# What is the effect of changing trade partners on value added? An input-output analysis for Brazil and Mexico*

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**Resumo:**
O objetivo deste estudo é observar como as mudanças na composição setorial e nos sócios comerciais das exportações afetaram o valor adicionado brasileiro e mexicano entre 2000 e 2019 por meio de uma análise quantitativa de decomposição estrutural insumo-produto. São utilizadas as matrizes de insumo-produto multirregionais estimadas pelo Banco Asiático de Desenvolvimento. Devido à concentração geográfica e setorial das exportações brasileira e mexicana, as contribuições desses dois aspectos tendem a contribuir na mesma direção. O Brasil apresentou resultados melhores que o México em termos do crescimento no período, e o primeiro viu suas exportações de *commodities* aumentarem substancialmente para a China. Em contraste, as exportações de automóveis do México cresceram mais concentradas nos Estados Unidos, mas foram menos dinâmicas. Além disso, o melhor resultado do setor de *commodities* brasileiro está relacionado a um coeficiente de valor agregado (em média) superior ao da *maquila* automotiva mexicana.

**Palavras-chave**: Brasil; México; composição das exportações; parceiros comerciais; modelos insumo-produto.

**Abstract:**
The objective of this study is to observe how the changes in the export sectoral composition and trade partners affected the Brazilian and Mexican value added between 2000 and 2019 using a quantitative input-output structural decomposition analysis. We use the multiregional input-output tables estimated by the Asian Development Bank. Due to the geographic and sectoral concentration of Brazilian and Mexican exports, the contributions of these two effects tend to contribute in the same direction. Brazil presented better results than Mexico in the period, and the former saw its commodity exports increase substantially to China. In contrast, Mexico's automobile exports grew more concentrated in the United States but were less dynamic. In addition, the better result in the Brazilian commodities sector is related to a higher value-added coefficient (on average) than the Mexican automotive maquila.

**Keywords**: Brazil; Mexico; Export composition; Trade partners; Input-output models.

**Área Temática:** 1 – Economia.

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**What is the effect of changing trade partners on value added?**
**An input-output analysis for Brazil and Mexico**

## 1. Introduction

Since 2015, the Brazilian and Mexican governments have been adopting strategies to stimulate growth through exports. However, as Alves-Passoni and Blancas (2022) show, this demand component could not accelerate the gross domestic product (GDP), even when it leads the growth. Furthermore, the increase in international competition and the productive fragmentation affected the trade insertion of these countries, especially concerning the sectoral composition and export trade partners.

The objective of this study is to observe how the changes in the export sectoral composition and trade partners affected the Brazilian and Mexican value-added between 2000 and 2019 using a quantitative input-output structural decomposition analysis. To this end, we decompose the value-added growth in the contributions of the value-added coefficient, the production technique (technical coefficients), domestic demand, and exports. To observe the effect of export composition, we express the sectoral export vector considering the level, the sectoral composition (product mix), and the export trade partners.

We focus our analysis on these countries because they have the highest GDP in Latin America (approximately two-thirds) and represent regional trade hubs in the region (Beaton et al. (2017); Chen and Lombardi (2014)). We use the world input-output tables (WIOT) valued at constant prices estimated by the Asian Development Bank (ADB).

The most recent study that compares the structure of exports from Brazil and Mexico is the one proposed by Passoni (2022a). In it, the author seeks to compare the structure of exports and imports of the two countries between 2000 and 2019 in considering Latin American structuralism and isolating the effect of the change in relative prices. The author finds there is a process of export specialization in both countries. While Mexico has increased transport equipment exports, Brazil exports more primary goods, especially in the mining and agricultural industries. However, an essential contribution of the author was that the regressive specialization of Brazilian exports is milder when removing the effect of relative prices and more related to the agriculture sector. In the case of Mexico, the fall in the relative prices of manufacturing goods demonstrates an even greater concentration in exports from the automotive industry.

When considering the trade partners, Castilho and Puchet (2011) compare the two countries between 1985 and 2008. The main result found by the authors is that Mexican and Brazilian trade integrations have different characteristics. Mexican exports have as the primary export market the United States of America (USA), and this relationship became more concentrated from 1990 onwards due North American Free Trade Agreement (NAFTA)r. This result is corroborated by other studies, such as Gómez and Camacho (2020), Costa, Castilho, and Puchet (2021), Fujii and Cervantes (2013), and Moreno-Brid et al. (2015), and they show the Mexican exports are mainly related to the automobile sector. In the Brazilian case, Castilho and Puchet (2011) argue that the specialization of the export structure depends on the trade partners. Goods with higher technological content are exported to Latin American countries, and primary products, such as agricultural and mineral goods, are exported to China. These results can also be seen in Castilho, Costa, and Torracca (2019) and Nassif and Castilho (2020).

Another study that compares the Brazilian and Mexican economies is the one dome by Alves-Passoni (2022b), which decomposes the gross output for 2000 and 2014 to identify the role of the manufacturing and services industries of medium-high and high technological intensity. Despite not being the author's objective, she recognizes that the external sector is more important in explaining the Mexican gross output changes, while in the Brazilian case is the domestic one. The decomposition also shows a reduction in the importance of the exported goods with high technology intensity, especially from 2010 onwards.

However, the gross output decomposition is limited because it does not consider the sector's capacity to generate value added (VA); that depends on the nature of the activity and the use of primary inputs (capital, land, and labor). Therefore, the contribution of this study is twofold: i) temporally expand the analysis of Brazilian and Mexican exports considering the trade partners; ii) understand how the sectoral and trade partners' composition changes impact the value-added growth. We hypothesize that an intrinsic relationship exists between the changes in sectoral and geographical contributions to VA in Brazil and Mexico.

In several theories, the differentiation of commercial partners is vital to determine the productive structure and the growth pattern. For example, in the case of Latin American structuralist theory (Prebish, 1950), the center-periphery model is a two-region model in which, on the one hand, we have a country and, on the other, the "rest of the world." According to this theoretical approach, production, export, and import structure depend on the technological gap between the two regions. The elasticities of external trade play a fundamental role in determining the growth restrictions since expenditures (which are reflected in imports) cannot grow more than the income generated from exports; if this occurs, there would be a current account deficit problem.

According to this theory, the global "south," which includes Latin American countries such as Brazil and Mexico, tends to have a productive specialization in a few products, primarily in commodities with little processing (agricultural and mineral) and low technological intensity. These goods are also subject to higher price competition in the international market (Singer, 1998), making them more likely to adopt policies to stimulate exports through prices, such as currency devaluations and subsidies to export sectors. In this context, Singer (1998) argues that not only the trade products should be analyzed, but also trade partners.

The extensions of Thirlwall's model of balance-of-payments constrained growth proposed by McCombie (1993) and Nell (2003) also analyze the impact of trade partners on growth. Their objective is to capture the effect of the growth of one region in others, being fundamental to understanding the spillover effect of economic policies. Even though this work aims not to observe the growth determinants of both countries and to capture the difference in the current account balance, the value-added decomposition contributes to understanding how the change in the composition of trade partners affects sectoral growth.

In addition to this introduction, this paper contains four more sections. The following presents an overview of the structure of Brazilian and Mexican trade partners and sectoral exports. The methodology aspects containing the structural decomposition analysis (SDA) and the database used are presented in Section 3. Then, we discuss the SDA results, and after that, we present some final discussion.

## 2. Brazilian and Mexican export partners and sectoral composition of exports

The structure of Brazilian and Mexican export partners is directly related to their regional integration. While Brazil plays a central role in Southern Common Market (Mercosur), Mexico responds to what happens with the other main poles, especially with the USA, due to NAFTA (Beaton et al., 2017).

Regarding the economic integration of the Latin American region, these authors argue that even though Brazil and Mexico are the leading countries in the area, they do not represent the central links of articulation, having importance only to neighbor countries or to others *via* economic blocs. Brazil stands out as a regional hub with Mercosur countries (Argentina, Paraguay, Uruguay, and Bolivia) and Mexico with some Central American and Caribbean countries (Dominican Republic, Paraná, Suriname, and Guyana according to Beaton et al. (2017) and Chile, Guatemala, Nicaragua, and Belize for Chen and Lombarde (2014)). In this sense, countries outside the region are responsible for determining regional networks, generating stimuli, and influencing the export agenda.

The Mexican connection with the North American market has led the country to have an essential integration in global value chains through the imports of parts and components used in the assembling process of automobiles exported to the USA (Puchet and Castilho, 2012). Despite Mexico being more commercially open than South American countries, its exports are concentrated in the US, especially after the reduction of trade barriers with NAFTA (Beaton et al., 2017). They highlight that the bilateral flows from Mexico to the USA in 2015 represent the third largest magnitude, followed by the relations with Canada and China.

Due to these structural characteristics, the sectoral composition of Mexican exports is more concentrated than the Brazilian. However, the concentration is even more predominantly concerning trade partners. Table 1 shows the composition of Mexican exports related to the six main export partners: the USA, Canada, China, Germany, Spain, and Japan. We found similar results to previous studies (see, for example, Gómez e Camacho (2020), Costa, Castilho e Puchet (2012), Fujii e Cervantes (2013) and Fraga and Moreno-Brid (2015)), where the USA accounts for more than two-thirds of all Mexican exports. This number decreased by approximately 5% between 2000 and 2019, from 80% to 74.5%. This loss, although small, is associated with an increase in exports to Canada (4% to 6.3%) and China (0.3% to 2.9%).

