAFTA benefits in the textile industry which in some cases are particularly demanding to non NAFTA producers. This is the case of the NAFTA rules of origin “yarn forward” and “fiber forward”. Yarn forward means that the yarn used to produce a fabric must originate in NAFTA member country. Flexibility in those rules is granted in the cases where the import textile materials are not widely produced in North America (the case of silk) provided that the fabric is cut and sewn in one or more NAFTA countries. More demanding rules of origin appear in the case of textiles goods whose production is particularly abundant in NAFTA. For example, cotton yarn and cotton knitted fabrics follow a fiber forward rule for goods traded between the three countries, while man-made fiber sweaters follow a "fiber-forward" rule as to trade between the United States and Mexico.

NAFTA rules of origin in the television industry and in the automotive industry are also an important factor by which foreign investors decide to allocate their production in Mexico when compared to East Asia. NAFTA requires color television tubes to be of North American origin in order to enjoy preferential access. Similarly, the regional value content requirement for autos and light vehicles, their engines and transmissions as well as for other vehicles was initially established to 50% and as of 2002 it was increased to 62%.

Finally, it is also worth mentioning the manufacturing goods whose production in Mexico has become progressively less competitive when compared to East Asia. This is the case of t“Other manufacturing goods” (umbrellas, toothbrushes, toys, bikes and so forth) whose production imply high volumes with low weight and very infrequent changes in style. Furthermore, the scope for increasing competitiveness of Mexican producers in this sector is highly limited given that those goods are mainly sourced in North America by huge retailers such as Wal-Mart and its counterpart for the Mexican domestic market Wal-Mex.

In a nutshell, for the next decade the manufacturing production in Mexico will offer significant advantages with respect to other major producers in emerging economies. Along with the proximity to the United States and tariff incentives under NAFTA/IMMEX program, producers in Mexico will also benefit from lower labor and energy cost. Nevertheless, the success of manufacturing production in Mexico will still depend on the way by which all those benefits are effectively combined with technical considerations observed in each manufacturing sector. The manufacturing goods that imply high a weight to value ratio, whose quality is more important than its price, that are specially protected under NAFTA considerations and whose production is mainly source to foreign markets will still be the key drivers of Mexican manufacturing production. This will be the case of flat screens, appliance of large size (fridges, electric ovens, etc), medical instruments and the automotive industry. Following the same stream of ideas, the manufacturing goods that imply low weight and high volume but whose production is abundant in North America (and that are therefore protected under NAFTA considerations) will

also be part of the key drivers of Mexican manufacturing production. In this case, we are referring to the manufacture in cotton.

The manufacturing production will be less competitive in the manufacturing sectors where technical considerations to allocate production are less important and, where the production in Mexico is less protected under NAFTA considerations. This will be the case of a large amount of products in the textile industry (clothing, footwear, leather, sportswear, etc.), in the electronic industry (appliances of small size, mobile phones, computers, microwaves, and so forth) and other manufacturing goods (toys, umbrellas, etc.).

With these ideas in mind, our research will now proceed to explain the methodology we will follow in order to identify the domestic and foreign value added content in Mexico's manufacturing production.

2. Methodology.

In assessing the value added contribution from the different countries and regions involved in the production of Mexico's final manufacturing output, our research will closely followed the approach posit by Los et al. (2014). By generalizing a measure of fragmentation proposed by Feenstra and Hanson (1999), those authors introduce a metric that uses information from World Input Output Tables to describe the international fragmentation of specific global production networks.

Specifically, Los et al. (2014) decompose the value of a final product in the last stage (country) where the final manufacturing production took place. This decomposition includes the value added shares generated in all the countries that contribute to that final product. Therefore, this measure does not only take into account the value added by the immediate suppliers of intermediates, but also the value added by suppliers further upstream

Formally, consider a particular industry *i* located in a specific country *j*, denoted by (*i,j*). To produce good (i,j) activities in industries s=1,…,S in each of the countries n=1,…,N are needed. To decompose its value, the first step to take is to find the levels of gross output associated with the production of (i,j). Those can be estimated by applying standard input output methods to global input output tables. Global input output tables contain information on the values of intermediate input flows among all country industries in the world, as well as on the values of flows from each of these country-industries to final use in each of the countries. These tables also contain information on value added generated in each of the country industries. Combining information on value of sales and value added per dollar of sales leads to estimates of value added in each of the *SN* industries as a consequence of final demand for product (i,j). For this, it is used an equation that has been a standard tool in input-output analysis for over decades (Miller and Blair, 2009);

$$\mathbf{g} = \hat{\mathbf{v}}(\mathbf{I} - \mathbf{A})^{-1}(\mathbf{Fe}) \quad (1)$$

In this equation, $\mathbf{g}$ is the vector of value added created in each of the SN country-industries involved in a value chain. The choice for a specific final output matrix **F** determines which value chain is considered. Final output is output delivered for household consumption and investment demand (both including domestic and final foreign demand). $\mathbf{e}$ is a summation vector. $(\mathbf{I} - \mathbf{A})^{-1}$ is the well-known Leontief inverse, the use of which ensures that

value added contributions in all tiers of suppliers are taken into account. **v** is a vector with value added over gross output ratios, for each of the country-industries[1].

The (*SNxSN*)-matrix **A** and the (SN)-vector **v** are obtained as $\mathbf{A} = \mathbf{Z}(\hat{\mathbf{x}})^{-\mathbf{1}}$ and $\mathbf{v}' = \mathbf{w}'(\hat{\mathbf{x}})^{-\mathbf{1}}$, respectively. **A** gives the intermediate inputs per unit of output of gross output, while **v** represents the value added generated per unit of gross output. F stand for a final demand matrix of dimensions SNxCN (where C is the number of final demand categories per country). This implies that Fe is an (SN) vector with a single positive element, which is obtained by adding foreign and final demand for (I,j)'s product.

As can be seen, implementing the aforementioned methodology will allow us to decompose g which contains the value added generated in each of the industries in each of the countries that can be attributed to the global value chains for Mexico (Domestic) and Mexico (Maquiladora/M. Global) final manufacturing production. Nevertheless, in the context of our research, implementing this methodology require world input output tables that separately includes Mexico (Domestic) and Mexico (Maquiladora/M. Global) in their setting. In the forthcoming lines, our research will explain in detail the empirical strategy we will follow in order to include times series of interpolated input output tables from Mexico (Domestic) and Mexico (Maquiladora/M. Global) into the World Input Output Tables.

[1] Matrices are indicated by bold capital symbols and (column) vectors by bold lowercases. Hats denote diagonal matrices with the corresponding vector on the main diagonal.

3. Data construction method: including Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) in WIOT.

A world input output table (WIOT) is an extension of a national input output table. The WIOT explicitly indicates the imports by country of origin of goods for intermediate and final use received by WIOD countries. It also indicates the domestic consumption of goods for intermediate and final use and the delivery of those goods domestically produced by county of destination. Considering our discussion in section 1, figure (1) indicates the set-up for a world input output table that divides Mexico into its Domestic economy and Maquiladora/Manufactura Global components. This figure has been divided into three quadrants. Quadrant (A) indicates the industry by industry intermediate use of goods from WIOD countries according to their origin (imported or domestic). Quadrant (B) indicates the final use of goods from WIOD countries according to their origin. Finally, quadrant (C) indicates the total output in each WIOD country.

Figure (1): WIOT Set up with Mexico (Domestic) and Mexico (Maquiladora)

		A				B				C
		Country A Intermediate use Industry	**Mexico (Domestic)** **Intermediate use** **Industry**	**Mexico (Maq/M.Global)** **Intermediate use** **Industry**	Rest of the World Intermediate use Industry	Country A Final domestic Use	**Mexico (Domestic)** **Final domestic Use**	**Mexico (Maq/M.Global)** **Final domestic Use**	Rest of the World Final domestic Use	Total
Country A	Industry	Intermediate use of domestic output	Intermediate use by Mexico (Domestic) of imported inputs delivered by country A	Intermediate use by Mexico (Maq/M.Global) of imported inputs delivered by country A	Intermediate use by RoW of imported inputs delivered by country A	Final use of domestic output	Final use by Mexico (Domestic) of imported final goods delivered by A	Final use by Mexico (Maq/M.Global) of imported final goods (Gross Capital Formation) delivered by A	Final use by RoW of imported final goods delivered by A	Output in A
Mexico (Domestic)	Industry	Intermediate use by A of imported inputs delivered by the Domestic economy of Mexico	Intermediate use by Mexico (Domestic) of intermediate goods delivered by Mexico (Domestic)	Intermediate use by Mexico (Maq/M.Global) of intermediate goods delivered by Mexico (Domestic)	Intermediate use by RoW of imported inputs delivered by country Mexico (Domestic)	Final use by A of imported final goods delivered by Mexico (Domestic)	Final use of domestic output delivered by Mexico (Domestic)		Final use by RoW of imported final goods delivered by Mexico (Domestic)	Output in Mexico (Domestic)
Mexico (Maq/M.Global)	Industry					Final use by A of imported final goods delivered by Mexico (Maq/M.Global)			Final use by RoW of imported final goods delivered by Mexico (Maq/M.Global)	Output in Mexico (Maq/M.Global)
Rest of the World (RoW)	Industry	Intermediate use by A of imported inputs delivered by RoW	Intermediate use by Mexico (Domestic) of imported inputs delivered by RoW	Intermediate use by Mexico (Maq/M.Global) of imported inputs delivered by RoW	Intermediate use of domestic output	Final use by A of imported final goods delivered by RoW	Final use by Mexico (Domestic) of imported final goods delivered by RoW	Final use by Mexico (Maq/M.Global) of imported final goods (Gross Capital Formation) delivered by RoW	Final use of domestic ouput	Output in RoW
		Value Added	Value Added	Value Added	Value Added					
		Output in A	Output in Mexico (Domestic)	Output in Mexico (Maq/M.Global)	Output in RoW					

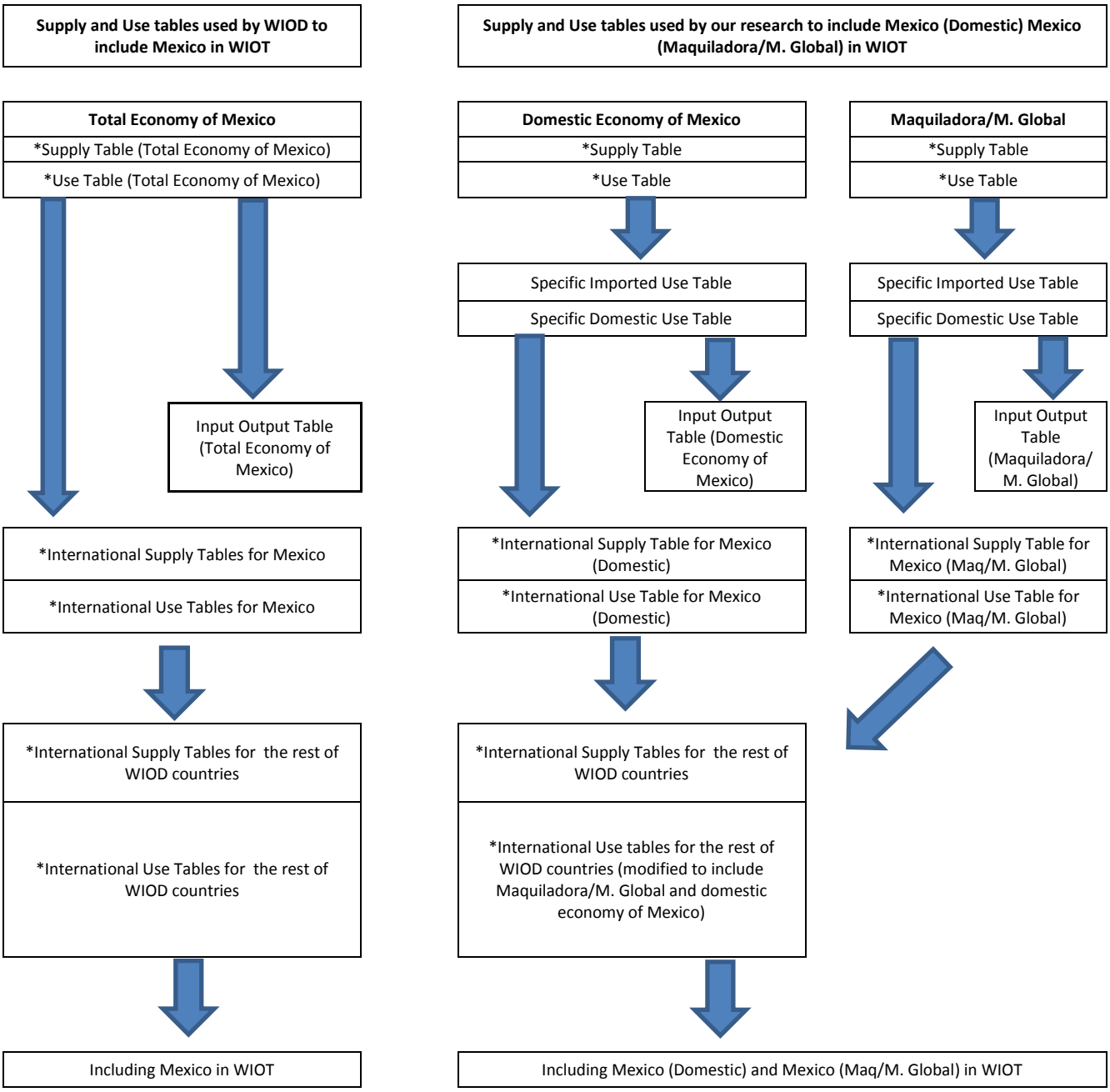
As can be seen in quadrant (A), Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) report their industry by industry intermediate use of goods delivered by Country A and the rest of the World respectively (imported intermediate goods). At the same time, Mexico (Domestic) and Mexico (Maquiladora/M. Global) report their industry by industry intermediate use of goods that are both delivered by the Mexico (Domestic) (domestic intermediate goods). Similarly, given that the maquiladora does not deliver any intermediate goods to country (A), Mexico (Domestic), Mexico (Maquiladora/M. Global) and the rest of the world all the squares designed to indicate those deliveries are left in blank (they are equal to zero).

