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RESEARCH

Competitiveness and Well-being in Municipalities of the Sierra Region in Sonora, Mexico

Competitividad y bienestar en municipios de la Región Sierra en Sonora, México

Date received: September 20th, 2019.

Date of approval: December 05th, 2019

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Abstract

Globalization affects productive processes and intensifies competitiveness at the national, regional, and local levels. However, regardless of the scale at which competitiveness is analyzed, recent literature indicates that its primary objective should be the creation of well-being. Therefore, the objective of this study is to analyze whether competitiveness levels are reflected in the well-being of the regional population. To this end, a competitiveness index is estimated and the well-being thresholds calculated by the Consejo Nacional de Evaluación de la Política Social (Coneval, 2016) are used. The results show that the Sierra region, composed of 38 municipalities, recorded a lower competitiveness index than the state of Sonora and a higher proportion of people whose income was insufficient to achieve economic well-being. Similarly, the region had a higher percentage of people who did not surpass the minimum well-being threshold. This means that in the region, both competitiveness levels and population well-being are below those of the overall population in the state of Sonora. Nevertheless, the most important contribution is to present the analysis methodology used.

Keywords: Population, well-being, competitiveness, Sierra region, state of Sonora.

JEL Codes: R1, R5, I3, I31

Resumen

La globalización repercute en los procesos productivos e intensifica la competitividad nacional, regional y local; sin embargo, independientemente de la escala en el análisis de la competitividad, la literatura reciente indica que el principal objetivo de ésta debe ser la creación de bienestar. Por ello, en este trabajo el objetivo es analizar si los niveles de competitividad se reflejan en el bienestar de la población regional, para lo cual se estima un índice de competitividad y se utilizan las líneas de bienestar calculadas por el Consejo Nacional de Evaluación de la política Social (Coneval, 2016). Los resultados muestran que la región Sierra, integrada por 38 municipios, registró un índice de competitividad menor que el Estado de Sonora y una mayor proporción de personas cuyo ingreso le era insuficiente para alcanzar su bienestar económico y, de igual manera, la región tenía un mayor porcentaje de personas que no superaban la línea de bienestar mínimo. Esto significa que en la región los niveles de competitividad y el bienestar de población están por debajo de la competitividad y el bienestar del conjunto de la población en el estado de Sonora; sin embargo, lo más importante es mostrar la metodología de análisis utilizada.

Palabras clave: Población, bienestar, competitividad, región Sierra, Estado de Sonora.

JEL Codes: R1, R5, I3, I31

Introduction

Within the framework of economic globalization, regions are considered the most appropriate level for measuring competitiveness, since in many countries they are the most important units for public policy formulation (Aranguren et al., 2010). According to Camagni (2002), regions are in direct competition with one another due to the free mobility of production factors, making the measurement of competitiveness at this level more relevant than at the national scale.

Nonetheless, regardless of the scale or the different definitions of the term competitiveness, several authors agree that its main goal should be the social well-being of the population: high income levels, improved quality of life, or greater prosperity (Aiginger 2006a; Grilo & Koopman 2006; Arroyo & Berumen 2003; Camberos & Huesca, 2002). This is because there is a relationship between the concept of competitiveness and a nation's ability to generate wealth for its citizens (Grilo & Koopman 2006).

In this regard, Aiginger (2006a and 2006b) argues that competitiveness should be defined as "the ability to create well-being," aiming to go beyond definitions that only focus competitive efforts on reducing production costs or maintaining favorable trade balances. From this perspective, it is clear that the analysis of competitiveness is not limited to the national or business level it is also applicable at the regional level, where an increase in competitiveness would be expected to have a positive impact on social well-being.

On the other hand, although the urbanization process in Sonora has been fueled by migrant populations from other states such as Baja California, Chihuahua, Jalisco, Michoacán, Nayarit, and Sinaloa, internally it is the municipalities in the mountainous area (zona serrana) that have historically lost population, which migrates from the Sierra to the Coast and Border regions in search of a better quality of life (Castro, 2000). Initially, this migration was driven by the agricultural prosperity of the 1960s and, in subsequent decades, by the urbanization and industrialization processes inherent to regional development in the state[1].