*Table 1 - Geographical distribution of Brazilian and Mexican exports (2000-2009, in %)*

| **MEXICO** | **USA** | **JPN** | **CAN** | **CHN** | **SPA** | **GER** | **WRD** | **TOT** |
|---|---|---|---|---|---|---|---|---|
| **2000** | 79.54 | 0.19 | 3.99 | 0.29 | 0.80 | 0.38 | 14.81 | 100.00 |
| **2008** | 73.70 | 0.28 | 5.02 | 1.15 | 1.34 | 0.34 | 18.16 | 100.00 |
| **2011** | 72.14 | 0.43 | 5.73 | 2.13 | 1.58 | 0.37 | 17.63 | 100.00 |
| **2015** | 74.40 | 0.35 | 5.01 | 1.80 | 1.68 | 0.51 | 16.24 | 100.00 |
| **2019** | 74.43 | 0.31 | 6.29 | 2.92 | 1.17 | 0.69 | 14.20 | 100.00 |
| **BRAZIL** | **USA** | **JPN** | **IND** | **CHN** | **MEX** | **GER** | **WRD** | ***TOT*** |
| **2000** | 21.99 | 4.55 | 2.39 | 2.39 | 4.34 | 3.53 | 60.82 | *100.00* |
| **2008** | 12.76 | 3.35 | 2.42 | 8.25 | 2.48 | 4.05 | 66.68 | *100.00* |
| **2011** | 9.47 | 3.63 | 2.66 | 14.37 | 1.84 | 3.13 | 64.91 | *100.00* |
| **2015** | 11.80 | 3.40 | 2.40 | 14.94 | 1.71 | 2.60 | 63.14 | *100.00* |
| **2019** | 17.52 | 4.03 | 1.69 | 31.26 | 2.15 | 3.83 | 39.52 | *100.00* |

Source: author's elaboration based on Consing et al. (2020) and ADB (2021).

When analyzing the Mexican sectoral export structure in Table 2, we see that in 2000 56% corresponded to the manufacturing industry, which is traditionally classified as having medium-high and high technological intensity. Mainly, this share comprises two sectors, electrical and optical equipment (31%) and transport equipment (20%). Since the USA accounts for the largest share of exports, what happens to this country has an essential impact on Mexico's export structure. Due to the global subprime crisis, between 2008 and 2011, the transport sector accounted for only 15% in these years of total Mexican exports. With the resumption of growth in the US, this sector grew its share substantially to 20% in 2012, reaching 32% in 2019.

Also, the decline in the share of these sectors may result from a composition effect. Between 2003-2013, the oil sector increased its exports due to the commodities boom, contributing to a reduction of other sectors in the Mexican export basket (Schneider, 2013). For example, the share of mining and quarrying exports to the USA changed from 6% in 2000 to 15% in 2008 and 18% in 2011. However, after the oil price decline since 2013, the oil sector only corresponds to 4.3% of Mexican exports to the US[†].

[†] As Passoni (2022a) shows, even though there was a significant price effect that tends to overestimate the oil share, the volume of oil exports also increased.

*Table 2 - Sectoral and partners composition of exports for Brazil and Mexico: 2000, 2011 and 2019*

| Countries | Mexico | | | | | | | | Brazil | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sectors** | **USA** | **JPN** | **CAN** | **CHN** | **SPA** | **GER** | **WRD** | **TOT** | **USA** | **JPN** | **IND** | **CHN** | **MEX** | **GER** | **WRD** | **TOT** |
| **2000** | | | | | | | | | | | | | | | | |
| **AGR** | 1.81 | 3.40 | 0.84 | 0.03 | 2.47 | 5.33 | 1.62 | 1.76 | 4.56 | 10.20 | 0.16 | 15.29 | 2.17 | 21.36 | 6.27 | 6.49 |
| **MNQ** | 6.24 | 7.21 | 4.67 | 1.49 | 66.14 | 0.45 | 29.48 | 10.07 | 0.89 | 9.64 | 0.65 | 11.31 | 0.67 | 7.55 | 7.08 | 5.52 |
| **TRM** | 21.88 | 20.54 | 19.37 | 9.24 | 6.46 | 20.02 | 18.98 | 21.18 | 55.76 | 50.58 | 10.12 | 17.71 | 21.90 | 40.27 | 43.36 | 43.97 |
| **CIM** | 60.30 | 42.32 | 65.64 | 63.88 | 14.78 | 56.72 | 35.39 | 56.42 | 34.31 | 10.30 | 14.81 | 8.58 | 63.62 | 28.70 | 23.57 | 26.68 |
| **CHM** | *1.71* | *13.55* | *0.82* | *5.46* | *5.21* | *8.19* | *6.12* | *2.41* | *7.59* | *5.71* | *4.95* | *3.63* | *3.95* | *9.15* | *5.04* | *5.69* |
| **MAC** | *2.37* | *3.82* | *1.68* | *1.78* | *0.16* | *6.60* | *1.93* | *2.28* | *6.98* | *0.71* | *1.76* | *1.38* | *4.75* | *9.56* | *2.96* | *3.98* |
| **EOP** | *33.22* | *20.67* | *37.11* | *55.95* | *7.58* | *38.02* | *18.68* | *31.08* | *8.88* | *3.65* | *2.42* | *1.11* | *7.06* | *2.76* | *5.92* | *6.21* |
| **TRA** | *23.00* | *4.29* | *26.03* | *0.69* | *1.84* | *3.91* | *8.66* | *20.65* | *10.87* | *0.23* | *5.68* | *2.47* | *47.85* | *7.24* | *9.65* | *10.79* |
| **OTH** | 9.77 | 26.52 | 9.48 | 25.35 | 10.14 | 17.48 | 14.53 | 10.58 | 4.49 | 19.28 | 74.26 | 47.10 | 11.65 | 2.12 | 19.73 | 17.34 |
| **2011** | | | | | | | | | | | | | | | | |
| **AGR** | 3.07 | 6.87 | 2.54 | 1.87 | 0.77 | 3.04 | 2.56 | 2.91 | 6.13 | 12.13 | 0.18 | 24.19 | 2.09 | 19.51 | 7.63 | 10.10 |
| **MNQ** | 17.84 | 16.95 | 7.24 | 48.65 | 81.29 | 2.62 | 11.43 | 17.70 | 16.38 | 32.85 | 18.46 | 45.56 | 0.66 | 20.55 | 16.94 | 21.43 |
| **TRM** | 23.12 | 22.07 | 19.67 | 13.05 | 6.91 | 33.47 | 28.63 | 23.45 | 46.67 | 46.44 | 12.82 | 16.30 | 30.96 | 34.78 | 41.10 | 37.12 |
| **CIM** | 51.11 | 44.74 | 65.79 | 32.94 | 9.13 | 54.44 | 48.48 | 50.43 | 25.40 | 6.07 | 9.16 | 3.76 | 63.93 | 23.54 | 19.60 | 18.04 |
| **CHM** | *2.57* | *13.99* | *1.44* | *4.95* | *3.85* | *6.53* | *10.07* | *3.96* | *12.89* | *4.79* | *3.04* | *1.45* | *8.31* | *6.68* | *4.59* | *5.02* |
| **MAC** | *7.29* | *5.08* | *5.40* | *3.86* | *1.33* | *9.82* | *5.00* | *6.61* | *5.57* | *0.44* | *1.47* | *0.77* | *14.50* | *7.70* | *3.26* | *3.32* |
| **EOP** | *24.98* | *7.12* | *35.59* | *16.49* | *3.16* | *31.10* | *21.45* | *24.39* | *2.63* | *0.31* | *1.47* | *0.33* | *5.34* | *4.16* | *2.23* | *2.02* |
| **TRA** | *16.28* | *18.55* | *23.36* | *7.64* | *0.79* | *6.98* | *11.96* | *15.47* | *4.31* | *0.53* | *3.18* | *1.22* | *35.77* | *4.99* | *9.51* | *7.68* |
| **OTH** | 4.86 | 9.38 | 4.76 | 3.48 | 1.90 | 6.43 | 8.90 | 5.51 | 5.41 | 2.51 | 59.37 | 10.19 | 2.36 | 1.61 | 14.74 | 13.31 |
| **2019** | | | | | | | | | | | | | | | | |
| **AGR** | 5.60 | 2.54 | 2.67 | 2.65 | 2.71 | 0.40 | 2.50 | 4.81 | 8.40 | 17.24 | 4.21 | 44.31 | 8.44 | 20.25 | 25.74 | 27.22 |
| **MNQ** | 4.35 | 9.15 | 0.93 | 15.44 | 62.79 | 1.25 | 11.69 | 6.18 | 12.00 | 36.86 | 27.58 | 35.89 | 0.14 | 11.81 | 14.16 | 21.32 |
| **TRM** | 17.71 | 18.32 | 17.05 | 11.86 | 6.42 | 9.74 | 11.94 | 16.49 | 32.78 | 31.11 | 40.97 | 14.28 | 31.75 | 37.71 | 36.31 | 28.63 |
| **CIM** | 69.08 | 42.54 | 74.35 | 59.82 | 16.17 | 64.58 | 46.21 | 65.16 | 23.03 | 3.26 | 12.30 | 1.42 | 55.83 | 16.12 | 9.37 | 10.34 |
| **CHM** | *1.75* | *9.61* | *1.77* | *3.57* | *2.89* | *4.58* | *3.59* | *2.12* | *3.11* | *1.40* | *4.28* | *0.87* | *7.71* | *4.35* | *2.77* | *2.37* |
| **MAC** | *6.71* | *5.08* | *6.50* | *3.47* | *1.82* | *5.60* | *3.26* | *6.04* | *5.48* | *0.33* | *2.53* | *0.36* | *13.95* | *3.97* | *2.24* | *2.47* |
| **EOP** | *25.29* | *16.85* | *27.28* | *40.72* | *5.46* | *36.92* | *19.97* | *24.94* | *1.63* | *0.15* | *0.64* | *0.09* | *3.32* | *1.58* | *0.83* | *0.79* |
| **TRA** | *35.33* | *10.99* | *38.79* | *12.06* | *5.99* | *17.48* | *19.39* | *32.06* | *12.81* | *1.37* | *4.85* | *0.10* | *30.85* | *6.22* | *3.52* | *4.71* |
| **OTH** | 3.27 | 27.45 | 4.99 | 10.23 | 11.92 | 24.04 | 27.66 | 7.36 | 23.79 | 11.53 | 14.94 | 4.11 | 3.84 | 14.11 | 14.43 | 12.50 |

