

# Evolution of Mexico's trade relations with the United States and China, 1993-2020

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## Abstract

This paper aims to analyze the evolution of the trilateral trade relationship between Mexico, the United States and China, and its main characteristics, from 1993 to 2020, through the application of vector autoregressive (VAR) models at different points in time. More specifically, trade links between these economies have been transformed from a first phase of little significance to a second phase with profound interrelationships since 2001, and finally to a consolidation stage, despite the increasingly complex environment.

**Keywords:** trilateral relationship; imports; exports; interdependence; competitive advantages.

## 1. INTRODUCTION

China's participation in the global economy and international trade has been on an upward trend, especially since it entered the World Trade Organization (WTO) at the end of 2001. It positioned itself as the world's second-largest economy in 2010 based on its Gross Domestic Product (GDP) at current US dollar prices (World Bank, 2021), behind only the United States. Over time, the gap between these two economies has steadily decreased.<sup>1</sup>

According to figures published by UNCTAD (2020) in 1978, China's participation in the international trade of goods<sup>2</sup> was only 0.8% based on US dollar figures at current prices. However, by 2020, the same indicator reached 13.1%, and in the case of exports and imports, 14.7% and 11.5%, respectively. As a result, since 2017, it has ranked first worldwide.<sup>3</sup>

Due to the obvious competitive advantages registered by these imports, products from China have been destined mainly for integration into the various local value chains as inputs, intermediate goods, and capital, and only a tiny proportion for final consumption. However, this same Mexican export model that has been applied since the then-North American Free Trade Agreement (NAFTA) has often also been subject to criticism within a trilateral trade framework between China, Mexico, and the United States (De la Cruz and Veintimilla, 2014; Ley, 2012; Anguiano, 2016; Embassy of Mexico in China, 2015; Limas, 2019, among others).

Although Mexico's imports from China grew significantly before 2000, its share of the total was still small, averaging 1.1% in 1993-2000. At present, everything indicates that the importance of products originating from the Asian country in total Mexican imports is stabilizing, consolidating an average of 18.2% in the period from 2016 to 2020, after experiencing a significant increase over a period of approximately 15 years.

This, on the one hand, has led to a growing trend in Mexico's trade deficit with China. On the other hand, this has also coincided with an increasing strengthening of the exporting power of Mexican production plants in the same period.

In addition to the above debates, so diverse and controversial in qualitative terms, quantitative analyses recently emerged around the trilateral foreign trade relationship between the three nations finding a high value in terms of the correlation coefficient of imports from China with Mexican exports to the US market (Levi, 2018). Meanwhile, by applying a cointegration VAR model from 1993-2019, the elasticity between the same two variables was approximately 0.24 (Liu *et al.*, 2020).

This study quantifies the relationship between imports from China and exports to the United States using the same VAR methodology but in detail in three phases based on monthly figures. In this respect, this study's purpose is to better understand the current reconfiguration of global value and supply chains that have been taking place worldwide since 2001 and 2008.

The analysis period is divided into three moments: 1993.02-2001.05; 2001.06-2008.08; and 2009.09-2020.12. To comply with the assumption of stationarity in the cointegration analyses, the two series used to estimate the models representing imports from China and exports to the United States from Mexico were applied in monthly growth rates in relation to the immediately preceding month.

The aforementioned division of the phases is directly related to the behavior of Mexican exports to the United States based on the emergence of global phenomena. Although imports were already an essential part of the development of the value and supply chains of Mexican industries, it is from 2001 onwards that these linkages were strengthened with greater speed and magnitude due to the competitive advantages resulting from the accession of China into the WTO. The great unknown is whether or not the trilateral foreign trade relations between the three economies, formed during the period in question, may have been modified by the possible effects of the financial crisis of 2008.

In addition to quantifying the links between imports from China and Mexican exports to the United States over the last 28 years, this paper attempts to specify the results derived from the adjustments made by these trade flows in the trilateral relationship to enrich those obtained in previous quantitative studies as the main contribution. Specifically, China's entry into the WTO enabled the Asian country to intensify its incursion into the North American

market, especially in the development of value and supply chains; the economic difficulties that occurred in 2008 are likely to strengthen these trilateral ties further.

To carry out this analysis, the following hypothesis was put forward: from June 2001 to August 2008, the importance of imports from China has been increasingly greater than in the first phase of the analysis to stimulate the dynamics of Mexican exports to the United States. Meanwhile, due to the global financial crisis in mid-2008, their subsequent dynamics could undergo some modifications, even structural changes, because both trade flows were temporarily interrupted.

