STRUCTURAL DEPENDENCY IN THE TWENTY-FIRST CENTURY: A SHIFT-SHARE ANALYSIS OF EMPLOYMENT IN CIUDAD JUAREZ[1][2][3]

Dependencia estructural en el siglo XXI: Un análisis de participación y cambio del empleo en Ciudad Juárez

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ABSTRACT

Motivated by recent global disruptions, this study examines the evolution of the municipality of Juárez, Chihuahua in terms of how much it has a dependent economy, given its ties to North America production networks. The paper tests whether structuralist and dependence theories continue to explain the city's economic dynamics. Using employment data from Juárez, México, United States and Canada for the period 2003-2018, the study apply the dynamic variant of shift-share technique to separate the sources of changes in Juárez employment into continental—for North America, sectoral, and merely local components. Results show that local dynamics have increasingly contributed to the growth of employment, especially in the sector of manufacturing, the economic linchpin of the region. Juárez, However, remain trapped in low value activities according to the results. The findings suggest that although Juárez is still dependent on central economies has developed capabilities to grow by itself un the twenty-first century.

Key words: Structural dependence; Ciudad Juárez; Dynamic shift-share; Export manufacturing; Regional economic growth.

RESUMEN

Motivado por las recientes disrupciones globales, este estudio examina la evolución del municipio de Juárez, Chihuahua, en términos de su grado de dependencia económica, dada su integración a las redes de producción de América del Norte. El trabajo pone a prueba si las teorías estructuralistas y de la dependencia son válidas para explicar la dinámica económica de la ciudad. Utilizando datos de empleo de Juárez, México, Estados Unidos y Canadá para el periodo 2003–2018, se aplica la variante dinámica de la técnica shift-share para descomponer las fuentes del cambio en el empleo juarense en componentes continentales -para América del Norte- sectoriales y estrictamente locales. Los resultados muestran que las dinámicas locales han contribuido de forma creciente al crecimiento del empleo, especialmente en el sector manufacturero, el motor económico de la región. Sin embargo, Juárez permanece atrapado en actividades de bajo valor agregado. Los hallazgos sugieren que, aunque sigue siendo dependiente de las economías centrales, ha desarrollado capacidades para crecer de manera autónoma en el siglo XXI.

Palabras clave: Dependencia estructural; Ciudad Juárez; Shift-share dinámico; Manufactura de exportación; Crecimiento económico regional.

1. Introduction

A wave of geopolitical and economic disruptions has reshaped the international landscape in recent years, exposing the vulnerabilities of highly globalized production systems. A pandemic, trade wars, and armed conflicts have forced the reconfigurations of supply chains throughout the world and across economic sectors. Regions such as the Mexican northern border are especially vulnerable to this situation, given its connection in global production maps. Those regions have suffered from abrupt contractions of employment, especially in the manufacturing sector. The municipality of Juárez, Chihuahua, long dependent on export-oriented factories for its economic viability, has become the epicenter of the turmoil affecting peripheral economies immerse in global value chains.

This paper has its motivation in these abrupt shifts and seeks for understanding the source of Juárez's economy current vulnerabilities, under the suspicious that local companies are deeply affected by external shocks. The research explores whether the economic dependency assumed by structuralist economists from the past century remains offering a valid explanation for the contraction of the employment in Juárez. Through an examination of the sectoral composition in the city over a 15-year period -including all the phases of the economic cycles- this study aims to assess how external shocks have shaped local labor markets. The structuralism provides a visor to analyze how peripheral economies remain subordinated within the global hierarchy of production, with a limited ability to autonomously drive their own development.

To test the relevance of selected theory in the current context, the study employs a dynamic shift-share methodology that decomposes changes in an economic variable into three components: a general effect -continental in this case-an industry mix effect, and competitive local effect, This technique results useful to compare the contributions of external factors to those internals in the variations of employment. The insight provided by the empirical analysis helps to determine whether Juárez´s growth has been driven by external demand, sectoral specialization, or endogenous development. This methodological approach is particularly suited for evaluating the structuralist claim that developing countries have zero, or few control of their economic performance and it is determined by external forces.

The relevance of selecting the municipality of Juárez, Chihuahua for this study comes from the historical and strategic integration within the United States-México border stripe. Juárez economic identity has been shaped by all the regional economic development programs that had taken place in the territory. Despite the apparent modernization of its economy, key questions remain about the depth of its productive transformation in some sectors, and structural dependence of others. Understanding whether Juárez's growth reflects adaptation, upgrading, or simply responsiveness to external cycles is a necessary base for the design of development policies with a long-term horizon.

Historically, decisions within globally spread value chains have shaped investment decisions of Juárez's locals. According to this mechanics, multinationals decide on the location and scope of the operations, while local firms -already integrated or seeking to integrate- adapt their processes and capabilities to remain viable suppliers. As Meyer et al. (2011) note, subsidiaries must balance their global role with their local embeddedness, which often means that strategic choices made abroad have direct local consequences. Moreover, Boschma (2024) emphasizes that regional trajectories are conditioned by their position in

global production networks, as dependence on external decisions limits diversification options and constrains long-term development paths. Hence, it is not hard to say that the degree of integration into global value chains not only determines the allocation of capitals but also shapes the operational adjustment of local firms, highlighting the organizational and strategic implications of dependence for actors of an integrated economy.