Note: USA: United States of America; JPN: Japan; CAN: Canada; CHN: China; SPA: Spain; GER: Germany; IND: India; MEX: Mexico; WRD: World; TOT: total. AGR: Agriculture, hunting, forestry, and fishing; MNQ: Mining and quarrying; TRM: Low/Med-Low manufacturing industry; CIM: Mid-High/High manufacturing industry; CHM: Chemicals and chemical products; MAC: Machinery, not elsewhere classified; EOP: Electrical and optical equipment, TRA: Transport equipment; OTH: Other industries.

Source: author's elaboration based on Consing et al. (2020) and ADB (2021).

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The increase in the share of transport equipment also occurs due to the Mexican strategy to stimulate growth through exports, which uses exchange rate devaluation and tax incentives as economic policies (Alves-Passoni and Blancas, 2021). Also, the USA's multinational automotive firms that operate in both countries changed their strategy and transferred various operations and segments to Mexico, such as the Premium categories (Carrillo and Hernández, 2020), which led to an increase in Mexico's exports to this country. Another meaningful increase in Mexican exports to the USA was related to the machinery sector, which went from a share of 2% in 2000 to 6% in 2011 and maintained this level until 2019.

Brazil's most important export destinations are concentrated (around 60%) in the group "rest of world," mainly because the Mercosur and Latin American Integration Society (ALADI) countries are not contained in the ADB database. Among the available countries in the database, the ones with the highest share are the USA, Japan, India, China, Mexico, and Germany. In this case, specialization differs depending on the commercial partner (Puchet and Castilho, 2012; Nassif and Castilho, 2020). Generally, the country exports goods of medium and medium-high technological intensity to Mercosur and ALADI and with less technological intensity to other countries, such as China, the USA, and Europe. Another interesting point is that despite Mexico being one of the two main Brazilian trade partners, the opposite is not valid. Brazilian exports to Mexico are concentrated in transport equipment (63% in 2000 and 55% in 2019).

As we see from Table 1, the main changes in Brazilian exports are related to the rest of the world and China. In 2000, the rest of the world accounted for 60% of all Brazilian exports, but at the end of the period only accounted for 40% of the total exports. This change occurred due to the increase in China's share, which grew from 2% to 31% of the total. The most significant changes in these aspects ohave ccurred since 2010.

In this context, Hiratuka and Sarti (2017) argue that the 2008's economic crisis increased international competition since the countries developed strategies to stimulate their exports as a demand source to counteract the drop in their growth rate. China increased its participation in the Latin American market, becoming a competitor to Brazilian export in the Mercosur and ALADI markets.

Table 2 shows the increase in China's share in the Brazilian exports of primary goods (agriculture and minerals). In 2000, the agriculture and mining exports to this country represented 6.5% and 5.5% of total Brazilian exports; in 2019, this number grew to 27% and 21%. Alone, China is the destination of 50% of the goods produced by the extractive mineral sector. Notice that the composition of Brazilian exports to China has changed. While in 2000, 15% of exports to China were associated with the agricultural industry, in 2019, this proportion was 44%. The mining and quarrying sector grew from 11% in 2000 to 35% in 2019.

Despite a continuous increase of these sectors in Brazilian exports, this is accentuated between 2015 and 2019. Also, in this period, we observe a reduction in the share of the rest of the world of Brazilian exports. Although we do not have information about other Latin American countries in the WIOT published by ADB, Nassif, and Castilho (2020), show a decline in the importance of these countries, mainly Argentina. It also affected the sectoral composition because most technological goods were exported to Latin America, as Puchet and Castilho (2011) and Nassif and Castilho (2020) show. Consequently, the share of Brazilian capital-intensive manufacturing exports fell from 26% to 10%. All the sectors that compose this group lost importance; however, we highlight the effect on electrical and optical equipment and chemical products. Regarding the main partners, the result is noticed in all partners except for China.

## 3. Methodology

### 3.1 Structural decomposition analysis

From a general point of view, the structural decomposition method analyzes the change of an economic variable using a set of comparative static changes in the parameters of an input-output table (Rose and Chen, 1991; Rose and Miernyk, 1989). This method can decompose the changes of several economic variables, but the most common are gross output, VA, employment, emission of CO2, and trade (imports and exports).

We will focus our structural decomposition on the sectoral VA ($\boldsymbol{v}$), which is calculated in the traditional input-output model considering the value-added coefficient, the inverse Leontief matrix, and the final demand (Miller and Blair, 2009)[3]:

$$\boldsymbol{v} = \hat{\boldsymbol{c}} \times (\boldsymbol{I} - \boldsymbol{A_d})^{-1} \times \boldsymbol{f} \quad (1),$$

$$\boldsymbol{v} = \hat{\boldsymbol{c}} \times \boldsymbol{L} \times \boldsymbol{f} \quad (2),$$

where $\hat{\boldsymbol{c}}$ is the diagonal vector of the value-added coefficient, which represents the VA per unit of output, calculated as the share of $\boldsymbol{v}$ in the sectoral gross output ($\boldsymbol{x}$), $\boldsymbol{c} = \boldsymbol{v}\boldsymbol{x}^{-1}$. It varies from $0 < c_j \leq 1$, depending on the usage of sector $j$ of primary factors of production (wage, capital, and land). $\boldsymbol{A_d}$ represents the direct technical coefficients, that is, the amount of input used by each sector to produce an additional unit of product, and $\boldsymbol{L} = (\boldsymbol{I} - \boldsymbol{A_d})^{-1}$ represents the inverse of Leontief; and $\boldsymbol{f}$ the final demand.

To achieve the objective of this study, we initially propose the breakdown of final demand into domestic demand ($\boldsymbol{d}$), which is composed by the household and government expenditures, and the gross fixed capital formation; exports ($\boldsymbol{e}$); and changes in inventories ($\boldsymbol{s}$), such as:

$$\boldsymbol{f} = \boldsymbol{d} + \boldsymbol{e} + \boldsymbol{s} \quad (3).$$

Putting together (2) e (3), we have:

$$\boldsymbol{v} = \hat{\boldsymbol{c}} \times \boldsymbol{L} \times (\boldsymbol{d} + \boldsymbol{e} + \boldsymbol{s}) \quad (4).$$

Next, we define $\boldsymbol{v_d}$, $\boldsymbol{v_e}$, and $\boldsymbol{v_s}$ as the VA generated by domestic demand, exports, and changes in inventories:

$$\boldsymbol{v_d} = \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{d} \quad (5),$$

$$\boldsymbol{v_e} = \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{e} \quad (6),$$

$$\boldsymbol{v_s} = \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{s} \quad (7).$$

So, putting together the previous equations, the sectoral VA can be expressed as:

$$\boldsymbol{v} = \boldsymbol{v_d} + \boldsymbol{v_e} + \boldsymbol{v_s} = \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{d} + \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{e} + \hat{\boldsymbol{c}}\boldsymbol{L}\boldsymbol{s} \quad (8).$$

The decompositions presented here will be concentrated in $\boldsymbol{v_d}$ and $\boldsymbol{v_e}$ since the change in inventories has no economic meaning.

Inspired by the final demand decomposition presented by Miller and Blair (2009), we disaggregate the export vector ($\boldsymbol{e}$) in terms trade partners composition, and sectoral composition (product mix) and level. For that, we assume $\boldsymbol{E}$ as a partitioned matrix that the three main partners form ($\boldsymbol{e_{st}}, \boldsymbol{e_{nd}}, \boldsymbol{e_{rd}}$, defined according to the average of the years) of each country and the rest of the world ($\boldsymbol{e_{rw}}$)

$$\boldsymbol{E} = [\boldsymbol{e_{st}} | \boldsymbol{e_{nd}} | \boldsymbol{e_{rd}} | \boldsymbol{e_{rw}}] \quad (9).$$

For Mexico, these countries would be the USA, Canada, and China, and for Brazil, the USA, China, and Japan.