On the other hand, in quadrant (B), Mexico (Domestic) and Mexico (Maquiladora/M. Global) report their final use consumption according to industry and domestic or imported origin. Mexico (Domestic) indicates the final use of goods delivered by Country (A,) by Mexico (Domestic) and by the rest of the World. Following our definition of maquiladora, Mexico (Maquiladora/M. Global) only indicates the final use (capital goods) of goods delivered by Country (A) and by the rest of the World. Country (A) in quadrant B report the final use of goods delivered by Country (A), by Mexico (Domestic), by Mexico (Maquiladora/M. Global) and by the rest of the World. The same description for Country (A) applies for the rest of the world. Finally, quadrant (C) indicates the total output by each industry in each WIOD country.

Following those ideas, several adaptations have to be made to the input tables (supply and use tables) originally used by WIOD that allow our research to include Mexico (Domestic) and Mexico (Maquiladora/M. Global) into the structure of the world input output tables. In order to better understand how our research needs to proceed, the left hand side of Figure (2) presents an overview of the supply and use tables used by WIOD to include Mexico (Total Economy) in the world input output tables

As can be seen, WIOD first created national (i.e. total economy) supply and use tables which were then used to create national input output tables. Afterwards, those supply and use tables were linked across countries (by means of bilateral trade data) to create international supply and use tables for Mexico. Finally, the international supply and use tables of Mexico, and that of the rest of WIOD countries, were used to create the world input output tables. Considering this situation, the right hand side of figure (2) also presents the supply and use tables that are required to include Mexico (Domestic) and Mexico (Maquiladora/M. Global) in WIOT. We require specific supply and use tables (imported and domestic use) for the domestic economy of Mexico and for the maquiladora industry to create input output tables and international use tables for each of these two concepts. Furthermore, we need to modify the original set up from all the international use tables from WIOD countries to include Mexico (Maquiladora/ M. Global) and Mexico (Domestic) in their original set up. The appendix to this research provides a detailed methodological discussion of the steps taken to build the national and international supply and use tables for the two components of the Mexican economy, as well as our final set up of WIOTs with those included.

Figure (2): Supply and Use Tables required for constructing WIOT.



4. Data Requirements

As seen in the previous section, including Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) into the WIOT implies creating supply and use tables (imported and domestic use) as well as international supply and use tables for each of the two components of the Mexican economy. Furthermore, it requires including Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) into the structure of the international use tables from each of the WIOD countries.

In order to meet these objectives, our research requires three type of data; (a) official supply and use tables (domestic and imported use) for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) respectively, and; (b) yearly data from the national accounting system classified according to gross production, gross value added, imported and domestic intermediate consumption, final use and, so forth. (a) and (b) will be the basis for calculating the time series SUTs for each component of the Mexican economy. Finally, the last type of data is (c) bilateral trade data by country of origin (imports) for Mexico (Domestic and Maquiladora/Manufactura Global, respectively) and by country of destination (exports) for Mexico (Maquiladora/Manufactura Global). The latter will be the input data to calculate the international use tables from Mexico (Domestic and Maquiladora/Manufactura Global) and to modify the structure of the international use table from the rest of WIOD countries. In the next lines, we will further describe the main features behind these three types of data.

4.1 Data for SUTs from Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global).

Our research plans to create time series of interpolated SUTs for the two components of the Mexican economy by means of the well know SUT-RAS procedure (Junius and Osterhaven, 2003). The SUT-RAS procedure requires a base matrix which is to be interpolated with yearly data on industrial output. INEGI (the Mexican Statistical Office) provides specific data for each component of the Mexican economy to carry out this endeavor.

As mentioned already, official SUTs for the total economy of Mexico (2003) were the ones used by WIOD to include Mexico into the WIOT. In order to construct those official SUTs for 2003, INEGI first created specific SUTs for Mexico (Domestic Economy) and for Mexico (Maquiladora). This means that the sum of the SUT for Mexico (Domestic) and the ones for Mexico (Maquiladora) equal the SUT for the total economy of Mexico. Moreover, the available official use tables are further decomposed in specific imported and domestic use tables, per each component of the Mexican economy, respectively.

INEGI also separately reports yearly data in terms of the national accounting system for Mexico (Domestic), Mexico (Maquiladora) and Mexico (Manufactura Global). Such data is similar to the one used by WIOD in order to include Mexico in their dataset. It includes data for gross production, gross value added, imported and domestic intermediate consumption, total imports and exports and final demand for the case of Domestic Economy (remember that Maquiladora/Manufactura Global do not consume final demand goods). All the information for the Domestic Economy of Mexico is readily available on INEGI's website (www.inegi.org.mx). The information for Maquiladora is also there available from 1990 to 2006. From 2007 onwards, data for the IMMEX program is available but it is not reported in terms of the national accounting system. Nevertheless, in 2014 INEGI released data for the Manufactura Global that is published in terms of the national accounts from 2003 to 2012.

With this background information in mind, we proceed as follows to construct our own data. The starting point was to interpolate the official 2003 domestic (imported) intermediate use table from the Domestic economy of Mexico with yearly data of domestic (imported) intermediate consumption for that same component of the Mexican economy. With this first step, we obtained time series of interpolated domestic and imported intermediate use tables for Mexico (Domestic) from 1998 to 2011. Those domestic and imported intermediate use tables were then added up to obtain the total intermediate use table in Mexico (Domestic). Finally, once we had the total intermediate use tables for Mexico (Domestic), yearly information for the final use of that same component was included in order to obtain the total use table for the Domestic economy as proposed in figure (3). With the correspondent specific information for Maquiladora and for Manufactura Global, our research followed the same approach in order to create time series of interpolated total use tables for Mexico (Maquiladora) from 1998 to 2006 and, for Mexico (Manufactura Global) from 2007 to 2011.

The same approach was followed when creating the times series of interpolated supply tables for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global). We used the SUT-RAS procedure to interpolate the correspondent 2003 supply table with yearly data on gross output according to the respective component of the Mexican economy. Once we had the time series of supply tables, we added them their corresponding information for total imports. In that way, we finally obtained time series of total supply tables for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global), respectively for the same period of time from the total use tables. Finally, with all those tables we ensure that basic accounting identity (total supply equals total use) was met for each component of the Mexican economy.

4.2 Data for the international SUTs from Mexico (Domestic) and Mexico (Maquiladora/ Manufactura Global).

In order to transit from SUTs to international SUTs, Timmer et al. (2014) relied in the bilateral import data reported by each WIOD country in the UN COMTRADE database. The bilateral import data, reported at the 6 digit level from the Harmonized System (HS), was then allocated in 3 use categories (intermediate, final consumption and, investment) according to the Broad Economic Categories Classification (BEC). Given the lack of standardized bilateral service trade data, WIOD constructed their own service database by relying on different data sources (including OECD, Eurostat, IMF and WTO). Similarly, since there is not a service data classification for breaking services down according to the aforementioned use categories, WIOD relied on the information provided in existing import use or symmetric import IO tables.

Once all the information from international trade statistics was gathered, WIOD determined by each use category the share of imports of product ***i*** delivered by country A in the total imports of product ***i*** received by country B in that same use category. For instance, with the international trade data, they determined for the intermediate use category the share of the imports of chemical products delivered by Canada in the total intermediate imports of chemical products received by Mexico. Finally, those shares of use categories were applied to the total imports of product ***i*** as given in the SUT time series to derive imported use categories. The shares (and not the actual values) from international trade statistics were used in order to ensure consistency between the data reported in the time series of interpolated SUT and the international SUTs.

Having this background information in mind, we can indicate all the necessary data to create international SUTs for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global). Transforming SUTs into international

SUTs requires bilateral trade data. INEGI reports official bilateral trade data for Mexico (Domestic) and for Mexico (Maquiladora) from 1998 to 2006. Each product category at a 8 digit level from the Harmonized System is reported in three columns; one column reporting the imports (exports) made by Maquiladora firms, a second column with the imports (exports) made by non-maquila firms and, a third column (the sum of maquila and non maquila firms) indicating the total imports (exports) made by Mexico under that 8 digit level product category. As of 2007, bilateral trade data for the total economy of Mexico is only available.

In this context, in order to further extend our analysis to more recent years and to include the concept of Manufactura Global our research did the following. Given that Manufactura Global by definition includes all the foreign firms that mainly import intermediate goods (at least 70% of their total imports) to process them and eventually export them as a final manufacturing good, we decided to implement the same criteria in our available bilateral data. This means that within each product category at the 8 digit level from the previous data base, we identified those products whose ratio of maquiladora imports (exports) to total imports (exports) was higher than 70%. In that way, we were able to obtain a list of 8 digit level codes from the Harmonized system that were the basis to identify the concept of Manufactura Global within the bilateral trade data from 2007 onwards. Similarly, those 8 digit level products that did not match with our codes from Manufactura Global were regarded as the bilateral data for Domestic Economy from 2007 onwards.

As for the case of the services, we faced the same problem as WIOD of not having a standardized service bilateral trade data base. Therefore, we decided to use the bilateral service data for Mexico provided by WIOD in their international SUTs. Given that “Other Business services” (the only service sector within Maquiladora) participates with less than 2% in the total gross production of Maquiladora, we assumed that all the bilateral service data reported for Mexico by WIOD correspond to the bilateral service data of the Domestic Economy of Mexico. Nevertheless, in order to have bilateral service trade data for the maquiladora sector of “Other Business Services” we assumed that its import structure by country of origin was the same as the one reported for that same service sector in WIOD’s bilateral import data for Mexico.

Following the same stream of ideas, once we gathered all the necessary bilateral import data for each component of the Mexican economy, we only implemented the BEC intermediate use category to identify the intermediate goods in the Domestic Economy of Mexico. This means that we did not classify our bilateral import data in terms of the other two BEC use categories of final consumption and investment. There are several reasons behind this idea. First of all, to our view, the bilateral import data for the Maquiladora and the Manufactura Global do not require any additional classification as their import data (by definition) belongs to their imported intermediate consumption. Second of all, our research decided not to modify the bilateral import data for final consumption and investment initially reported for Mexico in WIOD given that also, by definition, that data corresponds to the Domestic Economy of Mexico. Just be reminded that neither the Maquiladora nor the Manufactura Global import goods for final consumption or investment. Therefore, the structure of the international use tables from Mexico in the section of final demand and gross capital formation as initially reported by WIOD will remain completely unaltered and simply relabeled as final demand and gross capital formation for Mexico (Domestic).

The next step was to identify the imported intermediate use share of product i delivered by country A in the total intermediate imports of product i from each component of the Mexican economy. Once we obtained those

shares, we applied them to their corresponding total imports of product ***i*** as given in our imported use time series to derive imported use categories. Finally, the corresponding domestic use tables, the information for gross value added, gross production and total exports was included in order to have international use tables for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) from 1998 to 2011 as proposed in figure (4).

The last step before including Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global) into the WIOTs was to include those components of the Mexican economy into the structure of the international SUT from the rest of WIOD countries. In that context, our research decided that the information for Mexico initially reported by WIOD in the structure of the international SUTs from the rest ofWIOD countries corresponded to that of the Domestic Economy of Mexico. The main reason for this is that the Maquiladora industry only exports final manufacturing goods and by definition does not source intermediate goods to other market. Furthermore, exporting intermediate and final goods as well as capital goods (investment) is a role solely taken by the Domestic Economy of Mexico. Therefore, just like in the previous case, all the data for Mexico initially contained in the international SUTs from the rest of WIOD countries will be unaltered and simply relabeled as the one for Mexico (Domestic).