As the paper advances it becomes evident that Juárez remain vulnerable to external shocks and continues to specialize in slow-growing industries. Nonetheless, also signs of local dynamism are observed, especially in the manufacturing sector, one where exogenous aspects appear to drive growth. Such contradictory results suggest that structuralist diagnosis remains explanatory but requires a complement from other perspectives, The empirical analysis presented in this study contributes to the understanding of the limits and possibilities for economic autonomy in regions traditionally dependent on the exterior.

2. Literature Review

The economic history of Ciudad Juárez, where an overwhelming majority of the municipality's population lives and work, reflects the premise of structuralist economists that peripheral regions are shaped by a subordinated integration into global capitalism. From the early stages of industrial development along the border between México and the United States, Juárez's role was oriented towards labor-intensive assembly production, a pattern typical of dependent economies (Fuentes & Fuentes, 2004). The 1965's Border and Industrialization Program (BIP) and plans alike institutionalized this role by establishing a model based on maquiladora, where value-added process remained established in the United States, while México supplied low-wage labor and infrastructure subsidies (Gutiérrez, 2014). Over the last 50 years, Ciudad Juárez has undergone a profound transformation from a semi-urban community into an industrial urban center, marked by accelerated population growth and the shift from agricultural to industrial land use. This rapid expansion, has been shaped by domestic migration of people seeking for opportunities in the export manufacturing industry and the cross-border dynamics (Vázquez, 2023) Juárez´s economic history, oriented towards export, seems to explain its vulnerability to the economic cycles of the United States and other major economies, reinforcing the core-periphery dynamic described by Prebisch (1996) and Furtado (1961) as intrinsic to Latin America.

Rather than triggering convergence, the relationships between economies with uneven levels of development status have entrenched an historical unequal interdependence that exemplifies the structuralist critique. As theorized by Aníbal Pinto (1970), economies like that of Juárez tend to segment into "modern" export enclaves and marginalized local sectors, producing sharp productivity and income disparities. These enclaves -though located in a singular space- are functionally extensions of the economic center, with limited radiation to the rest of the region. In this context, Juárez represents a paradigmatic case of how peripheral industrialization can coexist with persistent underdevelopment, validating the structuralist argument that dependence is not merely a historical phase, but a structurally reproduced condition under global capitalism.

Throughout the twentieth century, the economic trajectory of the Mexican northern border region remained tightly bound to shifts in industrial demands on the other side of the border line. However,

this approach inhibited endogenous technological development, as foreign investment and multinational control limited the local absorption and creation of productive knowledge as Sunkel (1969) warns. The export manufacturing industry has been criticized for generating limited spillovers into the domestic economy, despite the employment growth is fostered. Lee (2015) echoes Pinto's (1970) analysis of "structural heterogeneity" across Latin America, by arguing that those divergences have created a dualistic industrial structure in the border region; one integrated with global production networks but with minimal articulation to México's broader productive system.

Efforts to industrialize México through trade liberalization, the country's accession to the General Agreement on Tariffs and Trade (GATT) -later turned into the World Trade Organization (WTO) -then to NAFTA in 1994 and its successor USMCA, have failed to alter the underlying pattern of dependence. Indisputably, NAFTA integrated México more fully into North American value chains, but authors like Ramírez & Vázquez (2023) argue that the structure of integration reinforced the country's peripheral status by anchoring its role as a supplier of semi-skilled labor, without improving domestic technological capabilities. Fajnzylber (1988) warns about "truncated technological learning", a phenomenon observed in Juárez with the stagnation of higher-value activities, persistent wage suppression, and weak human capital accumulation relative to productivity gains. In this sense, while structuralists emphasize technological stagnation, as a sign of dependence, it is observed that contemporary dynamics reproduce the patterns of integration they sought to explain, even though in a reshaped fashion.

Since the 1970's, the decade when structuralism was at its peak in Latin America, the economic relationship between México's northern border and the United States has evolved, shaped both by technological shifts and political realignments. Yet, the underlying dependence seems persistent. Peralta (2015) demonstrates that the performance of the Mexican economy -especially in the border states- has historically correlated with the cycles of the United States, due to the maquiladora activity sensitivity to the ups and downs of that market. The nature of the binational economic integration has produced deep asymmetries among Mexican regions: Andrés-Rosales et al. (2023), show how the states of Chihuahua and Baja California, integrated into global value chains, diverge from the rest of the country in productivity and wages, while experiencing internal dualities between export-oriented and domestically focused economic sectors. More recently, even though still limited, the adoption of advanced technologies has deepened the interconnection of border production with central economies such as the United States, reinforcing both opportunities and vulnerabilities, as revealed by Arriola et al. (2025). Although the channels of integration have changed, the structural conditions of dependence persist, now mediated by the capacities of technological absorption.

While structuralism has highlighted global economic asymmetries, critiques from neoclassical and institutional economists argue that the stream underestimates the benefits of comparative advantage and potential gains from international trade. Some authors think that Protectionist policies, derived from structuralist postulates (*e.g.,* import substitutions and tariffs) tend to lead to inefficiencies, fiscal imbalances, and barriers to innovation (Kreuger, 1997). Evenett (2019), for his part, contends that participating in global markets enables developing economies to access competitive technologies that accompany incoming investment. Moreover, authors criticizing structuralism argue that the process of globalization has allowed developing countries to leapfrog into high-value manufacturing and professional services through trade liberalization (Gereffi, 2013). Perspectives critical of structuralism suggest that, rather

than perpetuating dependency, economic integration, combined with proper domestic institutionalization is a catalyst for structural, long-term growth.

