

QUALITY OF LIFE RANKING OF SPANISH MUNICIPALITIES*

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Measuring the quality of life in municipalities entails two empirical challenges. First, collecting a set of relevant indicators that can be compared across the municipalities. Second, using an appropriate aggregating tool in order to construct a synthetic index. This paper measures the quality of life for the largest 643 Spanish municipalities using Value Efficiency Analysis (VEA). The indicators used cover aspects related to consumption, social services, housing, transport, environment, labour market, health, culture and leisure, education and security. Superefficiency VEA scores are also computed in order to construct a complete ordered ranking of the quality of life. The results show that the Northern and Central regions in Spain attain the highest levels of quality of life, while the Southern regions report low living conditions. It is also noticeable that none of the 10 biggest Spanish cities appear in the TOP50 ranking of quality of life.

Key words: quality of life, welfare, municipalities, DEA, VEA.

JEL Classification: R00, O18, H75, C60.

Gross Domestic Product (GDP) is the best known measure of macro-economic activity. Since its development in the 1930s, GDP has been also used as a benchmark in assessing the development and progress of countries and regions. However, notable economists and Nobel laureates, such as Joseph Stiglitz and Amartya Sen, have recently called attention about the limitations of GDP as a stand alone statistic to guide the debate about the progress of societies. Concern about the use of GDP as an appropriate measure of social progress dates back to the seminal work of Easterlin (1974), who found that while GDP per capita in the USA rose steadily from 1946 to 1970, data on reported happiness were stationary and even showed decline between 1960 and 1970.

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The first notable attempt to complement GDP with other indicators in order to improve the assessment of social progress was the Human Development Index (HDI), designed in 1990 by the United Nations Development Program. The objective of the HDI was to benchmark countries on the basis of a composite indicator that took into account GDP, health and education. More recently, in November 2007, the European Commission organized the “Beyond GDP” conference also with the objective of developing indicators that could complement GDP and provide a sound basis to support policy decisions. Along the same lines, at the beginning of 2008, the president of the French Republic created a Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), chaired by Nobel laureate Joseph Stiglitz. In a recent report of the CMEPSP, Stiglitz, Sen and Fitoussi (2009) stressed the importance of complementing GDP with measures of quality of life and sustainability.

In considering the limitations of GDP and what additional information is needed in order to produce more informative measures of social progress, Stiglitz, Sen and Fitoussi (2009) recommend making efforts to obtain measures of the quality of life of citizens¹. Quality of life indicators should include aspects of well-being that relate to the economic, environmental and social dimensions of life. The report of the commission identifies the areas that would be desirable to include in a measure of quality of life: health, education, personal activities (including commuting and leisure), housing, political voice, social connections, environmental conditions and personal and economic insecurity. To be able to construct useful measures of the quality of life that account for all such factors, improving the statistical data base is a fundamental challenge that is being seriously addressed by the European Union. At the national level of analysis, the European Quality of Life Survey now includes very useful information on all the dimensions previously cited and also includes information on reported subjective well-being. Unfortunately, at the municipal level of analysis, the information available is still scant. This contrasts with the recommendations of the Community Strategic Guidelines 2007-2013, which pay particular attention to the quality of life of urban and rural areas and stress the importance of measuring cohesion not only in terms of growth and jobs but also in terms of social and environmental objectives [Commission of the EU (2005)].

But even having statistical information about the components of the quality of life is not enough to produce comparable measures of the quality of life. The indicators must be aggregated in a sensible manner to construct a the quality of life index that allows ranking countries, regions, or municipalities and reporting overall improvement possibilities. The revision of the literature shows that several methodologies have been proposed and applied to different empirical settings. In this paper, we employ Data Envelopment Analysis (DEA) and a recent extension called Value Efficiency Analysis (VEA) to aggregate the information and derive an index of municipal quality of life.

(1) The CMEPSP also stresses the importance of measuring sustainability, since growth today can be achieved at the expense of future growth. Therefore, information about sustainability is also needed in order to make correct policy decisions.

DEA is a non-parametric frontier analysis method that has been extensively used in measuring the efficiency of production in firms and public organizations. In those contexts, the variables used in the DEA analysis are inputs (factors that have a cost and should be kept to a minimum) and outputs (products that have a positive value and should be increased to their maximum). DEA consistently weights inputs and outputs to obtain a precise index of productive efficiency. The DEA setting can be adapted to the measurement of the quality of life in municipalities by considering the indicators that imply drawbacks of living in a certain place as inputs (costly aspects that should be kept to a minimum) and the indicators that imply advantages as outputs (valuable factors that should be maximized). In using the DEA model to estimate an index of the quality of life, we follow the pioneer work of Hashimoto and Ishikawa (1993) who applied this methodology to measure the quality of life in Japan.

DEA is a reasonable method to aggregate the indicators of the quality of life because it can easily handle multiple dimensions (inputs/outputs) without imposing much structure on the relationships between those dimensions. Indeed, it is able to capture differences in the preferences of the population of different municipalities and uses different weights for the underlying dimensions of the quality of life within each municipality. However, DEA also has some important drawbacks that limit its empirical application. One of the most important limitations of DEA is its low discriminating power, especially when many dimensions are taken into account and the sample size is limited [Ali (1994)]. In those cases, DEA results show a considerable number of Decision Making Units (DMUs) on the frontier, even though some of them would be considered as low performers with a more delicate inspection of the data. These DMUs obtain a score of 100% simply because they are not comparable to the rest of the sample in one or another dimension². In fact, the DEA score is a weighted index of inputs and outputs and, as we mentioned above, each municipality has an extreme degree of flexibility to choose those weights according to the varying preferences of the population. Each municipality is free to select its own weights and is compared with the achievement that other municipalities would attain with those particular weights. We believe that some flexibility is desirable to express differences in specific municipality features and preferences but not to the extent of allowing total disparity.

Some recent advances in the DEA methodology, namely VEA-Value Efficiency Analysis, are useful to handle the absolute weight flexibility problem, at the cost of increased analytical complexities. The objective of this paper is to obtain quality of life scores for all the municipalities in Spain with a population over 10000 using VEA. We will compare municipal data that includes both indicators of advantages (education, health facilities, wealth, etc) and drawbacks (unemployment, delinquency, pollution, commuting times, etc.) associated with living in each city. To avoid the limitations of DEA's extreme flexibility of weights, we will employ VEA. This refinement of DEA adds a constraint on how the weights can be chosen by the different municipalities in the sample. As a result, VEA sig-

(2) Using the lowest quantity of an input, for instance. This problem is also present and intensified in variants of DEA such as FDH.

nificantly improves both the discriminating power of DEA and the consistency of the weights on which the evaluation is based. The empirical application also examines how the population characteristics of the municipalities relate to the estimated quality of life scores.