Nonetheless, bilateral data for the exports of Maquiladora and of Manufactura Global is still required in order to have complete international use tables for the rest of WIOD countries. So as to meet the aforementioned objective, our research also retrieved Maquiladora bilateral export data (by country of destination) from 1998 to 2006. Data for the bilateral exports of Manufactura Global was obtained with the same criteria we followed to identify its bilateral imports. This means obtaining codes at the 8 digit level of the HS whose ratio of maquila exports to total economy exports was higher than 70% and using those codes to retrieve Manufactura Global exports by country of destination from 2007 to 2011. Afterwards, we obtain the exports share by country of origin and applied them to their corresponding total exports of product ***i*** as given in our use tables from Maquila/Manufactura Global. Finally, that information of Maquila/Manufactura Global exports by country of origin and by product category was benchmarked with the corresponding information for final use reported in each WIOD country.

Finally, with all the required international SUTs for Mexico (Domestic), Mexico (Maquiladora/ Manufactura Global) and for the rest of WIOD countries, we proceeded to construct the WIOTs from 1998 to 2011. Following WIOD, we transformed all the international SUT into a world input output structure by means of the “fixed product-sales structure” assumption. This assumption states that each product has its own specific sales structure irrespective of the industry where it is produced. Sale structure here refers to the proportions of the output of the product in which it is sold to the respective intermediate and final demand users (Timmer et al., 2014).

Before presenting our main results, some considerations about the main methodological differences between Maquiladora and Manufactura Global should be addressed. According to INEGI (2014), Manufactura Global includes all the universe of firms under the IMMEX programme as well as those firms in the domestic economy of Mexico not enjoying IMMEX benefits but mainly producing for exports. Nevertheless, Manufactura Global also includes those firms in the domestic economy of Mexico that mainly export intermediate goods to other

countries to explicitly participate in global production networks. This situation becomes an issue because then the data for total exports in Manufactura Global does not solely include final manufacturing goods (as the Maquiladora exports do) but also intermediate goods. Therefore, in order to maintain the consistency between the data reported for the Maquiladora and that of the Manufactura Global our research will assume that in both cases their total exports equal total final manufacturing exports.

Two important factors support this assumption. On the one hand, given that official data for the Maquiladora and for the Manufactura Global overlap from 2003 to 2006, our research can directly identify the share of Maquiladora production within Manufactura Global for those 3 years. This Maquiladora share is of 71% and for those years. The remaining 29% corresponds to the sum of final manufacturing exports from PITEX firms, from firms in the Domestic Economy mainly producing final exports, as well those mainly exporting intermediate goods for global production networks. Unfortunately, there is no available data to find the share in Manufactura Global from the aforementioned firms. However, according to De la Cruz et al. (2011), exports of manufactured goods under the Maquiladora and PITEX programs accounted for 85.4 percent of total manufactured exports of $195.6 billion US dollars in 2006. Therefore, with those arguments in mind, we are confident that bulk of exports contained in the data for Manufactura Global corresponds to final manufacturing goods.

On the other hand, one alternative way to further confirm our assumption is to look at the imported intermediate goods delivered by Mexico to the United States, its largest trading partner that receives around 90% of their total manufacturing goods (De la Cruz et al., 2011). According to IO data from OECD.Stat recently available online, the share of Mexican manufacturing imported intermediate goods and services in the total manufacturing imports of intermediate goods and services from the United States is of 10% by 2005 (latest available year). This data considers however all the manufacturing firms in Mexico without distinguishing Maquiladora and Domestic Economy firms. To our view, this data indicates that the share of intermediate exports embodied in Manufactura Global should be smaller than that 10% given that that concept only includes those firms explicitly source foreign other firms to participate in global production networks. That data however will still be considered in Mexico (Domestic) that considers the whole universe of firms in Mexico sourcing (exporting) intermediate goods to WIOD countries.

5. Descriptive statistics.

This section presents descriptive statistics for the final manufacturing production from Mexico (Domestic) and Mexico (Maquiladora/M. Global), as well as their domestic and imported intermediate consumption (by country and region of origin).

Table 1 indicates the participation of manufacturing sectors in the total manufacturing production from each component of the Mexican economy studied by this research. As can be seen, the manufacturing structure in Mexico (Domestic) seems to be far more diversified than that of Mexico (Maquiladora/M. Global). Similarly, it can also be observed that the production from Electrical and Optical Equipment and Transport Equipment is equally important for Mexico (Domestic) and for Mexico (Maquila/M. Global). That is because those sectors have the largest share in their respective total manufacturing production (excluding the share from Food and Beverages in the case of the Domestic economy). A particular case is that of textile industry which seems to be progressively declining their share in the total production within each component of the Mexican economy. Finally, it is worth mentioning that most of the gross output from Mexico (Domestic) is sourced to the domestic

market and to the United States, while almost the entire production from Mexico (Maquiladora/M. Global) is sourced to the United States.

Table 1. Gross Output shares per manufacturing sector

	Mexico (Domestic)		**Mexico (Maquiladora)**		**Mexico (M. Global)**	
	1998	2011	1998	2006	2007	2011
Food, Beverages and Tobacco	21.1	24.7	0.5	0.9	0.9	0.6
Textiles and Textile Products	5.2	2.8	11.8	7.5	2.9	2.3
Leather, Leather and Footwear	1.5	0.9	0.6	0.3	0.2	0.2
Wood and Products of Wood and Cork	1.2	0.8	0.0	0.0	0.0	0.0
Pulp, Paper , Printing and Publishing	3.9	3.4	2.5	2.0	0.7	0.6
Coke, Petroleum and Nuclear Fuel	5.2	7.2	0.0	0.0	0.0	0.0
Chemicals and Chemical Products	10.5	8.9	0.2	0.2	1.8	1.9
Rubber and Plastics	2.8	2.3	2.2	3.1	1.8	1.7
Other Non-Metallic Mineral	3.8	3.3	0.6	1.9	0.7	0.5
Basic Metals and Fabricated Metal	9.2	11.4	3.3	3.3	4.4	4.4
Machinery, Nec	1.8	2.5	2.0	2.3	2.1	3.6
Electrical and Optical Equipment	14.8	13.3	51.6	54.0	46.4	38.4
Transport Equipment	16.0	15.6	17.8	17.5	32.3	38.5
Manufacturing, Nec; Recycling	3.0	2.9	6.9	7.1	5.9	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

On the other hand, table 2 indicates the total intermediate input structure by country of origin (including both the foreign and domestic inputs) for the total manufacturing production of Mexico (Domestic) and for 3 relevant sectors within that component. From 1998 to 2011, Mexico (Domestic) is the main source of intermediate goods for all the manufacturing firms in Mexico (Domestic). During those years, the share of Mexico (Domestic) in the total intermediate goods used by Mexico (Domestic) is of more than 70% with very few significant variations over time. In that same share, the US participates with 20%, and the the rest of countries participating in the remaining 10%.

The aggregate tendency in the intermediate input structure from Mexico (Domestic) can also be observed at the sector level. During the years here studied, the Transport sector used more than 54% of intermediate inputs sourced by Mexico (Domestic), while the corresponding one for the textile industry is of more than 70%. Electrical and Optical equipment is the only manufacturing sector within Mexico (Domestic) that does not completely follow the aggregate intermediate input structure. By 1998, this sector was primarily using intermediate goods produced by Mexico (Domestic). Nevertheless, by 2011 the US and progressively more East Asian producers accounted for the highest share in the intermediate input structure from Electrical equipment

Table 2. Share of intermediate inputs used in the manufacturing production from Mexico (Domestic)

	Total Manufacturing production		Textile and Textiles products		Electrical and Optical Equipment		Transport Equipment	
	1998	2011	1998	2011	1998	2011	1998	2011
Mexico (Domestic)	70.6	67.0	76.3	69.9	40.8	31.5	53.8	54.8
NAFTA								
United States	20.0	19.9	15.7	18.7	38.4	36.0	36.6	26.2
Canada	0.6	1.1	0.2	0.2	1.0	1.0	1.1	1.6
East Asia								
China	0.3	2.2	0.1	4.3	1.5	9.6	0.1	2.7
Japan	1.1	1.5	0.2	0.1	4.0	5.5	1.4	6.3
South Korea	0.3	0.6	1.7	0.6	0.3	1.6	0.0	0.8
Taiwan	0.3	0.3	0.7	0.6	1.2	1.2	0.3	0.3
Europe								
Germany	1.9	1.6	0.5	0.5	4.3	3.7	5.2	3.1
France	0.5	0.4	0.1	0.1	1.7	1.3	0.2	0.3
United Kingdom	0.3	0.2	0.1	0.1	0.6	0.4	0.1	0.1
Rest of Europe	1.8	2.3	1.2	1.7	4.0	3.3	0.6	1.9
Rest of the World	2.2	2.9	3.0	3.1	2.2	5.0	0.6	1.9
Total intermediate inputs	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Following the same stream of ideas, table 3 presents the intermediate input structure from Maquiladora (upper panel) and from Manufactura Global (lower panel). In this case, we can see that there are substantial differences with respect to Mexico (Domestic) both at the aggregate and sector level.

By 1998, US producers sourced more than 84% of the total intermediate inputs used by Maquiladora firms. The remaining share was consistent of 8.5% from intermediate goods sourced by Mexico (Domestic) (i.e. the domestic intermediate consumption from Maquiladora industry) while the other 12% belonged to intermediate goods from the rest of the world. Nevertheless, by 2011 a dramatic diversification was observed in the intermediate input structure from Manufactura Global. In that same year, US producers now sourced 32% of the total intermediate goods, East Asian countries 30%, Mexico (Domestic) 22.5% and Europe 7.1% with the remaining share belonging to the rest of the World.

The steady and sharp decline from the US intermediate goods in Maquiladora/M. Global is still observed in every single manufacturing sector within that component of the Mexican economy. In the case of the textile industry, such dramatic decline has come at the expense of a slight increase in the intermediate inputs sourced by Mexico (Domestic) and a steady (but still small) increase from East Asian inputs. As for the case of Transport Equipment,

the decline in US inputs is mainly associated to a continuous increase in the inputs sourced by Mexico (Domestic) and, to a less extent, to the inputs produced in Europe and East Asia.

The most interesting situation occurs in the case of the intermediate input structure from Electrical and Optical Equipment, which is the largest sector within Maquiladora/M. Global. As of 2006 East Asia became the most important supplier of electrical and optical equipment intermediate inputs used by Maquiladora/M. Global. By 1998, the joint participation of East Asian countries in the intermediate input structure of this sector was of 8% while by 2011 it moved to 50%. US electrical inputs moved from 84% to 27% while the ones sourced by Mexico (Domestic) nearly doubled (from 5% to 10%) during the years here studied.

In this context, our data confirms the structural duality from each component of the Mexican manufacturing production. First of all, firms in Mexico (Domestic) have remained highly dependent on the intermediate inputs also produced by Mexico (Domestic). The increasing globalization of production has only altered the intermediate input structure from the Electrical and Optical equipment that receives more intermediate inputs from US and from East Asia than from Mexico (Domestic). Nevertheless, that situation is compensated by the relatively unchanged intermediate input structure from the rest of manufacturing sectors.

On the other hand, firms in Mexico (Maquiladora/M. Global) still present a limited interaction with local producers in Mexico (Domestic) and are still highly dependent on the intermediate inputs sourced by foreign producers. Nevertheless, the globalization of production induced in Maquiladora and in Manufactura Global a dramatic change in their intermediate input structure with East Asia sourcing progressively more and the US sourcing progressively less.

