Generation and distribution of income in Mexico, 1990-2015

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Abstract

Purpose - The following article reviews the efficient use of economic and social resources to generate income, and at the same time reduce the concentration of wealth in the 32 states of the Mexican Republic during the period 2000-2010.

Design/methodology/approach - Human development in the entities of the country is characterized by low performance of the income factor. Therefore, it is necessary to develop mechanisms that will increase and improve income distribution. To diagnose the efficiency of Mexican entities the Data Envelopment Analysis (DEA) with the inclusion of a bad output was used and the Malmquist-Luenberger index to know its evolution.

Findings - Of the results, it is clear that only three of the 32 units studied were efficient in the generation and distribution of wealth, while the rest must increase their level of income and its distribution.

Keywords: Income, Human development, Concentration of wealth, Efficiency, Mexico.

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1. Introduction

In Mexico the Human Development Index (HDI) during the period 1990-2015 increased in 17.6%. However, this indicator of welfare is still lower than that of other Latin American economies; being one of the main causes the low level of *per capita* income in the economy (UNDP, 2018b). At the level of federal entities, Mexico City, Nuevo León, Chihuahua, Baja California, Sonora and Aguascalientes stand out as the states with the highest levels of human development. While Hidalgo, Michoacán, Chiapas, Oaxaca and Guerrero have the lowest HDI levels, thus, presenting a strong state and regional disparity in social welfare (UNDP, 2011, 2016). The dynamics of variables such as public expenditure, level of education and employed personnel, despite the positive trends throughout the study period, reveal the need for higher levels of investment, employment and education; since its impact on the income dimension of the national and state HDI has been low (INEGI, 2018a-h). In turn, the income concentration data in Mexico indicates that a significant percentage of the states have an asymmetric distribution of wealth, affecting negatively the level of welfare of the society (Tello, 2010; Quiroz & Salgado, 2016; Ortiz, Marroquín & Ríos, 2017). For this reason, it is relevant to establish as a research question, how efficient were the 32 entities of the Mexican Republic in the use of their economic and social resources to generate and distribute income, during the period 1990-2015. The results of this study allow to quantify the efficiency in the management of the resources during the analyzed period and, therefore, contribute to the design of strategies and policies that energize the behavior of the income dimension of the IDH.

Harttgen and Klasen (2012) conceive human development as the process that expands the opportunities of the persons for lives the life that they value and, therefore, reach a higher level of well-being. Understanding as opportunities the possibility to have a long and healthy life; being literate and possess knowledge; access to economic resources that allow a decent standard of living; and be involved in community life. If we don't own them, many other options and opportunities of life are inaccessible (UNDP, 2018a). Determining the level of human development of an economy is key to establish public policies; since it allows to evaluate the evolution of the living conditions of the population; diagnose the problems; and enrich the design of government objectives and strategies (López-Calva, Rodríguez-Chamussy & Székely, 2004).

In the measurement of human development highlights the HDI, proposed by the United Nations Development Program (UNDP). This index combines three elements to evaluate the progress of countries in terms of human development: the Gross Domestic Product (GDP) *per capita*, health and education; each one is included with the same weight in the index (Griffin, 2011; Harttgen & Klasen, 2012). It is due to its simplicity and easy access to the statistical information that is required for its calculation that the HDI has become the most used mechanism to measure human development and social welfare (León, 2002; Ordóñez, 2014). Under the vision of human development, and consequently of the HDI, the individual must be the center of the design of public policies, and at the same time the fundamental instrument of their own development (Griffin, 2011).

The distribution of income is the way in which the national product is distributed among those who have contributed to its production, grouping them into homogeneous categories according to the function exercised or according to the nature of the contribution made (Salinas, 1977; Medina, 2001). The concentration of income is caused by multiple factors. The way in which this asymmetry is measured is through inequality indices, which are measures that summarize the distribution of a variable among a set of individuals. Consequently, the inequality in the distribution of wealth is given by the degree of dispersion of income with respect to a reference value (Ruza, 1978; Carrillo & Vázquez, 2005; Ospina & Giraldo, 2005). The indicators of inequality are usually classified as positive and normative measures (Carrillo & Vázquez, 2005; Ospina & Giraldo, 2005; Mazaira, Becerra & Hernández, 2008). This research employs positive measures, since the normative depend on ethical judgments that are reflected in the values chosen for the parameters of the social welfare function (Acevedo, 1986). Of the divers positive inequality measures, this research uses the Gini Coefficient (Cg), because it allows a simple interpretation of the degree of income concentration and meets the four basic properties of an inequality indicator: is sensitive to the effect of socioeconomic factors of inequality, considers the influence of any social hierarchy on changes of the composition of the population, is consistent with the argument of the Lorenz curve, and shows invariance in the face of proportional increases in income (Gradín & del Rio, 2001; Medina, 2001; Yáñez, 2010).

The income dimension of human development apart of the GDP *per capita* includes other indicators such as the concentration of income to determine in a more inclusive way the economic well-being of society (Hicks, 1997; Alkire & Foster, 2011). Thus, it reaffirms the fact that there can be no economic well-being if the income generated by a society is not properly distributed among the population that generated it (Mazaira *et al.*, 2008; Yáñez, 2010). Hence, an excessive concentration of income can be considered as negative and, therefore, its decrease is recommended (Quiroz & Salgado, 2016). For it, is possible to point out that the variables that measure the concentration of income have a behavior similar to an unwanted output or bad output, while income itself would behave as a desired output, and whose improvement would increase its level.

