



Towards an Inclusive Europe: Ranking European Countries Based on Social Sustainability Indicators

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Abstract. The aim of the paper is to assess the state of social sustainability throughout European countries, based on the inclusion of various indicators that reflect the social dimension of sustainable growth. Using the methods for creating composite indexes combined with official social statistics, the ranking of European countries based on poverty and social exclusion indicators is provided. The terms poverty and social exclusion refer to various types of social disadvantages, related to the problems such as unemployment, income inequality, material deprivation and the inability to participate in social and political activities. Our analysis enables the evaluation of social sustainability, at the country level, through formation of a composite index that includes all observed indicators. The indicators included in the analysis are classified into three groups: (1) income distribution and monetary poverty, (2) living conditions (health, labour, and housing) and (3) material deprivation. Research is based on the data provided by European Union (EU) statistics on income and living conditions, a comparative statistic on income distribution and social inclusion for EU countries as well as accession candidate countries. The results are based on analysis that includes 33 countries. For the assessment of social sustainability, a multi-criteria analysis model is developed, combining the CRITIC method (CRITERIA Importance Through Intercriteria Correlation) for determining the relative importance of criteria and PROMETHEE (Preference Ranking Organization METHod for Enrichment Evaluation) method for ranking countries. The results clearly indicate that candidate countries have a lower level of social sustainability compared to EU countries.

Keywords: Social sustainability · Multi-criteria analysis · Poverty · Social exclusion · Material deprivation

1 Introduction

The problem of measuring poverty and social exclusion is contemporary task among academic researchers and at the same time analytically and operationally relevant topic at all levels of policymaking. The design of indicators is one of the crucial parts in measuring poverty and social exclusion, because of their ability to include all relevant aspects and provide comparability of data both at the regional and at the state level.

This approach was proposed by [1] in their study on European Union (EU) indicators for social inclusion. In order to make indicators consistent with their purpose, their design needs to be based on a set of following principles: (i) indicators should identify the essence of the problem and have an agreed normative interpretation, (ii) indicators should be robust and statistically validated, (iii) indicators should be interpretable in an international context, (iv) indicators should reflect the direction of change and be susceptible to revision as improved methods become available and (v) the measurement of an indicator should not impose too large a burden on countries, on enterprises, nor on citizens and the design of social indicators should use already available information, wherever possible [2].

A concept that meets all requirements mentioned above and it is accepted by the EU Commission is EU Statistics on Income and Living Conditions (EU-SILC) as an EU survey aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional micro data on income, poverty, social exclusion and living conditions. The main indicator people at risk of poverty or social exclusion (AROPE), consists of the three sub-indicators: (i) monetary poverty, (ii) severe material deprivation and (iii) very low work intensity. Despite the methodological objections that are present in scientific and professional literature in the field of statistics and sampling [3], EU-SILC is still the main, practically the unique, data source for constructing indicators of poverty and social exclusion in the multi-country comparative context of the EU. It is also important to emphasize that EU-SILC, like most other complex population-based surveys, is primarily designed to be representative at the country (rather than at the subnational or regional) level [3].

The aim of this paper is to compare and rank European countries from the aspect of indicators that show measures of poverty, social exclusion and material deprivation. The countries will be ranked according to three groups of criteria, representing different aspects of income distribution and monetary poverty, living conditions such as health, labour, and housing, as well as material deprivation, based on indicators contained in EU-SILC survey. As a result, a country ranking list will be created, pointing to main strengths and difficulties regarding social sustainability in analysed countries.

The structure of the paper includes a brief literature overview of the issues related to measuring social sustainability, after which methodology and data used in the paper are explained. The subsequent section presents the baseline results in the form of a ranking list, while the last section offers some concluding remarks.

