

Complex assessment of poverty using composite indicator

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Abstract

The article deals with measuring poverty whereas poverty is considered to be a multidimensional phenomenon and is represented by various dimensions. It aims to propose a methodical instrument for complex evaluation of poverty and the differences in poverty among the EU Member States. This instrument is also appropriate for regional comparison among the regions of Czech Republic. Methodical instrument on the basis of composite indicator has been suggested and it has been verified on selected poverty indicators. Using the composite indicator the development of the EU countries in the period 2004 – 2009 is described. While Denmark, Netherlands and Luxembourg made a huge improvement between the two years, the smallest progress was accomplished in Latvia, Hungary and Bulgaria.

Key words

Poverty, material deprivation, multivariate methods, composite indicator.

Anotace

Příspěvek se zabývá různými přístupy k hodnocení životní úrovně, přičemž se zaměřuje na měření chudoby jako vícedimensionálního jevu. Cílem příspěvku je konstrukce souhrnného indikátoru pro hodnocení chudoby a rozdílů v životní úrovni v členských státech EU, který je využitelný také pro hodnocení regionálních diferencí v rámci České republiky. Pomocí sestrojeného souhrnného indikátoru je posouzena nejen aktuální pozice jednotlivých států, ale také jejich vývoj v letech 2004 – 2009. Zatímco Dánsko, Nizozemsko a Lucembursko lze označit za nejsilnější státy s ohledem na největší zlepšení ve sledovaném období, nejnižší pokrok byl zaznamenán u Lotyšska, Maďarska a Bulharska.

Klíčová slova

Chudoba, materiální deprivace, vícerozměrné metody, souhrnný indikátor.

Introduction

Fighting against poverty is one of the priorities of the European Union. Social equality and reduction of poverty are both presented as one of the aims of Lisbon strategy (2000 – 2010) and strategy Europe 2020 – A European strategy for smart, sustainable and inclusive growth (2010 – 2020).

Among the scientists there is large agreement that poverty is a multidimensional phenomenon [3], [1], [16]. In the scientific works of this topic (social inclusion, poverty, living standard) one-dimensional approach is more and more substituted by the multidimensional approach. Bossert [5] presents three arguments for the multidimensional

approach for measuring poverty. Firstly he speaks of important studies arguing that well-being has to be understood as an issue that is affected by many factors such as housing, income or health. Many authors measure poverty based on the set of indicators both for measuring inequality among states, e. g. [15], [10] or within states [14]. Second reason for not considering one dimension only is connected with income distribution. The author argues that poverty rate as an indicator based on income it is not always a good measure since it neglects command over resources out of wealth, non-cash transfers from the government and support from family and friends. The third reason reflects the methodology of the European Union. Activities leading to first set of indicators for

measuring well-being were initiated already in 2000 at the Lisbon European Council. The EU Member States agreed to adopt the Open Method of Coordination (OMC). OMC is used by the Member States to support definition, implementation and evaluation of their social policies based on common objectives and indicators (see e. g. [7]).

Together with enlargement of the European Union the inequality between old and new Member States increased. This pointed out to the lack of measures that do not reflect the national income level - measures beyond the poverty rate [5], [4]. The indicators should be both of monetary and nonmonetary character [6], [3].

The aim of the article is the construction of composite indicator for measuring poverty and differences in poverty among the EU Member States. Using the composite indicator not only the present position of the states is to be evaluated but also the development in the period 2004 – 2009.

Material and methods

Composite indicator

Anderson [2] speaks of two basic empirical approaches to making univariate welfare comparisons: through comparing indices and comparing distributions through stochastic dominance tests. The first approach was used in this paper. The selection of appropriate method of calculation was based on four requirements which are discussed in the paper [13]. These are as follows:

Simplicity

The criterion of simplicity reflects the evaluation of severity of the composite indicator's calculation. To meet the requirements without reserve, the user without knowledge of statistics should be able to calculate the result. That means only with the knowledge of calculation of mean. The ranking and the ratio method fulfill that. The range method can be accepted with the reservation. This method works with variation range, which is not a well known concept for a common user. Standardization method contains the variance in its result. It is possible to calculate the variances in MS Excel, but its interpretation and understanding can cause difficulties for the common user. That is why the standardization method is not in this evaluation considered as easy and understandable.

