

## USING OF COMPOSITE INDEX IN MEASURING OF WELL-BEING

MIROSLAV HUŽVÁR, ALENA KAŠČÁKOVÁ

Matej Bel University, Faculty of Economics,  
Department of Quantitative Methods and Information Systems,  
Tajovského 10, Banská Bystrica, Slovakia  
e-mails: miroslav.huzvar@umb.sk, alena.kascakova@umb.sk

### Abstract

*Measuring the well-being of people and the progress of societies should be a key priority for development and policy making. Better Life Index is a newly designed tool which provides a comprehensive picture of well-being in OECD countries and other major economies, by looking at people's material conditions and quality of life across the population. The index is based on twenty-four indicators grouped in eleven topics concerning housing, income, jobs, community, education, environment, civic engagement, health, life satisfaction, safety and work-life balance. However, the OECD does not rank countries by the Better Life Index. Instead, users are encouraged to assign and share their own weights for the topics to design a composite indicator that can express their preferences on the contribution of each topic to well-being. The aim of this paper is to present and discuss the "benefit of doubt" approach to the construction of a composite index of well-being based on the eleven topics. By this approach, we assign to each country individual weights for the topics that can emphasize the strengths of the country in people's material conditions and quality of life. We show that such composite index is capable to provide policy makers with additional valuable information on untapped potential of individual countries in well-being.*

**Keywords:** *well-being, DEA method, composite index*

**JEL Codes:** *C38, C43, I31*

### 1. Introduction

Over the years, well-being has become established as a fundamental objective of the Treaties of the European Union. The Treaty of Lisbon states well-being as an explicit objective and Article 3 of the Treaty on the Functioning of the European Union (TFEU) states that the Union's aim is to promote 'the well-being of its peoples'. Europe 2020 aims to put people first to create 'more jobs and better lives'. It has adopted a number of targets that go beyond conventional measures of economic performance, with goals to reduce poverty and social exclusion, to promote education and employment (Eurofound, 2012).

Although the term 'well-being' is often used, there is no agreed definition and it is often used as an all-encompassing concept to describe the quality of people's lives (Dodge *et al.*, 2012). There is considerable ambiguity around the definition of well-being. For example, terms such as happiness, quality of life, and life satisfaction have been used interchangeably to mean well-being. Each represents elements of well-being, but individually does not reflect everything that well-being entails. Many of those who have attempted to define well-being see it as a dynamic process.

Selwyn and Wood (2015) state that the measurement of well-being can be considered using two broad approaches: objective and subjective measures. There is general agreement that both approaches are necessary. Objective measures make assumptions about what is required

for any individual and then set out indicators to estimate how far the requirements have been satisfied. Objective indicators usually measure three main areas:

Economic – e.g. GDP and household income

Quality of life – e.g. life expectancy, crime rates, educational attainment

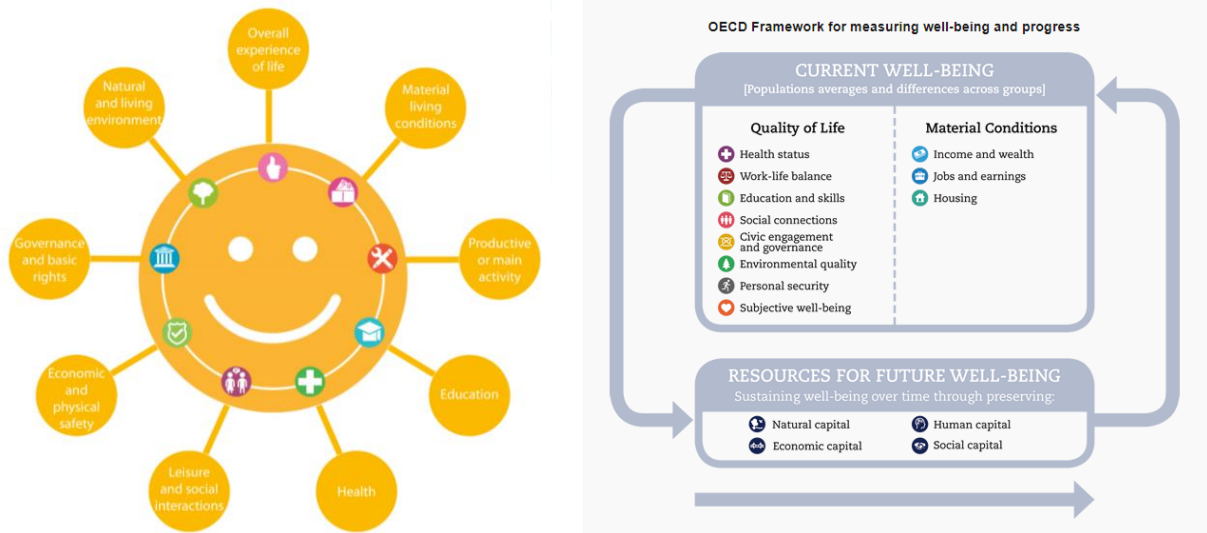
Environment- e.g. air pollution, water quality

