www.cya.unam.mx/index.php/cya

Contaduría y Administración
Accounting & Management

Contaduría y Administración 70 (4), 2025, e525

Management practices in the Mexican manufacturing SMEs under a contingent approach

Prácticas administrativas en las pymes manufactureras mexicanas bajo un enfoque contingente

Adriana Becerril Gutiérrez*, Pablo Mejía Reyes

Universidad Autónoma del Estado de México, México

Received December 7, 2022; accepted 27 de septiembre de 2024
Available online June 19, 2025

Abstract

The objective of this paper is to determine, from a contingent approach, the importance of different types of key management practices (performance monitoring, goal setting and personnel management) in Mexican manufacturing SMEs in the years 2015 and 2018 taking into account technological trajectories. For this purpose, an index is constructed through an Exploratory Factor Analysis (EFA) using 16 questions from the 2015 and 2018 National Survey on Productivity and Competitiveness of Micro, Small and Medium Enterprises (ENAPROCE). The results are then reviewed by differentiating firms by main product produced and by the four technological trajectories of Pavitt's (1984) taxonomy. The results show evidence that science-based firms are characterized by scoring higher on practices related to personnel management, while scale-intensive and specialized suppliers focus on goal-setting. On the other hand, supplier-dominated firms underperform in management practices.

JEL Code: C38, L60, M11, M12
Keywords: management practices; manufacturing SMEs; factor analysis

*Corresponding author.
E-mail address: adriana.becerril@hotmail.com (A. Becerril Gutiérrez).
Peer Review under the responsibility of Universidad Nacional Autónoma de México.

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

Resumen

El objetivo de este documento es determinar, desde un enfoque contingente, la importancia que tienen diferentes tipos de prácticas administrativas clave (monitoreo del desempeño, establecimiento de objetivos y manejo de personal) en las Pymes manufactureras mexicanas en los años 2015 y 2018 tomando en cuenta las trayectorias tecnológicas. Para ello, se construye un índice mediante un Análisis Factorial Exploratorio (AFE) empleando 16 preguntas de la Encuesta Nacional sobre Productividad y Competitividad de las Micro, Pequeñas y Medianas Empresas (ENAPROCE) de 2015 y 2018. Posteriormente se revisan los resultados diferenciando a las empresas por principal producto elaborado y por las cuatro trayectorias tecnológicas de la taxonomía de Pavitt (1984). Los resultados muestran evidencia de que las empresas basadas en la ciencia se caracterizan por obtener una puntuación mayor en las prácticas relacionadas con el manejo de personal, mientras que las intensivas en escala y las de oferentes especializados se enfocan en el establecimiento de objetivos. Por otro lado, las empresas dominadas por el proveedor presentan un bajo desempeño de las prácticas administrativas.

Código JEL: C38, L60, M11, M12
Palabras clave: prácticas administrativas; pymes manufactureras; análisis factorial

Introduction

The manufacturing sector plays a central role in explaining economic growth and development because, based on Kaldor's (1957 and 1966) arguments, it is defined as being dynamic, innovative, employing high levels of technology, requiring highly skilled personnel, producing positive externalities, having increasing returns, and exhibiting forward and backward linkages with other sectors (De Jesús-Almonte et al., 2021; Rendón-Rojas & Mejía-Reyes, 2015; Sánchez & Moreno, 2016).

From this perspective, it has been argued that the high growth in the Mexican economy during the period of import-substitution industrialization can be explained by the sustained expansion of the manufacturing sector (Sánchez & Moreno, 2016). In contrast, the relative stagnation of domestic production observed over the last forty years can be associated with the tertiarization of the economy and the slowdown in the manufacturing sector, as its share of gross domestic product (GDP) fell from 23.0% in 1981 to 16.0% in 2021 (INEGI, 2022a; De Maria y Campos, 2019). Therefore, some authors, such as Sánchez and Moreno (2016) and De Maria y Campos (2019), have emphasized that to promote sustained economic growth, it is crucial to implement an industrial policy that encourages a high-value-added industry characterized by high levels of science, technology, and innovation.

Moreover, in addition to the slowdown in the manufacturing sector, there has been considerable heterogeneity in performance by company size in recent years, with large companies accounting for 75.5% of value added and 94.9% of exports, despite representing only 0.8% of the total number of economic units (INEGI, 2022b). In contrast, micro, small, and medium-sized enterprises, despite their high presence in the economy and employment, have maintained very low levels of value added and exports, indicative of low performance, as generally measured by productivity. In fact, the literature shows that SMEs are, on average, less productive than large companies. For example, CEPAL (2016) reports that the productivity of large manufacturing companies is 7.0% and 5.0% higher than that of small and medium-sized companies, respectively.

Therefore, recognizing the importance of manufacturing SMEs as significant generators of employment that can contribute to inclusive economic growth, various aspects of their performance have been studied in international and national literature. Consequently, based on Marchese et al. (2019) and Owalla et al. (2021), the factors that influence their dynamics can be classified into external and internal factors. The former are exogenous to the operation of companies but affect their performance; these include institutional infrastructure, physical infrastructure, economic competition, production structure, foreign trade, and macroeconomic stability, among others. The latter are those over which the company has influence, such as administrative policies, organizational environment and capabilities, investments in research and development (R&D), and innovation, among others.

In the specific case of Mexico, there is extensive literature analyzing the role of exogenous factors in the performance of manufacturing companies. In particular, it has been found that certain aspects of the Mexican context, such as informality (Busso et al., 2012; Hanson, 2010; Hernández, 2013; Hernández, 2015; Levy, 2008; Pagés, 2010), the social security and protection model (Pagés, 2010; Levy, 2008), high production costs (Hernández, 2015), and some other aspects, such as lack of credit and complex and inefficient tax systems (Pagés, 2010), generate poor business performance. Nevertheless, these external factors do not fully explain the differences in business performance by size. Therefore, it is essential to examine the issue from a different perspective, considering the internal functioning of organizations.

To this end, the availability of increasingly detailed data on business operations has sparked interest in analyzing management practices and determining their impact on business performance. Management practices are defined as actions taken by management that involve intervention in the organization and produce desired effects or results (Barreto, 2010). Therefore, management practices can refer to explicit, measurable routines that guide employees' daily work, such as monitoring performance indicators and meeting objectives, as well as to those of a more strategic nature, including accounting, advertising, planning, mergers and acquisitions, and leadership, among others.

Under this definition, the role of management measures in enhancing business efficiency has been highlighted, as they aim to reorganize production factors to improve efficiency (Quinn & Scur, 2021). In this sense, they can be considered a type of technology (Bloom et al., 2016). In fact, empirical evidence shows a positive correlation between management practices and business performance, measured in terms of productivity (Bloom et al., 2014), size, profitability, and innovation (Bloom et al., 2022), as well as worker well-being (Scur et al., 2021).

To understand the relation between management practices and business performance in the context of Mexican manufacturing SMEs, it is essential to have a more detailed understanding of management practices. Among the analyses that have been carried out are the studies by Calderon et al. (2013) and Bruhn et al. (2012), who conducted randomized controlled trials in Mexican communities, and Bloom et al. (2019, 2022), who used data from ENAPROCE (Spanish: Encuesta Nacional sobre Productividad y Competitividad de las Micro, Pequeñas y Medianas Empresas) 2015 and 2018. The common denominator of these studies is that they find a positive relation between management practices and business performance, and they also reveal great heterogeneity in the adoption of the former. Nevertheless, the results tend to be generalized statements that ignore the particularities of each company, as the cause of the heterogeneity found is not explained.

It is therefore essential to clarify the differences in the adoption of management practices, given the divergence within Mexican manufacturing SMEs. Of the 32 055 economic units reported in the 2019 Economic Census, 35.3% are concentrated in the food industry subsector, accounting for only 14.2% of added value. In contrast, the subsector of transportation equipment manufacturing, which represents 0.6% of economic units, accounts for 31.4% of added value (INEGI, 2022b).

