The manufacturing industry in Mexico: a history of production without distribution

Germán Osorio Novela, Alejandro Mungaray Lagarda and Edison Jiménez López

Abstract

This paper analyses the historical performance of the Mexican manufacturing industry based on the strategies that began to be adopted in the 1960s. It examines in particular the relationship between the productive increases driven by the opening of the market and the levels of economic well-being observed among people involved in this sector. The results of a sequential analysis of historical trends and estimates of production functions and distribution mechanisms suggest that the productive success of the manufacturing industry has only served to boost the economic well-being of companies and their owners, but not that of their employees or the wider community.

Keywords

Industry, industrial enterprises, manufacturing enterprises, history, productivity, income, economic development, industrial statistics, Mexico

JEL classification

F20, F23, L60, O14, O54

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I. Introduction

Following the end of temporary worker programmes between the United States and Mexico in the mid-1960s, and thanks to the trade openness that began in the 1980s, which was consolidated by the entry into force of the Northern American Free Trade Agreement (NAFTA) in the 1990s, the Mexican manufacturing industry has undergone fundamental structural and operational changes. One such change was reflected in the development of the maquiladora industry, which established itself as one of the most dynamic industrial activities, at first in the northern border states, where it was able to take advantage of the logistics and oversight operations with United States companies —the main drivers of demand for products— but then in some inland states, which the industry has gradually moved into specialized productive sectors. Since then, the maquiladora industry has been recognized as a strategic and important source of employment for regional and national manufacturing development.

In this connection, in recent years the importance has been recognized of evaluating the impact of industrial development on well-being, specifically on the monetary income of employees and companies, through distribution mechanisms (Isaksson, 2007). Recent evidence indicates that total factor productivity is closely related to business development, which in turn is closely related to the well-being of economies and society at large (Basu and others, 2012). Thus, based on the productivity trends of Mexico’s industrial sector, the development of Mexican companies is at the centre of the debate surrounding their impact on the benefits reaped by society.

This paper seeks to measure the impact of productivity trends on the economic well-being of companies and employees, especially that of the so-called second- and third-generation maquiladoras, the introduction of which led to a considerable increase in the productive capacity of the country’s manufacturing sector in general, as a result of both direct and indirect effects on the sector (Carrillo and Hualde, 1998; Morales, 2000). Our hypothesis is that a more consolidated and productive industrial sector generates greater profits for companies and higher wages for their employees, which contributes to social well-being. The aim of the paper is to provide empirical data that contribute to understanding the performance of the manufacturing sector within society.

Statistical data from the Monthly Industrial Survey (EIM) for the years prior to 2007 (INEGI, n/d) and the Monthly Survey of the Manufacturing Industry (EMIM) for the decade 2007–2017 (INEGI, 2017), both carried out by the National Institute of Statistics and Geography (INEGI), were used to verify the hypothesis and achieve the aims of this study. These data correspond to a comprehensive measurement of the manufacturing sector, which includes companies ranging from those engaged in traditional manufacturing activities to economic entities that export manufactures, in accordance with the manufacturing industry, maquiladora and export services (IMMEX) programme.

The article is divided into five sections. After this introduction, section II contains an analysis of the manufacturing industry trends in Mexico in the period 1960–2017, including a review of the frame of reference of the export industry, taking into account the debate surrounding its contribution to strengthening the local productive sector and the derived benefits for the country. Section III describes the methodological aspects for estimating total factor productivity (TFP) and the parameters for defining the sector’s productive trends, as well as its impact on the monetary income of companies and their employees. The results and their interpretations are presented in section IV and the conclusions are set out in section V.

II. The manufacturing industry in Mexico and its growth strategy based on the external market

Following the end of the Bracero Program, under which temporary work permits were issued to Mexican labourers to allow them to work in the United Sates between 1942 and 1964, and with the return of those labourers to Mexico, the Government of Mexico began to think about strengthening the productive sector through mechanisms to attract foreign direct investment (FDI) that would generate sufficient labour demand to satisfy the growing supply. Thus, the policy to foster FDI in the maquiladora export industry was announced on 20 May 1965, which promoted the establishment of maquila plants along the northern border of the country and led to the construction of the first industrial parks in 1966.

