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Potential multisectoral manufacturing impact of nearshoring in Mexico's northern border states; An input-output approach

Potencial impacto multisectorial manufacturero del nearshoring en los estados de la frontera norte de México; un enfoque de insumo producto

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Abstract

The research main objective is to evaluate a multisectoral impacts set derived from the relocating firms process in Mexico under a propagation effect logic and using a field influence methodology. Considering the scenarios prospected by the Inter-American Development Bank (IDB), the Economic Commission for Latin America (CEPAL) and the Bank of Mexico (BANXICO), the impact on exports is evaluated and, as a consequence, implications are extended to the whole productive system along the six states of the northern border of Mexico. In order to achieve this goal, we build input-output models along the six northern border states, also, we made their adaptation to the vectors of exports by states published by the National Institute of Statistics and Geography (INEGI). The results show a concentrated growth projection by sector, as well as insignificant strengthening of intermediate demand value chains. However, according to them, nearshoring in Mexico will gather qualities of incidence in the relative variation in aggregate demand whose impact is broken down by sector and territory as a contribution of this study.

JEL Code: L6, C67, R3, O41, R11
Keywords: sectoral studies; manufacturing; input-output models; production analysis and business location; several sectors economic growth; regional economic activity

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Resumen

La presente investigación tiene como objetivo central evaluar un conjunto de impactos multisectoriales derivados del proceso de relocalización de firmas en México bajo una lógica de propagación de efectos empleando una metodología de campo de influencia. Considerando los escenarios prospectados por el Banco Interamericano de Desarrollo (BID), la Comisión Económica para América Latina (CEPAL) y el Banco de México (BANXICO), se evalúa el impacto en las exportaciones y, como consecuencia de ello, se extienden implicaciones al conjunto del aparato productivo a lo largo de los seis estados de la frontera norte de México. El alcance de tal objetivo requirió la construcción de las matrices regionales de insumo producto de dichas entidades federativas, así como la adaptación de éstas a los vectores de exportaciones por estados publicados por el Instituto Nacional de Estadística y Geografía (INEGI). Los resultados muestran la proyección de un crecimiento concentrado sectorialmente, así como poco significativo en el fortalecimiento a las cadenas de valor de demanda intermedia. No obstante, acorde a los mismos, el nearshoring, reunirá cualidades de incidencia en la variación relativa en la demanda agregada cuyo impacto se desagrega sectorial y territorialmente como una aportación del presente estudio.

Código JEL: L6, C67, R3, O41, R11
Palabras clave: estudios sectoriales; manufacturas; modelos input-output; análisis de la producción y localización empresarial; crecimiento económico de varios sectores; actividad económica regional

Introduction

In Mexico, nearshoring has emerged as one of the main references in the process of economic-sectoral coordination after the COVID-19 pandemic. Defined as the dynamics of relocation of economic activity and supply chains closer to local consumers, it has become an important mechanism in the face of the interruptions in the supply dynamics of inputs and end-use goods brought about by factors such as the pandemic, trade tensions between the United States and China, and the war between Russia and Ukraine (G-Global, January 3, 2023).

The literature on nearshoring is still scarce. Nonetheless, from the perspective of Regional Economics it is possible to find references in the Theory of Localization, the New Economic Geography, and International Trade Theory, which provide important analytical resources for understanding the location and potential reorientation of global value chains. An outstanding review of the factors that are encouraging global firms to carry out relocation processes can be found in Merino et al. (2020), who found evidence of counter-trend movements to globalization that denoted a dynamic of return of investments to the country of origin (back-shoring) or to those regions that met the criteria of relative proximity (near-shoring).

The phenomenon of firm relocation has intensified in the context of the COVID-19 pandemic, along with its necessary interpretation. This has been done in studies such as those of the United Nations Conference on Trade and Development-UNCTAD (2020), Gereffi (2020), Strange (2020), and De Meyer (2020), whose common aspect was to find severe supply shocks caused by the pandemic and how, in this

situation, global firms explored resilience mechanisms based on the relocation of supply chains in order to mitigate the increased costs caused by logistical constraints as a result of the suspension of activities.

The Organization for Economic Cooperation and Development (OECD) has not been indifferent to the issue, and in its report "Transforming industries: focus on nearshoring in the Dominican Republic (2020)," it has explained how nearshoring has meant important business opportunities, especially for developing economies. Nonetheless, it recognizes that geographical location has been only a marginal component of all those that can influence a decision to relocate, such as labor costs, education and skills of the labor factor, technological endowment, infrastructure, and density of production systems, mainly. The document also mentions a high level of competitiveness for Mexico only in the geographic proximity of the abovementioned factors. Conversely, China has a high level of competitiveness in all of them except geographic position.

The Economic Commission for Latin America and the Caribbean (ECLAC) has also shown interest in studying relocation patterns. In the study presented by Garrido (2022), ECLAC shows contrasting competitiveness indicators between Mexico and Southeast Asia, demonstrating qualities of investment attraction based on the reduction of costs and financial circuits that would mean relocation of investments formerly located in Asia, favoring a greater insertion of Mexico in global value chains. Thus, the author concludes that this makes particular sense if the strengthening of the export sector—which means nearshoring—stimulates the expansion of the domestic market. Nonetheless, capitalizing on this opportunity does not happen spontaneously but rather requires the formulation of public policies aimed at improving social structures and promoting their coordination with a global economy under progressive conditions of income and quality of life for the population, in addition to the need for decisive government intervention in the formation of high and attractive educational levels for the potential attraction of re-invested investments.

Therefore, this study aims to evaluate the impacts spread throughout the production structure of the six northern Mexican border states on the hypothesis that, although nearshoring, as an economic phenomenon, will affect a positive relative variation in aggregate demand, the impacts on the reconfiguration of the technical coefficients of production will not be determinants of a technological change. This will result in a limited variation in the components of intermediate demand, preserving the narrowness of Mexico's value chains linked to the export apparatus.

In the first section, this paper examines the growing expectations that the nearshoring dynamic has brought about for economic actors, as well as the growth that they estimate for the main variables of the real economy. The second section explores the relevance of associating the impact on exports derived from nearshoring to the set of state-productive apparatuses of Mexico's northern border. It explains the set of methodological resources of a sectorial order—especially from the field influence technique—proposed to achieve this objective. The third section presents the impact results prioritizing an

intersectoral disaggregation logic for the six border states considering the three main variables of the production destination, intermediate demand, final demand, and total gross production, analyzing the type of economic growth that nearshoring would imply in Mexico. Finally, the fourth section examines and reviews the results based on regulatory and prospective criteria.