The potential impact of trade frictions between China and the United States, the spread of Covid-19, and the emergence of mega-trade agreements such as the TMEC, the Trans-Pacific Partnership Agreement (TIPAT or TPP11), and the Agreement-Regional Comprehensive Economic Partnership (RCEP), among others, on the reconfiguration of value and supply chains is undoubtedly an issue of great importance. However, all of the above are recent events, and it is still too early to study their consequences quantitatively.

The study is divided into three sections in addition to this introduction. Section two describes the discussions surrounding trade exchanges, preceded by a brief quantitative analysis of these exchanges, followed by the results of the application of different VAR models for the 1993-2020 study period related to the different phases. The conclusions obtained from the analysis are presented in the last section.

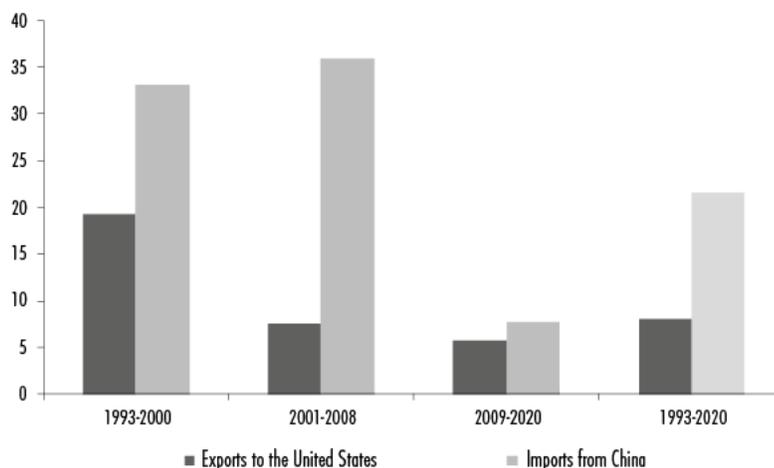
## 2. BRIEF OVERVIEW OF TRADE EXCHANGES BETWEEN MEXICO, CHINA AND THE UNITED STATES

An analysis of Mexico's trade exchanges with China and the United States between 1993 and 2020, in terms of US dollars at current prices, based on figures published by the Ministry of the Economy (SE [SE, 2021]), reveals at least two completely opposite extraordinary behaviors: deficit balances with the Asian country and surplus balances with the northern neighbor have grown steadily.

Mexican exports to the US market have grown at an average annual rate of 8% over the last 28 years, despite adjustments in some specific years, especially in 2009 and 2020, with a drop of 20.7% and 8.5%, respectively, due to economic and exogenous factors. A closer look at the figures for products shipped to the United States shows that, since the implementation of NAFTA in January 1994, performance was positive for the first seven years, with an average annual growth rate of 19.3%. However, this upward trend was interrupted in 2001, with a negative variation rate of 4.6%.

Afterward, although the expansion rate picked up again, the dynamic was reduced by 11.8 percentage points compared to 1993-2000, ending at 7.5% between 2001 and 2008, before the outbreak of the financial crisis. During the last 11 years, from 2009 to 2020, exports have been subject to an even slower pace, with an annual growth rate of 5.7% on average, in addition to two adjustments in 2015 and 2016, before the new decrease caused by the Covid-19 pandemic, culminating with an annual growth rate of 8% on average from 1993 to 2020 (see Figure 1).

Figure 1. Average annual percentage change in Mexico's exports to the United States and imports from China to the United States, 1993-2020



Source: Compiled by the authors based on figures published by the SE (2021).

It is important to note that between 1993 and 2020, Mexico had a trade surplus with the United States except for a few months in 1993 and 1994. In 2019 and 2020, the annual balance has been extraordinary and possibly related to the contraction of the Mexican economy and the sustained trade frictions between the two largest economies in the world since mid-2018 to date, with US\$165.1 and US\$171.4 billion (SE, 2021).

The increase in imports from China has been more significant than the increase in exports to the United States in the same period. During the same three phases analyzed separately, the annual growth rates were 33.2, 36.0 and 7.7%, respectively, and 21.5% for the entire period from 1993 to 2020 (see Figure 1). Furthermore, the deficit balance has been persistently increasing from USD\$341.7 billion in 1993 to USD\$65,639.5 million in 2020, peaking at USD\$76 081.7 million in 2018 (SE, 2021).

