

Rethinking the construction of welfare in Mexico: Going beyond the economic measures

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Abstract

This study utilized a multidimensional measure of social welfare composed of 26 social indicators integrated in nine categories: *education, employment and social protection, income, health, housing conditions, subjective wellbeing, social capital, use of technology, and culture and leisure* to help understand social welfare in Mexico. We also compared the integrated measure with the Human Development Index. Estimation was performed using the DP_2 method. Our analysis indicated that the *health* and *housing conditions* categories contributed the most to social welfare across the 32 Mexican States. In relation to the indicators, *income* and *trust in other people* were associated with welfare. Further, results on the welfare ranking of Mexican states revealed variations between the two indices (DP_2 and the HDI). Specifically, only four states occupied the same position on both indices, ten recorded different positions on DP_2 moving up or down from their levels of social welfare. Implications of observed correlations are presented.

The concept of social welfare is abstract and complex by nature (Phela, 2008). Indeed, no single theory can cover it comprehensively (Heffernan, Shuttlesworth, & Ambrosino, 1997). The categories used to measure social welfare flow and may change over time. Prominent among these are “The Accounts of society” and “Social indicators” theories. The first uses Gross Domestic Product (GDP) and per capita GDP indices to measure welfare. This perspective proposes a positive relationship between a country's wealth and social welfare (Sheldon & Parke, 1975). It suggests that an increase in GDP is likely to be associated with a rise in real per capita income and consequently the individual's purchasing power; improving both personal and collective welfare (Cárdenas, 2008).

The challenge with this perspective is that GDP focuses on measuring economic productivity and growth, which may not necessarily translate into improved welfare for the whole population. The “Accounts of society” approach also assumes that income is distributed equitably (Stiglitz, Sen, & Fitoussi, 2009). Consequently, a country's economic wealth is not an automatic condition of welfare since non-monetary measures and factors are not considered (Phélan, 2011)

despite the fact that these are often essential to understanding this kind of heterogeneous construct. For this reason, Sardar and associates (2002) argued that if GDP is the only indicator used to measure welfare in countries of the global south, focusing governmental interventions on enhancing GDP as a mechanism for improving welfare may be problematic because it could produce negative externalities.

The second model, “Social indicators,” emerged in the 1960s when the use of GDP as a measure of social welfare started losing credibility (Noll, 2011). The approach suggests that welfare can be measured by decomposing the construct into different plots (Pena-Trapero, 2009), thereby estimating the level of social welfare at the individual level (Zarzosa & Somarriba, 2013). Examples of such measures include the Human Development Index (HDI), the Human Poverty Index for Developing Nations (HPI-1), the Human Poverty Index (HPI-2), and the Happy Planet Index. Despite the relevance of this approach, challenges still exist in identifying categories that comprehensively assess welfare (Stiglitz et al., 2009). Indeed, as noted, social welfare is a multidimensional construct that includes not only objective indicators such as income, education, health and employment (Di Pasquale, 2008; Mæstad & Norheim, 2012), but also subjective indicators such as happiness and life satisfaction (Diener, 1994; Diener, Emmons, Larsen, & Griffin, 1985). It also incorporates such elements as the family, community and the social dimensions of human life along with social capital (Berigan & Irwin, 2011; Sarracino, 2013), use of technology (Kaino, 2012; Zhao, 2009) and culture and leisure (Jaeger, 2009; Haller et al., 2013).

During the past few years, consideration has increasingly been given to inclusion of multiple elements for estimating social welfare (Phélan, 2011; Stiglitz et al., 2009). This new approach has the potential to generate a multidimensional measure that covers different aspects of human life and human interaction. Building on this effort, the present study has combined the two

approaches – objective and quantifiable elements of social welfare (such as income, education levels, housing conditions) with qualitative dimensions based on people’s perceptions (subjective wellbeing and social capital) (Chan, Cheung, & Peng, 2004; Cuenca & Rodríguez, 2010; Diener, 2000; Sarracino, 2013). This formulation, we believe, has provided a more comprehensive measure of welfare in a given territory, covering the various dimensions of human interaction.

Building on this evidence, this article presents the results of a multidimensional assessment of social welfare in Mexico and compares it with the traditional HDI. We conducted a two-level assessment of welfare. First, factors contributing to welfare were identified. Second, an assessment of welfare indicators was then compared with the HDI. Social welfare, in this study, was captured using the following nine categories: material wellbeing comprising *education, employment and social protection, income, health, and housing conditions*; along with indicators for *subjective wellbeing, social capital, use of technology, and culture and leisure*. These categories were further broken down into 26 social indicators that were used to create the social welfare construct, and to compile the index utilized (DP_2).

A central contribution of this research is its potential to generate and advance mechanisms for measuring welfare that take into consideration both the material and non-material elements. The comparison with the HDI illustrates the relevance of measuring welfare by taking into account basic dimensions for quality of life (see UNDP, 2014). However, the DP_2 allows us to observe other elements of social relations; using non-material categories shows the importance of developing a more robust measures of social welfare.

Further, this exploration has potential to generate knowledge on how factors such as *social capital, use of technology, and culture and leisure* could influence welfare. In addition, by including the 32 Mexican Federal States, the results highlight those states with lower welfare

rankings along with factors that may be related to welfare in each state, drawing attention to areas that may require more policy consideration.