Anticipating impacts from nearshoring in Mexico

The cyclical and circumstantial nature of the nearshoring phenomenon has generated special expectations in Mexico. Its outlook is encouraging given that the country has natural advantages, including more than 3 000 kilometers of shared border with the world's largest economy, an institutional framework for bilateral trade relations provided by the Agreement between the United States of America, Mexico, and Canada (USMCA), the reduction in transportation costs and delivery times resulting from geographical proximity, its world leadership in metal-mechanical sectors (mainly those related to the automotive industry), its manufacturing processes already linked to corresponding activities in the United States, and a substantial young and qualified workforce (G-Global, January 3, 2023).

The credit rating agency Moody's has also formulated encouraging expectations regarding nearshoring in Mexico, as it finds that the northern, lower-western, Mexico City, and the State of Mexico regions will be the main beneficiaries of the relocation dynamics. In turn, the performance of these regions—which account for 70% of Foreign Direct Investment—is thanks to the growth that nearshoring shows in sectors such as automotive, large manufacturing processes, and agribusiness. From a regulatory standpoint, Moody's recognizes that capitalizing on these opportunities will depend on the certainty that Mexico can provide to foreign investment regarding security and fiscal conditions (Ayala, December 5, 2022). All in all, Moody's believes that by 2023, nearshoring may represent an opportunity for Gross Domestic Product (GDP) to grow by 3%, in addition to the structural conditions that have already brought the country an average growth of 2% (Hernández, September 13, 2022).

Taking as a reference what happened in 2021 (even suffering the effects of the pandemic), the Inter-American Development Bank (IDB) anticipates that, by 2023, nearshoring will constitute an important area of opportunity for Latin America and especially for Mexico. For example, by 2021, in Latin America, 571 000 new small and medium-sized economic units had been formed or benefited as subsidiary entities of relocalized value chains, of which 92 000 were in Mexico alone. In the investment portfolio by location pattern, Mexico occupies a preponderant role as the priority option for investments

that see the US market as a potential destination for exports of intermediate and final goods (Noguez, September 13, 2022).[1]

Sectoral coordination in the context of nearshoring for the Mexican economy

A benchmark for evaluating the intersectoral effects of nearshoring in Mexico lies in considering this phenomenon's impact on Mexican exports to the United States. Through a press release on June 7, 2022, the IDB announced that nearshoring could represent an increase in the short and medium term of USD 78 billion for Latin America and the Caribbean. According to the IDB, Mexico and Brazil would be the economies that would benefit the most, although it is hoped to influence the balanced distribution of relocation investments throughout the region. It is estimated that Mexico's exports under this heading would increase by USD 35 278 million, which could increase Mexico's participation in global value chains. Regarding the latter, the IDB presents evidence that "a 10 percent increase in a country's participation (in global value chains) leads to increases of between 11 and 14 percent of GDP per capita" (IDB, June 7, 2022).[2]

Primary economic-sectoral information references to assess impacts derived from nearshoring

An important resource of information and data generation on the viability of nearshoring as an indicator of Mexico's economic performance is found in the latest Regional Economies Report from the Bank of Mexico (Banxico).[3] In the third quarter of 2022, Banxico already has evidence of nearshoring as one of the main drivers of the manufacturing sector in the northern region. Executives consulted for the preparation of this document highlighted the improvement in input delivery times, which was attributed to the relocation of investments and the normalization of global supply chain operations. This document

[1]An illustrative fact about the expectations that economic and social actors are forming around nearshoring in Mexico was found in the search trends by country and region in Google Trends. In this data generation and interest pattern orientation engine, Mexico has the first place in the world in search criteria for the term "nearshoring," closely followed by other countries that could potentially host relocation such as Honduras, El Salvador, Guatemala, and the Dominican Republic. By sub-national region, in Mexico, Mexico City ranks first, followed by the six northern border states. This was tracked over the last 12 months. See: https://trends.google.es/trends/explore?geo=MX&q=nearshoring. Accessed on: January 6, 2023.

[2]The press release in which the IDB released these figures was derived from the 9th Summit of the Americas. See: https://www.iadb.org/es/noticias/nearshoring-agregaria-us78000-millones-en-exportaciones-de-america-latina-y-caribe. Note retrieved on January 5, 2023.

[3]As of today (early January 2023), the most recent Regional Economies Report from the Bank of Mexico is for the July-September 2022 quarter issued on December 16, 2022. See: https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-las-economias-regionales/reportes-economias-regionales.html

also correlates nearshoring with the recovery in business tourism, especially observed toward the second half of 2022 (Banxico, 2022a).

The Report on Regional Economies shows how the Northern Region is particularly benefiting from the relocation phenomenon, which can be explained by two main factors: the region's clear orientation toward manufacturing activities and the export sector and its remarkable geographic connectivity with the US economy. Chihuahua, Tijuana, Hermosillo, and Ciudad Juárez are the urban centers most benefiting from this. This work also anticipates that nearshoring will bring together in the short term the capacity to encourage not only manufacturing activity but also land and maritime transportation services, logistics, telephone and internet services, and business advisory consulting (Banxico, 2022a).

For Banxico, nearshoring may also represent an opportunity to expand credit channels. Economic units susceptible to relocation due to expansion dynamics may have significant financing needs. Likewise, liquidity requirements are especially important under a business logic aimed at reducing logistical delays in production and marketing. Given the competitive qualities of companies that prospect relocation, financial intermediation finds a lower probability of default, creating a virtuous circle between access to credit and benefits in real economy variables, such as investment and employment (Banxico, 2022b).

Sectoral information schemas in Mexico and the measurement of impact with input-output models

In November 2022, the National Institute of Statistics and Geography (INEGI; Spanish: Instituto Nacional de Estadística y Geografía) released the Supply and Use Tables and Multi-State Input-Output Matrices of Mexico (INEGI, 2022), which constitutes an advance in the spirit of creating sectoral information structures that reflect the productive configuration of specific regions. The methodological basis of INEGI (2022) recognizes the technical solvency of the method of Flegg's location coefficients[4] which, for the particular case of Mexico, has had important applications in the works of Chiquiar et al. (2017) with the construction of a frame of reference for manufacturing exports of the states; Dávila (2019), whose analysis extends to the construction of sectoral information resources expressed in social accounting matrices; Torre et al. (2017), who focus their impact work on the intersectoral effects derived from automotive

[4]Flegg's methodology is recognized as a top-down approach, also known in the literature as the indirect or non-survey method. These types of technique, oriented to the formation of sectoral data on a regional scale, have reached a high level of popularity because of the reliability of their results as well as their relative simplicity of application. They consist, essentially, in disaggregating national-sectoral information down to the regions after identifying their production patterns through the construction of location coefficients. See: Flegg and Tohmo (2019).

performance; and Chapa and Ayala (2018), whose interest centers on the incorporation of a wage parity rationale into sectoral regional economic structures.