**Also, consider the total of exports ($e$) as:**

$$e = i'Ei \quad (10).$$

The second step is to set $\boldsymbol{\delta}$ as a vector $(4 \times 1)$ that represents the total of exports for the three main partners

[3] Here, we follow the regular notation, denoting matrices with bold capital letters and vectors with bold lower-case letters; vectors are column vectors, and, thus, a row vector is represented by a transposed column vector.

and the rest of the world (RW):

$$\boldsymbol{\delta} = (i'E)' \quad (11).$$

By dividing $\boldsymbol{\delta}$ by the total exports, we now have the share of the main exports partners and the RW in the total exports ($\boldsymbol{\psi}, 4 \times 1$):

$$\boldsymbol{\psi} = \left(\frac{\mathbf{1}}{\boldsymbol{e}}\right)\boldsymbol{\delta} \quad (12).$$

Finally, we compute the share of products exported to each country ($\boldsymbol{T}, n \times 4$):

$$\boldsymbol{T} = (\boldsymbol{E})\left(\widehat{\boldsymbol{\psi}}\right)^{-\mathbf{1}} \quad (13).$$

Combining (10), (12), and (13) allow us to express $\boldsymbol{e}$ in terms of product mix, partners composition, and level:

$$\boldsymbol{e} = \boldsymbol{T\psi}e \quad (14).$$

After doing all these procedures, we have our base equation to proceed with the SDA analysis, which includes the VA that is generated by domestic demand and external demand, but also the disaggregation:

$$\boldsymbol{v} = \hat{\boldsymbol{c}}\boldsymbol{Ld} + \hat{\boldsymbol{c}}\boldsymbol{LT\psi}e + \boldsymbol{v_S} \quad (15).$$

In the SDA, we analyze the changes of VA ($\Delta\boldsymbol{v}$) between two years, '0' ($\boldsymbol{v^0}$) the initial and '1' ($\boldsymbol{v^0}$) the final year, as follows:

$$\Delta\boldsymbol{v} = \boldsymbol{v^1} - \boldsymbol{v^0} \quad \textit{(16).}$$

Starting with (8), we can express $\boldsymbol{\Delta v}$ in terms of the changes of four elements: the Leontief matrix, final domestic demand, exports, and inventories. So, we have:

$$\boldsymbol{\Delta v} = \left(\hat{\boldsymbol{c}}^{\mathbf{1}}\boldsymbol{L}^{\mathbf{1}}\boldsymbol{d}^{\mathbf{1}} + \hat{\boldsymbol{c}}^{\mathbf{1}}\boldsymbol{L}^{\mathbf{1}}\boldsymbol{e}^{\mathbf{1}} + \hat{\boldsymbol{c}}^{\mathbf{1}}\boldsymbol{x}_{\boldsymbol{S}}^{\mathbf{1}}\right) - \left(\hat{\boldsymbol{c}}^{\mathbf{0}}\boldsymbol{L}^{\mathbf{0}}\boldsymbol{d}^{\mathbf{0}} + \hat{\boldsymbol{c}}^{\mathbf{0}}\boldsymbol{L}^{\mathbf{0}}\boldsymbol{e}^{\mathbf{0}} + \hat{\boldsymbol{c}}^{\mathbf{0}}\boldsymbol{x}_{\boldsymbol{S}}^{\mathbf{0}}\right) \quad \textit{(17).}$$

Due to the diversity of forms, each decomposition may assume we use the mean of the polar decomposition to calculate the changes, following Dietzenbacher and Los (1998). So the decomposition for (16) using what suggest by Miller and Blair (2009) is:

$$\begin{aligned}
\mathbf{\Delta v} = \; & \left(\tfrac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{L}^1\boldsymbol{d}^1 + \boldsymbol{L}^0\boldsymbol{d}^0) + \left(\tfrac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{L}^1\boldsymbol{e}^1 + \boldsymbol{L}^0\boldsymbol{e}^0) + & \text{(18.a)}\\
& \left(\tfrac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \boldsymbol{\lambda}^0) \times \Delta\boldsymbol{L} \times (\boldsymbol{d}^1 + \boldsymbol{d}^0) + \left(\tfrac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \hat{\boldsymbol{c}}^0)\,\Delta\boldsymbol{L} \times (\boldsymbol{e}^1 + \boldsymbol{e}^1) + & \text{(19.b)}\\
& \left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \boldsymbol{\lambda}^0\boldsymbol{L}^0) \times \Delta\boldsymbol{d} + & \text{(20.c)}\\
& \left(\tfrac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \hat{\boldsymbol{c}}^0\boldsymbol{L}^0) \times \Delta\boldsymbol{e} + & \text{(21.d)}\\
& \left(\tfrac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{x}_{\boldsymbol{s}}^1 + \boldsymbol{x}_{\boldsymbol{s}}^0) + \left(\tfrac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \hat{\boldsymbol{c}}^0) \times \Delta\boldsymbol{x}_{\boldsymbol{s}} & \text{(22.e)}
\end{aligned}$$

As Oosterhaven and Van Der Linden (1997) and Miller and Blair (2009) suggest, we express the changes of $\Delta\boldsymbol{L}$ (18.b) as changes at $\Delta\boldsymbol{A_d}$ using a hierarchical SDA:

$$\Delta\boldsymbol{L} = \boldsymbol{L}^1\Delta\boldsymbol{A_d}\boldsymbol{L}^0 \quad (23).$$

Also, we decompose $\Delta\boldsymbol{e}$ (18.d) according to the definition presented in (14), as:

$$\Delta\boldsymbol{e} = \boldsymbol{T}^1\boldsymbol{\psi}^1e^1 - \boldsymbol{T}^0\boldsymbol{\psi}^0e^0 \quad (24)$$

$$\Delta\boldsymbol{e} = \left(\tfrac{1}{2}\right)\boldsymbol{\Delta T} \times (\boldsymbol{\psi}^1e^1 + \boldsymbol{\psi}^0e^0) + \left(\tfrac{1}{2}\right)(\boldsymbol{T}^1 + \boldsymbol{T}^0) \times \Delta\boldsymbol{\psi} \times (e^1 + e^0)$$
$$+ \left(\tfrac{1}{2}\right)(\boldsymbol{T}^1\boldsymbol{\psi}^1 + \boldsymbol{T}^0\boldsymbol{\psi}^0) \times \Delta e \quad (25).$$

Putting together (19) and (21) in (18), the value-added decomposition can be expressed by the changes in seven sources: value-added coefficient ($\Delta\hat{\boldsymbol{c}}$), technology ($\Delta\boldsymbol{A_d}$), domestic demand ($\Delta\boldsymbol{d}$), exports (product mix - $\Delta\boldsymbol{T}$, partners' composition – $\Delta\boldsymbol{\psi}$ **,** level – $\Delta e$**)**, and inventories ($\Delta\boldsymbol{v_s}$):

$\mathbf{\Delta v} =$ *Value-added coefficient*

$$\left(\frac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{L}^1\boldsymbol{d}^1 + \boldsymbol{L}^0\boldsymbol{d}^0) + \left(\frac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{L}^1\boldsymbol{e}^1 + \boldsymbol{L}^0\boldsymbol{e}^0) \quad (22.a)$$

*Technology*

$$\left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \hat{\boldsymbol{c}}^0) \times \mathbf{L}^1\Delta\mathbf{A_d}\mathbf{L}^0 \times (\mathbf{d}^1 + \mathbf{d}^1) + \left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \hat{\boldsymbol{c}}^0) \times \mathbf{L}^1\Delta\mathbf{A_d}\mathbf{L}^0 \times (\mathbf{e}^1 + \mathbf{e}^1) \quad (22.b)$$

*Domestic demand*

$$\left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \hat{\boldsymbol{c}}^0\boldsymbol{L}^0) \times \Delta\mathbf{d} \quad (22.c)$$

*Exports – sectoral composition*

$$\left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \hat{\boldsymbol{c}}^0\boldsymbol{L}^0) \times \left[\left(\frac{1}{2}\right)\Delta\mathbf{T} \times (\boldsymbol{\psi}^1\mathrm{e}^1 + \boldsymbol{\psi}^0\mathrm{e}^0)\right] \quad (22.d)$$

*Exports – partners' composition*

$$\left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \hat{\boldsymbol{c}}^0\boldsymbol{L}^0) \times \left[\left(\frac{1}{2}\right)(\mathbf{T}^1 + \mathbf{T}^0) \times \Delta\boldsymbol{\psi} \times (\mathrm{e}^1 + \mathrm{e}^0)\right] \quad (22.e)$$

*Exports – level*

$$\left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1\boldsymbol{L}^1 + \hat{\boldsymbol{c}}^0\boldsymbol{L}^0) \times \left[\left(\frac{1}{2}\right)(\mathbf{T}^1\boldsymbol{\psi}^1 + \mathbf{T}^0\boldsymbol{\psi}^0) \times \Delta\mathrm{e}\right] \quad (22.f)$$

*Inventories*

$$\left(\frac{1}{2}\right)\Delta\hat{\boldsymbol{c}} \times (\boldsymbol{x}_s^1 + \boldsymbol{x}_s^0) + \left(\frac{1}{2}\right)(\hat{\boldsymbol{c}}^1 + \hat{\boldsymbol{c}}^0) \times \Delta\boldsymbol{x_s} \quad (22.g).$$

Note that $\Delta\boldsymbol{v}$ presented above shows the sectoral changes of VA. If we want the economy's total, we must multiply each change by a summary vector $\boldsymbol{i}'$ (transposed column vector of ones). The $\Delta\hat{\boldsymbol{c}}$ contribution represents the changes in the VA per unit of output across the period. As Oosterhaven and Hoen (1998) mention, a negative/positive contribution indicates an increase/decrease in production efficiency since fewer/more primary factors of production are used to generate the same VA per unit of output. The interpretation of this contribution can show if the VA is related to more indirect/direct production techniques.