The international literature has sought to explain the heterogeneity in the adoption of management practices across and within countries. Authors such as Bloom and Van Reenen (2007), Bloom et al. (2014), and Marchese et al. (2019) state that although the adoption of good management practices is desirable for all companies, it does not always occur, largely due to circumstantial factors such as the degree of technological advancement. In particular, a higher level of technology means companies tend to automate their processes and hire more qualified personnel, so the adoption of their management practices will contrast with those of companies with a low level of technology, where less qualified personnel predominate in routine, high-volume activities.

Therefore, the objective of this document is to determine, based on contingency theory, the importance of different types of key management practices (performance monitoring, goal setting, and personnel management) in Mexican manufacturing SMEs in 2015 and 2018, considering technological trajectories according to the taxonomy proposed by Pavitt (1984) (science-based, scale-intensive, specialized suppliers, and supplier-dominated). To achieve this objective, an index is constructed using Exploratory Factor Analysis (EFA), which, unlike an unweighted average, identifies the most relevant variables from a set of variables and detects those that provide little information or are redundant. Subsequently, an analysis is performed, differentiating by the main product manufactured and by technological trajectory.

This document is divided into four additional sections. The first section reviews the literature and analyzes management practices from a contingency theory perspective. The second section provides a contextual analysis that describes some characteristics of manufacturing SMEs, based on data from the

2019 Economic Census and the 2018 ENAPROCE. The third section describes the methodology used to calculate the index. The fourth section presents the results, which are differentiated by product and categorized according to Pavitt's (1984) taxonomy. Finally, the main conclusions are presented.

Management practices using contingency theory

To explain the differences in the adoption of management practices among Mexican manufacturing SMEs, this section presents the main determinants of their adoption. First, those synthesized by Bloom and Van Reenen (2007, 2010) that relate to companies' context and characteristics are described. Subsequently, recognizing that in the Mexican case, these determinants would not be sufficient to explain the heterogeneity of management practices, it is proposed to conduct the analysis using contingency theory. The basic principles of this theory are presented, and the role of technological characteristics as a contingency variable is highlighted. Finally, Pavitt's (1984) taxonomy is described as a tool that can support business differentiation based on technological characteristics.

Bloom and Van Reenen (2007, 2010) compile their main determinants of management practices, including competition in the product market, labor regulation, multinational status, family ownership, and education, to explain the variation in these practices between and within countries. They basically argue that: 1) competition in the product market will force companies to adopt better management practices and eliminate poorly managed companies; 2) excessive labor regulation will limit managers' ability to adopt best policies related to personnel management; 3) multinational companies have better policies because the best-managed companies are more likely to become multinationals and because they tend to export their best policies; 4) primogeniture in family businesses can lead to poor management practices, as CEOs are promoted based on family ties rather than talent; and 5) higher levels of education are associated with best management practices because people are more likely to be aware of the benefits of implementing them.

Although the listed determinants are relevant for understanding the differences in the adoption of good management practices, it is essential to acknowledge that Mexican manufacturing SMEs face a series of common conditions, as described in the following section. This suggests that the differences observed could be explained by a factor that leads companies to adopt management practices tailored to their circumstances, which motivates an analysis using contingency theory.

Contingency theory (Perrow, 1967; Thompson, 1967; Woodward, 1965) posits that an organization operates according to its internal or external circumstances, diverging from the ideal-type approach that establishes a definition of what is universally applicable. Therefore, it is not possible to assert that all management practices are equally important and that it is desirable to adopt all of them.

Nonetheless, it can be asserted that, under similar circumstances, companies will develop specific management practices that lead to greater efficiency. This approach is found in the works of Bloom and Van Reenen (2007), Bloom et al. (2014), and Marchese et al. (2019).

Specifically, Bloom and Van Reenen (2007), when measuring management practices focused on performance monitoring, goal setting, and personnel management, found that the adoption of management practices will depend on the balance between costs and expected benefits, agency problems generated by the gap between the interests of shareholders and managers[1] and the heterogeneity of companies.

Meanwhile, Marchese et al. (2019) note that management practices may be irrelevant in traditional, low-tech markets, as these markets face an extremely competitive environment in which the source of competitive advantage lies in low prices, thereby creating little incentive to implement such measures. In contrast, in high-tech environments, management practices are more relevant, as these companies require entrepreneurs and workers to develop new skills to grow.

Likewise, Bloom and Van Reenen (2007) and Bloom et al. (2014) acknowledge that it cannot be said with certainty that one measure is superior to another, as each company employs the measures that best suit its unique environment. Specifically, the most innovative companies with the most human capital generally focus on staff incentives, while companies that are more intensive in physical capital focus more on monitoring measures and objectives.

Contingency theorists generally consider the organization's environment, size, and strategy as contingency variables. Nevertheless, the technological characteristics of companies have become a critical contingency factor. Similarly, various taxonomies have been identified in the literature to categorize companies based on their technological characteristics. Among these, Pavitt's (1984) proposal stands out. Following Woodward's (1965) conceptual framework, Pavitt reduces the wide diversity of companies, defined by size, industry, and type of innovation, into four technological trajectories: supplier-dominated, scale-intensive, specialized supplier, and science-based companies.

The first focuses on traditional activities based on the use of natural resources; its source of innovation comes mainly from equipment and material suppliers, so the appropriation of technological advantages is limited. The second refers to industries where economies of scale are relevant, i.e., those that produce standard materials (raw materials) and durable consumer goods. In this case, innovation can come from within, by creating specialized departments, or from outside, by creating a symbiotic relation with specialized suppliers. The third refers to small, specialized companies that supply equipment and instruments to other companies. There is generally a symbiotic relation between mass production companies and their specialized equipment suppliers, with the former providing operational expertise,

[1] The latter may not be interested in adopting good management practices due to the effort involved.

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

testing facilities, and even design and development resources to specialized equipment suppliers, while the latter provide knowledge and experience. The fourth refers to companies that use advanced technology and conduct research and development; they are generally encouraged to appropriate innovations through patents and tacit knowledge.

Table 1 presents Pavitt's (1984) technological trajectories, as classified by Dutrénit and Capdevielle (1993), which categorize SMEs based on their primary products[2]. In general, products from supplier-dominated companies include minerals, food, beverages, textiles, clothing, leather, leather products, footwear, wood, wood products, furniture, and paper. Those corresponding to scale-intensive companies include the manufacture of paper, basic chemicals, glass, basic metals, machinery and electrical appliances, radio, television, and communications equipment and devices, as well as transportation equipment. As for specialized suppliers, they are linked to the production of general-purpose and special-purpose machinery, as well as medical devices and optical and precision instruments. Science-based companies are related to other chemical products (predominantly pharmaceuticals) and office, accounting, and computer machinery.

Table 1
Pavitt's taxonomy (1984), according to the main products produced

Technological trajectory	Product code and name
Dominated by the supplier	(11) coal, lignite, and peat, (12) crude oil and natural gas, (13) uranium and thorium ores, (14) metallic ores, (15) stone, sand, and clay, (16) other minerals, (17) electricity, gas, steam, and hot water, (18) water, (21) meat, fish, fruit, vegetables, oils, and fats, (22) dairy products, (23) cereal milling products, starches, starch products, and other food products, (24) beverages, (25) tobacco products, (26) textile yarns, threads, and fabrics, (27) textile articles other than clothing, (28) knitted or crocheted fabrics and clothing, (29) leather, leather products, and footwear, (31) wood, cork, straw, and plaiting materials, and (38) furniture
Intensive in scale	(32) pulp, paper, paper products, printed matter, and related items, (33) coke oven products, refined petroleum products, and nuclear fuel, (34) basic chemicals, (36) rubber and plastic products, (37) glass, glass products, and other non-metallic products, (39) waste or scrap, (41) basic metals, (42) metal products, except machinery and equipment, (46) electrical machinery and equipment, (47) radio, television, and communications equipment and devices, and (49) transportation equipment.
From specialized suppliers	(43) general-purpose machinery, (44) special-purpose machinery, and (48) medical devices, optical and precision instruments
Based on science	(35) other chemical products, and (45) office, accounting, and computer equipment

Source: created based on Dutrénit and Capdevielle (1993) and the Central Product Classification version 1.1 issued by the United Nations Statistical Commission (2002).

