DETERMINANTS OF SUBJECTIVE WELL-BEING ACROSS COUNTRIES

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Abstract- This paper aims to contribute to the literature of the subjective well-being by exploring the extent to which certain economic, social and institutional variables may affect the well-being of citizens. Our empirical analysis is based on data mainly gathered from the World Value Survey (WVS) for a set of 82 countries that have participated in any of the six waves conducted so far. The methodological approach is based on frontier techniques, according to which the efficiency of the citizens of each country is evaluated according to their ability to achieve the highest levels of well-being from very different circumstances. Our results indicate that among the most efficient countries in terms of well-being we find mainly developing Latin American nations together with some European countries. Moreover, we find that several social indicators such as the quality of government, the unemployment rate or different indices representing inequalities have a significant effect on the estimated efficiency measures.

Keywords- Well-being, Efficiency, Cross-National study.

I. INTRODUCTION

The economics of happiness or wellbeing has become one of the most relevant fields of research in recent years with a growing number of applied studies reporting empirical associations between wellbeing indicators and multiple variables being published in the most prestigious economic journals [1,2]. As a result, there is an increasing body of literature devoted to assess the potential influence of multiple macroeconomic and social factors on those well-being indicators in cross national research [3].

The recent development of international databases that provide information on the levels life satisfaction or happiness of individuals, such as the World Value Survey (WVS), the European Social Survey (ESS) or the Gallup World Poll, has contributed notably to the development of this type of studies [4,5]. The methodological approaches used in those studies differ in detail, although most of them are based on defining an equation where the dependent variable is a measure of the absolute level of wellbeing and statistical and econometric techniques have been used to identify explanatory variables significantly associated to this indicator [6].

In this paper we adopt an alternative approach that has experience remarkable growth in recent years known as well-being efficiency, which consists of examining how countries attempt to maximize their levels of well-being given their endowments and the context in which they are operating. Within this framework, the level of happiness or life satisfaction reported by individuals is the result of combining certain resources, so increasing these inputs should lead to higher outcomes in terms of well-being. Nevertheless, if there are inefficiencies in the conversion process of resources into wellbeing it would be possible to increase the efficiency with which individuals reach their levels of happiness, increasing the levels of perceived wellbeing given a certain set of resources or, alternatively, attaining current levels of happiness with fewer resources. This approach has been adopted in a few empirical previous studies in which the methodology frequently applied to measure efficiency is fully nonparametric [7-10], because this approach is more flexible and generalizable. However, it also presents some limitations such as its poor discriminatory power when the sample size is small relative to the total number of inputs and outputs included in the model. Moreover, when using this approach it is not possible to recognize whether the differences in efficiency, i.e. the distance between observed and maximum possible output, are due to technical inefficiency or to noise effects attributable to omitted variables, measurement errors or variations in individuals' cultural and linguistic backgrounds.

In order to avoid this potential limitation, in the present study we employ the so-called Stochastic semi-Nonparametric Envelopment of Data (StoNED) [11] for computing well-being efficiency measures of countries´ performance. One of the main advantages of this method is that it allows for considering both inefficiency and noise in the deviations from the estimated function in a flexible framework. In addition, the proposed method can also been extended in order to account for the potential influence of contextual factors such as country characteristics, regulations or the environment in the model [12]. In the context of the present study, those factors are mainly represented by several macroeconomic variables, social indicators and institutional factors related to governance quality and welfare-state policy, which have been found to have sizeable effects on individual well-being [13,14].

The empirical analysis presented in this work is based on international data gathered mainly from the World Value Survey (WVS). This information has been combined with data about several contextual factors

retrieved from other sources of international data such as the World Bank datasets, the World Social Security Report, the World Economic Forum, the Freedom House Organization or Transparency International. Our dataset comprises 82 countries with different levels of development and representing all the continents.

The remainder of this paper is structured as follows. Section 2 describes the methodology applied to estimate measures of well-being efficiency. Section 3 explains the main characteristics of the dataset and the variables used in the empirical analysis study. Section 4 presents the main results. Finally, the paper ends with some concluding remarks in Section 5.

II. METHODOLOGY

In the present study, we will apply the StoNED method, which can be interpreted as the regression interpretation of data envelopment analysis (DEA) proposed by Kuosmanen and Johnson (2010) to combine the key advantages of this method with the probabilistic treatment of inefficiency and noise in stochastic models. Moreover, as we are interested in exploring the potential influence of a set of social and economic variables on efficiency levels, we apply an extension of this method known as StoNEZD that incorporates an average effect of the operational context common to all the evaluated units. In the following lines we introduce the key concepts of this framework.