1. THE MEASUREMENT OF QUALITY OF LIFE

At the individual level, quality of life or welfare comes from the consumption of a series of economic and social tangible goods (food, health attention, amenities, etc.) and also from intangible factors such as personal emotions or attitudes. While the economic evaluation of the intangible drivers of the quality of life falls outside the scope of actual measurement techniques, aggregate quality of life indicators at varying territorial levels have commonly been derived from the observation of tangible drivers. These measures can be a critical input to policy decision making if they are oriented towards achieving the maximum possible level of aggregate welfare and can complement traditional economic measures such as GDP. For example, resources available at the national level can be distributed to regions not just to target economic convergence but to attempt to reduce differences in quality of life across the territory³.

Not surprisingly, social welfare has always been a central topic of study in Economic sciences. However, its measurement has traditionally been limited to very aggregate and monetary based variables taken from national accounting. Quality of life is related to many dimensions of life, some of which are difficult to measure and report in national accounts. In order to provide an appropriate representation of all those dimensions, a growing body of literature, known as the social indicators approach, has evolved using a series of economic, environmental and social indicators without the need to assign them monetary values for aggregation⁴. At the local level of analysis, the main problem with this approach is the poor development of statistical sources that collect comparable data across municipalities [Zarzosa (1996; 2005)].

The social indicators approach faces two important empirical challenges. First, a complete set of indicators for all the relevant underlying dimensions of quality of life must be listed and measured. Second, a sound aggregation methodology must be applied to raw indicators in order to obtain a reasonable index of quality of life. With respect to the indicators to be used, the lists vary widely across studies and the main reason for this is data availability⁵. From the works of the CMEPSP and after

(3) According to the seminal model of Tiebout (1956), this public intervention would not be really necessary since people would sort themselves across municipalities with varying characteristics (public goods and taxes) in a manner according to their individual preferences. In this equilibrium, people vote with their feet and quality of life differentials would not persist across municipalities. However, this equilibrium requires certain assumptions such as perfect mobility and perfect information. Rosen (1985) claims that these assumptions do not represent real conditions and, therefore, important differences can be observed across municipalities and can be persistent over time.

(4) Another approach is the construction of hedonic price models that provide estimations about the relative value of some of these dimensions as determinants of the price of houses or rents.

(5) Also, different studies deal with different territorial levels of analysis (nations, counties, regions).

a thorough revision of the literature, Stiglitz, Sen and Fitoussi (2009) have confected a list of the underlying dimensions of quality of life: Health, Education, Personal activities (including commuting and leisure), Housing, Political voice, Social connections, Environment, Personal security and Economic security.

One or more indicators can be used to account for each of the underlying dimensions of quality of life. The indicators that we use in this paper are representative of 8 of the 9 dimensions outlined above⁶. For example, we use the unemployment ratio and the socio-economic level of the population as indicators of Economic security. Housing is proxied by the per capita size of the houses and their living conditions⁷. What is important is to use indicators that can approximate each dimension and that are comparable across the municipalities in the sample.

With respect to the second empirical problem, the aggregation methodology, several approaches have been proposed in the literature. The most important are the synthetic indicator of multidimensional distance (DP₂) proposed by Pena (1977), the hedonic price methodology proposed by Rosen (1979) and Roback (1982) and the data envelopment analysis (DEA) approach suggested by Hashimoto and Ishikawa (1993)⁸.

The multidimensional distance synthetic indicator (DP₂) is a mathematical function of the partial indicators that summarizes in a reasonable manner the original information contained in the set of indicators. Its computation is based on adding up the differences between the value of each indicator and its minimum value, which is referred to as the distance. Examples of the use of this method to measure the quality of life in Spanish municipalities are the studies of Sánchez and Rodríguez (2003) for Andalusia and Zarzosa (2005) for Valladolid. Other recent studies apply this index to measure the quality of life in European nations [Somarriba (2008), Somarriba and Pena (2009)].

Perhaps the most widely used methodological approach to the measurement of the quality of life is the estimation of hedonic prices. This methodology can be traced back to the early work of Rosen (1979) and Roback (1982) who established that, given an equilibrium in the land and labour markets, the value of regional amenities and other determinants of the quality of life should be capitalized in wages and rents [Deller *et al.* (2001)]. Therefore, differences in wages and rents should arise from underlying differences in the quality of life. Blomquist, Berger and Hoehn (1988) used this technique to estimate a quality of life index based on climatic, environmental and urban variables for a sample of cities. More recently, Gabriel, Matthey and Wascher (2003) developed the model to include not only the prices of factors in the local market but also data on municipal facilities.

(6) In particular, we do not use any measure of political voice. While this dimension of quality of life may be important to compare countries in which political participation may differ greatly, we do not think that would be a very relevant dimension to compare municipalities within the same country, as is done in this paper.

(7) Table 1, in Section 4, provides a detailed list of the indicators used and the underlying dimension that is proxied in each case.

(8) Some authors also point to factor analysis as a valid aggregating methodology (Somarriba and Pena, 2009).

Non-parametric approaches to the aggregation of indicators to measure the quality of life have also been suggested in the literature. Hashimoto and Ishikawa (1993) proposed the use of Data Envelopment Analysis (DEA) to evaluate the quality of life in the 47 prefectures of Japan. Although DEA was initially developed to measure efficiency in production, some non-standard uses of this technique have been proposed in the literature focusing on the properties of DEA as a powerful aggregating tool⁹. The aggregation is done by comparing the indicators of each unit to the best practices observed, which form the so-called best practice frontier. While the application of DEA to the measurement of the quality of life is still scant, we can cite several studies that use this methodology in different settings [Hashimoto and Isikawa (1993), Hashimoto and Kodama (1997), Despotis (2005a,b), Marshall and Shortle (2005), Murias, Martínez, and Miguel (2006), Somarriba and Pena (2009)].

We believe that the DEA methodology has important advantages over alternative aggregation methods. First, it combines information on the underlying determinants of the quality of life. Second, it does not impose a strict functional form on the relationship between the variables and does not require any assumption on market equilibria. Third, final scores are obtained by comparison. The DP_2 measure also makes comparisons but it takes the minimum value of each variable as the reference. DEA, in contrast, constructs a comparison frontier from the best municipalities observed in the sample on the basis of a comparative assessment of the indicators. A fourth advantage of DEA is that it provides each municipality with information on the improvements that should be made in each indicator in order to reach the quality of life frontier. Furthermore, it informs about the municipalities that act as frontier references for each low performing municipality in the sample. For these reasons, we will employ the DEA and VEA methodologies to compute quality of life scores for Spanish municipalities.

2. METHODS

To compute the VEA quality of life scores, we must first obtain the DEA frontier for the municipalities in the sample. The DEA frontier identifies the municipalities that would be considered as the best referents under certain (conservative) assumptions. DEA was developed to measure relative efficiency by comparison of data on inputs and outputs of productive units. In this paper, we will use the same setting of comparison but the inputs will be the drawbacks associated with living in a city and the outputs will be the advantages¹⁰. Even though there

(9) The Handbook on Constructing Composite Indicators, elaborated jointly by the OECD and the European Commission, includes DEA as an appropriate method to weight partial indicators [OECD (2008)].

