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Do socioeconomic conditions affect economic performance? the case of the highland region of San Luis Potosi in Mexico

¿Las condiciones socioeconómicas tienen efectos en el desempeño económico? el caso de la región del altiplano de San Luis Potosí en México

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Abstract

"Human capital" is a term that refers to the "level of education" of a population, these skills will produce economic value, which will have an important impact on the development and growth of a region. This research aims to prove that the relationships of some variables of social condition influence the economic development of a given region. The study focuses on the highland area of the State of San Luis Potosí in Mexico. Demographic data from various localities in the area were evaluated. The method of Partial Least Squares (PLS-SEM) was used to estimate the causal relationships between variables such as Education and Health with respect to economic development and migration in the study context. The results indicate that a major problem linked to the scarcity of human capital in this region is migration, which in turn has effects on economic growth and development.

JEL Code: O10, O15, O18
Keywords: economic development; socio-economic situation; subregional study; partial least squares

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Resumen

El término "capital humano" se refiere al "nivel de educación" de una población, estas habilidades producirán valor económico, el cual tendrá un impacto importante en el desarrollo y crecimiento de una región. Esta investigación tiene como objetivo probar que las relaciones de algunas variables de condición social influyen en el desarrollo económico de una región determinada. El estudio se centra en la zona del Altiplano del Estado de San Luis Potosí en México. Se evaluaron datos demográficos de diversas localidades de la zona. Se utilizó el método de Mínimos Cuadrados Parciales (PLS-SEM) para estimar las relaciones causales entre variables como Educación y Salud con respecto al desarrollo económico y la migración en el contexto de estudio. Los resultados indican que un problema importante vinculado a la escasez de capital humano en esta región es la migración, que a su vez tiene efectos sobre el crecimiento económico y del desarrollo.

Código JEL: O10, O15, O18
Palabras clave: desarrollo económico; situación socioeconómica; estudio subregional; partial least squares

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Introduction

The idea of human capital has been known since the work of Schultz (1960) and Becker (1964). It recognizes the relationship of education and training with better economic performance, while health has recently been recognized as an integral component of human capital (T. P. Schultz, 1997). Based on this theory, international organizations such as UNESCO and the OECD have proven that the socioeconomic conditions in which individuals develop affect educational performance, both in general and at the level of individual entities and subregions, which explains the differences in terms of human capital formation, economic results, performance, and regional growth and development.

Accordingly, this paper seeks to prove the existence of a relation between socioeconomic and educational conditions and economic performance in the highland region of San Luis Potosí (SLP), using data available at the local level for the year 2010.[1] The aim was to establish a model that not only complies with the requirements of partial least squares or PLS[2]—which establishes statistically reliable relationships—but also helps to explain how certain socioeconomic variables influence educational variables and these variables influence economic performance in the region.

This document is divided into three sections. In the first one, there is a theoretical review of how economic development is explained by social and educational conditions and a brief review of the conditions that prevail in this regard in the highland region of the SLP. The following two sections describe the model and methodology used to approach the problem. The model analysis was carried out

[1]Data obtained from the 2010 population and housing census
[2]This analysis tool is known as Partial Least Squares (PLS)

based on the statistical technique of path analysis (Wright, 1934), which allows the researcher to know the causal relations between several variables. The Partial Least Squares (PLS) technique was used to evaluate and measure the model. The PLS technique "is the specification of causal and/or predictive relationships in terms of predictors (conditional expectations), followed by least squares estimation of the unknowns" (Wold, 1975). This will help the present authors to formulate the conclusions.

Educational status, economic performance, and regions

The economics of education first emerged as a subject of study to explain that part of economic growth that productive factors could not explain. With the seminal work of T. W. Schultz (1961), the idea of human capital was born first, and then the idea that this is the result of future investment in education, from which two conditions are derived: efficiency and equity.

From the condition of efficiency, the degree of returns that education generates and that are measured in terms of economic or social benefits is extracted, while from the condition of equity, the existence of degrees of learning that are the product of the different conditions in which the actors of education act is evident. Therefore, to obtain homogeneous results, the State must participate and invest to achieve them (Leyva López & Cárdenas Almagro, 2002) in a broader and more generalized manner to limit the inequalities that may exist by region as a result of historical and economic conditions, so that the resulting benefits are distributed more homogeneously throughout society.

Based on these ideas, it is feasible to think that education plays a key role in improving the opportunities of individuals, regions and countries. However, it also depends directly on the structure of the regional educational system as well as on the levels of education that children and teenagers achieve and their ability to take advantage of them, which in turn depend on socioeconomic conditions such as rurality, family and culture, labor market, and gender, among others.