In the production function framework, technology is represented by a frontier production function f(x), which indicates the maximum output that can be produced with inputs x. The observed output (y_i) may deviate from $f(x_i)$ due to random noise (v_i), inefficiency ($u_i>0$) and the effect of contextual factors (z_i). This model can be formally defined as follows

$$y_i = f(x_i) \cdot e^{\varepsilon_i}$$
$$\varepsilon_i = \delta z_i + v_i - u_i \qquad (1)$$

According to this definition of the composite disturbance term, $\delta z_i - u_i$ can be interpreted as the overall efficiency of a unit, being δz_i the part of technical inefficiency explained by the contextual variables being identical for all firms. Therefore, it is implicitly assumed that the exogenous variables only have influence on the distribution of the inefficiency scores, but they do not affect the location of the frontier.

The StoNEZD method estimates efficiency in two stages. In the first stage, the shape of the frontier is obtained by applying convex nonparametric least squares, which does not assume a priori any assumption about the functional form but it builds upon constraints like monotonicity and convexity. Specifically, the estimator can be solved as the optimal solution to the following quadratic programming problem:

$$\min_{\alpha,\beta,\delta,\phi,\varepsilon} \sum_{i=1}^{n} (\varepsilon_i^{CNLS})^2$$
$$\text{subject to } y_i = \alpha_i + \beta_i' x_i + \delta' z_i + \varepsilon_i^{CNLS} \quad \forall\, i=1,\ldots,n$$
$$\alpha_i + \beta_i' x_i \le \alpha_h + \beta_h' x_i \quad \forall\, h,i=1,\ldots,n$$
$$\beta_i \ge 0 \; \forall\, i = 1,\ldots,n \qquad (2)$$

where ε_i^{CNLS} represent the residuals of the regression and the estimated coefficients α_i and β_i characterize tangent hyperplanes to the unknown function $f(x_i)$ at point x_i. Likewise, δ represents the average effect of contextual variables z_i on performances, the term $\delta' z_i$ represents the portion of inefficiency that is explained by the contextual variables and u_i is the efficiency term that remains unexplained.

In order to disentangle inefficiency from noise, and maintaining the assumptions of half-normal inefficiency and normal noise, we use the Method of Moments, in which the second and the third central moments can be estimated based on the distribution of the residuals:

$$\hat{M}_2 = \sum_{i=1}^{n} (\hat{\varepsilon}_i^{CNLS})^2 / (n-1)$$
$$\hat{M}_3 = \sum_{i=1}^{n} (\hat{\varepsilon}_i^{CNLS})^3 / (n-1) \qquad (3)$$

The second moment is simply the variance of the distribution and the third is a component of the skewness:

$$M_2 = \left[\frac{\pi-2}{\pi}\right] \sigma_u^2 + \sigma_v^2$$
$$M_3 = \left(\sqrt{\frac{2}{\pi}}\right)\left[1 - \frac{4}{\pi}\right] \sigma_u^3 \qquad (4)$$

Finally, parametric techniques can be used to estimate inefficiency measures of performance. The conditional expected value of the inefficiency can be computed using the conditional mean estimator $E(u_i|\varepsilon_i^{CNLS})$ and the formulation developed by Battese and Coelli (1988).

III. DATA AND VARIABLES

The data used in this study come mainly from the World Values Survey (WVS). This is an extensive dataset that provides information on multiple aspects regarding social and political life in many countries worldwide. Among many different issues, it provides information on the level of subjective well-being derived from a life satisfaction indicator measured on a scale of 1-10, which we use as our main output variable. National well-being levels are calculated as the country-average value of the individual responses. Apart from measures of well-being, the WVS dataset also provides information about different factors identified in previous literature as the main determinants of well-being [15]. In our case, we selected three inputs: (i) level of income, represented by the relative position of the individuals in the

income distribution of their country (in deciles); (ii) health status perceived by the individuals defined in a four-level scale (poor, fair, good or very good); and (iii) level of education, considering ten different categories according to the total years of completed education. Again, national levels are again calculated as the average value of the individual responses for each country.

As contextual variables we selected various indicators reflecting economic and social context in the country. The economic indicators include the total public social protection expenditure, available from the World Social Security Report, as a proxy of welfare-state policies and the unemployment rate and the Gini index, as proxies of economic inequality, both available from the World Bank Open Data section.

The social indicators include the gender inequality index constructed by the World Economic Forum, an aggregate index representing the quality of governance provided by the World Bank and the corruption perceptions index (ranging from 0 to 100) calculated by Transparency International. Our final sample comprises 82 countries for which there was available data for all the variables.

IV. RESULTS

In this section we present the efficiency scores estimated taking into account the contextual variables using the StoNEZD method described in section 3. Figure 1 shows the histogram of efficiency estimates. Nevertheless, the most interesting insights can be drawn by exploring the ranking of countries according to their efficiency scores and compare them with the average levels of life satisfaction declared by individuals from each country. If we focus on top performers (Table 1), we notice that most of them are developing countries in which individuals report to have the highest life satisfaction levels in the sample (e.g. Puerto Rico, Colombia, Uzbekistan, Guatemala, Mexico or Ecuador).