### Discussions on the trilateral relationship in trade between Mexico and its main partners

While Mexico's trade flows with its first two trading partners have been increasing; still, with opposing balances over the last 28 years, its export power has lost momentum due to a series of events that have taken place on national and international levels, including the increasingly intensified

competition from Chinese products in the US market, especially since 2001 (Galdelayher and Porzecanski, 2010; Jenkins and Dussel, 2009). In this regard, some studies also indicate that the relative loss of the advantages provided by NAFTA was due to the absence of structural reforms to increase the country's competitiveness, as well as the significant increase in free trade agreements between the US economy and other Latin American countries (Espinosa and Serra, 2005; De la Cruz and Veintimilla, 2014; Galdelayher and Dussel, 2013).

It is also important to note that the significant increase in the import of products from China into the Mexican market coincides with the decrease in consideration of US goods during the period in question. In 1993, products from Asia accounted for only 0.6% of total Mexican imports and 69.3% in the case of the United States; however, in 2020, the figures were 19.2% and 43.8% for the two countries, respectively. In other words, the drop of 25.5 percentage points in the Mexican import market from its northern neighbor was offset mainly by the increase in the presence of Chinese products, with 18.6 percentage points, which have practically absorbed 73.0%.

It is argued that a constant improvement in the competitiveness of Mexican products in international markets has led to a substitution between Chinese and North American products (Dussel and Galdelayher, 2014). As a result, Mexico's growing exports to its northern neighbor's market during the NAFTA implementation period have generated additional benefits for nations in the rest of the world with which neither Mexico nor the United States has signed free trade agreements, mainly China (De la Cruz and Veintimilla, 2014). As a result, approximately half of the surplus sustained with Mexico by the United States was offset by the growing deficit recorded in the trade balance with China throughout the period from 1993 to date (Ruíz, 2004; Zhang, 2013; Ortiz, 2011; Zottele and Santiago, 2015). In this scenario, Mexico became a "springboard and place for assembly" (Gutiérrez, 2014) to place its products in the North American market, while China serves as an "uninvited guest" (Dussel and Galdelayher, 2014) within the trade agreement in the North American zone. At the end of the day, for López *et al.* (2014), both China and Mexico are part of the tremendous global factory, whose axis is located in the US market.

In summary, despite the diverse, controversial opinions in the discussions on the consequences of China's increasingly active participation in trade with Mexico and the United States, the links between the three countries represent an undeniable fact. Presumably, the displacement of US goods by those from China resulted in an additional boost for Mexican exports to the US market due to the improvement in the level of competitiveness of its products derived from the incorporation of goods from the Asian country in various local value chains, such as inputs, intermediates, and capital. However, these conclusions have yet to be quantitatively confirmed.

Quantitatively, despite the need for studies on the subject, interesting results were found. In the first instance, there are the interrelations of trade exchange between the three economies through the estimation of the correlation coefficients for the respective trade balances that Mexico holds with the two nations, both expressed in absolute terms of US dollars at current prices from 2003 to 2017, which was 0.9723; and particularly for products cataloged in Chapters 84, 85 and 87<sup>4</sup> within the Harmonized Commodity Description and Coding System (HS), was 0.9712, 0.8728 and 0.5562, respectively (Liu, 2019). In turn, a similar result was reported by Levi (2018), but among the imports from China and Mexican exports to the United States between 1997 and 2017, which was 0.9807. This would indicate that Mexico's imports and exports with its two main trading partners are almost perfectly correlated and that the deficit and surplus balances behave the same.

Recently, the trilateral trade relations between the three nations were quantified through the estimation of a VAR model. It was concluded that China's imports and Mexico's exports to its northern neighbor showed an elasticity of 0.2449, according to monthly figures from January 1993 to July 2020, which would imply that for every percentage point of variation in Mexican exports to the United States, imports from China by Mexico would have to adjust by 0.2449 percentage points in the same direction (Liu *et al.*, 2020).

However, previous studies show limitations that require a more in-depth analysis to achieve an optimal diagnosis of the trilateral relations between the three economies involved. First, the estimation of the correlation coefficient is based on the levels of trade flows in terms of current US dollars; nevertheless, its trend is possibly a typical driver and, because of its importance, could distort the results of the analysis, which are not necessarily consistent with the fundamental relationships between imports and exports or between trade balances.