Literature review

Measurement of social welfare has progressed considerably since the construct was first assessed in the 1950s. Indeed, current measures acknowledge that income or government provisions are not the only way to estimate welfare (Noll, 2011; Trapero, 2009). Although income continues to be regarded as the key determinant of household welfare and consumption (Stiglitz et al., 2009), this measure could exclude other essential elements of human life (Escudero & Simon, 2012). Indeed, welfare is said to be a comprehensive construct that comprises different aspects of human life, including the social context. As a result, scholars are increasingly considering a broader conceptualization of welfare, one that encompasses material and subjective wellbeing (Ansa, 2008; Castellanos, 2013; Cuenca & Rodriguez, 2010; Diener & Emmons, 1985; Sen, 1999).

Material wellbeing has been broadly assessed in terms of health, education, income, housing, and basic services, to mention a few items (Escudero & Simon, 2012; Gaitán, 2006; Mæstad & Norheim, 2012). These indicators are said to reflect social welfare at both the individual and the collective levels (Di Pasquale, 2008). On the other hand, subjective wellbeing is commonly measured in terms of happiness (affective component) and life satisfaction (cognitive component); these indicators allow for understanding aspects of life/wellbeing beyond income (Diener, et al., 1985). Regarding the individual and collective effects of these sets of variables, there is some evidence to suggest that the happiest people value the circumstances surrounding their lives and are more productive and sociable (Rodríguez-Fernández & Goñi-Grandmontagne, 2011). This suggests that high levels of subjective wellbeing may be beneficial to society (Diener, 2000).

In recent years, use of technologies such as the Internet, computers and telephones (fixed and/or mobile) has become an important component of social welfare (Cuenca & Rodriguez, 2010). Besides connecting people to the world, technology also plays a key role in the community by fostering citizen participation and community development (London, Pastor, Servon, Rosner, & Wallace, 2014). Similarly, it has been found that the use of technology has a significant and positive impact on the economic growth of countries, and has a positive effect on GDP per capita (Farhadi, Ismail, & Fooladi, 2012). Further, scholars have observed that use of technology has an effect on rural economies and on the education sector (Zhao, 2009). Use of technology is also said to be positive for personal development and to reduce social isolation, especially among minorities and disadvantaged communities (London, et al., 2014).

In addition to the elements highlighted in the foregoing discussion, the existence of social networks and norms are said to influence creation of ties and relationships, leading to collective action (Castellanos, 2013; Chan et al., 2004). There is also evidence connecting social capital to positive effects such as improved household welfare, reduced probability of being poor, and increased household per capita expenditure (Grootaert, Oh, & Swamy, 2002).

Another element to note is culture. At the individual and collective levels, culture is said to positively influence welfare through community cohesion, access to books and libraries, and attendance of cultural events (Gaddis, 2013). Culture is also connected with the reduction of educational inequality, especially among disadvantaged children and youth (Jaeger, 2009). Evidence also links culture to positive welfare effects at the level of society (Berigan & Irwin, 2011).

Research questions

The evidence reviewed provides a framework for investigating the questions of interest to this study, which are:

- (i) To explore the utility of a multidimensional measure of social welfare based on nine categories: (a) *education*; (b) *employment and social protection*; (c) *income*; (d) *health*; (e) *housing conditions*; (f) *subjective wellbeing*; (g) *social capital*; (h) *use of technology*; (i) *culture and leisure*;
- (ii) To identify factors that may be essential for understanding welfare in each of the 32 states of Mexico, based on the multidimensional measure;
- (iii) To compare the resulting (DP_2) index to the Human Development Index (HDI).

Methods

Country background

Mexico has a population of 122.3 million people (2010), 51.2 percent of whom are females, a GDP of 1,261 billion USD, and a poverty rate of 52.3 percent (National Institute of Statistics and Geography [INEGI in Spanish], 2010, World Bank, n.d.). The majority of the population is between the ages of 15 and 64 (63.9%). The country has a life expectancy at birth of 75.7 years (INEGI, 2010). More than 60 percent of the population are employed in the services sector, while 13.6 percent are still dependent on agricultural and livestock activities. A considerable proportion of the population over 14 years old is economically active (60%). Informal employment is an important source of income. Indeed, about 29.3 percent of the employed population are in the informal sector (INEGI, 2010).

Mexico's widespread territory reveals distinctive regional and economic characteristics. For instance, based on a series of indicators on areas such as *education*, *housing conditions*, *health* and *employment*, INEGI groups the 32 states in seven stratum (2014). This division allows us to observe the diversity of economic and social conditions (see Table 1). For instance, nearly 11 percent of the total population are concentrated in only one entity, Mexico City; on average, all indicators surpass the national median. Table 1 also shows that the condition of states

in stratum 1, 2, and 3 are relatively different from the states in groups 4 to 7. Altogether, states in group 1 report significantly poorer conditions in *education, healthcare* and *housing conditions*, with Chiapas, Guerrero, and Oaxaca (stratus 1) showing poorer outcomes. Indeed, only about 13 percent of households in these states have access to a telephone and nearly 6 of 10 houses still have dirt floors. Furthermore, while seven of 10 habitants in the capital city have tertiary education, only 3 of 10 people in Chiapas, Guerrero, and Oaxaca reported having access to tertiary education.

[Insert Table 1 about here]

Source of data

Data used for this study cover the year 2012 and comes from multiple sources¹, including data from three surveys collected by INEGI: the Socioeconomic Conditions Module of the National Survey of Income and Expenditure at Households” (MCS-ENIGH, 2012), the National Survey of Occupation and Employment (ENOE, 2012), and the Module on Availability and Use of Information and Communications Technology in Households (MODUTIH 2013). The ENIGH contains information on the distribution, amount, and structure of income and expenditure of households. The ENOE consolidates information on the occupational features of the population nationwide, as well as other demographic and economic variables related to employment conditions. The MODUTIH contains information on the availability of computers, telephone, cable television, and internet services, as well as on the economic conditions that affect the acquisition and availability of these services and their use.