The International Monetary Fund (IMF, 2009) defines FDI as arising when an investor resident in one economy makes an investment that gives control or a significant degree of influence on the management of an enterprise that is resident in another economy. The Organization for Economic Cooperation and Development (OECD, 2008), together with Krugman and Obstfeld (2003), defines it as capital from abroad that is intended for the exploitation, production and/or marketing of products, goods and services in the local economy, either for sale in the territory or for export.

According to the North American Industry Classification System (NAICS), the manufacturing industry includes all those economic branches grouped into activities related to food, tobacco, textiles and textile products; leather and hide tanning and finishing; wood; paper; petroleum and coal products; chemicals, plastics and rubber; minerals; metals; computer and electronic products and communication equipment; electrical equipment; electric power generation equipment and transport equipment. The term *maquila* dates back to the Middle Ages in Europe, specifically Spain, and refers to the practice whereby local farmers would pay mill owners for processing their wheat with a portion of the flour obtained. Currently, the Mexican National Council of the Maquiladora and Export Manufacturing Industry (INDEX) defines the maquiladora industry as any partial activity in a manufacturing process, such as assembly or packaging, carried out by a company other than the original manufacturer. However, the definition of *maquila* used by INEGI broader, referring to it as an economic unit that combines actions and resources under the control of a sole owner or controlling entity, to perform mainly activities for the transformation, production, assembly or processing of one or more products, in whole or in part (INEGI, 2015).

The origin of the maquiladora export industry in Mexico is related to two events. Firstly, the adoption of special tariffs in the United States that were applied only on the value added of maquila imports and not on their total value, and, secondly, the launch of the Border Industrialization Program (BIP) in Mexico in 1965, which allowed the duty-free, temporary importation of inputs and taxed export products on the added value of the final goods (Carrillo, 2000). These measures helped to stabilize the high unemployment rate along the northern border, by consolidating growth dynamics and providing a solid source of employment and foreign exchange.

Over time, these benefits were extended to other specific regions in Mexico, initiating a slow process of economic decentralization to other inland states. The entry into force of NAFTA in 1994 led to the development of maquiladora export industry plants in the Bajío and central areas of the country. The growth rates of the maquiladora export sector have been increasing every year since then, consolidating its position in the national economy and helping to attract more FDI (Mungaray, Ramírez and Texis, 2006).

According to Caves (2007), FDI promotes competitiveness by encouraging firms to improve their efficiency to ensure their productivity and survival. This is evident in Mexico from the fact that, initially, the productivity of maquiladoras was minimal, but then improved over time. In turn, it is logical to conclude that information on FDI operations and management styles are disseminated across the whole manufacturing sector through learning-by-doing processes (Lucas, 1988) and spillover effects (Romer, 1990).

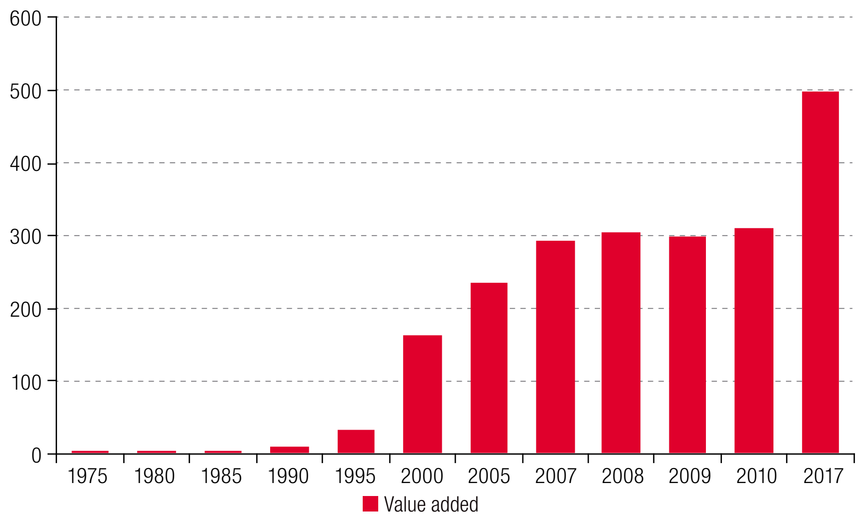
Thus, following the entry into force of NAFTA, the manufacturing industry underwent an accelerated development, thanks mainly to the confidence of foreign investors, the devaluation of the peso in December 1994, economic growth in the United States and the adoption of the just-in-time manufacturing model (Bendesky and others, 2004). According to INEGI data, in 2017, there were more than 5,000 active plants in Mexico belonging to the manufacturing, maquiladora and export services industry, employing approximately 2.5 million people, of which 2 million are hired directly and the rest are hired under subcontracting schemes. The national average of real wages per employed person was approximately US$ 770 per month. However, a considerable gap can be observed when analysed from the state level. For example, with regard to the northern states, wages are highest in the main maquiladora region of Nuevo León (US$ 876), followed by Coahuila and Baja California (around US$ 763). Wages are lowest in the maquiladora plants located in the states of Sonora and Chihuahua (US$ 650 a month).