Likewise, the application of the VAR model could also have the same limitation when interpreting the results obtained despite the figures being expressed in logarithmic terms.

Finally, as mentioned in previous paragraphs, imports from China and Mexican exports to the United States registered significant adjustments between 1993 and 2020 due to a series of events that took place, which is why in particular periods, trilateral relations could suffer modifications that have not been quantitatively exploited.

This study aims to show the evolution of trade exchanges between the three economies and thus enrich the other qualitative and quantitative studies.

### 3. ESTIMATION OF THE VARIOUS VAR MODELS

This study not only attempts to evaluate trade relations between the three economies and their general characteristics over the entire period from 1993 to 2020 but also to detail the differences between different stages to understand the evolution of the process in the development of trilateral trade.

Before proceeding to the estimation of the cointegration VAR models, the possible errors and limitations mentioned above in interpreting the correlation coefficients need to be mentioned.

According to the figures for Mexico's trade with China and the United States, the correlation coefficients register values close to unity; for example, 0.9560 for the entire period. This would imply the existence of an almost perfect linearity between imports from China (MCH) and Mexican exports to the United States (XM) in terms of their monthly recorded level, despite the drop observed in the last study period from their highest level of 0.9684, as shown in the column corresponding to the figures in levels of Table 1.

**Table 1. Correlation coefficients between imports from China and Mexican exports to the United States, 1993.01-2020.12**

<i>Period</i>	<i>Figures in levels</i>	<i>Growth rate</i>	<i>Figures in levels with a delay</i>
1993.01-2020.12	0.9560	0.4160	0.4280
1993.02-2001.05	0.9466	0.3690	0.5351
2001.06-2008.08	0.9684	0.6777	0.6941
2008.09-2020.12	0.8909	0.4108	0.4084

Source: Compiled by the authors based on the figures of the SE (2021).

To eliminate possible distortions caused by trends in import and export flows, two different adjustments were made to check for the existence of distortions caused by the trend of the two variables.

First, the monthly growth rate was calculated concerning the immediately preceding period. Then the correlation coefficient of trade flows was estimated in relative terms, as shown in the third column of Table 1. A considerable decrease was observed compared to the figures reported in the previous column.

Secondly, the first difference was applied for imports and exports so that two new series with eliminated trends were constructed when quantifying the indicator (fourth column). Results similar to those calculated using the growth rate (third column) were observed.

By eliminating the trend within trade flows and applying the growth rate in relation to the immediately preceding period, like the first difference, it can be observed that trend factors exist within the relationship between trade flows, suggesting a relationship prone to linearity with a significant proportion. On the other hand, despite the decrease in value after applying the two respective transformations, the calculated correlation coefficient is still substantial, especially in the second period (2001.06-2008.08), since both exceeded the value of the first period (2001.06-2008.08) 0.6, with a high significance, which undoubtedly justifies a positive relationship between the two variables and is supported by the qualitative studies.

The results shown in Table 1 infer that the correlation coefficients derived from the figures in levels and in levels with a delay or with the growth rate are entirely different. However, between the three stages of the analysis, presumably from 2001 onwards, the relationship between the two variables is more closely linked than in the first stage. Thus, it is expected that applying the VAR model following the methodology proposed by Johansen (1991, 1995) and the classical causality analysis of Granger (1969) will yield the same results.

### Stationarity of the variables involved

Based on the above considerations, the growth rate of both variables was estimated concerning the immediately preceding period, where:

DX = Growth rate of exports to the United States, and

DM = Growth rate of imports from China.

Two variables linked to trade flows were included to complete the estimation using the VAR model: the index of manufacturing industrial activities in Mexico and the real exchange rate.