The contrasting perspectives on the economic interaction between developing and developed countries reveal a persistent tension regarding the consequences of dependency and potential benefits of integration. On the one hand, evolution of less favored economies following externally oriented models based on export manufacturing, has reinforced a peripheral role characterized by low value-added activities, technological stagnation, and labor segmentation. On the other hand, integration into international markets has created avenues for the expansion of employment, investment inflows, and presence in global value chains as opportunities for development contingent on domestic institutional choices. At first glance, observation of developing economies patterns offers examples of both increasing economic activity and persistent inequalities. This study explores whether Juárez's economic trajectory supports the structuralist interpretation of dependency in the contemporary global context.

3. Data and Methodology

This section presents the empirical strategy used to measure the evolution of the structural dependence that the municipality of Juárez, Chihuahua, holds with respect to North America. To achieve this, the document relies on harmonized employment data processed through a variant of the shit-share method. The analysis spans four benchmark years, corresponding to the Economic Census conducted by México's official statistics agency: 2003, 2008, 2013, and 2018. Together, these periods capture the evolution across different economic phases of integration and disruption. These years include periods of sustained growth, the deep contraction associated with the 2008 financial crisis, the crisis of public safety that the region suffered in that same period, and the initial years of institutional transitions following the negotiation of the United States-México-Canada Agreement (USMCA). By tracing the composition and performance of Juárez's employment across these moments, the section provides a framework for measuring the external, structural, and local drivers of change in one of México's most export- oriented cities.

The methodological core of this work is shift-share analysis, a technique frequently applied to measure regional dependency and divergence using different economic indicators. Said technique stems from the scarcity of data at a municipal level to conduct macroeconomic analysis, as it enables linking local employment change with national and supra-national trends. First formalized by Dunn (1960), the method decomposes the growth of an economic variable at a regional level into three components, reflecting national trends, sectorial behavior, and local competitive effects respectively. Through this composition, it becomes possible to identify to what extent a region´s performance is explained by external forces -signaling dependency- or by endogenous conditions that reveal a more autonomous dynamic. Borusyak et al. (2025) provide a systematic guide to the use of the technique´s instruments, highlighting its ability to relate regional shocks to national and international processes and to isolate how much of local variations is driven by structural exposure to wider economic changes. Shift-share analysis has become a valuable tool for examining how regional economies position themselves within broader growth patterns.

Recent applications of shift-share analysis in different contexts confirm its enduring relevance to explain regional economic dynamics. In the Mexican case, Castelán et al. (2020) analyze the divergences between export-oriented sectors and local economic activities by means of this technique. Rendón et al.

(2021) use a version consisting of regrouping components into only two effects, while introducing an additional one to measure the regional specialization. Using census benchmark, they illustrate how given Mexican states adjusted their productive structures, and how some became *winners* as they oriented towards emerging industries. Similarly, Herath (2024) uses a variant of shift-and share for West Virginia, identifying sectoral strengths, demonstrating how the method can highlight uneven regional advantages to support policy decisions. Shift-share analysis remains it capacity to separate structural and competitive forces, though in its static form it remains limited by selection of base years, making it necessary to employ variants that reflect changes over time.

This study follows the logic of the dynamic shift-share model developed by Barff & Knight (1988), which reduces the dependence on a single base year by decomposing growth into successive periods. Ideally, the dynamic version recalculates the components of shift-share on a yearly basis, summing them up across the studied period, providing a continuous picture of structural changes. In this case, employment data comparable between the municipality of Juárez and the region of reference (*i.e.,* North America) with full sectoral detail are only available at four-year intervals (2003, 2008, 2013, and 2018), which is why the decomposition is applied to each of the intervals (2003-2008, 2008-2013, and 2013-2018). This semi-dynamic strategy captures key turning points in the economy of the regions of interest -such as the turmoil of the 2008 financial crisis and the public safety issues in Juárez those years- while recognizing the limitation that annual recalculations cannot be performed due to data constraints.

Despite its wide use, shift-share analysis is not exempt from limitations. First, it is essentially an accounting decomposition rather than a causal model, which means that the components do not explain why the variable of interest -in this case employment- grows or declines, but only attribute observed changes to structural or competitive factors (Houston, 1967). Second, the results are sensitive to the level of sectoral and spatial aggregation, as different classifications can alter the magnitude and even the sign of the effects (Nazara & Hewings, 2004). Additionally, the method does not offer a way to differentiate variations resulting from genuine local dynamics from measurement noise, and the competitive component is particularly unstable over time (Stevens & Moore, 1980). Finally, in the static version, the method depends heavily on the choice of initial and final years, which can distort conclusions when major shocks occur within the study period, a flaw present in the variant used here, as a four-year period is enough to see shifts in a local economy like Juárez (e.g., the opening or closing of a major company). These warnings underline the importance of complementary variants of the technique and careful interpretation of results.

The employment data used in this study come from the official statistics agencies of United States, México, and Canada: U.S. Bureau of Labor Statistics (2024), INEGI (2024), and Canada Statistics (2024), respectively. These sources report establishment-based employment by economic sector and geographic unit as used in each of the countries. Data is harmonized using North America Industrial Classification System (NAICS), offering a single taxonomy for comparing employment across industrial sectors. Nonetheless, data are not free from limitations, as confidentiality restrictions make Canada's agency suppress or aggregates small-cell values at finer levels of disaggregation. To guarantee consistency, this paper applies sectoral grouping across all geographic units employed. These include: (NAICS 52-53); financial and real estate services, (54-56); scientific, technical, professional, and business services, (61-62); education and health, as well as (51 & 71); information plus arts and entertainment. These aggregate categories

preserve compatibility while avoiding exclusion of any major sector. Sector 11, including agriculture, forestry, fishing and hunting, along with 22 related to utility services are excluded from the analysis because of a lack of homogeneity in the way the United States and Canada report them. These exclusions do not affect the results as mentioned sectors represent about 0.2% of total employment in Juárez, a municipality whose labor market is overwhelmingly industrial in nature.