The state matrices, whose methodology is expressed in INEGI (2022), were constructed based on the latest Input-Output Matrix prepared for Mexico with the 2014 Economic Census, which presents information from 2013.[5] Hence, and seeking the most recent impact simulation representation possible, this document considers the projection made by INEGI of this matrix for 2018.[6]

In addition to the above, the export vectors by state (INEGI, 2020)[7] were used to simulate the intersectoral effects of the positive variation in exports expected due to nearshoring. Taking the disaggregation of export subsectors as a reference for industrial classification implied adjusting the Input-Output Matrix projected to 2018 (IOM18) to these economic activities. Table A1 shows the activities covered in this study, which allow the 2018 IOM to be adjusted to the export vector operating as a pivot variable.

The regionalization process of the input-output matrices of Mexico's northern border states

Once the IOM18 had been adjusted to the export vectors by subsector,[8] the regionalization process was carried out to obtain the input-output matrices for the states of Mexico's northern border. Considering the above-described technical advantages of Flegg's methodology, the following method contained in Flegg and Tohmo (2019) was used:

$$FLQ_{ij} = (CILQ_{ij})(\lambda_r^{\delta})(a_{ij}) \tag{1}$$

Where:

$FLQ_{ij} =$ Flegg-Webber coefficient;

$CILQ_{ij} =$ Cross-industry location coefficients;

[5]See INEGI's microsite on Economy, Productive Sectors, and Input-Output Matrix at: https://www.inegi.org.mx/temas/mip/#Informacion_general. Date of consultation: January 7, 2023.

[6]See INEGI's microsite on the Supply and Use Tables of the Mexican Social Accounting Matrices at: https://www.inegi.org.mx/investigacion/mcsm/#Tabulados. Accessed on: January 7, 2023.

[7]Exports by state are presented in thousands of dollars. They group 26 subsectors, predominantly from manufacturing. The activities listed prioritize the analysis of exports because, as a whole, they represent in average terms up to 90% of the total exports carried out by the country. See: INEGI (2020) and the microsite on exports by state at: https://www.inegi.org.mx/programas/exporta_ef/#Documentacion. Date of consultation: January 7, 2023.

[8]This adjustment process involved, above all, discarding activities. In specific cases, they were aggregated (by adding the respective rows and columns of the Supply and Use Tables) following the North American Industrial Classification (NAICS) pattern.

λ_r^{δ} = Weighting factor of the relative size of the region;

a_{ij} = National technical input-output coefficients.

Where, in turn, the term λ_r^{δ} is given by:

$$\lambda_r^{\delta} = log_2\left(1 + \frac{Y_r}{Y_n}\right)^{\delta} \quad (2)$$

Where:

Y_r = Gross regional value added;

Y_r = Gross national value added.

Equation 2 constructs the scalar λ_r^{δ} that, according to the methodological proposal of Flegg and Webber (1997), constitutes a plausible assessment of the relative size of a subnational region in a country's productive structure. The generation of sectoral input-output schemes at the level of the federal entities provides the necessary elements to simulate impacts, given the aim of this study, related to the multisectoral effects of the positive variations in the level of exports implied by the dynamics of relocation projected for 2023.[9]

Field influence and nearshoring effects assessment

A valuable technical-methodological resource for measuring intersectoral dispersion effects of wealth is represented by field influence, originally proposed by Hewings et al. (1988), whose initial purpose was to evaluate the observed sectoral effects of productive reconfiguration derived from technological changes. The technique has also evaluated structural change as a criterion for recording relevant changes in the industrial mix of sectors (Sonis et al., 1996).

From the empirical perspective, field influence applications stand out in the works of Campoy et al. (2015) and Thakur and Alvayay (2012). The former focus on an analysis of structural change applied to the economy of Andalusia, Spain. In a comparative manner over time and using a Social Accounting Matrix, the paper evaluates multiplier and wealth dispersion effects based on the technical-productive composition of the Andalusian economic sectors. The latter use a spatial differentiation criterion to characterize the structure of subnational regions in Chile and explore causal effects on the determinants of the ability to spread wealth from simulated impacts on the relative requirements of intermediate goods.

[9]Although the base input-output matrix for the six regionalization processes (one per state) is based on information extracted from the 2019 Economic Census, the technical production coefficients are particularly stable over time, which is illustrative of their industrial mix (input and production factor requirements). See Miller and Blair (2009: 304).

Finally, Van Der Linden and Oosterhaven (1995) adapt field influence to a reasoning of technical-productive impacts occurring in the framework of the third industrial revolution using, in a pioneering effort, the first inter-country input-output matrices. The study extends the implications of technological change to the assessment of spill-over effects, highlighting measures of knowledge dispersion and technological interdependence between sectors and between countries, mainly in Northern Europe.

Based on the hypothesis that nearshoring can mean a boost to the productive reconfiguration of sectors with predominantly exporting capacity in Mexico, field influence is proposed as a resource for measuring the magnitude and intersectoral scope of this phenomenon, which will benefit Mexico under the terms described in the first section of this document.