Moreover, Sonora is classified as a state with a medium level of migration intensity, ranking 20th out of 32 nationally (Conapo, 2012: 5, Table 3). By 2010, only one municipality had a high migration intensity index, and like the state, thirteen municipalities had medium migration intensity, five of which were located in the Sierra region: Bavispe, Tepache, Bacanora, Opodepe, and Sahuaripa. Meanwhile, 58 municipalities had low or very low migration intensity indexes (ibid, 2012: 9, Table 6).

The objective of this study is to determine the levels of competitiveness in the Sierra region and its municipalities within the state of Sonora, in order to identify whether competitiveness levels are reflected in the well-being of the regional population. To that end, two specific objectives are proposed: 1) to estimate the levels of competitiveness in the Sierra region and its 38 constituent municipalities, and 2) to comparatively analyze the municipalities that exhibit the highest and lowest levels of competitiveness and well-being in the region.

Following this introductory section, the second part briefly outlines the concept of competitiveness. The third part describes the methodological approach for measuring competitiveness and regional well-being. The fourth part presents the analysis of competitiveness levels and population well-being in the municipalities of the Sierra region in the state of Sonora. Finally, the study concludes with a summary of the main findings.

The concept of competitiveness

Porter (1990) argues that productivity is the sole foundation of national competitiveness, and that it is, in turn, the main determinant for achieving a high standard of living, with international trade playing a fundamental role in this process. However, Budd and Hirmis (2004) point out that the same author assumes that competitiveness is the ability of firms and industries to increase their market share, for which innovation is essential.

For his part, Camagni (2002) argues that David Ricardo's principle of comparative advantage does not operate at the subnational level, and that it is rather Adam Smith's principle of absolute advantage that governs production, specialization, and trade.[2] In other words, he warns that the adjustment mechanisms that function at the national level such as price and wage flexibility and the exchange rate

[1] Process in which the state's three main urban centers stand out: the cities of Hermosillo (state capital), Nogales, and Ciudad Obregón.

do not operate in the same way at the regional level.

According to this author, there are three aspects of regions that invalidate the theory of comparative advantage: a) regions are obliged to trade with one another; it is not an optional matter from which an initial trade position can be defined; b) there is free mobility of production factors between territories c) there is a single currency within the region, which renders an exchange rate between territories unjustifiable.

Therefore, reference is made to the asset endowment of a region, which although external to firms influences their establishment in a given territory. Specifically, he refers to regional externalities institutional, infrastructure-related, technological, and social that benefit firms in such a way that no other set of factors induces the distribution of productive activity (Kitson et al., 2004; Camagni, 2002).

Turok (2004) argues that regional competitiveness is not an end in itself, but rather an indication of the determinants of economic success. He assumes that cities or regions with inherent economic advantages will be more successful in engaging in competitive activities. Therefore, externalities not only explain the reason behind different productivity levels across regions but also why those differences do not diminish over time.

On the other hand, Aiginger (2006a) and Kitson et al. (2004: 993) point out that productivity alone reveals only one aspect of competitiveness. It is also important to consider the regional employment rate, so as not to fall into the error of considering a region competitive simply because it increased productivity through massive layoffs and business closures.

Therefore, Aiginger (2006a and 2006b) argues that competitiveness should be defined as "the ability to create well-being," setting aside definitions that focus competitive efforts solely on reducing production costs or maintaining favorable trade balances. This implies a reevaluation of the competitive process through variables related to well-being, with the expectation that an improvement in competitiveness will positively impact people's well-being.

Measurement of competitiveness

Competitiveness is measured by considering the regional externalities that influence the establishment of firms in a territory and that constitute a competitive advantage of one region over another by fostering economic activities. To this end, a Competitiveness Index (INCOM) is first estimated for the region and each municipality using the statistical technique of principal component factor analysis. The competitiveness levels provided by the method were calculated based on thirteen indicators obtained from different sources of information [3]. Let Iij represent the socioeconomic j for each municipality i, wherej=1,2,...,13; e i=1,2,...,72. The indicators are as follows:

*Ii1*Road Infrastructure,

*Ii2*Educational Infrastructure,

*Ii3*Hospital Infrastructure,

*Ii4*Public Transport Density,

*Ii5*Employed Population,

*Ii6*Unemployed Population,

*Ii7*Highly Skilled Workforce,

*Ii8*Medical Coverage,

*Ii9*Private Investment by Municipality,

*Ii10*Public Investment by Municipality,

*Ii11*Business Size,

*Ii12*Income by Municipality,

*Ii13*Financial System.