The $\Delta\boldsymbol{A_d}$ contribution shows how the changes in the technical coefficient impact the sectoral VA. If it is positive/negative, the whole economy uses more/fewer domestic intermediate inputs to produce one additional unit of VA. We also show the sectoral contributions to attend domestic and external markets (the two terms of 22.b) to observe the difference according to the source of demand. The contribution associated with $\Delta\boldsymbol{d}$ can be positive or negative; if positive, the changes in the domestic market in year one compared to year zero positively affected the VA; the opposite applies when negative.

Concerning the external contribution ($\Delta\boldsymbol{e}$), the changes in $\Delta\boldsymbol{T}$ show how the product mix between years 0 and 1 had a positive/negative contribution to the generation of VA. If $\Delta\boldsymbol{\psi}$ is positive/negative, it will indicate if the chances in the export's destinies were beneficial/disadvantageous to $\Delta\boldsymbol{v}$. Moreover, it shows the magnitude and sign related to the effect of the level of exports on the changes in $\Delta\boldsymbol{v}$, no matter the sectoral composition or export market. As the inventories in the national accounts have no economic meaning, we only show them to keep the consistency in the model, but they are not analyzed.

### 3.2 Database and sectoral classification

We used the World Input-Output Tables (WIOT) valued at constant prices estimated by the Asian Development Bank (ADB), which extended the originally published by the University of Groningen (Consing et al., 2020; ADB, 2021). It has the information for both countries, and this database's multiregional aspect allows us to disaggregate the export vector according to the trade partners. The data are deflated using the sectoral deflators of gross output, a procedure very similar to the double deflation method.

The database contains 35 sectors, and we group them into five categories:

- *Agriculture, hunting, forestry, and fishing* (AGR);
- *Mining and quarrying* (MNQ);
- *Traditional manufacturing industry* (TRM): food, beverages, and tobacco; textiles and textile products; leather, leather products, and footwear; wood and products of wood and cork; pulp, paper, paper products, printing, and publishing; coke, refined petroleum, and nuclear fuel; rubber and plastics; other nonmetallic minerals; and basic metals and fabricated metal;
- *Capital-intensive manufacturing industry* (CIM): chemicals and chemical products (CHM); machinery not elsewhere classified (NEC) (MAC); electrical and optical equipment (EOP); and transport equipment (TRA); and
- *Other sectors* (OTH): public utilities; construction; services.

To better characterize the manufacturing industry, we divided it into traditional and capital-intensive manufacturing. The first group is generally classified as having low and mid-low technology intensity (see, for example, the OECD technology intensity classification by Galindo and Rueda (2016)). The second group is cataloged as having medium and high technology intensive. We prefer not to use the OECD nomenclature because these technology intensity classifications are based on developed countries, such as OECD members. They do not fit the research and development (R&D) process done by the firms in Latin American countries, such as Brazil and Mexico (see the discussion of Cassini and Robert (2017)). Since we are particularly interested in the second group, we also show the disaggregated information for the sectors inside the capital-intensive manufacturing industry.

The database is available between 2000 and 2020. Moreover, we excluded the last year due to the economic crisis caused by Coronavirus-19, as this would affect the analysis of general trends in the economic processes experienced by countries. The decomposition was performed from 2000-2019, considering the following subperiods: 2000-2008, 2010-2014, and 2015-2019. Since only some years in the series are available, we only use the polar ones to calculate the growth rates. Note that this excludes what happened inside the period and may affect the comparison with other research that use a chained growth method.

## 4. Discussion of results

This section compares Brazil and Mexico's value-added decomposition between 2000 and 2019. In this period, Mexico and Brazil's value-added growths were 1.21% and 1.22% *per annum* (hereafter, p.a.), as shown in Table 3. It also shows all the elements of the structural decomposition analysis for Mexico and Brazil from 2000-2019 and for 2000-2008, 2010-2014, and 2015-2019.

Between 2000 and 2019, the value-added coefficient contribution was negative in both countries, representing approximately -4% of the total growth in VA in the period. If, on the one hand, this means that there was a reduction in VA per unit of output, that is, countries have lost their capacity to generate added value; on the other, it may also indicate an increase in production efficiency. However, something interesting to note is that in Mexico, the export sector had a positive contribution related to the value-added coefficient (0.60p.p.), while the domestic sector contributed negatively (-1.79p.p.). In the Brazilian case, domestic (-1.99p.p.) and external (-0.71p.p.) sectors contribute negatively to value-added growth.

Regarding the domestic technological contribution, seen by the variation of technical coefficients, there was a negative contribution in Brazil and Mexico, either related to domestic or external demand, indicating that fewer intermediate inputs are used for the production process. This may be a sign of a reduction in the chaining of productive activities, but it also indicate that more efficient techniques are being used in the production process. However, we are not able to affirm if this reduction represents a "positive" or "negative" effect on the economy, stimulating economic growth, without combining it with other information, such as the capital accumulation rate, as Aroche-Reyes (2021) proposed.

*Table 3 – Results of structural decomposition analysis for Mexico: 2000-2019 and subperiods*

| SDA variables | | Mexico | | | | Brazil | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2000-2019 | 2000-2008 | 2010-2014 | 2015-2019 | 2000-2019 | 2000-2008 | 2010-2014 | 2015-2019 |
| Value-added coefficient | Domestic | *-1.79* | -3.57 | -0.11 | -0.53 | *-1.99* | -3.74 | 0.29 | -0.25 |
| | Export | *0.60* | -0.47 | 0.33 | -0.72 | *-0.71* | -1.13 | 0.52 | 0.26 |
| | Total | *-1.19* | -4.04 | 0.22 | -1.24 | *-2.70* | -4.87 | 0.81 | 0.01 |
| Technology | Domestic | *-2.90* | -1.54 | -1.93 | 0.39 | *-2.70* | -0.53 | -1.76 | -0.38 |
| | Export | *-0.29* | 0.45 | 0.28 | -0.80 | *-0.53* | 0.18 | -0.76 | -0.42 |
| | total | *-3.19* | -1.08 | -1.65 | -0.41 | *-3.23* | -0.34 | -2.52 | -0.80 |
| Domestic Demand | | *38.09* | 24.75 | 7.80 | 0.38 | *40.11* | 24.38 | 8.01 | 0.77 |
| Exports | Product | *-3.24* | 0.72 | -0.35 | -1.82 | *0.40* | 0.02 | 0.01 | 0.34 |
| | Partners | *-0.37* | 0.12 | 0.02 | -0.48 | *0.24* | 0.10 | 0.00 | 0.06 |
| | Level | *12.85* | 6.63 | 1.85 | 3.87 | *12.53* | 6.73 | 1.88 | 3.75 |
| | Total | *9.25* | 7.47 | 1.52 | 1.56 | *13.17* | 6.86 | 1.89 | 4.15 |
| Inventories | | *-2.85* | -0.28 | -1.55 | 2.20 | *-1.13* | 0.97 | -0.27 | 0.36 |
| Accumulated growth | | *40.10* | 26.82 | 6.34 | 2.49 | *46.22* | 27.00 | 7.93 | 4.49 |
| Annual growth | | 1.21 | 1.51 | 1.59 | 1.26 | 1.22 | 1.51 | 1.68 | 1.46 |

Source: author's elaboration based on Consing et al. (2020) and ADB (2021).

The domestic source of demand is responsible for 95% and 87% of the total VA growth in Mexico and Brazil between 2000 and 2019, respectively. According to Alves-Passoni and Blancas (2022), approximately 80% and 90% of Mexican and Brazilian demand are related to domestic components (household consumption, gross fixed capital formation, and government spending). This shows that Brazilian exports have a greater capacity to generate VA compared to Mexico, because even though they represent a smaller share of total demand (10%), they contribute more to added value (13%) than Mexican exports (5%), that corresponds to 20% of total demand.

When analyzing the contribution of exports to value-added growth, the two countries show different behaviors. In Mexico, the change in the product mix between 2000 and 2019 contributes negatively to VA growth. In Table 4, we see that only the agricultural sector had a positive contribution related to the product mix changes[4]. Additionally, the mining and quarrying (-1.34p.p.) sector and a group of other sectors (-1.5p.p.) were the most negatively affected by the changes in the product mix.

The change in Mexican trade partners, which, as seen in section 2, corresponds to a reduction in the USA share and an increase in the participation of China and Canada, also negatively contributed to VA growth (-0.37p.p.). This impact is modest among the sectors; however, it is felt more widely in groups of traditional manufacturing and transport equipment sectors. The contribution of the exports vector (9.25p.p.) is positive because the level effect (12.85p.p.) more than offsets the negative contribution from the other effects. It corresponds to 23% of total value-added growth.

In the Brazilian case, both changes in the pattern of exported products (0.4p.p.) and trade partners (0.24p.p.) have a modest positive contribution, representing only 1% of the value growth added. When looking at the sectoral breakdown of the effect of the change in the exported basket in Table 5, only the agricultural (1.98p.p.) and Mining and quarrying (1.37p.p.) sectors had a positive impact. The other sectors, especially those in the traditional manufacturing industry (-0.83p.p.) and the capital-intensive manufacturing industry (-0.64p.p.), contribute negatively to the value-added growth.

There is a similar sectoral effect regarding the changes in the Brazilian trade partners. The agricultural sector (1.98p.p.) and mining and quarrying (1.37p.p.) are the ones that contribute to this positive effect. As discussed in section 2, these sectors' expansion occurs due to the increase in China's share in the Brazilian economy. Therefore, there is an intrinsic relationship between $\Delta \boldsymbol{T}$ and $\Delta \boldsymbol{\psi}$.