The field influence technique starts from the idea of recognizing the accumulation of direct-indirect effects of intermediate requirements as a collection of vectors, of which, if two specific ones are disaggregated from among the totality of them, the result will be (Miller & Blair, 2009:578):
Considering *i* as column and *j* as row:

$$L_i = \begin{bmatrix} l_{1i} \\ l_{2i} \\ \vdots \\ l_{ni} \end{bmatrix} \text{ and } L_j = \begin{bmatrix} l_{j1} & l_{j2} & \cdots & l_{jn} \end{bmatrix} \tag{3}$$

Thus, the natural measure of intersectoral dispersion of wealth derived from an i-jth intermediate transaction is given by:

$$F[i,j] = L_i L_j = \begin{bmatrix} l_{1i} \\ l_{2i} \\ \vdots \\ l_{ni} \end{bmatrix} \begin{bmatrix} l_{j1} & l_{j2} & \cdots & l_{jn} \end{bmatrix} = \begin{bmatrix} l_{1i}l_{j1} & l_{1i}l_{j2} & \cdots & l_{1i}l_{jn} \\ l_{2i}l_{j1} & l_{2i}l_{j2} & \cdots & l_{2i}l_{jn} \\ \vdots & \vdots & & \vdots \\ l_{ni}l_{j1} & l_{ni}l_{j2} & \cdots & l_{ni}l_{jn} \end{bmatrix} \tag{4}$$

Where the term F[i, j] (denoting the idea of Field) gives rise to a matrix which, as seen in (4), acquires a dimension of nxn, where n represents the number of sectors of economic activity included in the impact study.

For this study, the changes induced in the export vector (predicted by nearshoring) lead to changes in the technical production structure of the sectors in a magnitude ε. In the intermediate demand production structure such changes are verified through modifications in the technical coefficients of production (a_{ij}) evaluated through:

$$a_{ij} = a_{ij}(t+1) - a_{ij}(t) \tag{5}$$

Alternatively, and considering the induction of changes given by the ratio ε, Equation 5 can be re-expressed for estimation as (Thakur & Alvayay, 2012: 102):

$$a_{ij}(\varepsilon) = a_{ij}(t) + \varepsilon a_{ij} \tag{6}$$

This gives rise to the solution of the open Leontief model in a contrasting perspective (given the structural change induced, in this case, by the estimated expansion in exports derived from the relocation), given by:

$$C(0) = [I - A(t)]^{-1} \rightarrow C(t+1) = [I - A(t+1)]^{-1} \tag{7}$$

From where the specific measure of impact per intermediate transaction can be extracted as a Markov process, considering the literals of Equation 4, given by:

$$L^{*}_{(ij)} = L + \Delta L_{(ij)} = L + \left[\left(\Delta a_{ij}\right)/\left(1 - l_{ij}\Delta a_{ij}\right)\right]F[i,j] = L + F[i,j]k^{1}_{(ij)} \tag{8}$$

Where $\mathrm{k}^{1}_{(\mathrm{ij})}$ is a constant for each specific simulated variation in the technical production coefficients $\left(\Delta \mathrm{a}_{\mathrm{ij}}\right)$.

Impact assessment in the northern border states of Mexico

INEGI (2020) provides an important reference for the representation of exports in Mexico, explaining the methodological basis that justifies the treatment of this variable at the state level and with a quarterly follow-up from 2007 to 2021.[10] In this outline, the treatment of economic activities with a three-digit disaggregation (at the subsector level) is noteworthy. Although the original information disaggregates 26 subsectors, this study has been limited to treating 21 of them, seeking full compatibility with the IOM18 (see sections 2.2 and 2.3 and Table A1).

[10]The computer reference for this information structure can be found at https://www.inegi.org.mx/temas/exportacionesef/#Tabulados. Date of consultation: February 6, 2023.

Based on INEGI's methodology (2020), which translates into the aforementioned information structure of exports by state, it is found that by 2021, the northern border states together played the leading role in the dynamics of Mexican exports, contributing 57.9% of the total. This percentage is broken down into the contributions of Baja California (10.9%), Coahuila (12.1%), Chihuahua (13.3%), Nuevo León (9.4%), Sonora (4.7%), and Tamaulipas (7.4%).

Given the prospective nature of the dynamics of value chain relocation, there is not yet full certainty as to which sectors and regions in Mexico will particularly benefit. From a territorial perspective, Moody's credit agency highlights the opportunities for participation that the State of Mexico, the Bajío region, Mexico City, and the northern border states will have (Ayala, December 5, 2022). This appreciation, added to the prominence of the manufacturing sector, coincides with the outlook formed by Banxico in its reports on the regional economies of July-September and October-December 2022 (Banxico, 2022a and Banxico, 2022c).

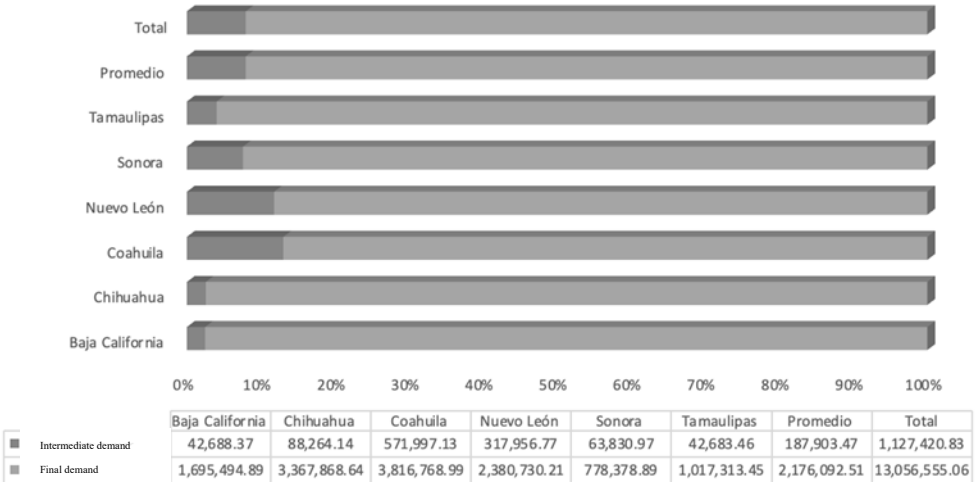
The references to the regional-sectoral impact of nearshoring anticipate that this dynamic will reinforce the export sectors of the states and sectors with this profile. Based on this first approximation of the impacts envisaged, this research preserves the current structure of state and intersectoral activity in exports, constructing a new export vector aimed at inducing propagated effects in the main variables of the system of national accounts.

Nearshoring and the technical-productive reconfiguration in northern border states

Considering the export vectors by state, whose methodological basis is referred to in INEGI (2020), manufacturing exports, particularly toward the United States, are especially prominent. In average terms, in the productive structure of Mexico's northern border states, manufacturing exports account for up to 94% of total exports. Such a magnitude leads the impact analysis to focus particularly on the variations induced in the indicators of the System of National Accounts by the simulated technical changes in the manufacturing subsectors.

