

ASSESSMENT OF MATERIAL LIVING CONDITIONS BY THE MEANS OF INTEGRATED INDICES IN THE VISEGRAD GROUP

Šoltés V., Nováková B.*

Abstract: Assessment of quality of life (QOL) has been recently subject to extensive research and discussion. According to many authors, QOL includes different aspects of life which implies its multidimensional character. The main aim of the paper is to provide assessment framework for the QOL dimension of material living conditions and to calculate integrated indices of material living conditions quality in the Visegrad Group (V4). We use Additive Ratio Assessment (ARAS) method to calculate partial and integrated indices in the V4 and analyse its development over the period of 2005–2013. Analysis of dynamics of material living indices point out differences and facilitate comparison between the V4. Analytical framework of material living conditions assessment can help to develop policy and management recommendations which improve material living conditions and consequently QOL.

Key words: quality of life, material living conditions, multi-criteria methods, additive ratio assessment method, integrated index

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Introduction

According to Sen (2004), material resources are only the facilities which can be finally transformed into well-being, in accordance with individual values, preferences, free will and capabilities. Although economic conditions do not reflect QOL intrinsically, they can provide a framework to measure the potential of individuals and households to achieve and ensure their own self-defined well-being. We should evaluate material living standards not only in monetary terms, but rather in this wider context (Eurostat, 2015).

There is a huge technological progress and innovation in management and conditions of life level which yields an enormous influence over economic activity. There exists an increasing complexity and interplay between all issues associated with property management decisions (Langston et al., 2008). The economic performance of countries is often confronted with the social development of society and QOL of its inhabitants. Increasing of QOL is therefore desirable trend and should be assessed inside and also between countries.

QOL represents complex, multi-dimensional concept, for which there is no uniform, universally accepted definition (Ira and Andráško, 2007; Das, 2008). Many disciplines, from economics, theology, psychology, medicine, up to

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geography focus on QOL issues. QOL reflects the difference between the hopes and expectations of the individual and of the individual's present experience (Fayers and Machin, 2000). For better understanding and assessment, it is very important to define the explored area of QOL, and also appropriate selection of suitable indicators (Murgaš, 2009; Gavurová, 2011; Pastor et al., 2015). In the terms of QOL assessment, there can be distinguished between three dimensions: the objective QOL which evaluates objective conditions of the life of people who are not the subject of psychological research; the subjective QOL based on the judgment and evaluation of the conditions of life; the subjective well-being including expressed emotional system and assessment of the conditions of our lives (Džuka, 2004).

QOL is characterised as a broader concept than economic production and living conditions. It could include a number of factors that affect our evaluation of life above its material page (Stiglitz et al., 2009). Appropriate research studies refer that the concept of QOL has been investigated from different aspects which imply its multidimensional character (Dima et al., 2014; Khaef and Zebardast, 2015; Šoltés and Gavurová, 2015). Selection of proper indicators is very important and influential stage of managerial decision making process. However, there is no standard method for selection of indicators (Diener, 1995). A development of multidimensional indicators of QOL is recommended in Eurostat report (2011). It is built on the recommendations by Stiglitz et al. (2009). Authors of the report recommend multidimensional measurement of QOL with focus on nine dimensions, namely: Material living conditions, Productive or main activity, Health, Education, Leisure and social interactions, Economic and physical safety, Governance and basic rights, Natural and living environment and Overall experience of life. Assessment of this different life dimensions complement indicator of GDP which is traditionally used as the measure of economic and social development. The first eight of these dimensions evaluate the functional capabilities of citizens in filling the self-defined well-being. The last one is devoted to measurement of the subjective perception of own life and well-being.