¹ Please note that when the indicator for 2012 was unavailable, the indicator from the closest year was used. This was the case for life satisfaction, happiness, trust in other people, trust in institutions, personal networks, computer use, Internet use, mobile use, attendance at arts events, books read in a year, and library attendance.

In addition, five other sources of data were utilized. One was the National Survey of Habits, Practices and Cultural Consumption (ENHPCC, 2010), conducted by the National Council for Culture and Arts. This survey includes national and state data on the practices, attached value, and use of cultural infrastructure. It also includes information regarding leisure, perception of culture, and cultural values. A second source was the National Values Survey: what unites and what divides (ENVIUD, 2010), sponsored by Banco Nacional de Mexico and headed by Grupo Financiero Banamex and the Este País Foundation. This data set (ENVUD) examines issues related to Mexicans' shared values, their trust in institutions and organizations, participation in civic groups, interest in public affairs, and political preferences, among others. Data for the study also came from Projections of the Mexican Population 2010–2050, by the National Population Council of the Government of Mexico (CONAPO, 2012), a governmental institution that gathers and analyses information on the population dynamics. Lastly, *health* and *social security* data were gathered from two sources: the Department of Health Information (DGIS, 2012) and the National Center for Children's and Adolescent's Health (CENSIA, 2013). Data for these two sources were collected by the Ministry of Health.

Selection of indicators and construction of the Multidimensional Social Welfare Index

The social welfare index used in this study is based on the nine categories identified earlier: *education, employment and social protection, income, health, housing conditions, subjective wellbeing, use of technology, and culture and leisure*. These categories have been used in previous research (De Graaf, 1998; Diener, 1994; Diener, et al., 1985; Esping-Andersen, 2007), and were selected based on four criteria: (i) consistency with previous research (Bellani & D'Ambrosio, 2011; Diener, 2000; Di Pasquale, 2008; Gaitán, 2006; Grootaert, et al., 2002; Jaeger, 2009; London et al., 2014; Luhmann, Schimmack, & Eid, 2011; Mæstad & Norheim,

2012); (ii) availability of the indicator in Mexico; (iii) representativeness of the data sources across the 32 states; and (iv) mutual exclusiveness of the indicators.

Based on the selection criteria, ten of 36 indicators identified were excluded from analysis. Consequently, the social welfare index utilized only 26 indicators. These were organized under nine categories to mirror the primary measures of welfare collected from a total of eight national data sets (see Table 2).

[Insert Table 2 about here]

In line with previous research (see e.g. Rodríguez-Martín, 2011; Cuenca & Rodriguez, 2010; Zarzosa & Somarriba, 2013), the study used a welfare index created by adding indicators from the multiple surveys identified earlier into a synthetic or global index. Specifically, a function of the form $I = F(X_1, X_2, \dots, X_n)$; where I is the synthetic index with n being the number of partial indicators that provide information for the welfare index. For instance, *limited education* would be a partial indicator of the level of *education* in a particular territory, and their degree of social welfare in general. This is expressed as:

$$\begin{bmatrix} x_{11} & \dots & x_{1n} \\ \vdots & \diagdown & \vdots \\ x_{r1} & \dots & x_{rn} \end{bmatrix}$$

where r is the number of territories $\forall j \in [1, \dots, r]$, and n the number of variables or partial indicators $\forall i \in [1, \dots, n]$ in a matrix X of observations of type $r \times n$, the x_{ji} component denotes the state of the variable i in the territory j . The territories are the rows and the columns the variables. The partial indicators that have a negative relationship with social welfare are introduced as negative numbers; therefore, a value that is larger than the absolute value of the item is interpreted as a decrease in the overall level of welfare. For partial indicators that have a positive relationship with social welfare, if they take higher values in absolute value, this is viewed as an increase in the overall level of social welfare. In this study, 12 indicators with

negative value were integrated (*limited education, unemployment, social security, minimum income, access to health care, infant mortality, maternal mortality, food insecurity, quality and space, household without water, household without drainage, and household without electricity*). The remaining 14 had a positive value or relationship with social welfare (*immunization, births attended, life expectancy, life satisfaction, happiness, trust in other people, trust in institutions, personal networks, computer use, internet use, mobile phone use, cultural events attendance, books read and library attendance*).

To develop the synthetic index, the distance indicator (DP_2), from Pena-Trapero (2009) was used. The DP_2 is a multidimensional indicator that reunites the required characteristics for a synthetic index: uniqueness, homogeneity, monotony, existence and determination, invariance regarding the baseline, transitivity, completeness, and additivity. See Pena-Trapero (2009) for the mathematical explanation of each characteristic. These features produce a more robust method than Factor Analysis or the Principal Components, two methods that use data envelopment analysis such as the one used in the Human Development Index (Pena-Trapero, 2009). Moreover, the DP_2 has the advantage of allowing variables expressed in different measures to be added to the index (Zarzosa, 2009).

The DP_2 produces an index used to rank the 32 states/territories included in the study. Higher values on the index represent better social welfare outcomes, because of their location in relation to the fictitious base reference. In this instance, the base reference comprises the results from an imaginary territory which reflects the worst scenario for all the indicators (Cuenca & Rodriguez, 2010; Zarzosa & Somarriba, 2013, p. 7).