Interpretation

Sufficient interpretation of resulted value of composite indicator is an important aspect. This aspect is different in particular method. The ratio method is considered to be the most appropriate. We can easily comment which results are higher than average (which is higher than 1) and which results are below the average. We can even say by how many percent or how many times is the result of a certain region higher or lower than the average. Standardization and range methods are acceptable with the reservations. Utilization of standardization method is limited when the mean value is zero. When using range method, we do not calculate with the mean. Further, it is not possible to deduce which regions are higher than average and which are below the average. It is hard to relate results of other regions to the zero mean when using standardization method, especially when calculating the proportion. The interpretation of ranking method is not complicated; however there is information about primary values lost.

Differences reflection

When calculation the regional differences it is important to intercept and qualify these differences as well as it is possible. The results of ranking method depict the differences in results out of the focus. That is why we consider this method not suitable. All other methods are suitable with reservations. Each of them in a certain way lowers the degree of disparity and the influence of the distant values. The result of the ratio method depends on the distant indicator's values. They distort the height of the mean and also the value of the composite indicator. The standardization method is a bit more resistant against extreme values than the ratio method. The range method is even less sensitive to those values than the standardization method.

Applicability

All compared approaches were found to be applicable to the data in the regional development. All methods enable to summarize the data in different units and to create the final aggregate indicator. When calculating the ratio method there cannot be zero in the denominator which may be limitative.

According to adjusted requirements for the aggregate indicator, the ratio method based on

the median was chosen (see [13]). The resulted formula for computation is than written as follows:

$$CI_i = \frac{\sum_{j=1}^m y_{ij}}{m}, \text{ where } y_{ij} = \frac{x_{ij}}{\tilde{x}_{\cdot j}}, \quad (1)$$

where index i represents the region; $i = 1, \dots, 27$ and index j variable; $j = 1, \dots, m$; where m is number of variables; x_{ij} is original variable; $\tilde{x}_{\cdot j}$ is the median of the variable.

Indicators of poverty and social inclusion

There are various activities leading to set of indicators of poverty and living conditions. For example Gönner et al. [11] introduced a multidimensional model of poverty – Nested Spheres of Poverty (NESP). The authors defined three categories covering basic needs (such as food, health, housing or education) and individual capabilities (skills and physical condition to get out of poverty): **health, wealth and knowledge**.

The initiatives can be however dated much earlier. In 1990 the well-known measure of well-being Human Development Index (HDI) was introduced. The aim of the initiative was to create a single measure by combining indicators of life expectancy, educational attainment and income. It is an indicator that reflects three dimensions: health, education and living standards. Although this is an indicator that takes into account various dimensions of development, many authors, e. g. [17], [1], argue that it is a limited indicator. Ranis et al. [17] aimed to define categories of human development beyond HDI. They established 11 categories and examined the correlation between HDI and other indicators of human development. They found that HDI is poorly correlated with a range of important dimensions of life: mental well-being, environment, economic stability and others.

While our analysis is focused on the EU Member States it is necessary to introduce the activities in the EU. The discussion about indicators needed to measure well-being and poverty among EU States resulted in the adoption of set of indicators in 2000. These indicators are known as the Laeken Indicators. It is a core set of indicators of

poverty and social exclusion which are regularly produced for every EU country on a comparable basis. It is a set of 18 indicators covering income, work, education and health. The **Laeken indicators** cover wide range of topics including poverty rate, inequality of income distribution, life expectancy long term unemployment and others (for detailed information see e. g. [9]).

The discussion of the dimensions of poverty and indicators used to measure them continued. “The measures of income poverty within the Laeken Indicators are based on member specific poverty lines, that is, for each state the income threshold depends on the income distribution of the specific country and does not take into account inequality between

the Member States. This practice has become more problematic with the enlargement of the Union and the wide differences existing between the income distributions of old and new Member States” [5].

Bossert et al. [5] then argues that most of the indicators of human well-being are qualitative and that constitutes a limitation in methodological instruments to be used. In this case a counting approach (see [3]) is a possible solution. A counting measure of individual poverty is the number of dimensions in which a person is poor. This approach is used for assessment of material deprivation. Material deprivation is defined as an enforced lack of a combination of items depicting material living conditions, such as housing conditions, possession of durables, and capacity to afford basic requirements [12].