QOL indicators and indices which are created from them are established to identify the situation and development in the economic, demographic, social, environmental and other areas. QOL indicators often serve as an input for calculation of the overall aggregate index. Aggregate index is a dimensionless number that has many advantages such as transparency, possibility of simple comparisons, and aggregation of various values. On the other hand, one of the frequent disadvantages is distortion of results or exclusion of relevant variables. Also significant is the issue of relevance and individual choice of weights which is often subjective and greatly influenced by the opinion of the researcher (Heřmanová, 2012). Warner (2006) deals with the social QOL indicators and gives also guidelines to define meaningful and useful QOL indicators. Many indices have been calculated in various research studies (e.g. Weziak-Bialowolska, 2014; Chan et al., 2005; Čulková et al., 2015). According to OECD, composite indicators compare country

performance and represent a useful tool in policy analysis and public communication (OECD, 2008a). They serve for simple comparisons of countries that can be used to demonstrate complex and sometimes elusive issues in different fields, e.g. economy, society or environment. On the other hand, composite indicators can offer misleading policy messages if they are badly constructed or misinterpreted.

Indicators of Material Living Conditions in Eurostat

Material living conditions refer to an individual's standard of living as expressed through three different sub-dimensions: income, consumption and material conditions (Eurostat, 2015). The living standard of people measured in both relative (in comparison to other people) and in absolute conditions (their satisfaction with life necessities) reflects whether people live in poverty (Weziak-Bialowolska, 2014). Eurostat recommends using objective and also subjective indicators to complement the assessment of certain domain, because both are important in the context of QOL (Eurostat, 2011).

Firstly, we use median equivalised net income which demonstrates sharing of individuals' incomes in one household. It is defined as the sum of all income from all different sources acquired by all members of the person's household, divided by an equivalised household size in accordance with a standard scale, while taking into account the composition of the household in terms of number of adults and children (Eurostat, 2015). Eurostat uses an equivalisation factor calculated according to the OECD approach. It assigns a weight of 1.0 to the first person aged 14 or more, a weight of 0.5 to other persons aged 14 or more and a weight of 0.3 to persons aged 0-13 (OECD, 2008b). To avoid inaccuracies caused by the extreme outliers across population in different groups, it is better to use median instead of mean. Eurostat uses version of the indicator calculated after social transfers. We use income expressed in purchasing power parities (PPPs) converted in purchasing power standard (PPS) units (regardless of each country's price level) to ensure comparability in cross-country analyses.

Aspect of income differences and inequality is represented in indicator of income quintile share ratio (S80/S20 ratio). It is defined as the proportion of the total income received by the top quintile (i.e. the 20% of the population with the highest income) to that received by the bottom quintile (i.e. the 20% of the population with the lowest income). This measure is useful in comparison of inequality over time or across countries.

Concept of poverty can be perceived differently in different contexts (Callander et al., 2012). Poverty threshold is a point which divides individuals into the poor (level of his individual welfare does not exceed fixed poverty threshold) and not poor (exceeds fixed poverty threshold) (Želinský, 2014). There are several approaches for determining the poverty threshold. Eurostat recommends a relative approach where income and including social transfers reflect the concept that poverty is related to social exclusion. Risk of poverty is defined in comparison with

the overall income level in each society. Joint Report by the Commission and the Council on social inclusion from 2004 describes it as economic conditions in which an individual do not have enough money to completely participate in the society. Therefore a person's risk-of-poverty threshold is conventionally set at 60% of the national median equivalised disposable income. It is variable both between countries and also inside country and it is even expressed in PPS. We have to be aware when interpreting the numbers, e.g. country with a higher proportion of population at risk of poverty may indicate significantly higher overall real income actually for the population at risk of poverty. Another at risk indicator of poverty (AROP) which uses the monetary thresholds levels of 2008 is updated for inflation and better reflects the effects of the crisis, namely poverty perceived in comparison to previous standard of living (Eurostat, 2015).