Following the simulated changes in the configuration of the technical coefficients of production, the impacts on the main components of the production destination can be assessed, namely intermediate demand, final demand, and total gross production. Figure 1 illustrates the absolute variation that nearshoring would imply in intermediate and final demand and segments the relative weight that both components of the production destination would occupy. The result of the present simulation, as can be seen, confers barely significant relative importance to goods concentrated in intermediate demand. The evidence is similar to the conclusions of works such as those of Murillo-Villanueva *et al.* (2022), Fuji and Cervantes (2013), Fuji and Cervantes (2017), and Gaytán-Alfaro (2022), for whom Mexico's export

dynamics have had little impact on the aggregation of value by the domestic market, manifested by limited nodes of exchange of intermediate requirements, which is expressed in value chains that are not very complex and extended. The phenomenon referred to after the treatment of the IOM18 used in this research is evident in the scant importance of the relative weight of intermediate demand in the absolute variation of the components of total gross production.

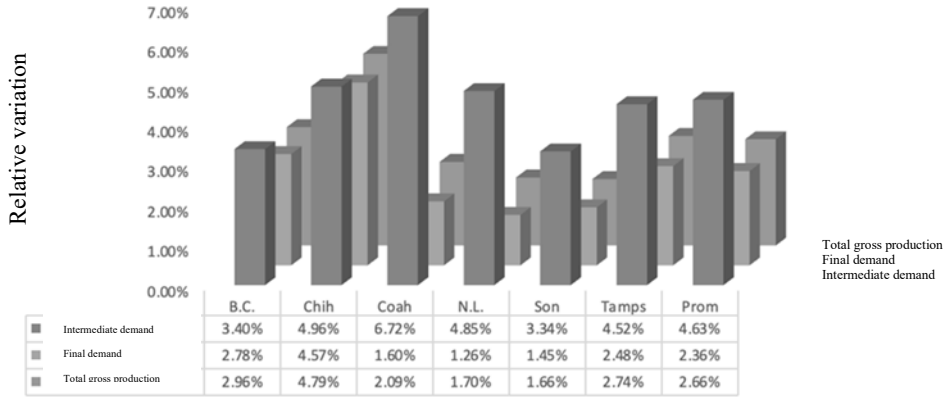


	Baja California	Chihuahua	Coahuila	Nuevo León	Sonora	Tamaulipas	Promedio	Total
Intermediate demand	42,688.37	88,264.14	571,997.13	317,956.77	63,830.97	42,683.46	187,903.47	1,127,420.83
Final demand	1,695,494.89	3,367,868.64	3,816,768.99	2,380,730.21	778,378.89	1,017,313.45	2,176,092.51	13,056,555.06

Figure 1. Estimated absolute variation of nearshoring in the components of Intermediate Demand and Final Demand in thousands of USD and relative participation in the formation of Total Gross Production in the states of the Northern Border of Mexico; Projection to 2023
Source: created by the authors based on the results of the impact of the estimated input-output tabulators for Mexico's northern border states

Concerning their respective base values, the relative impacts on intermediate demand, final demand, and total gross production can be seen in Figure 2. Due to their technical-productive configuration and the induction of changes in the export vectors by the arguments implied by nearshoring, some of the results show that Coahuila is the state that would increase its intermediate demand components the most (+6.72%). Likewise, Chihuahua would have the highest relative variation of final demand (+4.57%).

Considering final demand as a proxy variable for aggregate demand and the latter as the main reference for GDP, nearshoring would mean the possibility that the northern border states would find an economic growth justification of around 2.3%, specifically in manufacturing activities.



	B.C.	Chih	Coah	N.L.	Son	Tamps	Prom
Intermediate demand	3.40%	4.96%	6.72%	4.85%	3.34%	4.52%	4.63%
Final demand	2.78%	4.57%	1.60%	1.26%	1.45%	2.48%	2.36%
Total gross production	2.96%	4.79%	2.09%	1.70%	1.66%	2.74%	2.66%

Figure 2. Total relative variation in the components of Intermediate Demand, Final Demand, and Total Gross Production in the face of estimated changes in exports from nearshoring in Mexico's Northern Border states; Projection to 2023
Source: created by the authors based on the results of the impact of the estimated input-output tabulators for Mexico's northern border states

Table 1 summarizes cross-sectoral effects derived from the estimated impact of nearshoring. The measure is disaggregated across the six northern border states and three production destination variables: intermediate sales, final demand, and total gross production. Given the importance of final demand as a measure of the destination of value addition, the analysis of the results can be focused on this variable to determine a measure of economic growth. In this regard, it is possible to observe that Chihuahua would add about 4.5 points to its relative variation in the GDP of the manufacturing sector due to the relocation dynamics, positioning itself as the state that would grow the most.

The observation of relative intersectoral variations suggests a notable prominence of subsector 334 Manufacture of computer, communication, measuring, and other electronic equipment, components, and accessories, which would potentially grow by 64.2% in its total gross production in Chihuahua. In contrast, it would grow by 27.2% in Baja California and 14.26% in Tamaulipas.

Other subsectors of interest regarding their expected growth are 335 Manufacture of accessories, electrical appliances, and electric power generation equipment, and 336 Manufacture of transportation equipment. Subsector 335 is expected to be particularly important in Coahuila, Nuevo León, Sonora, and Tamaulipas, with expected rates of between 3.86% and 6.21% in total gross production. In turn, subsector 336 would stand out in these same states with a minimum rate of 7.38% (Sonora) and a maximum of

15.79% (Coahuila) in the same variable. This last result suggests the boom in business that the automotive industry and its associated metal-mechanical implements would acquire in these states.

Table 1 presents the standard deviation for each variable across the six states analyzed as a measure of interest. This indicator illustrates the degree of dispersion in the estimated intersectoral growth rates. Thus, for example, although Chihuahua would have the highest growth rates (mainly explained by the remarkable performance of subsector 334 Manufacture of computer, communication, measuring, and other electronic equipment, components, and accessories), its production expansion dynamics would be little shared with the rest of the state's productive apparatus. On the other hand, Nuevo León, Sonora, and Tamaulipas seem to be more harmonious in terms of the distribution of their growth path, which may suggest that nearshoring in these states may be a factor that drives, in addition to relative growth, a significant trend toward diversification of the productive structure.