Table 1. Total employment by sectors and its variations in North America

Sector	Total Employment by Sector				Employment Growth by Sector			
	2003	*2008*	*2013*	*2018*	*(2003-2008)*	*(2008-2013)*	*(2013-2018)*	*(2003-2018)*
00	134,165,127	55,401,075	154,866,543	174,018,143	15.8%	-0.3%	12.4%	29.7%
21	754,390	1,041,996	1,200,134	1,062,383	38.1%	15.2%	-11.5%	40.8%
23	7,944,391	9,000,971	7,411,237	8,927,780	13.3%	-17.7%	20.5%	12.4%
31-33	20,607,999	19,678,221	18,090,970	20,190,185	-4.5%	-8.1%	11.6%	-2.0%
43	7,400,003	7,900,799	7,812,356	8,423,548	6.8%	-1.1%	7.8%	13.8%
46	12,366,275	22,692,920	22,251,117	23,788,701	83.5%	-1.9%	6.9%	92.4%
48-49	5,490,775	6,029,465	5,938,669	7,008,336	9.8%	-1.5%	18.0%	27.6%
52	6,739,536	6,992,173	6,542,537	7,161,447	3.7%	-6.4%	9.5%	6.3%
53	2,223,884	2,430,862	2,224,075	2,536,775	9.3%	-8.5%	14.1%	14.1%
52-53	9,877,020	10,497,535	9,869,812	10,896,622	6.3%	-6.0%	10.4%	10.3%
54	8,815,894	9,790,584	10,191,446	11,431,317	11.1%	4.1%	12.2%	29.7%
55	2,930,846	2,913,717	3,141,520	3,667,935	-0.6%	7.8%	16.8%	25.1%
56	9,934,626	12,298,766	12,628,182	15,466,282	23.8%	2.7%	22.5%	55.7%
54-56	21,681,366	25,003,067	25,961,148	30,565,534	15.3%	3.8%	17.7%	41.0%
61	4,320,373	4,920,719	5,500,740	5,841,493	13.9%	11.8%	6.2%	35.2%
62	17,505,252	19,689,602	21,366,358	23,659,034	12.5%	8.5%	10.7%	35.2%
61-62	21,825,625	24,610,321	26,867,098	29,500,527	12.8%	9.2%	9.8%	35.2%
51	3,844,581	3,727,784	3,553,701	3,964,705	-3.0%	-4.7%	11.6%	3.1%
71	2,691,874	2,994,539	3,089,879	3,477,137	11.2%	3.2%	12.5%	29.2%
51 /71	6,536,455	6,722,323	6,643,580	7,441,842	2.8%	-1.2%	12.0%	13.9%
72	12,660,213	14,757,911	15,493,724	18,251,338	16.6%	5.0%	17.8%	44.2%
81	7,020,615	7,465,547	7,326,698	7,961,347	6.3%	-1.9%	8.7%	13.4%

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies

Source: Own elaboration based on INEGI (2024), U. S. Bureau of Labor Statistics (2024) and Canada Statistics (2024).

Table 1 presents data for North America across the four benchmark periods (2003, 2008, 2013, and 2018) by sector, including aggregations as described in the paragraph above, which are highlighted to ease its identification, as it is in the rest of the tables in the document. The table includes absolute employment levels and the corresponding percentage change between periods. This structure enables transparent reading of sectoral performance in the sub-continent over time and serves as a precursor to the decomposition required for the shift-share analysis. Table 2 replicates the information content in Table 1,

but for the Juárez´s case. Observing the magnitude and timing of employment changes in unprocessed form is essential to contextualize the results presented below.

Table 2. Total Employment by Sectors and its Variations in Juárez, Chihuahua

Sector	Total Employment by Sector				Employment Growth by Sector			
	2003	2008	2013	2018	(2003-2008)	(2008-2013)	(2013-2018)	(2003-2018)
00	357,063	395,713	373,101	525,106	10.8%	-5.7%	40.7%	47.1%
21	276	96	73	110	-65.2%	-24.0%	50.7%	-60.1%
23	11,535	5,749	4,614	5,227	-50.2%	-19.7%	13.3%	-54.7%
31-33	205,235	230,790	223,376	329,725	12.5%	-3.2%	47.6%	60.7%
43	8,758	8,904	10,026	12,262	1.7%	12.6%	22.3%	40.0%
46	54,406	55,879	50,104	59,703	2.7%	-10.3%	19.2%	9.7%
48-49	11,168	14,460	11,991	19,329	29.5%	-17.1%	61.2%	73.1%
52	776	1,196	1,270	1,536	54.1%	6.2%	20.9%	97.9%
53	2,327	2,688	2,191	3,005	15.5%	-18.5%	37.2%	29.1%
52-53	3,103	3,884	3,461	4,541	25.2%	-10.9%	31.2%	46.3%
54	3,764	5,164	3,673	6,181	37.2%	-28.9%	68.3%	64.2%
55								
56	10,737	10,244	11,312	20,093	-4.6%	10.4%	77.6%	87.1%
54-56	14,501	15,408	14,985	26,274	6.3%	-2.7%	75.3%	81.2%
61	3,691	5,750	5,211	6,104	55.8%	-9.4%	17.1%	65.4%
62	4,954	8,850	8,643	9,617	78.6%	-2.3%	11.3%	94.1%
61-62	8,645	14,600	13,854	15,721	68.9%	-5.1%	13.5%	81.9%
51	9,166	13,255	6,113	6,067	44.6%	-53.9%	-0.8%	-33.8%
71	2,079	2,118	2,809	2,796	1.9%	32.6%	-0.5%	34.5%
51 /71	11,245	15,373	8,922	8,863	36.7%	-42.0%	-0.7%	-21.2%
72	17,223	17,941	19,240	27,072	4.2%	7.2%	40.7%	57.2%
81	10,968	12,629	12,455	16,279	15.1%	-1.4%	30.7%	48.4%