From the Third Regional Comparative and Explanatory Study (TERCE) conducted by UNESCO, conclusions can be drawn about the strong connection between education and economic performance and how the conditions in which children and teenagers learn have strong and direct effects on educational outcomes. For 15 Latin American countries, this study states that the socioeconomic level is the variable with the greatest impact on learning and that there is a direct relationship between inequality in the region and its school systems (Treviño et al., 2016), which results in low social mobility and translates into intergenerational transmission of social position and poverty (Romero Rodríguez, S.I., 2010).

One finding is that poverty is associated with inequality, which prevents the achievement of educational objectives since poverty generates restrictions in terms of food and nutrition, housing,

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services, and well-being in general. This aspect generates the dilemma of whether or not to send children to school, where girls may be at a clearer disadvantage (Treviño et al., 2016)[3].

As one of the main elements to explain the level of learning is socioeconomic—which considers variables such as the mother's level of education and type of employment, income level, housing floor material, and services available, including the availability of books—the study shows for the case of Mexico that the level of learning is considerably higher if the social environment is also higher, which confirms the assertion of the study (Treviño et al., 2016).

In the study, rurality—which can also explain school achievement as it is closely related to poverty, inequality, and iniquity—shows that, on average, rural populations present the lowest levels of socioeconomic development in Mexico. In contrast, private urban populations present the highest (Treviño et al., 2016).

School attendance—which may be subject to compliance with certain requirements—, school selection processes, or the need to work, are also highlighted in the study as elements that affect educational performance and cause education to be truncated. Therefore, policies such as eradicating mandatory quotas, selection processes, and support so that children do not drop out of school because of work are recommended (Treviño et al., 2016).

In this regard, the New Economic Geography (NEG), referring to the relationship between education, labor, and wages, states that regions with considerable distances between consumption markets and the sources of inputs cannot achieve convergence in income levels. Consequently, heterogeneous economic areas emerge, and localities far from the economic centers are characterized by low educational levels (López-Rodríguez et al., 2007). This fact may be conditioned by trade liberalization processes, which allow certain regions of countries to successfully integrate into international trade or business, but not others. The case of migration will be a very important phenomenon because those who can migrate to regions with greater opportunities for economic growth will do so (Garduño Rivera, 2014), determining differentiated levels of regional growth and productivity (Kaldor, 1984).

Likewise, the NEG maintains that market size, transportation costs, international trade, and economies of scale will be the main determinants of the concentration of activities (Krugman & Elizondo, 1996); (Fujita et al., 1999), which will generate and explain the levels of structural heterogeneity in the productive and economic apparatus as well as in educational and social performance.

[3]According to this study, Mexico has been increasing the percentage of its population below the poverty line, going from 31.7 to 41.2 from 2006 to 2014.

The highland region of San Luis Potosí

The impact of economic growth on national and regional development has been recognized in Mexico since the end of the last century (PND 1995-2000)[4]. However, since then, the heterogeneity in regional socioeconomic conditions has scarcely changed, and it is evident in the large number of documents that point out the problems of poverty, education, migration, health, nutrition, and income, among others, related to socioeconomic conditions with evident impact on regional economic growth and development (González Rivas, 2007; Mayer-Foulkes, 2008; Pintor Sandoval et al., 2017).

According to the 2016 State Competitiveness Index of the Mexican Institute of Competitiveness (IMCO; Spanish: Instituto Mexicano de la Competitividad), six factors increase the competitiveness in Mexican states: economy connected abroad through exports and Foreign Direct Investment (FDI); high activity in the manufacturing industry; connection to energy networks; high percentages of personnel employed in formal companies and competitive salaries; higher density of large companies that generate formal and quality jobs; and education systems that generate human capital, aligned to the productive structure of the state (Instituto Mexicano para la Competitividad 2016).

In this regard, San Luis Potosí has maintained its 19th place in the last two observations of the index (although it ranked 18th in 2008). This is the result of improvements in FDI in the automotive and auto parts sectors mainly, which generates improvements in foreign trade, investment by large companies, formal employment, and jobs with well-paid salaries, as well as in its participation in the manufacturing sector. Consequently, its economic growth has been close to the national average but is mainly explained by the central sub-region of the state.

Based on the same study, the state has areas of opportunity related to the supply of natural gas energy resources, which is a determining factor for the increase of investments and the installation of large national and international companies, but which has not been satisfactorily addressed. Investments in quality physical infrastructure, transportation, roads, and highways have also stagnated or have not grown with the desired speed, reducing competitiveness in terms of transportation costs and the movement of people and materials.