Given that income generation involves the use of resources, it is important, prior to any manipulation of factors, to determine under which combination of socioeconomic inputs an economy is achieving the highest level of income *per capita* with the lowest concentration of it. In other words, it is relevant to analyze the efficiency in the generation of income. Several studies point the importance of the efficient use of resources to increase the economic well-being of an economy. Arguing that the welfare of society depends on the application of public policies aimed at the efficient use of resources and the promotion of greater equity in the distribution of wealth (Martić & Savić, 2001; Cortés, 2003; Stimson, Stough & Roberts, 2006; Vargas, 2009; Halkos & Tzeremes, 2010; Tello, 2010; Poveda, 2011; Torres & Rojas, 2015; Quiroz & Salgado, 2016; Ortiz *et al.*, 2017). Thus, the hypothesis of the research is that very few entities of the Mexican Republic were efficient in the usage of their economic and social resources to generate and distribute income, during the period 1990-2015. This has important repercussions on the economic and social well-being of the Mexican population.

For the analysis of the efficiency the literature offers different methodologies. Data Envelopment Analysis (DEA), developed initially by Charnes, Cooper and Rhodes (1978), is a methodology widely used as an alternative to parametric methods (Banker, Charnes & Cooper, 1984; Bemowski, 1991). In essence, DEA compares an observed production unit with a virtual unit, which obtains the same or more product with the same or lesser number of factors. However, unwanted outputs often are produced together with desirable results. In this sense, Pittman (1983) introduces unwanted outputs in the calculation of productivity indexes, adapting the methodology of Caves, Christensen and Diewert (1982), and determines the shadow prices of these. The result of this new approach allows to deduce an efficiency measure that, while maximizing the good outputs, minimizes the undesired outputs from a benchmarking process (Serra, 2004). Although the applications of DEA have been mostly in productive units, it is also applied in studies of quality of life, economic well-being, human development and social welfare (Mahlberg & Obersteiner, 2001; Despotis, 2005; Yago, Lafuente & Losa, 2010;

Giménez, Ayvar-Campos & Navarro-Chávez, 2017). Mariano, Sobreiro and Rebelatto (2015) perform an extensive review of the literature that use DEA for the analysis of human development. According to our knowledge, this work is the first that analyze the efficiency in the generation of income considering bad outputs from a temporal perspective. For it, the Malmquist-Luenberger index is used to measure changes in the efficiency, technological change and productivity over time, taking into consideration the undesirable outputs of the productive process (Chung, Färe & Grosskopf, 1997).

The research is structured in five sections, the first one analysis the socioeconomic aspects of economic well-being. In the second, the theoretical elements of human development and income distribution are addressed. In the third, the methodological features of the generation and distribution of income DEA model are presented. In the fourth, the main results of the DEA model are exposed, indicating the entities that efficiently used their resources. Finally, the conclusions are established, where the fundamental aspects of the research are highlighted.

2. **The income dimension of human development in the entities of Mexico**

The study of the dynamics of the income dimension of the HDI shows that, during the period 1990-2010, the highest income indices were held by the states of Nuevo León, Mexico City, Chihuahua, Campeche and Sonora. On the other hand, the entities with the lowest income indices were Chiapas, Oaxaca, Guerrero, Tlaxcala and Hidalgo, which is directly related to the behavior of the GDP *per capita* (UNDP, 2011, 2016). Table 1 a-d of the annex shows that GDP *per capita* had an increase of 58% during the period 1990-2015, as a result of increases in public spending and investment attraction policies. The states of the country with the highest GDP *per capita* levels are Campeche, Mexico City, Jalisco, Nuevo Leon, Queretaro, Quintana Roo and Tabasco.

[Insert Table 1 a-d]

The public spending had a major expansion from 33,938 million pesos in 1990 to 1,955,597 million pesos in 2015. The educational level of the society presented an increase of 45.5%, this is, in 1990 the average level of education was 6.3 years and in 2015 it was 9.1 years. The employed population grew 116%, excelling Mexico City, State of Mexico, Nuevo León, Jalisco, Puebla and Veracruz (see Table 1 a-d). The establishment of companies during this stage was incentivized since they went from 736,860 in 1990 to 5,654,014 in 2015, factor that had a direct impact on the generation of jobs and on the remunerations of the population. An element that also presented development was the Gross Capital Formation, being, the Foreign Direct Investment the variable that showed the highest growth during the years studied. Specifically, the states of Baja California, Chihuahua, Guanajuato, Jalisco, State of Mexico, Mexico City, Nuevo León, Puebla and Veracruz were the more benefited (INEGI, 2018a-h). Despite the positive behavior of these indicators, the low impact of the income dimension on the national and state HDI reflects the importance of increasing *per capita* income levels, since this would lead to higher levels of well-being in the entities of the country.

[Insert Table 2]

The concentration of income in Mexico decreased during the period 1990-2015, going from 0.519 in 1990 to 0.469 in 2015. When carrying out the analysis by states, it was observed that Baja California Sur, Tlaxcala, Colima, Baja California and State of Mexico presented the highest levels of income distribution, while Oaxaca, Guerrero, Hidalgo, Querétaro and Campeche were the ones that had the highest concentration of income. These results have as a background the poor performance of these last entities in terms of generation and distribution of GDP (see Table 2).

3. Methodology

The idea of Farrell (1957), who explains that to measure the efficiency of a set of productive units it´s necessary to know the function of production and the frontier of efficiency, has been applied empirically through two methodologies: stochastic frontiers estimation and DEA measurements. The first involves the use of econometrics and the second involves linear programming algorithms and benchmarking. DEA is a technique used to measure the comparative efficiency of homogeneous units. Starting from the inputs and outputs, this method provides a classification of the DMU (Decision Making Unit), giving them a relative efficiency score. A DMU is efficient when there is no other (or combination of them) that produces more output, without generating less of the rest, and without consuming more inputs. In this case we speak of an output-oriented model while in the opposite case it is called an input-oriented model. DEA models take advantage of the know-how of the DMUs and once determined who is efficient and who is not, set improvement goals for the inefficient, and based on the achievements of the efficient (Bemowski, 1991; Navarro & Torres, 2003; Serra, 2004). In our case, the model was oriented to the output because the ultimate goal of economic well-being is to maximize income and minimize the concentration of it.