Based on these indicators, it is necessary to construct a summary measure that accounts for competitiveness. Thus, principal component factor

[2] The principle of comparative advantage states that countries produce and export the goods in which they are most efficient, meaning those with a relatively lower cost compared to the rest of the world; whereas absolute advantageimplies that a country tends to specialize in the production and export of goods for which it has a greater resource endowment than other countries.

[3] The data were obtained from the following sources: a) State and Municipal Database System (SIMBAD) of the National Institute of Statistics and Geography (INEGI); b) 2010 Population and Housing Census; c) Sociodemographic and Economic Information Bank of INEGI at the municipal level; d) Ministry of Public Education; and e) Ministry of Communications and Transportation

analysis is used a statistical method that transforms a set of indicators into a new one, providing a simpler interpretation of the phenomenon under study (Díaz de Rada, 2002). This requires that the original variables exhibit a high degree of correlation, which is the case for the indicators used.

The association between variables and the suitability of the factor analysis are measured by Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The closer this measure is to one, the more common factors are present, indicating the appropriateness of factor analysis (Ibid, 2002). In Table 1, both tests demonstrate the relevance of factor analysis for studying the interrelations among the thirteen variables; the KMO statistic has a value of 0.89, qualifying as meritorious, and Bartlett's test assigns a high Chi-square value indicating reliability.

Before applying the aforementioned method to calculate the INCOM, to eliminate the effects of notably different variances, these are standardized using the arithmetic mean and standard deviation for each municipality as follows:

$$z_{ij} = I_{ij} - I_j / ds_j$$

Where:

z_{ij} :standardized indicator j $(j=1,...,13)$ for municipality i $(i=1,...,72)$,

I_{ij} : indicator j, of the unit analysis i

I_j : sample mean of each indicator j,

ds_j :typical standard deviation of economic indicator j.

These new variables have an arithmetic mean equal to zero, while the variance and standard deviation

Table 1. KMO and Bartlett's Test for INCOM 2010

Kaiser-Meyer-Olkin	Measure of sampling adequacy	0.892
Bartlett's test of Sphericity	Aprox. Chi-square	2501.323
	df	78
	Sig.	0

Source: Own elaboration based on INEGI, Municipal Database System (SIMBAD) 2010 and the Principal Component Statistical Method.

equal one. For the estimation of INCOM, the statistical software package SPSS Statistics version 22 was used, which provides standardized principal components with mean zero and standard deviation one. Thus, the INCOM values correspond to the first standardized component of each municipality, which is the linear combination of the thirteen standardized variables, that is:

$$Y_{il} = INCOM_i = \sum_{j=1} c_j z_{ij} = c_1 z_{i1} + c_1 z_{i2} + \ldots + c_1 z_{i13}$$

Where:

Y_{i1}: value of municipality i in the first standardized principal component,

$INCOM_i$: value of the Muncipal Competitiveness Index in municipality i,

I_{ij}: weighting coefficient of indicator j to determine the first standardized principal component,

I_{ij}: standardized indicator j of municipality i.

To measure the degree of competitiveness of each municipality in the region, as well as the region itself, the Municipal Competitiveness Index (Table 2) is used, which includes both positive and negative values. The values obtained range from a maximum of 6.62821 to -0.46437. Higher positive values indicate a high level of regional and municipal competitiveness; conversely, the more negative the value, the lower the level of competitiveness in the region and its municipalities.

Measurement of Well-being

The next step in the methodology is to measure well-being, to see if there is a positive correlation between the competitiveness index and the level of well-being. For this purpose, the methodology developed by Coneval (2016) for the official measurement of poverty in Mexico is used. It is based on two approaches: one related to social rights, measured through social deprivation indicators that represent fundamental human rights in social development, and the economic well-being approach, measured through satisfiers acquired from the population's monetary resources and represented by well-being thresholds.

The social rights approach is measured using the following social deprivation indicators: 1)

Table 1. KMO and Bartlett's Test for INCOM 2010

INCOM 2010 Range	Competitiveness Level
[6.62821, 0.0731276]	Very High
[0.0731276, -0.2521676]	High
[-0.2521676, -0.3544517]	High
[-0.3544517, -0.4070057]	Low
[-0.4070057, -0.46437]	Very low

Source: Own elaboration based on INEGI, Municipal Database System (SIMBAD) 2010 and the Principal Component Statistical Method.