[2] The classification was based on the three main products manufactured by the company, which are variables reported in ENAPROCE and coded according to the Central Product Classification version 1.1 issued by the United Nations Statistical Commission (2002).

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

Although the taxonomy proposed by Pavitt (1984) has received various criticisms[3], such as classifying by industry rather than by company, leading to some companies that manufacture a similar product but with completely different technologies being classified in the same way[4], it is one of the best known and most widely accepted, as well as offering a suitable classification for contingency analysis (Souitaris, 2002).

Characteristics of Mexican manufacturing SMEs

Mexican manufacturing SMEs exhibit distinct characteristics due to a series of structural and functional deficiencies that have hindered their performance. To inform readers about the current state of these companies, statistics on variables of interest are provided, based on the latest data from the Economic Census and ENAPROCE.

The 2019 Economic Census recorded 32 055 economic units classified as SMEs in the manufacturing sector, representing 0.7% of the national total. They also employ 1 460 011 workers, equivalent to 5.4% of the national total, and their gross census value added amounts to 679 308.1 million pesos, representing 6.8% (INEGI, 2022b).

Likewise, according to data from ENAPROCE 2018[5] (INEGI, 2022c), of the total number of manufacturing SMEs (which in this case amounts to 30 605 units[6]), only 5.8% have foreign capital participation; in 38.6% of cases, the manager or CEO makes the decisions; 8.9% are suppliers to a foreign or multinational company; 5.9% are integrated into a production chain; 9.5% had access to sources of financing; and 14.6% provided training. Regarding the educational level of their workers, 3.4% have no education, 59.2% have basic education, 23.9% have upper secondary education, and 13.5% have higher education. In terms of variables related to innovation, 10.2% of companies registered or applied for patents or trademarks, 25.1% had some form of certification, and 16.8% introduced product, process, organizational, or marketing innovations to the market.

Additionally, poor management practices persist across performance monitoring, goal setting, and personnel management. Regarding performance monitoring measures, it was found that although considerable effort is being made to adopt best practices, the score remains divided. Specifically, 65.4% of companies responded to problems that arose in the production process, but only 13.3% implemented a

[3] Other criticisms are listed in Archibugi (2001).
[4] One example is the footwear industry, since although various companies may use traditional technology, depending on their main production, they may have a very different technological base (Morales et al., 2018).
[5] In some cases, the percentage provided for SMEs includes data from microenterprises because it is not reported separately.
[6] Since it is based on the National Statistical Framework of Economic Units (MENUE), based on the Mexican Business Statistics Registry (RENEM) and updated to the third quarter of 2017.

continuous improvement process to prevent similar problems. On the other hand, 60.3% of companies did not monitor key performance indicators, and most companies that did monitor indicators reported reviewing only one or two indicators per month.

Regarding objective setting, 28.9% of companies did not have production objectives, and those that did focused mainly on short-run objectives (less than 1 year). Additionally, 25.4% of companies with production objectives reported that all managers and most workers in the production area were aware of them.

In terms of personnel management, 54.9% of companies do not promote non-managers, and 67.4% do not promote managers. Likewise, 76.7% of companies rarely or never reassign or dismiss a non-manager when they perform poorly, and this percentage rises to 82.9% for managers.

Calculation of the management practices index

To perform a comprehensive contingency analysis of management practices in Mexican manufacturing SMEs, an index is calculated from 16 ENAPROCE questions. Its construction is described in detail below, including the source of information, sample selection and cleaning, and the empirical methodology.

Source of information

To understand the breadth of what measuring management practices entails and to generalize beyond case studies, the work of Bloom and Van Reenen (2007, 2010) stands out. The authors developed instruments to evaluate management practices in various countries and contexts. These instruments are based on explicit, formal, frequent, and specific policies related to performance monitoring, goal setting, and personnel management (Bloom et al., 2019); consequently, they are more easily measurable. The instruments are: the World Management Survey (WMS) and the Management and Organizational Practices Survey (MOPS), which evaluated these areas in US companies using closed-ended questions.

The MOPS has been significant because it has been implemented in Australia, China, Colombia, Denmark, Finland, Germany, Japan, the Netherlands, Pakistan, the United Kingdom, and Mexico (Scur et al., 2021). In Mexico, INEGI (Spanish: Instituto Nacional de Estadística y Geografía) conducted the ENAPROCE survey in 2015 and 2018, which included some questions that were exact copies of the 2010 and 2015 MOPS in the United States (Bloom et al., 2019).

Based on the above, the data used in this research were obtained from ENAPROCE, an INEGI study conducted in 2015 and 2018 to gain an in-depth understanding of some characteristics of manufacturing SMEs. The 2015 survey collects data from 2014 and 2013, depending on the type of question, as well as from the start of the company or the interview (June-July 2015). Likewise, the 2018 survey does the same for 2017 and 2016, depending on the type of question, and also from the start of the company or the interview (October-November 2018). Additionally, this survey comprises eighty-five questions, divided into twelve sections covering various topics. For this research, 16 questions are used: five related to performance monitoring, three to goal setting, and eight to personnel management, as shown in Table 2.

Table 2
ENAPROCE questions related to management practices

Category	Question number	Definition
Performance monitoring	PA1	What happens when a problem arises?
	PA2	Number of key performance indicators (KPIs)
	PA3	Frequency with which managers reviewed KPIs
	PA4	Frequency with which non-managers reviewed KPIs
	PA5	Location of scoreboards
Goal setting	PA6	Description of the objectives calendar
	PA7	Difficulty in achieving objectives
	PA8	Knowledge of operational objectives
Personnel management	PA9	What are non-manager performance bonuses based on?
	PA10	Percentage of non-managers receiving performance bonuses
	PA11	What are managers' performance bonuses based on?
	PA12	Percentage of managers receiving performance bonuses
	PA13	Promotion criteria for non-managers
	PA14	Promotion criteria for managers
	PA15	When is a non-manager with poor performance reassigned or dismissed?
	PA16	When is a poorly performing manager reassigned or dismissed?

Source: based on ENAPROCE 2015 and 2018.

Following the approach of Bloom et al. (2019), questions are normalized so that best policies receive a score of 1, worst policies receive a score of 0, and companies that report partial performance in their policies receive an intermediate score[7].

Sample selection and cleaning

The 2015 ENAPROCE sample was obtained by considering the companies registered in the Directory of Timely Results of the 2014 Economic Censuses, while the 2018 ENAPROCE sample was based on the National Statistical Framework of Economic Units (MENUE; Spanish: Marco Estadístico Nacional de

[7] See the appendix to Bloom et al. (2019) for more details on the normalization of responses.

Unidades Económicas) based on the Statistical Registry of Businesses in Mexico (RENEM; Spanish: Registro Estadístico de Negocios de Mexico) updated to the third quarter of 2017.

To ensure the companies were statistically representative, they were stratified by size, sector, and state, and a simple random sample was selected within each stratum. Company size was classified as micro, small, medium, or large, based on the number of employees and total revenue. The sector of activity was based on SCIAN 2013, which includes manufacturing, trade, and private non-financial services. The state refers to the company's location.

To illustrate, for ENAPROCE 2018, 180 aggregations were obtained by combining the 16 strategic sectors and the 32 states. The sample size was calculated based on the stratum size, the desired confidence level, and the acceptable sampling error. In both surveys, a 95.0% confidence level and an expected non-response rate of 15.0% were considered. The 2015 survey used a relative error of 10.0%, and the 2018 survey used an error of 8.0%. Thus, the sample size of the 2015 ENAPROCE for SMEs in the manufacturing sector was 4 224 economic units, and that of 2018 was 4 131 units.