Objective measures have been used for many years, but it has been increasingly recognized that objective measures on their own cannot measure a nation's progress and that subjective measures are also needed. Subjective measures ask people to assess their own well-being. The New Economics Foundation argues that the only way to know if someone is happy or satisfied is to ask him or her. Subjective measures allow for differences in people's values and preferences and are seen as less paternalistic than objective measures. For measuring the subjective well-being there are three broad approaches (the evaluative, experience and eudemonic).

Measuring well-being calls for a plurality of other indicators because several dimensions need to be taken into account. Current well-being has to do with both economic resources, such as income, consumption and wealth, and with non-economic aspects of people's lives (what they do and what they can do, how they feel, the natural environment in which they live, etc.). Finally, assessing whether current well-being can be sustained over time requires looking at resources that will be passed onto future generations. This requires a scoreboard that can assemble indicators of changes in financial, physical and human capital, together with a well-chosen set of environmental indicators. Gross domestic product (GDP), a measure of national economic production, has come to be used as a general measure of well-being and progress in society, and as a key indicator in deciding a wide range of public policies. However GDP does not properly take into account non-economic factors such as social issues and the environment (European parliamentary research Service, 2014). The United Nations Development Programme (UNDP) has strengthened elements in the Human Development Index (Conelly, Kongar, 2017). European quality of life survey is an established tool for documenting and analysing quality of life in the EU, which was first carried out in 2003.

Eurostat continues to explore approaches to indicators of social and environmental progress, including the establishment of an expert group on quality of life and the introduction of a short module on quality of life into the Survey on Income and Living Conditions in 2013. The Expert Group recommends organising a set of quality of life (QoL) indicators for the EU on the basis of the 8 + 1 dimensions: 8 of these relate to people's capabilities to pursue their self-defined wellbeing in accordance with their own values and priorities. The last dimension, 'overall experience of life', refers to the personal perception of quality of life (i.e. life satisfaction, emotions, meaning of life). The indicators considered in above mentioned approaches of OECD and Eurostat are shown in the Figure 1.

Figure 1: Quality of Life indicators (EUROSTAT) and framework for measuring of well-being (OECD)



Source: EUROSTAT (2018) and OECD (2013).

The aim of our paper is to introduce an alternative approach to the aggregation of individual topics included in OECD Better Life Index in order to produce a composite indicator that more carefully reflects the specific situation in compared countries. For this purpose we apply the so called “benefit of doubt” method that is based on data envelopment analysis (DEA) and allows us to set individual and the best possible values of topic weights for each country. The composite indicator can be used not only for ranking of the countries, but due to the properties of DEA technology, it is able to identify the well-being topics that represent the weak points of a given country with regard to the comparable countries which exhibit the best well-being performance.

The paper is organized as follows. In Section 2 we present the calculation of OECD Better-Life Index based on 24 indicators included in 11 well-being topics and chosen fixed weights of the topics. In Section 3 we explain DEA methodology for computing of an alternative composite well-being index that assigns individual weights of topics for each surveyed country to emphasize the strengths and suppress the weak points of the country to a certain extent. The research results are presented and compared to the original OECD Better-Life Index in Section 4. Finally, Section 5 summarizes the results and indicates the possibilities of further research.

## 2. Better Life Index

Measuring well-being and progress is a key priority that the OECD is pursuing through various streams of work, notably the OECD Better Life Initiative, launched in May 2011 (OECD, 2018a). As is defended by Durand (2015) “the OECD framework represents one way (albeit imperfect) to operationalize the capabilities approach and make it measurable through indicators that can be collected and used by policy-makers and National Statistical Offices to monitor well-being conditions in the population and their evolution over time.” The OECD Better Life Initiative brings together data collected throughout the OECD which feed into two main pillars of the Initiative, How’s Life? and Your Better Life Index. How’s Life? is a report that provides a comprehensive picture of well-being in OECD countries and other major economies, by looking at people’s material conditions and quality of life across the population.