(10) The DEA approach tries to reduce inputs to the minimum possible because they imply a cost in production. It also tries to increase outputs to the maximum because they have a positive value for the productive firm. In our setting, city drawbacks imply a cost of living in the municipality and should be reduced to a minimum, while advantages imply a benefit for citizens and should be increased to the frontier maximum. Thus, the parallelism is clear and the applicability of DEA to our research setting is straightforward. Throughout the paper, we will refer indistinctly to inputs-drawbacks and outputs-advantages.

are many variants of DEA programs, in this paper, we follow the traditional specifications of Charnes *et al.* (1978) for the constant returns to scale frontier (CCR) and Banker *et al.* (1984) for the variable returns to scale frontier (BCC). The CCR DEA model with an output orientation requires solving the following mathematical program for each DMU i in the sample¹¹:

$$\begin{aligned} & \min \frac{\sum_{m=1}^M v_m x_{im}}{\sum_{s=1}^S u_s y_{is}} \\ & \text{s.a. :} \\ & \frac{\sum_{m=1}^M v_m x_{jm}}{\sum_{s=1}^S u_s y_{js}} \geq 1 \quad , \quad \forall j \\ & u_s, v_m \geq 0 \quad , \quad \forall s, m \end{aligned} \tag{1}$$

where x_{im} represents the consumption of input m by DMU i , y_{is} represents the production of output s by DMU i , v_m is the shadow price of input m , and u_s is the shadow price of output s . The program finds the set of shadow prices that minimizes the production cost of unit i with respect to the value of its outputs, conditioned to obtain ratios larger or equal to 1 for all the other DMUs in the sample. If DMU i is on the frontier, optimal shadow prices will give the minimum possible value for the ratio, i.e. 1. Underperformers would only attain values greater than 1 for the objective function. Fractional program [1] involves some computational complexities. Thus, it is preferable to solve the following equivalent linear program:

$$\begin{aligned} & \min \sum_{m=1}^M v_m x_{im} \\ & \text{s.a. :} \\ & \sum_{s=1}^S u_s y_{is} = 1 \\ & \sum_{s=1}^S u_s y_{js} - \sum_{m=1}^M v_m x_{jm} \leq 0 \quad , \quad \forall j \\ & u_s, v_m \geq 0 \quad , \quad \forall s, m \end{aligned} \tag{2}$$

(11) We describe the dual DEA programs instead of the more usual primal specifications because we will use the weights of inputs and outputs in these dual programs to perform the VEA analysis. Anyway, the primal specification would, of course, reach exactly the same solutions and provide the same performance indicators.

This program finds the shadow prices that minimize the cost of DMU i , but normalizing the output value to 1. If DMU i is on the best practice frontier, it will obtain a cost equal to 1 while, if it is below the frontier, it will obtain a value greater than 1. In the latter case, the solution to the linear program must also identify at least one other DMU within the sample that obtains the minimum cost of 1 with the shadow prices that are most favourable to DMU i . Program [2] is solved for every DMU in the sample, and each of them will obtain its most favourable set of shadow prices for inputs and outputs and the corresponding quality of life scores. For an easier interpretation, it is common to use the inverse of the objective function in [2] as the performance score. Therefore, the score is bounded within the (0,1] interval and values lower than 1 reflect the distance to the best practice frontier.

Banker *et al.* (1984) relax the constant returns to scale assumption modifying linear program [2] to allow for variable returns to scale in the production technology:

$$\begin{aligned}
 & \min \sum_{m=1}^M v_m x_{im} + e_i \\
 & \text{s.a:} \\
 & \sum_{s=1}^S u_s y_{is} = 1 \\
 & \sum_{s=1}^S u_s y_{js} - \sum_{m=1}^M v_m x_{jm} - e_i \leq 0 \quad , \quad \forall j \\
 & u_s, v_m \geq 0 \quad , \quad \forall s, m
 \end{aligned} \tag{3}$$

where the intercept e_i is added to relax the CCR condition that forced the objective function to pass through the origin in [2]. In program [3], that condition will only be satisfied if $e_i^* = 0$. For values greater or smaller than 0, the reference in the frontier for the DMU will be located in a local zone with decreasing or increasing returns to scale, respectively. Most productive activities are subject to variable returns to scale and this is why most empirical applications use the BCC program to measure the technical efficiency of production. In our case, we find no scale reasons that recommend applying the CCR or the BCC model to the measurement of the quality of life of municipalities. However, all our indicators of drawbacks and advantages are ratios and this fact calls for a BCC specification of the DEA model [Hollingsworth and Smith (2003)]. Thus, we consider that the BCC frontier is the most appropriate to evaluate the quality of life in municipalities.

A distinctive feature of DEA is the absolute flexibility in the way the linear program can assign weights (shadow prices) for each particular DMU in the sample. Recall that the program is solved independently for each DMU and, then, shadow prices for inputs and outputs may be completely different from one DMU to another. The main argument to defend the extreme weight flexibility in DEA is the convenience of obtaining an evaluation of the performance of each DMU under its most favourable scenario. In the context of measuring quality of life, extreme flexibility allows for extreme heterogeneity in the preferences of the population of the different municipalities regarding the set of drawbacks and advantages considered

in the evaluation. However, extreme flexibility may also be an object of criticism because it often produces an extreme inconsistency in the values of the shadow prices across DMUs. To avoid this inconsistency the DEA literature has suggested some solutions to restrict the range of acceptable values for those weights [Thompson *et al.* (1986), Dyson and Thanassoulis (1988), Allen *et al.* (1997), Roll *et al.* (1991), Wong and Besley (1990), Pedraja *et al.* (1997), Sarrico and Dyson (2004)].

In turn, the problem of weights restriction methods is that they require making value judgements about the range of shadow prices that is considered appropriate. In order to facilitate the implementation of weight restrictions in practice, Halme *et al.* (1999) proposed an alternative methodology under the name Value Efficiency Analysis (VEA). The objective of VEA is to restrict weights using a simple piece of additional information that must be supplied to the DEA program. The most notable difference between VEA and conventional methods of weights restriction is that, instead of establishing appropriate ranges for shadow prices, an outside expert is asked to select one of the DEA-efficient DMUs as his Most Preferred Solution (MPS). Once the MPS is selected, the standard DEA program is supplemented with an additional constraint that forces the weights of the DMU under evaluation (i) to take the MPS (o) to the frontier. In other words, the new linear program requires that the optimal shadow prices selected by DMU i must also be good for the MPS. As this requirement is made for all the DMUs in the sample, the optimal sets of shadow prices of all the linear programs must be good for the MPS. Thus, the MPS forces a high degree of consistency in the sets of shadow prices across DMUs. An immediate effect of the VEA constraint is that DMUs that obtained a DEA score of 1 just because they had an extreme value in one input or output will only obtain a VEA score equal to 1 if they can stand the additional comparison with the MPS. The BCC VEA program with an output orientation can be expressed as follows:

$$\begin{aligned}
 & \min \sum_{m=1}^M v_m x_{im} + e_i \\
 & \text{s.t. :} \\
 & \sum_{s=1}^S u_s y_{is} = 1 \\
 & \sum_{s=1}^S u_s y_{js} - \sum_{m=1}^M v_m x_{jm} - e_i \leq 0 \quad , \quad \forall j \\
 & \sum_{m=1}^M v_m x_{om} + e_i - \sum_{s=1}^S u_s y_{os} = 0 \\
 & u_s, v_m \geq 0 \quad , \quad \forall s, m
 \end{aligned} \tag{4}$$

Program [4] is identical to program [3] but the MPS constraint has been added. Thus, the MPS (o) must obtain a value of 1 with the shadow prices of DMU (i). Indirectly, this requirement restricts the range of shadow prices allowed

to the range that makes the MPS (o) be part of the best practice frontier in all the linear programs¹².