Based on the ENAPROCE data, it was necessary to refine the sample to obtain consistent results. To this end, companies were eliminated that: 1) did not report the product they manufactured or the strategic sector to which they belonged (262 companies in 2018), 2) were engaged in trade or services (173 companies in 2015 and 158 companies in 2018), and 3) did not provide scores for more than 10 questions referred to in ENAPROCE (883 companies in 2015 and 811 in 2018). The purging resulted in samples of 3 168 companies for 2015 and 2 900 for 2018.

Empirical methodology for index calculation

To construct the management practices index, EFA[8] is used to reduce the 16 ENAPROCE questions related to management practices (which may be difficult to understand and describe) to a certain number of common factors, replacing the original variables with minimal loss of information.

Basically, EFA expresses the observed variables as a function of both common and specific unobserved factors. In mathematical terms, it seeks to explain p observable variables $X_1, X_2, \dots X_p$ as a linear combination of $k \leq p$ common factors $F_1, F_2, \dots F_k$ and a single factor for each variable $e_1, e_2, \dots e_p$. Additionally, l_{jh} corresponds to the factor loading of variable j in factor h. It can be expressed in matrix form:

[8] For more details on the use and application of EFA, it is recommended to consult Hayes (2022) and Kline (2023).

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_p \end{bmatrix}_{px1} = \begin{bmatrix} l_{11} & l_{12} & \cdots & l_{1k} \\ l_{21} & l_{22} & & l_{2k} \\ \vdots & & \ddots & \vdots \\ l_{p1} & l_{p2} & \cdots & l_{pk} \end{bmatrix}_{pxk} \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_k \end{bmatrix}_{kx1} + \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_p \end{bmatrix}_{px1}$$

(1)

In short, this means that:

$$X_{px1} = L_{pxk}F_{kx1} + e_{px1}$$

(2)

Therefore, the problem to be solved by the FA consists of estimating the coefficients l_jh for j=1,…,p variables and h=1,…,k factors of the factorial matrix L, which are called estimated factor loadings.

Considering that the main purpose of FA is to explain the greatest variability present in the original variables with a minimum number of factors, it is important to identify the variance of variable X. To do this, EFA assumes that the common factors are standardized variables that are not correlated with each other. Therefore: 1) the covariance matrix of the common factors corresponds to the identity matrix E(FF^')=I, and 2) the expectation of the common factor vector is a null vector E(F)=0. This implies that the variance of each variable is decomposed into two parts: the communality, which is the variance explained by the common factors, and the specificity, which is the specific variance of each variable[9]. In mathematical terms, the variance of variable X can be expressed as:

$$V_j = l_{j1}^2 + l_{j2}^2 + \cdots l_{jp}^2 + \varpi_j^2 \qquad \text{j=1…p}$$

(3)

where $l_{j1}^2 + l_{j2}^2 + \cdots l_{jp}^2$ corresponds to the variance explained by the common factors, known as communality, and ϖ_j^2 represents the specific variance of each variable, known as specificity.

As suggested in Figure 1, to carry out the EFA, it is necessary, in principle, to perform reliability and validity tests to ensure the viability of the analysis; subsequently, if the result is positive, factor extraction is performed; then, the number of factors to be considered is determined; then, orthogonal rotation methods are applied to facilitate the interpretation of the factor matrices; finally, the factor scores are estimated and the index is constructed in which the weights assigned to each factor correspond to the proportion of variance in the data matrix (Martínez & Sepúlveda, 2012; Peón & Pérez, 2015; Pérez, 2004).

[9] To see the complete procedure, see Pérez (2004).

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

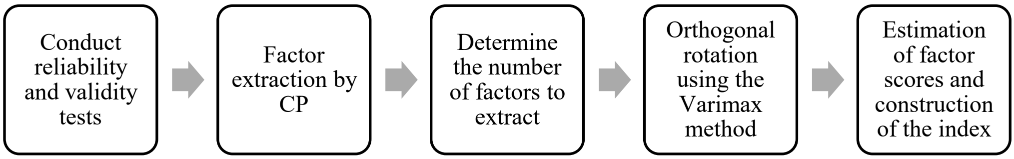

Figure 1. Process for obtaining the index.
Source: created based on the empirical methodology described.

In this study, three tests were applied to assess the reliability and validity of the data. These tests were: visual analysis of the correlation matrix, Bartlett's sphericity test, and the Kaiser-Meyer-Olkin (KMO) sample adequacy measure. Factor extraction aims to obtain the factors that explain the greatest variability in the original data; therefore, the principal component extraction method, which maximizes variance, was applied.

To determine the number of factors to be used, the criteria of eigenvalue, sedimentation, and percentage of variance were considered. Subsequently, factor rotation was performed, the sole purpose of which was to facilitate the interpretation of the factor matrices without altering the explained variance. In this research, Varimax orthogonal rotation was used to ensure that the factors were uncorrelated. Finally, the factor scores were estimated using the regression method and obtained by weighted averages.

Applying the FA to the 16 questions of the ENAPROCE in 2015 and 2018, it was determined that the technique was viable because a positive result was obtained in the aforementioned reliability and validity tests: 1) the determinant of the correlation matrix is close to 0, indicating that there is a high linear dependence between the variables, i.e., there is redundant information that can be grouped into factors; 2) Bartlett's sphericity test rejects the null hypothesis that the correlation matrix is an identity matrix, which means that there are sufficient significant correlations between the variables to conduct FA; and 3) the KMO statistic measures the degree of suitability of the data for FA by comparing the magnitudes of the observed correlations with the partial correlations. A KMO value between 0.5 and 1 indicates that PCA is appropriate (Suárez, 2007). In this case, the KMO values of 0.637 for 2015 and 0.647 for 2018 are acceptable.

Once the factors were extracted using the principal component extraction method and the three selection criteria[10] were applied, it was determined that six factors should be retained for the 2015 sample

[10] In relation to the variance percentage criterion, factors explaining at least 65% of the total variance were retained. In this regard, there is no established percentage to meet this criterion; nonetheless, authors such as Hair et al. (2010) establish a minimum of 60%.

and five for the 2018 sample. Figure 2 shows the sedimentation graphs for the two samples, and Table 3 shows the results of the factor extraction.

The KMO sample adequacy measure compares the magnitudes of the partial correlation coefficients to those of the correlation coefficients.

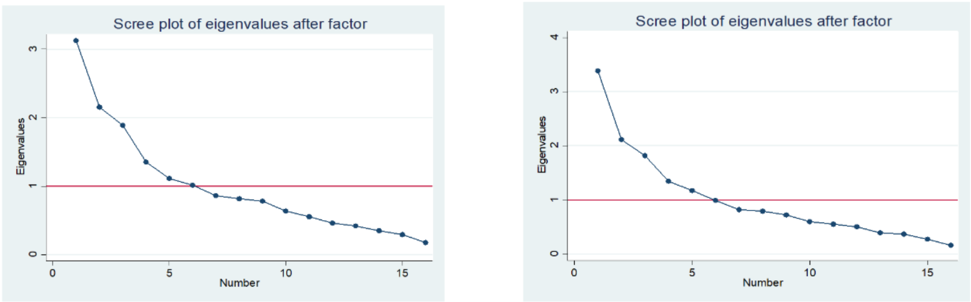

Figure 2. Sedimentation graphs.
Source: created using data from ENAPROCE 2015 and 2018.

Table 3
Results of factor extraction using the principal component extraction method from the 2015 and 2018 samples

	2015		
Factor	Intrinsic value	Ratio	Cumulative
Factor 1	3.1266	0.1954	0.1954
Factor 2	2.1568	0.1348	0.3302
Factor 3	1.8888	0.1181	0.4483
Factor 4	1.3543	0.0846	0.5329
Factor 5	1.1114	0.0695	0.6024
Factor 6	1.0162	0.0635	0.6659
	2018		
Factor 1	3.3840	0.2115	0.2115
Factor 2	2.1117	0.1320	0.3435
Factor 3	1.8180	0.1136	0.4571
Factor 4	1.3462	0.0841	0.5412
Factor 5	1.1726	0.0733	0.6145
Factor 6	0.9874	0.0617	0.6762

Source: created using data from ENAPROCE 2015 and 2018

After rotating the factors, it was found that the first factor depends on questions about return bonuses, the second on questions about key performance indicators, and the third on questions about reassignment or dismissal for poor performance. The following factors vary depending on the sample. In 2015, the fourth factor relates to promotion criteria, the fifth to questions about company objectives, actions in response to problems, and the location of scorecards, and the sixth to the difficulty of achieving objectives. In 2018, the fourth factor concerns certain questions about company objectives, and the fifth concerns the remaining questions.