[4] The value-added coefficient of this sector was 0.65 in 2000 and 0.69 in 2019.

*Table 4 – Results of structural decomposition analysis for Mexico: 2000-2019 and subperiods*

| | $\Delta\hat{c}$ | | | $\Delta A_d$ | | | | $\Delta$e | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Dom** | **Exp** | **total** | **Dom** | **Exp** | **total** | $\Delta v_D$ | $\Delta T$ | $\Delta\psi$ | $\Delta e$ | **Dom** | $\Delta v_s$ | $\Delta v$ |
| **2000-2019** | | | | | | | | | | | | | |
| **AGR** | 0.05 | -0.18 | -0.13 | -0.75 | 1.05 | 0.29 | 0.62 | 1.05 | -0.03 | 1.03 | 2.04 | -1.19 | 1.64 |
| **MNQ** | -0.42 | 0.09 | -0.33 | 0.06 | -1.34 | -1.28 | 0.01 | -1.34 | -0.01 | 2.77 | 1.42 | 0.61 | 0.43 |
| **TRM** | 1.02 | -0.24 | 0.78 | -0.62 | -0.57 | -1.19 | 3.61 | -0.83 | -0.45 | 2.60 | 1.32 | 0.69 | 5.20 |
| **CIM** | 0.02 | -0.94 | -0.93 | -0.38 | 1.31 | 0.93 | 2.38 | -0.64 | -0.29 | 1.27 | 0.33 | -0.55 | 2.16 |
| **CHM** | -0.13 | -0.16 | -0.28 | -0.15 | -0.08 | -0.23 | 0.78 | -0.11 | -0.04 | 0.44 | 0.30 | 0.15 | 0.71 |
| **MAC** | 0.06 | -0.18 | -0.12 | -0.07 | 0.65 | 0.58 | 0.46 | -0.06 | -0.06 | 0.25 | 0.14 | -0.47 | 0.58 |
| **EOP** | 0.33 | -0.48 | -0.16 | -0.28 | -0.72 | -1.00 | 0.23 | -0.27 | -0.06 | 0.20 | -0.13 | 1.21 | 0.15 |
| **TRA** | -0.24 | -0.12 | -0.37 | 0.11 | 1.46 | 1.57 | 0.92 | -0.21 | -0.13 | 0.38 | 0.03 | -1.44 | 0.71 |
| **OTH** | -2.46 | 1.87 | -0.59 | -1.20 | -0.74 | -1.94 | 31.46 | -1.48 | 0.42 | 5.19 | 4.13 | -2.40 | 30.67 |
| **Total** | *-1.79* | *0.60* | *-1.19* | *-2.90* | *-0.29* | *-3.19* | *38.09* | *-3.24* | *-0.37* | 12.85 | 9.25 | -2.85 | 40.10 |
| **2000-2008** | | | | | | | | | | | | | |
| **AGR** | -0.04 | -0.07 | -0.10 | -0.48 | 0.14 | -0.34 | 0.73 | 0.14 | 0.00 | 0.20 | 0.34 | 0.13 | 0.76 |
| **MNQ** | 0.14 | 0.02 | 0.16 | 0.36 | 1.53 | 1.89 | 1.44 | 1.53 | 0.13 | 1.21 | 2.87 | -1.61 | 4.74 |
| **TRM** | -2.31 | -0.05 | -2.36 | -0.14 | -0.25 | -0.39 | 1.92 | -0.34 | -0.13 | 1.38 | 0.92 | -0.18 | -0.09 |
| **CIM** | -1.41 | -0.42 | -1.83 | 0.21 | 0.16 | 0.38 | 2.27 | -0.10 | -0.07 | 0.80 | 0.62 | 0.11 | 1.55 |
| **CHM** | -0.96 | -0.02 | -0.98 | 0.00 | 0.08 | 0.08 | 0.34 | 0.01 | -0.02 | 0.22 | 0.20 | -0.27 | -0.62 |
| **MAC** | -0.08 | -0.13 | -0.20 | 0.02 | 0.39 | 0.41 | 0.43 | 0.02 | -0.02 | 0.16 | 0.16 | -0.27 | 0.52 |
| **EOP** | -0.19 | -0.22 | -0.41 | -0.11 | -0.14 | -0.25 | 0.08 | -0.10 | -0.02 | 0.14 | 0.02 | 0.31 | -0.24 |
| **TRA** | -0.19 | -0.05 | -0.24 | 0.30 | -0.17 | 0.14 | 1.42 | -0.03 | -0.01 | 0.28 | 0.24 | 0.35 | 1.89 |
| **OTH** | 0.04 | 0.06 | 0.10 | -1.49 | -1.13 | -2.62 | 18.39 | -0.51 | 0.19 | 3.03 | 2.72 | 1.27 | 19.86 |
| **Total** | *-3.57* | *-0.47* | *-4.04* | *-1.54* | *0.45* | *-1.08* | *24.75* | *0.72* | *0.12* | 6.63 | 7.47 | -0.28 | 26.82 |
| **2010-2014** | | | | | | | | | | | | | |
| **AGR** | -0.03 | -0.01 | -0.04 | -0.05 | 0.17 | 0.12 | 0.17 | 0.17 | 0.00 | 0.09 | 0.27 | -0.25 | 0.27 |
| **MNQ** | -0.12 | 0.10 | -0.02 | -0.10 | -0.42 | -0.52 | 0.26 | -0.42 | 0.05 | 0.48 | 0.11 | 0.27 | 0.09 |
| **TRM** | 1.00 | -0.04 | 0.96 | -0.99 | 0.10 | -0.89 | 0.40 | 0.08 | 0.00 | 0.39 | 0.46 | -0.19 | 0.75 |
| **CIM** | 0.22 | 0.08 | 0.30 | -0.20 | 0.14 | -0.06 | 0.32 | -0.06 | -0.01 | 0.17 | 0.10 | -0.21 | 0.45 |
| **CHM** | 0.06 | -0.01 | 0.05 | -0.07 | 0.00 | -0.07 | 0.11 | 0.01 | 0.00 | 0.06 | 0.07 | 0.03 | 0.19 |
| **MAC** | 0.04 | 0.00 | 0.04 | -0.06 | -0.04 | -0.10 | 0.02 | 0.00 | 0.00 | 0.03 | 0.03 | 0.06 | 0.06 |
| **EOP** | 0.13 | 0.02 | 0.15 | -0.07 | -0.21 | -0.28 | 0.05 | -0.03 | 0.00 | 0.02 | -0.01 | 0.19 | 0.10 |
| **TRA** | -0.02 | 0.08 | 0.06 | 0.00 | 0.39 | 0.40 | 0.14 | -0.04 | -0.01 | 0.05 | 0.00 | -0.49 | 0.10 |
| **OTH** | -1.17 | 0.20 | -0.97 | -0.59 | 0.29 | -0.30 | 6.65 | -0.12 | -0.03 | 0.72 | 0.57 | -1.17 | 4.78 |
| **Total** | -0.11 | 0.33 | 0.22 | -1.93 | 0.28 | -1.65 | 7.80 | -0.35 | 0.02 | 1.85 | 1.52 | -1.55 | 6.34 |
| **2015-2019** | | | | | | | | | | | | | |
| **AGR** | 0.07 | -0.09 | -0.02 | -0.25 | 0.25 | 0.00 | 0.21 | 0.25 | -0.01 | 0.42 | 0.66 | -0.46 | 0.39 |
| **MNQ** | -0.29 | -0.16 | -0.45 | 0.32 | -1.43 | -1.10 | -0.46 | -1.43 | -0.04 | 1.00 | -0.46 | 2.20 | -0.27 |
| **TRM** | 0.71 | -0.19 | 0.51 | 0.34 | -0.69 | -0.35 | 0.62 | -0.39 | -0.16 | 0.70 | 0.16 | 1.16 | 2.11 |
| **CIM** | 0.35 | -0.38 | -0.03 | -0.06 | 0.81 | 0.75 | 0.17 | -0.20 | -0.07 | 0.29 | 0.02 | -0.26 | 0.65 |
| **CHM** | 0.11 | -0.07 | 0.05 | -0.01 | -0.18 | -0.18 | 0.15 | -0.07 | 0.00 | 0.12 | 0.05 | 0.34 | 0.40 |
| **MAC** | 0.05 | -0.01 | 0.04 | 0.01 | 0.03 | 0.03 | 0.02 | -0.01 | -0.02 | 0.07 | 0.03 | 0.01 | 0.14 |
| **EOP** | 0.07 | -0.01 | 0.06 | -0.01 | 0.09 | 0.07 | 0.06 | -0.04 | -0.01 | 0.03 | -0.02 | -0.06 | 0.11 |
| **TRA** | 0.11 | -0.29 | -0.17 | -0.04 | 0.87 | 0.83 | -0.06 | -0.08 | -0.04 | 0.08 | -0.04 | -0.54 | 0.01 |
| **OTH** | -1.36 | 0.10 | -1.26 | 0.04 | 0.25 | 0.29 | -0.16 | -0.06 | -0.21 | 1.46 | 1.19 | -0.45 | -0.39 |
| **Total** | *-0.53* | *-0.72* | *-1.24* | *0.39* | *-0.80* | *-0.41* | *0.38* | *-1.82* | *-0.48* | 3.87 | 1.56 | 2.20 | 2.49 |

Source: author's elaboration based on Consing et al. (2020) and ADB (2021).