A controversial issue in VEA is how to select the MPS [Korhonen *et al.* (1998)]. Our empirical setting is designed to measure quality of life by comparing the drawbacks and advantages associated with living in the different municipalities of the sample. In this context, it would be difficult to find an expert that would provide the MPS. However, there are previous studies that evaluate the quality of life in the biggest Spanish cities using alternative methodologies. We will refer to their results to select a reasonable MPS for our sample.

3. DATA

We are interested in measuring quality of life conditions in all the Spanish municipalities with a population of over 10000. Comparable municipal information is scant in Spain. The only database that contains comparable information for all the Spanish municipalities is the Census of Population and Housing which provides very rich information to proxy the drawbacks and advantages of living in different cities. The most recent available data refers to 2001. Our final sample includes a total of 643 municipalities and is sufficiently large and representative to solve the DEA model proposed. We followed the recommendations of the CMEPSP to choose the variables that could reasonably proxy the relevant dimensions of quality of life in municipalities (Table 1).

Table 1: VARIABLES USED TO PROXY QUALITY OF LIFE IN MUNICIPALITIES

Drawbacks (inputs)	Advantages (outputs)
Unemployment (UNEMP)	Socioeconomic condition (ASC)
Pollution (POLLUT)	Commercial market share (SHARE)
Lack of Parks (GREEN)	Cultural and sports facilities (CULT)
Lack of cleanliness (DIRT)	Health facilities (HEALTH)
Acoustic pollution (NOISE)	Education facilities (EDUC)
Delinquency/vandalism (CRIME)	Social care facilities (SOCIAL)
Bad communications (COM)	Average education level (AEL)
Commuting time (TIME)	Post compulsory education (POST)
	University studies (UNIV)
	Avg. Net usable area (AREA)
	Living conditions (LIVCOND)

Source: Own elaboration.

(12) We used the software LINGO to solve the DEA and VEA programs of this research. While many packages are pre-programmed to solve DEA, we are not aware of one that can solve VEA. However, any mathematical programming software can be used to solve [3].

To approximate the advantages of living in a municipality, we use 11 variables. The economic advantages of municipalities are measured with two variables. The Average Socio-economic Condition (ASC) is an index variable elaborated by INE that reflects the socio-economic status of the population on the basis of the jobs declared by citizens¹³. The second variable is the Commercial Market Share (SHARE) of the municipality. This variable, taken from the *Anuario Económico de España* (La Caixa, 2001), is an index that measures the consumption capacity of a municipality in relation with the total consumption capacity of Spain¹⁴. It proxies purchasing power.

Municipal facilities are proxied with four variables¹⁵. Cultural and sports facilities (CULT) include theatres, cinemas, museums, art galleries, sports centres, etc. Health facilities (HEALTH) include hospitals and primary care centres. Education facilities (EDUC) include primary and secondary schools, colleges and nursery schools. Social care facilities (SOCIAL) encompass senior centres, social services, pensioner clubs, etc. Education is approximated with three variables. First, the Average Education Level (AEL) is an index variable computed by INE that indicates the average attainment of the population of the municipality¹⁶. To this variable, we add the percentage of people that completed post-compulsory education (POST) and the percentage of the population with university studies (UNIV). Finally, housing advantages are accounted for with two variables, the Average Net Usable Area per capita (AREA) and an Index of Living Conditions (LIVCOND)¹⁷.

With respect to the drawbacks of living in a municipality, we use 8 variables. Economic insecurity is proxied by the unemployment rate (UNEMP). Environmental drawbacks are measured in four dimensions. First, POLLUT indicates the percentage of houses that notify problems of pollution and/or bad smells. Second, GREEN indicates the percentage of houses that report scant green zones (gardens, parks) nearby. Third, DIRT measures the percentage of houses that report a poor cleanliness in surrounding streets. Fourth, NOISE measures the percentage of houses that complain about acoustic pollution.

The personal insecurity of the municipality is approximated by the percentage of houses that report problems of delinquency or vandalism (CRIME). Finally, transport and commuting problems are proxied by two variables: the number of houses that report having bad communications (COM) and the average time employed on journeys to school or work (TIME)¹⁸.

(13) In the computation of this index, INE uses class marks that go from 0 (unemployed) to 3 (entrepreneur).

(14) To compute this index, La Caixa takes into account the population, number of phones, automobiles, trucks and vans, banking offices and retail activities. In order to make this index comparable across municipalities, we divided it by the population and multiplied it by 10000.

(15) To make the numbers comparable, we divided the total number of facilities by the population and multiply the result by 10000.

(16) For the computation of the index, INE uses class marks that go from 1 (illiterate) to 10 (PhD).

(17) This index, elaborated by INE, ranges from 0 to 100 and takes into account factors of the buildings such as the age of construction, tumbledown status, hygienic conditions, running water, accessibility, heating, etc.

(18) The raw data distinguishes between these two destinations. Our variable is the arithmetic average of the two. We must also indicate that INE does not compute an index associated with these variables.

The 19 variables considered cover most of the underlying dimensions of quality of life as described in Stiglitz, Sen and Fitoussi (2009): Health, Education, Personal activities (including commuting and leisure), Housing, Political voice, Social connections, Environment, Personal security and Economic security. Health is accounted for by the variables HEALTH and SOCIAL. Education is measured by EDUC, AEL, POST, and UNIV. Personal activities are represented by GREEN, COM, and TIME. Housing is proxied by AREA and LIVCOND. Social connections are indirectly represented by CULT. The Environment is accounted for by the variables POLLUT, DIRT, and NOISE. Personal security is represented by CRIME and Economic security is approximated by UNEMP, ASC, and SHARE. The only dimension that is not covered in our list is Political voice. However, it should be remembered that, while this dimension is crucial when comparing countries, it is of little relevance when comparing regions within the same country that are subject to similar political rules and institutions.