In the educational field, this is another category with ample areas of opportunity since in 2010 no municipality was among those with the highest education averages. In fact, the state's schooling average is 8.58 years of schooling, while the national average is 8.63 years.

[4]National Development Plan 1995-2000 Published by the Diario Oficial de la Federación Available at: http://www.diputados.gob.mx/LeyesBiblio/compila/pnd.htm Accessed 12/10/2018

The correlation between education and innovation is established because the concentration of skilled labor force in a region allows companies to adopt and develop new technologies (Simón Fernández et al., 2004), which is possible in the state, given the level of investment in the development of human capital that has been achieved. This was achieved with scholarships for graduate studies granted to students from the state, which has the first position at the national level, the bachelor's degrees certified by COPAES, which represent 2% at this same level, and the seven PNPC graduate programs. What has been done regarding Science and Technology legislation and the fact that it has large companies that invest in R&D in their production processes (Foro Consultivo Científico y Tecnológico, 2012) are factors that speak in favor of the state.

The above information comes from the National Ranking of Science, Technology and Innovation (STI) of the Scientific and Technological Consultative Forum (FCCyT; Spanish: Foro Consultivo Científico y Tecnológico), which seeks to have a measure of comparison of the resources that each state in the country possesses and which places SLP in 13th place with a value of -0.067, which means that the state is below but very close to the national average.

Among the components of this ranking are research infrastructure, scientific productivity, population with professional and postgraduate qualifications, economic and social environment, ICTs, and human resource trainers, which would explain why the state cannot jump to the top of this ranking or the competitiveness ranking.

This study points out the lack of patents granted, the population with postgraduate qualifications, the average number of years studied, illiteracy, low internet connectivity, and postgraduate and undergraduate teaching staff. However, in terms of researchers who are members of the National Researchers System (NRS), the state is in eighth position, which is considered a favorable point (Foro Consultivo Científico y Tecnológico, 2012).

According to a historical regional division, SLP is divided into four major regions: Central, Middle Zone, Huasteca and Highlands.

The region of study, the Highlands, is in the northeastern part of the state and is composed of 15 municipalities: Catorce, Cedral, Charcas, Guadalcázar, Matehuala, Moctezuma, Salinas, Santo Domingo, Vanegas, Venado, Villa de Arista, Villa de Guadalupe, Villa de la Paz, Villa de Ramos, and Villa Hidalgo.

The municipality of Matehuala is considered the economic center of the region because it is the main center for its most important activities and contains the region's main companies, including Matehuala's industrial park.

The climate ranges from desert to semi-desert in the northern part of the region, but pine and oak vegetation can also be found near the state capital, allowing mining, commerce, protected agriculture, the food industry, and tourism as the main economic activities. This explains, at least in part, why it occupies the second place in the state in terms of GDP participation with 6.4%—far from the first place occupied by the Central region with 84.1%—, where economic activities and international trade are mainly in the following sectors: automotive, metal mechanics, household appliances, and services (Comité de Planeación del Desarrollo Estatal, 2016).

According to data from 2015, the highlands also occupy the second place in GDP per capita with MXN$59,130; however, this area ranks third in population level, which makes this region very important according to its productive capacity. In this same document, it can be found that the region has high participation in mining, especially in the production of fluorite, copper, gypsum, gold, zinc and silver, and beef and goat meat production. In the tourism sector, hotel occupancy increased by 6% from 2012 to 2014 (Comité de Planeación del Desarrollo Estatal, 2016), mainly due to the economic activity of Matehuala and the town of Real de Catorce, which is promoted as a tourist attraction by the authorities.

The model

The model helped to explain the economic environment of the highland region of San Luis Potosí (SLP) with the following variables: Economy, Basic Education, Middle and Higher Education, Marginalization, Migration, and Health. These variables were selected based on information from the 2010 National Population and Housing Census[5] for San Luis Potosí, Mexico. This meant that certain localities that did not contain relevant information for the previously mentioned variables were eliminated from the study.

Under this premise, a model based on path analysis was developed to calculate the relationship between each variable and its contribution to the region's sustainable development. The model will be measured using the Partial Least Squares technique for models based on Path analysis (Wold, 1975). The model focuses on representing economic development in two aspects: The first relates economic development and social marginalization to the population's access to health and education services (basic, middle, and higher levels). As described in the previous section, the highlands of San Luis Potosí tend to be one of the regions with the highest poverty rates in the state[6] (De la Torre García & Rodríguez García, 2014). Thus, reduced access to health services will significantly affect the educational sector and, in turn, will generate greater social marginalization. That is, if a certain proportion of the population in the region

[5]The National Population and Housing Census is carried out by the National Institute of Statistics, Geography and Informatics (INEGI; Spanish Instituto Nacional de Estadística, Geografía e Informática), among other economic and social studies.