Table 1
Summary of intersectoral manufacturing effects of nearshoring in Mexico's northern border states; Intermediate demand, final demand, and total gross production; Projection to 2023 *According to the Industrial Classification System for North America

SCIAN code*	Sector	Baja California			Chihuahua			Coahuila			Nuevo León			Sonora			Tamaulipas		
		Intermediate demand	Final demand	Total gross production	Intermediate demand	Final demand	Total gross production	Intermediate demand	Final demand	Total gross production	Intermediate demand	Final demand	Total gross production	Intermediate demand	Final demand	Total gross production	Intermediate demand	Final demand	Total gross production
311	Food industry	0.10%	0.05%	0.05%	0.17%	0.16%	0.16%	1.51%	0.06%	0.10%	0.25%	0.22%	0.22%	0.16%	0.09%	0.09%	0.19%	0.06%	0.06%
312	Beverage and tobacco industry	0.63%	0.01%	0.02%	1.43%	0.00%	0.00%	3.73%	2.18%	2.19%	1.33%	0.04%	0.05%	0.71%	0.20%	0.21%	1.12%	0.01%	0.02%
314	Manufacture of textile products, except garments	2.16%	0.05%	0.11%	3.14%	0.00%	0.10%	5.37%	0.00%	0.17%	4.21%	0.01%	0.16%	2.76%	0.15%	0.22%	3.65%	0.26%	0.34%
315	Manufacture of garments	1.70%	0.34%	0.39%	2.56%	0.10%	0.16%	4.30%	0.64%	0.76%	4.56%	0.00%	0.12%	2.58%	0.36%	0.41%	2.49%	0.01%	0.08%
316	Tanning and finishing of leather and fur, and manufacture of leather, fur, and leather substitute products	2.52%	0.02%	0.08%	1.15%	0.01%	0.10%	6.53%	0.11%	0.33%	4.43%	0.00%	0.20%	4.17%	0.00%	0.09%	4.80%	0.00%	0.11%
321	Wood industry	2.30%	0.06%	1.16%	3.06%	0.00%	1.48%	3.03%	0.00%	1.77%	2.49%	0.01%	1.62%	2.03%	0.00%	0.97%	2.97%	0.00%	1.34%
322	Paper industry	0.74%	0.03%	0.19%	1.70%	0.01%	0.22%	1.80%	0.00%	0.20%	0.96%	0.02%	0.21%	1.09%	0.09%	0.20%	1.25%	0.03%	0.18%
323	Printing and related industries	1.76%	0.20%	0.28%	3.69%	0.01%	0.14%	2.83%	0.00%	0.10%	1.73%	0.00%	0.09%	1.53%	0.01%	0.06%	1.93%	0.30%	0.37%
325	Chemical industry	1.40%	0.12%	0.23%	1.67%	0.10%	0.23%	3.15%	0.01%	0.32%	2.02%	0.08%	0.35%	1.69%	0.85%	0.92%	1.75%	1.35%	1.41%
326	Plastics and rubber industry	4.22%	0.65%	1.04%	5.95%	0.18%	0.83%	11.50%	0.45%	1.86%	8.94%	0.26%	1.52%	5.18%	0.15%	0.70%	6.93%	0.63%	1.28%
327	Manufacture of products based on non-metallic minerals	1.91%	0.09%	0.42%	2.47%	0.01%	0.46%	7.40%	0.02%	1.22%	4.77%	0.41%	1.46%	3.32%	0.00%	0.45%	3.97%	0.26%	0.78%
331	Basic metal industries	4.06%	0.14%	1.19%	4.70%	0.31%	1.47%	7.55%	0.96%	2.92%	5.66%	0.60%	2.74%	4.06%	0.73%	1.78%	6.12%	0.02%	1.46%
332	Manufacture of metal products	3.64%	2.47%	2.58%	4.44%	0.41%	0.76%	9.65%	0.08%	1.08%	6.98%	0.44%	1.26%	4.60%	0.80%	1.12%	5.68%	0.46%	0.90%
333	Manufacture of machinery and equipment	4.51%	5.95%	5.91%	5.73%	5.16%	5.17%	10.82%	3.65%	3.91%	6.57%	1.97%	2.11%	5.30%	0.69%	0.82%	7.60%	7.66%	7.66%
334	Manufacture of computer, communication, measuring, and other electronic equipment, components and accessories	16.12%	27.38%	27.21%	30.16%	64.90%	64.25%	11.04%	0.13%	0.35%	8.64%	0.81%	0.98%	5.46%	4.35%	4.37%	10.65%	14.32%	14.26%
335	Manufacture of accessories, electrical appliances, and electric power generation equipment	4.49%	3.30%	3.32%	6.21%	4.22%	4.26%	9.95%	6.14%	6.21%	6.07%	4.68%	4.71%	4.74%	3.84%	3.86%	6.84%	5.66%	5.69%
336	Manufacture of transportation equipment	4.96%	5.08%	5.08%	6.86%	6.94%	6.93%	15.61%	15.81%	15.79%	12.90%	13.45%	13.42%	7.22%	7.39%	7.38%	9.15%	9.46%	9.45%
337	Manufacture of furniture, mattresses, and blinds	2.14%	0.91%	0.92%	3.08%	0.08%	0.11%	5.31%	0.06%	0.10%	4.09%	0.03%	0.07%	2.64%	0.41%	0.43%	3.57%	1.72%	1.73%
339	Other manufacturing industries	5.16%	6.05%	6.04%	6.10%	4.18%	4.21%	6.69%	0.12%	0.30%	5.60%	0.95%	1.08%	4.21%	7.51%	7.44%	5.24%	4.90%	4.91%
	Average variations	3.40%	2.78%	2.96%	4.96%	4.57%	4.79%	6.72%	1.60%	2.09%	4.85%	1.26%	1.70%	3.34%	1.45%	1.66%	4.52%	2.48%	2.74%
	Standard deviation	0.0344	0.0632	0.0621	0.0641	0.1477	0.1455	0.0387	0.0379	0.0368	0.0316	0.0315	0.0308	0.0188	0.0244	0.0235	0.0287	0.0407	0.0393

Source: created by the authors based on the results of the impact of the estimated input-output tabulators for Mexico's northern border states

This study essentially assesses potential effects derived from the dynamics of value chain relocation on plausible production structure scenarios in Mexico's northern border states. This simulation of impacts is based on the expected changes in Mexican exports forecast by the IDB (June 7, 2022) and by ECLAC (Garrido, 2022). Given the expected dynamism in exports (in the order of USD 35.3 billion[11]) and the prominence of the northern border states of Mexico in this variable, this research was geographically limited to these states and the manufacturing subsectors.