The European Union defined a set of indicators for the monitoring of the European strategy for social protection and social inclusion. In 2009 portfolio of indicators has been updated. Indicators can be divided into four groups:

- Overarching portfolio (14 indicators)
- Social inclusion portfolio (11 primary, 3 secondary indicators)
- Pensions portfolio (11 primary, 11 secondary indicators)
- Health portfolio (18 primary, 12 secondary indicators)

For the purpose of evaluation of poverty and social inequality the social inclusion indicators are to be used. For the social inclusion strand the aim is to

make a strong impact on the reduction of poverty and social exclusion by ensuring:

- access for all to the resources,
- active social inclusion of all, both by promoting participation in the labour market and by fighting poverty and exclusion,
- that social inclusion policies are well-coordinated and involve all levels of government and relevant actors (including people experiencing poverty) that they are efficient and effective and mainstreamed into all relevant public policies [8].

Indicators to be used for monitoring the social inclusion largely draw from the existing set of Laeken Indicators. As it was already mentioned the subgroup (social inclusion portfolio) consists of 11 primary and 3 secondary indicators. Primary indicators are then considered to be “the leading indicators which cover the broad fields that have been considered the most important elements in leading the social exclusion” [8]. Secondary indicators support these lead indicators by describing the problem more deeply or in other dimension. The European Commission [8] emphasizes that poverty and social exclusion are concept that encompasses **income, access to essential durables, education, health care, adequate housing or distance from the labour market.**

Many authors agreed poverty to be a multidimensional phenomenon. Our analysis is therefore based on a set of indicators following the Open Method of Coordination on Social Inclusion and Social Protection. For the analysis indicators of the social inclusion strand (Social inclusion portfolio) and indicators of the health and long term care strand (Health portfolio) were selected. While the new methodology for evaluation of social inclusion and poverty was introduced in 2009 some of the indicators are not available yet. Our analysis covers 13 indicators. Description of the indicators used is presented in the table No. 1.

Results and discussion

The ratio median method has been chosen as a method of composite indicator. Median is a robust characteristic of central location, its usage in the calculation enables more expressive differentiation of the resulting value of composite indicator. Median of each indicator is not defaced in the

calculation by distant observations as much as it is in the case of mean. It enables more outstanding differentiation of composite indicator.

The ratio method can be characterized by the formula (1).

As it is obvious from the table No. 2, Denmark achieved the best results in all tracked years. It is followed by Luxembourg and Netherlands. In 2009 these regions embodied better results in variables such as material deprivation rate; people aged 18 – 59 living in jobless households or healthy life years in absolute value at birth of male and females as well. Their composite indicator was markedly above the value 1 which indicated the median value. The ladder is closed by Bulgaria, Romania and Latvia which showed worse results in mentioned variables. Bulgaria and Romania embodied above-average results in the healthy life years in absolute value at birth. Romania and Bulgaria are mainly focused on agriculture and the engineering and on the production with low value added. According to strategically regional documents for years 2007 – 2013, both countries are supposed to focus on the entrepreneurial activity, the exploitation of brownfields and on the better cooperation of institutions of science and research with firms. Both countries are characterized by high poverty rate and high real poverty gap which has been also caused by worse qualifying structure; the regions have been trying to solve this problem by staff retraining. The biggest progress is perceptible between the years 2004 and 2009 in Netherlands, Luxembourg and Denmark. In terms of the tracked indicators, the smallest progress was accomplished in Latvia, Hungary and Bulgaria.