Educational backwardness, 2) access to health 3) access to social 4) quality and space 5) access to basic services in housing and, 6) access to food; meanwhile economic well-being is measured through two basic baskets, one food-based and one non-food-based, which allow estimates for both rural and urband localities.

From this, two well-being thresholds are determined: 1) Economic well-being line, which is the sum of the costs of the food and non-food[4], baskets, compared to household or individual income, enabling indentification of the population that does not have sufficient resources to acquire the goods and services required to satisfy their basic needs, even if they were to use all of their income; 2) Minimun well-being line, which corresponds to the cost of the food basket, allowing indentification of the population that, even if using all of three or more social deprivations and issuficient income to acquire the food basket (income below the minimun-well being line).

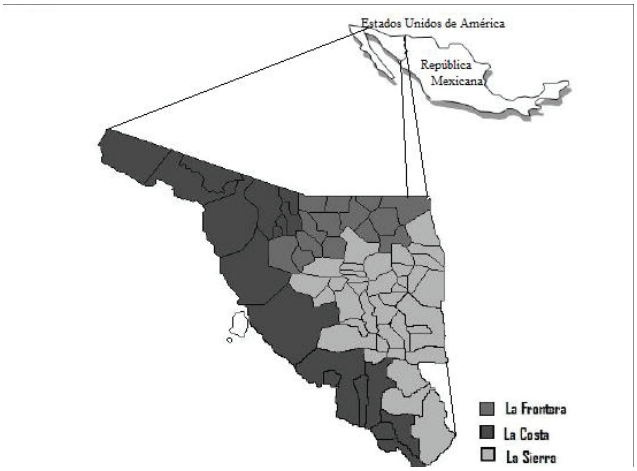
Thus, by combining the social rights approach (social deprivations) and economic well-being (income), the population in poverty is identified according to the following definitions: 1) A person is considered to be in poverty when they have at least one social deprivation and do not have sufficient income to meet their needs (their income is below the economic well-being line), and 2) A person is considered to be in extreme poverty when they have three or more social deprivations and do not have sufficient income to acquire a basic food basket (their income is below the minimum well-being line).

The Sierra Region: Competitiveness and Population Well-being

Traditionally, three major region[5] regions have been recognized in the state of Sonora: the coastal plain or coast, the border, and the sierra (Gracida J.J., 2002 and Wong, G.P., 1996), and this classification is used in this study to facilitate analysis (Map 1). The Coast is located in the western part of Sonora and extends along the Gulf of California. In the north, it includes small mountain ranges such as the Sierra Sonoyta and El Pinacate, and in the south, the Sierra del Seri, Bacatete, Álamos, and the extensive valleys of the Yaqui and Mayo rivers (Arroyo and Bracamontes, 2006).

The Sierra Region is located in the eastern part of the state. The Sierra Madre Occidental mountain range crosses the state from north to south, forming high mountains through which several rivers flow, such as the Yaqui River, the Sonora

Map 1. Regions in the State of Sonora, Mexican Republic



Source: Taken from Arroyo and Bracamontes (2006)

[4] For 2010, the economic well-being line was $2,120.04 in urban areas and $1,330.50 in rural areas, while the minimum well-being line was $978.29 in urban areas and $683.72 in rural areas (Coneval, 2016).

[5] The municipalities by region are: a) Coast: Altar, Átil, Bácum, Benito Juárez, Caborca, Cajeme, Empalme, Etchojoa, Guaymas, Hermosillo, Huatabampo, Navojoa, Oquitoa, Pitiquito, Plutarco Elías Calles, Puerto Peñasco, San Ignacio Río Muerto, San Luis Río Colorado, Sáric, and Tubutama; b) Border: Agua Prieta, Bacoachi, Benjamín Hill, Cananea, Cucurpe, Fronteras, Imuris, Magdalena, Naco, Nacozari de García, Nogales, Santa Ana, Santa Cruz, and Trincheras; c) Sierra: Álamos, Aconchi, Arivechi, Arizpe, Bacadéhuachi, Bacanora, Bacerac, Banámichi, Baviácora, Bavispe, Carbó, Cumpas, Divisaderos, Granados, Huachineras, Huásabas, Huépac, La Colorada, Mazatán, Moctezuma, Nácori Chico, Onavas, Opodepe, Quiriego, Rayón, Rosario Tesopaco, Sahuaripa, San Felipe, San Javier, San Miguel de Horcasitas, San Pedro de la Cueva, Soyopa, Suaqui Grande, Tepache, Ures, Villa Hidalgo, Villa Pesqueira, and Yécora.