The results show the low relative impact on intermediate demand components (which are recognized as strategic for strengthening domestic value chains), as opposed to the notable prominence in the relative variations of final demand, which, characteristically of Mexican exports, have little eminently national value aggregation.

Notwithstanding, intermediate demand alone would have a significant impact, growing by an average of 4.63% (for the six states and the manufacturing subsectors). On the other hand, the interstate analysis gives Chihuahua a special position as the state that would contribute the most to its economic growth with an expected rate of 4.57% (of relative variation in the components of aggregate demand). Intersectorally, sectors 334 Manufacture of computer, communication, measuring, and other electronic equipment, components, and accessories; 335 Manufacture of accessories, electrical appliances, and electric power generation equipment and 336 Manufacture of transportation equipment, are the ones that would adopt a better performance in the variables of the destination of production (intermediate demand, final demand, and total gross production).

Nevertheless, the expected growth reports asymmetry patterns in both geographic and inter-sectoral aspects. For example, growth in Baja California and Chihuahua is expected to be highly concentrated (in both cases, especially in favor of the subsector 334 Manufacture of computer, communication, measuring, and other electronic equipment, components, and accessories); that of Coahuila and Nuevo León is moderately concentrated (a process in which the automotive industry is expected to have relatively greater participation with the leading role of subsector 336 Manufacture of transportation equipment); while Sonora and Tamaulipas, although with less significant rates, would contribute to the diversification in the participation of intersectoral growth.

Mexico has important factors that would work in favor of the materialization of such impacts, including its geographical position, a relatively growing competitiveness via wages (in comparison with China, which has increased its labor costs), as well as taking advantage of the opportunity provided by the effects on supply chains brought about by the supply crisis caused by COVID-19 (Garrido, 2022).

[11]See: https://www.iadb.org/es/noticias/el-bid-aliado-del-gobierno-mexicano-en-el-fomento-del-nearshoring. Date of consultation: May 2, 2023.

Banxico, for its part, adds the need to meet the preconditions for the viability of taking advantage of the synergistic effects of nearshoring, given the need to increase the complexity of production processes. This is accompanied by extending the configuration nodes of value chains and raising the degree of qualification in the operational performance of the labor factor and effective coordination with supply networks. It is also based on the certainty of contracts, communication, and trust between companies. To this end, geographic proximity can strengthen and speed up the coordination between sectors, a factor that boosts financial profitability based on the performance of the real economy (Banxico, 2022b:22).

According to the results presented, relocation dynamics represent an important framework of opportunities for the Mexican economy, but its concrete observation depends on the presence of factors that guarantee its viability. Such technical and qualitative aspects demand the provision of an efficient infrastructure, the adequate allocation of space, the availability of resources (some of them, such as water, with significant shortages and the need to prioritize their use for human consumption), as well as the creation and preservation of an effective rule of law that provides certainty to investments in the exercise of ownership and mobility of materials and goods. For this reason, although the sectoral information and impact simulation (achieved in this research) have methodological support, their results should be taken with the reservations imposed by a sociopolitical reality whose variables are separated from the coverage and objectives of the research process presented here.

References

Ayala, C. (5 de diciembre de 2022). "Entidades federativas se benefician por el nearshoring: Moody's". El Economista. Recuperado el día 5 de enero de 2023 de https://www.eleconomista.com.mx/estados/Entidades-federativas-se-benefician-por-el-nearshoring-Moodys-20221205-0081.html

Banco de México (Banxico) (2022a). Reporte sobre las Economías Regionales. Trimestre julio-septiembre 2022. 1-67. Disponible en: https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-las-economias-regionales/reportes-economias-regionales.html.

BANXICO (2022b). Reporte de Estabilidad Financiera. Diciembre de 2022. 1-129. Disponible en: https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-el-sistema financiero/reportes-sistema-financiero-s.html.

BANXICO (2022c). Reporte sobre las Economías Regionales. Trimestre octubre-diciembre 2022. 1-83. Disponible en: https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-las-economias-regionales/reportes-economias-regionales.html.

BID (7 de junio de 2022). "Nearshoring agregaría US$78.000 millones en exportaciones de América Latina y el Caribe". Comunicados de Prensa. Recuperado el día 6 de enero de 2023 de https://www.iadb.org/es/noticias/nearshoring-agregaria-us78000-millones-en-exportaciones-de-america-latina-y-caribe#

Campoy, P., Cardenete, M. & Delgado, M. (2015). "Análisis estructural a través de matrices de contabilidad social: una aplicación a la economía andaluza para el período 2005-2010". Perspectiva Socioeconómica, 20, 7-28. DOI: 10.21892/24627593.211.

Chapa, J. C., y Ayala, E. A. (2018). Valoración del trabajo y equidad de género en México. Pearson. Disponible en: https://economia.uanl.mx/departamentos/centro-de-investigaciones-economicas/.

Chiquiar, D., Alvarado, J., Quiroga, M., y Torre, L. (2017). Regional input-output matrices, an application to manufacturing exports in Mexico (Working Paper Num. 2017-09). Banco de México Working Papers. Disponible en: https://www.econstor.eu/handle/10419/174462

Dávila, A. (coord.) (2019), Modelos económicos de las regiones en México. 1a. ed., México, Universidad Autónoma de Coahuila/Miguel Ángel Porrúa Editor. 322 pp. ISBN: 978-607-524-299-6,

De Meyer, A. (2020). "It won't be business as usual after Covid-19. The Straits Times". Disponible en: https://www.straitstimes.com/opinion/it-wont-bebusiness-as-usual-after-covid-19.

Flegg, A. T., y Tohmo, T. (2019). "The regionalization of national input-output tables: A study of South Korean regions". Papers in Regional Science, 98(2), 601-620. https://doi.org/10.1111/pirs.12364.

FLEGG, A.T. Y WEBBER, C.D. (1997). "On the Appropiate Use of Location Quotients in Generating Regional Input-Output Tables", Regional Studies, vol. 31, num.8. Pp. 795-805. https://doi.org/10.1080/00343409512331349173.

Fuji, G. Y Cervantes, M. (2017): "The Weak Linkages Between Processing Exports and the Internal Economy. The Mexican case", Economic Systems Research, 29:4, 528-540. https://doi.org/10.1080/09535314.2017.1351332.

