MEASURING WELFARE IN ROMANIA: ALTERNATIVE AND COMPLEMENTARY MEASURES TO GROSS DOMESTIC PRODUCT

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ABSTRACT
The study presents alternative measures for measuring the welfare of a country in the context of identifying relationships generated by the impact of changes in the income level, measured by gross domestic product (GDP), related to other welfare, measured by the Happy Planet Index (HPI). The analysis was conducted in Romania, during the period from 2012 to 2016. The research methodology involves simple linear regression and welfare descriptive variables such as GDP, GDP/capita, HPI and its subcomponents' indicators, namely life satisfaction, life expectancy and ecological footprint. Identification of aspects that have an impact on the welfare of citizens allows to compare levels of wellbeing experienced worldwide and to identify the main areas at the national level on which improvements can be made. The results indicate that, although there is no correlation between GDP and HPI, GDP/capita has great influence on both life satisfaction and life expectancy. Also, GDP has influence on the ecological footprint. Given these considerations, the main conclusion of the research is that, although the level of welfare, quantified using GDP, changes positively, this change is due to the increased life expectancy, life satisfaction, reduced ecological footprint rather than to changes in income levels.
KEYWORDS: *indicators, GDP, HPI, life satisfaction, welfare.*

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1. Introduction

Research conducted in 2011 by the Organisation for Economic Co-operation and Development (OECD) showed that the Gross Domestic Product (GDP) of a country does not provide a complete picture of citizens' welfare, because it does not accurately measure economic and social progress in the long term, i.e., it no longer proves its utility as a completely objective indicator. Recent studies have shown that citizens' welfare depends on other factors, mainly subjective one. Therefore, it is reasonable to approach alternative indicators, complementary to GDP, which include both aspects of subjective and objective nature. One such indicator is the Happy Planet Index (HPI). This index quantifies the welfare level on three different levels via the sub-indicators of life satisfaction, life expectancy, and ecological footprint.

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The need to address an indicator complementary to GDP was also mentioned under the initiative called "Beyond GDP" organised by the European Commission in 2007, in partnership with the European Parliament, the Club of Rome, OECD and the World Wildlife Fund for Nature (WWF). The conference was organised seeking to overcome the "monopoly" imposed by GDP in evaluating and comparing countries and regions. Although GDP represents a comprehensive indicator of economic growth and social development, it does not account for citizens' equality, health or satisfaction, and it does not relate to the environmental sustainability. Therefore, HPI index can be used in correlation, to measure the progress of countries.

The overall research objective of this paper aims to present alternative indicators for measuring the welfare of a country in the context of identifying relationships generated by the impact of changes in income levels, measured by GDP, related to other welfare aspects, measured by HPI. Welfare aspects are highlighted using HPI subcomponents, and income levels are quantified using GDP or GDP/capita.

The research methodology is based on the statistical analysis performed through simple linear correlation. The limitations of the paper are related to the methodology, as no supplementary methods could be used due to the fact that the data set was limited to a relatively short period of time referring to one country only.

Identifying aspects that have an impact on the welfare of citizens could allow the provision of public goods and services that would ensure a high degree of individual and collective welfare. Moreover, citizens are not concerned about an increase in GDP itself, but care for happiness they receive from goods and services they consume. The problem analysed in this study refers to the fact that nowadays, although GDP is growing, the social welfare is not increasing. Therefore, alternative well-being and environmental indicators must be considered along with economic growth in order to measure the societal welfare. The objective of the paper is to identify to what extent GDP and GDP/capita, indicators of economic growth, influence life satisfaction, life expectancy, ecological footprint, and welfare indicators.

Given these considerations, the first part of the paper summarises the main conceptual aspects concerning the citizens' welfare and methods of approach. Then the paper continues with the exposure of methodology used to develop the empirical study, as well as the main results obtained. At the end there are presented the conclusions of the conducted study.

2. Literature

The economic implications of welfare have been the subject of numerous debates at international level. Some authors as B. S. Frey and A. Stutzer (2002) stated that the welfare felt by citizens has a significant role in economic results. Also, according to C. Graham et al. (2004), if a person shows a high level of welfare, that individual will be more productive and effective, and thus, will get an improvement in both personal income and health.