The position of the countries depicting the combination of the stage in certain year and the change in the certain period (table 2) can be digestedly characterized by so called **Diagram of the regional development** (figure 1). The countries in the quadrants leaders, stagnant and catching up can be considered as those with good developing potential. Dashed line for composite indicator in the year 2009 and also for composite indicator of change between the years 2004 and 2009 represents the mean value from the composite indicators of

Shortcut	Label
POV_RATE	At risk of poverty rate (cut-off point: 60% of median equivalised income after social transfers) - percentage of total population
REL_POV_GAP	Difference between the median equivalised income of persons aged 0+ below the at-risk-of poverty threshold and the threshold itself, expressed as a percentage of the at-risk-of poverty threshold
MAT_DEP	Material deprivation rate - Economic strain and durables dimension, 3 items or more ¹ - percentage of total population
EDU_LEAVER	Early leavers from education and training - Percentage of the population aged 18-24 with at most lower secondary education (their highest level of education or training attained is 0, 1 or 2 according to ISCED 97) and have not received education or training in the four weeks preceding the survey
JOBLESS_HOUSE_18M ORE	People aged 18-59 living in jobless households: share of persons aged 18-59 who are living in households where no-one works
LONG_UNEMPLOY	Total long-term unemployed population (≥ 12 months' unemployment, ILO definition) as a proportion of total active population aged 15 years or more
POV_TRESHOLD	At-risk-of-poverty thresholds in PPS, single person
LE_BIRTH_FEM	Life expectancy at birth, females
LE_65_FEM	Life expectancy at 65, females
LE_BIRTH_MALE	Life expectancy at birth, males
LE_65_MALE	Life expectancy at 65, males
HLY_FEM	Healthy life years in absolute value at birth, females
HLY_MALE	Healthy life years in absolute value at birth, males

¹Share of population living in households lacking at least 3 items among the following 9 items: The household could not afford: 1) to face unexpected expenses, 2) one week annual holiday away from home, 3) to pay for arrears (mortgage or rent, utility bills or hire purchase installments), 4) a meal with meat, chicken or fish every second day, 5) to keep home adequately warm, or could not afford (even if wanted to): 6) a washing machine, 7) a color TV, 8) a telephone, 9) a personal car.

Table 1: Indicators used for the analysis.

Country	CI 09	Rank	CI 04-09	Rank	Country	CI 09	Rank	CI 04-09	Rank
Denmark	1,587	1	1,025	3	Malta	0,995	15	0,987	22
Luxembourg	1,502	2	1,030	2	Poland	0,982	16	1,011	9
Netherlands	1,466	3	1,038	1	Slovakia	0,973	17	1,001	13
Cyprus	1,399	4	1,007	10	Italy	0,951	18	0,994	16
Sweden	1,379	5	1,024	4	Spain	0,929	19	0,986	23
Austria	1,301	6	1,014	6	Greece	0,914	20	0,989	19
Finland	1,234	7	1,018	5	Estonia	0,881	21	1,002	12
Slovenia	1,181	8	1,001	14	Portugal	0,881	22	0,981	24
Czech Rep.	1,181	9	1,013	7	Hungary	0,862	23	0,969	26
United Kingdom	1,070	10	0,991	17	Lithuania	0,860	24	0,989	20
France	1,056	11	1,001	15	Bulgaria	0,805	25	0,973	25
Belgium	1,039	12	1,012	8	Romania	0,792	26	0,987	21
Germany	1,023	13	1,006	11	Latvia	0,758	27	0,964	27
Ireland	1,012	14	0,991	18					

Table 2: Composite indicator – results.