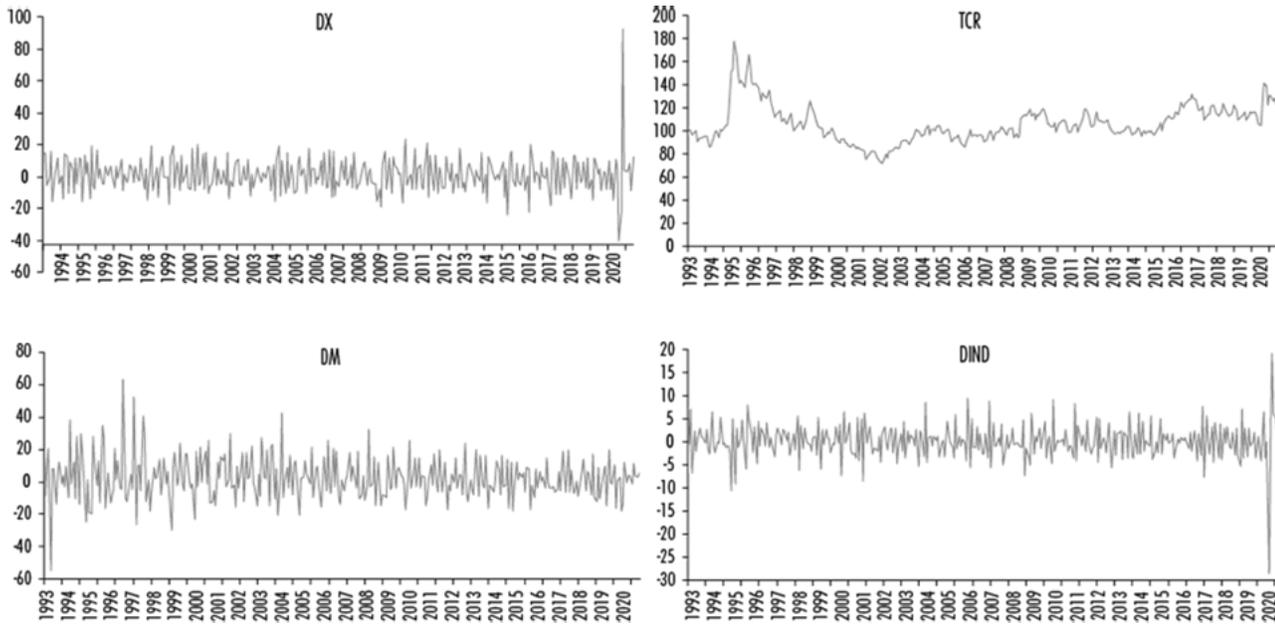
DIND = Growth rate of the index of industrial manufacturing activity, and

TCR = Real exchange rate.

According to previous analyses, especially related to estimating the correlation coefficient between DX and DM, a positive relationship is expected. The relationship between Mexican exports to the United States and the growth rate of the index of industrial manufacturing activity would also be the same; on the other hand, the relationship between DX and TCR is negative (Krugman and Obstfeld, 2006).

Therefore, the behaviors of the four variables involved in the VAR model are shown in Figure 2, where the stationarity is evident or, in other words, they are integrated in zero order, I (0).

Figure 2. The behavior of the variables involved in the VAR model



Source: The authors prepared based on the SE figures (2021).

To estimate the VAR models at each stage, Augmented Dickey-Fuller and Phillips-Perron stationarity tests were applied under the null hypothesis that the series contains a unit root. The results of the tests are shown in Tables 2 and 3.

**Table 2. Augmented Dickey-Fuller Test**

Variable	Statistic <i>t</i>	Level 5%	Probability
DX	-5.002313	-2.870274	0.0000
DM	-3.320621	-2.870330	0.0148
TCR	-2.984614	-2.869978	0.0374
DINM	-5.555374	-2.870274	0.0000

Source: Compiled by the authors according to figures from SE (2021).

**Table 3. Phillips-Perron test**

Variable	Statistic <i>t</i>	Level 5%	Probability
DX	-33.46882	-2.869978	0.0000
DM	-25.69340	-2.869978	0.0000
TCR	-3.03500	-2.869978	0.0328
DINM	-35.59169	-2.869978	0.0001

Source: Compiled by the authors according to figures from SE (2021).

### Estimation of the var model for the entire period (1993-2020)

According to the previous results, a VAR model with eight delays was estimated for each of the stages, as shown in Table 4, where the sequentially modified LR statistic (LR), the final prediction error (FPE), and the Akaike (AIC), Schwarz (SC), and Hannan-Quinn (HQ) information criteria are shown.

**Table 4. Selection criteria for order of VAR delays**

<i>Delay</i>	<i>LogL</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SC</i>	<i>HQ</i>
0	-4 732.509	NA	44 811 162	28.96948	29.01584	28.98797
1	-4 272.638	905.6794	2 967 314	26.25467	26.48647	26.34716
2	-4 218.247	105.7869	2 346 440	26.01986	26.43711*	26.18635
3	-4 179.86	73.72289	2 046 404	25.88294	26.48562	26.12342
4	-4 135.116	84.83582	1 716 843	25.70713	26.49526	26.02160
5	-4 096.271	72.69975	1 493 464	25.56741	26.54098	25.95588*
6	-4 074.000	41.13776	1 437 963	25.52905	26.68806	25.99151
7	-4 058.601	28.06542	1 444 237	25.53273	26.87718	26.06919
8	-4 013.094	81.83020*	1 206 827*	25.35226*	26.88215	25.96271

Note: \* indicates the order of delays selected by the criterion.