Internationally speaking, the difficulty regarding quantifying welfare and comparing its level with the well-being felt is a challenge in its own way, mainly due to the fact that recent studies have revealed that the GDP of a country does no longer provide a complete picture of its citizens' welfare. Famous economists, Nobel Prize winners, such as Kenneth Arrow, Simon Kuznets, Daniel Kahnedman, Robert Solow, Amartya Sen and Muhammad Yunus (Wasselink et al., 2007) stated that GDP has many limitations in presenting all aspects of the citizens' welfare: *i) focus strictly on production, ii) not to include issues such as health and wishes of citizens, educational level or natural resources, iii) lack of monitoring all aspects of welfare.*

Moreover, empirical studies presented by B. Bleys (2005), Y. Goossens et al. (2007), J. E. Stiglitz et al. (2009), P. Scheplemann et al. (2010) revealed some limitations of GDP, i.e., the simplicity of its calculation, and that includes only objective factors impacting human welfare.

On the other hand, we find a number of supporters of GDP, including Paul Samuelson (1999), who argued that GDP is one of the most important discoveries of the 20th century, it provides politicians valuable information on economic key-goals. The same point of view was supported by Joe Grice (2013).

Due to the different points of view on the ability of GDP to fully capture all aspects of welfare, researches have revealed a number of indicators that go beyond GDP: HPI (Happy Planet Index), HDI (Human Development Index), EPI (Environmental Performance Index), and Ecological impact.

In order to make a reductionist approach, the present paper presents HPI. First mentioned by N. Marks et al., (2006), HPI was introduced in July 2006 by the New Economics Foundation (NEF). The calculation of this index uses both *subjective elements*, such as *life satisfaction* and *objective elements* such as *ecological footprint* and *life expectancy*. The utility of the index is supported by numerous authors, among which we mention R. Veenhoven (2007).

Unquestionably, studies have not stopped here, at simply identifying ways of assessing welfare. Several authors have tried to find to highlight the relationships that these indicators of welfare measuring develop, in order to present the most important aspects on which public policymakers can bring improvements to the process of adopting and implementing public policies.

E. Proto et al. (2013) identified, using linear regression, the existence of correlations between GDP or GDP / capita and life satisfaction, life expectancy and ecological impact (HPI sub-indicators). The research was conducted on 14 European Union countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK) and revealed that life satisfaction improves considerably with GDP changes for countries with low income. For countries with a high level of income, life satisfaction shows a tendency to decrease, once decreases in GDP happen.

Regarding Romanian reality, O. R. Lobont (2013) states it is specific the need to pay special attention to social policies, particularly those on social cohesion, equality of chances and uniform distribution of revenue. To increase transparency in the decision-making process and the efficiency of governance, public participation should be permanently embedded, or permanent involvement of civil society in decision-making (Lobont, Moldovan, 2014). Therefore, the level of happiness of the plenipotentiary partner in the public decision process becomes a precondition for the public decision-maker.

The essential contribution that this research brings in the welfare area of study, directly relevant to public policy, is that it specifies both areas and the factors that can significantly improve citizens 'quality of life for a country that went through a series of political reconfigurations from the economic and social point of view, as it is the case of Romania.

3. Empirical analysis

The research methodology applied aimed to test the correlation between the following variables: *(i) GDP and HPI* and *(ii) GDP and GDP/capita and HPI subcomponents: life satisfaction, life expectancy, and ecological footprint.*

The correlations between the variables were realised with Excel, through the regression function, and it was aimed to determine the statistical correlation and determination coefficients. The analysis was realised in the Romanian context, during 2012 and 2016. The data used in the analysis was limited to this short period of time, which constituted a limitation from the methodological point of view, as no other correlation methods are suitable for a small dataset. When a sample is too small, it does not satisfy the cointegration and causality tests proving a conflict in the results. For this reason, testing for Granger causality was not possible in this study.