Table 2 shows some descriptive statistics of the variables used to approximate the quality of life in Spanish municipalities. The table shows enormous differences between minimum and maximum values in almost all the variables considered. For instance, Las Rozas (Madrid) has 13.8 times more population with a university degree than Cabezas de San Juan (Sevilla). Crime and vandalism problems in Olivenza (Badajoz) are 94 times lower than in Sevilla. However, being best or worst in one or another dimension does not necessarily imply a very high or low quality of life. In many cases, a municipality excels in some dimensions and shows a poor performance in others. Table 2 evidences one of these cases. Boadilla del Monte (Madrid) excels in socio-economic condition but suffers from severe problems with communications which, in turn, imply time-consuming journeys to work or school (4 times longer than living in Pilar de la Horadada (Alicante)). Another good example is El Ejido (Almería). This municipality is a nice place for job seeking people, as reflected by its very low unemployment rate (5.43), although not the lowest. However, it shows very poor education attainments. This is why we need a technique capable of finding appropriate weights for the different dimensions that determine the overall quality of life. The VEA methodology explained in Section 3 allows us to set reasonable weights for each dimension and construct a meaningful aggregate indicator.

4. RESULTS

The DEA model was run to obtain an initial best practice frontier. This is a necessary step to know which municipalities are located on the frontier and, thus, can be considered as appropriate candidates to be the MPS for the VEA analysis. Table 3 summarizes the DEA results for the 643 municipalities grouped by au-

Instead, the report includes the percentage of people in seven intervals that go from “less than 10 min” to “more than 90 min”. We took mark classes in the mean of the intervals (90 for the last interval) and weighted each class mark by the percentage of population within the interval. The weighted sum can be interpreted as the average time employed to get to school or work and is the variable used in this paper.

Table 2: DESCRIPTIVE STATISTICS OF DRAWBACKS AND ADVANTAGES

	Mean	SD	Min	Max
Drawbacks				
UNEMP	13.55	5.86	4.57	50.08
POLLUT	18.32	9.34	1.50	72.80
GREEN	39.39	14.82	1.15	82.40
DIRT	31.75	11.17	5.78	70.00
NOISE	29.45	9.55	3.47	61.34
CRIME	17.74	10.27	0.61	57.42
COM	14.42	9.85	0.87	75.40
TIME	21.15	5.45	10.05	39.59
Advantages				
ASC	0.96	0.12	0.63	1.27
SHARE	24.23	2.93	17.56	48.83
CULT	7.31	4.77	0.00	36.14
HEALTH	10.86	12.44	0.00	245.24
EDUC	10.36	6.76	0.64	98.34
SOCIAL	6.97	4.52	0.00	45.35
AEL	2.74	0.22	2.19	3.48
POST	37.22	9.38	14.45	68.35
UNIV	11.26	6.09	3.32	45.84
AREA	35.52	4.27	20.45	64.79
LIVCOND	62.79	4.27	40.80	82.04

Source: Own elaboration.

tonomous regions. The North and Central regions of Spain obtain quality of life scores that are higher than the Southern regions. Navarra, Aragón and País Vasco have a large share of the DEA frontier, with 32 out of 59 municipalities from these regions in the sample. La Rioja also shows an average that is very close to 1, although it does not have any municipality on the frontier. On the other hand, Andalucía, Canarias, Comunidad Valenciana and Murcia, with only 28 out of 277 municipalities on the frontier, show the poorest results with averages of around 0.9. The other regions show mediocre results. Madrid and Galicia achieve mediocre averages with large standard deviations. In other words, some of the best and worst places to live in Spain may be found in Madrid and Galicia.

Table 3: SUMMARY OF DEA RESULTS GROUPED BY AUTONOMOUS REGIONS

	n	Average	Min	Max	SD	Frontier (%)
Andalucía	134	0.882	0.761	1	0.064	12 (8.9)
Aragón	12	0.982	0.904	1	0.033	8 (66.7)
Asturias	21	0.943	0.836	1	0.055	5 (23.8)
Baleares	17	0.945	0.867	1	0.046	6 (35.3)
Canarias	36	0.890	0.769	1	0.069	6 (16.7)
Cantabria	10	0.940	0.909	1	0.034	2 (20.0)
Castilla y León	23	0.959	0.879	1	0.034	6 (26.1)
Castilla-La Mancha	28	0.949	0.866	1	0.049	10 (35.7)
Cataluña	96	0.945	0.822	1	0.043	18 (18.7)
Com. Valenciana	81	0.913	0.811	1	0.046	8 (9.9)
Extremadura	13	0.948	0.894	1	0.035	2 (15.4)
Galicia	56	0.918	0.814	1	0.058	10 (17.9)
Madrid	38	0.924	0.798	1	0.059	10 (26.3)
Murcia	26	0.899	0.810	1	0.049	2 (7.7)
Navarra	7	0.990	0.960	1	0.018	5 (71.4)
País Vasco	40	0.963	0.873	1	0.046	19 (47.5)
La Rioja	3	0.968	0.929	0.993	0.034	0 (0)
Ceuta/Melilla	2	0.809	0.806	0.812	0.005	0 (0)
Total	643	0.922	0.761	1	0.060	129 (20.1)

Source: Own elaboration.

Overall, the minimum score (0.761) is obtained by Sanlúcar de Barrameda, a municipality in Cádiz (Andalucía). Among the main drawbacks of living in this municipality we find one of the largest unemployment rates in the sample

(31.65%) and an important lack of green zones (61.7%)¹⁹. It also has one of the lowest average socio-economic condition in the sample (0.68) and a very poor education attainment (AEL = 2.31). To resist the comparison with the frontier this municipality should improve (at least) 24%.

A total of 129 municipalities in the sample obtain a DEA score equal to 1, which means they cannot make any (relative) improvement, given the data observed and the structure of the DEA program. Some of them belong to the frontier because they are excellent places to live in many or all the dimensions considered (e.g., Tres Cantos). In turn, other frontier municipalities do not excel in any dimension but have a good balance between drawbacks and advantages (e.g., Pamplona, Oviedo, Vitoria, San Sebastián). Some other municipalities reach the DEA frontier just because they excel in one dimension although they have mediocre results in others and, therefore, can be questioned as appropriate referents (e.g., El Ejido, Carballo, Boadilla del Monte)²⁰.

There are two views about this last set of DEA-frontier municipalities. First, there may be a certain specialization in the offers of municipalities as good or reasonable places to live and questioned frontier municipalities are simply the best possible referents to those that specialize in offering the same lures. The second view is that DEA is very flexible in evaluating municipalities with extreme data. These municipalities are allowed to assign unreasonable weights to drawbacks and/or advantages in the DEA program to reach the DEA frontier.

In our view, some of the results of the DEA analysis evidence the strong limitations of this technique in assigning reasonable weights. Some municipalities with very poor results are taken to the frontier simply because there is no other municipality that does better in some dimension of the quality of life setting. In other words, the flexibility of the weights allows some municipalities to put a very low value on those dimensions in which they perform poorly and a high value on those dimensions in which they perform better. El Ejido (Almería) is a perfect example of this. It achieves a DEA score equal to 1 giving a very high value (cost) to unemployment, since it shows one of the lowest unemployment rates in the sample. It would not matter if this reduced its poor education attainment figures by half. It would still be on the DEA frontier just because it cannot be compared with any other high performing municipality in terms of unemployment. Therefore, in this particular case, just one simple indicator completely determines the results of the DEA program. A close scrutiny of the data reveals that El Ejido is good in just one variable (unemployment), terrible in other variables (education, living conditions) and mediocre in the rest. Therefore, it should not be considered as a good place to live and even less a referent.