These differences in the latter factors may be due to changes in organizational culture. In 2015, the culture may have been more individualistic and focused on promotion and recognition. In 2018, the culture may have been more collaborative and focused on company objectives. Subsequently, the factor scores were estimated, and a weighted-average index was created. To obtain the weighting assigned to each factor, the variance explained by each factor is redistributed. The result of this distribution is presented in Table 4.

Table 4
Proportion of variance explained by each factor and factor weighting of the 2015 and 2018 samples

Factor	Proportion of variance explained	Cumulative variance ratio	Weighting
	2015		
Factor 1	0.1701	0.1701	0.2554
Factor 2	0.1192	0.2892	0.1790
Factor 3	0.1067	0.3959	0.1602
Factor 4	0.1032	0.4991	0.1550
Factor 5	0.102	0.6011	0.1532
Factor 6	0.0648	0.6659	0.0973
	2018		
Factor 1	0.1721	0.1721	0.2801
Factor 2	0.1197	0.2918	0.1948
Factor 3	0.1095	0.4013	0.1782
Factor 4	0.1081	0.5094	0.1759
Factor 5	0.1051	0.6145	0.1710

Source: created using data from ENAPROCE 2015 and 2018

Once the factors have been estimated and their respective weights obtained, the management practices index (API) is calculated as follows:

$$\mathrm{IPA}_{15} = 0.2554\mathrm{f}_{1,15} + 0.1790\mathrm{f}_{2,15} + 0.1602\mathrm{f}_{3,15} + 0.1550\mathrm{f}_{4,15} + 0.1532\mathrm{f}_{5,15} + 0.0973\mathrm{f}_{6,15} \tag{4}$$

$$\mathrm{IPA}_{18} = 0.2801\mathrm{f}_{1,18} + 0.1948\mathrm{f}_{2,18} + 0.1782\mathrm{f}_{3,18} + 0.1759\mathrm{f}_{4,18} + 0.1710\mathrm{f}_{5,18} \tag{5}$$

Finally, for comparative and presentation purposes, the index is rescaled to range from 0 (lowest performance) to 1 (best performance). In mathematical terms, based on Peón and Pérez (2015), the adjustment consisted of:

$$\mathrm{IPAs_i} = \frac{\mathrm{IPA_i} - \min(\mathrm{IPA_i})}{\max(\mathrm{IPA_i}) - \min(\mathrm{IPA_i})} \tag{6}$$

Results obtained

The management practices index measures the degree of adoption of basic and core strategies for the smooth running of businesses, such as performance monitoring, setting challenging goals, and personnel management. Table 5 presents the calculation of this index for manufacturing SMEs in Mexico for 2015 and 2018. In general, the results are similar to those of Bloom *et al*. (2022), who, when calculating the index using unweighted averages, obtain means of 0.462 and 0.474 for the same years. This convergence in results suggests that Mexican companies score low in the implementation of management practices.

In comparison, Bloom *et al*. (2019) calculated the index for a sample of 35 000 manufacturing companies in the United States in 2010 and 2015, obtaining a score of 0.615. In addition, Bloom *et al*. (2012) compared the index between countries on a scale of 0 to 5 and found that countries such as the United States, Canada, and Australia had scores of 3.35, 3.17, and 3.02, respectively, while Mexico obtained a score of 2.92. Mexico's low score on the management practices index, compared to other countries, suggests a lag in adopting key strategies for competitiveness and business growth. This result suggests that Mexican SMEs may be missing out on opportunities to enhance their productivity, efficiency, and profitability.

Table 5
Overall results of the management practices index for the 2015 and 2018 samples

Sample	# Companies	Mean	Std. Deviation	Performance monitoring	Goal setting	Personnel management
2015	3 168	0.455	0.188	0.526	0.627	0.371
2018	2 900	0.422	0.196	0.521	0.623	0.398

Source: created using data from ENAPROCE 2015 and 2018

Table 5 presents the results categorized by policy type. The first corresponds to policies related to performance monitoring, which refers to a company's ability to control its internal operations and use this control to drive continuous improvement. The second relates to how companies set the right objectives. The third relates to personnel management, which tracks how a company promotes and rewards its employees based on their performance.

The data indicate that Mexican manufacturing SMEs score moderately on management practices focused on setting objectives and monitoring performance, suggesting they have a clear vision of what they want to achieve and how to measure their progress, but they still have opportunities to improve the implementation and monitoring of their plans. Nonetheless, they score remarkably low on personnel management policies, indicating a lack of effective systems to attract, motivate, and retain human talent, which, in turn, affects their competitiveness and productivity. To this end, it would be desirable for Mexican manufacturing SMEs to adopt best practices in human resource management, such as performance evaluation, continuous training, employee participation, and recognition of achievements, to raise the national average.

Thus, Negrón (2020) found strong relations between the impact of human resource management and people's productivity, providing evidence for paying special attention to human resource management. Through an EFA, Jaimes, Luzardo, and Rojas (2018) determined that group behavior factors (participation, conflict management, organizational culture, leadership, and training and development) and social environment factors in the workplace (motivation, job satisfaction, cohesion, and organizational climate) explain 62.3% of the variability in the human dimension of labor productivity.

Likewise, standard deviations of 0.188 and 0.196 were presented for 2015 and 2018, respectively. Therefore, when comparing these data with the standard deviation of 0.152 reported by Bloom et al. (2022) for the United States, a greater dispersion in the adoption of management practices is observed in the Mexican case, thereby denoting the heterogeneity mentioned at the beginning.

McKenzie and Woodruff (2017) demonstrated that variation in business policies explains differences in sales, profits, and labor productivity in both microenterprises and larger firms. Furthermore, they found that the best business policies are associated with higher survival rates and faster sales growth in Sri Lanka, Kenya, and Nigeria. The authors concluded that a one-standard-deviation improvement in business policies is associated with a 43.0% increase in labor productivity and a 25.0% increase in TFP.

Tables 6 and 7 present the companies classified by product, with the highest and lowest index scores in the 2015 and 2018 samples. The companies that consistently obtained the best scores for management practices in both years are those related to creating transportation equipment, as well as radio, television, and communications equipment and devices, which were characterized by above-average scores in all three areas of management practices. In contrast, companies engaged in yarn, thread, and textile production showed notably low levels across all three types of practices in both years.

Table 6
Results of the management practices index by product created from the 2015 sample

Location	Product created	# Companies	Index mean	Performance monitoring	Goal setting	Personnel management
1	Transportation equipment	166	0.524	0.582	0.708	0.424
2	Waste or scrap	10	0.520	0.593	0.636	0.383
3	Radio, television, and communications equipment and devices	36	0.513	0.566	0.688	0.431

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

Location	Product created	# Companies	Index mean	Performance monitoring	Goal setting	Personnel management
4	Electrical machinery and equipment	77	0.510	0.607	0.680	0.393
5	Dairy products	42	0.499	0.516	0.593	0.451
24	Stone, sand, and clay	8	0.426	0.452	0.517	0.443
25	Furniture	309	0.424	0.476	0.591	0.366
26	Beverages	16	0.407	0.554	0.623	0.258
27	Office, accounting, and computer equipment	8	0.400	0.578	0.691	0.216
28	Yarns, threads, and textile fabrics	24	0.395	0.490	0.556	0.311
	Total	3 168	0.455	0.526	0.627	0.371

Notes: The data presented correspond to the mean of the indices obtained by companies classified within each technological trajectory.
The total may not add up because the information on tobacco companies has been anonymized in accordance with the confidentiality criteria of the INEGI Microdata Laboratory.
The index score obtained by each type of company was compared with the others according to the following color scale:
Lower Medium Higher
Source: created using data from ENAPROCE 2015