There is still some discussion in Mexico about whether maquiladoras and trade openness were the appropriate development strategy for the country's manufacturing industry. An important aspect of the discussion focuses on the definition of development, whose interpretation ranges from the impact on economic growth to the structural change that provides a general increase in economic activity and output and results in an improved standard of living for the majority of the population (Anderson, 1990).

It is undeniable that the development of the manufacturing-maquiladora industry, which had its origins in the 1960s, generated economic benefits for the country, reflected in higher levels of production, employment, and new technology transfer and implementation, as well as in the creation of a new work culture and the establishment of new development hubs (Eaton, 2001). This favourable situation of increased production underpinned a remarkable growth trend, especially in the 1990s; however, investment began to decline in the early 2000s, before rallying again in 2003. The sector then underwent a crisis in 2008 and 2009.

There was a turning point in the 2010s following the global economic crisis of 2008, which caused a drop in production as a result of corporate readjustments affecting manufacturing plants. However, in general terms, value added production has followed a positive trend and achieved high growth rates (see figure 1). In 2017, the average real production value of the industry was 452.614 billion pesos a month, an increase of 555% with respect to 1990.[1]

Figure 1
Mexico: value added of the export industry
(Billions of constant pesos)



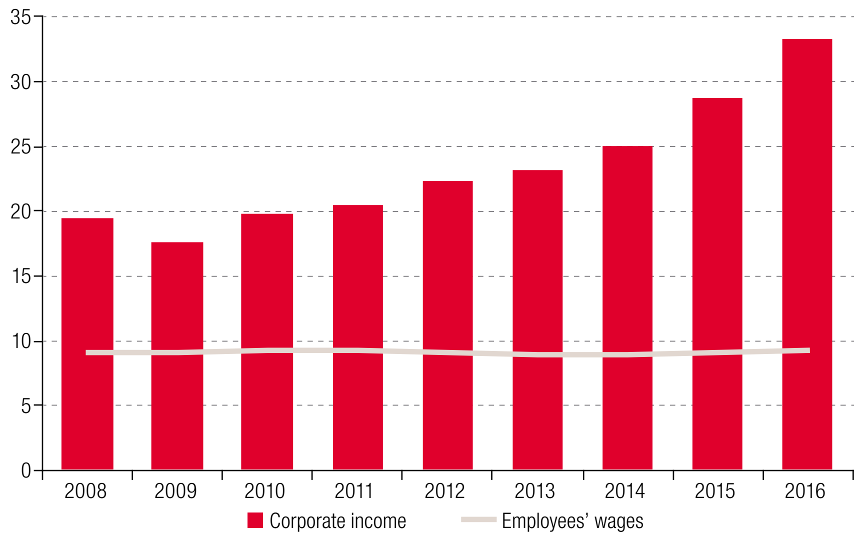
Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.

[1] All monetary data used were deflated according to the National Producer Price Index (NPPI), with 2012 as the base year.

The contribution of the manufacturing industry to job creation has grown by 391% over the last 25 years, which is reflected in more than 2 million new jobs. However, the rate slowed between 2007 and 2017: only 257,175 new jobs were created. This was largely as a result of the economic slowdown of 2008 which pushed up unemployment and lasted for four years. This shows the high sensitivity of manufacturing employment to economic imbalances; in most cases, critical adjustments in the industry are made through layoffs, which increases the productivity of the other workers.