However, this statement only seems to be valid for relatively poor developing countries, for which the values of inputs (income, health and education) are frequently lower than the average. Actually, if we observe that several rich countries placed at the top positions in the ranking of life satisfaction, they do not appear among the top performers in terms of efficiency when their high values in input variables are taken into account (e.g. Switzerland, Qatar, Canada, United States or Great Britain).

In order to summarize those discrepancies, we have calculated the Spearman correlation coefficients between those classifications, which allow us to identify that there are significant differences (0.54).

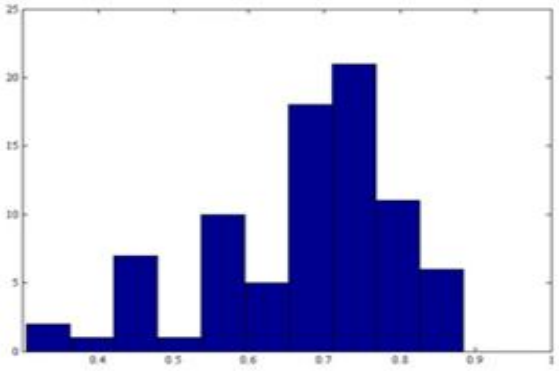


Figure 1. Histograms of efficiencies

Table 1. Top performers in terms of efficiency and life satisfaction levels

Efficiency	Score	Life satisfaction	Score
Puerto Rico	0.8841	Colombia	8.400
Colombia	0.8510	Puerto Rico	8.313
Uzbekistan	0.8342	Mexico	8.095
Kazakhstan	0.8310	Switzerland	8.085
Guatemala	0.8309	Qatar	8.004
Mexico	0.8281	Guatemala	7.976
Finland	0.8254	Ecuador	7.923
Poland	0.8180	Uzbekistan	7.878
Slovenia	0.8101	Norway	7.836
Philippines	0.8095	Finland	7.790
Slovakia	0.7977	Canada	7.769
Ecuador	0.7960	Sweden	7.726
Viet Nam	0.7907	Netherlands	7.619
Spain	0.7902	United States	7.619
Russia	0.7791	Brazil	7.616
Trinidad & Tobago	0.7726	Great Britain	7.583
Kyrgyzstan	0.7718	El Salvador	7.457
El Salvador	0.7652	Australia	7.435
Peru	0.7622	Uruguay	7.410
Netherlands	0.7608	Thailand	7.398
Mean	0.6708	Mean	6.622

The fact that among the top performers we find mainly Latin American countries is somewhat unexpected, especially if we take into account that their economic and socio-political situation is characterized by very unequal distribution of income, high levels of corruption and, in some cases, even high violence and crime rates. Some potential factors that could explain the higher levels of well-being reported by individuals from those nations are their slower pace of life, the important role of family and interpersonal relations, a relative indifference for materialistic values or the quality of social life [16,17]. Finally, in order to examine the average effect of social and economic indicators variables included as contextual variables in the model, Table 2 reports the values of the δ parameter for each variable in both models together with the correspondent t-statistic. As expected, we found a significant and positive sign in both models for the unemployment rate, the Gini index and the

gender inequality index, which indicates that lower levels of those indicators are associated with higher efficiencies. In contrast, we identify a significant and negative sign for the quality of government and civil liberties in both models, which implies that for higher values of those indices we identify better performances in terms of well-being efficiency. These results corroborate that countries with higher levels of well-being are characterized by having high quality institutions [18]. Finally, we also observe a negative value of δ for the corruption perception index, which confirms the results of some previous studies [19].

Table 2. Effect of contextual variables on efficiency

	$\widehat{\delta_1}$	t-Statistic
Social protection expenditure	0.0145***	11.227
Unemployment rate	0.0531***	13.747
Gini index	0.1661***	35.359
Gender Inequality index	0.3594***	87.231
Quality of governance (WGI)	-0.0830***	27.845
Corruption Perception Index	-0.0338***	-22.608

*** Significant at the 1% level

CONCLUDING REMARKS

The present paper constitutes a new contribution to the novel line of research focused on measuring well-being efficiency of countries, which consists of examining whether their individuals are able to achieve the maximum well-being levels given their existing resources, both in relative and absolute terms. Our results show that the consideration of inputs values in relative or absolute terms matters might affect the results. Nevertheless, we find that the most efficient countries in terms of well-being efficiency are mainly developing countries from Latin America, where individuals report to have high levels of life satisfaction even though they have to cope with an adverse social an economic context and poor institutions. It might be explained by personality or cultural differences as well as the ability of individuals to adjust to the existence of severe problems such as corruption or violence. On the other hand, we find that relatively rich countries, where individuals report high levels of subjective well-being, are outperformed by many developing countries with lower levels of output once we take into account the values of input variables in the estimation of well-being efficiency measures.

The use of the StoNEZD method has also allowed us to test the statistical significance of the average effect of contextual variables included in the model. According to the results obtained, we identify that efficiency gains could be achieved through enhancing the quality of government and reducing the unemployment rate and inequalities. However, we have not been able to draw clear evidence with regard to the influence of social expenditures.

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