[6]The data presented by the UNDP in the "Municipal Human Development Index in Mexico: a new methodology" were used to calculate the annual per capita income of the municipalities that make up the highland region, which is US$7,232.5 and is lower than the state average of US$7,325.9.

studied does not have access to basic health services, their educational performance and development will likely be negatively affected. In this regard, according to Camberos and Bracamontes (2007), marginalization can be considered as:

"a situation in which a group of individuals and families living within a locality or municipality, urban or rural, do not satisfy their basic needs, according to the criteria determined by recognized institutions such as the United Nations Development Program (UNDP) and the World Bank."

Likewise, the authors point out that: "Marginalized population is also understood as the sector of society that, due to socioeconomic and political organization, is excluded from access to the consumption and enjoyment of goods and services, and from participation in political affairs."

The relationship between the socioeconomic variables Health and Education has been studied over time. Ross and Wu (1995) pointed out its importance, indicating that those individuals who had access to a certain level of education tend to have a stable economic life and, therefore, a better quality of life (in the sense of health) than those who did not. Consequently, it is assumed that citizens' access to health services from the beginning of their educational life will be compensated by better social welfare and therefore, human capital development will positively impact economic development. Accordingly, there are diverse social groups in Mexico, the most vulnerable being those residing in rural areas or indigenous groupings (Ochoa Nogales et al., 2018), specifically minors. While it is true that there are government programs for the development of these areas and to support their inhabitants, it is also true that the level achieved has not contributed to sustainable development due to the lack of people-government communication (Fernandez, 2018). Bearing in mind the previous notes, the relationship that exists between access to basic health services, specifically in this topic of study, which is the highland region of the Potosi highlands, can be established through the following assumptions:

$$Basic\ education = f(\ Health) \tag{1}$$

$$Higher\ education = f(Basic\ Education, Health) \tag{2}$$

Given the above assumption, a socioeconomic variable that has had an impact, especially in the most vulnerable regions, Marginalization, can also be related. In this regard, the lack of access to health and education services, both basic and higher education, will increase the marginalization index. The study on the Absolute Marginalization Index mentions the main indicators that influence marginalization, among them Education (Almejo Hernández et al., 2013). In turn, in Ramos Soto et al. (2018), the main factors that have implications in the index of marginalization, poverty and inequality are studied, finding that the lack of access to basic public services (such as education or health) are triggers of the same. Given the above, the following assumption can be made:

$$Marginalization = f(Higher\ Education, Health) \tag{3}$$

The above expressions simply demonstrate the relationship between the variables. However, it is possible to define them through a linear function by expressing the hypotheses as follows:

$$Basic\ education = \beta_1 Health + \varepsilon \tag{4}$$

$$Higher\ Education = \beta_2 Basic\ Education + \beta_3 Health + \varepsilon \tag{5}$$

$$Marginalization = \beta_4 Higher\ education + \beta_5 Health + \varepsilon \tag{6}$$

It can be stated then that there is a direct causal relationship between the variable Health and the variables Basic and High School Education and, in turn, a direct relationship between the variable Health and Marginalization.

In a second aspect, Migration, as stated by Rojas et al. (2011), is considered as the "geographic displacement of individuals or groups, generally for economic or social reasons[7]." This definition is consistent with the objectives of this study since the migration variable can be identified as an economic and social indicator with implications for the education sector and, in turn, for marginalization.

In the same line of thought, migration is a key factor in explaining economic development. Ramos Soto et al. (2018) point out that migration is a source of economic inequality. For Hildebrandt and McKenzie (2005), migration contributes to the most vulnerable populations (in rural areas) having less access to health services and other basic services such as education. Nonetheless, the negative consequence of this relationship may be overshadowed depending on the number of remittances acquired by migrant households (Acosta Rangel & Caamal-Olvera, 2017). Thus, the greater the inflow of remittances by migrants, the greater the access to public services. Therefore, it can be assumed that:

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[7]The authors mention that this is a definition taken from the Diccionario de la Real Academia Española.

$$Migration = \beta_6 Basic\ education + \beta_7 Higher\ education + \beta_8 Migration + \varepsilon \quad (7)$$

Once the previous model has been established, another series of variables that influence the economic development of a state can be considered. In the first instance, the variables Marginalization and Education influence economic development, as mentioned above. In the development of the model, a causal relationship was established between Higher Education and Economic Development, with the understanding that the level of education also has an influence. That is to say, if the level of education in a region is higher, its economic development will gradually increase, and the level of Marginalization will decrease at the same rate, so it can be suggested that there is a causal relationship between these two variables, such that:

$$Economic\ development = \beta_8 Marginalization + \beta_9 Higher\ education + \varepsilon \quad (8)$$

As already mentioned, if the population settled in a region has few educational opportunities and therefore limited well-paid job opportunities, this will generate marginalization, which would not only establish this negative social gap but would also mean potential population mobility, i.e., a migrant population in search of better opportunities.