Table 3. Share of intermediate inputs used in the manufacturing production from Mexico (Maquila)

	Total Manufacturing production		Textile and Textiles products		Electrical and Optical Equipment		Transport Equipment	
	1998	2006	1998	2006	1998	2006	1998	2006
Mexico (Domestic)	8.5	10.9	12.5	16.0	5.6	6.8	7.5	14.2
NAFTA								
United States	84.5	42.5	85.2	71.0	83.6	29.5	90.2	62.4
Canada	0.3	1.3	0.2	1.5	0.3	0.8	1.0	5.9
East Asia								
China	0.6	12.7	0.2	5.2	0.8	16.2	0.5	4.1
Japan	1.8	7.9	0.1	0.4	2.8	12.6	0.2	3.5
South Korea	1.7	7.6	0.4	0.8	3.0	12.6	0.0	2.3
Taiwan	0.8	3.6	0.5	0.9	1.1	5.9	0.5	0.3
Europe								
Germany	0.2	1.0	0.1	0.5	0.2	1.0	0.0	1.5
France	0.2	0.3	0.0	0.1	0.3	0.3	0.0	0.2
United Kingdom	0.0	0.4	0.0	0.1	0.0	0.3	0.0	1.0
Rest of Europe	0.2	1.6	0.2	0.9	0.2	1.7	0.0	1.2
Rest of the World	1.3	10.2	0.5	2.7	2.0	12.2	0.1	3.5
Total intermediate inputs	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 3. Share of intermediate inputs used in the manufacturing production from Mexico (M. Global)

	Total Manufacturing production		Textile and Textiles products		Electrical and Optical Equipment		Transport Equipment	
	2007	2011	2007	2011	2007	2011	2007	2011
Mexico (Domestic)	19.7	22.5	17.2	17.6	11.5	10.1	31.8	40.1
NAFTA								
United States	35.0	32.2	61.0	53.6	27.2	26.6	46.1	39.5
Canada	1.4	1.3	1.5	2.0	0.8	0.6	3.7	3.1
East Asia								
China	12.7	17.5	5.7	9.7	17.2	27.7	1.8	2.0
Japan	6.6	5.3	0.5	0.3	10.5	9.4	4.6	5.2
South Korea	6.8	5.1	0.7	1.0	13.4	10.1	0.5	1.6
Taiwan	3.0	1.6	1.2	1.0	5.5	2.8	0.4	0.5
Europe								
Germany	2.8	2.8	1.1	1.7	2.1	2.6	5.9	4.2
France	0.6	0.7	0.2	0.1	0.4	0.4	0.5	0.4
United Kingdom	0.5	0.5	0.1	0.1	0.3	0.3	0.2	0.1
Rest of Europe	2.9	3.1	3.9	3.6	2.3	2.3	1.5	1.8
Rest of the World	8.2	7.4	7.0	9.3	8.9	7.2	2.9	1.6
Total intermediate inputs	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

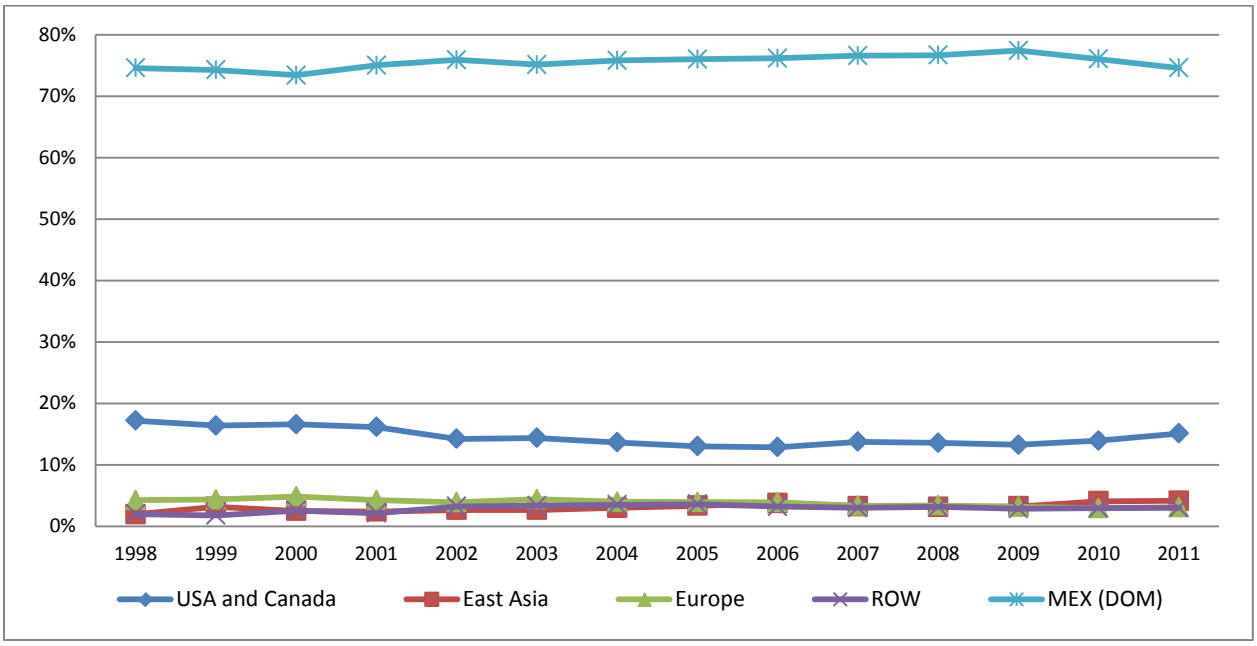
6. Results

This section describes the value added structure embodied in the final manufacturing output (industry and sector level) produced by Mexico (Domestic), Mexico (Maquiladora/M. Global) and Mexico (Total economy), respectively. The value added structure has been derived using equation (1) and indicates both the domestic and foreign value added content (by country and region of origin). In the specific case of the Mexico (Maquiladora/M. Global) and Mexico (total economy), the corresponding domestic value added embodied in their final manufacturing output separately addresses the individual contribution from Mexico (Maquiladora/M. Global) and Mexico (Domestic).

6.1 Domestic Economy of Mexico.

Figure (1) indicates the value added structure by country of origin in the total final manufacturing output (total industry level) of Mexico (Domestic) from 1998 to 2011. As can be observed, the value added contribution from Mexico (Domestic) and from each region here studied did not suffer significant variations over time. The value added contribution from Mexico (Domestic) was always higher than 74%. In the case of the foreign value added contributions by country of origin, the US/Canada and Europe decreased their individual contribution at the expense of an increase in the East Asian one. East Asian countries have more than doubled their joint value added contribution in the final output from Mexico (Domestic) and by 2009 their corresponding share is higher than that of Europe. Nevertheless, the value added from both East Asia and Europe remains significantly lower when compared to that from US/Canada.

Figure 1. Value Added contribution (by country of origin) in Mexico (Domestic) Total final manufacturing output.

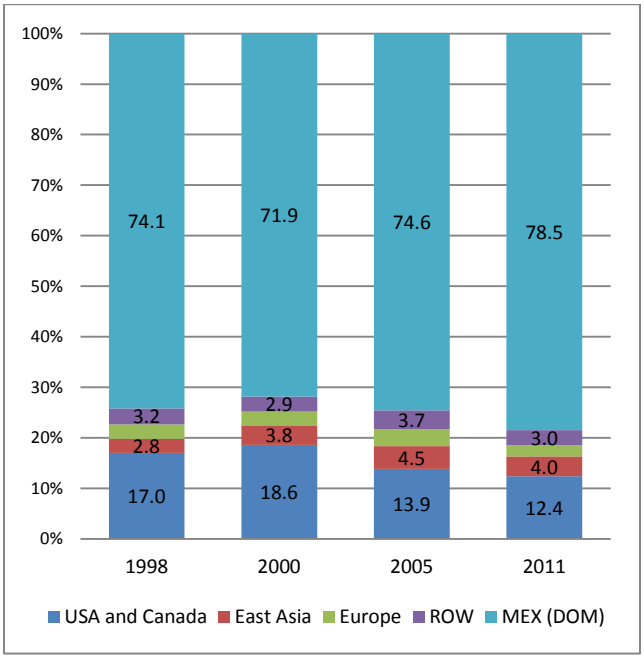


On the other hand, table (3) indicates the evolution of the value added structure per manufacturing sector in Mexico (Domestic) for selected years. Following the aforementioned industry level (aggregate) tendency, most the manufacturing sectors in Mexico (Domestic) present over time remarkably high levels of domestic value added with very little variations in their foreign value added content by country of origin. Electrical and Optical equipment is the only exception. This is the manufacturing sector in Mexico (Domestic) with the lowest

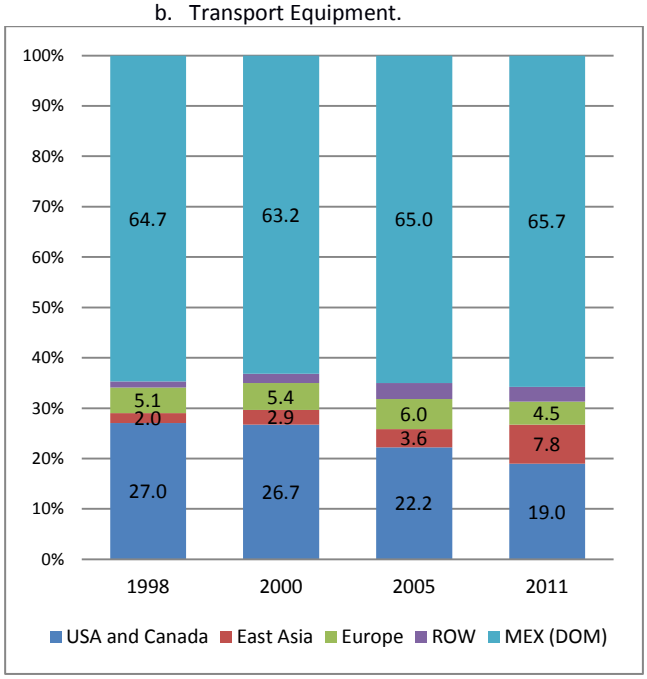
domestic value added that has been declining over time (45% in 1998 and 39% by 2011). East Asian countries are responsible for this decline and for the one from US/Canada as well as the one from Europe within that same sector. This is mainly because of the fact that their corresponding share doubled from 6% in 1998 to 14% by 2011. According to our results, within East Asian countries, China is the main responsible for this increasing share in light of a tenfold increase on its individual value added share during the years here studied.

Figure 2. Value added contribution (by country of origin) in Mexico (Domestic) final manufacturing output.

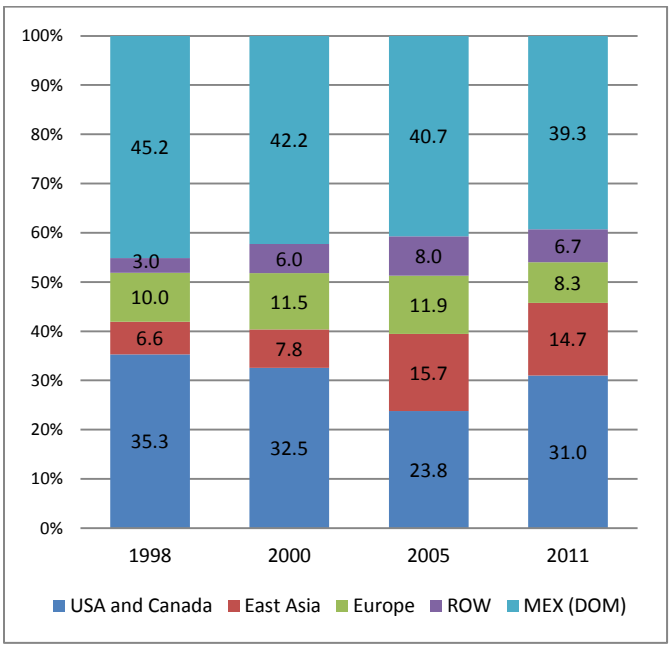
a. Textiles and Textile Products



b. Transport Equipment.



c. Electrical and Optical Equipment.

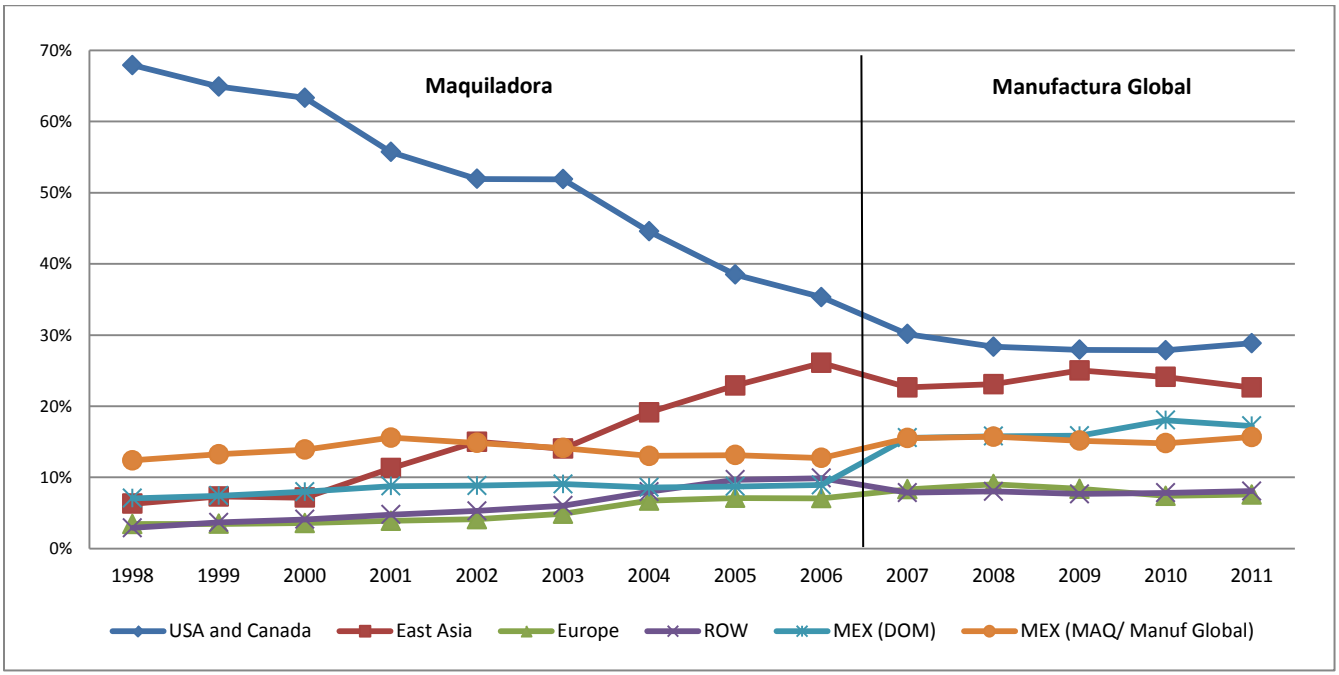


Considering this situation our research can infer that the increasing value added from East Asian countries (notably China) in the Electronic and Optical equipment produced by Mexico (Domestic) is the main responsible for an increasing value added share of those countries in the aggregate tendency (total industry level) observed in Mexico (Domestic). Nevertheless, their corresponding share in the total industry level is still small given the remarkably high value added sourced by Mexico (Domestic) and the strong interaction with NAFTA neighbors (US/Canada) in most of the manufacturing sectors.