Due to the existence of undesirable outputs, for the calculation of the annual efficiency levels, a model based on a directional distance function (DDF) was used (Färe, Grosskopf & Lovell, 1994), precisely with the objective to maximize income while minimizing the concentration of it, given the amount of available resources. The DDF models has been widely used in efficiency studies (Sueyoshi & Goto, 2010; Färe, Grosskopf, Noh & Weber, 2005; Watanabe & Tanaka, 2007). The mathematical expression of it is as follows:

$$
\begin{aligned}
& Max\ \beta \\
& s.t \\
& \sum_{k=1}^{K} \lambda_k y^t_{km} \geq y^{ot}_m (1+\beta) \quad m = 1 \ldots M \\
& \sum_{k=1}^{K} \lambda_k b^t_{kh} \leq b^{ot}_h (1-\beta) \quad h = 1 \ldots H \\
& \sum_{k=1}^{K} \lambda_k x^t_{kn} \leq x^{ot}_n \quad n = 1 \ldots N \\
& \beta \geq 0 \; ; \; \lambda_k \geq 0 \quad k = 1 \ldots K
\end{aligned}
\tag{1}
$$

where β is the maximum increase and reduction achievable simultaneously in the good and bad outputs respectively. y^t_{km} represents the output *m* of the unit *k* in the year t, b^t_{kh} the bad output *h* of the unit or country *k* in the year t, and x^t_{kn} the input *n* used by the country *k* in the year *t*. y^{ot}_m, b^{ot}_h, x^{ot}_{kn} denote the observed levels of good and bad outputs and inputs for the country evaluated in the year *t*. The linear mathematic program (1) is solved for each unit analyzed.

For determined the evolution of efficiency and productivity over time, the Malmquist-Luenberger (ML) index is used, which has its origins in the Malmquist index (MI) (Caves *et al.*, 1982; Chung *et al.*, 1997). The MI can explain the change in the total productivity of the factors as a product of the efficiency change or catching up and technological change. Chung *et al.* (1997) modified the MI to apply it to the case of DDF. The new index called ML was decided to use in this investigation since undesirable variables were considered in the income dimension of the HDI. The mathematical expression of the index is as follows (Chung *et al.,* 1997):

$$ML^{t,t+1} = \left(\frac{\left(1 + D^t\left(x^t, y^t, b^t\right)\right)}{\left(1 + D^t\left(x^{t+1}, y^{t+1}, b^{t+1}\right)\right)} \times \frac{\left(1 + D^{t+1}\left(x^t, y^t, b^t\right)\right)}{\left(1 + D^{t+1}\left(x^{t+1}, y^{t+1}, b^{t+1}\right)\right)} \right)^{1/2} \quad (2)$$

where $D^t\left(x^t, y^t, b^t\right) = \max\left(\beta \mid \left(y^t + \beta g_y^t, b^t - \beta g_b^t\right) \in P\left(x^t\right)\right)$ is the DDF defined for each unit analyzed taking its data for year *t* $\left(x^t, y^t, b^t\right)$ and as a reference the set of production possibilities for the same year $P\left(x^t\right)$. In an analogous way, it could be defined, for example, $D^{t+1}\left(x^t, y^t, b^t\right) = \max\left(\beta \mid \left(y^t + \beta g_y^t, b^t - \beta g_b^t\right) \in P\left(x^{t+1}\right)\right)$. In this case, the DDF would take the data for year t $\left(x^t, y^t, b^t\right)$ for each unit analyzed and, as a reference, the set of production possibilities for year *t + 1*, that is, $P\left(x^{t+1}\right)$. In the latter case, the DDF is crossed in the sense that it uses the data of one year for the analyzed units and projects them on the production possibility frontier of a different year. A value of $ML^{t,t+1}$ greater than one would mean that there has been an improvement in productivity between years *t* and *t + 1*, while a value less than one would be interpreted in the opposite way. Any of the DDF needed for calculating the ML index can be calculated from (1).

The expression (2) can be decomposed, by simple algebraic manipulation, such as:

$$ML^{t,t+1} = MLEFF^{t,t+1}\ x\ MLTECH^{t,t+1} \quad (3)$$

Where:

$$MLEFF^{t,t+1} = \frac{1 + D^t\ (x^t, y^t, b^t)}{1 + D^{t+1}(x^{t+1}, y^{t+1}, b^{t+1})} \quad (4)$$

represents the efficiency change or catch up, that is, if the unit analyzed has approached or moved away in the period with respect to the frontier. If it has been approximated, the expression (4) takes a value greater than one and less than one otherwise. While:

$$MLTECH^{t,t+1} = \left[\frac{[1+D^{t+1}(x^t,y^t,b^t)]\ x\ [1+D^{t+1}(x^{t+1},y^{t+1},b^{t+1})]}{[1+D^{t}\ (x^t,y^t,b^t)]\ x\ [1+D^{t}\ (x^{t+1},y^{t+1},b^{t+1})]}\right]^{1/2} \tag{5}$$

represents technological change, that is, if the frontier has improved or worsened over the period. In case of improvement (positive technological change), the expression (5) takes a value greater than one, and less than one otherwise.