Assessment of poverty and social exclusion can be also subjective. It concerns self-appraisals based on the implicit criteria, e.g. someone's subjective feeling of his living standard. Objective and subjective evaluation by individuals do not automatically correspond (Veenhoven, 2006). Report of Task Force about Multidimensional measurement of the QOL recommends using both objective and subjective indicators to complete assessment of all 9 dimensions of QOL. Special emphasis should be put in comparing responses to subjective and objective questions, and also to comparison of the countries (Eurostat, 2011). Self-reported difficulty to make ends meet is indicator which shows households experienced feeling of poverty (Eurostat, 2015). Townsend (1987) defines state of material deprivation as a limited access to recourses when people cannot afford to consume goods and services which are typical for society where they live. Materially deprived people are excluded from minimally accepted way of life of society because of insufficient resources (e.g. Layte et al., 2001). Eurostat understands material deprivation as a state of economic strain characterised as the enforced inability to afford representative material standards (e.g. unexpected expenses; a one-week annual holiday away from home), considered by most people to be desirable or even necessary to lead an acceptable life. Severe material deprivation rate is therefore calculated as the proportion of population confront with the enforced inability to afford a certain amount of determined items (Eurostat, 2015). Achieved level of education is one of the most important determinants on risk of being materially deprived (Abdallah and Stoll, 2012). Because housing conditions have a considerable effect on overall QOL, indicators reflecting them also complement assessment of material living conditions (e.g. Potter and Cantarero, 2006). EU-SILC questionnaire includes questions about objective existence of structural problems with dwelling, overcrowding and basic amenities.

Data and Methodology

For our analysis and calculations of indices we used data from Eurostat database, section Cross-cutting topics: QOL: Material living conditions for the available time period of 2005-2013. The data used in this section are primarily derived from EU-

SILC European Survey on Income and Living Conditions (EU-SILC) in the EU countries. Indicators measuring objective and subjective material living conditions used in the analysis are summarized in the Table 1.

Table 1. Indicators measuring objective and subjective material living conditions

Indicator	Units
Median equivalised net disposable income	purchasing power standard units (PPS)
Income quintile share ratio (S80/S20)	%
At risk of poverty rate by poverty threshold and anchored at a fixed moment in time (2008)	% of total population
Inability to make ends meet (proportion of households making ends meet with great difficulty)	% of total population
Severely materially deprived people	% of total population
Share of total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of floor	% of total population

To evaluate the development of indicators within the first QOL dimension (material living conditions) recommended by Eurostat we used integrated indices which we have calculated by the means of Additive Ratio Assessment (ARAS) method. This method belongs to multi-criteria methods (management, decision making methods). The integrated indices of material living conditions can be calculated for our comparative evaluation of the V4 in the terms of QOL. In this part we describe the ARAS method based on Zavadskas et al. (2010) and Štreimikiene and Baležentis (2013).

In the first stage, a multiple criteria decision making matrix X is formed for each index. It consists of m rows (countries) and n columns (certain time periods):

$$X = [x_{ij}]_{m \times n} \quad (1)$$

where i denotes the i -th country ($i = 1, 2, \dots, m$), j stands for the j -th time period ($j = 1, 2, \dots, n$), and x_{ij} is value representing the performance value of the i -th country in j -th time period. In our case, we have considered different V4 countries as alternatives and different time periods as criteria separately for each material living conditions indicator. The values of the ideal solution can be defined either by putting in the pre-known optimal values of a certain phenomenon, or by selecting the maxima for benefit criteria (minima for cost criteria).

In case when optimal value of j criterion is unknown, then: $x_{0j} = \max x_{ij}$, if $\max x_{ij}$ is desirable trend; and, $x_{0j} = \min x_{ij}^*$ if $\min x_{ij}^*$ is desirable trend.

In the second stage the input values of all criteria are normalized. Zavadskas et al. (2010) used total ratios to the optimal value for that purpose. The criteria whose desirable values are maxima are normalized by the means of next formula:

$$\bar{x}_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \quad (2)$$

The criteria whose desirable values are minima are normalised by the means of next formula:

$$\bar{x}_{ij} = \frac{(1/x_{ij})}{\left(\sum_{i=0}^m 1/x_{ij}\right)} \quad (3)$$

After this stage, criteria are transformed to dimensionless numbers in closed interval [0, 1] and they can be compared.

In the third stage each criterion can be weighted according to its significance. Normalized-weighted values of all time periods are calculated by the means of next formula:

$$\hat{x}_{ij} = \bar{x}_{ij} w_j; i = \overline{0, m} \quad (4)$$

where \hat{x}_{ij} is the weighted normalized value of the j -th time period for the i -th country. Sum of weights should be as follows:

$$\sum_{j=1}^n w_j = 1 \quad (5)$$

In our case, we did not weight the time periods and we attributed equal weights to all them which virtually implied that no specific weight vectors were used.