The increase in production has translated into an increase in corporate income, but not in employees' wages, especially in the last decade (see figure 2). While wages increased in real terms from US$ 387 to US$ 626 per month between 1990 and 2007, they have not increased since then, and have even decreased. Wages were equivalent to 52% of corporate income in 2009, but this figure dropped to 28% in 2016. Yet, both production value and hours worked have increased steadily since 2008.

Figure 2
Mexico: relationship between income and wages in the manufacturing industry, 2008–2016
(Billions of United States dollars)

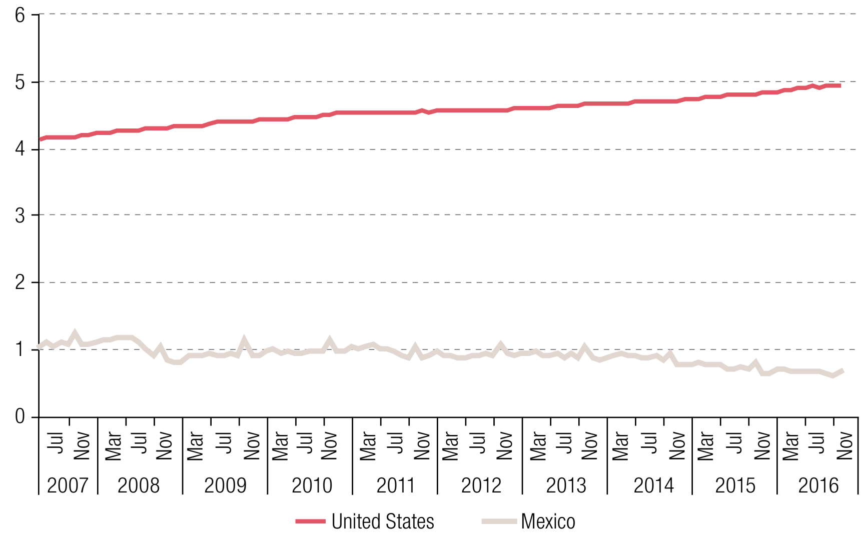


Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.

This scenario shows a clearly inefficient and unequal distribution of income. This trend is only observed in Mexico: if one compares the monthly wages in real terms paid to industrial workers in the United States with those of workers in Mexico, one can see a considerable and sustained increase in wages in the United States that contrasts markedly with the situation in Mexico. This widens the wage gap between the two countries further (see figure 3).

It is evident that the production capacity of the Mexican manufacturing industry has increased effectively. The industry's structure has evolved from its initial arrangements and capacities owing to its increasing strategic market opening and ability to attract FDI. However, this trend emerged against the backdrop of the wider discussion (Texis, Mungaray and Grijalva, 2009) surrounding the lack of mechanisms to distribute wealth to the workers and social sectors associated with the industry, which becomes increasingly relevant as the gap between corporate profits and employees' wages continues to grow. Ros (2015) argues that the problems of economic inequality that exist in Mexico are mainly the result of a process of increasing employment precariousness, linked specifically to a steady decline in workers' share of the functional distribution of income, as real wages have stagnated with respect to labour productivity.

Figure 3
Mexico and the United States: monthly wages per employee in the manufacturing industry, 2007–2016
(Thousands of dollars, adjusted for exchange rates)



Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.

The reasons for this, a consequence of the development of the Mexican manufacturing industry, are associated with the changes caused by maquiladora activities since the 1960s. The labour structures and plants' organization reached a turning point following a series of adjustments that took place as a result of market liberalization, the introduction of new materials and technological innovations and, above all, changes in the relationship between the government and the industry (Mungaray, 1990; Carrillo, 1990) and between large multinational companies and local firms.

When international companies are able to use the intermediate goods offered by local businesses to produce their products, links are created that boost the development of the local economy. Rodríguez-Clare (1996) points out that, since there are large communication costs between headquarters and production plants located in other countries, the presence of a variety of similar intermediate goods in the two economies means that multinational companies do not behave as enclaves in the host country, since they are integrated into the local economy and influence regional development. This may explain why production plants located in the interior of Mexico tend to generate more linkages and benefits at the local level, compared to those on the border with the products' final market. However, the dynamics of globalization, which are largely based on global production chains, create an important counterweight to the linking and generation of local supply networks.