To increase the discriminating power of DEA and achieve a higher degree of congruence in the shadow prices assigned by the different municipalities in the DEA linear programs, we solved the VEA analyses using the city of Pamplona as

(19) In the other dimensions, it scores around the mean although far from the best performers.

(20) Boadilla del Monte is a municipality in Madrid that excels in many dimensions (education, socio-economic condition, housing, pollution). On the other hand, its citizens have long drives to school or work and the level of facilities (health, cultural, etc) is relatively low.

the MPS. We selected this city as the MPS on the basis of previous studies that evaluate the quality of life of Spanish municipalities using very different methodologies. OCU (2007)²¹ carried out a survey to know the degree of satisfaction of citizens regarding the city where they lived. They only surveyed people in 17 of the largest Spanish cities, asking about 11 variables related with the quality of life (housing, culture, sports and amusement facilities, education, transport and communications, security, urban landscape, labour market, commercial activity, public administration and health attention). They also asked the citizens to weight the variables²². Pamplona obtained the best evaluation from its own citizens. Another study that highlights the virtues of Pamplona as a good referent and, therefore, candidate to be our MPS is Mercociudad elaborated by MERCOC (2008). The methodology is based on a survey of 9,000 citizens of the 78 cities with a population over 100,000 in Spain but is complemented with the use of secondary sources of information and the criteria of experts. Their goal is not to measure the quality of life but rather the overall reputation of cities as attractors of tourists, businessman, cultural activity, etc. However, one of the rankings they elaborate refers to the 10 best cities to live in. Barcelona, Madrid, Valencia and Pamplona are the first four. Of these four, only Pamplona is on our DEA frontier²³.

Therefore, Pamplona is a nice place to live as reported by independent studies that rely on very different methodologies and also has a very good balance with respect to the drawbacks and advantages included in our quality of life framework. In all our 19 variables, Pamplona stands much better than average, except for the variables that measure the number of facilities, in which Pamplona is around the average. Pamplona excels in education attainment, communications and driving time to work or school, pollution and living conditions²⁴.

The results of the VEA (Table 4) show a dramatic reduction in the number of municipalities that are ascribed to the quality of life frontier and a more moderate reduction in the average score of quality of life. Remember that now the linear programs search for the weights that maximize the score of the municipality but those weights must keep Pamplona on the frontier (i.e., the weights must be reasonable according to our reasonable MPS, Pamplona).

The number of frontier municipalities drops from 129 (DEA) to 26 (VEA), an 80% reduction. This means that only 26 municipalities in the sample can fully justify their quality of life dimensions when using weights that are reasonable for Pamplona. To see how unreasonable some DEA results can be, the VEA score for El Ejido (Almería) is just 0.81, while it belonged to the DEA frontier. Carballo (Coruña) also

(21) OCU stands for Organización de Consumidores y Usuarios and is the largest consumers association in Spain.

(22) Security was the most relevant variable for citizens, with an average weight of 18%, followed by labour market (15%), housing (13%) and health services (12%).

(23) Therefore, it is the only one that can be used as the MPS. Barcelona, Madrid and Valencia could not be considered as the MPS because the VEA program would not have a feasible solution as the city is not on the DEA frontier.

(24) Other good candidates to be the MPS were Vitoria, Getxo and San Sebastian. However, we were not able to find the independent support of other studies as we did with Pamplona. We repeated the VEA analysis with these municipalities as the MPS and found no important differences.

falls from 1 to 0.82 and Boadilla del Monte (Madrid) abandons the frontier falling to 0.95, penalized by its bad communications²⁵. Analyzing the averages in the autonomous regions, all of them experiment notable reductions except Cantabria, Navarra and Ceuta/Melilla. The reduction in Asturias, Castilla-La Mancha, Galicia and Madrid is especially significant. Eight regions have no municipalities on the VEA frontier, while only two did not have representatives on the DEA frontier. The lowest VEA score is again obtained by Sanlúcar de Barrameda (Cádiz). The Central and Northern regions of Spain also obtain the highest indexes of VEA quality of life, although the scores in Castilla-La Mancha and Asturias suffered important reductions. Andalucía, Canarias, Murcia, and Ceuta/Melilla obtain the poorest scores and are closely followed by Madrid, Asturias, and Galicia. The standard deviation is very high in these regions while it remains moderate in the rest of Spain.

Table 4: SUMMARY OF VEA RESULTS GROUPED BY AUTONOMOUS REGIONS (MPS = PAMPLONA)

	n	Average	Min	Max	SD	Frontier (%)
Andalucía	134	0.854	0.755	0.972	0.051	0 (0)
Aragón	12	0.965	0.877	1	0.038	3 (25.0)
Asturias	21	0.884	0.809	0.984	0.041	0 (0)
Baleares	17	0.915	0.863	1	0.039	1 (5.9)
Canarias	36	0.856	0.762	0.976	0.059	0 (0)
Cantabria	10	0.934	0.901	1	0.033	1 (10.0)
Castilla y León	23	0.938	0.877	1	0.032	1 (4.3)
Castilla-La Mancha	28	0.902	0.839	0.970	0.038	0 (0)
Cataluña	96	0.923	0.814	1	0.044	6 (6.2)
Com. Valenciana	81	0.892	0.806	0.975	0.036	0 (0)
Extremadura	13	0.920	0.877	1	0.032	1 (7.7)
Galicia	56	0.875	0.779	0.997	0.054	0 (0)
Madrid	38	0.882	0.766	1	0.062	2 (5.2)
Murcia	26	0.868	0.805	0.937	0.033	0 (0)
Navarra	7	0.988	0.960	1	0.017	4 (57.1)
País Vasco	40	0.945	0.866	1	0.045	5 (33.3)
La Rioja	3	0.951	0.916	0.980	0.032	7 (17.5)
Ceuta/Melilla	2	0.808	0.805	0.811	0.004	0 (0)
Total	643	0.893	0.755	1	0.057	26 (4.0)

Source: Own elaboration.

(25) In the DEA program, Boadilla del Monte assigned a weight 0 to communications and time to the work or school. Although it still is a good place to live, it is no longer a referent (frontier) under the VEA formulation.

Figures 1 and 2 depict the geographical distribution of quality of life conditions in Spain. While our sample covers more than 76% of the Spanish population, it only represents 18.3% of the territory, as evidenced by Figure 1. The maps show how the highest indexes of quality of life are obtained by municipalities in the central northern part of Spain. The southern regions, Canary Islands, Madrid and some parts of Galicia and Asturias account for the majority of low quality of life municipalities. However, we can see that, in all these low quality of life zones, there are municipalities with excellent living conditions like Tres Cantos (Madrid), Oviedo (Asturias), Santiago de Compostela (Galicia), Estepa (Andalucía) and San Bartolomé de Tirajana (Canary Islands).