Source: Compiled by the authors in *E-views* with data from SE (2021).

In addition to the requirement of stationarity, the Granger causality between the different variables also needs to be calculated to avoid the error of estimating a spurious VAR model. The test results are shown in Table 5.

**Table 5. Granger Causality**

<i>Dependent variable: DX</i>			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob.</i>
DM	20.72184	8	0.0079
TCR	15.53329	8	0.0496
DIND	51.79732	8	0.0000
All	136.0659	24	0.0000

Source: Compiled by the authors in *E-views*.

The inverse polynomial roots estimated in the model are inside the unit circle, which guarantees the dynamic convergence of the final solutions shown in the standardized cointegration equation (equation 1).

$$DX - 1.06DM + 0.0232TCR - 5.8502DIND = 0 \quad (1)$$

Equation 1 shows that, for the entire study period (1993-2020), both the real exchange rate and the respective growth rates of imports from China and Mexico's manufacturing index have an influence on the growth rate of exports to the United States, and that all are consistent with expectations. In particular, for each percentage point increase in exports to the United States, imports from China increase by 1.06 units.

### Results obtained in the three respective stages

For this paper, three stages were established from 1993 to 2020, according to monthly figures: January 1993-May 2001, June 2001-August 2008, and September 2008-December 2020.

#### VAR model for the first period (February 1993 - May 2001)

Similar to the estimation of the VAR model for the whole period, in the model estimated for this period, the inverse polynomial roots are inside the unit circle. The standardized equation is shown in equation 2.

$$DX - 0.4766DM + 0.016TCR - 3.1165DIND = 0 \quad (2)$$

However, when estimating Granger causality (see Table 6), it can be observed that, as a consequence of China's still low participation in the world market and the absence of exchange rate policies in relation to the significant devaluation of the Mexican peso in 1994, respectively, imports of Chinese origin and the real exchange rate did not have statistically significant impacts on Mexican exports to the United States.

**Table 6. Granger Causality**

<i>Dependent variable: DX</i>			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob.</i>
DM	10.52877	8	0.2299
TCR	9.980015	8	0.2664
DIND	37.21192	8	0.0000
All	61.69916	24	0.0000

Source: Compiled by the authors in *E-views*.

Nevertheless, as a whole, the three variables showed causality. In the case of imports, applying the *ceteris paribus* principle, a positive coefficient of 0.4766 was obtained by taking exports as the explained variable.

In general, the beginning of this first period is characterized by the approval and implementation of NAFTA, which led to the opening of the Mexican economy to free trade in the region, specifically, with a 0% import tax rate in the zone and 19% on average for the rest of the world (Reyes, 2005). This resulted in greater integration in the NAFTA zone, which, at the same time, benefited non-member countries participating in the production of goods sold to the United States, specifically suppliers of inputs, parts, and packaging material free from tariffs and compensating duties under the temporary import regime.<sup>5</sup>

At the same time, this period was characterized by an insufficient share of the Asian economy, consistent with the Granger causality estimate. According to the SE (2021), despite an average annual growth rate of 30%, the maximum importance of imports from China in total Mexican imports was only 1.65% in 2000.

In short, Mexico had reached a stage of growth driven by the dynamism of exports to the United States, resulting from the competitive advantages provided by the signed agreement and national and regional integration, mainly with a reduced representation of imports of Chinese origin.

#### Var model for the second period (June 2001-August 2008)

As in the previous two cases, the polynomial roots of the estimated model lie within the unit circle, and, therefore, the dynamic convergence of the ensemble solution shown in the standard equation below is guaranteed.

$$DX - 1.9981DM - 0.0409TCR - 15.3021DIND = 0 \quad (3)$$

Table 7 shows the Granger causality test, which indicates that both imports and the industrial activity index exhibit causality on exports to the northern neighbor. This is not the case for the exchange rate. However, together the three variables exhibit causality.