Of the total inputs consumed by the manufacturing-maquiladora industry at the national level, 75% are imported (INEGI, 2017). This indicator increases considerably if we consider plants located in the northern part of the country, especially in Baja California and Chihuahua, where 97% of the total are imported, followed by Tamaulipas, with 88%. Surprisingly, only 60% of inputs consumed in the states of Sonora and Nuevo León are imported (INEGI, 2017).

The policies of the Government of Mexico aimed at promoting manufacturing have failed to establish a more effective relationship between local and foreign companies (Gallagher and Shafaeddin, 2010), which has led to a number of negative effects, mainly a lack of development of endogenous capacity of domestic firms and a slow and limited transfer of technology to local businesses. Hence, Jenkins, Dussel and Mesquita (2008) point out that, in the field of international trade, competition between countries is strongly related to the focus or specialization that each nation seeks to channel into its economy, which defines losers or winners in this paradigm of globalization. In this regard, Gallagher and Shafaeddin (2010) note that, while China is developing through a socialist market mechanism, Mexico has only followed an open market path, without central planning.

As a result of this increase in international competitiveness, Mexican manufacturers have had to step up productivity, use idle capacity, improve plant management and develop products to compete with the lowest prices worldwide, especially those levied by emerging Asian countries (Utar and Torres, 2013). With respect to employment, Heid, Larch and Riaño (2013) point out that, during the 1990s, this industry was a mixed blessing for the economy: despite having helped to reduce unemployment, informality increased by 0.9%, overall welfare (measured by income, employment benefits, health and housing indicators) decreased by 3.7%. Other regional studies detected a drop in hourly wages, which leads employees to work longer hours and boosts companies' productivity, to the detriment of workers' quality of life (Mungaray, Ramírez and Texis, 2006).

Nevertheless, the companies established as a result of the manufacturing liberalization in Mexico are now in a highly productive or "third-generation" stage, where not only are have linkages been created, but also new ideas and products are being designed, researched and developed, while human capital is championed. To achieve this, it was necessary to go through a first stage or first generation, which was those companies that arrived in Mexico between 1965 and 1983 (Carrillo and Hualde, 1998). They are referred to as "footloose" investments because in periods of crisis they will uproot and move elsewhere. These plants were located in a 20-kilometre strip along the border with the United States, whose productive structure required the intensive use of labour mainly for assembly work (Cruz, 2001).

The second generation covers the period from 1983 to 1994, during which the industry and government entities set up new mass training programmes with regard to technology and robotization to cultivate qualified personnel, raise quality standards and create the first separate industrial park complexes in the country, less specialized in assembly processes and more focused on manufacturing processes. Another notable event during this period was Mexico's entry into what would become the World Trade Organization (WTO) in 1986. The so-called third generation came online in 1994, the main characteristic of which is the strong knowledge-based competition, underpinned by large investments in research and development (R&D) (Cruz, 2001).

Despite these developments, it has been difficult for the industry to integrate more fully with the national productive framework, because of both the competitive limitations of the other economic sectors and the absence of a business support policy that not only allows the industry to earn the profits that would be expected from its long-standing presence in Mexico, but also to reap regional and business benefits in line with the Mexican productivity advantages.

Recent research suggests that the keys to Mexico's development need to be analysed, taking into account manufacturing export trends and the country's poor economic growth. The evident lack of transmission mechanisms between the manufacturing industry and other economic sectors means that the national economy lacks factors that are indispensable for increasing the social and economic conditions of the population, such as integrated fixed investment processes, productive densification and better quality jobs (Moreno Brid and others, 2016).

Research by Ibarra (2011) and Vázquez and Avendaño (2012) has identified the weak effect that Mexican exports have on gross domestic product (GDP) growth owing to the large and rising share of the maquila sector in manufacturing exports. Although the industry's exports generate a positive trade balance for the sector, they depend mainly on imported inputs and intermediate goods that cannot be replaced by others of domestic origin. However, Ibarra and Blecker (2016) detect a positive trend in the use of domestic intermediate inputs in manufacturing activities in Mexico, which perhaps reflects a systematic and increasingly stable linkage between that sector and the local economy.

Thus, the positive and negative effects of the industrial development strategy of promoting the export sector —expressed in indicators such as levels of FDI, number of employees, hours worked, corporate income, wages per employee and production value, among others— make it possible to determine objectively whether the marginal productivity trend of manufacturing factors has led to an increase in the economic well-being of the people linked to that sector.