Several methodological explanations regarding the dataset used are needed before presenting the results. First of all, the formula for happy planet index is measured as follows:

$$HPI = \frac{Life\,satisfaction \times Life\ \ expectancy}{Ecological\ \ footprint} \tag{1}$$

Computing the HPI over a period of time longer than the one proposed in this paper was obstructed due to a degree of novelty and lack of statistical data on life satisfaction and ecological footprint. The statistical values of HPI are available on the Happy Planet Index website, being centralised by the New Economics Foundation.

The first subindicator, "Life satisfaction", was quantified by means of ad-hoc surveys addressed to individuals in order to determine individual satisfaction on life. The data used in this study were obtained from the World Database of Happiness. Survey respondents were asked the following question: "How satisfied are you regarding your life?" The responses were given on a Likert-scale, from 0 to 10, ranging from "not at all" to "very" satisfied (Veenhoven, 2008). For the years about which the World Database of Happiness does not provide data, the complementary source was the Gallup World Poll.

The second subindicator, "Life expectancy", is an estimating date, based in the social, economic and environmental conditions of one country, representing the average number of years that a new born is expected to live, considering the mortality rates nowadays.

The third subindicator, "Ecological footprint", represents a measuring method for the point in which the ecological demand of human activities exceeds the biosphere capacity to provide goods and services. The main source for this data was the Global Footprint Network.

The source for GDP and GDP / capita data is the World Bank, with values expressed in $.

The data used in this analysis is presented in Table 1.

Table 1. Values of HPI and GDP subcomponents indicators

Year	Life satisfaction	Life expectancy	Ecological footprint	Happy Planet Index	GDP (bn.$)	GDP / capita ($/capita)
2012	5.2	74.6	2.7	42.2	171.67	8518.02
2013	5.2	75	2.3	40.1	191.55	8851.96
2014	5.7	75	1.4	37.7	199.49	9158.52
2015	5.8	75	1.4	30.1	177.95	9530.66
2016	5.5	75	1.4	28.8	188.71	9507.33

Source: the authors' calculations based on the data presented by The Gallup World Poll, World Database of Happiness, World Health Organization, United Nations, Global Footprint Network and World Bank.

The simple linear model studies the connection between the factor variable *x*, and the resulting variable y, using a stochastic function of the form:

$$y = \alpha + \beta x + \boldsymbol{\varepsilon} \quad (2)$$

Which makes the general formula for this analysis to be:

$$HPI = \alpha_1 + \beta_1 * GDP + \varepsilon_1, \quad (3)$$

Where:

- HPI represents the dependent variable;
- GDP represents the independent variable;
- α_1 represents the value of HPI when GDP has 0 value (with no relevance on the model);
- β_1 represents the regression slope, and it shows the change in the value of HPI when GDP varies with one unit;
- ε_1 represents other factors that were not quantified in the model, but have an impact on HPI.

The specific formulas used were:

$$Life\ satisfaction = \alpha_2 + \beta_2 * GDP/capita + \varepsilon_2, \quad (4)$$

Where:

- Life satisfaction is the dependent variable;
- GDP/capita is the independent variable;
- α_2 represents the value of Life satisfaction when GDP / capita is 0 (it has no relevance to the model);
- β_2 is the regression slope, being the change in the Life satisfaction value when the GDP / capita changes with one unit;
- ε_2 reflects other non-quantified factors that have an impact on Life satisfaction.

$$Life\ expectancy = \alpha_3 + \beta_3 * GDP/capita + \varepsilon_3, \quad (5)$$

Where:

- Life expectancy is the dependent variable;
- GDP / capita is the independent variable;
- α_3 represents the value of Life expectancy when GDP/capita is 0 (with no relevance to the model);
- β_3 represents the regression slope, indicating the change in Life expectancy value when the GDP / capita changes with one unit;
- ε_3 represents the value of other factors which were not quantified in the model, having an impact on life expectancy.

$$Ecological\ footprint = \alpha_4 + \beta_4 * GDP + \varepsilon_4, \quad (6)$$

Where:

- Ecological footprint is the dependent variable;
- GDP is the independent variable;
- α_4 represents the value of Ecological footprint when GDP is 0 (with no relevance to the model);
- β_4 is the regression slope, and it shows to what extent the Ecological footprint changes with one unit change in GDP;
- ε_4 represents other factors which were not cuantified in the model but have an impact on Ecological footprint.