Analysis of the results

For the contrast between the model variables, it is necessary to establish a statistical analysis to obtain the value of the regression and its coefficient of determination, making it possible to represent the reality of the object of investigation. That is, to establish the relationship between the proposed model’s latent variables and manifest variables.

For this type of methodology, collecting data confirming the model's quality and measurement instruments is very important. In this aspect, two classic measurements can be referenced: the reliability and validity of each element and the model in general. For example, Canales Cerón (2006) state that “Reliability points to the elimination of contingent distortions in the application of the instrument (from the “presence” of the interviewer to the context, but above all to the sampling quality) and validity, as the correspondence between the measurement and the measured.” In this regard, Yong Varela (2004) points out the common application of two statistical techniques for data analysis in quantitative research. The first is related to the description and organization of the data in such a way as to allow the researcher to “describe” the relationship of the research variables. The second technique evaluates the inference of the

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behavior of the research variables for a population sample; this method will allow the researcher to evaluate the consistency of a model and study hypothesis.

Causal relationships between different variables

One statistical technique to evaluate this relationship between variables is multiple regressions using path analysis. Streiner (2005) points out that this type of instrument allows different (complex) models to be reviewed and compared. Nonetheless, they cannot be used to establish causality or to determine whether a model is correct—only to consolidate the consistency of the data with the proposed model. Chen and Tseng (2012) also note that structured equation techniques are multivariate based on path analysis. Such techniques will allow the researcher to determine the validity of the empirical investigation by analyzing various groups of variables and their respective cause-effect relationship.

These analysis tools based on structural equations have been implemented in various economic and social research areas. For example, two of the most commonly used techniques in this context can be mentioned: Covariance-based models and partial least squares models (Caballero Domínguez, 2006). Methodological differences can be distinguished between these two techniques. The covariance-based model maximizes the explained variance of the endogenous latent variables by estimating the partial model relationships in an iterative sequence of ordinary least squares. Partial least squares-based models typically estimate model parameters in a way that minimizes the discrepancy between the covariance and sample matrices (Joe F. Hair, Sarstedt, et al., 2011, p. 415).

The PLS technique is characterized by its ability to analyze multivariate models based on linear regression with high dimensionality and multicollinearity, and few observations. As in any research project, the selection of the analysis instrument will depend on the objectives and context of the research (Hair Jr et al., 2014). Therefore, for this research and due to the complexity of the model being developed, the partial least squares (PLS) model will be adopted to analyze and evaluate its consistency. The analysis in this type of study consists mainly of two phases: the first analyzes the reliability of the constructs, and the second, the validation of the study hypotheses through PLS-SEM, which will be described later. The computer software for SEM modeling, SmartPLS v2.0 (Cheung & Vogel, 2013), was used to calculate the PLS-SEM algorithm, T-tests, and predictive relevances. Microsoft Excel 2016 was used for the descriptive analysis and graphs in general.

To avoid type II statistical error, a methodology to determine the sample size suggested by Ringle et al. (2012) is statistical power analysis. The statistical software G-Power was used with a mean size f^2=0.15 and assigning “Migration” as the construct of the proposed model with 3 causal relationships (Basic Education, Higher Education, Marginalization) for an optimal value of 95% at the confidence level, which is an acceptable value in the area of social sciences (Joseph F. Hair, Sarstedt, et al., 2012), which established a minimum sample size of 119 elements, as can be seen in Table 1.