Table 1: Indicators considered in topics of Better Life Index

Topic	$k$	Indicator ( $j$ )
Work and Life	1	<ul style="list-style-type: none"> <li>• Employees working very long hours</li> <li>• Time devoted to leisure and personal care</li> </ul>
Income and Wealth	2	<ul style="list-style-type: none"> <li>• Household net adjusted disposable income</li> <li>• Household net financial wealth</li> </ul>
Jobs and Earnings	3	<ul style="list-style-type: none"> <li>• Employment rate</li> <li>• Long term unemployment rate</li> <li>• Average gross annual earnings of full-time employees/ Personal earnings</li> <li>• Labour market insecurity</li> </ul>
Housing	4	<ul style="list-style-type: none"> <li>• Number of rooms per person/ Rooms per person</li> <li>• Dwellings without basic facilities</li> <li>• Housing expenditure</li> </ul>
Health status	5	<ul style="list-style-type: none"> <li>• Life expectancy at birth</li> <li>• Self-reported health status</li> </ul>
Education and skills	6	<ul style="list-style-type: none"> <li>• Educational attainment</li> <li>• Students' cognitive skills</li> <li>• Expected years in education</li> </ul>
Social connections/ Community	7	<ul style="list-style-type: none"> <li>• Social network support</li> </ul>
Civic engagement and governance	8	<ul style="list-style-type: none"> <li>• Stakeholder engagement for developing regulations</li> <li>• Voter turnout</li> </ul>
Environmental quality	9	<ul style="list-style-type: none"> <li>• Air pollution</li> <li>• Satisfaction with water quality</li> </ul>
Personal security/Safety	10	<ul style="list-style-type: none"> <li>• Homicides rates</li> <li>• Feeling safe walking alone at night</li> </ul>
Life satisfaction (Subjective well-being)	11	<ul style="list-style-type: none"> <li>• Life satisfaction</li> </ul>

Source: OECD (2016).

Your Better Life Index (BLI) is an interactive web-based tool that allows citizens to measure and compare well-being across countries according to the importance they give to the various dimensions of people's well-being (OECD, 2013). Kruger and Stones (2014) state that the OECD's Better Life Index ([oecdbetterlifeindex.org](http://oecdbetterlifeindex.org)) cleverly finesses the problem of how to aggregate different components of wellbeing by allowing users to set their own weights.

The individual indicators along with measurement units are defined in: <http://www.oecd.org/statistics/OECD-Better-Life-Index-2016-definitions.pdf>. Data of indicators for 35 OECD and 3 non-OECD countries in years 2013 – 2017 are available at: <http://stats.oecd.org/Index.aspx?DataSetCode=BLI>.

Construction of Better Life Index is based on 11 topics. Each topic is evaluated based on one to four statistical indicators, which are assigned equal weights. Scores for each topic can then be integrated into an overall value: the default is to treat all topics equally, but users of the interactive website can give greater importance to certain dimensions so as to come up with their own overall country values and rankings. Users have to rate each topic from 0 ("not important") to 5 ("very important"). The score given to each topic is converted into a weight, by dividing the grade given to each topic by the sum of the grades given to all topics, so that

the sum of all weights is equal to 1, i.e.  $\sum_{k=1}^{11} w_k = 1$ .

The Index gathers many indicators, expressed in very different units (dollars, years, etc.). To compare and aggregate values expressed in different units, the values have to be normalised. This normalisation is done according to a standard formula which converts the original values of the indicators into numbers varying in a range between 0 (for the worst possible outcome) and 1 (for the best possible outcome). The formula is:

$$u_{ij}^k = \frac{x_{ij}^k - x_{j\min}^k}{x_{j\max}^k - x_{j\min}^k}, \quad (1)$$

where  $u_{ij}^k$  is the normalized value of the indicator  $j$  in the topic  $k$  for the country  $i$ ,  $x_{ij}^k$  is the actual value of the indicator  $j, j=1, \dots, 24$  in the topic  $k, k=1, \dots, 11$ , for the country  $i, i=1, \dots, n$ ,  $x_{j\min}^k$  is the minimum value and  $x_{j\max}^k$  is the maximum value of the indicator  $j$  in the topic  $k$ .

When an indicator measures a negative component of well-being, the formula used is:

$$u_{ij}^k = 1 - \frac{x_{ij}^k - x_{j\min}^k}{x_{j\max}^k - x_{j\min}^k}. \quad (2)$$

After normalisation, indicators are averaged with equal weights and the topic value  $u_i^k$  for the topic  $k$  and the country  $i$  is calculated using formula:

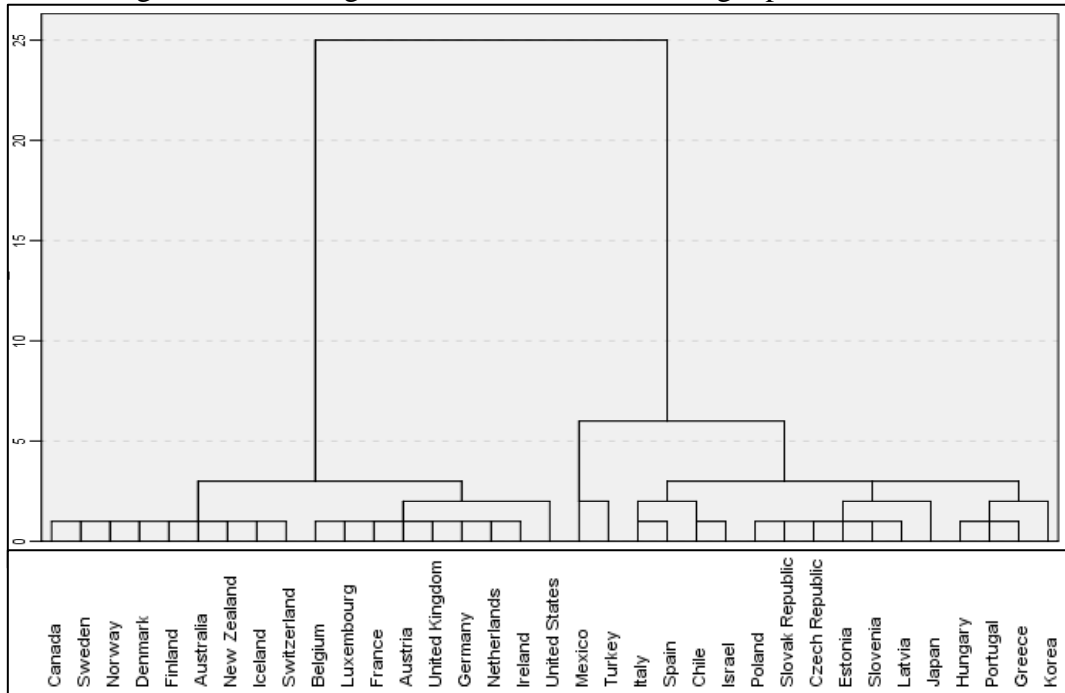
$$u_i^k = \sum_{j=1}^{m_k} u_{ij}^k, \quad (3)$$

where  $m_k$  is number of indicators in the topic  $k$  (OECD, 2018b).

For our research we use topic indicator values of 35 OECD countries from 2017.

Situation in well-being in surveyed countries is quite heterogeneous from the point of view of measures in objective and subjective dimensions of peoples' lives. Norway has a very high level of majority of measures in "objective topics" and also in life satisfaction. People in Finland are very satisfied with their lives, but income is rated quite lower. In Portugal is very low life satisfaction, lower income level and civic engagement, but very well ranked personal security and work-life balance. The method which allows us to look at the similarity of countries in terms of all 11 topics is cluster analysis. We used hierarchical clustering, squared Euclidean distance and Ward Linkage. Simply can be recognized 3 main clusters. According to the original values we can find the cluster of the best 18 countries (see Figure 2 from the left), then Mexico and Turkey where is the worst situation, and the group of Southern European, post-communist and Asian OECD countries.

Figure 2: Dendrogram – clustering of 35 OECD countries using topic indicators.



Source: The authors' work.

The advantage of cluster analysis is to find countries with the similar well-being situation. But this method is not appropriate for setting the weights or ranking countries.

The basis for ranking is a construction of composite indicator. The value of composite Better Life Index for the country  $i$  can be calculated as the weighted arithmetic mean of topic values using the weights  $w^k$  for each topic  $k$  :

$$BLI_i = \sum_{k=1}^{11} u_i^k \cdot w^k, \quad (4)$$

The above mentioned web tool for construction of the composite index allows the user to assign the same weight for a given topic to all surveyed countries. But the situation in topics level is very individual. The countries with positive development and higher weight of an indicator or negative development and lower weight of given indicator are privileged, but others are disadvantaged.

That is why we decided to use the method of setting the individual topic weights for countries based on the principle “the best weights for each country”. This idea can be realized using the method called “benefit of the doubt”.

### 3. Research methodology

We apply DEA to design an alternative approach to aggregate the topic values into the composite indicator of well-being, based on the benefit of doubt. This synthetic macroeconomic performance measure was introduced by Melyn and Moesen (1991). The technique was inspired by the first DEA model called CCR, published by Charnes *et al.* (1978).

The CCR model was originally designed for the assessment of efficiency of decision-making units in their transformation of inputs into outputs. In order to apply benefit of doubt technique for the construction of well-being composite indicator, we consider a unit input for

all countries while the values of 11 well-being topics reflecting the national situation in the specified domains are the outputs. We use an output-oriented DEA model for the calculation of efficiency score for each country as a composite well-being measure alternative to BLI. Moreover, the benefit of doubt method requires the assumption of constant returns to scale.