In order to present a ranking of municipalities based on quality of life standards, DEA and VEA assign the same value [1] to all the municipalities on the frontier. In our case, this amounts to 26 municipalities whose living conditions are reflected as equivalent by the VEA index (129 under DEA). Superefficiency scores can be computed to allow for differences among frontier municipalities. These scores are obtained by solving a slightly modified version of linear programs 1-4 that eliminates the municipality that is being evaluated from the frontier. For underperforming municipalities the scores are the same²⁶. But municipalities that were on the quality of life frontier will be, under the new restrictions, above the frontier. The distance that separates them from this new frontier is called superefficiency in the DEA literature and allows the making of comparisons among DEA-frontier DMUs.

While we are not aware of any previous study that has estimated superefficiency scores in a VEA program, the way to proceed is exactly the same, with one important exception. It is not possible to compute a superefficiency score for the MPS of the VEA program. The reason is simple. To compute superefficiency, the program should remove the MPS from the frontier. But to maintain the VEA specification, the program must force the MPS to be on the frontier. Therefore, it is not possible to compute a superefficiency VEA score for the MPS. Notice also that it would make no theoretical sense since the MPS is defined as a municipality that is considered as an ideal referent for the entire sample. Table 5 shows the quality of life ranking for the top 50 and bottom 50 municipalities in the sample.

Laredo (Cantabria) is the municipality with the largest superefficiency VEA score, followed by Soria (Castilla y León) and Jaca (Aragón). In the Top 50 there is a massive presence of municipalities from the central north of Spain (e.g., Pamplona, Laredo, Soria, Jaca, Getxo, Huesca, San Sebastián, Palencia, Oviedo, León, Teruel, Logroño, Burgos, Vitoria). Cataluña also has various municipalities in the Top 50. In contrast, almost all the municipalities in the Bottom 50 come from Andalucía, Canarias, Madrid and Galicia²⁷. Although there is no precise relationship between quality of life and the size of the municipality, none of the big Spanish cities appears in the TOP50. Barcelona occupies position 75 with an index of 0.966 and Madrid is at 246 with a quality of life score of just 0.908. Valencia (170), Sevilla (358), Zaragoza (194), Málaga (438), Murcia (240), Las Palmas de Gran Canaria (488), Bilbao (106) and Palma de Mallorca (245) complete the deceptive quality of life ranking of the 10 biggest Spanish municipalities.

(26) They were already below the frontier and the change in the linear program has no practical effect.

(27) In fact, 47 of the 50 belong to these regions. The other three are from Valencia, Murcia and Ceuta.

Figure 1: VEA SCORES OF QUALITY OF LIFE IN SPANISH MUNICIPALITIES WITH OVER 10,000 INHABITANTS



Figure 2: WEIGHTED AVERAGES OF QUALITY OF LIFE IN SPANISH PROVINCES (VEA)

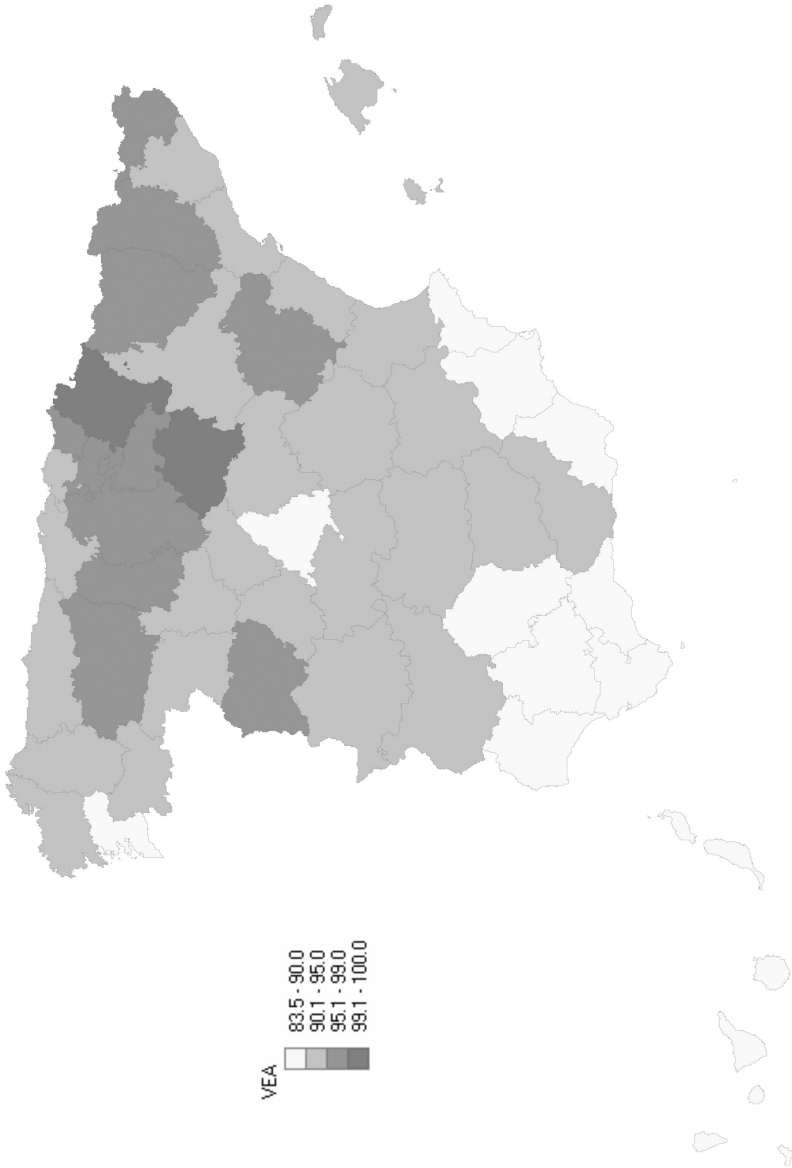


Table 5: QUALITY OF LIFE RANKING BASED ON VEA SUPEREFFICIENCY SCORES (TOP 50 AND BOTTOM 50)

Municipality	TOP 50	Rank	Score	Municipality	BOTTOM 50	Rank	Score
Pamplona		1	MPS	Barbate		594	0.808
Laredo		2	1.480	La Puebla del Río		595	0.808
Soria		3	1.427	Tacoronte		596	0.808
Jaca		4	1.331	Carmona		597	0.807
Torrelodones		5	1.267	Güímar		598	0.807
Zafra		6	1.213	Gibraleón		599	0.806
Banyoles		7	1.135	Alfajar		600	0.806
Getxo		8	1.127	Ceuta		601	0.806
Tres Cantos		9	1.073	La Unión		602	0.806
Burlada		10	1.073	Bueu		603	0.805
Huesca		11	1.041	Conil de la Frontera		604	0.804
Barañain		12	1.031	La Algaba		605	0.804
Zarautz		13	1.030	Navalcarnero		606	0.803
Arrigorriaga		14	1.019	Ciempozuelos		607	0.802
Ripoll		15	1.018	Chiclana de la Frontera		608	0.800
Monzón		16	1.018	San Martín de la Vega		609	0.800
Oñati		17	1.017	Granadilla de Abona		610	0.800
Zizur Mayor		18	1.016	Jódar		611	0.800
Olot		19	1.013	Santa Úrsula		612	0.798
San Sebastián		20	1.009	Cofín		613	0.797
Elgoibar		21	1.006	Mos		614	0.794
Sant Cugat del Valles		22	1.005	O Porriño		615	0.790
Torelló		23	1.003	Medina-Sidonia		616	0.790
Girona		24	1.002	Isla Cristina		617	0.790
Gernika		25	1.001	Illora		618	0.788