The main results obtained were analysed based on the correlation coefficient returned, and are presented in Table 2. In the correlation analysis of life satisfaction and life expectancy, we used the GDP / capita. The reason for this is that, as stated by Mankiw (2001), unlike GDP, GDP / capita provides a more accurate picture on welfare.

The correlation between GDP and HPI is highlighted in Figure 1. There is no evidence of a statistically significant correlation between GDP, as welfare indicator, and Happy Planet Index, which reflects an overall effect of the subindicators that will also be analysed separately.

The correlations between life satisfaction, life expectancy and GDP/capita are illustrated in Figure 2 and Figure 3, while the influence of changes in GDP on ecological footprint is presented in Figure 4. The results illustrated show that higher levels of GDP / capita are associated with greater life satisfaction and life expectancy, expressing a direct relationship between the variables. On the contrary, welfare expressed by GDP has an indirect impact on the ecological footprint: higher values of GDP are associated with lower levels of the ecological footprint indicator.

Table 2. Interpretation of results based on the correlation coefficient value

Tested variables	Correlation coefficient values	Correlation coefficient value interpretation	Similar results obtained previously
GDP and Happy Planet Index	0.0575	*Weak* or *Null* correlation (*Fig. 1*)	The research realised by Alba Campus and Mariano Porcu (2010) demonstrated that there is *no correlation* between GDP and HPI at the level of the 178 countries analysed, including Romania
Life satisfaction and GDP/capita	0.8260	*Strong* correlation (*Fig. 2*)	The authors Mindaugas Degutis, Sigitas Urbonacicius and Algis Gaizutis (2010) found a *strong correlation* between the level of GDP/capita and the Life satisfaction indicator value
Life expectancy and GDP/capita	0.7689	*Strong* correlation (*Fig. 3*)	Anca Vitcu, Elena Lungu and Luminița Vitcu (2008) identified a *strong correlation* between the values of GDP/ capita and Life expectancy
Ecological foot-print and GDP	0.939	*Strong* correlation (*Fig. 4*)	In the World Wildlife Fund (WWF) Report (2007) it was mentioned that changes in ecological footprint and GDP are realised in the same way, which means that between these two variables there is a degree of association