River, the Magdalena River, and the Sonoyta River, all of which empty into the Gulf of California. Meanwhile, the Border Region is located in the northern part of the state and is characterized by municipalities that border the United States of America, as well as others adjacent to them.

Regional Population Distribution

The Sierra Region is made up of 38 of the 72 municipalities that constitute the State of Sonora more than half of the municipalities. Table 3 (2nd and 3rd columns) shows that 122,165 people lived in the Sierra, equivalent to 4.59% of the state's total population in 2010. The municipalities in this region are classified as rural, with fewer than 15,000 inhabitants, except for Álamos, which had a population of 25,848 and accounted for 21.16% of the region's total population. In hierarchical order, it is followed by the municipalities of Ures (7.52%), San Miguel de Horcasitas (6.86%), Cumpas (5.21%), Yécora (4.95%), Sahuaripa (4.93%), Carbó (4.38%), Rosario Tesopaco (4.28%), and Moctezuma (3.83%). These nine municipalities concentrate 63.11% of the population in the Sierra Region.

To a lesser extent, five other municipalities also contribute to the region's population: Baviácora (2.91%), Quiriego (2.75%), Arizpe (2.49%), Opodepe (2.36%), and Aconchi (2.16%), totaling 15,468 inhabitants, or 12.66% of the population in the Sierra Region. In the remaining twenty-four municipalities, only 29,601 people lived representing 24.33% of the regional population. This means that each of these municipalities had approximately 1,000 inhabitants, roughly equivalent to one percentage point per municipality in relation to the total population of the Sierra. Among the least populated municipalities are San Javier (0.53%), Onavas (0.36%), and Oquitoa (0.02%).

Regional and Municipal competitiveness

[6] This municipality has held the designation of Pueblo Mágico since 2005, and since 1984 it has hosted the Alfonso Ortiz Tirado Festival (FAOT), an internationally renowned cultural event in which other municipalities in the state also participate, bringing significant dynamism to regional tourism.

Columns 4 and 5 of Table 3 report the competitiveness indices for the state, the region, and the municipalities. These figures show that the Sierra had a Medium Competitiveness Index, which is below the High Competitiveness Index of the State of Sonora.

In terms of municipal competitiveness, only Álamos has a Very High Competitiveness Index. Meanwhile, like the state, five of the thirty-eight municipalities that make up the region Cumpas, La Colorada, Moctezuma, Sahuaripa, and Ures register High Competitiveness. Ten municipalities, like the Sierra region itself, present a Medium Competitiveness Index: Arizpe, Banámichi, Carbó, Huepac, Mazatán, Rosario Tesopaco, San Felipe de Jesús, San Miguel de Horcasitas, Villa Pesqueira, and Yécora.

Regarding municipalities with High and Medium competitiveness, it is worth noting that although they are characterized by an agricultural-livestock economic base and minimal infrastructure, the abundance of skilled and semi-skilled labor has fostered the development of the maquila industry, as in the case of Moctezuma and Ures. Their areas of influence extend to small rural communities in the Sierra and along the Sonora River, reaching all the way to Hermosillo. Additionally, they benefit from good connectivity, with roads linking them, such as the Hermosillo–Moctezuma-Huásabas highway and Federal Highway No. 16, which runs from Hermosillo to Chihuahua (Wong, G. P., 1996).

The remaining 22 municipalities are characterized by having a level of competitiveness lower than that observed at the regional and state levels. Specifically, ten municipalities had a Low Competitiveness Index: Aconchi, Arivechi, Bacerac, Baviácora, Granados, Huásabas, Quiriego, San Javier, San Pedro de la Cueva, and Soyopa; while twelve municipalities had a Very Low Competitiveness Index: Bacadéhuachi, Bacanora, Bavispe, Divisaderos, Huachinera, Nacori Chico, Onavas, Opodepe, Rayón, Suaqui Grande, Tepache, and Villa Hidalgo.