Table 7
Results of the management practices index by product created from the 2018 sample

Location	vs. 2015		Product created	# Companies	Index mean	Performance monitoring	Goal setting	Personnel management
1	↑	2	Radio, television, and communications equipment and devices	36	0.529	0.594	0.702	0.491
2	↑	22	Stone, sand, and clay	5	0.508	0.518	0.461	0.589
3	↓	2	Transportation equipment	153	0.480	0.581	0.691	0.436
4	↑	6	Basic metals	69	0.472	0.560	0.630	0.445
5	↑	8	Rubber and plastic products	119	0.471	0.580	0.664	0.418
26	↓	8	Wood, cork, straw, and plaiting materials products	48	0.389	0.460	0.623	0.389
27	↓	25	Waste or scrap	5	0.385	0.447	0.656	0.420
28		n.a.	Uranium and thorium ores	12	0.384	0.492	0.597	0.368
29	↓	8	Knitted or crocheted fabrics and clothing	173	0.368	0.474	0.611	0.353
30	↓	2	Yarns, threads, and textile fabrics	11	0.335	0.482	0.609	0.287
			Total	2 900	0.422	0.521	0.623	0.398

Notes:

The data presented correspond to the mean of the indices obtained by companies classified within each technological trajectory.
The total may not add up because the information on tobacco companies has been anonymized in accordance with the confidentiality criteria of the INEGI Microdata Laboratory.
The index score obtained by each type of company was compared with the others according to the following color scale:
Lower Medium Higher
n.a.: not applicable
Source: created using data from ENAPROCE 2018

On the other hand, some companies occasionally obtained a good score in one year, but in the next year their score dropped significantly, such as companies engaged in waste or refuse processing[11], which in 2015 ranked second for best management practices due to an outstanding score in the performance monitoring category, while in the other categories they had an average score; nevertheless, in 2018 they fell 27 positions due to a 24.6% reduction in their performance monitoring score.

The above implies that good management practices are adopted jointly, meaning that measures tend to reinforce each other and that a company that performs well in one category will likely perform well in others, consistent with the findings of Athey and Stern (1998). Documenting and sharing management practices within the organization enables it to learn from its past experiences. This knowledge can be transformed into concrete actions, thus strengthening its capacity to improve results and respond more quickly and efficiently to the various changes in the context of SMEs. If measures are not taken to analyze, systematize, and disseminate the knowledge gained through programs and projects, there is a risk that mistakes will be repeated, positive experiences will be overlooked, and opportunities to optimize policies will be lost. Therefore, to achieve better results, policies must necessarily act together, as one alone will not generate lasting change.

In this regard, according to Martínez, Maldonado, and Pinzón (2013), customer orientation, competency orientation, and cross-functional coordination have a positive and significant influence on innovation levels in Mexican manufacturing SMEs. These findings indicate that greater collaboration across departments within the organization and the strategic alignment of management practices significantly enhance the innovative capacity of SMEs. The authors conclude that isolated improvements in a single management practice are insufficient to realize the innovative potential of these companies fully.

Differentiating companies by their technological characteristics, companies are distinguished by exceptional performance in a specific aspect of management practices. For example, the transportation equipment industry, as mentioned in the introduction, is one of the most important among manufacturing

[11] A similar case can be observed in companies that produce stone, sand, and clay.

http://dx.doi.org/10.22201/fca.24488410e.2025.4910

SMEs and is characterized by its scale-intensive nature. Therefore, although its management practices are high in all areas, the establishment of objectives stands out. The analysis in Table 8 provides a more in-depth examination of the results by technological characteristics.

Table 8 shows the results obtained by technological trajectories according to Pavitt's taxonomy (1984). For the 2015 and 2018 samples, it was found that science-based and scale-intensive companies achieved higher management practice scores, while specialized supplier companies achieved average scores, and supplier-dominated companies achieved the lowest scores.

Science-based companies focused on adopting sound personnel management practices, while scale-intensive and specialized suppliers scored higher in goal setting. In addition, supplier-dominated companies performed poorly in all three aspects of management practices. This is consistent with contingency theory, which posits that companies will specialize in certain measures according to the conditions of their environment, particularly their technological trajectory.

Science-based companies, characterized by innovation and greater human capital, perform well across all management practices but score higher in personnel management than other companies. In other words, these types of companies aim to improve their workers' skills and knowledge by incentivizing them through effective policies, such as performance bonuses, clear promotion criteria, and fair procedures for resignation or dismissal in cases of poor performance.

In contrast, scale-intensive and specialized supplier companies, characterized by their intensive use of physical capital and reliance on low-skilled workers, focus on policies related to setting production targets. Thus, economies of scale are crucial for this type of company, so they will focus on increasing their production rather than incentivizing their staff.

As for supplier-dominated companies, which focus on traditional manufacturing activities, they possess mature, widely disseminated technologies, which means that, as Marchese et al. (2019) anticipated, management practices are relatively unimportant. In other words, the source of competitive advantage for these companies lies in offering standardized products at low prices, so there may be little incentive to improve their management practices due to the associated costs.

Table 8
Results of the management practices index by technological trajectories for the 2015 and 2018 samples

Classification	# Companies	Mean	Performance monitoring	Goal setting	Personnel management
		2015			
Based on science	258	0.483	0.558	0.631	0.399
Intensive in scale	1 296	0.467	0.538	0.653	0.378
From specialized suppliers	281	0.460	0.546	0.658	0.360
Supplier-dominated companies	1 333	0.438	0.503	0.595	0.362
Total	3 168	0.455	0.526	0.627	0.371

Classification	# Companies	Mean	Performance monitoring	Goal setting	Personnel management
		2018			
Intensive in scale	1 161	0.440	0.539	0.645	0.410
Based on science	191	0.429	0.510	0.620	0.424
From specialized suppliers	358	0.422	0.535	0.633	0.386
Supplier-dominated companies	1 190	0.403	0.501	0.599	0.385
Total	2 900	0.422	0.521	0.623	0.398

Notes:
The data presented correspond to the mean of the indices obtained by companies classified within each technological trajectory.
The total may not add up because the information on tobacco companies has been anonymized in accordance with the confidentiality criteria of the INEGI Microdata Laboratory.
The index score obtained by each type of company was compared with the others according to the following color scale:
Lower Medium Higher
Source: created using data from ENAPROCE 2015 and 2018

Implementing management practices improves organizational performance. For example, Pérez et al. (2018) observed that SMEs in Sonora with continuous access to technology can maintain better customer relations and increase productivity and competitiveness. Gosnell, List, and Metcalfe (2020) also measured employee productivity using four management practices: performance monitoring, performance feedback, goal setting, and social incentives. They found that these measures, especially monitoring and goal setting, significantly increase employee productivity, resulting in cost savings for the company.

In this research, companies that performed worst in personnel management also performed worst in performance monitoring. These companies were grouped as supplier-dominated, as they have little interest in innovating their products because their competitive advantage lies in reducing costs.

Regarding personnel management, Bandiera et al. (2020) state that differences in productivity among small businesses are due to the hiring of leaders. Companies that hire leaders tend to perform better, and it takes three years for a new CEO to make a relevant impact. In Mexico, management positions in SMEs are filled by family members, which may contribute to poor personnel management practices.

Conclusions

The objective of this document is to determine the importance of different types of key management practices (performance monitoring, goal setting, and personnel management) in Mexican manufacturing SMEs in 2015 and 2018, considering technological trajectories from a contingency approach. To this end, an index was calculated using EFA, and the results were analyzed, differentiating companies by the products they manufactured and their technological trajectories, according to Pavitt's taxonomy (1984).

The management practices analyzed were: performance, setting demanding objectives, and personnel management. The results are consistent with contingency theory, which states that companies will act according to their circumstances, meaning that not all companies will adopt best management practices despite their apparent benefits; instead, they will adopt them rationally. Furthermore, depending on their technological characteristics, they will prefer to adopt certain management practices over others, especially in the short run, based on tacit knowledge.