*Table 5 - Results of structural decomposition analysis for Brazil: 2000-2019 and subperiods*

| | $\Delta\hat{c}$ | | | $\Delta A_d$ | | | | $\Delta e$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Dom** | **Exp** | **total** | **Dom** | **Exp** | **total** | $\Delta d$ | $\Delta T$ | $\Delta\psi$ | $\Delta e$ | **total** | $\Delta v_s$ | $\Delta v$ |
| **2000-2019** | | | | | | | | | | | | | |
| **AGR** | 0.13 | 0.10 | 0.23 | -0.57 | -0.18 | -0.75 | 1.32 | 1.98 | 0.33 | 2.01 | 4.32 | -0.10 | 5.02 |
| **MNQ** | -0.70 | -0.65 | -1.35 | 0.08 | 0.03 | 0.11 | 1.33 | 1.37 | 0.23 | 1.47 | 3.07 | 0.01 | 3.18 |
| **TRM** | 1.02 | 0.34 | 1.37 | -0.62 | -0.19 | -0.81 | 3.61 | -0.83 | -0.45 | 2.60 | 1.32 | -0.28 | 5.20 |
| **CIM** | 0.02 | -0.04 | -0.02 | -0.38 | -0.07 | -0.45 | 2.38 | -0.64 | -0.29 | 1.27 | 0.33 | -0.08 | 2.16 |
| **CHM** | -0.13 | -0.03 | -0.15 | -0.15 | -0.03 | -0.18 | 0.78 | -0.11 | -0.04 | 0.44 | 0.30 | -0.03 | 0.71 |
| **MAC** | 0.06 | 0.02 | 0.07 | -0.07 | -0.02 | -0.09 | 0.46 | -0.06 | -0.06 | 0.25 | 0.14 | 0.00 | 0.58 |
| **EOP** | 0.33 | 0.05 | 0.38 | -0.28 | -0.04 | -0.32 | 0.23 | -0.27 | -0.06 | 0.20 | -0.13 | 0.00 | 0.15 |
| **TRA** | -0.24 | -0.07 | -0.32 | 0.11 | 0.02 | 0.13 | 0.92 | -0.21 | -0.13 | 0.38 | 0.03 | -0.05 | 0.71 |
| **OTH** | -2.46 | -0.46 | -2.92 | -1.20 | -0.13 | -1.33 | 31.46 | -1.48 | 0.42 | 5.19 | 4.13 | -0.68 | 30.67 |
| **Total** | *-1.99* | *-0.71* | *-2.70* | *-2.70* | *-0.53* | *-3.23* | *40.11* | *0.40* | *0.24* | 12.53 | 13.17 | -1.13 | 46.22 |
| **2000-2008** | | | | | | | | | | | | | |
| **AGR** | -0.13 | -0.04 | -0.17 | 0.38 | 0.10 | 0.48 | 0.98 | 0.11 | 0.09 | 0.66 | 0.86 | 0.08 | 2.24 |
| **MNQ** | 0.07 | 0.04 | 0.11 | 0.51 | 0.11 | 0.62 | 0.81 | 0.86 | 0.02 | 0.86 | 1.74 | 0.16 | 3.44 |
| **TRM** | -2.31 | -0.58 | -2.89 | -0.14 | 0.02 | -0.12 | 1.92 | -0.34 | -0.13 | 1.38 | 0.92 | 0.08 | -0.09 |
| **CIM** | -1.41 | -0.36 | -1.77 | 0.21 | 0.06 | 0.28 | 2.27 | -0.10 | -0.07 | 0.80 | 0.62 | 0.15 | 1.55 |
| **CHM** | -0.96 | -0.24 | -1.19 | 0.00 | 0.01 | 0.01 | 0.34 | 0.01 | -0.02 | 0.22 | 0.20 | 0.02 | -0.62 |
| **MAC** | -0.08 | -0.02 | -0.10 | 0.02 | 0.01 | 0.03 | 0.43 | 0.02 | -0.02 | 0.16 | 0.16 | 0.01 | 0.52 |
| **EOP** | -0.19 | -0.04 | -0.23 | -0.11 | -0.02 | -0.13 | 0.08 | -0.10 | -0.02 | 0.14 | 0.02 | 0.00 | -0.24 |
| **TRP** | -0.19 | -0.06 | -0.25 | 0.30 | 0.07 | 0.37 | 1.42 | -0.03 | -0.01 | 0.28 | 0.24 | 0.12 | 1.89 |
| **OTH** | 0.04 | -0.19 | -0.15 | -1.49 | -0.11 | -1.60 | 18.39 | -0.51 | 0.19 | 3.03 | 2.72 | 0.49 | 19.86 |
| **Total** | *-3.74* | *-1.13* | *-4.87* | *-0.53* | *0.18* | *-0.34* | *24.38* | *0.02* | *0.10* | 6.73 | 6.86 | 0.97 | 27.00 |
| **2010-2014** | | | | | | | | | | | | | |
| **AGR** | -0.05 | -0.02 | -0.08 | -0.12 | -0.05 | -0.17 | 0.33 | 0.32 | 0.02 | 0.26 | 0.61 | 0.01 | 0.70 |
| **MNQ** | 0.30 | 0.30 | 0.60 | 0.14 | 0.02 | 0.16 | 0.32 | -0.21 | 0.02 | 0.34 | 0.15 | 0.03 | 1.25 |
| **TRM** | 1.00 | 0.29 | 1.28 | -0.99 | -0.24 | -1.23 | 0.40 | 0.08 | 0.00 | 0.39 | 0.46 | -0.17 | 0.75 |
| **CIM** | 0.22 | 0.04 | 0.25 | -0.20 | -0.05 | -0.25 | 0.32 | -0.06 | -0.01 | 0.17 | 0.10 | 0.03 | 0.45 |
| **CHM** | 0.06 | 0.01 | 0.07 | -0.07 | -0.02 | -0.09 | 0.11 | 0.01 | 0.00 | 0.06 | 0.07 | 0.02 | 0.19 |
| **MAC** | 0.04 | 0.01 | 0.06 | -0.06 | -0.02 | -0.08 | 0.02 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.06 |
| **EOP** | 0.13 | 0.02 | 0.15 | -0.07 | -0.01 | -0.09 | 0.05 | -0.03 | 0.00 | 0.02 | -0.01 | 0.00 | 0.10 |
| **TRA** | -0.02 | 0.00 | -0.02 | 0.00 | 0.00 | 0.00 | 0.14 | -0.04 | -0.01 | 0.05 | 0.00 | -0.02 | 0.10 |
| **OTH** | -1.17 | -0.08 | -1.25 | -0.59 | -0.44 | -1.02 | 6.65 | -0.12 | -0.03 | 0.72 | 0.57 | -0.17 | 4.78 |
| **Total** | 0.29 | 0.52 | 0.81 | -1.76 | -0.76 | -2.52 | 8.01 | 0.01 | 0.00 | 1.88 | 1.89 | -0.27 | 7.93 |
| **2015-2019** | | | | | | | | | | | | | |
| **AGR** | 0.03 | 0.02 | 0.05 | -0.87 | -0.28 | -1.15 | -0.08 | 0.84 | 0.29 | 0.78 | 1.91 | 0.03 | 0.77 |
| **MNQ** | 0.03 | 0.03 | 0.05 | 0.16 | 0.03 | 0.19 | 0.23 | 0.15 | 0.20 | 0.52 | 0.87 | 0.01 | 1.36 |
| **TRM** | 0.71 | 0.21 | 0.92 | 0.34 | 0.02 | 0.37 | 0.62 | -0.39 | -0.16 | 0.70 | 0.16 | 0.05 | 2.11 |
| **CIM** | 0.35 | 0.08 | 0.43 | -0.06 | -0.02 | -0.08 | 0.17 | -0.20 | -0.07 | 0.29 | 0.02 | 0.12 | 0.65 |
| **CHM** | 0.11 | 0.03 | 0.14 | -0.01 | 0.00 | -0.01 | 0.15 | -0.07 | 0.00 | 0.12 | 0.05 | 0.07 | 0.40 |
| **MAC** | 0.05 | 0.01 | 0.06 | 0.01 | 0.00 | 0.00 | 0.02 | -0.01 | -0.02 | 0.07 | 0.03 | 0.02 | 0.14 |
| **EOP** | 0.07 | 0.01 | 0.08 | -0.01 | 0.00 | -0.02 | 0.06 | -0.04 | -0.01 | 0.03 | -0.02 | 0.01 | 0.11 |
| **TRA** | 0.11 | 0.03 | 0.14 | -0.04 | -0.01 | -0.06 | -0.06 | -0.08 | -0.04 | 0.08 | -0.04 | 0.02 | 0.01 |
| **OTH** | -1.36 | -0.08 | -1.44 | 0.04 | -0.16 | -0.12 | -0.16 | -0.06 | -0.21 | 1.46 | 1.19 | 0.14 | -0.39 |
| **Total** | *-0.25* | *0.26* | *0.01* | *-0.38* | *-0.42* | *-0.80* | *0.77* | *0.34* | *0.06* | 3.75 | 4.15 | 0.36 | 4.49 |

Source: author's elaboration based on Consing et al. (2020) and ADB (2021).