Competitiveness and Regional Well-being

In Table 3 (columns 6 to 9), when analyzing whether competitiveness in the Sierra region and its municipalities is reflected in improved population well-being, it becomes evident that

Table 3. Levels of competitiveness and well-being of the population in the Sierra Region of Sonora

State, Region, and Municipalities	Total Population	%	INCOM	Competitiveness Level	Population with the income below the economic well-being line	%	Population with the income below the minimum well-being line	%
Sonora	2,662,480	100.00	-0.00369	High	1,074,180	40.3	295,313	11.1
Sierra Region	122,165	4.59	-0.34153	Medium	65,239	53.4	27,900	22.8
Alamos	25,848	21.16	0.21503	Very high	14,322	55.4	7,180	27.8
Cumpas	6,362	5.21	-0.24755	High	2,402	*37.8*	590	*9.3*
La Colorada	1,663	1.36	-0.13135	High	985	59.2	402	24.2
Moctezuma	4,680	3.83	-0.09727	High	2,281	48.7	544	11.6
Sahuaripa	6,020	4.93	-0.22582	High	2,855	47.4	1,066	17.7
Ures	9,185	7.52	0.04622	High	3,683	*40.1*	1,062	*11.6*
Arizpe	3,037	2.49	-0.31677	Medium	1,778	58.5	691	22.8
Banámichi	1,646	1.35	-0.34178	Medium	811	49.3	271	16.5
Carbó	5,347	4.38	-0.30394	Medium	1,843	*34.5*	974	18.2
Huépac	1,154	0.94	-0.34403	Medium	364	*31.5*	85	*7.4*
Mazatán	1,350	1.11	-0.30451	Medium	641	47.5	177	13.1
Rosario Tesopaco	5,226	4.28	-0.32970	Medium	3,030	58.0	1,215	23.2
San Felipe de Jesús	396	0.32	-0.35158	Medium	158	39.9	46	11.6
San Miguel de Horcasitas	8,382	6.86	-0.27063	Medium	5,466	65.2	3,557	42.4
Villa Pesqueira	1,254	1.03	-0.31043	Medium	686	54.7	215	17.1
Yécora	6,046	4.95	-0.32787	Medium	5,021	83.0	2,907	48.1
Aconchi	2,637	2.16	-0.39259	Low	1,255	47.6	398	15.1
Arivechi	1,253	1.03	-0.39157	Low	736	58.7	275	21.9
Bacerac	1,467	1.20	-0.40053	Low	902	61.5	302	20.6
Baviácora	3,560	2.91	-0.35804	Low	1,738	48.8	522	14.7
Granados	1,150	0.94	-0.35517	Low	479	41.7	132	11.5
Huásabas	962	0.79	-0.38013	Low	458	47.6	127	13.2
Quiriego	3,356	2.75	-0.37332	Low	1,433	42.7	596	17.8
San Javier	492	0.40	-0.35627	Low	196	39.8	53	10.8
San Pedro de la Cueva	1,604	1.31	-0.36690	Low	894	55.7	286	17.8
Soyopa	1,284	1.05	-0.37025	Low	739	57.6	256	19.9
Bacadéhuachi	1,252	1.02	-0.42027	Very Low	834	66.6	346	27.6
Bacanora	784	0.64	-0.43795	Very Low	493	62.9	198	25.3
Bavispe	1,454	1.19	-0.43307	Very Low	943	64.9	368	25.3
Divisaderos	813	0.67	-0.42763	Very Low	398	49.0	112	13.8
Huachinera	1,350	1.11	-0.41753	Very Low	790	58.5	312	23.1
Nácori Chico	2,051	1.68	-0.43870	Very Low	1,438	70.1	620	30.2
Onavas	399	0.33	-0.43823	Very Low	229	57.4	85	21.3
Opodepe	2,878	2.36	-0.41920	Very Low	1,728	60.0	723	25.1
Rayón	1,599	1.31	-0.41427	Very Low	1,030	64.4	443	27.7
Suaqui Grande	1,121	0.92	-0.41630	Very Low	673	60.0	237	21.1
Tepache	1,365	1.12	-0.44737	Very Low	858	62.9	368	27.0
Villa Hidalgo	1,738	1.42	-0.44578	Very Low	669	38.5	159	9.1

Source: Source: Own estimation of competitiveness indices based on the principal components method and various INEGI databases: a) State and Municipal Basic Data System (SIMBAD); b) Population and Housing Census, 2010; c) Municipal Socio-Demographic and Economic Information Bank; d) Secretariat of Public Education; and e) Secretariat of Communications and Transport.