Table 5: QUALITY OF LIFE RANKING BASED ON VEA SUPEREFFICIENCY SCORES (TOP 50 AND BOTTOM 50) (continuation)

Municipality TOP 50	Rank	Score	Municipality BOTTOM 50	Rank	Score
Alcúdia	26	1.001	Gondomar	619	0.788
Tolosa	27	0.999	La Orotava	620	0.786
Mollerussa	28	0.998	Utrera	621	0.786
Ejea de los Caballeros	29	0.997	Telde	622	0.786
Muros	30	0.997	A Laracha	623	0.786
Pozuelo de Alarcón	31	0.993	Alhaurín el Grande	624	0.783
Barberà del Vallès	32	0.993	Los Palacios y Villafraanca	625	0.783
Lasarte	33	0.989	Lora del Río	626	0.781
Tafalla	34	0.988	Moaña	627	0.779
Palencia	35	0.985	Morón de la Frontera	628	0.777
La Garriga	36	0.984	Pinos Puente	629	0.775
Oviedo	37	0.984	Níjar	630	0.773
León	38	0.983	Beja	631	0.772
Teruel	39	0.983	Icod de los Vinos	632	0.772
Azpeitia	40	0.983	Álora	633	0.770
Vic	41	0.983	Coria del Río	634	0.769
Durango	42	0.982	Parla	635	0.766
Igualada	43	0.982	Mejorada del Campo	636	0.766
Bergara	44	0.982	Vejer de la Frontera	637	0.765
Logroño	45	0.980	Cártama	638	0.764
Tarazona	46	0.980	Arcos de la Frontera	639	0.764
Mondragón	47	0.979	Los Realejos	640	0.763
Vitoria	48	0.979	Guía de Isora	641	0.762
Burgos	49	0.977	Vícar	642	0.758
Beasain	50	0.977	Sanlúcar de Barrameda	643	0.755

Source: Own elaboration.

5. CONCLUDING REMARKS

There are two main empirical problems in the measurement of quality of life in municipalities. The first one has to do with the data. Choosing a representative set of variables that proxies the drawbacks and advantages associated with living in each municipality is essential to obtain meaningful results. In this paper, we follow the recent description of Stiglitz, Sen and Fitoussi (2009) of the underlying dimensions of quality of life, within the working group of the Commission on the Measurement of Economic Performance and Social Progress. Unfortunately, the ultimate selection of variables is strongly constrained by the availability of comparable data. There is very scant comparable information about living conditions in Spanish municipalities. The only sources of comparable information that can be used are the INE surveys on population and housing and La Caixa's *anuario económico*²⁸. The INE surveys are very rich in variables that can proxy the quality of life conditions of municipalities. With the aim of representing most of the dimensions of quality of life suggested in the literature but constrained by data availability, we finally used 19 variables (8 drawbacks and 11 advantages) that approximate the most important dimensions of quality of life: Health, Education, Personal activities (including commuting and leisure), Housing, Social connections, Environment, Personal security and Economic security.

The second empirical problem is how to synthesize the information contained in the raw variables collected to construct an aggregate index of quality of life that can be useful for citizens and decision makers. We contend that the DEA methodology provides an excellent procedure to aggregate information in a sensible manner. DEA constructs a quality of life frontier and weights the drawbacks and advantages in the manner that is most advantageous to the municipality under analysis. However, the empirical application of DEA also has some important problems that we have tried to overcome in this paper. Value Efficiency Analysis (VEA) was developed to easily incorporate qualitative information into the DEA specification. Our results show that VEA significantly increased the discriminating power of DEA and achieved more congruence in the weights of the variables used in the analysis.

The paper applied both DEA and VEA methodologies to quality of life data from a sample of 643 Spanish municipalities during the year 2001. The sample includes all the municipalities with over 10000 inhabitants for which we were able to compile complete data²⁹. Our sample represents 76.3% of the Spanish population. The DEA scores show moderately high average levels of quality of life, with an average of 0.92. However, after the weights are forced to have some degree of consistency in the VEA analysis, the average decreases to 0.89. From 129 DEA frontier municipalities, only 26 are also on the VEA frontier. In reality, what is happen-

(28) Caja España also provides a municipal database on its webpage, but most of the information is taken from the INE statistics.

(29) Only one municipality with a population of over 25,000 was excluded because data on commuting times and university studies were not reported in the INE database. This municipality is la Vall d'Uixo (Castellón).

ing is that VEA allows a simple identification of the municipalities whose DEA (high) score is based on unrealistic values for the shadow prices of the variables used in the analysis. These municipalities (El Ejido or Boadilla del Monte, for instance) benefit from the extreme flexibility of DEA, while simple inspection of the complete vector of variables clearly shows that they are underperformers.

To further discriminate among frontier municipalities, we computed superefficiency scores. This allows the construction of a complete ordered ranking of quality of life. The results evidence that the best standards of quality of life are obtained by municipalities in the central northern regions of Spain, that is, Navarra, País Vasco, Castilla y León, Aragón and Cantabria. The lowest scores are obtained in the southern regions (Andalucía, Murcia, Valencia) and also in the Canary Islands and Galicia. Many municipalities in the province of Madrid also obtain low indexes of quality of life. It is also noticeable that none of the 10 biggest Spanish cities appears in the TOP50 ranking of quality of life.



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RESUMEN

La medición de la calidad de vida en municipios afronta dos grandes retos empíricos. En primer lugar, es necesario contar con indicadores relevantes que sean comparables entre municipios. En segundo lugar, debe utilizarse una metodología apropiada para agregar la información. Este trabajo mide la calidad de vida en los 643 municipios españoles con más de 10000 habitantes, aplicando el Value Efficiency Analysis (VEA). Los indicadores utilizados cubren áreas como el consumo, servicios sociales, vivienda, transporte, medio ambiente, mercado de trabajo, salud, cultura y ocio, educación y seguridad. El computo de índices VEA de supereficiencia permite construir un ranking completo de calidad de vida. Los resultados muestran que las regiones del norte y centro alcanzan los mayores niveles de calidad de vida. Es de destacar el hecho de que ninguna de las 10 ciudades más grandes de España entra en el TOP 50 del ranking.

Palabras clave: calidad de vida, bienestar, municipios, DEA, VEA.

Clasificación JEL: R00, O18, H75, C60.