2 Literature Review

Social sustainability issues have marked the last decade of policy making, as social environment has become one of the essential determinants of human prosperity. However, there is no generally accepted definition of social sustainability [4]. The lack of a uniform definition of social sustainability stems from the fact that social sustainability has often been seen as an adjunct to economic and environmental sustainability, which have long been considered priority aspects of sustainability. According to [5], the definition of social sustainability must be based on the fundamental values of democracy and equality with respect for all human rights. Social sustainability reflects the possibility of achieving

the development goals of a society based on the interconnectedness of all individuals within society, taking into account spatial constraints and the natural environment [6]. Within the concept of sustainable competitiveness, The World Economic Forum defines social sustainability as the set of policies and factors that enable individuals to contribute and benefit from the economic prosperity of the society they live in [7]. Furthermore, social sustainability is closely related to economic sustainability, since the realization of a broader set of human rights is one of the determinants of foreign direct investment, and consequently economic growth [8]. The new approach to economic growth – inclusive growth, insists on its sustainability over decades, its cross-sectoral foundations, creation of new employment and reducing poverty [9]. More specifically, economic growth ought to be cohesive, sustainable, and inclusive and be supposed to ensure prosperity for the whole of Europe [10].

Even though initially neglected, in recent years social sustainability has become particularly important, especially having in mind the growing number of inhabitants on the planet. However, measuring progress towards social sustainability is a challenging task. Namely, in addition to the difficulties in defining social sustainability, there are ambiguities about the criteria that should be taken into account when assessing the concept of social sustainability [11]. The evaluation of sustainability policies in most countries is mainly based on the assessment of individual indicators, which almost inevitably makes it impossible to compare the overall performance with other countries. This is due to the fact that in the case of evaluation of individual indicators, one country may be better than another in one indicator, but worse in another indicator, and it is not possible to objectively compare the two countries. If there is no objective measure that encompasses all dimensions of the multidimensional phenomenon, there is a danger that excessive public attention will be focused on only one or several dimensions [12], which would lead to an utterly erroneous strategic direction of policies [13]. A solution for evaluating multidimensional phenomena can be found in creating composite indices. Composite indices can aggregate several dimensions of data that characterize a complex, multidimensional phenomenon into a single indicator. This makes it possible to compare several countries, as well as to monitor the evolution of an individual country over time. There have been many attempts of constructing aggregate, single measure indicators, based on a number of indicators [14]. Evaluation of different aspects of sustainability was performed using different techniques [15–21], where the main focus of these research is on the evaluation of the economic and environmental dimension of sustainability. However, in the last decade there has been a noticeable increase in the number of studies evaluating the social dimension of sustainability. Including different aspects of social environment is most often achieved by the use of multi-criteria assessment methods [22, 23]. Therefore, in this paper, the sustainability assessment of European countries will be performed using a non-compensatory multicriteria method, the PROMETHEE method.

3 Model Development and Methodology

The paper is aimed to explore and assess social sustainability, at the country level, through formation of a composite measure that includes all various social indicators. The sample of countries included in the research encompasses the EU27 countries, Switzerland,

Norway and four candidate countries for EU accession: North Macedonia, Montenegro, Albania and Serbia. The indicators included in the analysis are grouped into three key areas in relevant for measuring poverty and social exclusion: (1) income distribution and monetary poverty, (2) living conditions (health, labour, and housing) and (3) material deprivation. Each area includes a set of indicators and a total number of observed indicators/criteria is 15 (Fig. 1). Indicators were selected based on a review of the literature, taking into account leading European policies and the availability of data. Research is based on the data provided by Eurostat database and the last year for which complete data are available for all countries in the sample (2019) is used [24]. In addition to the Eurostat database, there are other open databases available online, such as the database of Organization for Economic Co-operation and Development (OECD. Stat) or the World Bank datasets (for example World Development Indicators), however, due to the comprehensiveness, uniformity and greater availability of the data, the authors opted to use only data from the Eurostat database.