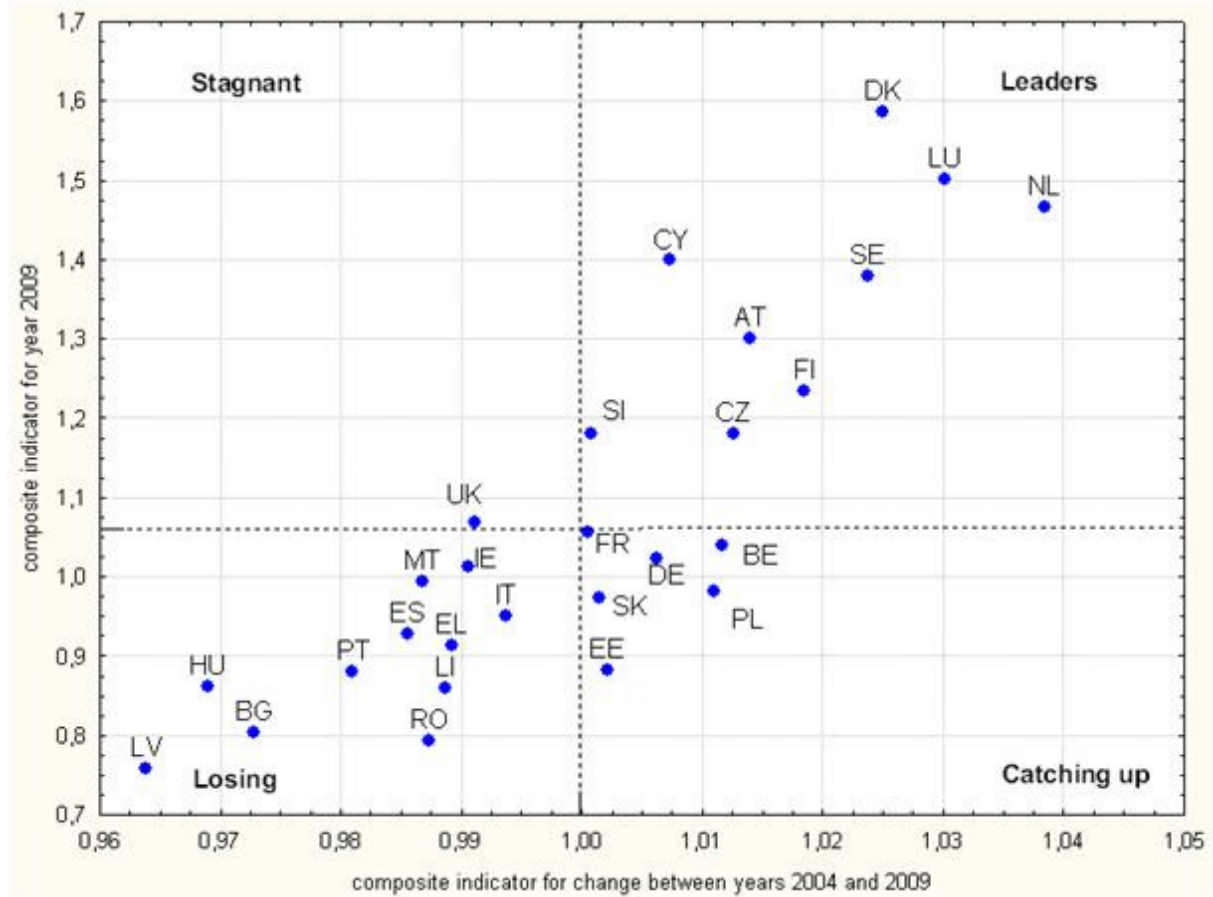


Figure 1: Diagram of the regional development.

observed countries. The best results embody those leaders where there has been the positive development provided in the years 2004-2009 as well as above-average value of composite indicator 2009. These are above all Denmark, Netherlands and Luxembourg. In the light of the change they made huge improvement in the period 2004-2009. The above-average height of composite indicator for the year 2009 and below-average improvement in the period 2004-2009 are characteristic for United Kingdom, the stagnant quadrant. France, Slovakia, Germany, Estonia, Belgium and Poland can be considered as the Catching up. The quadrant Losing contains countries which usually reach below-average values in terms of single years, but even in terms of a change of tracked time series, the countries remain to be under-average.

Conclusion

Methodical instrument for complex evaluation of poverty and the differences in poverty among regions has been suggested in this work. It has been verified on selected poverty indicators. The suitable method for the evaluation of position of the regions

has been chosen, the method has been modified by the authors to suit even better the primary requirements. The important base for the determination of the composite indicator is the quantity of data, which is important to gather for all primary indicators. The missing indicators lower the quality of analysis. Using the values of composite indicators for the year 2009 and the change between 2004 and 2009 the diagram of regional development which enabled the categorization of the states was created.

The utilization of the methodological instrument for the complex evaluation of the poverty is universal and is not limited by the type of a country or region. The suggested methodology enabled to carry out a comparison of country collectively, on base of all selected indicators and separately according to topical indicator groups. Differences among particular countries were quantified with the help of composite indicators and based on the results ranking of countries was found.

A situation analysis in selected countries with the help of the composite indicator can be used in creation of development programs aiming to a

stabilization and decrement of poverty. The identification of differences among countries and the determination of the certain rank of countries

can be beneficial for the definition of trouble shooting countries and better support aiming.

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