**Table 7. Granger Causality**

<i>Dependent variable: DX</i>			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob.</i>
DM	8.24365	8	0.0021
TCR	24.25010	8	0.4100
DIND	28.81203	8	0.0003
All	94.09219	24	0.0000

Source: Compiled by the authors in *E-views*.

As a result of the above, this second period is characterized by ratification of the free market and a significant increase in the participation of the Chinese economy in the global market. However, although Mexican exports to the world's major markets increased, they were less dynamic than in the previous period. At the same time, Chinese imports of intermediate goods and final consumer goods grew at a much faster rate; in other words, for every percentage point increase in exports to the United States, imports from the Asian country increased by 1.99 percentage points, which implies that Chinese products would have done so with greater intensity to improve the competitive advantages of Mexican production in global value chains, especially for sectors with high levels of exports.

This could be explained by the significant competitive advantages of imports from Asia compared to imports from other countries, especially the United States, in terms of price and quality. In this sense, for each unit of US product replaced by a similar product from China in its incorporation into the different value chains installed in Mexico, this would presumably imply a consequent increase in the competitiveness of final goods from this country in international markets and, therefore, would encourage greater demand and exports destined mainly for the United States.

Therefore, the greater penetration of goods of Chinese origin in the NAFTA zone by incorporating them into the various links could lead to significant repercussions on Mexico's bilateral trade relationship with the United States, specifically, the ever-increasing incorporation of imported goods from China could have at least partially compensated a reduction in Mexico's competitive advantages due to the aforementioned elements. In other words, the share of Mexican products in the US import market could be even lower if the Asian country had not participated so actively in developing value and supply chains in Mexico.

### VAR model for the third period (September 2008-December 2020)

The third and final period of the analysis is located between several events: the global financial crisis, the outbreak of trade friction between China and the United States, the emergence of several mega trade agreements, and the spread of the Covid-19 pandemic, although the last three are recent and their effects have probably not yet been reflected in trade flows.

Without prejudice to generality, when estimating the model for this period, the polynomial roots were also located within the unit, thus ensuring the dynamic convergence of the solution shown in the standardized equation below:

$$DX - 0.9265DM + 0.0045TCR - 4.716DIND = 0 \quad (4)$$

As can be seen, for this period, by increasing the growth rate of exports to the United States by one unit, the growth rate of imports of Chinese origin increased by 0.92, a significant reduction in relation to the previous period, but still higher than the figure for the first period of the study.

Likewise, and according to Table 8, for imports, the real exchange rate, and the industrial production index, Granger causality showed that the three variables have individual and joint effects on exports to the United States.

**Table 8. Granger Causality**

<i>Variable dependiente: DX</i>			
<i>Excluded</i>	<i>Chi-sq</i>	<i>df</i>	<i>Prob.</i>
DM	16.88419	8	0.0313
TCR	22.06133	8	0.0048
DIND	36.52375	8	0.0000
All	161.9448	24	0.0000

Source: Compiled by the authors in *E-views*.

The period is characterized by a pronounced loss of dynamism in foreign trade in an environment of lower growth, less stability, and less margin for the application of trade policies, in addition to a generalized economic stagnation in the face of the financial crisis in 2008. Despite the above, it is worth noting that, given the financial crisis, thanks to the links between domestic and foreign parties and other factors, Mexico immediately recovered its exports to the United States within a year.

It should be noted that, in the last two years of this third phase of the analysis, Mexico has surpassed China as the leading trading partner of the United States due, among other things, to the conflict that has existed between the two largest economies in the world since 2018,<sup>6</sup> which caused both imports and exports between the United States and China to decrease, while those with Mexico increased steadily.

Another factor that has influenced Mexico's trade relationship with its two main partners in this latest stage is the renegotiation of NAFTA, which resulted in the Mexico-United States-Canada Agreement (T-MEC),<sup>7</sup> specifically about the controversial issue of Article 32.10 (Government of Mexico, 2019) regarding negotiations with economies that are not considered market economies.

Finally, it is essential to note that, as shown in Table 9, the influence that imports from China have on global value chain linkages, and consequently on Mexican exports to the United States, is present throughout the entire study period, with 1.0600.

In other words, trade links between these economies transformed from a first phase of little significance (0.4766) to a second phase of profound interrelationships from 2001 onwards (1.9981), and finally to a current stage of consolidation (0.9265), despite the increasingly complex current environment, which is consistent with the results based on the correlation coefficient (see Table 1).