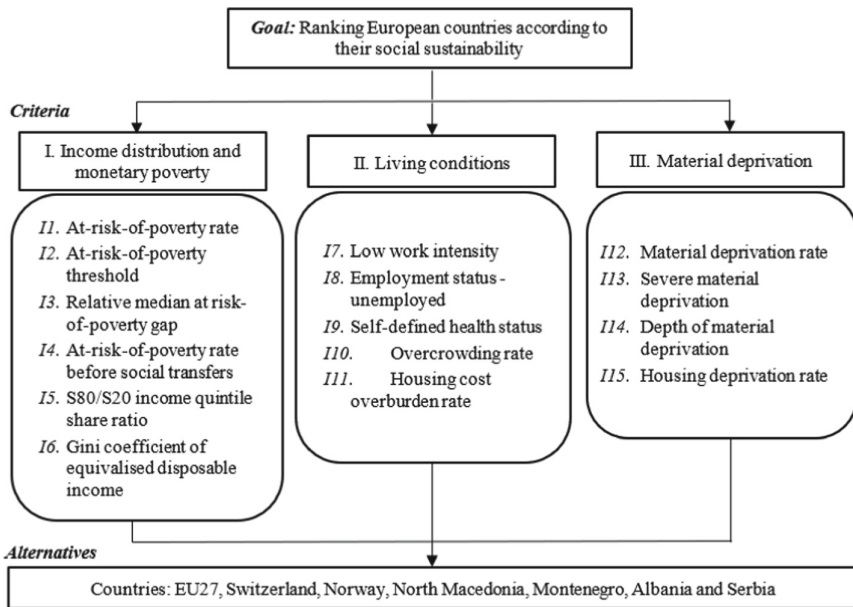


Fig. 1. Hierarchical structure of the model

The creation of composite measures of social sustainability of the observed 33 countries, based on 15 indicators of poverty and social exclusion, is achieved by solving a proposed multi-criteria model. The model is solved by the integrated approach of the CRITIC method for determining the weight coefficients and the PROMETHEE II method for determining the final rank of alternatives.

3.1 Objective Approach to Weights Determination Using CRITIC

The creation of composite measures of social sustainability of the observed 33 countries, based on 15 indicators of poverty and social exclusion, is achieved by solving a proposed multi-criteria model. The model is solved by the integrated approach of the CRITIC method for determining the weight coefficients and the PROMETHEE II method for determining the final rank of alternatives.

CRITIC method (CRiteria Importance Through Intercriteria Correlation) is an objective weight determination method, founded by [25], that belongs to the group of correlation methods and is based on the analytical examination of the decision-making matrix in order to determine the information contained in the criteria for evaluating the alternatives.

The assessment of weights in multi-criteria decision-making problems is a key stage of the whole decision-making process [26]. All weighting coefficients can be classified into two basic groups: subjective methods, based on the modelling of subjective preferences of the decision-maker and objective, based on the application of mathematical and statistical tools for analysis of decision matrix and though analytical procedure the significance of the criteria is determined [27, 28].

CRITIC method for the determination of objective weights is based on the quantification of the contrast intensity and the conflicting character of the evaluation criteria [29]. To determine the contrast within the criterion, the standard deviation of the normalized values of the attribute of the observed criterion is used, as well as the correlation coefficients of all criteria pairs [30].

Algorithm of CRITIC method includes six iterative steps described below [25]:

Step 1. Calculate the standardized values r_{ij} of performance matrix using linear normalization as

$$r_{ij} = \frac{x_{ij} - x_{ij}^{\min}}{x_{ij}^{\max} - x_{ij}^{\min}} \quad (1)$$

where $x_{ij}^{\max} = \max_i x_{ij}$ and $x_{ij}^{\min} = \min_i x_{ij}$, $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$.

Step 2. Calculate the standard deviation σ_j of each vector r_j , $j = 1, 2, \dots, n$ in linear normalized decision matrix, $r_j = (r_{1j}, r_{2j}, \dots, r_{mj})$. Standard deviation σ_j of vector r_j is nothing else but measure of the contrast intensity of the corresponding criterion.

Step 3. Construct symmetric matrix, with dimension $n \times n$ and generic elements R_{ij} , which are the linear correlation coefficients between each pair of normalized criteria in the model.

Step 4. Calculating measure of the conflict between criteria through the aggregation formula

$$\sum_{j=1}^n (1 - R_{ij}) \quad (2)$$

Step 5. Calculation of amount of information C_j emitted by the j^{th} criterion.

$$C_j = \sigma_j \sum_{j=1}^n (1 - R_{ij}) \quad (3)$$

Step 6. Determination of and relative importance, i.e. weight W_j of j^{th} criterion based on C_j values using additive normalization

$$W_j = \frac{C_j}{\sum_{j=1}^n C_j} \quad (4)$$

The most commonly used criteria in economics are in the field of finance, or ratio analysis, as well as in all problems where there is a relatively significant correlation between the coefficients of the performance matrix. As indicators of poverty and material deprivation are often relative numbers, the performance matrix of the problem that is solved in this paper fits into the description for the application of the CRITIC method.