It is also important to emphasize that these sectors have a high value-added coefficient as they demand fewer inputs[5]. Industries with low demand for inputs, such as primary and service sectors,

[5] The agricultural sector's coefficient is 0.57 and 0.59, and the mining and quarrying one is 0.62 and 0.49 for 2000 and 2019. For example, in Brazil, the sector that has the lowest value-added coefficient is the "Coke, refined petroleum, and nuclear

naturally tend to have a higher added value per unit of output than others, such as the manufacturing industry. Also, all Brazilian sectors contribute positively to the growth of value added related to the export level. Nevertheless, the traditional manufacturing industry (2.6p.p.), agricultural (2p.p.), and mining and quarrying (1.5p.p.) are the ones that have the most critical impact.

At this point, a critical issue must be considered to relativize this result: relative prices' impact. Even if the series used is valued at constant prices, which would imply the exclusion of inflation, this is not valid for the case of relative prices, as shown by Alves-Passoni (2022c). Therefore, these results must be analyzed sparingly.

Something interesting about Mexico is the difference in the decomposition for VA and gross output. When performing the same decomposition, we observed a considerable difference in the importance of the transport equipment sector. While this sector contributes only 2% of the value-added growth, in the case of the gross output, the contribution is equivalent to 11%. This result is one of the points addressed by Fujii and Cervantes (2013, 2017) and Fuentes and Brugués (2020), that although this sector corresponds to an essential part of Mexican production, its capacity to generate VA is limited. One of the main differences between the decomposition of gross output and VA is the value-added coefficient, which weighs all the structural decomposition components. Since it was only 0.40 in 2000 and 0.39 in 2019, the transport equipment sector has a limited capacity to generate VA. Other factors that could contribute to the greater importance of this sector, even with this value-added coefficient, could be the indirect effects, such as the generation of jobs with high salaries. However, as stated by Murillo et al. (2018), this sector's capacity to generate jobs is limited.

Brazil and Mexico have similar growth rates not only for the whole period but also for the subperiods. Between 2000 and 2008, both VA growth is approximately 1.51%. Between 2010 and 2014, Mexico grew slightly less than Brazil, 1.59% p.a. compared to 1.68%p.a. The most significant difference exists for 2015-2019, when Mexico grew by 1.26% while Brazil by 1.46% p.a.

In the subperiods 2000-2008 and 2010-2014, the domestic sector was central in generating VA in these countries. Alves-Passoni and Blancas (2022) and Moreno-Brid and Fraga (2015) mentioned a considerable increase in GFCF in both countries between 2000 and 2008, which contributes to the importance of the domestic sector in explaining the variations in VA. In the 2000-2008 period, the $\Delta\boldsymbol{d}$ corresponds to 92% (24.75p.p.) of total VA growth in Mexico and 90% (24.38p.p.) in Brazil.

In 2010, the countries adopted a series of special measures to combat the effect of 2008's subprime crisis. The Brazilian government increased public investments and implemented subsidies, lower interest rates, and tax incentives to stimulate private investment, especially in residential ones. The Mexican government likewise introduced expansionary fiscal policies. These policies, which lasted for a few years, influenced the domestic sector to contribute positively to the generation of VA. It corresponds to 123% of Mexican VA growth (7.8p.p.) and 101% in Brazilian (8p.p.).

However, the analyzed subperiods differ in two aspects. The first relates to the contribution of the VA associated with exported products, which was negative during 2000-2008 (-0.47p.p and 1.12p.p in Mexico and Brazil) and positive between 2010-2014 (0.33 and 0.52p.p.) in the Mexican economy.

On the other hand, for the Mexican economy, while in the first subperiod, the change of the composition of exported goods had a positive effect on VA (0.72p.p.), it was negative in the second one (-0.35p.p.). In both cases, the mining and quarrying sector is decisive in dictating this trend. The commodity boom between 2003-2008 benefited the increase of goods in the mining and quarrying sector, such as steel, iron, and oil exports used for industrial production.

The boom affected Brazil and Mexico primarily because of the rise in demand from China (Carvalho, 2018; Schneider, 2013). As we saw in Table 1, between 2000 and 2008, China increased its share of Mexico's exports. As Alves-Passoni (2022a) points out, part of this increase may be due to the relative prices of goods in this sector. The share of mining and quarrying in the Mexican economy went from 6% of the total VA to 8% between 2000 and 2008. The negative contribution of the sectoral composition in Mexico between 2010-2014 is also related to the transport equipment sector, which had the second highest contribution related to $\Delta\boldsymbol{T}$ (-0.12p.p.) and the most negative in $\Delta\boldsymbol{\psi}$ (-0.03p.p.). In this period, the economic recovery in the USA contributed to stimulating Mexican exports' growth of

fuel" sector, with 0.11 in 2000 and 0.19 in 2019.

transport equipment.

In the Brazilian case, the change in the product mix had a positive contribution in 2000-2008 (0.02p.p.) and 2010-2014 (0.01p.p.). While the first subperiod it is more related to the mining and quarrying sector, the agricultural industry led to a positive effect in the second one. Regarding the impact of the changes in the partners, in both subperiods, there was a positive effect related to the mining, quarrying, and agricultural sector. Both effects ($\Delta\boldsymbol{T}$ and $\Delta\boldsymbol{\psi}$) is associated with the increase in China's demand for these products.

The subperiod that most differs from the others is between 2015 and 2019. It is the only one in which the contribution of exports is more significant than that of domestic demand in Brazil and Mexico. In Brazil, this happened partially because the government implemented robust fiscal policies like reducing social transfers, overall budget cuts, reduction in government investments (mainly in civil construction), and tax increases to expand revenues. As an induced effect, the gross fixed capital formation declined in the period (Alves-Passoni and Blancas, 2022).

Since 2011 the Mexican government has adopted a strategy to stimulate growth through private investment and exports. The instruments used were interest rate cuts, reducing public investment (based on the idea of a crowding out effect), devaluating the exchange rate, and tax incentives to stimulate exports. As Alves-Passoni and Blancas (2022) state, the increase in the importance of exports in the Mexican economy represents an "export-led stagnation," where this component only contributes more to the VA because the domestic part had a poor performance.

Between 2015 and 2019, we observed a difference in the contributions related to exports. In Brazil, the change in the export agenda and trade partners positively affected the generation of added value associated with the agriculture and mineral extraction sectors exported to China. In Mexico, the opposite occurs, intensifying exports of automotive goods to the USA. In fact, the transport equipment sector negatively contributed to the value-added growth associated with exports. The positive contribution of the change in the level of Mexican exports was not enough to offset the negative contribution of the difference in the export basket and trade partners.

A common characteristic in Mexico and Brazil was that the manufacturing sectors presented a largely negative contribution to the growth of VA in terms of the change in the composition of the export basket and trade partners in all subperiods. In part, this effect is offset by the positive contribution of the export level but also indicates that the structural changes in exports have not contributed to the ability to generate added value from exports.

## 5. Final remarks

The objective of this study was to observe how the changes in the sectoral and export trade partners affected the Brazilian and Mexican value-added between 2000 and 2019 using a quantitative input-output structural decomposition analysis. We found a strong relationship between the modification/permanence of trade partners and the structure of the export basket, considering product quality, design and differentiation.

There is a crucial difference between Brazil's and Mexico's export composition changes. While the change in the export basked and trade partners had a negative effect on the value-added growth in Mexico, the repercussion was positive in the Brazilian case. In part, the difference in this result arises from the export composition of the two countries. Brazil has specialized (regressively) in agricultural and mineral goods exports to China. Mexico, however, has maintained its specialization in the transport equipment sector in USA and Canada.

In that sense, Brazil presented better results than Mexico in the period, and the former saw its commodity exports increase substantially to China. In contrast, Mexico's automobile exports grew more concentrated in the USA but were less dynamic. In addition, the Brazilian commodities sector had a higher value-added coefficient than the Mexican automotive maquila. Also, in the last case, the higher share of imported inputs to attend the transport equipment sector decrease the appropriation of value added.

Even though the exports contributed more to value-added growth compared to the domestic sector between 2015 and 2019, the average VA growth did not increase. Also, focusing on exports to grow has some limitations. In the Brazilian case, exporting primary goods to attend to the expansion of large markets, such as China, tends to be temporary and only remains in the short term. In this sense, the trajectory suggested by Perez (2008) may be interesting to take advantage of market niches to encourage the development of technology, and technological capabilities contribute to long-term growth, such as nanotechnology, biotechnology, new materials, and energy generation.

For Mexico, the growing dependence of the automotive sector on exports to the USA needs to be questioned. In the analyzed period, these changes did not positively affect the Mexican economy due to the size of the Mexican value-added coefficient and the weak stimulus that this sector has in generating indirect VA.

It is important to emphasize that one of the main limitations of this study is that it does not take into account the variation in relative prices, which tends to overestimate the importance of sectors with an increasing trajectory of relative prices (agriculture, mining, and quarrying) and underestimate the participation of industries with fell in relative prices (manufactured goods). However, it would be necessary to estimate a suitable database to reach this end.

However, it is necessary to emphasize that transversal policies must be implemented to develop manufacturing activities. Even if they do not positively affect value-added growth in this study, they have essential chaining effects through paying salaries and other remuneration. Furthermore, the weakness of a productive structure tends to contribute to greater dependence on imported inputs, which indirectly has the long-term effect of dismantling production chains and thus affecting growth. It is also important to note that the manufactured goods sectors have a more remarkable ability to compete for product differentiation and set a higher markup compared to more homogeneous products, such as primary products.

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