In the last stage we calculated material living conditions integrate index which consists of 6 partial indices represented by 6 matrices A, B, C, D, E, F, and is computed by the means of the next formula:

$$I_{ij} = A_{ij} + B_{ij} + C_{ij} + D_{ij} + E_{ij} + F_{ij} \quad (6)$$

where: I_{ij} is integrated index of material living conditions at the time period j and $A_{ij}, B_{ij}, C_{ij}, D_{ij}, E_{ij}, F_{ij}$ are the values of partial indices for i -th country in the j -th period.

Finally, we were able to analyse and compare the values of integrated indices of material living conditions for the V4 in the time period of 2005-2013. The highest the value of index is, the better the performance of country in analysed time period. Within each country, equal weights were utilised for different indices of material living conditions, therefore no specific weight vectors were used.

Dynamics of Integrated Indices of Material Living Conditions in the V4

Dynamics of calculated integrated material living conditions indices (according to formula 7) in the V4 during analysed time period is presented in Figure 1. The indices were computed using data from Eurostat presented in previous chapter

in graphical analysis. Partial indices for every indicator (A, B, C, D, E, F) in i -th country and j -th time period were calculated by applying formula 3 in cases where increase is desirable trend or formula 4 in cases where increase is undesirable trend in negative form, e.g. proportion of severely materially deprived people or S80-S20 ratio, to ensure that growth of indices represents the higher material living conditions quality.

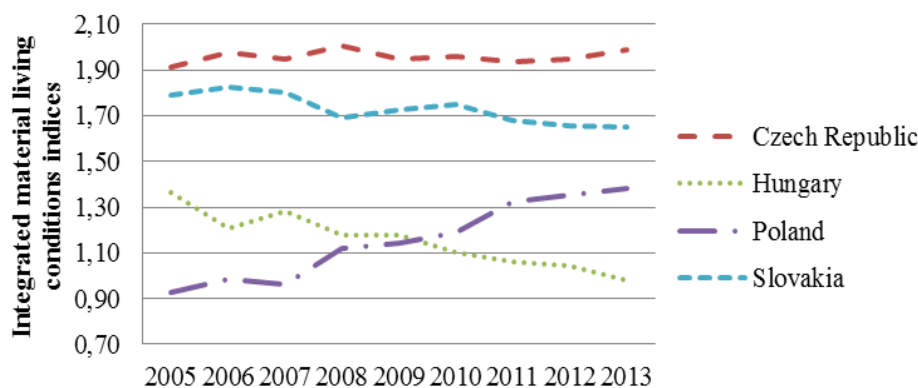


Figure 1. Development of integrated material living conditions indices in the V4 (2005-2013)

We can see in the Figure 1 that the highest integrated indices of material living conditions were calculated in the Czech Republic. Slovakia was ranked second in overall assessment during the whole analysed period. Since the second half of the period, Hungary had the lowest values of integrated indices. On the other hand, Poland recorded the improvement of material living conditions indices and has moved from the position of the last country (at the beginning of the analysed period) to the third place. Values of correlations coefficients confirmed growth of indices in Poland (value about 0.98), decline of indices in Hungary and Slovakia (values below -0.88) and stagnation in the Czech Republic (value about 0.2). Compared with the findings of OECD Better Life Initiative (OECD, 2015), Hungary had one of the lowest values of household disposable income per capita in the OECD, and also one of the lowest values of average earnings. However, regional inequalities in income were smaller in Hungary than in the Czech Republic and Slovakia. Regional inequalities in income in Poland were larger than in the Czech Republic.

When we look at dynamics of integrated indices in more detail (see Table 2), the Czech Republic achieved the first position in the V4 mainly due to the best values almost in all partial indices except for the last partial index concerning housing conditions. On the other hand, Slovakia achieved second place after improvement in several areas of this dimension, particularly in growth of median equivalised net income, decrease in proportion of population at risk of poverty

anchored at a fixed moment, small decrease of proportion of severely materially deprived people and the lowest proportion of people with housing problems. Hungary recorded the deterioration almost in all analysed indicators of material living conditions and only slight growth of income indicator which took it to the last position in the V4 at the end of analysed period. Poland recorded relative improvement in dimension of material living conditions from the last to the third place. There was significant growth of income indicator and also decrease in poverty and material deprivation indicators which contributed to the improvement.