3.2 PROMETHEE Outranking Method

PROMETHEE (Preference Ranking Organization METHod for Enrichment Evaluation) is a well-known family of multiple-criteria decision making methods founded by [31]. It is a group of widely applied outranking methods based on pair-wise comparison of the alternatives in accordance to each separate criterion [32].

The algorithm of PROMETHEE method consists from five iterative steps [33]:

Let's assume again the same multi-criteria problem that can be described as

$$\text{Max/Min } \{f_1(a), f_2(a), \dots, f_n(a) | a \in K\}, \quad (5)$$

where K is a finite set of alternatives and $f_j, j = 1, 2, \dots, n$, are k criteria to be maximized or minimized.

Step 1. Determination of deviation between two alternatives a and b ($a, b \in K$) through the pairwise comparison.

$$d_j(a, b) = f_j(a) - f_j(b), \quad (6)$$

where $d_j(a, b)$ is the difference between the evaluation of alternative a and b on each criterion $j, j = 1, 2, \dots, n$.

Step 2. Application of the preference function

$$P_j(a, b) = F_j[d_j(a, b)], j = 1, 2, \dots, k \quad (7)$$

where $P_j(a, b)$ denotes the preference of alternative a regarding to alternative b on each criterion, as a function of $d_j(a, b)$.

Step 3. Calculation of an overall preference index $\pi(a, b), \forall a, b \in K$

$$\pi(a, b) = \sum_{j=1}^n P_j(a, b)w_j \quad (8)$$

Preference index $\pi(a, b)$ of alternative a over alternative b is defined as weighted sum of preference functions $P_j(a, b)$. Relative importance of each criterion in the model is denoted as $w_j, j = 1, 2, \dots, k, \sum_{j=1}^n w_j = 1$.

Step 4. Calculation of positive and negative outranking flows φ^+ and φ^- and determination of partial ranking (PROMETHEE I)

$$\varphi^+(a) = \frac{1}{m-1} \sum_{x \in A} \pi(a, x) \quad (9)$$

$$\varphi^-(a) = \frac{1}{m-1} \sum_{x \in A} \pi(x, a) \quad (10)$$

Number of alternatives in the model is denoted as m .

Step 5. Calculation of complete ranking (PROMETHEE II) as a net outranking flow

$$\varphi(a) = \varphi^+(a) - \varphi^-(b) \quad (11)$$

Three PROMETHEE software packages, including PROMCALC, DECISION LAB and Visual PROMETHEE, have been developed to facilitate the implementation of PROMETHEE method. In this paper, all the calculations are performed using Visual PROMETHEE software, academic edition, developed by Bertrand Mareschal.

4 Empirical Data and Analysis

As the sample covers 33 European countries, it is a heterogeneous sample, with substantial disparities in both macroeconomic and social indicators, which are the subject of analysis in this paper. Also, the data included in research include a wide range of data on poverty, material deprivation, and living conditions, so it is needed to present more detailed description and range of values of these data.

When it comes to macroeconomic data, significant differences can be observed between member states and candidate countries. Regarding unemployment rates, average unemployment rate in the sample is 4.5%, and the most of EU27 countries are below or on sample's average when it comes to unemployment data, while candidate countries are quite above the average, with unemployment rates ranging from 6.3% (Serbia) up to 11.5% (Albania). However, even some EU15 countries such as Spain (9.1%) and Greece (10.7%) have unemployment rates in the range of unemployment rates characteristic for candidate countries. When youth unemployment is observed, the average of the sample is 27.5%, with youth unemployment again being highest in the candidate countries. High unemployment rates are characteristic of the labour markets of transition countries and affect older workers with outdated skills and young people alike, as indicated by especially high youth unemployment rates [34]. Unemployment has a certain social cost, which is reflected in many ways [35]: in addition to loss of income, the consequence of lack of employment is reflected in the interruption in the productive role of individuals, and consequently leads to loss of social status and social legitimacy because social contacts and social interaction are developed mainly through participation in the labour market. The problems of unemployment and deprivation became especially pronounced due to the COVID-19 pandemic, during which many temporary and low-skilled workers lost their jobs. The consequences of the pandemic will most likely be reflected in a further increase in inequality and unemployment, and the focus of European countries must be on reducing poverty and social exclusion, as well as providing quality jobs and conditions for training and retraining. Prior to the pandemic, 91 million people were at risk of poverty or social exclusion, but that number rose to 96.5 million in 2020 [36].