For a territory j , the DP_2 is expressed as:

$$DP_{2,j} = \sum_{i=1}^n \left\{ \left(\frac{d_i}{\sigma_i} \right) (1 - R_{i,i-1,i-2,\dots,1}^2) \right\}$$

with $R_i^2 = 0$ and $d_i = |x_{ji} - x_{*i}|$ with the reference vector $X_* = (x_{*1}, x_{*2}, \dots, x_{*n})$, defined as:

n , is the number of variables

x_{ji} , is the value of the variable i in the territory J

x_{*i} , is the reference value of the variable i that serves as comparison for all the territories

(usually the minimum value of the r territories is used)

σ_i is the standard deviation of the variable i

$R_{i:t-1,t-2,\dots,t-1}^2$ is the coefficient of determination in the linear regression of X_i on

$X_{t-1}, X_{t-2}, \dots, X_1$, that represents the goodness of fit from the model to predict X_i ,

$(1 - R_{i:t-1,t-2,\dots,t-1}^2)$ is the correction factor that shows the variance part of X_i not explained

by the linear regression model, this factor weighs indicator with useful information not

included above

DP_i is the sum of the distances between the value of variable i in territory J , and the

value of hypothetical territory (the minimum value of that variable in all territories)

weighted by the unexplained variance of X_i , and the variance X_i

Analysis

As noted, social welfare is not observable by a single measure; it is accurately assessed by multiple factors (Duarte & Jiménez, 2007). This study suggests specific categories composed by a series of indicators that were utilized to generate a measure of welfare by using the DP_i .

Therefore, the central questions of this study were answered by estimating DP_i and disaggregating it by indicator. First, DP_i identifies the factors that make up different categories of welfare in each of the 32 states in Mexico. The purpose is to identify what is the contribution of each indicator to the construction of social welfare in each state. These contributions produce

an index used to define the states' ranking on social welfare. Lastly, we compared the resulting (DP_2) index with the HDI. The goal was to understand how DP_2 compares with the traditional measure of welfare (HDI) at the level of the state.

To answer the first set of questions, a correction factor was used. This factor provides an explanation of each partial indicator's weight at the state level while distinguishing which factors contribute more for each case. The final results are shown in Table 3 which lists the indicators and their weight per category and individually. The correlation factor per indicator shows the absolute correlation value of each individual item with the index. This value refers to how each individual indicator is entered and weighted for the construction of the index. Finally the last column shows the results of the vector of Discrimination Coefficients (DC), based on Ivanovic's test (1974). These values account for the discriminating power of each partial indicator that influences the social welfare value for each territory. Specifically, a partial indicator can affect the value of the social welfare index, but might not be discriminatory; thus, it will have no effect on the distances. On the contrary, an indicator may have a high discriminatory power affecting the distances directly (Zarzosa & Somarriba, 2013). This is expressed as:

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{k_i} m_{ji}m_{li} \left| \frac{x_{ji} - x_{li}}{\bar{X}_i} \right|$$

where m is the number of territories and m_{ji} is the absolute frequency of x_{ji} . The resulting values of the DC range from 0 to 2, where a value of zero shows no discriminating power, and a value higher than zero indicates some discriminating power up to the maximum of 2. The DC value together with the correction factors are the true measures of the real impact of each social indicator in the disparities obtained in the DP_2 between the different states (Zarzosa & Somarriba, 2013).

Results

The utility of a multidimensional measure of social welfare

The resulting values of the correction factor by category and by indicator, along with the correlation coefficient and DC, are presented in Table 3. Among the nine categories examined, the category that contributes the most to social welfare was *health* with 1.89, followed by the *housing conditions* (1.33) and *income* (1.00). However, it should be noted that as a category, *income* is comprised of only one indicator, while *health* consists of seven indicators. An overview of the remaining six categories and their contribution to the understanding of welfare follows: *social capital* (0.87), *culture and leisure* (0.73), *use of technology* (0.48), *employment and social protection* (0.49), *subjective wellbeing* (0.41), and *education* (0.19). These results draw attention to the relevance of these categories in explaining the multidimensionality of social welfare.

Table 3 also shows the correction factor for each indicator. Among the 26 indicators examined, *minimum income* (1.00) ranked first on the social welfare index, suggesting it may be the primary correlate of social welfare. *Minimum income* was also the indicator with the highest degree of lineal correlation (0.93). Another item with high values was *trust in other people*, with a unique contribution of 48 percent to the explanation of the synthetic index. *Household without electricity* was also important in understanding welfare, accounting for an additional 43 percent of new information on the index. Other indicators with a high correction factor with the overall index of welfare included *social security* and *household without water* (31 and 37%, respectively). This observation is important and may suggest that, in Mexico, *minimum income*, *trust in other people*, *social security* and *household without water* may be the main indicators of social welfare.

The relation between the correction factor and the correlation coefficient was also examined. *Trust in institutions* (15%), *happiness* (13%) and *internet user* (2%) contributed the least to the index. In the same vein, except for *internet use*, these items recorded a low correlation coefficient (see Table 3). Interestingly, despite being amongst the indicators with an important contribution to the index (0.24), *personal networks* had the lowest of all correlations with the synthetic index (0.13).

[Insert Table 3 about here]

Lastly, the DC values were also examined. These ranged from 0 to 2, with zero representing a low level of discrimination (see Table 3). The values suggest that when an indicator records a value of 0, its contribution to welfare is the same in every state, or that there is low inequality/difference among states for that particular indicator. Similarly, the closer the value gets to 2, the more inequality/difference there is for that indicator across and within territories.