Table 1
Minimum sampling for a 95% Power Analysis

f TESTS - LINEAR MULTIPLE REGRESSION: FIXED MODEL, R² DEVIATION FROM ZERO		
ANALYSIS:	A PRIORI: COMPUTE REQUIRED SAMPLE SIZE	
INPUT:	EFFECT SIZE F²	= 0.15
	A ERR PROB	= 0.05
	POWER (1-B ERR PROB)	= 0.95
	NUMBER OF PREDICTORS	= 3
OUTPUT:	NONCENTRALITY PARAMETER Λ	= 17.8500
	CRITICAL F	= 2.6835
	NUMERATOR DF	= 3
	DENOMINATOR DF	= 115
	TOTAL SAMPLE SIZE	= 119
	ACTUAL POWER	= 0.9510

Source: Created by the authors based on the results of G-Power

Measurement of the model

Path analysis models should be evaluated according to their causal mode, i.e., how the relationships between the various variables in the model will be considered. For this research and due to the characteristics of the proposed model, the relationships between its variables will be considered reflexive. It was decided to follow the method of Roldán and Sánchez-Franco (2012), who recommend using measurement procedures, convergent validation, discriminant validation, and structural evaluation of the model as a methodology to evaluate this type of relation.

For convergent validity analysis, some rules must be considered. For example, Martinez-Torres et al. (2008) point out that this type of analysis indicates the degree of correlation between the scale items, which should show a strong correlation. One of the most widely used methods in the social sciences to perform this analysis (reliability of a scale and its internal consistency) is Cronbach's alpha. The acceptable value in the academic literature for this unit of measurement is $\alpha \geq 0.7$ and $\alpha \leq 0.9$ (Oviedo & Arias, 2005).

Table 2 shows that the values obtained in the model for Cronbach's alpha are higher than 0.7 for each of the variables studied, so it can be considered to have an acceptable internal consistency. Fornell and Larcker (1981) propose evaluating the constructs' composite reliability (for social sciences) to ensure that the model is consistent. In this case, the values proposed for this type of analysis should be greater than 0.7. In addition to this evaluation measure, convergent validity should be measured through the Average Variance Extracted (AVE) for each construct of the model. The recommendation for this measure is AVE > 0.5. For this case study, all the constructs proposed in the model exceed the values above, implying internal consistency in the model.

Table 2
Convergent and discriminant validity analysis

					Correlation chart					
	AVE	COMP. REL.	R^2	$A\ CR.$	ECO.	BAS. ED.	MID. HIGH. ED.	MRG.	MIG	HEALTH
ECO.	0.9619	0.987	0.8478	0.9801	0.9808					
BAS. ED.	0.8395	0.9127	0.5882	0.8102	0.6959	0.9162				
MID. HIGH. ED.	0.8922	0.9431	0.6904	0.8793	0.9094	0.7701	0.9446			
MRG.	0.7954	0.8861	0.1123	0.7434	0.4332	0.2262	0.3260	0.8919		
MIG.	0.861	0.9253	0.7251	0.8387	0.7268	0.8073	0.7898	0.3047	0.9279	
HEALTH	0.783	0.9351	0	0.907	0.7254	0.7670	0.7909	0.3051	0.7867	0.8849

Source: created by the authors

The discriminant validity of the constructs in a model suggests that the degree to which the variable is measured should not be a reflection of some other variable, i.e., there should be no correlation between them (Martinez-Torres et al., 2008). To perform this test, it is suggested to use the square root of the mean variance extracted from each construct on the correlation matrix. Fornell and Larcker (1981) suggest that the resultant of this operation should be greater than the correlations of the group constructs. Table 2 shows the results of this operation for the proposed model, where the square root of the AVE (figures in bold) is greater than the loadings of each construct in the group.

Figure shows the loadings and ratio weights in the structural model in the SmartPLS 2 software.

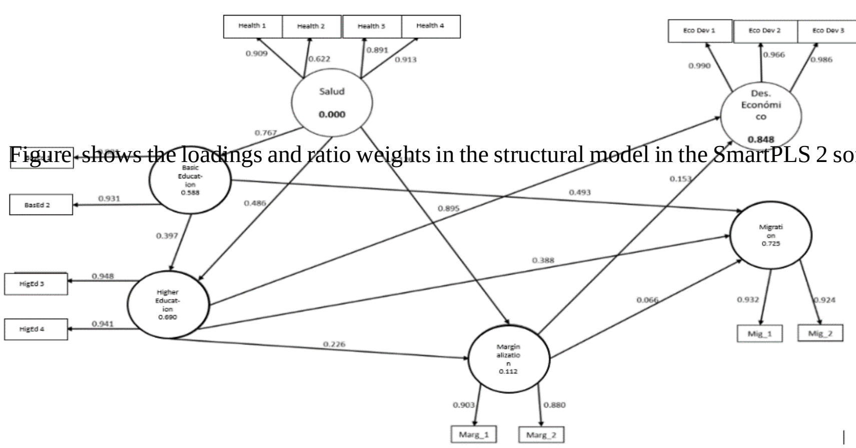

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Figure 1. Results of the structural model obtained from SmartPLS
Source: created by the authors