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies

Source: Own elaboration based on INEGI (2024), U. S. Bureau of Labor Statistics (2024) and Canada Statistics (2024).

The shift-share analysis consists of decomposing analyzed variable, employment in this case, as observed in the region of study into three distinct effects to distinguish the sources of growth (contraction) of said indicator. In order to do that the first step is to measure the absolute change of employment, the indicator selected for this study, in every sector, within each of the regions involved as shown in equation (1):

Where:

$$\Delta E_s^r = E_s^{r,t_1} - E_s^{r,t_0} \qquad (1)$$

Based on (1) it is possible to calculate the rates at which employment grows in each of the regions of interest, as follows: ΔE_s^r

$$E_s^{r,t}.$$ Continental growth rate -- $\qquad$ *(2)*

$$E_s^{r,t_0}$$ Continental sectoral growth rate -- $\qquad$ *(3)*

Regional sectoral growth rate -- $\qquad$ *(4)*

Continental growth rate is the proportional growth of employment in the whole North American area. Continental sectoral growth rate refers to the percentual increasing in employment in each sector (s) in North America during each period. Finally, Regional sectoral growth accounts for the growth of the employment in each of the sector in the municipality of Juárez during the time lapse studied.

$National\ Effect\ (NE)\ is\ NE_s^r = E_s^{r,t_0} g^G$ are computed:

(5): employment change expected if all sectors in Juárez had grown at average continental rate.

$Industry - Mix\ Effect\ (IME)\ is\ IME_s^r = E_s^{r,t_0}(g_s^G - g^G)$

(6): deviation due to Juárez's initial specialization in faster -or slower- growing sectors

$Regional\ Competitive\ Effect\ (RCE)\ is\ RCE_s^r = E_s^{r,t_0}(g_s^r - g_s^G)$

(7): the portion of growth specific to the local context of Juárez beyond structural and continental influences in each of the sectors.

In the end, the addition of three factors equals absolute change for all sectors in the region:

$$\Delta E_s^r = NE_s^r + IME_s^r + RCE_s^r$$

Which completes the decomposition of observed employment variation (Houston, 1967).

An adaptation of the variant to the technique known as dynamic shift-share is employed in this paper to enhance its analytical power. The modification consists of recalculating the three components for each intermediate period: 2003-2008, 2008-2013, and 2013-2018. This avoids over-reliance on a single base year and allows identification of breaking points in the trends of local employment. In particular, the method captures the contraction caused by the 2008 financial crisis which significantly altered employment dynamics throughout North America (Kalleberg & Wachter, 2017). The dynamic model allows assessment of whether the studied municipality's dependance intensified or declined over time, possibly reflecting the effects of technological upgrading, enhanced integration into value chains, or improvement in human capital. Research has shown that higher absorptive capacity -measured through education levels and innovation capabilities- can reduce regional dependency on external growth patterns (Cohen & Levinthal, 1990).

In this semi-dynamic variant, the components are calculated for each of the years, conducting an aggregation of all of them to obtain a description of the transformation of the economy during the period considered. Assuming the complete studied period includes the intervals between the time *t* and the time *t+n*, the total c

$$Total\ National\ Effect\ (NE_p)\ is\ \ NE_{sp}^{r} = \sum_{t}^{t+n}(E_s^{r,t_0}g^G) \quad (5_p)$$

$$Total\ Industry - Mix\ Effect\ (IME_p)\ is\ IME_{sp}^{r} = \sum_{t}^{t+n}E_s^{r,t_0}(g_s^G - g^G)\ (6_p)$$

$$Total\ Regional\ Competitive\ Effect\ (RCE_p)\ is\ RCE_{sp}^{r} = \sum_{t}^{t+n}E_s^{r,t_0}(g_s^r - g_s^G)\ (7_p)$$

4. Findings

This section presents the results of the shift-share decomposition applied to the Juárez's employment data for the period studied (2003-2018), as well as each of the five-years intervals within (2003-2208, 2008-2013, and 2013-2018). The objective is to analyze how much the employment variations during each period for each of the sectors is attributable to general trends in North America, to industrial performance, and to the local dynamics. To facilitate the interpretation, the section incorporates graphic elements that yield a clear view of key patterns at a glance.

The shift-share results help uncover whether employment growth (declining) in the municipality of Juárez was primarily driven by external structural forcer or by local conditions. Reviewing these results allow reader to recognize if Juárez has remined aligned with continental trends, benefited from favorable sectoral specialization, or developed a unique growth trajectory shaped by regional conditions. Disaggregation also helps to identify cyclical vulnerabilities or competitive gains that emerge at specific points in time, particularly in response to macroeconomic shocks such as the 2008 financial crisis. In this way, the section offers a detailed empirical foundation to reflect on the nature and persistence of Juárez's structural dependence on the North American economy.