More specifically, although the estimation for the entire study period shows a causality between the two variables, there are some discrepancies in the three specific phases. In particular, in the first period, there is no statistically sufficient evidence of the existence of significant effects in terms of the estimated causality analysis; for the second period, the degree of dependence of Mexican exports to the United States was higher than those observed in the rest of the analysis period; and finally, the impact in the third period, although undoubtedly significant, decreased by about 50% concerning the previous period; i.e., it had a significant stable effect but with a lower coefficient of cointegration.

**Table 9. Summary of cointegration results**

<i>Period</i>	<i>DX</i>	<i>TCR</i>	<i>DM</i>	<i>DIND</i>
All: January 1993 - December 2020	1	0.0232	-1.0600	-5.85020
First: January 1993 - May 2001	1	0.0160	-0.4766	-3.11650
Second: June 2001 - August 2008	1	-0.0409	-1.9981	-15.30210
Third: September 2008 - December 2020	1	0.0045	-0.9265	-4.71600

Source: Compiled by the authors according to figures from SE (2021).

#### 4. CONCLUSIONS

Based on the analysis carried out, the assertion that Mexican exports to the United States depend at all times on imports from China is an assertion in which there is a certain degree of ambiguity since, as we have seen through the estimation of various econometric models, different nuances are observed at each stage. According to the cointegration results obtained, it was found that Mexico's bilateral relationship with its two main partners has evolved significantly due to the economic adjustments that have occurred over the last three decades.

Thus, the analysis of the results provides a broader picture of the quantitative estimation of Mexico's trade ties with these two important nations. In addition, the increasing penetration of products from China has been gradually consolidated, highlighting consumables, intermediate and capital goods in the development of the value and supply chains, which has revealed at least two implications: first, there are greater competitive advantages of the various goods from the Asian country compared to those originating in other nations; second, Mexican industry faces an enormous and ever more significant challenge than before in the development of the various supply chains to meet the requirements of trade liberalization.

This productive mix from China contributes to strengthening the exporting power of Mexican production plants; in particular, because products from the Asian country are presumably more competitive than products from other countries, there has been a process of substitution of products from the United States for similar products from the Asian country.

Finally, the importance of recent events, such as the mega trade agreements signed by related parties, in addition to the T-MEC, TIPAT or TPP11 and the RCEP, and the spread of Covid-19, among others, in trilateral relations due to their impact on the reconfiguration of value and supply chains, undoubtedly merits particular attention. However, due to the limited information available to date, it is still too early to carry out quantitative studies, much less to draw concrete conclusions, which would be a subject for future research.

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<sup>1</sup> The comparison between economies could be applied in different ways, as indicated by the World Bank (2021), since the same source of information indicates that, based on Purchasing Power Parity (PPP) at constant 2011 prices, the Chinese economy was already in second place in 2001 and, based on its GDP at constant 2010 prices, in 2005 it became the world's second-largest economy. Finally, in terms of PPP, China surpassed even the United States as the world's largest economy according to both current and constant prices.

<sup>2</sup> Participation refers to the sum of imports and exports.

<sup>3</sup> According to UNCTAD (2020), the European Union is made up of the countries on the continent and represents the greatest power in international trade. However, if each country is taken into consideration separately, none of them has more power than China.

<sup>4</sup> Chapter 84: Nuclear reactors, boilers, machinery, apparatus and mechanical appliances, parts of such machinery or apparatus.

Chapter 85: Electrical machinery, devices and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers, and parts and accessories of such articles.

Chapter 87: Vehicles, motor cars, tractors, velocipedes and other land vehicles; parts and accessories thereof.

<sup>5</sup> Refers to the entry of goods into the country to remain there, for a limited time and for a specific purpose. Chapter III Temporary imports and exports of the Customs Law. (Chamber of Deputies, 2006).

<sup>6</sup> In this respect, the United States imposed a tariff rate of 25% on a basket of products imported from China with a total value of US\$250 billion, and 15% on other products with a value of US\$300 billion. Similarly, China applied a total of US\$185 billion for goods imported from the US. In both cases, the figures clearly exceeded the total amount of goods traded between these two economies, which was undoubtedly an eminent reflection of the severity of the trade war (Liu, 2019).

<sup>7</sup> On November 30, 2018, it was made official at the Buenos Aires summit, where the presidents of Mexico, the United States and Canada signed the T-MEC, also called USMCA (United States-Mexico-Canada Agreement).