Evaluation of the structural model

As mentioned above, it is important to analyze the structural model employing statistical significance through bootstrapping (resampling) in this type of exercise. This technique consists of performing statistical analysis based on the bootstrap of a set of data belonging to a random sample by replacing the original sample to generate the bootstrap sample providing the standard errors and t-statistics for the corroboration of the hypotheses raised. The minimum accepted value for resampling is usually 500, and another aspect of validity is that the number of cases should be the same as the number of observations in the original sample. This study will be based on the recommendations made by Joe F. Hair, Ringle, et al. (2011), where they suggest increasing the number of samples from 500 to 5,000. For the contrast of the confidence intervals, this study will be based on the values proposed by Roldán and Sánchez-Franco, (2012), who they point out that $\rho < 0.05; \rho < 0.01; \rho < 0.001$. Concerning the above, one-tailed t-statistics will be obtained and defined as:

$$t(N-1) \rightarrow t(5\,000-1) \therefore t(0.05; 4\,999) = 1.6451, t(0.01; 4\,999) = 2.3270, t(0.001; 4\,999) = 3.0902 \quad (9)$$

Table 3 contains the results of the structural model in which it can be observed that the relationship that defines the Marginalization to Migration and the Health to Marginalization relations are not significant since they did not reach the minimum criterion of the distribution for p<0.05 compared to the other relationships.

Table 3
Results of the structural model (Total effects). Based on the one-tailed t(N-1) test

HYP		EXPECTED EFFECT	PATH COEFFICIENT	T-VALUE BOOTSTRAP	SUPPORTED
H1	BAS. ED.→MID. HIGH. ED.	+	0.3972	4.2097***	YES
H2	BAS. ED. → MIG.	+	0.4932	3.6527***	YES
H3	MID. HIGH. ED. → ECO.	+	0.8595	28.93***	YES
H4	MID. HIGH. ED.→ MRG.	+	0.2262	1.8988*	YES
H5	MID. HIGH. ED. → MIG.	+	0.3883	3.1943***	YES
H6	MRG. → ECO.	+	0.153	3.0671**	YES
H7	MRG. → MIG	+	0.0665	1.1248	NS
H8	HEALTH → BAS. ED.	+	0.767	7.3147***	YES

H9	HEALTH → MID. HIGH. ED.	+	0.4862	5.4235***	YES
H10	HEALTH → MRG.	+	0.1262	1.059	NS

. *P<0.05 =1.64, **P<0.01=2.32, ***P<0.001-=3.092, NS: NOT SIGNIFICANT
Source: created by the authors based on the one-tailed t(n-1) test

The evaluation of the structural model (in addition to hypothesis testing) requires an analysis of the confidence intervals as a measure of uncertainty to avoid the standard errors derived from resampling. To calculate the resampling confidence intervals, the method suggested by Roldán and Sánchez-Franco (2012) will be adopted. This analysis suggests performing the analysis by percentiles with minimum values of 2.5% and maximum values of 97.5%.

Table 4 shows that hypotheses H4, H7 and H9 are not statistically significant for this study. It can also be seen that the relationships Marginalization → Migration (H7) and Health → Middle and Higher Education (H9) again coincide with respect to the results in Table 3.

Table 4
Structural model results (bootstrap percentile method at 97.5% confidence interval, n= 5000 subsamples)

HYP		EXPECTED EFFECT	PATH COEFFICIENT	LOW (2.5%)	HIGH (97.5 %)	SUPPORTED
H1	BAS. ED.→MID. HIGH. ED.	+	0.3972	0.2038	0.5715	YES
H2	BAS. ED. → MIG.	+	0.4932	0.1663	0.6960	YES
H3	MID. HIGH. ED. → ECO.	+	0.8595	0.7914	0.9079	YES
H4	MID. HIGH. ED.→ MRG.	+	0.2262	-0.0056	0.4686	NS
H5	MID. HIGH. ED. → MIG.	+	0.3883	0.1543	0.6347	YES
H6	MRG. → ECO.	+	0.153	0.0586	0.2568	YES
H7	MRG. → MIG	+	0.0665	-0.0297	0.2084	NS
H8	HEALTH → BAS. ED.	+	0.767	0.4941	0.8974	YES
H9	HEALTH → MID. HIGH. ED.	+	0.4862	0.3175	0.6721	YES
H10	HEALTH → MRG.	+	0.1262	-0.0922	0.3806	NS

Source: created by the authors

Although the most accepted consideration for explaining variables in a model is the R^2, another statistical criterion can be considered: the Stone-Geisrer test (Q^2) on the dependent constructs (Joseph F. Hair, Ringle, et al., 2012). The predictive relevance test suggests performing the cross-validation calculation of the components for redundancy and communality, which should be greater than zero. **¡Error! No se encuentra el origen de la referencia.** shows the model has a predictive significance $Q^2 > 0$.