6.2 Maquiladora Industry (1998-2006) and Manufactura Global (2007-2011).

When compared to Mexico (Domestic), a complete different story is observed in the case of the value added structure from Mexico (Maquiladora/M. Global). Figure (3) presents the value added contribution by country of origin in the industry level (aggregate) final manufacturing output produced by Mexico (Maquiladora/M. Global). Acknowledging the differences between the firms included in Maquiladora industry and those included in Manufactura Global, figure (3) is divided into two panels that separately address those firms according to the years where data was available.

Figure 3. Value Added contribution (by country of origin) in Mexico (Maq/M. Global) Total final manufacturing output.



As mentioned already, the individual value added contributions from Mexico (Maq./M. Global) and from Mexico (Domestic) are separately considered in the final manufacturing output produced by Mexico (Maq./M. Global). In this context, the sum of the value added contribution from Mexico (Maq./M.Global) and from Mexico (Domestic) should be equal to the total domestic value added embodied in the Maquiladora/M. Global final manufacturing production. During the years where data for the Maquiladora was available, we observed that share of Mexico (Maquiladora) was slightly higher than that of Mexico (Domestic) with 12.4% and 7.1% in 1998 and 12.7% and 8.9% by 2006, respectively. When considering the joint contribution from Mexico (Maquiladora)

and Mexico (Domestic) (i.e. the total domestic value added contribution) in Maquiladora production, we observed the same cyclical behavior in the Mexican domestic value added content of maquila exports initially described by Castillo & De Vries (2014).

Following those authors, such cyclical behavior is mainly related to external shocks and not to changes in the domestic regulatory environment. Nevertheless, the specificity from our data allow us to indicate that those external shocks mainly impact the value added share from Mexico (Maquiladora) with the one from Mexico (Domestic) remaining unaltered. The US crisis and China's entrance to the World Trade Organization (WTO) in 2001 (the first external shock considered by our research) induced a steady decline on the individual value added contribution from Mexico (Maquiladora) from 15.6% in 2001 to 12.7% in 2006. That individual decline from Mexico (Maquiladora), however, was compensated by the relatively unaltered value added from Mexico (Domestic) which only moved from 8.8% to 8.9% in those years.

An important consideration to fully understand the aforementioned tendencies in the domestic value added of Maquiladora production is that the corresponding individual contribution from Mexico (Maquiladora) is only reflecting the value added contribution from the labor employed in maquiladora firms. Just remember that by definition the Maquiladora industry does not produce intermediate goods of any kind. Therefore, we can see that the decreasing value added from Mexico (Maquiladora) from 2001 to 2006 is indicating the loss in employment from the Maquiladora firms that were shut down as a result of the external shocks in 2001. Following the same stream of ideas, we can see that the value added contribution from Mexico (Domestic) in Maquiladora production was not significantly altered by the external shock of 2001. The value added contribution from Mexico (Domestic) is the most important one given that this is the instrument by which Mexican manufacturing suppliers can interact more efficiently with foreign producers in order to trigger more benefits for the rest of the economy away from merely assembling (inducing for instance a process technological learning). Nevertheless, from 1998 to 2006, this share in Maquiladora production did not suffer any significant modifications (it remained lower than 9%) indicating that Mexican suppliers are still away to meet the requirements from foreign producers.

A relatively similar situation is observed in the corresponding data for Manufactura Global. In this case, we can see that the value added contribution from Mexico (Domestic) in the total final manufacturing output from Mexico (Manufactura Global) is higher than the corresponding one from Mexico (Domestic) in Mexico (Maquiladora). Such situation explains the increase in the value added from Mexico (Domestic) from 2006 to 2007, when the value added tendencies transit from Mexico (Maquiladora) to Mexico (Manufactura Global) in figure (2). The main factor behind the higher value added from Mexico (Domestic) embodied in Mexico (Manufactura Global) is the fact that the corresponding data for Manufactura Global is taking into account not only the Maquiladora firms, but also those in the PITEX program as well as those in the Domestic Economy that are highly engaged in global production networks. Therefore, the higher universe of firms in Manufactura Global that are being sourced with intermediate inputs from Mexico (Domestic) makes the corresponding value added trends higher from 2007 to 2011 than the ones from 1998 to 2006.

Nevertheless, despite its higher value from 2007 to 2011, the value added contribution from Mexico (Domestic) in the total final manufacturing output from Mexico (Manufactura Global) shows the same tendency that it showed from 1998 to 2006 in Mexico (Maquiladora). This means that Mexico (Domestic) does not show any

significant variations on their value added contribution to Mexico (Manufactura Global). It only shows a modest increase in their share (from 15.5% in 2007 to 17.2% in 2011) and just like in the case of Maquiladora, it does not seem to have been severely affected by external shocks (the financial crisis in 2008 in this case).

On the other hand, despite considering a larger amount of firms, the tendency from the value added contribution of Mexico (Manufactura Global) on its own final output does not significantly increase when compared to the tendency of the value added contribution from Mexico (Maquiladora) on its corresponding final output. During the years where the transition between Mexico (Maquila) and Mexico (M. Global) is made, the value added contribution from Maquiladora slightly increases from 12.7% in 2006 to 15.6% by 2007 in Manufactura (Global). Similarly just like the case of Maquiladora, Mexico (Manufactura Global) seems to be sensitive to external shocks. In this case, as a result of the financial crisis in 2008, the value added contribution from Mexico (Manufactura Global) on its own final output decreased from 15.7% in 2008 to 14.8% in 2010 with small signals of recuperation by 2011. The source of that value added decrease can also be found in the fact that the value added from Mexico (Manufactura Global) is solely reflecting the hiring of less workers as a result of firms under Manufactura Global reducing its output/shutting down.

To our view, the value added contributions from Mexico (Manufactura Global) and Mexico (Domestic) in the total final manufacturing output of Mexico (M. Global) from 2007 to 2011 follow the same patterns observed in the corresponding data for Mexico (Maquiladora). On the one hand, given the little variations observed in the contribution from Mexico (Domestic), we can conclude that manufacturing firms in Mexico supplying domestic inputs to IMMEX firms (and to those other firms highly engaged in global production networks) are still far away from meeting the requirements of foreign producers. Those foreign producers seek to source one of the major markets in the World (United States) and Mexican suppliers sourcing Manufactura Global have not proved in meeting their competitive standards. When considering the joint contribution from Mexico (Domestic) and Mexico (Manufactura Global) in the total output from Manufactura Global (i.e. the total domestic value added embodied in the final output from M. Global), we can see that contribution from Mexico (Domestic) has become slightly higher than that of Mexico (M. Global)

Nevertheless, just like the in case of Maquiladora, the variations in the total domestic value added embodied in M. Global can still be attributed to the variations in the value added contributions from Manufactura Global.

Figure (3) also indicates the value added contribution from the rest of countries participating in the final manufacturing production of Mexico (Maquiladora) and Mexico (Manufactura Global). In this case, a dramatic decline in the value added contribution from US/Canada producers is observed over time. In 1998, the value added contribution from US/Canada producers in the total final manufacturing output from Mexico (Maquiladora) was of 68%. By 2006, the last year where Maquiladora data was available, the same US/Canada value added contribution had declined to 35%. This declining tendency continues from 2007 to 2011 in the case of the value added contribution from US/Canada in the final output from Manufactura Global (its corresponding share by 2011 was of 29%). Given the small increases and minor variations in the total domestic value added embodied in the final manufacturing output of Maquiladora and M. Global, we can indicate that the decline in the US/Canada value added in such final output largely occurred at the extent of a increasing value added contribution from East Asian producers.

In 1998, the joint value added contribution from East Asian producers in the final manufacturing output from Mexico (Maquiladora) was of 6.3%. By that time, it was already larger than the one from Europe (3.4) and the one from the rest of the world (2.7%), but 10 times smaller than the joint contribution from US/Canada. In 2006, the joint contribution from East Asia in Maquiladora production was of 26% and, by 2011 its contribution was of 23% of the final output in Manufactura Global. During those years, the country that was mainly driving the increasing East Asian value added content is, of course, China. By 2005, the individual contribution from China in Maquiladora production surpassed that of Japan and by 2011, Chinese producers accounted for half of the total East Asian value added embodied in Manufactura Global final manufacturing output.

In this context, it can be argued that during the last decade (2000s) the increasing globalization of production induced two effects in the value added structure that is embodied in the Mexican production for final manufacturing goods that is mainly exported to the US. On the one hand, it induced a dramatic shift in the value added contribution from foreign producers participating in the production of Mexico (Maquila/Manufactura Global), with NAFTA neighbors adding progressively less value added in the total final manufacturing output and East Asia steadily adding more and more. On the other hand, the increasing globalization of production did not significantly alter the domestic value added structure from Mexico (Maquiladora/M. Global). From 1998 to 2006, the value added contribution from the firms in the Domestic Economy of Mexico did not show any signs of being drastically boosted by the increasing globalization of production faced by Maquila producers. Similarly, the corresponding value added of Mexico (Domestic) embodied in Manufactura Global from 2007 to 2011 does not seem to have any drastic change. In this context, the variations in the total domestic value added of Mexico (Maquiladora/M. Global) are mainly reflecting the response (expansion/contraction) from the low qualified labor there working to the external shocks in 2001 and 2008.

At the end, the main outcome induced by the increasing globalization of production during the 2000s in the aggregate value added structure from the final manufacturing output in Mexico (Maquiladora/M. Global) has been a drastic diversification in the value added contribution by country of origin. According to figure (2), this process of value added diversification has become more evident since 2005 and it has become deeper over time. For instance, by 2010 the domestic value added contribution from Mexico (total firms) in Manufactura Global production was of 33%, that of US/Canada was of 28%, the one from East Asia 24%, the one for Europe 8.4% and the rest of the World 7.7%.