The well-being and minimum well-being estimates come from Coneval (2016)

there was no improvement for the Sierra. Despite having a Medium Competitiveness Index, 53.4% of the population did not reach the average well-being level; meanwhile, the state, with a High Competitiveness Index, had around 60% of its population above the average well-being threshold. On the other hand, the Medium Competitiveness level in the Sierra was not enough to meet the minimum well-being of 22.8% of the population a higher proportion than the state (11.1%). This means that 22% of the region's population had insufficient income to purchase a basic food basket that meets

minimum nutritional requirements, even if all their income were devoted to this purpose. Therefore, in terms of competitiveness and well-being, the Sierra region's population is worse off than the population of Sonora as a whole.

Among the six municipalities that stood out with a Very High and High Competitiveness Index, two had higher proportions than those observed at the regional and state levels when considering the percentage of people whose income is insufficient to achieve economic well-being: La Colorada (59.2%) and Álamos (55.45%). Similarly, Moctezuma (48.7%) and Sahuaripa (47.4%) also had higher percentages than the state. The same is true when considering the population unable to purchase a food basket that meets minimum nutritional requirements: La Colorada (59.2%)and Álamos (55.45%), followed by Moctezuma (48.7%) and Sahuaripa (47.4%), all above the state level.

This implies that only two of the six municipalities with Very High and High competitiveness levels also have the highest well-being levels. Thus, the municipalities of Ures (40.1%) and Cumpas (37.8%) have lower proportions of people compared to the state whose income does not allow them to achieve economic well-being. Similarly, these two municipalities, Ures (40.1%) and Cumpas (37.8%), have the lowest proportions of people whose income does notallow them to meet the minimum well-being threshold.

Of the ten municipalities with a Medium Competitiveness Index, five had higher proportions of people with insufficient income for economic well-being than the region and the state: Yécora (83.0%), San Miguel de Horcasitas (65.2%), Arizpe (58.5%), Rosario Tesopaco (58.0%), and Villa Pesqueira (54.7%). Meanwhile, three municipalities: Banámichi (49.3%), Mazatán (47.5%), and San Felipe de Jesús (39.9%), had higher percentages than Sonora. Only Carbó (34.5%) and Huepac (31.5%) reported a lower proportion than the state.

Among the 22 municipalities with Low and Very Low Competitiveness Indexes, very high percentages of people had income insufficient to achieve economic well-being in 21 of them. Only Villa Hidalgo (38.5%) had a lower percentagethan the state. Similarly, a high proportion of the population in 21 of these municipalities lacked the income necessary to purchase a food basket meeting minimum nutritional requirements. Again, Villa Hidalgo (9.1%) had a percentage lower than that of the state.

Conclusions and discussion

In this study, competitiveness was defined as regional externalities that can potentially attract investment and promote economic activity. The goal was to test whether competitiveness is reflected in the well-being of the regional population. To this end, the principal component method was used to estimate a Competitiveness Index, and based on the methodology developed by Coneval (2016), well-being was measured.

Based on the redefined concept of competitiveness as a foundation for increasing population well-being, this study examined the relationship between both aspects within Sonora State and the Sierra Region, made up of 38 municipalities.

The results show that the Sierra region recorded a Medium Competitiveness Index lower than that of the state and a higher proportion of people (53.4%) with insufficient income to reach economic well-being, compared to Sonora (40.3%). The Sierra also had a higher percentage (22.8%) than the state (11.1%) in terms of people below the minimum well-being line, meaning the population in the Sierra is worse off than the general population of Sonora in terms of well-being.

The evidence also shows that of the 38 municipalities in the Sierra region, only Álamos was classified as Very High in competitiveness, 5 as High, and 10 as Medium. However, when compared to their well-being levels, it was found that only four municipalities Cumpas, Carbó, and Huépac are in a better situation than the state, as they had lower percentages of people with insufficient income to reach both economic well-being and minimum well-being. Therefore, only these three municipalities simultaneously registered high competitiveness and the best well-being levels in the region under study.