Conclusions

We calculated partial and integrated indices of material and living conditions and analysed their dynamics over time period 2005-2013 in the V4 countries. Indices were calculated by the means of ARAS method which belongs to managerial methods with various implications in decision making process, e.g. management, sustainability assessment of country (Štreimikiene and Baležentis, 2013), selection of effective alternative of structures, technologies, investments (Zavadskas et al., 2010), etc. In our paper we have focused on application of ARAS method in QOL assessment which enables us to easily compare and rank the V4 in terms of material living conditions quality.

The highest integrated indices of material living conditions quality were obtained for the Czech Republic mainly due to the best values almost in all partial indices, except for index of housing conditions. Slovakia was at the second place and recorded the improvement in several areas of this dimension. Hungary recorded worsening of material living conditions and consequently, at the end of analysed period was ranked at the last place from the V4. On the other hand, Poland achieved relative improvement mainly due to increase of income and decrease of poverty and material indicators.

Indicators of material living standards are closely associated with real household income, consumption and distribution of poverty. This point of view may provide more detailed analysis into this dimension of QOL. Based on such analysis could be developed management and policy recommendations to improve material living conditions not only at national level but also at regional level and among different social groups which can lead to higher QOL in the countries and regions.

On the other hand, it is important to take into consideration that assessment of material living conditions is complex issue in which larger amount of relevant indicators is needed to avoid misleading information resulting in ineffective policy or management recommendations. However, aggregate information could be sometimes misleading in case of large differences between various social groups and households. Even though value of integrated index in country is relatively high, there can be still significant groups of people suffering material deprivation or stating low satisfaction with their standard of living (Eurofound, 2015).

Another aspect which could affect QOL and is important for future research is insecurity of future and fear of losing required standard of living level. Certain

social groups (e.g. retired) can be vulnerable more than others. Therefore, deeper analysis of different social groups which was beyond the scope of this article could be useful.

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OCENA MATERIALNYCH WARUNKÓW ŻYCIA PRZY POMOCY ZINTEGROWANYCH WSKAŹNIKÓW W GRUPIE WYSZEHRADZKIEJ

Streszczenie: Ocena jakości życia (QOL) została ostatnimi czasy przedmiotem rozległych badań i dyskusji. Zdaniem wielu autorów, QOL obejmuje różne aspekty życia, które zakładają jej wielowymiarowy charakter. Celem artykułu jest przedstawienie ram oceny dla wymiaru QOL materialnych warunków życia i obliczenie wskaźników jakości materialnych warunków życia w Grupie Wyszehradzkiej (V4). Używamy addytywnej metody oceny wskaźników (ARAS), aby obliczyć wskaźniki cząstkowe i zintegrowane w V4 i przeanalizować jej rozwój w okresie 2005-2013. Analiza dynamiki indeksów materialnych warunków życia podkreśla różnice i ułatwia porównanie pomiędzy krajami V4. Analityczne ramy oceny materialnych warunków życia mogą przyczynić się do rozwoju polityki i zaleceń dotyczących zarządzania, które poprawią materialne warunki życia, a w konsekwencji jakość życia (QOL).

Słowa kluczowe: jakość życia, materialne warunki życia, metody wielokryterialne, addytywna metoda oceny wskaźników, wskaźnik zintegrowany

評估的生活與維謝格拉德集團的綜合指標材料

摘要：生活質量（QOL）的評估最近一直受到廣泛的研究和討論。據許多學者，包括生活質量的生活，這意味著它的多面性的不同方面。本文的主要目的是為物質生活條件的生活質量維度的評估框架，並計算維謝格拉德集團（V4）在物質生活條件質量綜合指數。我們使用添加劑比考核（ARAS）的方法來計算部分索引和整合在V4及以上的 2005 -2013 年期間分析其發展。物質生活指數的動態分析 指出的 差異和促進V4之間的比較。物質生活條件的評估分析框架可以幫助制定政策和管理的建議，這些建議改善物質生活條件和生活質量。因此。

關鍵詞：生活質量，物質生活條件，多標準的方法，添加劑比考核方法，綜合指數