III. Methodology

To analyse the share and productivity of the manufacturing industry factors over time, a series of regressions were calculated for two periods covering the years in which the sector saw its greatest productive growth since the 1960s: the first from 1994 to 2006, based on the Monthly Industrial Survey, and the second from 2007 to 2017, based on the Monthly Survey of the Manufacturing Industry. The partition into two periods was due to the change in the data registration methodology of the official source of information in Mexico, INEGI. Given the methodological modifications, the variables are not compatible throughout the study period and should therefore be analysed separately for econometric purposes. The data used cover 240 classes of manufacturing activities based on the 2017 NAICS Manual (INEGI, 2017).

With respect to econometric analysis, the estimates were derived from production functions that reflect the technical relationship between the different variables involved in the manufacturing production process, so that:

$$Y = F(X_1, X_2, \dots , X_n, A) \quad (1)$$

Where, Y is production; X_n is inputs or production factors; and A is total factor productivity (TFP).

Thus, to obtain coefficients that show marginal changes and variations in production and efficiency, the following Cobb-Douglas production function was used:

$$Y_{it} = AK^{\alpha_1}L^{\alpha_2} \quad (2)$$

Where, K is the capital factor or input; L is the labour factor or input; and $\alpha_{1,2}$ is the share or elasticity of the capital and labour factors in production, respectively.

If equation (2) is transformed logarithmically into linear form, we get:

$$lnY = lnA + \alpha_1 lnK + \alpha_2 lnL \quad (3)$$

The production variable is the gross production value of the manufacturing sector. The capital variable comprises the total inputs consumed (except labour input). In this regard, some empirical studies on measuring productivity argue that it is important to calculate the flow of services produced by capital assets (in relation to total inputs that occur at the same time as the use of capital investment levels), rather than capital stocks alone (Jorgenson, Gollop and Fraumeni, 1987; Oulton, 2001), as they are not always used to its maximum capacity, depending on which point in the economic cycle they fall; thus, the degree of capital utilization can be measured through the use of inputs or service flows (CLAPES/ICARE, 2016) (see table 1). For the labour factor, the number of hours worked was considered.

Equation (3) was calculated using a cointegrated dynamic panel data structure for both periods; the viability of this type of partition has been verified for the estimation of functions linked to productive factors, particularly employment (Arellano and Bond, 1991), and they also allow the collection of information from all the industry's subsectors. The observations were deflated with respect to the producer price index (PPI), using 2003 and 2012 as base years, respectively. To deseasonalize the time-series data and minimize bias in the coefficients, the moving-average method was used, which takes averages that span and compensate for the high and low values and determine the group average.

Table 1
The main variables of analysis of the manufacturing sector, 2007–2017
(Thousands of United States dollars a month)

Variable	Average value	Maximum value	Deviation
Production value	37 454 640	44 254 539	3 419 594
Capital factor	20 481 956	32 032 696	4 056 893
Labour factor	59 257	67 539	3 580
Monetary income per company	2 906 158	3 566 144	247 046
Monetary income per employee	0.894	1.167	0.0709

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.

Before estimating the regressions, unit root tests were performed to avoid artificial regression problems (Arellano and Bond, 1991). Three tests were conducted: Fisher augmented Dickey-Fuller (Fisher-ADF); Im-Pesaran-Shin (IPS); and Hadri. For the first two, a null hypothesis of the existence of unit roots was assumed, and for the last one, a null hypothesis of stationarity in the panel data. When testing the variables at levels and subsequently the first differences, it was observed that they were all stationary at first difference in both periods, so they are integrated of order (1).