Hence, the composite well-being indicator for a country  $i$  is calculated as an efficiency score  $S_i$  using the following linear program:

$$\max S_i = \sum_{k=1}^{11} u_i^k \cdot w^k \quad (5)$$

*subject to*

$$\sum_{k=1}^{11} u_i^k \cdot w^k \leq 1, \text{ for any country } i \quad (6)$$

$$w^k \geq 0, \text{ for any topic } k. \quad (7)$$

The objective function (5) is maximized with respect to the weights of topics  $w^k$  (unlike in the BLI web calculator, the values of weights are not required to be integer in this program). Since the topic values  $u_i^k$  for the topic  $k$  and the country  $i$  are non-negative, the constraints (6) and (7) imply that the score  $S_i$  for the country  $i$  is non-negative and less than or equal to 1. If there exists a non-zero set of weights  $w^k$  such that the optimum value  $S_i^* = 1$ , the country  $i$  is considered (technically) efficient by the model, otherwise it is inefficient.

The linear program needs to be solved for each country to produce a country-specific set of weights that depend on the country values of topics used for the construction of the objective function. Hence, the methodology allows us to set unequal weights of the eleven topics for each country in contrast with the fixed weights assigned by users to the topics in the construction of BLI with OECD web tool. Indeed, the topic weights are not predefined. Instead, they are calculated during the process of composite index construction as the optimum values for each country in the sense that they maximize the value of composite well-being indicator for the country. Thus, each country benefits from the doubts about setting the right weights for the topics.

However, applying the best weights for a given country does not assure that the calculated score will reach the maximum possible value of one since there may exist another country whose well-being performance calculated with the same weights is higher. If it really happens, the country in consideration is clearly inefficient in the well-being, and the country (or countries) with better performance under the same weights are considered as reference peer(s) that form the efficiency frontier for given country.

The CCR model admits any non-negative values of input and output weights. Thus, it may happen that a country is assigned very low or even zero weights for its worst well-being topics and very high weights for the best ones. This corresponds to the possibility of unrestricted mutual substitution among the eleven topics in the evaluation of well-being. But this assumption is unacceptable since each of the dimensions determined by OECD significantly contributes to the whole well-being characteristics of a country. Note that the BLI web tool allows users to exclude some topics from the consideration by assigning zero values to their weights, but this setting is then automatically applied to all countries. Besides zero, the web application allows integer non-zero values of topic weights that may vary from 1 to 5, i.e. the weight of one topic may be at most five times greater or less than the weight of another one.

In order to set similar restrictions on the topic weights, we apply output-oriented assurance region DEA model under constant returns to scale (AR-O-C) instead of traditional CCR model. The assurance region model was proposed by Thompson *et al.* (1986) and further developed by Dyson and Thanassoulis (1988). It allows us to set the constraints to limit the region of weights for individual outputs. Thus, we can distinguish the importance of considered topics with the relative magnitude of their weights. Moreover, assurance region model is able to differentiate the countries in efficiency scores even if their number is relatively low to the total number of considered inputs and outputs.

In our assurance region models we set lower and upper bounds on the ratio of topic weights using a parameter  $d$  ( $0 < d < 1$ ):

$$1 - d \leq \frac{w^m}{w^k} \leq 1 + d, \quad (8)$$

for a fixed topic  $k$  and any other topic  $m$  ( $m = 1, \dots, 11, m \neq k$ ). The restrictions mean that the weight of any topic  $m$  can be greater or less than the weight of a fixed topic  $k$  by at most  $100 \cdot d$  percent.

Adding the conditions (8) to the linear program defined by (5)-(7), we get a DEA model that combines the idea of assurance region with benefit of doubt. We will apply the model for the construction of composite well-being indicator to rank the OECD countries by their overall performance in well-being while the weights of the topics are not fixed, but their individual adjustment for each country is possible to some extent. Hence, a country rank may benefit from the substitution of worse performance in some topics with better performance in other topics.

The distance of an inefficient country from the efficiency frontier estimated by DEA model determines the range of inefficiency which is expressed by the score lower than one. The efficiency frontier is constructed based on the performance of efficient countries. Moreover, DEA models are able to identify the potential for improvement of an inefficient country in individual outputs (topics) that are reflected by the projection of the observed performance to the efficiency frontier. Therefore, the projections resulting from DEA model can be viewed as an ideal performance recommended for the country (of course, the projection for an efficient country coincides with its observed performance).

#### 4. Results and Discussion

In this section we present and discuss the properties of proposed well-being composite indicator along with country ranking and other observations resulting from the indicator. A comparison with OECD BLI will be made as well.

Table 2 compares average and extreme values of composite indicator, calculated for individual countries as an efficiency score by DEA model developed in previous section, and the OECD Better Life Index, calculated under the assumption of equal weights of all topics.