Table 3 provides a guide for interpreting the signs and dimensions of the components. It defines the possible combinations of effects and their implications in terms of dependance, vulnerability, and local competitiveness of each sector.

Dynamic shift-share models yield significant analytical benefits, relevant in the context of this research, that are not attainable through the traditional mode. First, it eliminates potential bias presented due to the over-reliance on a single base year, which can present special circumstances (Esteban-Marquillas, 1972). Secondly, breaking the full period into intervals makes it possible to detect inflection points and structural shifts in employment trajectory across time (Barff & Knight, 1988). Overall, the dynamic formulation enhances the temporal resolution of the analysis and increases the explanatory power of the decomposition.

Table 3. Interpretation Guide for Shift-Share Components

Continúa...

Indicator	Sign	Interpretation
National Effect (NE)	+	Sector is growing in line with general continental employment trends
	-	Sector contracts due to continental shrinking

Industry-Mix Effect (IME)	+	**Sector is growing in line with general continental employment trends**
	-	**Sector contracts due to continental shrinking**
Competitive Effect (CE)	+	**Sector is growing in line with general continental employment trends**
	-	**Sector contracts due to continental shrinking**
Difference CE-NE	+	**Local conditions are more influential than continental trends (signals autonomy)**
	-	**Continental trends are more influential than Local conditions (signals Dependency)**
CE / Total Change	>100%	**Local factors drive sector's growth, overcoming negative trends elsewhere.**
	<0%	**Local factors are dragging sector's growth below continental growth**

Source: Own elaboration based on Arias et al. (2011).

The results observed during the fifteen-year span (2003-2018) reveal that the labor market in the municipality of Juárez was largely shaped by external conditions, with a handful of sectors showing strong autonomous growth. Four sectors -(21) Mining, (23) Construction, (46) Retail Trade, and (51 & 71) Information plus Arts and Entertainment- showed a negative Competitive Effect (CE), indicating underperformance in relation to continental benchmark. However, when comparing the magnitude of CE relative to the total employment change, (31-33) Manufacturing is the only one for which local dynamics surpassed the National Effect (NE), as the former is almost double the latter. That result in the comparison suggests local factors such as technological absorption and human capital enhancement play a central role in sector's expansion. Table 4 provides a detailed visualization of the growth magnitude and component distribution by sector for the entire period.

Table 4. Shift-Share Components of Employment Change in Juárez by Sector 2003-2018

Sector	Total Change	Growth Components		
		NE	**IME**	**RCE**
00	168,043	106,064	-	61,979
21.00	- 166	82	31	- 279
23.00	- 6,308	3,426	- 1,999	- 7,736
31-33	124,490	60,964	- 65,125	128,651
43.00	3,504	2,602	- 1,390	2,293
46.00	5,297	16,161	34,092	- 44,956
48-49	8,161	3,317	- 231	5,074
52.00	760	231	- 182	711
53.00	678	691	- 364	351
52-53	1,438	922	- 601	1,118
54.00	2,417	1,118	- 1	1,300
55.00				
56.00	9,356	3,189	2,789	3,378
54-56	11,773	4,307	1,634	5,831
61.00	2,413	1,096	203	1,113
62.00	4,663	1,472	270	2,921

Continúa...

61-62	7,076		2,568		472		4,036
51.00	-	3,099	2,723	-	2,436	-	3,385
71.00	717		618	-	11		111
51 /71	-	2,382	3,340	-	1,783	-	3,940
72.00	9,849		5,116		2,490		2,243
81.00	5,311		3,258	-	1,788		3,841

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies.

Source: Own elaboration.

Table 5. Shift-Share Components of Employment Change in Juárez by Sector 2003-2008

Sector	Total Change		Growth Components				
			NE	IME		RCE	
00	38,650		56,517	-		-	17,867
21.00	-	180	44	62		-	285
23.00	-	5,786	1,826	-	292	-	7,320
31-33	25,555		32,485	-	41,745	34,815	
43.00	146		1,386	-	794	-	447
46.00	1,473		8,612	36,821		-	43,960
48-49	3,292		1,768	-	672	2,196	
52.00	420		123	-	94	391	
53.00	361		368	-	152	144	
52-53	781		491	-	296	586	
54.00	1,400		596	-	180	984	
55.00							
56.00	-	493	1,699	856		-	3,048
54-56	907		2,295	-	74	-	1,315
61.00	2,059		584	-	71	1,546	
62.00	3,896		784	-	166	3,278	
61-62	5,955		1,368	-	265	4,852	
51.00	4,089		1,451	-	1,729	4,367	
71.00	39		329	-	95	-	195
51 /71	4,128		1,780	-	1,460	3,808	
72.00	718		2,726	128		-	2,136
81.00	1,661		1,736	-	1,041	966	

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies.

Source: Own elaboration.

The first of the intercensal time lapses (2003-2008) covers an epoque of robust employment growth across most sectors in the list, as seen in Table 5. Nonetheless, (46) Retail Trade experienced a negative CE, accounting for a decline more than five times greater than its NE in absolute terms. (43) Wholesale Trade, (21) Mining, and (21) Construction showed competitive underperformance. Speaking about

the effect of the industrial mix (IME), only (46) Retail Trade, (56) Administrative Services, and (21) Mining, present positive values, which suggest that most industries in Juárez were initially concentrated in industries that grow slower than the continental average. Several sectors, on the other hand, exhibited local momentum, including (31-33) Manufacturing, (46-48) Transportation and Warehousing, (52-53) Finance and Real Estate, (61-62) Education and Health Services, and (51 & 71) Information, Arts and Entertainment, all of which recorded CEs surpassing their corresponding NEs.