Average employment rate in the sample is 72.9% and it is evident that candidate countries North Macedonia, Albania, Montenegro and Serbia, are far below the average of the sample with employment rates ranging from 55.2% (Montenegro) up to 65.9%

(Serbia). On the other hand, the highest employment rates refer to Switzerland (82.5%), the Netherlands (80%) and Nordic countries (Denmark, Sweden and Norway).

The most significant disparities in the sample are visible in the data on median equivalised net annual income (in €), where the ratio between the highest value in Switzerland and the lowest in Albania is almost 18.5. Finally, when it comes to gross domestic product presented as GDP per capita in PPS, (EU27 = 100) it could be concluded that the candidate countries are far below the sample average, with GDP per capita PPS less than 50% of sample average. However, even some member states such as Bulgaria and Greece are quite below the sample average, with GDP per capita PPS less than 70% of sample average. On the other hand, non-EU countries (Norway and Switzerland) are far above the sample average.

Differences are evident in both economic and social indicators in the sample, and the application of the multi-criteria approach allows the aggregate analysis of these indicators and the comparison of countries based on all observed parameters at the same time.

5 Results and Discussion

The first part of the results refers to determining the weight coefficients in the multi-criteria model, i.e., to determining the relative importance of each of the indicators of poverty and social exclusion included in the model. For the purpose of weights determination, the algorithm of CRITIC method is applied.

The results of weights determination based on CRITIC method are given in Table 1. The criterion with highest relative importance is I_2 , At-risk-of-poverty threshold ($W_2 = 0.139$), followed by I_9 , Self-defined health status and I_4 , At-risk-of-poverty rate before social transfers.

Table 1. Relative importance W_j of j^{th} criterion

Indicator	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8
W_j	0.061	0.139	0.061	0.083	0.050	0.047	0.067	0.063
Indicator	I_9	I_{10}	I_{11}	I_{12}	I_{13}	I_{14}	I_{15}	
W_j	0.094	0.059	0.067	0.051	0.050	0.051	0.057	

Source: Authors' calculations.

According to PROMETHEE II algorithm, ranking is conducted through calculation of net outranking flow φ as the difference between positive and negative outranking flows φ^+ and φ^- (Table 2).

Table 2. PROMETHEE flow table

Rank	Country	Composite index (φ)	Rank	Country	Composite index (φ)
1	Norway	0.2527	18	Austria	0.0334
2	Slovenia	0.2182	19	Luxembourg	0.0318
3	Czech Republic	0.2153	20	Germany	0.0116
4	Malta	0.1973	21	Croatia	0.0013
5	Finland	0.1501	22	Lithuania	-0.0010
6	Cyprus	0.1317	23	Spain	-0.0020
7	Netherlands	0.1271	24	Sweden	-0.0084
8	France	0.1033	25	Latvia	-0.0284
9	Slovakia	0.1031	26	Italy	-0.0541
10	Estonia	0.0996	27	North Macedonia	-0.2219
11	Switzerland	0.0767	28	Greece	-0.2480
12	Portugal	0.0740	29	Montenegro	-0.2765
13	Poland	0.0577	30	Bulgaria	-0.3009
14	Belgium	0.0569	31	Romania	-0.3010
15	Hungary	0.0527	32	Albania	-0.3162
16	Denmark	0.0450	33	Serbia	-0.3215
17	Ireland	0.0402			

Source: Authors' preview of results generated using Visual PROMETHEE.