Fujii Gambero, G., & Cervantes M., R. (2013). México: valor agregado en las exportaciones manufactureras. Revista CEPAL, 109, 143-158. Disponible en: https://repositorio.cepal.org/items/d569c2f7-0f5b-4e05-ae97-8580c4026958.

G-Global (3 de enero de 2023). "Nearshoring: qué es y cuál es su impacto en México". https://g-global.com/es/nearshoring-que-es-y-cual-es-su-impacto-en-mexico/

Garrido, C. (2022). México en la Fábrica de América del Norte y el Nearshoring. Ciudad de México, Comisión Económica para América Latina y el Caribe (CEPAL), 2022. Disponible en: https://www.cepal.org/es/publicaciones/48056-mexico-la-fabrica-america-norte-nearshoring.

Gaytán-Alfaro, E. D. (2022). Integración económica de México al mercado común de América del Norte: un análisis insumo-producto multipaís en el marco normativo del T-MEC. Revista De Economía Mundial, (61), 159-193. https://doi.org/10.33776/rem.v0i61.5346.

Gereffi, G. (2020). "What does the COVID-19 pandemic teach us about global value chains? The case of medical supplies". Journal of International Business Policy 3(3):287–301. Disponible en: https://link.springer.com/article/10.1057/s42214-020-00062-w.

Hernández, E. (13 de septiembre de 2022). "Si aumenta 'nearshoring', economía de México podría crecer casi 3%: Moody´s". Revista Forbes México. Recuperado el día 5 de enero de 2023 de https://www.forbes.com.mx/si-aumenta-nearshoring-economia-de-mexico-podria-crecer-casi-3-moodys/

Hewings, G.J.D., Sonis, M., Jensen, R.C., (1988). "Fields of influence of technological change in input–output models". Regional Science Association. No. 64. Pp. 25–36. https://doi.org/10.1111/j.1435%2D5597.1988.tb01112.x.

INEGI (2020). Exportaciones Trimestrales por Entidad Federativa: Síntesis Metodológica. 1-24. Disponible en: https://www.inegi.org.mx/contenidos/productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/702825197438.pdf.

INEGI (2022). Cuadros de Oferta y Utilización y Matrices Insumo-Producto Multi-Estatales de México: Fuentes y Metodología. 1-55. Disponible en https://www.inegi.org.mx/investigacion/coumip/.

Merino, F., Di Stefano, C. & Fratocchi, L. (2020). Back-Shoring vs. Near-Shoring: A Comparative Study. https:// doi.org/10.3233/ATDE200201. 622-633.

MILLER, R., Y BLAIR, P. (2009). Input- Output Analysis: Foundations and Extensions. Cambridge University Press.

Murillo-Villanueva, B., Carbajal Suárez, Y. & Almonte, Leobardo de Jesús. (2022). Valor agregado en las exportaciones manufactureras del TLCAN, 2005, 2010 y 2015. Un análisis por subsector. Análisis Económico, 37(95), 69-88. Epub 01 de agosto de 2022. https://doi.org/10.24275/uam/azc/dcsh/ae/2022v37n95/murillo.

Noguez, R. (13 de septiembre de 2022). "El BID quiere impulsar el 'nearshoring'; hay confianza para la inversión en México". Revista Forbes México. Recuperado el día 5 de enero de 2023 de https://www.forbes.com.mx/el-bid-quiere-impulsar-el-nearshoring-hay-confianza-para-la-inversion-en-mexico/

OCDE (2020). "Transforming industries: focus on nearshoring in the Dominican Republic". En Production Transformation Policy Review of the Dominican Republic. OECD-library/United Nations 2020. Disponible en: https://www.oecd-ilibrary.org/sites/5a95b3b1-en/index.html?itemId=/content/component/5a95b3b1-en.

Sonis, M., Hewings, G.J.D., Guo, J., (1996). "Sources of structural change in input–output systems: a field influence approach". Economic System Research. No. 8 (1). Pp. 15–32. https://doi.org/10.1080/09535319600000002.

Strange, R. (2020). "The 2020 Covid-19 pandemic and global value chains". Journal of Industrial and Business Economics. 47(3):455–465. Disponible en: https://link.springer.com/article/10.1007/s40812-020-00162-x.

Thakur, S. & Alvayay, J. (2012). "Identification of regional fundamental economic structure (FES) of Chilean economy: A field of influence approach". Structural Change and Economic Dynamics, 23 (1): 92-107, ISSN 0954-349X, https://doi.org/10.1016/j.strueco.2011.10.004.

Torre Cepeda, L. E., Alvarado Ruiz, J. A., y Quiroga Treviñ o, M. (2017). Matrices insumo- producto regionales: Una aplicación al sector automotriz en México (Working Paper Núm. 2017-12). Banco de México Working Papers. Disponible en: https://www.econstor.eu/handle/10419/174465

UNCTAD (2020). World investment report 2020. International Production Beyond the Pandemic. United Nations Conference on Trade and Development. Disponible en: https://unctad.org/en/PublicationsLibrary/ wir2020_en.pdf.

Van der Linden, J. & Oosterhaven, J. (1995). "Fields of influence of technological change in EC intercountry input-output tables, 1970-80". Research Report, 1-30, University of Groningen, Research Institute SOM (Systems, Organisations and Management). Disponible en: https://ideas.repec.org/p/gro/rugsom/95d17.html.

Annex

Table A1
Disaggregation of sub-sectors considered in the export vectors by state; Mexican economy, 2007-2021

Code	Subsector
111	Agriculture
112	Animal breeding and exploitation
311	Food industry
312	Beverage and tobacco industry
314	Manufacture of textile products, except garments
315	Manufacture of garments
316	Tanning and finishing of leather and fur, and manufacture of leather, fur, and leather substitute products
321	Wood industry
322	Paper industry
323	Printing and related industries
325	Chemical industry
326	Plastics and rubber industry
327	Manufacture of products based on non-metallic minerals
331	Basic metal industries
332	Manufacture of metal products
333	Manufacture of machinery and equipment
334	Manufacture of computer, communication, measuring, and other electronic equipment, components, and accessories
335	Manufacture of accessories, electrical appliances, and electric power generation equipment
336	Manufacture of transportation equipment
337	Manufacture of furniture, mattresses, and blinds
339	Other manufacturing industries

Source: INEGI (2020); Quarterly Exports by State: Methodological Summary https://www.inegi.org.mx/programas/exporta_ef/#Documentacion