A relevant finding was the evolution of performance over time. Companies that initially performed better in 2015 experienced a decline in 2018, suggesting that management practices are dynamic and subject to change over time. When analyzing differences between companies, it was observed that those engaged in the production of capital goods and durable consumer goods tended to perform better in goal setting and personnel management. Likewise, science-based and scale-intensive companies showed greater overall adoption of management policies. Nevertheless, despite these advances, Mexican SMEs still have deficiencies in some areas, especially in personnel management. This information suggests that there is considerable room for improvement in human resource management.

Based on these findings, several recommendations can be made. First, it is essential to design customized support programs tailored to each SME's specific characteristics. Second, it is necessary to strengthen entrepreneurs' capacities in key areas such as personnel management, goal setting, and continuous improvement. Additionally, the adoption of continuous improvement models should be encouraged, as they can contribute to improved long-run performance.

Regarding the design of personalized support programs, these must be focused not only on financing but also on training through monitoring, meeting objectives, and proper personnel management, which generates benefits such as reduced staff turnover. Specifically, training focused on increasing the adoption of good management practices may be irrelevant in supplier-dominated companies, as the entrepreneur has no incentive to adopt them.

In contrast, a science-based or scale-intensive company will seek to implement all three types of measures, but will focus particularly on personnel management or goal setting, respectively. In general, there is evidence that business training maintains a strong association between business practices and company performance. Therefore, it is recommended that training courses be comprehensive and consistent to lead to significant changes in business practices, thereby impacting company sales and profits.

The future research agenda should broaden the analysis to a wider set of management practices and deepen its relation with other performance indicators, such as productivity and profitability. It is also necessary to update the survey used in this study to incorporate new variables and reflect changes in the business environment. Conducting longitudinal studies will allow for the analysis of the evolution of management practices over time and their impact on business performance.

Acknowledgments

Thanks to the Microdata Laboratory of the National Institute of Statistics and Geography (INEGI) for facilitating access to ENAPROCE microdata through project LM 2053. The conclusions and opinions expressed in this research are the responsibility of the authors and do not constitute part of the official statistics of the National Statistical and Geographic Information System or INEGI.

References

Archibugi, D. (2001). Pavitt's taxonomy sixteen years on: a review article. Economics of Innovation and New Technology, 10(5), 415-425. http://doi.org/10.1080/10438590100000016

Athey, S. & Stern, S. (1998). An Empirical Framework for Testing Theories About Complementarity in Organizational Design (No. w6600). National Bureau of Economic Research. http://doi.org/10.3386/w6600

Bandiera, O., Hansen, S., Prat, A., and Sadun, R. (2020). CEO behavior and firm performance Journal of Political Economy 128(4), 1325-1369. http://doi.org/10.1086/705331

Barreto Bernal, P.C. (2010). Innovación y administración: Conocimiento Explícito e Implícito en las Prácticas administrativas. Revista Electrónica Fórum Doctoral, 2, 1-22. Disponible en: https://publicaciones.eafit.edu.co/index.php/forum-doctoral/article/view/2765/2574 y consultado: 15/10/2022.

Bloom, N., Brynjolfsson, E., Foster, L., Jarmin, R., Patnaik, M., Saporta-Eksten, I., & Van Reenen, J. (2019). What drives differences in management practices?. American Economic Review, 109(5), 1648-1683. http://doi.org/10.1257/aer.20170491

Bloom, N., & Van Reenen, J. (2007). Measuring and Explaining Management Practices across Firms and Countries. The Quarterly Journal of Economics, 122(4), 1351-1408. http://doi.org/10.1162/qjec.2007.122.4.1351

Bloom, N., & Van Reenen, J. (2010). Why Do Management Practices Differ across Firms and Countries? Journal of Economic Perspectives, 24(1), 203-224. http://doi.org/10.1257/jep.24.1.203

Bloom, N., Genakos, C., Sadun, R., & Van Reenen, J. (2012). Management practices across firms and countries. Academy of management perspectives, 26(1), 12-33. http://doi.org/10.5465/amp.2011.0077

Bloom, N., Iacovone, L., Pereira-López, M., & Van Reenen, J. (2019). Management in Mexico: Market Size, Frictions and Misallocation. Unpublished working paper, Stanford University, Stanford, CA. Disponible en: https://sistemas.colmex.mx/Reportes/LACEALAMES/LACEA-LAMES2019_paper_763.pdf y consultado: 22/10/2022.

Bloom, N., Iacovone, L., Pereira-Lopez, M., & Van Reenen, J. (2022). Management and misallocation in Mexico (No. w29717). National Bureau of Economic Research. http://doi.org/10.3386/w29717

Bloom, N., Lemos, R., Sadun, R., Scur, D., & Van Reenen, J. (2014). JEEA-FBBVA Lecture 2013: The new empirical economics of management. Journal of the European Economic Association, 12(4), 835-876. http://doi.org/10.1111/jeea.12094

Bloom, N., Sadun, R., & Van Reenen, J. (2016). Management as a Technology? (No. w22327). National Bureau of Economic Research. http://doi.org/10.3386/w22327

Bruhn, M., Karlan, D., & Schoar, A. (2012). The Impact of Consulting Services on Small and Medium Enterprises: Evidence from a Randomized Trial in Mexico. Yale University Economic Growth Center Discussion Paper 1010. New Haven: Yale University. http://doi.org/10.1596/1813-9450-6508

Busso, M., Fazio, M. V., & Algazi, S. L. (2012). (In)Formal and (Un)Productive: The Productivity Costs of Excessive Informality in Mexico. SSRN Electronic Journal. http://doi.org/10.2139/ssrn.2207240

Calderon, G., Cunha, J. M., & De Giorgi, G. (2013). Business literacy and development: Evidence from a randomized controlled trial in rural Mexico (No. w19740). National Bureau of Economic Research. http://doi.org/10.3386/w19740

CEPAL. (2016). Productividad y brechas estructurales en México. México: Repositorio CEPAL. Disponible en: https://repositorio.cepal.org/bitstream/handle/11362/40165/1/S1600553_es.pdf y consultado: 16/09/2022.

De Jesús-Almonte, L., Andrés-Rosales, R., & Carbajal-Suárez, Y. (2021). Productividad manufacturera y crecimiento económico en las entidades federativas de México: un análisis de efectos espaciales, 1998-2018. Regiones y Desarrollo Sustentable, 21(41). Disponible en: https://www.researchgate.net/profile/Andres-Rosales/publication/353315993_13productividad_manufacturera/links/60f305160859317dbdedb827/13productividad-manufacturera.pdf y consultado: 16/09/2022.

De Maria y Campos, M. (2002). Pequeñas y medianas empresas industriales y política tecnológica: El caso mexicano de las tres últimas décadas. Naciones Unidas, CEPAL, Unidad de Desarrollo Industrial y Tecnológico, División de Desarrollo Productivo y Empresarial. Disponible en: https://repositorio.cepal.org/bitstream/handle/11362/4508/S026405_es.pdf?sequence=1&isAllowed=y y consultado: 18/09/2022.

Dutrénit, G., & Capdevielle, M. (1993). El perfil tecnológico de la industria mexicana y su dinámica innovadora en la década de los ochenta. El trimestre económico, 60(239 (3), 643-674. Disponible en: http://www.jstor.org/stable/45401609 y consultado: 24/10/2022.

Gosnell, G., List, J., & Metcalfe, R. (2020). The Impact of Management Practices on Employee Productivity: A Field Experiment with Airline Captains. Journal of Political Economy. 128 (4) 1195–1233. http://doi.org/10.1086/705375

Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010). Multivariate data analysis (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Hanson, G. H. (2010). Why Isn't Mexico Rich? Journal of Economic Literature, 48(4), 987-1004. http://doi.org/10.1257/jel.48.4.987

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications.