Table 2: Comparison of proposed DEA-based composite well-being indicator with OECD Better Life Index calculated with equal weights of topics.

Composite indicators for measuring well-being	BLI equal weights	Indicator based on DEA benefit of doubt and assurance region model with parameter $d$				
		$d=1/4$	$d=1/3$	$d=1/2$	$d=3/5$	$d=2/3$
Maximum difference of topic weight (vs. Life Satisfaction)	0 %	± 25 %	± 33 %	± 50 %	± 60 %	± 67 %
Assurance region for weights Upper bound / Lower bound	-	5 : 3	2 : 1	3 : 1	4 : 1	5 : 1
Average value	0.598	0.785	0.795	0.813	0.823	0.830
Maximum value	0.795	1	1	1	1	1
Minimum value	0.278	0.407	0.429	0.479	0.512	0.538
Number of efficient countries	-	4	5	7	8	8
Pearson (DEA vs. BLI)	1	0.999	0.998	0.995	0.993	0.990
Spearman (DEA vs. BLI)	1	0.996	0.989	0.979	0.977	0.975

Source: OECD (2018c) and the authors' work.

The DEA model is considered for various values of the parameter  $d$  used for setting the lower and upper bounds of assurance regions that are defined by (8). As the basic weight  $w^k$  we use that of Life Satisfaction since it is the only topic included in BLI that represents the self-evaluation of well-being by citizens. The parameter  $d$  defines the range of the region around  $w^k$  where the weights  $w^m$  of all other topics, measuring the objective conditions for well-being, can fall. In other words, the weights of all other topics can differ from the weight of Life satisfaction by at most  $\pm 100 \cdot d$  %.

The values of  $d$  are chosen to determine integer ratios between the upper and lower bounds of the assurance region, i.e. the maximum and minimum possible values of the topic weights. Indeed, the value  $d=2/3$  determines a topic to be at most five times more or less significant within the composite well-being indicator than another topic. This coincides with the maximum ratio of non-zero weights allowed by BLI web application. Since DEA models aim to minimize weights of weak topics and maximize weights of strong ones, a considerable number of topics for each country may be assigned just the boundary values of the regions when we apply the restrictions defined by (8).

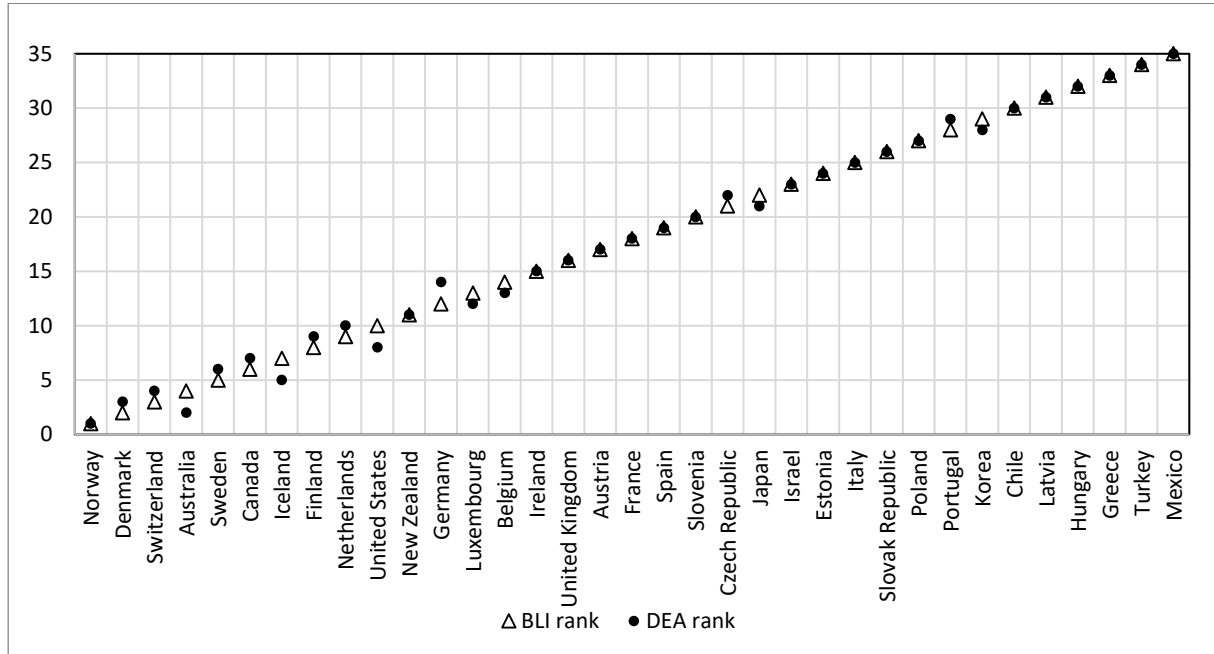
Of course, the maximum efficiency scores equal 1 and indicate efficient countries. Higher values of  $d$  imply larger assurance regions that allow the DEA model to set better topic weights for all countries to improve their scores. Thus, the average and minimum scores as well as the number of efficient countries are naturally increasing for greater values of the parameter  $d$ . On the other hand, larger assurance regions for topic weights result in bigger differences between BLI and proposed DEA-based indicator. However, the correlation between the country values, measured by Pearson coefficient, and country ranks, measured by Spearman coefficient, are still very high for all considered values of parameter  $d$ .