Results of this analysis indicate that there are four indicators with the higher DC values. These relate to housing conditions: *household without water* (1.04), *household without electricity* (0.98), *household without drainage* (0.83) and *quality and space* (0.82). This observation shows that there is greater inequality between states in this category. Other areas where there were differences within and across territories were *minimum income* (0.51), *trust in other people* (0.50), and *maternal mortality* (0.36). Lower values were recorded in *life expectancy* (0.02), *births attended* (0.04), *personal networks* (0.04), and *happiness* (0.04); suggesting greater homogeneity among the states on these measures. Lastly, except for *internet use*, the indicators that contributed the least to social welfare (e.g. *happiness* and *trust in institutions*) were also those with a lower DC value (0.04 and 0.08, respectively).

Factors that could be essential in understanding welfare in Mexico (based on the multidimensional measure)

Analysis of how the categories behaved within states is presented in Table 4. The table shows that in most states, indicators with higher contributions to welfare are related to *health, housing conditions* and *income*. These observations are noteworthy. Indeed, on the surface, they may highlight the relevance of the economic and material indicators of welfare. However, in five states, *income* was not the primary indicator of welfare. In fact, it was displaced by non-material indicators such as *social capital* and *culture and leisure*. For example, in the case of Zacatecas, Tabasco, and Oaxaca, *social capital* ranked higher in explaining welfare. Moreover, in Chiapas and Guerrero, *culture and leisure* were more important than *income* in understanding welfare. It could be that among people in poverty, non-income or non-material indicators may be better measures of welfare. In fact, the observations made here are in-line with findings from previous studies (see e.g. Devoto et al., 2012). Indeed, as observed by Devoto and colleagues (2012), factors such as leisure have potential to enhance interactions among household members, improving their quality of life.

[Insert Table 4 about here]

Comparing the (DP_2) index to the Human Development Index (HDI)

The 32 Mexican states were ranked on the multidimensional Index for Social Welfare based on their performance on the indicators. The value of the synthetic index DP_2 (the level of welfare for each territory) provided a ranking for each state. Higher values on the index represented better social welfare outcomes, whereas a lower value indicated poor welfare. States were placed in one of four groups created by following the HDI criteria (UNDP, 2012) and using a cut-off point with the index values such that values above 21 were placed in the very high welfare category; the next category of welfare (high) included values between 19.13 and 20.99; medium welfare

consisted of values between 17.00 and 18.99; while the low welfare category included values under 17.00. These quartiles were used to draw a comparison between DP_2 and the Human Development Index (HDI), allowing us to examine the index in relation to a well-known and more traditional measure.

[Insert Table 5 about here]

Eight states with index values ranging from 24.30 (the top corresponding to Baja California Sur) to 21.82 were placed in the very high category. The next cluster contained eight states with high levels of welfare (ranging from 20.80 to 19.13), followed by states labeled as medium level welfare states (ranging from 18.99 to 17.00). The remaining eight states (with values below 16) were placed in the low level welfare group. Overall, the values of DP_2 show that the difference among the states ranked in the first three groups was marginal. The distance, however, widened with respect to states with lower welfare conditions.

Comparing the positions of states on the two indices – the DP_2 index and the HDI – reveals some variations. Indeed, only nine of the 32 states moved positions on the welfare groupings. We highlight a few in this discussion. For example, Queretaro's position changed, the state moved from the very high welfare category on DP_2 to the high category on the HDI. The state of Baja California Norte also changed its position from a high welfare state to a very high welfare state. Yucatán moved from a high to a medium welfare state. Mexico (State) and Nayarit changed positions from medium welfare on DP_2 to the high group on the HDI. The states of Guanajuato and Zacatecas moved from medium to low welfare whereas Tlaxcala moved from low to medium welfare. Perhaps the most dramatic change was evident in the state of San Luis Potosi, which changed positions from low welfare state on DP_2 to the high welfare grouping.

Discussion and implications

This study set out to explore three main questions: (i) to determine the utility of a multidimensional measure to explain social welfare for Mexico; (ii) to identify factors that could be essential in understanding welfare in each of the 32 States of Mexico based on the multidimensional measure; (iii) to compare the DP_2 to the HDI.

Our analyses point to the fact that the multidimensional measure utilized has merit. The index captures the abstract and complex dimension of social welfare, and identifies the potential relevance of the non-material measures put forward in previous research (Di Pasquale, 2008; Phela, 2008; Stiglitz et al., 2009). Results of this study indicate that among the nine categories examined, *social capital*, *health*, *housing conditions* and *income* contribute the most to understanding welfare in Mexico. These results draw attention to the importance of non-income related measures in explaining welfare. Indeed, in regions of acute poverty such as Oaxaca, Chiapas, and Guerrero, non-monetary elements may be important for welfare. Certainly, these results point to the relevance of social policy intervention in such areas as creation of quality jobs that meet the requirements established under the Mexican law for working hours, rest and access to health care; policies oriented to expansion and full coverage of telephone and internet networks, especially to rural areas; policies facilitating a social environment promoting reduction in school dropout, especially at secondary and high school levels; and the development of policies that promote cultural practices contributing to stronger positive relationships between individual households and their community.

Results of this study also show that a sound understanding of welfare may require inclusion of multiple indicators that take into account the diversity and complexity of welfare and poverty in Mexico. Indeed, there is some evidence to suggest that inclusion of multiple dimensions of welfare tend to capture local realities more accurately (Cuenca & Rodriguez, 2010;

Rodríguez-Martín, 2011; Zarzosa & Somarriba, 2013). A more refined exploration of the existing conditions and a targeted approach to social service provision should produce more adequate and specific responses for the country and for each state.