For the application of the model to this empirical case, it was used as output the GDP *per capita* and as a bad output the concentration of the income, measured by the Cg, this due to the theoretical representativeness that has the level of income and the distribution of it to explain the economic well-being of a economy. The selection of inputs was based on the theoretical pillars that explain the behavior of the components of the HDI income dimension. In this sense, the postulates of the UNDP (2011, 2016, 2018a), Mahlberg and Obersteiner (2001), Arcelus, Sharma and Srinivasan (2006), Despotis (2005), Yago *et al.* (2010), Emrouznejad, Osman and Anouze (2010), Blancas and Domínguez-Serrano (2010), Jahanshahloo, Hosseinzadeh, Noora and Parchikolaei (2011), and Blancard and Hoarau (2011, 2013) were analyzed, arriving at the conclusion that the indicators that explain the behavior of the income dimension of human development are: the average annual change in the consumer price index, inequality index, exports, imports, foreign direct investment, total debt service, development assistance, public spending, electricity consumption *per capita*, proportion of the population that uses the internet, degree of schooling, economically active population, employed personnel, economic units, gross capital formation, remunerations and salary.

Given the availability of statistical information for the states of the Mexican Republic, the number of indicators was reduced. With these data, a statistical analysis was carried out determined fist a matrix of correlations. Subsequently, factorial analysis was carried out, which are very useful for depurate the correlation matrix. The factorial analysis, under the concept of main components, passed the tests of Kaiser-Meyer-Olkin (KMO), with values higher than 0.70, and the test of sphericity of Bartlett, with a high result and with a small level of significance. Due to the positive results in the tests, we proceeded with the factorial analysis and a matrix of communalities was obtained, which showed that the inputs that best explain the HDI income dimension are: Public Expenditure, Degree of Schooling and Employed Personnel (see Table 3 to 6).

[Insert Tables 3, 4, 5 and 6]

The statistical information of these variables was possible to obtain it through the databases of the Instituto Nacional de Estadística, Geografía e Informática de México, the Secretaría de Educación Pública de México, the Consejo Nacional de Población, the Consejo Nacional de Evaluación de la Política de Desarrollo Social, the Banco de México, and the Human Development Reports of UNDP.

4. **Analysis and discussion of results**

The states considered efficient in the use of their resources to generate income and at the same time reduce the concentration of income, during the period 1990-2015, were Baja California Sur, Campeche and Mexico City. On the other hand, Quintana Roo and Nuevo León stand out as entities that approach efficiency (see Table 7). These results are related to the endowment of factors that these states have and the level of life of their population. Specifically, it can be seen in Tables 1 and 2 that Baja California Sur, Campeche and Mexico City were characterized for occupying the first positions in terms of GDP *per capita*, Public Expenditure, Employed Personnel and Average Degree of Schooling; as well as having the lowest levels of income concentration. Behavior that directly affected the position that they occupied in the national ranking of HDI (UNDP, 2011, 2016, 2018b). Emphasizing with this the preponderant position that they occupy within the regional dynamics of Mexico, being the entities that historically stand out in the country for their socioeconomic dynamism (Garza & Schteingart, 2010; Tello, 2010; Quiroz & Salgado, 2016; Ortiz *et al.*, 2017). Thus, in this case, the efficient use of resources corresponds with the behavior of the main socioeconomic indicators and to the level of human development displayed by these entities during the study period.

[Insert Table 7]

The results of Table 7 also show that entities such as Oaxaca, Chiapas, Michoacán, Guerrero and Veracruz were the most inefficient in generating economic well-being. These states didn´t use efficiently their resources to increase their GDP *per capita* and at the same time reduce the concentration of income in the period 1990-2015. Performance that is linked to the allocation of public expenditure, employed personnel and average grade of schooling that in comparison these states have with other entities of the Mexican Republic (INEGI 2018a-h); since historically they have been characterized as being the most lagging in economic and social terms (Garza & Schteingart, 2010; Tello, 2010; Quiroz & Salgado, 2016; Ortiz *et al.*, 2017). Behavior that has been reflected in the health, education and income indicators of the HDI (UNDP, 2011, 2016, 2018b).

Table 8 shows that the entities rated as efficient in the generation of economic well-being (Baja California Sur, Campeche and Mexico City) didn´t have a similar performance in terms of productivity, during the period 1990-2015. In the case of Baja California Sur, Campeche and Mexico City the Malmquist-Luenberger (ML) index worsened. That is, these states, despite being efficient, didn´t present substantial improvements in the efficient use of their resources. In general, Table 8 shows that during the period 1990-2015, the 32 entities worsened the use of their resources to generate and distribute income. This deterioration is consistent with the low levels of economic well-being that place Mexico in the ranking of countries with medium degree of HDI (UNDP, 2018b).

These results show that the states of the country that received the most resources in the period 1990-2015 (Campeche, Jalisco, Nuevo Leon, Queretaro, Quintana Roo, Tabasco and Mexico City) were not always the most efficient in the generation and distribution of income. Similarly, it is observed that, despite the general increase in the efficient use of resources in the country, it is necessary to promote public policies that encourage this type of management and promote investment, employment and education in each of the entities of the Mexican Republic. This is because the efficient use of economic and social resources would generate economic well-being and, therefore, contribute to a higher level of human development in Mexico. Causal relationship that had already been exposed by authors such as Martić and Savić (2001), Arcelus *et al.* (2006), Stimson, Stough and Roberts (2006), Halkos and Tzeremes (2010), Emrouznejad *et al.* (2010), Blancas and Domínguez-Serrano (2010), Jahanshahloo *et al.* (2011), Blancard and Hoarau (2011, 2013) and Poveda (2011). Thus, the efficiency results of this study match with the theoretical arguments that indicate that the efficient use of resources contributes significantly to the human development of the countries (Mahlberg & Obersteiner, 2001;

Despotis, 2005; Yago *et al.*, 2010; Giménez *et al.*, 2017). As with the empirical evidence that highlights that the lack of economic growth and the presence of income concentration in Mexico; as a consequence of the cheapening of the labor force, the absence of employment for the trained personnel, the little social mobility, the deficient public services, and the absence of a social and labor policy that benefits the most disadvantaged social classes; perpetuate poverty and marginalization (Cortés, 2003; Vargas, 2009; Tello, 2010; Torres & Rojas, 2015; Quiroz & Salgado, 2016; Ortiz *et al.*, 2017).