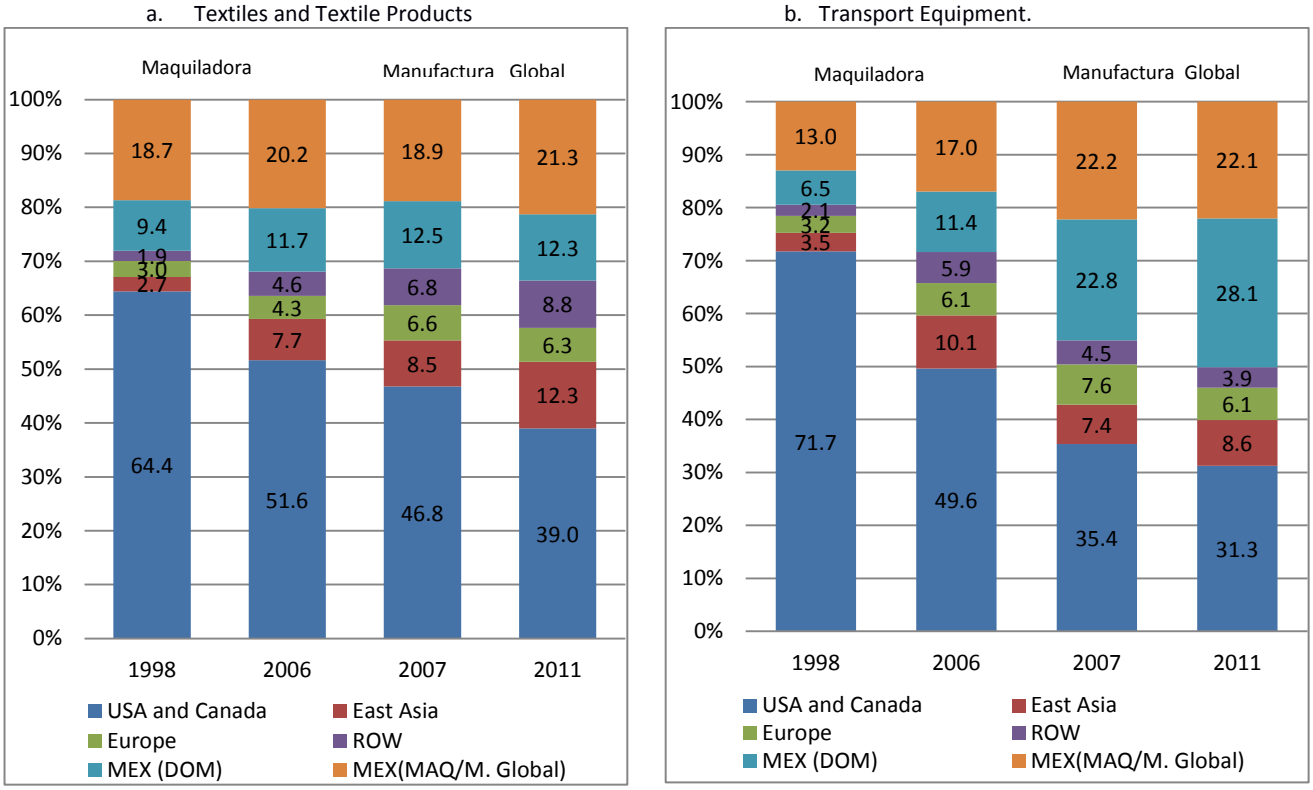
Table (4) presents the value added structure per manufacturing sector for selected years for Mexico (Maquiladora) and Mexico (M. Global) respectively. As can be seen, the decline in the value added share from US/Canada producers and, the corresponding diversification of the value added structure observed at the industry level (aggregate level) from Mexico (Maquiladora/M. Global) is also observed at the sectoral level (manufacturing sector). In the case of the textile industry, we can see that loss in US/Canada value added mainly occurred at the extent of textile producers in East Asia (notably China) but also from those in Europe and the rest of the World. The joint contribution from Mexico (Domestic) and Mexico (Maquiladora/Global), i.e. the total domestic value added embodied in the final manufacturing output, was always between a range of 28 and 33% and thus it was not drastically modified. One more time, we can see that firms in Mexico (Domestic) supplying inputs to Maquiladora/M. Global did not boost their value added as a result of the decline in US/Canada value

added. The value added from Maquiladora/M. Global suffered minor variations related to the sensitivity of labor to the external shocks in 2001 and 2008.

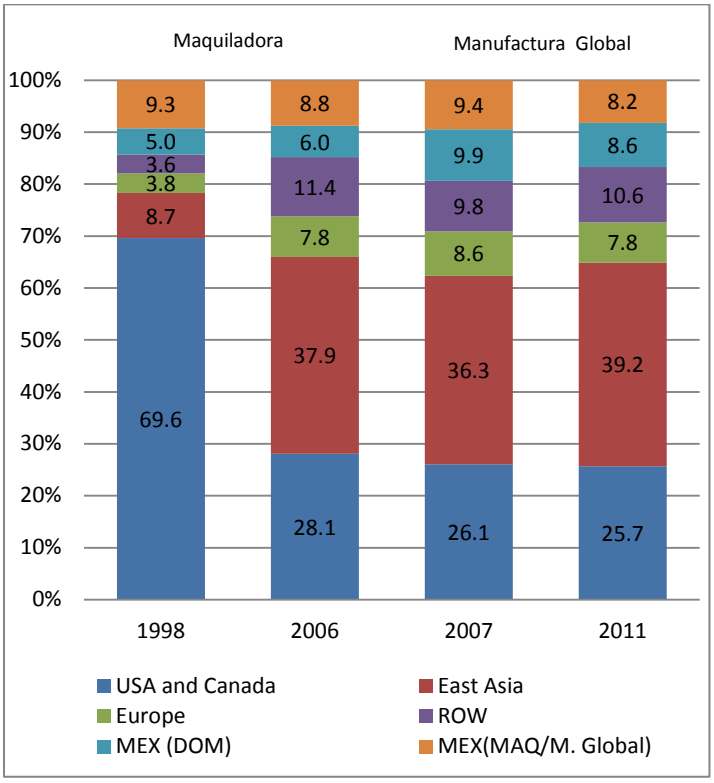
The most drastic change from all the manufacturing sectors is observed in the case of the Electric and Optical equipment. In the case of Mexico (Maquiladora) from 1998 to 2006, the US/Canada reduced their value added embodied in that final manufacturing output from 70% to 28% (in each year respectively), while East Asia increased theirs from 9% to 38% during the same period of time. Such tendencies continue in the years where data for Mexico (Manufactura Global) was available. By 2011, the corresponding share for East Asia was of 39% while that of US/Canada was 26%. Just like the previous case of the textile industry, the contribution of Mexico (Domestic) and Mexico (Maquiladora/M. Global) remained low and did not seem to be substantially modified.

Finally, transport equipment shows a somewhat different trend in their value added structure. Here, we can also see that the US/Canada have substantially declined their value added contribution both the case of the final output in Mexico (Maquiladora) and Mexico (Manufactura Global). Nevertheless, this time, such a decline mainly occurs at the expense of an increasing value added contribution from Mexico (Domestic) and Mexico (Maquiladora/M. Global). From 1998 to 2006, it can be seen that firms in Mexico (Domestic) nearly double their value contribution in the final output of the transport sector from Mexico (Maquiladora). The value added from Mexico (Maquiladora) also steadily increased despite a contraction as a result of the external shock in 2001. In this context, the joint contribution from firms Mexico to the final transport production in Mexico (Maquiladora) increased from 20% in 1998 to 29% by 2006.

Figure 4. Value added contribution (by country of origin) in Mexico (Maquiladora/M. Global) final manufacturing output.



c. Electric and Optical Equipment



In the years where data for Mexico (Maquiladora) transits to become Mexico (Manufactura Global), we see that the corresponding value added for Mexico (Domestic) nearly doubles from 2006 to 2007. This situation is mainly because of the higher universe of firms considered under the concept of Manufactura Global. Despite this situation, from 2007 to 2011 we see that in general the tendency for the automotive sector in the Maquiladora also holds for the case of the Manufactura Global. A continuous decline from US/Canada value added this time occurring at the expense of an increase from the value added of firms in Mexico. By 2011, the value added contribution from Mexico (total economy) in the transport equipment sector from Manufactura Global was of 50%, the one from US/Canada 31%, East Asia with 8.6%, Europe 6.1% and the rest of the world 4%.

6.3 Total Economy of Mexico (1998-2011).

Figure (5) presents the evolution from the value added structure in the final manufacturing output produced by Mexico (total economy). As can be inferred, such figure was obtained by adding the value added structure from Mexico (Domestic) and the one from Mexico (Maquiladora/M. Global). In this context, it becomes clear that the value added structure from Mexico (total economy) is largely reassembling the value added structure from Mexico (Domestic). Similarly, we can see that substantial decline in the US/Canada value added embodied in Maquiladora/M. Global production is largely offset by the value added contribution from US/Canada in the final output from Mexico (Domestic).

Figure 5. Value added contribution (by country of origin) in Mexico (total economy) final manufacturing output.

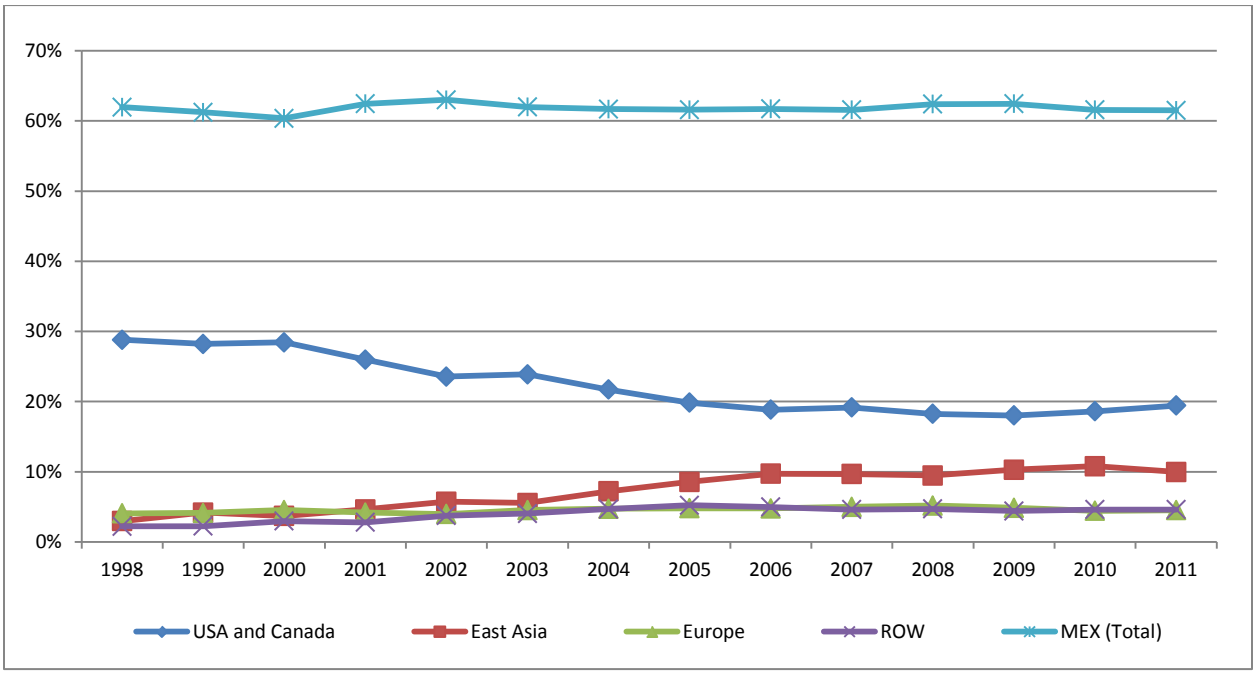


Figure (4) also indicates an increasing contribution from East Asian in the total final manufacturing output produced in the total economy of Mexico. According to our results, the main source from such increase is the higher levels of value added from East Asian producers identified in the production of Electrical and Optical Equipment by Mexico (Domestic) and, to a much larger extent, in the same production by Mexico (Maquiladora/M. Global).

Our results also allow us to assess the individual domestic value added contribution from the following three components in the total final manufacturing production by Mexico (total economy). This can be observed in table 3. First of all, the value added contribution from the firms in Mexico (Domestic) sourcing other intermediate inputs for firms in Mexico (Domestic) accounts for the largest share in total value added structure from Mexico (total economy). The contribution of this component decreased during the years here studied (from 57.5% in 1998 to 51.1% in 2011). Second of all, the value added contribution from the firms in Mexico (Domestic) sourcing intermediate goods to Mexico (Maquiladora/M. Global) increased from 1.6 to 5.4%. Finally, the individual value added contribution from the firms in Mexico (Maquiladora/M. Global) was of less than 5% with little declines due to the external shocks of 2001 and 2008. As can observed in table 3, the main source of the small but yet steady increases in the total domestic value added embodied in the final manufacturing output produced by Mexico (total economy) mainly come from the increasing contribution of the last three components in the production from transport equipment and, to a less extent, the production from textile goods.