This study revealed that Guerrero and Chiapas reported the lowest values on the index (DP_2). These are, in fact, the two most impoverished states – the two report the highest rates of poverty in the country (CONEVAL, 2014). In both cases, *income* did not offer a substantial contribution to welfare. This could be because in these states more than 45 percent of the population do not have enough money to buy a basic food basket (MCS-ENIGH, 2012). Similarly, data on Chiapas indicates that *education* does not contribute to welfare in that state. This is a reflection of the fact that the state has the lowest levels of education in the country, with 33.5 percent of its population having no basic education (MCS-ENIGH, 2012).

Most interestingly, in Chiapas *culture and leisure* were more important to welfare than were *income* and *housing conditions*. This finding supports our argument for the need to include a multidimensional measure in the assessment of social welfare. This is significant in that it has potential to lead to the implementation of interventions that have a greater probability of reflecting local realities. This observation points to the need for designing social policies towards poverty based on a multidimensional notion of welfare. As suggested by others (see Grootaert et al., 2002; Raczynski & Serrano 2005; Robison, et al, 2002; Woolcock, 2001), this approach may reflect the complexity of human interaction and quality of life in the most impoverished states, while appreciating the role of social relations at the family, social, and community levels in welfare and development.

We also noted some minor variations in the positions of states on the two indices – the DP_2 index and the HDI. Specifically, 9 of the 32 states moved positions on the welfare groupings. The reasons for the observed changes are complex and beyond the scope of the

current study. However, a possible explanation for the observed discrepancy on the welfare grouping of the states could be that while DP_2 includes a larger number of indicators and measures grouped in nine categories, relevant for a complex society such as Mexico, the HDI, uses a series of global indicators, focusing specifically on income, health, and education, with four indicators (life expectancy, mean years of schooling, expected years of schooling, and Gross National Income per capita) (UNDP, 2012, 2014). These items are important as they are used to denote a global understanding of development and welfare, but they may fail to accurately reflect the local reality.

Despite the noted variations, the DP_2 index compared favorably with the HDI. Indeed, most states remained in the same level or category of welfare on both indexes, with the same states ranking at the top and at the bottom. This is suggestive; the multidimensional index of social welfare and the HDI may be similar and comparable. Although the HDI has withstood the test of time, the DP_2 may be a more appropriate measure at the local level because it is equivalent to the HDI and better captures the specificities of social welfare in Mexico.

Study limitations

A number of challenges and limitations need to be acknowledged. First, there are information limits. The study depended on secondary data and is subject to the measures utilized. The study utilized proxies where necessary. In addition, some data sets had to be discarded due to lack of representativeness at the state level (see Table 2).

Moreover, some indicators failed to fully account for the specific weaknesses of social welfare in Mexico, particularly at the state level. Given that social welfare is still not a priority in governments' agenda, existing measures tend to put emphasis on poverty rather than welfare. Indeed, there may be need for more precise measures to minimize the use of one-item categories,

such as the one used to capture *income* and *education*. The inclusion of items capturing such factors as quality of education and income inequality may be useful.

Our results point to the need to include information on the welfare conditions of municipalities, districts, and neighborhoods. This is essential for the development and implementation of adequate local public policies that are responsive to different contexts. Only by approaching welfare in a multidimensional way will the existing gaps in social welfare between and within states begin to be reduced. Scholars pursuing future research based on this study may encounter challenges in estimating welfare at state and municipal levels. Addressing these challenges might involve including the local voices, particularly from the poorest states.

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Table 1. Key socioeconomic indicators per stratum (percentage population).¹

	State	Total area ²	Pop.	Tertiary education or more	Access to health care	Household with no telephone	Household with non-dirt floor
	Mexico			52.23	39.16	35.13	85.21
7	Mexico City	0.08	10.71	72.34*	50.59*	66.79*	98.66*
6	Aguascalientes Coahuila Jalisco Nuevo León	15.31	19.60	57.76*	55.44*	48.89*	94.55*
5	Baja Calif. Norte Baja Calif. Sur Chihuahua Mexico (State) Sonora Tamaulipas	34.44	12.73	58.02*	53.44*	45.04*	91.61*
4	Colima Morelos Nayarit Querétaro Quintana Roo Sinaloa Yucatán	9.67	23.17	56.8*	41.13*	36.86*	90.84*
3	Durango Guanajuato Michoacán Tlaxcala Zacatecas	14.92	11.22	42.11	32.62	26.56	86.22*
2	Campeche Hidalgo Puebla San Luis Potosí Tabasco Veracruz	13.81	13.74	44.27	27.47	21.06	76.05
1	Chiapas Guerrero Oaxaca	11.78	8.83	35.19	19.35	13.40	59.14

Source: Elaborated by the authors with information from INEGI (2014). Socioeconomic Regions of Mexico. Indicators per stratum according to classification of the states.

¹ All indicators are stated in percentage of total population in each state.

² Proportion of the national total was calculated using INEGI (2010), Principal Indicators

Table 2. Variable composite of the Multidimensional Social Welfare Index.