This means that no clear correspondence was found between medium or high competitiveness levels and well-being, except in the municipalities of Cumpas, Ures, Carbó, and Huépac. The remaining 34 municipalities showed low levels of economic and minimum well-being.

Finally, considering efficiency criteria in public

policy, the municipalities in this region should be prioritized in various government programs for infrastructure development, improvement of public services, and poverty reduction.

References

Aiginger, K.(2006a). Competitiveness: from a dangerous obsession to a welfare creating ability with positive externalities. Journal of Industry, Competition and Trade, 6(2): 161–177.

Aiginger, K. (2006b). Revisting an evasive concept: introduction to the special issue on competitiveness.

Journal of Industry, Competition and Trade, 6(2): 63-66.

Arroyo, Jesús y Berumen S. (2003).Competitividad Implicaciones para empresas y regiones. Guadalajara/ Los Ángeles: Universidad de Guadalajara/UCLA. 520 pp.

Arroyo, Jesús y Bracamontes N. J.(2006). El Desarrollo Regional en el Estado Fronterizo de Sonora, México,

Estudios Fronterizos, Vol. 7, Núm. 14, ISSN: 0187-696, Julio-Diciembre. Pp.55-80.

Aranguren, J., Franco, S., Ketels, C., Murciego, A., Navarro, M., Wilson, J.R. (2010). Benchmarking Regional Competitiveness in the European Cluster Observatory, European Cluster Observatory, Methodology Background Paper 1. 25pp.

Budd, L. y Hirmis, A.(2004). Conceptual framework for regional competitiveness. Regional Studies, 38(9): 1015-1028.

Camagni, R.(2002). On the Concept of Territorial Competitiveness: Sound or Misleading?, Urban Studies, 39(13): 2395-2411.

Camberos, M. y Huesca, L.(2002). Cambios económicos, competitividad y bienestar de la población en la región noroeste de México en la globalización. Estudios Fronterizos, 3(6): 9-32.

Castro, L. (2000). Migración y Urbanización en Sonora, en Sonora 2000 a debate. Problemas y soluciones, riesgos y oportunidades, Cal y Arena:395-414.

Consejo Nacional de Población-Conapo [Conapo] (2013). Geografía e intensidad migratoria México-Estados unidos 2010.Boletín de Migración Internacional. Año I, Número Especial 2013 / issn 2007-6371. Pp.1-10 Consejo Nacional de Población-Conapo [Conapo] (2012). Índice Absoluto de Intensidad Migratoria. México Estados Unidos. 2000- 2010.http://www.conapo.gob.mx/work/models/OMI/Publicaciones/IAIM_MX_USA_2000- 2010/HTML/files/assets/basic-html/page-120.html

Consejo Nacional de Evaluación de la Política Social [Coneval (2016).“Líneas de Bienestar”. https://webdrp.coneval.org.mx/Medicion/Paginas/Lineas-de-bienestar-y-canasta-basica.aspx

Díaz de Rada, V. (2002). Técnicas de Análisis Multivariante para Investigación Social y Comercial. Ejemplos Prácticos utilizando el SPSS versión 11. Madrid, Editorial Ra-Ma.

Gracida, J. (2001).La llegada de la modernización a Sonora. Establecimiento del ferrocarril, 1880-1897, UNISON.

Grilo, I. y Koopman, G. (2006). Productivity and Microeconomic Reforms: Strengthening EU Competitiveness.

Journal of Industry, Competition and Trade, 6(2): 67-84.

Instituto Nacional de Estadística, Geografía e Informática [INEGI], (2016). Sistema Estatal y Municipal de Bases de Datos (Simbad).www.inegi.org.mx

Instituto Nacional de Estadística, Geografía e Informática [INEGI], (2010). Censo de Población y Vivienda 2010. www.inegi.org.mx

Kitson, M., Martin, R. y Tyler, P.(2004). Regional Competitiveness: an elusive yet key concept?, Regional Studies, 38(9): 991-999.

Porter, M. (1990). The Competitive Advantage of Nations, Harvard Business Review. 90211: 73-91. Turok, I. (2004). Cities, regions and competitiveness. Regional Studies, 38(9): 1069-1083.

Wong, P. (1996). La reestructuración secto-espacial en Sonora: una tipología regional, en Las regiones ante la globalidad, coordinado por Miguel Ángel Vázquez Ruiz, Hermosillo: Gobierno del Estado de Sonora. 87-115.