Conclusions

Human development in Mexico as a goal of economic development models has been partial since, on one hand, it exists a positive evolution in terms of health and education, coupled with positive, but not sufficient, growth rates of employed personnel, public expenditure and GDP *per capita*. While, on other hand, there are important lags in social matters such as marginalization and concentration of income. In regional terms, there is an uneven development of the entities in Mexico. States such as Campeche, Jalisco, Nuevo Leon, Queretaro, Quintana Roo, Tabasco, Puebla and Mexico City have high levels of well-being. While, others like Oaxaca, Guerrero, Michoacán and Chiapas are distinguished by their economic backwardness.

Human development seeks to expand the capabilities of the human being, adding to the economic factor the health and education dimensions to have a holistic vision of social welfare. The concentration of income, understood as the unequal distribution of the product generated by a society among its members, is directly related to the concept of human development from the income dimension, since economic well-being is not only the generation of income it is also the way in which it is distributed among the population.

Based on the DEA methodology, it was determined how efficient were Mexican entities in the use of the resources to generate income and at the same time reduce the concentration of it during the period 1990-2015. The model was elaborated with constant returns to scale, oriented to the output and including a bad output. The outputs of the model was the GDP *per capita*, the bad output the concentration of income and the inputs were the public spending, the degree of schooling and the personnel employed.

Oaxaca, Chiapas, Michoacán, Guerrero and Veracruz were the most inefficient entities in the generation of economic well-being. While, Baja California Sur, Campeche and Mexico City had the highest efficiencies, that is, with the resources they possess were efficient in the generation of income and in the reduction of the concentration of it. The Malmquist-Luenberger Index in this case reflected that all the states presented a negative evolution in their efficiency and productivity over the period studied.

The results obtained in this study show that the states that received the most economic resources (Campeche, Jalisco, Nuevo León, Querétaro, Quintana Roo, Tabasco and Mexico City) were not always the most efficient in the generation and distribution of income. Making evident the need for a more adequate use of resources, through the establishment of public policies focused by entity for the promotion of investment, employment, education and the reduction of inequity.

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Tables

TABLE 1 a						
DATA OF THE INCOME FACTOR IN MEXICO, 1990 - 2015						
GDP per capita						
(Pesos)						
State	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
Aguascalientes	7,272	9,145	11,724	14,270	17,368	14,332
Baja California	8,612	10,825	13,053	15,492	17,445	14,972
Baja California Sur	10,744	10,256	11,412	14,864	14,823	17,201
Campeche	10,571	15,308	15,477	20,276	20,819	41,776
Chiapas	3,641	3,566	3,717	4,760	4,585	5,043
Chihuahua	9,253	10,677	13,437	17,149	21,009	14,125
Colima	8,990	7,683	9,013	11,668	12,433	12,355
Ciudad de México	19,999	19,291	23,400	30,911	34,413	28,689
Coahuila	7,319	11,004	12,159	16,377	17,306	18,356
Durango	6,211	6,528	7,425	10,833	10,907	10,419
Estado de México	7,209	6,150	6,895	8,557	9,453	8,289
Guanajuato	5,453	5,473	6,577	8,671	9,311	10,727
Guerrero	4,990	4,386	4,994	6,574	5,942	6,090
Hidalgo	6,285	4,519	5,216	6,929	6,611	8,562
Jalisco	8,633	7,497	9,120	11,581	11,612	13,338
Michoacán	4,248	4,358	4,996	6,649	7,121	7,823
Morelos	9,411	6,706	7,676	10,811	9,074	9,015
Nayarit	6,457	4,495	5,146	7,014	8,578	9,028
Nuevo León	12,677	13,449	16,522	22,185	23,730	22,112
Oaxaca	3,756	3,593	3,856	5,420	5,614	6,260
Puebla	4,933	5,177	6,626	8,459	9,387	8,133
Querétaro	6,743	9,208	11,035	13,878	15,690	16,872
Quintana Roo	18,111	12,516	14,313	17,913	15,093	15,231
San Luis Potosí	5,583	5,883	6,696	9,532	11,641	11,598
Sinaloa	7,988	6,116	6,833	9,184	9,040	11,211
Sonora	7,728	10,004	10,789	14,237	17,607	17,580
Tabasco	5,461	5,311	5,718	7,938	8,244	16,639
Tamaulipas	7,161	8,491	10,060	13,840	12,181	13,540
Tlaxcala	4,310	4,116	4,943	6,223	6,034	7,086
Veracruz	4,390	5,093	5,150	7,366	8,343	8,982
Yucatán	6,662	5,740	7,494	9,854	9,644	10,334
Zacatecas	4,120	4,559	4,755	6,610	7,799	9,172
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).						