Results presented in Table 2 indicate that the highest ranked country with the highest social sustainability is Norway and in context to the previous literature the results is confirming findings given in Global Inequality by [37]. The most of old member states (EU15) have positive values in net outranking flow φ (composite index) according to poverty and social exclusion indicators, which points out their steadily social sustainability. However, several countries in the EU15 group have a negative outranking flow, among which are Italy, Spain, and Greece. At the very bottom of the list there are EU candidate countries, Albania and Serbia, whose data on poverty and social exclusion are the worst and point to seriously high poverty rates, poor living conditions and material deprivation of a significant part of the population. The countries that joined the EU in 2004 have satisfactory results, except two of the Baltic countries that have negative results (Latvia and Lithuania). Member states that have joined the EU in 2007 (Bulgaria and Romania) are at the bottom of the list, which indicates a very low level of social sustainability in these countries. Finally, some relatively good results when it comes to reducing poverty and social exclusion are recorded in Croatia, that has joined the EU in 2013.

The relatively low level of social sustainability of European countries, and especially the old EU member states, is a consequence of the fact that in the previous decades the

social dimension of European integration was severely neglected, resulting in harsh and serious social difficulties [38]. Therefore, nowadays EU policies are aimed at eradicating sources of social instability, preventing and eradicating poverty and reducing the development gap [39]. Europe's strategic orientation towards achieving a strong social protection system and improving employment is reflected in the priority areas of the new cohesion policy. One of the main policy objectives of 2021–2027 EU cohesion policy is a more social and inclusive Europe. However, creating a universal policy to reduce poverty and social exclusion is difficult to do due to the specifics of individual countries [40]. Policies need to be adapted to the local level, as it is then possible to make the widest impact [39].

In 2017, the European Commission introduced the European Pillar of Social Rights, which entails a set of social rights and principles and was complemented by a package of proposals to improve social policy and eradicate poverty and social exclusion. It is believed that the application of the European Pillar of Social Rights principles will improve living standards, increase employment and alleviate social difficulties [41]. However, in order to achieve social sustainability, strategies must be aimed at strengthening social policy and social infrastructure, improving labour market conditions, providing trainings for adult population, providing adequate housing conditions, improving access to quality healthcare and access to basic services of sufficient quality [42].

6 Conclusion

Social sustainability is characterized by multidimensionality, which, for policy purposes, is useful to synthesize in one measure on the basis of which it would be possible to quantify the progress of countries towards social sustainability. In this paper, ranking of 33 European countries based on their indicators of poverty and social exclusion was performed. In contrast to the previous literature, our empirical results are obtained using integrated approach of two multi-criteria decision-making methods – CRITIC and PROMETHEE II.

There are significant conclusions drawn in the fact that country of the best social sustainability is not EU country, but Norway, the fact that the process of European integration, do not necessarily mean reducing poverty and social exclusion (Bulgaria, Latvia, Romania, etc.), as well as the fact that candidate countries have a very pronounced problem of social unsustainability. The results further indicate the importance of inclusive growth, since it can be noticed that a high level of economic development is not a necessary precondition for achieving a high level of social sustainability. The obtained results can be the basis for further creation of policies in the social sphere aimed at achieving social sustainability and reducing poverty and social exclusion. Creating adequate policies in the social sphere aimed at reducing poverty, encouraging employment, securing quality health care, providing adequate living conditions and reducing inequality must be a priority of European countries. The introduction of the European Pillar of Social Rights represents a positive step towards achieving social sustainability and, if implemented in compliance with planned legislative measures, can enhance the EU's social image and contribute to improving the social situation of the population [38].

The contribution of the paper is twofold. In theoretical terms, it contributes to the literature on social sustainability, with special emphasis on issues of poverty and social

exclusion. The contribution in methodological terms is reflected in the application of the well-known family of ranking methods, PROMETHEE for solving a new kind of problem - the creation of composite indexes of social sustainability, which is a step forward in applying PROMETHEE II method for solving socio-economic problems.

The research faces some limitations. Firstly, the ranking has been conducted based only on data from one year. Further research will focus on analysis that includes longer period of observation, in order to determine the trends of changing individual social policies of countries in the sample and to see the direction of their social (un)sustainability. Secondly, although when choosing the indicators, the authors took into account the availability of data and current European policies, it should be noted that it is important to include a wider range of institutional, social and economic factors in the composite indicator in future research such as [35]: the integration of vulnerable social groups, literacy, education, et cetera.

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