The R^2 values are considered as a base value to explain the model statistically. To this end, the proposal of Joe F. Hair, Ringle, et al. (2011) will be adopted, in which they suggest considering R^2 values of 75% as substantial, 50% as a moderate value, and 25% as a weak explanatory value. **¡Error! No se encuentra el origen de la referencia.** shows that the proposed model largely explains that the factors studied (Education, Health, and Marginalization) clearly imply Migration and Economic Development in the Potosi highlands. The study suggests that the less access the population has to basic services such as Health and Education, the greater the decrease in Economic Development and therefore the greater the Migration. In this model, Economic Development directly affects Middle and Higher Education and Marginalization, which together explain that 84.7% of these factors influence an acceleration or deceleration in the development of the state. This figure could also explain the current situation at the national level where, according to the Education Panorama, 16% of adults (25 to 64 years of age) have higher education qualifications (Organisation for Economic Cooperation and Development, 2016).

In the same way, the next point under study is Migration. In this analysis, the Migration variable showed a 72.5% explanation for the variables Middle and Higher Education 39.8%, and 30.6% for Basic Education. It is reasonable to assume that with fewer educational opportunities, there will be less development, and migration will increase.

In the case of the Education variables, it can be observed that both have a direct relationship with the Health variable, which represents 58.8% for Basic education and 69% for Higher Middle Education. These figures provide a clear picture that demonstrates that if the population does not have access to Basic Health services, it is very likely that they will not complete their Basic and Middle-Higher level education. The relationships between Higher Secondary Education and Health concerning the Marginalization variable had little explanation for this model, with 11.2%. This may be because the population is not necessarily influenced by higher education status or health services to be considered marginalized. Nonetheless, other factors should be considered, such as the incorporation of sources of employment that reduce the population's migration rates and therefore justify an increase in their level of education.

Table 5
Effects on endogenous variables

VARIABLE AND HYP.			R^2	Q^2	EFFECT	CORRELATION	VARIANCE EXPLAINED
ECONOMY			0.8478	0.8077			
	H3	MID. HIGH. ED. → ECO.			0.8595	0.9094	0.7816293
	H6	MRG. → ECO.			0.153	0.4332	0.0662796
BASIC EDUCATION			0.5882	0.4733			
	H8	HEALTH → BAS. ED.			0.767	0.7670	0.588289
MIDDLE AND HIGHER EDUCATION			0.6904	0.5799			
	H1	BAS. ED.→MID. HIGH. ED.			0.3972	0.7701	0.30588372
	H9	HEALTH → MID. HIGH. ED.			0.4862	0.7909	0.38453558
MIGRATION			0.7251	0.5846			
	H2	BAS. ED. → MIG.			0.4932	0.8073	0.39816036

H5	MID. HIGH. ED. → MIG.			0.3883	0.7898	0.30667934
H7	MRG. → MIG			0.0665	0.3047	0.02026255
MARGINALIZATION		0.1123	0.0875			
H4	MID. HIGH. ED.→ MRG.			0.2262	0.3260	0.0737412
H10	HEALTH → MRG.			0.1262	0.3051	0.03850362

Source: created by the authors

Conclusions

The proposed methodology and model made it possible to establish a positive and direct relationship between the explanatory variables health, education, and marginalization, and the explained variables migration and economic performance. This means that to the extent that socioeconomic conditions such as health or access to better basic services such as water, electricity, drainage and housing, or educational conditions improve, this will have positive effects on economic performance and on the reduction of migration, given that there will be better infrastructure and educational conditions that will allow investment to increase and with it the generation of companies, employment and production, which will be closing a virtuous circle.

The SLP highlands is a region with little entrepreneurial and business development, which subjects it to a vicious circle of low social development linked to low economic development, accompanied by migration processes. To break this vicious circle, public intervention is needed to promote improvements in health, education, and infrastructure, which will lead to improvements in socioeconomic conditions by generating and increasing human capital, which will change the region's social and economic dynamics.

The low volume of human capital, a product of migration and education problems, should be present in public policymakers' minds when promoting regional economic growth and development since it is indispensable but also depends on socioeconomic conditions, as demonstrated in this work.

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