In order to rank observed countries by use of proposed DEA-based well-being indicator, we apply the following procedure. First, we calculate optimum solutions of linear program defined by (5)–(8) for each country  $i$  and for each fixed topic  $k=1, \dots, 11$  while setting the parameter  $d=1/4$ . We obtain 11 efficiency scores for each country and we rank the countries by the mean of the scores.

As can be seen in Figure 3, only 16 out of 35 OECD countries have slightly changed their ranks compared to BLI ranking determined using equal weights of topics. Three countries

(Australia, Iceland, and the United States) have improved their rank by two positions, and Germany has worsen its rank by two places.

Figure 3: Comparison of country ranks by BLI and DEA-based well-being indicator.



Source: The authors' work.

The observations on well-being shortfalls in individual countries that result from data envelopment analysis are summarized in Table 3. They represent projections of the well-being topics recommended by DEA model defined by linear program (5)-(8), where the fixed topic  $k$  is Life Satisfaction and the parameter  $d=1/4$ .

For the sake of simplicity, the projections are represented with asterisks. By one asterisk we denote the projections that recommend to improve the corresponding topic value by more than 10 % and less than 50 %. Two asterisks indicate the recommendations for topic value increase by 50-100 %. Even higher shortfalls are emphasized by a triple of marks.

Note that the projections were calculated with regard to all eleven well-being topics and the efficiency frontier determined by the countries showing the best overall performance under given assumptions (Australia, Denmark, Norway, Switzerland) that are considered efficient by the model and referential for the other countries.

The analysis allows us to identify similarities and differences in well-being among countries and geographic regions. The Czech Republic, Poland and Slovakia were included in the same cluster by dendrogram in Section 2, and they actually exhibit shortfalls compared to reference countries in the same well-being topics. Poland and Slovakia are particularly similar as for the ranks as well as the range of recommendations.

Table 3: Identification of well-being shortfalls by proposed DEA model.

Country	Work and life	Income and wealth	Job and earnings	Housing	Health status	Education and skills	Community	Civic engagement	Environmental quality	Safety	Life Satisfaction
Australia											
Austria	*			*	*	*	*	*	*		*
Belgium			*	*	*		*		**	*	*
Canada	*								*		
Chile	*	***	**	**	**	**	***	***	***	***	**
Czech Republic	*	***	*	**	**		*	*	**	*	**
Denmark											
Estonia	*	***	*	**	***		*		*	*	***
Finland		*	*	*	*						
France			*	*	*	*	**		**	*	**
Germany				*	*		*		*	*	*
Greece	*	***	***	**	*	**	***	*	***	*	***
Hungary		***	*	**	***	*	***	***	***	**	***
Iceland	**			**							
Ireland		*	*	*				***	*	*	*
Israel	**	*	*	**		*	**	**	***	*	*
Italy	*		**	**	*	**	*	*	***	**	***
Japan	**			**	*		*	***	**	*	***
Korea	**	**	*	*	***		***		***	*	***
Latvia	*	***	**	***	***		**	*	**	**	***
Luxembourg				*		**	*		*	*	*
Mexico	***	***	**	***	***	***	***		***	***	**
Netherlands				*			*	*	*		
New Zealand	*	*	*	*						*	
Norway											
Poland	*	***	*	***	***		*	*	***	*	***
Portugal	*	***	**	*	**	**	**	***	*	*	***
Slovak Republic	*	***	**	***	***	*	*		***	**	***
Slovenia	*	***	*	*	*		*	*	**		***
Spain		**	***	*		*		*	**		**
Sweden			*	*			*			*	
Switzerland											
Turkey	***	***	***	***	**	***	**		***	**	***
United Kingdom	*			*	*	*			*	*	**
United States	*				*		*		*	*	*

Source: The authors' work.

## 5. Conclusion

The importance and complexity of the concept of well-being makes a challenge for finding appropriate measures of current situation and progress of individual countries and their mutual comparison. The methodology implemented in Better Life Index introduced by OECD and the

related datasets provide a unique opportunity for further study and a deeper insight to the situation from different perspectives.