Hernández Laos, E. (2013). Legislación laboral, sector informal y productividad multifactorial en México. Economía UNAM, 10(28), 5-52. http://doi.org/10.1016/S1665-952X(13)72186-8

Hernández Reyes, F. E. (2015). El crecimiento económico y la productividad en México, 1980-2011. Economía Informa, 391, 96-102. http://doi.org/10.1016/j.ecin.2015.05.008

INEGI (2022a). Banco de Información Económica. Instituto Nacional de Estadística y Geografía. México, INEGI. Recuperado el 7 de septiembre de 2022. Disponible en: https://www.inegi.org.mx/app/indicadores/ y consultado: 10/09/2022.

INEGI (2022b). Censo económico 2019. Instituto Nacional de Estadística y Geografía. México, INEGI. Recuperado el 25 de octubre de 2022. Disponible en: https://www.inegi.org.mx/programas/ce/2019/ y consultado: 10/09/2022.

INEGI (2022c). Encuesta Nacional sobre Productividad y Competitividad de las Micro, Pequeñas y Medianas Empresas (ENAPROCE). Instituto Nacional de Estadística y Geografía. México, INEGI. Recuperado el 4 de noviembre de 2022. Disponible en: https://www.inegi.org.mx/programas/enaproce/ 2018 y consultado: 10/09/2022.

Jaimes, L., Luzardo, M. & Rojas, M. D. (2018). Factores Determinantes de la Productividad Laboral en Pequeñas y Medianas Empresas de Confecciones del Área Metropolitana de Bucaramanga, Colombia, 29(5), 175-186. http://doi.org/10.4067/S0718-07642018000500175

Kaldor, N. (1957). A model of economic growth. Economic Journal, 67(268), 591-624. http://doi.org/10.2307/2227704

Kaldor, N. (1966). Causes of the Slow Rate of Economic Growth of the United Kingdom: An inaugural lecture. London: Cambridge University Press. http://doi.org/10.1017/s0770451800040616

Kline, R. B. (2023). Principles and practice of structural equation modeling. Guilford publications.

Levy, S. (2008), Good Intentions, Bad Outcomes, Washington, D. C., Brookings Institution Press. Disponible en: https://books.google.com.mx/books?hl=es&lr=&id=2qXFY2KiQ34C&oi=fnd&pg=PP1&ots=

s1k3okI_oX&sig=q8kSm7BVnbIapH5-wxoS_ajs-Fg&redir_esc=y#v=onepage&q&f=false y consultado: 22/09/2022.

Marchese, M., Giuliani, E., Salazar-Elena, J. C., & Stone, I. (2019). Enhancing SME productivity: Policy highlights on the role of managerial skills, workforce skills and business linkages. OECD SME and Entrepreneurship Papers, No. 16, OECD Publishing, Paris, http://doi.org/10.1787/825bd8a8-en.

Martínez, M. C., Maldonado, G. & Pinzón, S. Y. (2013). The Relationship between Market Orientation and Innovation in Mexican Manufacturing SME's, Advances in Management & Applied Economics, 3(5), 125-137. Disponible en: https://ideas.repec.org/a/spt/admaec/v3y2013i5f3_5_9.html y consultado: 22/09/2022.

Martínez, C. M., & Sepúlveda, M. A. R. (2012). Introducción al análisis factorial exploratorio. Revista colombiana de psiquiatría, 41(1), 197-207. http://doi.org/10.1016/S0034-7450(14)60077-9

McKenzie, D. & Woodruff, C. (2017). Business Practices in Small Firms in Developing Countries. World Bank, 1-40, http://doi.org/10.3386/w21505.

Morales, A., Rendon, A., y Guillén I. J. (2018). Cuarta revolución industrial e innovación disruptiva en empresas productoras de calzado multinacionales y mexicanas. Red Internacional de Investigadores En Competitividad, 12, 623–641. Disponible en: https://www.riico.net/index.php/riico/article/view/1651 y consultado: 24/08/2022.

Negron, L. A. (2020). Relationship between quality management practices, performance and maturity quality management, a contingency approach, Quality Management Journal, 27(4), 215-228, http://doi.org/10.1080/10686967.2020.1809582.

Owalla, B., Gherhes, C., Vorley, T., & Brooks, C. (2019). Factors Affecting SME Productivity: A Systematic Review and Research Agenda. Academy of Management Proceedings, 2019(1), 16184. http://doi.org/10.5465/AMBPP.2019.16184abstract

Pagés, C. (2010). La era de la productividad: cómo transformar las economías desde sus cimientos. Washington, D.C.: Banco Interamericano de Desarrollo. Disponible en: https://publications.iadb.org/es/publicacion/la-era-de-la-productividad-como-transformar-las-economias-desde-sus-cimientos y consultado: 22/09/2022.

Pavitt, K. (1984). Sectoral patterns of technical change: towards a taxonomy and a theory. Research policy, 13(6), 343-373. http://doi.org/10.1016/0048-7333(84)90018-0

Peón, S. B. G., & Pérez, I. G. G. (2015). Índice de Competitividad Municipal 2013: Metodología para su construcción basada en Análisis Factorial y su aplicación en municipios urbanos en México. Revista de Métodos Cuantitativos para la Economía y la Empresa, 20, 112-153. Disponible en: https://www.upo.es/revistas/index.php/RevMetCuant/article/view/2242 y consultado: 27/10/2022.

Pérez, C. (2004). Técnicas de análisis multivariante de datos. Aplicaciones con SPSS. Pearson Prentice Hall. Madrid. 2004

Pérez, A., Barceló, M., Navarro, R. F. & Pompa, F. J. (2018). Impacto de la Consultoría en el Noroeste de México por parte de las PyMES-TI, Sistemas, cibernética e informática, 2(2), 61-65. Disponible en: https://www.researchgate.net/profile/Rene-Navarro-3/publication/266446491_Impacto_de_la_Consultoria_en_el_Noroeste_de_Mexico_por_parte_de_las_PyMES-TI/links/54c170120cf2dd3cb958a2b8/Impacto-de-la-Consultoria-en-el-Noroeste-de-Mexico-por-parte-de-las-PyMES-TI.pdf y consultado: 25/10/2022.

Perrow, C. (1967). A Framework for the Comparative Analysis of Organizations. American Sociological Review, 32(2), 194. http://doi.org/10.2307/2091811

Quinn, S., & Scur, D. (2021). Management practices and public policy: an overview. Oxford Review of Economic Policy, 37(2), 221-230. http://doi.org/10.1093/oxrep/grab007

Rendón-Rojas, L., & Mejía-Reyes, P. (2015). Producción manufacturera en dos regiones mexiquenses: Evaluación de las leyes de Kaldor. Economía Sociedad y Territorio, 1, 425. http://doi.org/10.22136/est012015597

Sánchez Juárez, I. L., & Moreno Brid, J. C. (2016). El reto del crecimiento económico en México: industrias manufactureras y política industrial. Revista finanzas y política económica, 8(2), 271-299. http://doi.org/10.14718/revfinanzpolitecon.2016.8.2.4

Scur, D., Sadun, R., Van Reenen, J., Lemos, R., & Bloom, N. (2021). The World Management Survey at 18: lessons and the way forward. Oxford Review of Economic Policy, 37(2), 231-258. http://doi.org/10.1093/oxrep/grab009

Souitaris, V. (2002). Technological trajectories as moderators of firm-level determinants of innovation. Research Policy, 31(6), 877-898. http://doi.org/10.1016/S0048-7333(01)00154-8

Suárez, O. M. (2007). Aplicación del análisis factorial a la investigación de mercados. Caso de estudio. Scientia et technica, 1(35), 281-286. Disponible en: https://moodle2.utp.edu.co/index.php/revistaciencia/article/view/5443 y consultado: 15/10/2022.

Thompson, J. D. (1967). Organizations in action. New York: McGraw-Hill.

United Nations Statistical Commission (2002). Central Product Classification version 1.1. updated Feb. 2002. Disponible en: https://unstats.un.org/unsd/publication/SeriesM/SeriesM_77ver1_1E.pdf y consultado: 24/08/2022.

Woodward, J. (1965). Industrial Organization; Theory and Practice. New York: Oxford University Press. http://doi.org/10.1177/017084068100200219