TABLE 1 b						
DATA OF THE INCOME FACTOR IN MEXICO, 1990 - 2015						
Public spending						
(Millions of Pesos)						
State	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
Aguascalientes	268	1,126	4,634	8,403	13,441	22,524
Baja California	1,907	5,106	21,843	20,764	30,537	42,143
Baja California Sur	161	776	3,161	5,868	9,556	16,305
Campeche	276	1,727	6,082	10,186	15,138	23,169
Chiapas	944	4,927	18,554	34,424	57,418	87,811
Chihuahua	791	4,223	14,518	26,563	44,555	66,599
Colima	204	840	3,326	5,746	8,827	16,665
Ciudad de México	7,707	17,991	56,676	79,624	130,541	210,845
Coahuila	552	3,252	10,867	19,859	38,234	44,812
Durango	328	942	7,327	11,706	25,024	33,969
Estado de México	2,316	13,185	41,977	88,876	171,651	246,145
Guanajuato	718	3,676	15,484	28,192	48,465	81,367
Guerrero	602	1,691	14,382	23,673	39,798	55,580
Hidalgo	320	2,309	9,324	17,806	27,397	46,139
Jalisco	2,976	11,452	25,587	44,201	73,161	96,809
Michoacán	558	3,525	15,443	27,409	48,321	62,741
Morelos	378	1,389	6,793	11,724	19,544	28,242
Nayarit	272	1,309	5,596	8,920	16,517	21,198
Nuevo León	3,325	9,149	21,315	34,393	59,417	86,631
Oaxaca	1,495	7,631	14,733	25,974	51,711	70,202
Puebla	671	4,298	19,301	31,532	54,491	84,600
Querétaro	299	2,221	6,823	12,398	20,841	30,789
Quintana Roo	212	1,021	5,105	10,176	23,018	31,485
San Luis Potosí	367	2,356	9,761	18,318	27,761	42,795
Sinaloa	679	3,128	10,654	18,249	35,340	47,721
Sonora	981	3,464	11,631	21,530	44,105	57,500
Tabasco	1,256	3,423	14,023	28,068	35,013	47,262
Tamaulipas	766	3,302	13,517	22,976	43,696	52,599
Tlaxcala	292	681	4,820	7,689	16,458	21,523
Veracruz	1,664	6,368	28,088	47,807	98,322	114,417
Yucatán	337	1,080	3,617	12,846	21,768	34,548
Zacatecas	314	1,459	6,310	11,241	24,748	30,462
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).						

TABLE 1 c						
DATA OF THE INCOME FACTOR IN MEXICO, 1990 - 2015						
Degree of schooling						
(Years)						
State	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
Aguascalientes	6.7	7.3	7.9	8.7	9.46	9.7
Baja California	7.5	7.9	8.2	8.9	9.54	9.8
Baja California Sur	7.4	7.9	8.4	8.9	9.69	9.9
Campeche	5.8	6.5	7.2	7.9	8.53	9.1
Chiapas	4.2	4.8	5.6	6.1	6.73	7.3
Chihuahua	6.8	7.3	7.8	8.3	9.01	9.5
Colima	6.6	7.1	7.7	8.4	9.12	9.5
Ciudad de México	8.8	9.2	9.7	10.2	10.81	11.1
Coahuila	7.3	7.8	8.5	9	9.79	9.9
Durango	6.2	6.8	7.4	8	8.74	9.1
Estado de México	7.1	7.6	8.2	8.7	9.48	9.5
Guanajuato	5.2	5.8	6.4	7.2	7.9	8.4
Guerrero	5	5.6	6.3	6.8	7.55	7.8
Hidalgo	5.5	6	6.7	7.4	8.21	8.7
Jalisco	6.5	7	7.6	8.2	8.98	9.2
Michoacán	5.2	5.8	6.4	6.9	7.62	7.9
Morelos	6.8	7.3	7.8	8.4	9.17	9.3
Nayarit	6.1	6.7	7.3	8	8.72	9.2
Nuevo León	8	8.4	8.9	9.5	10.17	10.3
Oaxaca	4.5	5.1	5.8	6.4	7.08	7.5
Puebla	5.6	6.2	6.9	7.4	8.14	8.5
Querétaro	6.1	6.8	7.7	8.3	9.26	9.6
Quintana Roo	6.3	7.1	7.9	8.5	9.3	9.6
San Luis Potosí	5.8	6.4	7	7.7	8.51	8.8
Sinaloa	6.7	7.1	7.6	8.5	9.28	9.6
Sonora	7.3	7.8	8.2	8.9	9.6	10
Tabasco	5.9	6.5	7.2	8	8.78	9.3
Tamaulipas	7	7.5	8.1	8.7	9.48	9.5
Tlaxcala	6.5	7.1	7.7	8.3	9.13	9.3
Veracruz	5.5	6	6.6	7.2	7.84	8.2
Yucatán	5.7	6.3	6.9	7.6	8.26	8.8
Zacatecas	5.4	5.9	6.5	7.2	7.89	8.6
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).						

TABLE 1 d						
DATA OF THE INCOME FACTOR IN MEXICO, 1990 - 2015						
Employed Personnel						
(Persons)						
State	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
Aguascalientes	212,365	292,184	331,083	406,782	460,428	518,514
Baja California	565,471	785,060	906,369	1,181,866	1,318,160	1,512,261
Baja California Sur	102,763	142,847	169,014	225,302	258,651	357,412
Campeche	149,983	214,141	243,323	326,946	345,981	394,634
Chiapas	854,159	1,101,341	1,206,621	1,552,418	1,722,617	1,898,952
Chihuahua	773,100	1,041,766	1,117,747	1,328,974	1,276,383	1,539,769
Colima	133,474	178,907	199,692	256,986	289,025	340,008
Ciudad de México	2,884,807	3,449,206	3,582,781	3,957,832	3,985,184	4,147,971
Coahuila	586,165	724,729	822,686	965,240	1,040,436	1,247,782
Durango	347,275	402,351	443,611	556,402	576,977	724,360
Estado de México	2,860,976	3,908,623	4,462,361	5,553,048	6,195,622	7,065,112
Guanajuato	1,030,160	1,304,041	1,460,194	1,887,033	1,961,002	2,381,939
Guerrero	611,755	776,577	888,078	1,164,045	1,301,453	1,390,303
Hidalgo	493,315	690,874	728,726	926,353	932,139	1,208,638
Jalisco	1,553,202	2,180,447	2,362,396	2,870,720	3,073,650	3,424,781
Michoacán	891,873	1,105,816	1,226,606	1,595,979	1,602,495	1,903,548
Morelos	348,357	504,109	550,831	663,781	719,727	778,745
Nayarit	233,000	286,693	318,837	408,313	430,055	544,513
Nuevo León	1,009,584	1,317,418	1,477,687	1,832,395	1,975,245	2,225,108
Oaxaca	754,305	955,626	1,066,558	1,408,055	1,450,587	1,621,204
Puebla	1,084,316	1,446,039	1,665,521	2,161,852	2,358,045	2,564,998
Querétaro	288,994	428,651	479,980	651,557	683,693	766,182
Quintana Roo	163,190	259,071	348,750	518,040	655,226	738,156
San Luis Potosí	529,016	616,679	715,731	935,462	979,539	1,116,158
Sinaloa	660,905	818,932	880,295	1,139,861	1,110,501	1,290,410
Sonora	562,386	751,405	810,424	957,211	972,978	1,309,197
Tabasco	393,434	546,794	600,310	731,237	762,850	907,599
Tamaulipas	684,550	903,894	1,013,220	1,271,428	1,308,505	1,491,450
Tlaxcala	196,609	290,914	328,585	430,958	439,084	531,163
Veracruz	1,742,129	2,145,521	2,350,117	2,701,735	2,852,644	3,092,678
Yucatán	407,337	531,197	618,448	788,841	899,766	977,644
Zacatecas	294,458	267,925	353,628	524,128	541,914	600,148
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).						