Category	Indicator	Measure	Data Source
1. Education	Limited education	% pop. without the basic education according to their age or not in a formal education center ² .	MCS-ENIGH, 2012
2. Employment and social protection	Unemployment	Average annual % unemployment of the economically active population.	ENOE, 2012
	Social security ³	% of employed, not economically active, 65 years-old or over, and without access to social security.	MCS-ENIGH, 2012
3. Income	Minimum income	% pop. with an income below the poverty line, unable to buy a basic basket of food ⁴ .	MCS-ENIGH, 2012
4. Health	Access to health care	% pop. without access to private or public healthcare.	MCS-ENIGH, 2012
	Infant mortality	# of deaths of children under five years old per 1,000 live births.	DGIS, 2012
	Immunization	% of the one year old children who received the basic vaccination or immunization scheme.	CENSIA, 2013
	Maternal mortality	Rate of death of a woman while pregnant or within 42 days of termination of pregnancy.	CENSIA, 2013
	Births attended	% of births attended by skilled health personnel.	DGIS, 2012
	Life expectancy	# of years a newborn infant is expected to live under the prevailing patterns of mortality.	CONAPO, 2012
	Food insecurity ⁵	% pop. with a moderate to severe degree of food insecurity.	MCS-ENIGH, 2012
	5. Housing conditions	Quality and space	% pop. living in households with at least one of these: dirt floor, ceilings and walls of unstable materials ⁶ , and overcrowding.
Household without		% of households.	MCS-ENIGH, 2012

² The Education Act in Mexico establishes compulsory preschool, primary, and secondary education.

³ An employee benefit defined as the right to receive medical services and paid medical leave in case of accident, illness, or maternity, and to have access to a contributory or non-contributory pension or retirement system (CONEVAL, 2010).

⁴ The minimum income line identifies the population that cannot acquire the necessary food for a proper nutrition even if they use all their income (CONEVAL, 2010). The cost of the basic basket of food as of November 2012 was \$63.22 USD per month for rural areas (= \$2.11 USD per day) and \$88.85 USD per month for urban areas (= \$2.96 USD per day).

⁵ Based on the Mexican Food Security Scale (EMSA), it evaluates aspects such as concern for lack of food, changes in the quality and quantity, and hunger experiences (CONEVAL, 2010).

⁶ Unstable material refers to cardboard sheets or debris, mud or clay, reed, bamboo or palm, cardboard, metal, or asbestos sheets and other waste material. Overcrowding occurs when the ratio of people per room exceeds 2.5 (CONEVAL, 2010).

	water		
	Household without drainage	% of households.	MCS-ENIGH, 2012
	Household w/o electricity	% of houses.	MCS-ENIGH, 2012
6. Subjective wellbeing	Life satisfaction	Life satisfaction scale.	ENVUD 2010
	Happiness	Average index of happiness.	ENVUD 2010
7. Social capital	Trust in other people	% people that declare trusting other people.	ENVUD 2010
	Trust in institutions	Score of trust in public and private institutions*	ENVUD 2010
	Personal networks	Scale of personal membership to different groups and organizations.	ENVUD 2010
8. Use of technology	Computer use	% of users of 6 years old or more.	MODUTIH 2013
	Internet use	% of users of 6 years old or more.	MODUTIH 2013
	Mobile phone use	% of users aged 6 years old or more.	MODUTIH 2013
9. Culture and leisure	Cultural events attendance**	% of population that attended cultural events and libraries in the last year.	ENHPCC 2010
	Books read	% people that read one book or more a year.	ENHPCC 2010
	Library attendance	% people that attended a library at least once in the year.	ENHPCC 2010

Source: Elaborated by the authors based on the selection and estimation procedure.

Notes: * A compound of measures of trust in: the church, the army, the police, the Federal, State and Local government, the trade unions, the political parties, the Congress, the Supreme Court of Justice, the Federal Election Institute, civil society organizations requesting for donations, major corporations, small business, the media and private banks.

** Scale built based on measurements of attendance to dance, music, theatre and visual arts events, plastic arts, museums as well as painting, sculpture and music exhibits.

Table 3. Correction factor and DC by categories and indicators.

Variable		Correction factor		Correlation coefficient	DC
		per category	per Indicator		
Health	Maternal mortality	1.89	0.31	0.79	0.36
	Food insecurity		0.29	0.70	0.28
	Life expectancy		0.28	0.66	0.02
	Immunization		0.26	0.35	0.14
	Access to health care		0.26	0.54	0.28
	Infant mortality		0.26	0.72	0.18
	Births attended		0.23	0.74	0.04
Housing conditions	Household without electricity	1.33	0.43	0.50	0.98
	Household without water		0.37	0.84	1.04
	Household without drainage		0.34	0.83	0.83
	Quality and space		0.19	0.82	0.57
Income	Minimum income	1.00	1.00	0.93	0.51
Social capital	Trust in other people	0.87	0.48	0.45	0.50
	Personal networks		0.24	0.13	0.04
	Trust in institutions		0.15	0.28	0.08
Culture and leisure	Books read	0.73	0.36	0.34	0.26
	Cultural events attendance		0.18	0.31	0.13
	Library attendance		0.19	0.29	0.24
Use of technology	Mobile phone use	0.48	0.26	0.77	0.19
	Computer use		0.20	0.84	0.22
	Internet use		0.02	0.84	0.25
Employment & social protection	Social security	0.49	0.31	0.86	0.23
	Unemployment		0.18	0.63	0.33
Subjective wellbeing	Life satisfaction	0.41	0.28	0.38	0.05
	Happiness		0.13	0.23	0.04
Education	Limited education	0.19	0.19	0.81	0.30

Source: Elaborated by the authors based on the estimation results.

Table 4. Percentage contribution of the partial indicators by state.