The dual estimation of equation (3) sought to determine both the factor intensity of manufacturing and the factors' shares and output. This allowed possible changes in the sector's productive behaviour to be detected. Once the shares and the types of output were determined, TFP was calculated based on the estimation of the parameter, under the methodology known as the Solow residual (López-Córdova, Esquivel and Monge-Naranjo, 2003; Céspedes and Ramírez-Rondán, 2014). To do this, equation (3) was used to calculate the derivative of the logarithms with respect to time, and thus the growth rate of the variables was obtained, which is expressed as follows: A

$$\Delta Y = \Delta A + \alpha_1 \Delta K + \alpha_2 \Delta L \tag{4}$$

The Solow residual methodology demonstrated that, while the growth rate of A, which is associated with TFP, is an unobservable variable, it can be estimated through the residual in equation (4) and is conditioned by the growth rate of observable variables such as production, capital and labour, with respect to their corresponding shares. The coefficient reflects that part of output growth that cannot be explained by growth in the primary factors or product inputs, such as capital and labour (Hulten, 2001). The TFP growth rate[2] is defined as follows:

$$\Delta TFP \equiv \Delta A = \Delta Y - \alpha_1 \Delta K - \alpha_2 \Delta L \tag{5}$$

Once TFP was obtained, it was contrasted with the variables of average remuneration per manufacturing employee (total remuneration divided by employed personnel) and of corporate profits (monetary income per company); these variables are considered indicators of the economic well-being of employees and companies, respectively. In addition, two control variables were established: the first, based on a dichotomous variable that reflects the effects of the economic crisis that affected Mexico in 2008; the second is associated with the degree of trade openness in the manufacturing industry, through the average openness index (AMIC) (Durán and Álvarez, 2008), according to the following equation:

$$AMIC = \frac{Z_i + M_i}{Y_i} \tag{6}$$

Where, Z_i is manufacturing exports; M_i is manufacturing imports; and Y_i is manufactures' production value.

[2] After checking the cointegration of the variables.

So, the regressions to be calculated are:

$$W = \beta_0 + \beta_1 A + \beta_2 AMIC + \beta_3 D_1 + \varepsilon \quad (7)$$

$$R = \beta_0 + \beta_1 A + \beta_2 AMIC + \beta_3 D_1 + \varepsilon \quad (8)$$

Where, W is the growth rate of average wages per employee; R is the growth rate of corporate profits; A is the TPF growth rate; $AMIC$ is the average openness index of the manufacturing trade; and D_1 is the economic crisis indicator.

The growth rates' variables confirmed the stationarity of the time series[3] and were estimated by ordinary least squares (OLS); this reveals the impact and benefits derived from the development of the manufacturing industry in terms of economic well-being. Both TFP and the trade openness index were expected to be significant and to have a positive impact on indicators of employees' and corporate well-being. Similarly, the indicator that captures the years of economic crisis was expected to be statistically significant.

IV. Analysis of results

Table 2 presents the regression coefficients of equation (3) by time period. With regard to the results of the data for the first period, the Hausman test suggested that the fixed effects model was appropriate for estimating the equation. The estimated coefficients were positive and significant, with a confidence level of 99% and an almost equal magnitude of 0.36. While this does not allow the intensive factor of the manufacturing activity in this period to be determined comprehensively, it can be affirmed that, based on the Wald test, the sum of its values was statistically less than one, which means that the production factors present decreasing returns to scale.

Table 2
Summary of the statistical estimates and tests for production function (3) using the panel data model

Variables	Period 1 (1994–2006)	Period 2 (2007–2017)
Constant	6.876*	-0.0000362
Capital	0.369*	0.1001*
Labour	0.351*	1.135*
Statistics		
F statistic	2 644.17	1 473.19
Prob. F	0.000	0.000
Hausman test Ho: Random Effects	Rejected	Not rejected
Chi^2	6.08	4.43
Hausman Prob.	0.0479	0.2186
Wald test Ho: $\alpha_1 + \alpha_2 = 1$	Rejected	Rejected
F-test	283.19	52.10
F Prob.	0.000	0.000
Observations	1 920	1 656

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.
Note: *significant at 1%.

[3] The stationarity of the time series was tested using the ADF and Kwiatkowski-Phillips-Schmidt-Shin tests.

Regarding the results for the second period, the Hausman test indicated that the random effects model was appropriate for interpreting the coefficients, which were significant at 99%. In this case, there was an increasing returns to scale; a large share of the coefficient was associated with the labour factor (of a magnitude of 1.13) compared to the share of the capital coefficient (just 0.10), which was confirmed by the Wald test. The robust data from this second regression suggest that manufacturing is labour-intensive, a result that was expected for the first period of analysis as well.