TABLE 2						
THE COEFFICIENT OF GINI IN MEXICO, 1990 -2015						
Sate	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
National	0.519	0.518	0.516	0.499	0.482	0.469
Aguascalientes	0.488	0.471	0.454	0.481	0.507	0.451
Baja California	0.476	0.461	0.446	0.476	0.506	0.432
Baja California Sur	0.458	0.475	0.493	0.489	0.485	0.447
Campeche	0.504	0.512	0.520	0.517	0.514	0.484
Chiapas	0.543	0.542	0.542	0.541	0.541	0.512
Chihuahua	0.509	0.508	0.507	0.490	0.473	0.465
Colima	0.536	0.520	0.505	0.511	0.517	0.507
Ciudad de México	0.510	0.487	0.465	0.470	0.476	0.460
Coahuila	0.500	0.506	0.511	0.465	0.420	0.440
Durango	0.486	0.482	0.478	0.474	0.470	0.431
Estado de México	0.520	0.509	0.498	0.483	0.468	0.438
Guanajuato	0.519	0.522	0.525	0.479	0.433	0.513
Guerrero	0.542	0.545	0.549	0.532	0.516	0.480
Hidalgo	0.528	0.530	0.531	0.498	0.465	0.467
Jalisco	0.560	0.542	0.523	0.492	0.461	0.445
Michoacán	0.543	0.523	0.502	0.496	0.489	0.438
Morelos	0.532	0.547	0.561	0.491	0.420	0.452
Nayarit	0.501	0.497	0.493	0.490	0.488	0.471
Nuevo León	0.499	0.484	0.469	0.483	0.498	0.515
Oaxaca	0.517	0.541	0.565	0.537	0.509	0.503
Puebla	0.563	0.559	0.554	0.518	0.481	0.505
Querétaro	0.583	0.556	0.529	0.508	0.487	0.484
Quintana Roo	0.538	0.554	0.571	0.524	0.477	0.464
San Luis Potosí	0.551	0.548	0.545	0.526	0.507	0.463
Sinaloa	0.515	0.498	0.481	0.474	0.466	0.457
Sonora	0.497	0.496	0.495	0.487	0.479	0.487
Tabasco	0.540	0.530	0.520	0.499	0.478	0.457
Tamaulipas	0.522	0.511	0.500	0.474	0.449	0.476
Tlaxcala	0.485	0.501	0.518	0.471	0.425	0.395
Veracruz	0.538	0.548	0.558	0.546	0.533	0.489
Yucatán	0.526	0.558	0.590	0.526	0.462	0.481
Zacatecas	0.492	0.508	0.523	0.522	0.521	0.499
Source: Own elaboration based on data published by the CONEVAL (2018a-b).						

TABLE 3								
MATRIX OF CORRELATIONS								
		GP_I	GraEsc_I	EP_I	EU_I	MW_I	Rem_I	GDP_O
Correlations	GP_I	1	0.53	0.78	0.83	0.63	0.8	0.23
	GraEsc_I	0.53	1	0.3	0.33	0.75	0.57	0.7
	EP_I	0.78	0.3	1	0.93	0.26	0.82	0.06
	EU_I	0.83	0.33	0.93	1	0.41	0.8	0.03
	MW_I	0.63	0.75	0.26	0.41	1	0.41	0.36
	Rem_I	0.8	0.57	0.82	0.8	0.41	1	0.43
	GDP_O	0.23	0.7	0.06	0.03	0.36	0.43	1
Note: GDP *per capita* (GDP), Total public expenditure (GP), Average grade of schooling (GraEsc), Employed Personnel (EP), Economic Units (EU), Minimum Wage (MW), Remuneration (Rem).								
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).								

TABLE 4		
KMO AND BARTLETT TEST		
Sampling adaptation measure of KMO.		0.72667374
Bartlett's sphericity test	Approximate Chi-square	1227.8515
	Gl.	21
	Sig.	6.531E-247
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).		