State	1. Health	2. Housing conditions	3. Income	4. Soc. capital	5. Culture & leisure	6. Use of technology	7. Subj. well-being	8. Employment & social protection	9. Education	DP_2
Baja Calif. Sur	0.29	0.19	0.15	0.12	0.07	0.07	0.03	0.05	0.03	1.00
Mexico City	0.26	0.22	0.17	0.06	0.11	0.06	0.03	0.04	0.04	1.00
Colima	0.29	0.22	0.16	0.12	0.04	0.06	0.04	0.05	0.02	1.00
Aguascalientes	0.27	0.21	0.14	0.10	0.11	0.05	0.04	0.04	0.03	1.00
Nuevo León	0.29	0.23	0.17	0.07	0.03	0.06	0.06	0.06	0.03	1.00
Querétaro	0.30	0.19	0.15	0.14	0.07	0.04	0.05	0.04	0.03	1.00
Coahuila	0.27	0.23	0.17	0.06	0.05	0.06	0.07	0.06	0.04	1.00
Sonora	0.24	0.20	0.18	0.14	0.05	0.08	0.03	0.04	0.03	1.00
Jalisco	0.28	0.24	0.15	0.07	0.05	0.07	0.05	0.05	0.03	1.00
Tamaulipas	0.32	0.24	0.17	0.07	0.01	0.07	0.05	0.04	0.03	1.00
Baja Calif. Norte	0.25	0.25	0.19	0.06	0.04	0.09	0.05	0.04	0.04	1.00
Chihuahua	0.21	0.24	0.16	0.09	0.05	0.08	0.08	0.05	0.03	1.00
Sinaloa	0.29	0.23	0.18	0.09	0.06	0.07	0.01	0.05	0.03	1.00
Quintana Roo	0.28	0.23	0.16	0.05	0.06	0.08	0.06	0.05	0.03	1.00
Morelos	0.27	0.23	0.17	0.09	0.08	0.05	0.03	0.04	0.03	1.00
Yucatán	0.28	0.18	0.17	0.07	0.11	0.06	0.07	0.06	0.02	1.00
Mexico	0.25	0.25	0.17	0.06	0.12	0.05	0.03	0.03	0.04	1.00
Campeche	0.31	0.24	0.15	0.08	0.05	0.05	0.03	0.06	0.03	1.00
Guanajuato	0.32	0.24	0.17	0.10	0.02	0.05	0.05	0.03	0.02	1.00
Zacatecas	0.35	0.26	0.09	0.10	0.04	0.04	0.05	0.04	0.03	1.00
Durango	0.31	0.26	0.13	0.12	0.02	0.05	0.03	0.04	0.04	1.00
Tabasco	0.30	0.20	0.14	0.16	0.04	0.06	0.05	0.02	0.03	1.00
Nayarit	0.30	0.15	0.14	0.10	0.10	0.07	0.07	0.04	0.03	1.00
Hidalgo	0.28	0.23	0.14	0.09	0.10	0.04	0.06	0.03	0.03	1.00
San Luis Potosí	0.36	0.15	0.16	0.14	0.04	0.03	0.03	0.06	0.03	1.00
Michoacán	0.30	0.22	0.15	0.09	0.11	0.04	0.03	0.04	0.02	1.00
Tlaxcala	0.30	0.31	0.16	0.06	0.04	0.05	0.02	0.03	0.04	1.00
Veracruz	0.26	0.18	0.16	0.16	0.06	0.05	0.07	0.05	0.02	1.00
Puebla	0.27	0.26	0.11	0.11	0.10	0.04	0.05	0.04	0.03	1.00
Oaxaca	0.24	0.17	0.13	0.17	0.12	0.02	0.04	0.07	0.02	1.00
Chiapas	0.26	0.18	0.00	0.18	0.20	0.02	0.10	0.06	0.00	1.00
Guerrero	0.20	0.24	0.03	0.13	0.15	0.02	0.08	0.11	0.04	1.00

Source: Elaborated by the authors based on the estimation results.

Note: The highlights are used to illustrate the general pattern of social welfare in the country and per state.

Table 5. Multidimensional Index of Social Welfare.

Level	State	DP_2	Ranking	
			DP_2	HDI
Very high	Baja California Sur	24.30	1	3
	Mexico City	24.25	2	1
	Colima	23.68	3	7
	Aguascalientes	23.57	4	8
	Nuevo León	23.37	5	2
	Querétaro	22.88	6	12
	Coahuila	22.12	7	6
	Sonora	21.82	8	5
High	Jalisco	20.80	9	15
	Tamaulipas	20.29	10	11
	Baja California Norte	20.12	11	4
	Chihuahua	20.09	12	17
	Sinaloa	19.79	13	9
	Quintana Roo	19.69	14	10
	Morelos	19.63	15	13
	Yucatán	19.13	16	20
Medium	Mexico (State)	18.99	17	14
	Campeche	18.86	18	18
	Guanajuato	18.47	19	26
	Zacatecas	18.16	20	27
	Durango	17.70	21	21
	Tabasco	17.26	22	19
	Nayarit	17.19	23	16
	Hidalgo	17.00	24	24
Low	San Luis Potosí	15.51	25	13
	Michoacán	15.45	26	29
	Tlaxcala	15.10	27	22
	Veracruz	15.01	28	28
	Puebla	13.50	29	25
	Oaxaca	9.80	30	31
	Chiapas	9.39	31	32
	Guerrero	6.27	32	30

Source: DP_2 Elaborated by the authors using statistical databases from Mexican government institutions and others institutions.

HDI taken from UNDP, 2012. The new method of the HDI (UNDP, 2014) used in current reports is not used here because it is methodologically inappropriate for this study.

The states that change their position in the ranking and their group are highlighted, allowing for a systematic comparison between the indices.