Table 3. Value added contribution by region/country of origin in Mexico (Total economy) final manufacturing output

		Total Manufacturing production		Textile and Textiles products		Electrical and Optical Equipment		Transport Equipment	
		1998	2011	1998	2011	1998	2011	1998	2011
Mexico	(Domestic Mx)	57.5	51.1	44.1	58.4	23.1	16.0	50.9	34.2
	(Domestic to MAQ/M.G.)	1.6	5.4	3.8	3.1	2.5	5.1	1.4	13.5
	(MAQ/M.G.)	2.8	4.9	7.6	5.4	4.5	4.9	2.8	10.6
	Total Mexico	62.0	61.5	55.4	67.0	30.1	25.9	55.1	58.3
United States	(Domestic Mx)	12.7	9.7	9.9	8.9	17.5	12.1	20.5	9.2
	(MAQ/M.G.)	15.2	8.5	25.7	9.5	33.4	14.7	14.9	13.8
Canada	(Domestic)	0.6	0.6	0.3	0.3	0.6	0.6	0.8	0.7
	(MAQ/M.G.)	0.3	0.6	0.5	0.5	0.6	0.6	0.4	1.2
	Total US and Canada	28.8	19.4	36.3	19.2	52.0	27.9	36.5	24.9
China	(Domestic Mx)	0.3	1.4	0.2	2.2	0.7	3.2	0.1	1.3
	(MAQ/M.G.)	0.2	3.8	0.3	2.4	0.6	12.6	0.2	1.5
Japan	(Domestic Mx)	0.9	1.1	0.3	0.2	2.0	1.9	1.1	2.3
	(MAQ/M.G.)	0.7	1.9	0.4	0.3	2.1	5.5	0.3	2.0
South Korea	(Domestic Mx)	0.2	0.2	0.8	0.3	0.2	0.5	0.1	0.3
	(MAQ/M.G.)	0.3	1.1	0.2	0.2	1.1	3.8	0.1	0.5
Taiwan	(Domestic Mx)	0.2	0.1	0.3	0.2	0.5	0.4	0.2	0.1
	(MAQ/M.G.)	0.2	0.4	0.2	0.2	0.6	1.3	0.1	0.2
	Total East Asia	3.0	10.0	2.7	6.1	7.6	29.2	2.3	8.2
Germany	(Domestic Mx)	1.3	0.7	0.4	0.4	1.9	1.2	2.6	1.0
	(MAQ/M.G.)	0.2	0.8	0.2	0.4	0.4	1.6	0.1	1.3
France	(Domestic Mx)	0.4	0.2	0.2	0.1	0.8	0.4	0.2	0.2
	(MAQ/M.G.)	0.1	0.2	0.2	0.1	0.3	0.4	0.1	0.2
United Kingdom	(Domestic Mx)	0.3	0.2	0.2	0.1	0.5	0.2	0.3	0.1
	(MAQ/M.G.)	0.2	0.2	0.2	0.1	0.3	0.4	0.1	0.2
	Rest of Europe	1.6	2.2	1.5	2.1	2.7	3.7	1.2	2.2
	Total Europe	4.1	4.5	2.9	3.2	6.9	8.0	4.7	5.3
	Rest of the World	2.2	4.6	2.7	4.5	3.3	9.0	1.4	3.4
	Total final manufacturing production	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In this whole context, we can indicate how the effects from the increasing globalization of production can be identified in the value added structure from the Mexico (total economy). On the one hand, the steady declined in the sourcing of intermediate inputs from US/Canada producers in the three most important manufacturing sector in Mexico (i.e. Textiles, electrical and optical equipment and transportation) induced a decline the US/Canada value added share that can be observed in the three levels of analysis for Mexico's production (Domestic, Maq./M.Global and, total). Such decline made room for an increase in the value added share from foreign and domestic producers that was differently exploited depending on the manufacturing sectors. On the one hand, East Asian producers gained significant value added share in the Electronic and optical equipment production from Mexico (Domestic) and specially in the case of the one from Mexico (Maq./M. Global) where they now account for the largest share. This increase is the main source behind the increasing East Asian value added observed at the aggregate level in the total production from Mexico (total economy). On the other hand, firms in Mexico (Domestic) and Mexico (Maq./M. Global) increase their value added share in the transport equipment and textile production. Such increase is behind the increasing domestic value added tendency from Mexico in their total manufacturing production.

7. Concluding remarks.

Finally, in order to fully understand the differences in the value added tendencies from Mexico (Domestic) and Mexico (Maquiladora/M. Global) as well as their impact on the aggregate value added structure from Mexico (total economy) we need to address the sources from the increasing globalization of production. In this sense, we will refer to the different reallocation decisions from US producers that used to source Mexico (Domestic) and Mexico (Maquiladora) with an important amount of inputs.

In light of the increasing globalization of production, US producers sourcing the Mexican market with intermediate goods decided to reallocate their production on the basis of 3 criteria; (1) NAFTA beneifts (protection) prevailing in their corresponding manufacturing sectors, as well as other incentives for exports (Maquiladora/IMMEX); (2) technical considerations in organizing the production, and; (3) other costs (mainly labor). The weighting of those 3 criteria largely determined the decision from US producers to reallocate their production in cheaper locations at East Asia (mainly China) or in Mexico.

In the case of the textile industry, US producers mainly decided to reallocate their production to Mexico than to East Asia. This is especially true in the case in the case of the Cotton industry, where both Mexican and US producers benefit from the large cotton plantations and the cheap Mexican labor. More importantly, as mentioned already in section 2, NAFTA protects this sector with quite demanding rules of origin (fabric and yarn forward). In the rest of textile sectors (leather, footwear and so forth), US producers decided to reallocate mainly to East Asia. Given the importance of this North American production, we believe that the aforementioned factors account for the decrease in US value added and the increase in Mexico (Domestic) and Mexico (Maquiladora/M. Global) within the textile industry.

In the case of the transport equipment sector, it can be observed that US producers sourcing the Mexican market mainly decided to reallocate their production to Mexico. Furthermore, not only US producers but also producers in East Asia and in Europe are progressively reallocating production to Mexico. The main reason for non-NAFTA producers to reallocate is to enjoy the benefits that producing in Mexico grants them in order to export to US market. Furthermore, and especially in the case from the US producers, the combination of

technical considerations with cheap labor makes the manufacturing in Mexico an attractive alternative. These factors, to our view, mainly account for the increasing value added from Mexico (Domestic) and Mexico (Maq./M. Global) in the transport sector.

As for the case of the electrical and optical equipment sector, it can be inferred that US producers initially sourcing the Mexican market with intermediate goods decided to reallocate their production to East Asia in order to source the same Mexican market. The lack of demanding rules of origin within NAFTA in this sector, the modularity for the production of these goods (its high value to weight ratio), the low shipping costs, the cheap Chinese labor and so forth induced US producers to reallocate their production to East Asian in order to source from that location the required inputs for the Mexican market. The manufacturing sectors in the Electrical and Optical equipment that do not enjoy an important modularity in their production (ovens, fridges, heaters) were less likely to reallocate their production in East Asian and opted for Mexico instead. In this context, we believe that these are the main factors behind the increasing value added from East Asian embodied in the final manufacturing output of this sector in Mexico (Domestic) and Mexico (Maq./M. Global).

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Appendix.

Supply and Use tables for Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global).

The first step taken by our research was to define the set-up for the supply and use tables of maquiladora/manufactura global and domestic economy of Mexico. This set up is presented in figure (3).

Figure (3): Supply and Use Tables for Mexico (Domestic Economy) and Mexico (Maquiladora/M. Global).

Mexico (Domestic Economy)

	Supply	Intermediate use	Final Use			Total
	Product	Industry	Final Demand	GCF	Exports	
Product		$I_{i,j}^{de}$	F_i^{de}	GCF_i^{de}	X_i^{de}	Total use by product (TU^{de})
Industry	$S_{i,j}^{de}$					Total output by industry (go^{de})
Imports	M^{de}					
		Value added				
	Total supply by product (TS^{de})	Total input by industry				

Mexico (Maquiladora/M. Global)

	Supply	Intermediate use	Final Use			Total
	Product	Industry	Final Demand	GCF	Exports	
Product		$I_{i,j}^{maq}$		GCF_i^{maq}	X_i^{maq}	Total use by product (TU^{maq})
Industry	$S_{i,j}^{maq}$					Total output by industry (GO^{maq})
Imports	M^{maq}					
		Value added				
	Total supply by product (TS^{maq})	Total input by industry				

Notes: (de) refers to Domestic Economy and (maq) refers to Maquilladora/M. Global

Let S denote supply and M imports, subscripts i and j denote products and industries respectively. Superscript (de) stands for domestic economy of Mexico and (maq) indicate maquiladora/manufactura global. Then, total supply (TS) for each product (i) will be given by the summation of supply and imports as follows;

$$TS_i^{de} = \sum_j S_{i,j}^{de} + M_i^{de} \quad (1.1)$$

$$TS_i^{maq} = \sum_j S_{i,j}^{maq} + M_i^{maq} \quad (1.2)$$

Total use (TU) should be determined by the summation of final demand (F), gross capital formation (GCF), exports (X) and intermediate use (I). This identity will only hold for the domestic economy of Mexico. In the case of the maquiladora, total use will not consider the concept of final demand given that this industry does not consume final goods. Therefore;

$$TU_i^{de} = \sum_j I_{i,j}^{de} + F_i^{de} + GCF_i^{de} + X_i^{de} \quad (2.1)$$

$$TU_i^{maq} = \sum_j I_{i,j}^{maq} + GCF_i^{maq} + X_i^{maq} \quad (2.2)$$

Then, the identity of supply and use for each concept will be given for the domestic economy as follows

$$\sum_j S_{i,j}^{de} + M_i^{de} = \sum_j I_{i,j}^{de} + F_i^{de} + GCF_i^{de} + X_i^{de} \quad (3.1)$$

And for the maquiladora;

$$\sum_j S_{i,j}^{maq} + M_i^{maq} = \sum_j I_{i,j}^{maq} + GCF_i^{maq} + X_i^{maq} \quad (3.2)$$

The second accounting identity will be written as follows:

$$\sum_j TS_{i,j}^{de} = VA_j^{de} + \sum I_{i,j}^{de} \quad \forall j \quad (4.1) \text{ for the domestic economy}$$

$$\sum_j TS_{i,j}^{maq} = VA_j^{maq} + \sum I_{i,j}^{maq} \quad \forall j \quad (4.2) \text{ for the maquiladora/m. global}$$

This identity indicates that for each industry the total value of output (at the left hand side) is equal to the total value of inputs (right hand side). The latter is given by the sum of value added (VA) and intermediate use of products.

International Supply and Use tables for Mexico (Domestic) Mexico (Maquiladora/M. Global)

With this information in mind, we proceed to calculate the international supply and use tables. An international use table is an extension of the national use table. The main difference with respect to the national use table is that the international use table explicitly indicates the use of each product by country of origin. Therefore, in order to continue a split must be made between the products that were imported and those that were domestically produced. Equations 5, 6 and 7 indicate the intermediate consumption, final demand and gross capital formation for each of the two components of the Mexican economy respectively. The first superscript (de/maq) indicates the component of the Mexican economy, while the second superscript (dom/m) indicates domestic or imported origin respectively. For instance, $I_i^{de\ dom}$ indicates the domestic intermediate consumption by the domestic economy of Mexico, and $I_i^{de\ m}$ stands for the imported intermediate consumption by the domestic economy of Mexico. Thus;

$$I_{i,j}^{de} = I_{i,j}^{de\ dom} + I_{i,j}^{de\ m} \quad \forall i,j \quad (5.1)$$
$$I_{i,j}^{maq} = I_{i,j}^{maq\ dom} + I_{i,j}^{maq\ m} \quad \forall i,j \quad (5.2)$$

$$F_i^{de} = F_i^{de\ dom} + F_i^{de\ m} \quad \forall i \quad (6)$$

$$GCF_i^{de} = GCF_i^{de\ dom} + GCF_i^{de\ m} \quad \forall i \quad (7.1)$$
$$GCF_i^{maq} = GCF_i^{maq\ m} \quad \forall i \quad (7.2)$$

In this context, equation 8 shows the supply for the domestic economy and for the maquiladora industry, respectively. As can be seen, the supply of the domestic economy contains the domestic intermediate goods produced by the domestic economy and delivered to the maquiladora ($I_{i,j}^{maq\ dom}$). Similarly, the supply of the maquiladora equals the total exports from this industry as all the production is to be exported.

$$\sum_j S_{i,j}^{de} = \sum_j I_{i,j}^{de\ dom} + \sum_j I_{i,j}^{maq\ dom} + F_i^{de\ dom} + GCF_i^{de\ dom} + X_i^{de} \quad \forall i,j \quad (8.1)$$
$$\sum_j S_{i,j}^{maq} = X_{i,j}^{maq} \quad \forall i,j \quad (8.2)$$

Finally, we also split the total imports from each component of the Mexican economy as follows:

$$M_{i,j}^{de} = I_{i,j}^{de\ m} + F_{i}^{de\ m} + GCF_{i}^{de\ m} \qquad \forall i,j \qquad (9.1)$$
$$M_{i,j}^{maq} = I_{i,j}^{maq\ m} + GCF_{i}^{maq\ m} \qquad \forall i,j \qquad (9.2)$$

On the basis of this information, figure (4) presents a set up for the international supply and use tables for Mexico (Domestic), Mexico (Maquiladora/M. Global). Here, all the information presented in previous equation is allocated according to their use (intermediate or final) and according to their origin (domestic or imported by country of origin).

Figure (4): International SUT for Mexico (Domestic), Mexico (Maquiladora/M. Global).