Table 6. Shift-Share Components of Employment Change in Juárez by Sector 2008-2013

Sector	Total Change	Growth Components		
		NE	IME	RCE
00	- 22,612	- 1,361	-	- 21,251
21.00	- 23	- 0	15	- 38
23.00	- 1,135	- 20	- 996	- 120
31-33	- 7,414	- 794	- 17,822	11,202
43.00	1,122	- 31	- 69	1,222
46.00	- 5,775	- 192	- 896	- 4,687
48-49	- 2,469	- 50	- 168	- 2,251
52.00	74	- 4	- 73	151
53.00	- 497	- 9	- 219	- 268
52-53	- 423	- 13	- 219	- 191
54.00	- 1,491	- 18	229	- 1,702
55.00		-	-	-
56.00	1,068	- 35	310	794
54-56	- 423	- 53	643	- 1,013
61.00	- 539	- 20	698	- 1,217
62.00	- 207	- 30	784	- 961
61-62	- 746	- 50	1,389	- 2,085
51.00	- 7,142	- 46	- 573	- 6,523
71.00	691	- 7	75	624
51 /71	- 6,451	- 53	- 127	- 6,271
72.00	1,299	- 62	956	404
81.00	- 174	- 43	- 191	61

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies.

Source: Own elaboration.

The following interval (2008-2013) encompasses the global financial crisis and the respective aftermath, reflecting contractionary effects typical of that type of process. During that time span, most sectors experienced a decrease in total employment (See Table 6). Those moving the other way around were (43) Wholesales Trade, (52) Financial Services, (71) Arts and Entertainment, and (72) Accommodations and Food Services. In this period CE surpassed NE also for the majority of the sectors, suggesting that despite macroeconomic unrest, Juárez displayed resilience. Notably, (31-33) Manufacturing main-

tained a positive CE, while (43) Wholesales Trade, and (72) Accommodations and Food Services also recorded local competitive gains. In contrast, (21) Mining, (52-52) Finance and Real Estate Services, and (61-62) Education and Health Services registered negative CE, emphasizing their vulnerability to external shocks.

The las five-year time lapse showed a recovery in employment in almost all sectors, with universally positive NEs. A situation similar presented for CE, for which only (23) Construction, and (51 & 71) Information in Mass Media, Arts, and Entertainment showed negative figures. It is remarkable that, despite the economic rebound, most sectors registered a negative IME, suggesting that Juárez's industrial composition remained concentrated in activities that underperform when comparing to the global performance of continental economy. Nevertheless, the widespread positive CE signals a period of locally driven recovery. The effects of the recovery can be seen clearly in Table 7.

Table 7. Shift-Share Components of Employment Change in Juárez by Sector 2013-2018

Sector	Total Change	Growth Components		
		NE	IME	RCE
00	152,005	46,140	-	105,865
21	37	9	- 17	45
23	613	571	374	- 331
31-33	106,349	27,624	- 1,704	80,429
43	2,236	1,240	- 455	1,452
46	9,599	6,196	- 2,734	6,137
48	7,338	1,483	677	5,178
52	266	157	- 37	146
53	814	271	37	506
52	1,080	428	- 68	720
54.00	2,508	454	- 7	2,061
55.00		-	-	-
56.00	8,781	1,399	1,143	6,239
54-56	11,289	1,853	805	8,631
61.00	893	644	- 322	570
62.00	974	1,069	- 141	47
61-62	1,867	1,713	- 355	509
51.00	- 46	756	- 49	- 753
71.00	-6,451	-53	-127	-6,271
51 /71	1,299	-62	956	404
72.00	-174	-43	-191	61
81.00	-22,612	-1,361	-	-21,251

Note: Sectors 52-53, 54-56, 61-62 and 51/71 groups due to information differences among the three national agencies.

Source: Own elaboration.

Figure 1. Shift-Share Components of Employment Change in Manufacturing Sector in Juárez 2003-2018

—— 56,517	1,386	-31	1,240
—— -	-794	-69	-455
—— -17,867	-447	1,222	1,452

—— 56,517   —— -   —— -17,867
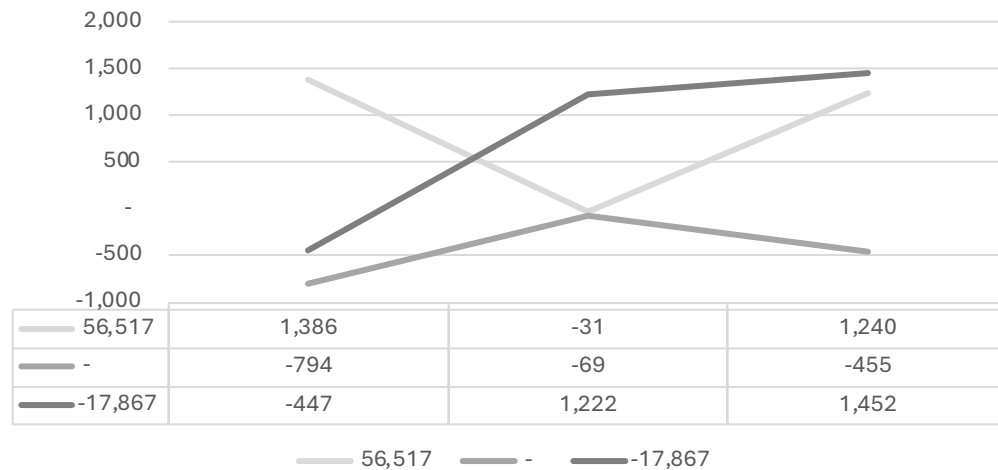
Source: Own elaboration.