TABLE 5						
ANTI-IMAGE MATRIX						
		GP_I	GraEsc_I	EP_I	MW_I	GDP_O
Covariance anti-image	GP_I	0.199	0.023	-0.196	-0.129	-0.039
	GraEsc_I	0.023	0.204	-0.062	-0.151	-0.210
	EP_I	-0.196	-0.062	0.290	0.132	0.083
	MW_I	-0.129	-0.151	0.132	0.256	0.118
Correlation anti-image	GP_I	-0.039	-0.210	0.083	0.118	0.418
	GraEsc_I	0.566	0.116	-0.814	-0.573	-0.134
	EP_I	0.116	0.582	-0.254	-0.660	-0.718
	MW_I	-0.814	-0.254	0.428	0.483	0.238
a	Sample adaptation measure					
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).						

TABLE 6		
MATRIX OF COMPONENTS		
	Component	
	1	2
GP_I	0.34	0.9
GraEsc_I	0.9	0.3
EP_I	0.01	0.93
MW_I	0.71	0.43
Extraction method: Analysis of main components.		
Rotation method: Varimax standardization with Kaiser.		
a	The rotation converged in 3 iterations.	
Source: Own elaboration based on the INEGI (2018a-h), Banxico (2018), Banco Mundial (2018) and SEP (2018).		

TABLE 7						
EFFICIENCY IN MEXICO WITH OUTPUT ORIENTATION AND CONSTANT SCALE RETURNS, 1990 - 2015						
DMU	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**
Aguascalientes	0.720	0.852	0.952	0.877	0.932	0.684
Baja California	0.757	0.864	0.921	0.862	0.876	0.701
Baja California Sur	0.942	1.000	1.000	1.000	1.000	0.723
Campeche	0.811	1.000	1.000	1.000	1.000	1.000
Chiapas	0.594	0.587	0.568	0.567	0.559	0.557
Chihuahua	0.765	0.829	0.894	0.872	0.949	0.676
Ciudad de México	1.000	1.000	1.000	1.000	1.000	0.861
Coahuila	0.714	0.849	0.869	0.898	0.921	0.741
Colima	0.749	0.809	0.857	0.855	0.908	0.641
Durango	0.688	0.741	0.743	0.773	0.757	0.640
Estado de México	0.690	0.653	0.637	0.635	0.640	0.610
Guanajuato	0.652	0.658	0.661	0.657	0.662	0.621
Guerrero	0.633	0.629	0.611	0.606	0.580	0.573
Hidalgo	0.675	0.634	0.640	0.638	0.628	0.606
Jalisco	0.709	0.675	0.700	0.679	0.674	0.674
Michoacán	0.613	0.623	0.616	0.605	0.601	0.603
Morelos	0.761	0.703	0.719	0.763	0.734	0.615
Nayarit	0.690	0.648	0.664	0.670	0.699	0.611
Nuevo León	0.854	0.913	0.987	0.971	0.949	0.748
Oaxaca	0.599	0.588	0.573	0.577	0.576	0.572
Puebla	0.627	0.636	0.641	0.633	0.638	0.593
Querétaro	0.671	0.771	0.842	0.832	0.873	0.702
Quintana Roo	1.000	1.000	0.999	0.934	0.858	0.690
San Luis Potosí	0.649	0.671	0.682	0.694	0.741	0.645
Sinaloa	0.726	0.691	0.705	0.704	0.674	0.642
Sonora	0.724	0.820	0.829	0.820	0.889	0.709
Tabasco	0.644	0.654	0.656	0.670	0.670	0.711
Tamaulipas	0.699	0.763	0.792	0.811	0.742	0.665
Tlaxcala	0.631	0.646	0.653	0.658	0.651	0.604
Veracruz	0.611	0.624	0.592	0.603	0.608	0.606
Yucatán	0.686	0.671	0.734	0.719	0.724	0.624
Zacatecas	0.623	0.646	0.639	0.643	0.661	0.606
Source: Own elaboration based on the data of Tables 1 and 2.						

TABLE 8				
MALMQUIST LUENBERGER INDEX IN MEXICO, 2000 - 2010				
DMU	**Catch up**	**Technological Change**	**Malmquist - Luenberger Index**	**Type**
Aguascalientes	0.949	0.259	0.246	Worsened
Baja California	0.925	0.646	0.598	Worsened
Baja California Sur	0.767	0.194	0.149	Worsened
Campeche	1.233	0.260	0.321	Worsened
Chiapas	0.937	0.559	0.524	Worsened
Chihuahua	0.884	0.398	0.352	Worsened
Ciudad de México	0.861	1.022	0.880	Worsened
Coahuila	1.039	0.376	0.390	Worsened
Colima	0.856	0.202	0.173	Worsened
Durango	0.930	0.293	0.273	Worsened
Estado de México	0.884	0.697	0.616	Worsened
Guanajuato	0.953	0.437	0.417	Worsened
Guerrero	0.905	0.399	0.361	Worsened
Hidalgo	0.898	0.276	0.248	Worsened
Jalisco	0.950	0.760	0.722	Worsened
Michoacán	0.984	0.419	0.412	Worsened
Morelos	0.809	0.264	0.213	Worsened
Nayarit	0.885	0.258	0.228	Worsened
Nuevo León	0.876	0.760	0.666	Worsened
Oaxaca	0.956	0.703	0.672	Worsened
Puebla	0.947	0.428	0.405	Worsened
Querétaro	1.046	0.276	0.289	Worsened
Quintana Roo	0.690	0.172	0.119	Worsened
San Luis Potosí	0.994	0.317	0.315	Worsened
Sinaloa	0.884	0.380	0.336	Worsened
Sonora	0.979	0.483	0.473	Worsened
Tabasco	1.103	0.617	0.681	Worsened
Tamaulipas	0.951	0.423	0.402	Worsened
Tlaxcala	0.958	0.310	0.297	Worsened
Veracruz	0.992	0.711	0.705	Worsened
Yucatán	0.909	0.283	0.257	Worsened
Zacatecas	0.974	0.328	0.319	Worsened
Source: Own elaboration based on the data of Tables 1 and 2.				