The Better Life Index is supported with an interactive web tool that allows users to set their own weights to 11 well-being topics and thus to determine the ranking of observed countries. However, setting appropriate weights is one of the most difficult steps in the any evaluation and ranking process.

In our paper we proposed another approach to setting the weights for well-being topics that is based on data envelopment analysis methodology. We used a linear programming model that combines the benefit of doubt idea (to find the best weights for individual countries to reach the highest possible evaluation score) with assurance regions (to limit the freedom in mutual substitution of the topics by putting restrictions on their weights). Our approach follows the assumption that all identified topics are significant for determining the current situation in well-being, but the level of their development and importance may be different in various countries, due to many historical, demographic, and social factors. Besides the alternative ranking, the DEA-based approach allows to identify the level of shortfalls in well-being topics for each country.

Further development and adjustment of this approach may bring more detailed and useful information for policy makers responsible for the area of well-being.

### **Acknowledgements**

The support of the grant scheme VEGA No.1/0621/17 DECISION-MAKING PROCESS OF SLOVAK HOUSEHOLDS ABOUT ALLOCATION OF TIME FOR PAID AND UNPAID WORK AND HOUSEHOLD STRATEGIES' IMPACT ON SELECTED AREAS OF THE ECONOMIC PRACTICE is gladly acknowledged.

### **References**

- [1] Charnes, A., Cooper, W. W., Rhodes, E. 1978. Measuring the efficiency of decision making units. *European Journal of Operational Research*, vol. 2, pp. 429-444.
- [2] Conelly, R., Kongar, E. 2017. *Gender and time use in a global context*. New York: Palgrave Macmillan. ISBN 978-1-137-56836-6.
- [3] Dodge, R. et al. 2012. The challenge of defining wellbeing. 2012. *International Journal of Wellbeing*, vol. 2, No. 3, pp. 222-235.
- [4] Durand, M. 2015. The OECD Better life initiative: *How's life?* And the measurement of well-being. *Review of Income and Wealth*, series 61, iss. 1, pp. 4-17.
- [5] Dyson, R. G., Thanassoulis, E. 1988. Reducing Weight Flexibility in Data Envelopment Analysis. *Journal of the Operational Research Society*, vol. 39, pp. 563-576.
- [6] Eurofound. 2012. *Third European Quality of Life Survey - Quality of life in Europe: Impacts of the crisis*. Luxembourg: Publications Office of the European Union. ISBN 978-92-897-1099-2.
- [7] European parliamentary research Service. 2014. *Measuring well-being and progress. Looking beyond GDP*. Research report. [cit. 26-02-2018] <http://www.europarl.europa.eu/EPRS/140738REV1-Measuring-well-being-and-progress-FINAL.pdf>
- [8] EUROSTAT. 2018. *Quality of life (QoL) > Data: background information*. <http://ec.europa.eu/eurostat/web/gdp-and-beyond/quality-of-life/data>
- [9] Kruger, A. B., Stone, A. A. 2014. Progress in measuring subjective well-being. *Science*, vol. 346, iss. 6205, pp. 42-43.

- [10] Melyn, W., Moesen, W. Towards a synthetic indicator of macroeconomic performance: unequal weighting when limited information is available. In: Public Economics Research Papers 17. Centre for Economic Studies, Leuven, 1991, pp. 1-24.
- [11] OECD. 2013. Well-being. Research report. [cit. 01-03-2018] <https://www.oecd.org/sdd/OECD-stat-work-2013-well-being.pdf>
- [12] OECD. 2016. Better Life Index 2016: Definitions and Metadata. Research report. [cit. 01-03-2018] <http://www.oecd.org/statistics/OECD-Better-Life-Index-2016-definitions.pdf>
- [13] OECD. 2018a. Measuring well-being and progress. Research report. [cit. 01-03-2018] <https://www.oecd.org/sdd/OECD-Better-Life-Initiative.pdf>
- [14] OECD. 2018b. What's the Better Life Index? <http://www.oecdbetterlifeindex.org/about/better-life-initiative/>
- [15] OECD. 2018c. Better Life Index – Edition 2017. <http://stats.oecd.org/Index.aspx?DataSetCode=BLI2016>
- [16] Selwyn, J., Wood, M. 2015. Measuring Well-Being: A literature Review. University of Bristol – Explore Bristol Research. Online at: [https://research-information.bristol.ac.uk/files/41278115/Measuring\\_Wellbeing\\_FINAL.pdf](https://research-information.bristol.ac.uk/files/41278115/Measuring_Wellbeing_FINAL.pdf)
- [17] Thompson, R. G. et al. 1986. Comparative Site Evaluations for Locating a High-Energy Physics Lab in Texas. *Interfaces* 16, pp. 35-49.