Mexico (Domestic Economy)

		Supply	Intermediate use	Final Use			Total
		Product	Industry	Final Demand	GCF	Exports	
Country A	Product		$I_{i,j}^{de\ m(A)}$	$F_{i}^{de\ m(A)}$	$GCF_{i}^{de\ m(A)}$		Total use of imported products delivered by A
Mexico (Domestic Economy)	Product		$I_{i,j}^{de\ dom}$	$F_{i}^{de\ dom}$	$GCF_{i}^{de\ dom}$	X_{i}^{de}	Total use of domestic products
Mexico (Maquiladora/ M. Global)	Product						
Rest of the World	Product		$I_{i,j}^{de\ m(RoW)}$	$F_{i}^{de\ m(RoW)}$	$GCF_{i}^{de\ m(RoW)}$		Total use of imported products delivered by RoW
Mexico (Domestic Economy)	Industry	$S_{i,j}^{de}$					TU^{de}
	Rest of the World	M_{j}^{de}					
			Value added (VA)				
		TS^{de}	Output				

Mexico (Maquiladora/M.Global)

		Supply	Intermediate use	Final Use			Total
		Product	Industry	Final Demand	GCF	Exports	
Country A	Product		$I_{i,j}^{maq\ m(A)}$		$GCF_{i}^{maq\ m(A)}$		Total use of imported products delivered by A
Mexico (Domestic Economy)	Product		$I_{i,j}^{maq\ dom}$				Total use of products delivered to Maq/M.Global
Mexico (Maquiladora/ M. Global)	Product					X_{i}^{maq}	X_{i}^{maq}
Rest of the World	Product		$I_{i,j}^{maq\ m(RoW)}$		$GCF_{i}^{maq\ m(RoW)}$		Total use of imported products delivered by RoW
Mexico (Maq./M.Global)	Industry	$S_{i,j}^{maq}$					TU^{maq}
	Rest of the World	M_{j}^{maq}					
			Value added (VA)				
		TS^{maq}	Output				

Notes: the first superscript indicates the main component being studied (Domestic Economy or Maq/M. Global) and the second superscript indicates origin from goods (domestic or imported). For instance $I_{i,j}^{mqq\ \ m(RoW)}$ indicates intermediate imports delivered by the Rest of the World to the maquiladora/m. global.

In order to construct those international use tables, we need to break down imports by country of origin and by use category. Following Timmer et al. (2014), this step requires international trade statistics that are to be benchmarked with the official data from the national accounting system by which the national SUTS were built. That step was followed in order to ensure consistency between the data in the national and international use tables.

Formally, let $m_{i,k}^{l}$ indicate the share of use categories ***l*** (intermediate, final consumption or investment) in imports of product ***I*** delivered by a particular country ***k*** to a component of the Mexican economy **α** (domestic economy or maquiladora/m.global) defined as follows.

$$m_{i,k}^{\alpha\, l} = \frac{\widetilde{M}_{i,k}^{\alpha\, l}}{\widetilde{M}_{i}^{\alpha}} \text{ such that } \sum_k \sum_l m_{i,k}^{\alpha\, l} = 1$$

where $\widetilde{M}_{i,k}^{\alpha\, l}$ is the total value from all 6-digit products that are classified by use category ***l*** and WIOD product group ***i*** imported from country ***k*** (and delivered to component **α**) , and $\widetilde{M}_{i}^{\alpha}$ the total value of WIOD product group ***i*** imported by component **α** of the Mexican economy. These shares have to be derived from the bilateral trade statistics and applied to the total imports of product ***I*** by component **α** of the Mexican economy as given in the SUT time series to derive their imported use categories. In this context $I_{i,k}^{\alpha\, m}$ is the amount of product group ***i*** imported from country ***k*** and used as intermediate by industry ***j*** in component **α** of the Mexican economy.

$$I_{i,k}^{\alpha\, m} = m_{i,k}^{\alpha\, I} M_{i}^{\alpha} \frac{I_{i,j}^{\alpha}}{I_{i}^{\alpha}} \quad \forall j$$

Where $I_{i}^{\alpha} = \sum_j I_{i,j}^{\alpha} \quad \forall i$ such that $\frac{I_{i,j}^{\alpha}}{I_{i}^{\alpha}}$ is the share of intermediates of product ***i*** used by industry ***j*** in each component **α** of the Mexican economy.

By definition, it is only the domestic economy of Mexico that demands goods for final demand and for gross capital formation. Therefore, our research did not modify that data original reported by WIOD on their international use tables for the total economy of Mexico. We simply transfer them to our international use tables and relabeled them as the final demand and gross capital formation for the Domestic economy of Mexico. Finally, in the case of the imported gross capital formation for the Maquiladora and M. Global, we obtained that data from our trade data statistics after classifying its bilateral import by its corresponding BEC category. Afterwards, we simply allocate those gross capital imports classified by product category in the columns for gross capital formation (there will be no changes in inventories for the Maquiladora/M. Global). This is because of the fact that official imported use table for the maquiladora does not provide gross capital categories so we cannot benchmarked them.

International SUT for the rest of WIOD countries including Mexico (Domestic) and Mexico (Maquiladora/Manufactura Global).

Figure (5) presents the set up for an international use table for the rest of WIOD countries where Mexico (Domestic) and Mexico (Maquiladora/M. Global) are included. Here, we assume that the domestic economy of Mexico delivers goods for intermediate use, final demand and gross capital formation. On the other hand, it is assumed that the maquiladora/m. global only delivers goods for final demand. Therefore, our research decided that we only needed to calculate the columns for final demand delivered by the domestic economy of Mexico ($F_i^{a\ m(de)}$) and by Maquiladora/M. Global ($F_i^{a\ m(maq)}$). This means that the data for intermediate goods and gross capital formation demanded by WIOD countries and delivered by Mexico (as initially reported by WIOD) will remain unaltered. We will simply re-label them as the intermediate goods and gross capital formation delivered by the domestic economy of Mexico.

Figure (5): International SUT for WIOD countries including Mexico (Domestic), Mexico (Maquiladora/M. Global).

WIOD Countries (Country A)

		Supply	Intermediate use	Final Use			Total
		Product	Industry	Final Demand	GCF	Exports	
Country A	Product		$I_{i,j}^{a\ dom}$	$F_i^{a\ dom}$	$GCF_i^{a\ dom}$	X_i^a	Total use of domestic products
Mexico (Domestic Economy)	Product		$I_{i,j}^{a\ m(de)}$	$F_i^{a\ m(de)}$	$GCF_i^{a\ m(de)}$		Total use of imported products delivered by Mexico (Domestic)
Mexico (Maquiladora)	Product			$F_i^{a\ m(maq)}$			Total use of imported products delivered by Maquiladora
Rest of the World	Product		$I_{i,j}^{a\ m(RoW)}$	$F_i^{a\ m(RoW)}$	$GCF_i^{a\ m(RoW)}$		Total use of imported products delivered by RoW
Country A	Industry	$S_{i,j}^a$					TU^a
	Rest of the World	M_j^a					
			Value added (VA)				
		TS^a	Output				

Notes: the first superscript indicates the main country being studied and the second superscript indicates origin from goods (domestic or imported). For instance $I_{i,j}^{a\ m(RoW)}$ indicates intermediate imports delivered by the Rest of the World to country A.

In calculating the final demand deliveries by Mexico (Domestic) to the rest of WIOD countries, ideally we would have to find the difference between the data originally provided by WIOD and our specific data for Mexico (Maq/M. Global). This is because, in principle, the data originally provided by WIOD in the international use tables for the rest of WIOD countries contains both Maquila and Domestic economy deliveries. In doing that, however, we found that our Maq/M. Global export data was in many case much larger than the one originally provided in WIOD for the case of Mexico. This issue is explained by the fact that (when constructing those tables) WIOD relied on the imports reported by each country and that our data for Maq/M. Global in this specific international use tables needs to rely on the data for exports. Therefore, in order to exclude negative values and ensure the consistency of our results, our research will also assume that the final demand deliveries originally reported by WIOD for the case of the total economy of Mexico correspond to the those deliveries by the Domestic Economy of Mexico.

Relying in Maq/M. Global bilateral exports is a crucial step in constructing international SUTs like the one in figure (5). This is because there is no other alternative way by which we can indicate how the Maq/M. Global gross production in each of the WIOD countries. Furthermore, we are confident that aforementioned assumption will not severely bias our results given that the bulk of manufacturing exports from Maq/M. Global go to the United States.

Formally, let $x_{i,k}^{maq}$ indicate the share of final demand use in exports of product ***i*** delivered by Maq/M. Global to particular country ***k*** defined as follows.

$$x_{i,k}^{maq} = \frac{\tilde{X}_{i,k}^{maq}}{\tilde{X}_{i}^{maq}} \text{ such that } \sum_k x_{i,k}^{maq} = 1$$

where $\tilde{X}_{i,k}^{maq}$ is the total value from all 6-digit products that are classified by product group ***i*** exported by Maq/M. Global and delivered to country ***k***, and $\tilde{X}_{i}^{maq}$ the total value of WIOD product group ***i*** exported by Maq/M Global. These shares have to be derived from the bilateral trade statistics and applied to the total exports of product ***i*** from Maq/M. Global. Finally, that value is applied to the final demand share of use category from the rest of WIOD countries (as given in their SUT time series) to derive the necessary imported final use categories. In this context $F_i^{k\,m(maq)}$ is the amount of product group ***i*** imported from Maq/M. Global and used as final demand in country k

$$F_i^{k\,m(maq)} = x_{i,k}^{maq}\, X_i^{maq} \frac{FC_{i,f}^{k}}{FC_i^{k}}$$

Where $\frac{FC_{i,f}^{k}}{FC_i^{k}}$ is the share of final demand goods by use categories in country k.

Once we had all the international SUT for Mexico (Domestic), Mexico (Maquiladora/Manufactura Global) and the rest of WIOD countries, we proceeded to calculate the WIOT which is presented in Figure (6). Following WIOD, we transformed all the international SUT into world input output structure by means of the "fixed product-sales structure" assumption. This assumption states that each product has its own specific sales structure irrespective of the industry where it is produced. Sales structure here refers to the proportions of the output of the product in which it is sold to the respective intermediate and final users.

Figure (6): Final set up of World Input Output Table including Mexico (Domestic) and Mexico (Maquiladora/M.Global)

		Country A Supply Industry	**Mexico (Domestic Economy)** Supply Industry	**Mexico (Maquiladora/ M. Global)** Supply Industry	**Rest of the World** Supply Industry	**Country A** Intermediate use Industry	**Mexico (Domestic Economy)** Intermediate use Industry	**Mexico (Maquiladora/ M. Global)** Intermediate use Industry	**Rest of the World** Intermediate use Industry	**Country A** Final Use	**Mexico (Domestic Economy)** Final Use	**Mexico (Maquiladora/ M. Global)** Final Use	**Rest of the World** Final Use	Total
Country A	Industry					$I_{j,j}^{a\ dom}$	$I_{j,j}^{de\ m(a)}$	$I_{j,j}^{maq\ m(a)}$	$I_{j,j}^{row\ m(a)}$	$F_j^{a\ dom}$, $GCF_j^{a\ dom}$	$F_j^{de\ m(a)}$, $GCF_j^{de\ m(a)}$	$GCF_j^{maq\ m(a)}$	$F_j^{row\ m(a)}$, $GCF_j^{row\ m(a)}$	Output in A
Mexico (Domestic)	Industry					$I_{j,j}^{a\ m(de)}$	$I_{j,j}^{de\ dom}$	$I_{j,j}^{maq\ de}$	$I_{j,j}^{row\ m(de)}$	$F_j^{a\ m(de)}$, $GCF_j^{a\ m(de)}$	$F_j^{de\ dom}$, $GCF_j^{de\ dom}$		$F_j^{row\ m(de)}$, $GCF_j^{row\ m(de)}$	Output in Mexico (DE)
Mexico (Maq/M.Glob)	Industry									$F_j^{a\ m(maq)}$			$F_j^{row\ m(maq)}$	Output in Mexico (MAQ)
Rest of the World (RoW)	Industry					$I_{j,j}^{a\ m(RoW)}$	$I_{j,j}^{de\ m(RoW)}$	$I_{j,j}^{maq\ m(RoW)}$	$I_{j,j}^{row\ dom}$	$F_j^{a\ m(RoW)}$, $GCF_j^{a\ m(Row)}$	$F_j^{de\ m(row)}$, $GCF_j^{de\ m(row)}$	$GCF_j^{maq\ m(row)}$	$F_j^{row\ dom}$, $GCF_j^{row\ dom}$	Output in RoW
Country A	Industry	Domestic Supply												
Mexico (Domestic)	Industry		Domestic Supply											
Mexico (Maq/M.Glob)	Industry			Domestic Supply										
Rest of the World (RoW)	Industry				Domestic Supply									
		Imports	Imports	Imports	Imports									
Total		Total Supply	Total Supply	Total Supply	Total Supply									
						Value Added	Value Added	Value Added	Value Added					
						Output in A	Output in Mexico (DE)	Output in Mexico (MAQ)	Output in RoW					