The fact that manufacturing companies increasingly integrated technology during the second period suggests that this process has not transformed this industry into a capital-intensive sector or led to a decrease in the relative demand for labour; rather it has translated into an increase in the productivity of their employees and higher output from their increasing returns to scale.

Table 3 presents the results of equations (7) and (8), which indicate that the evolution of manufacturing performance, expressed in TFP, was not statistically significant for the growth rate of employees' wages. However, the average trade openness index, which shows the constant increase in the average trade openness of manufacturing products, and the variable that reflects the effects of the 2008 economic crisis on Mexico, were statistically significant for the levels of economic well-being of employees.

Table 3
Summary of statistical estimates and tests of economic well-being functions using the ordinary least squares (OLS) model

Variables	Well-being of the employees	Well-being of the companies
Constant	0.378*	0.092**
TFP	-0.121	0.348***
Trade openness	0.231*	0.058**
Economic crisis	0.048***	0.003
F statistic	5.585	5.394
F Prob.	0.001	0.001
Observations	105	105

Source: Prepared by the authors, on the basis of data from the National Institute of Statistics and Geography (INEGI), "Encuesta Mensual de la Industria Manufacturera (EMIM)", Economic Information Bank, 2017 [online database] http://www.inegi.org.mx/sistemas/bie/?idserPadre=104001000010.
Note: *significant at 1%, **significant at 5% and ***significant at 10%.

Meanwhile, the evolution of TFP and the industry's trade openness were significant for the economic well-being of companies (understood as monetary income per economic unit), but the effects associated with the economic crisis were not statistically significant. This suggests that the negative impacts resulting from the economic instability were mainly transmitted to the economic well-being of employees, in other words, they were transferred to the direct income received by the employees, despite the fact that their productivity increased constantly during the whole period under analysis.

The manufacturing industry's development strategy since the market was opened up has therefore led to a steady increase in the productivity of each input, the industry's general performance and TFP. However, the impact on the economic well-being of the participating agents has been asymmetrical. The TFP trend and trade openness has been statistically significant for business owners' income levels, and the economic crisis did not affect their levels of well-being, probably due to the high growth in corporate productivity and competitiveness as a result of the adjustments to their number of employees. However, this increase in productive capacity has not been significantly reflected in the growth in average wages per employee, which were affected by the economic crisis.

V. Conclusions

The results of this research show that the strategy to promote Mexico's manufacturing industry through the openness to trade, technology and FDI of the maquiladora industry has improved its productive performance. This improvement is associated in particular with the consolidation of the second and third generations of this sector, when productivity increases were sought, linked to the acquisition of capital and investment in R&D.

There is statistical evidence that manufacturing production remains highly labour-intensive, so the increase in capital and technology has not changed the structure of factor use. Nevertheless, this increase led to the adoption of flexible production processes that have helped the industry to transition from declining returns to scale to increasing returns to scale over the past 20 years. This has boosted the corporate income of those companies that have been consolidating their presence in international markets and have thus become more resistant to economic recessions and crises, as evidenced by the fact that the economic imbalance that occurred in Mexico during the 2008 crisis did not have a statistically significant impact on the growth rates of the economic well-being of business owners.

The empirical data obtained also supports the hypothesis that this productive development has not translated into an improvement in the economic well-being of employees, something that is reflected in the growth rates of their average real wages per hour of work. Despite being increasingly productive thanks to investments in technology, training processes and a reduction in leisure time during the working day, employees can only increase their income by working more hours, instead of through contractual mechanisms to share the benefits of that higher productivity.

It can therefore be concluded that the right elements have not yet been put in place, both by companies and by the government, to ensure that the growth in the manufacturing industry is also reflected in a rise in the economic well-being of its employees through better and fairer wages, commensurate with the increase in productivity. Despite the fact that Mexico's manufacturing industry is now in a highly productive or third-generation stage, other studies (Ocegueda, 2003) also recognize the vicious circle that exists between the large proportion of labour employed in the sector and the low wages those employees receive.

The perspective presented herein points to the need to continue reflecting on the development strategy of the manufacturing industry in order to advance further not only with regard to job creation, but also conditions that promote equitable remuneration for employees, based on their productivity and linked to innovation and training. This discussion opens the door to the possibility that future research will address, in addition to economic well-being, the impact of business development on efforts to resolve challenges related to social well-being in general, and employees' living conditions in particular.

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