5. Discussion

The results from the 2003-2008 period reveal an expansion of the local economy in terms of employment yet disclose the presence of structural limitations. Predominance of negative IMEs across the sectors aligns with the structuralist premise of adverse specialization, where peripheral economies get locked into low-value sectors. Nonetheless, the CEs surpassed NEs in key sector suggesting local dynamics played a significant role. (31-33) Manufacturing stands out among those competitive sectors, probably because of embedded production capabilities or labor coordination, which is particularly important in technology-intensive sectors. In contrast, (46) Retail Trade presented a CE several times more negative than its own NE, suggesting the sector's vulnerability to external conditions.

The following time interval, encompassing a period of a severe financial crisis, reflected how vulnerable is Juárez´s employment is to macroeconomic unrest. The behavior of variables -employment in this case- reinforces the structuralist notion of cyclical vulnerability of peripheral nations and their regions. Most sectors had a negative balance during that period, underscoring the sensitivity of local employment in front of global downturns. Despite generalized contraction, CE remained positive and greater than NE in several sectors, demonstrating local resilience amid external shocks. Developments of the period challenge the strict dependency thesis that peripheral economies are externally driven and limited to react. (31-33) Manufacturing maintained a positive CE, suggesting a surprisingly limited dependence on sectors with external cycles. One of the biggest limitations of shift-share methodology is the lack of explanation on causality, but it might be presumed that the sector is locally driven in part due to technological spillovers or learning processes resulting from the industrialization efforts. Conversely, the underperformance of sectors such as (21) Mining, and (52-53) Finance and Real Estate Services -consistent throughout two

intercensal periods- highlights the persistence of dualism and lack of integration in the economy.

The final period of the time lapse (2013-2018) reflects a recovery of the global economy, according to the positive value of NE in almost all sectors, even though IME remained predominantly negative. Signs of the components suggest that Juárez remains stocked in a structurally disadvantageous industrial mix, just as several dependent economies. However, CE remained positive across the majority of sectors, pointing to a recovery increasingly driven by internal momentum. This dynamic implies some degree of local upgrading and partial decoupling from structural limitations. The ability of the municipality to generate autonomous growth despite the suboptimal performance of incumbent industries indicates progress in local capacities, possibly linked to organizational improvements and/or human capital enhancement strategies.

(31-33) Manufacturing is clearly the linchpin of the economy in Juárez due to the number of employees and because of the strong evidence of structural transformation found in the analysis. Across the entire period studied (2003-2018), the CE of the sector was consistently positive and represented over 100% of total growth in the first two periods, diminishing to a still relevant 76% in the final phase. This trend directly challenges structuralist assumption of truncated technological learning -supposedly to appear after the downturn of financial crisis- and a lack of spillovers. Sustained CE for the sector suggests the development of specific capabilities, possibly related to technological absorption, skilled labor attraction and retention, and/or, less probable, to insertion into global value chains.

6. Conclusions

The findings of this study reaffirm that the postulates of structuralist economists are still relevant to understand Juárez's economic landscape, even though reveals signs of local dynamism that challenge determinism in the interpretations. The shift-share resulting components show that, during the 2003-2008 period, Juárez exhibited growth largely in tune with North American patterns, reflecting the recovery from the global recession followed the 9/11 terrorist attack at the beginning of the century. However, the subsequent five-years span, extended to 2013, clearly shows how global financial crisis compounded with Juárez´s severe public crisis to contract employment and reinforce the vulnerability of an economy tied to external demand. Finally, the 2013-2018 interval marks a new recovery in which local employment gradually aligned again with supra-regional expansion, though without signs of breaking away from its structural role as a supplier of low- and medium-value-added activities. Persisting cyclical correlation with North American economy, illustrate structuralist observation that peripheral economies dynamics resonates with external markets rather than through their own endogenous momentum.

It is also important to highlight the study's limitations. One of the most important is the inability to identify causality, restricting the explanatory power regarding the specific drivers behind local competitiveness. The decomposition technique is sensitive to the classification of sectors, the time intervals available, and the benchmark region framing the analysis, all of which may shape the results without offering insights into mechanism of change. Therefore, future research should explore studies aimed at specific sectors using complementary methods such as surveys; at firm level, value chain analysis, or econometric modeling if available data allows it, to better understand how technological spillovers, labor dynamics,

and institutional factors influence regional growth.

In sum, while the structuralist lens remains a feasible tool to diagnose persistent asymmetries in regional development, the evidence from Juárez suggest that dependency and emerging capacities coexist in the region during the studied period. The recognition of such duality is essential for an effective design of policies that address historical disadvantages but also foster the internal engines of growth that the local economy has of its own.

Strengthening local absorptive capacity -through human capital, technological upgrading, and linkages between multinational subsidiaries and local suppliers- emerges as essential to reduce their city's recurrent exposure to external shocks. Beyond policy, future research will benefit from incorporating the recently released 2924 Economic Census in México, which is likely to reflect the effects of the COVID-19 pandemic, the modifications to NAFTA coming into effect on 2020, armed conflicts in Europe, as well as renewed local transformations. A new round of analysis with that data would make it possible to evaluate whether Juárez remains locked in structural dependence or has begun to diversify its productive base under the pressure of recent global disruptions.

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