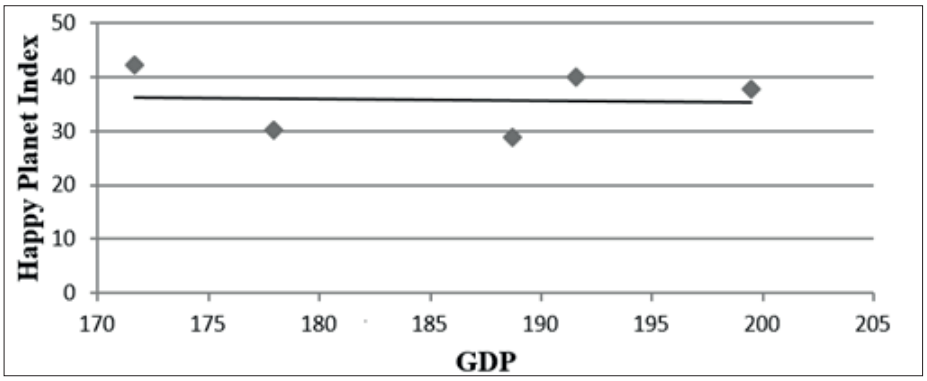

Figure 1. Correlation between GDP and HPI

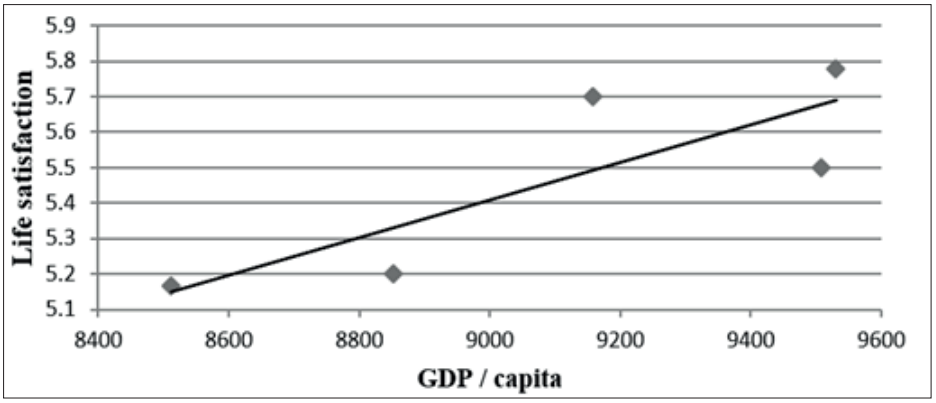

Figure 2. Correlation between GDP / capita and life satisfaction

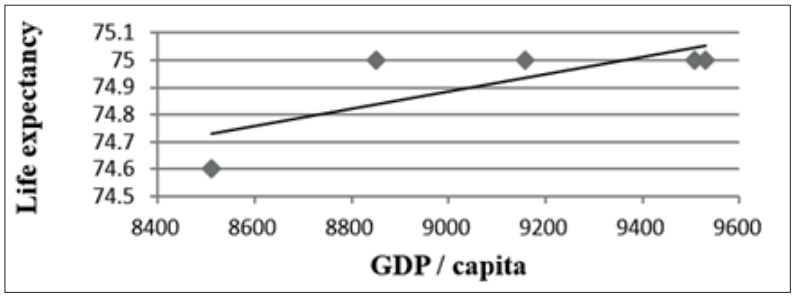

Figure 3. Correlation between GDP / capita and life expectancy

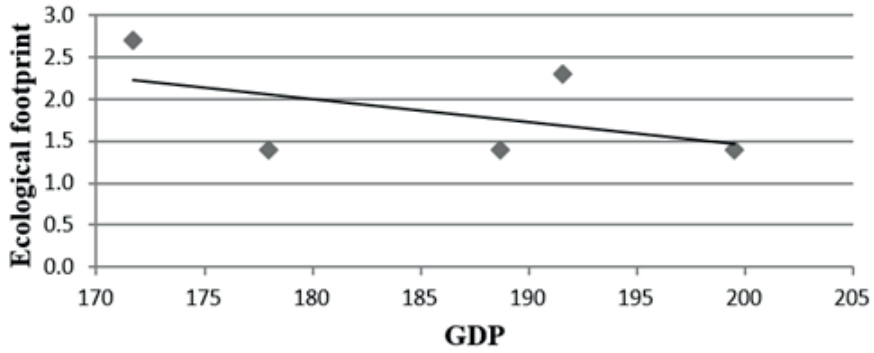

Figure 4. Correlation between GDP and ecological footprint

Considering the correlations between the variables, the proportions in which the explanatory variables (GDP and GDP / capita) influence the variations in the dependant variables (life satisfaction, life expectancy, ecological footprint) are determined based on the coefficient of determination. Results are evidenced and explained in Table 3.

Table 3. Interpretation of results based on the coefficient of determination

Analysed correlation	The value of the coefficient of interpretation	Interpretation of the value
GDP / capita and Life satisfaction	0.6824	68.25% of the variance in life satisfaction is a result of the variance in GDP/capita indicator. The rest, 31.74% of the variance, is due to other factors, which were not measured in this model
GDP / capita and Life expectancy	0.5912	59.12% of the variance in life expectancy is an effect of the variance in GDP/capita, and 40.88% is due to other factors, unmeasured in the model
GDP and Ecological footprint	0.8819	88.19% of the variance in ecological footprint is an effect of the variance in GDP, while 11.81% is due to factors which were not included in the model

Note: correlation between GDP and HPI was not included in the model due to the fact that there is no correlation between the two indicators, as previously indicated in the analysis.

Conclusions

This study aimed to estimate to what extent welfare is determined by variations in GDP. Therefore, HPI and HPI subindicators analysis was proposed as a complementary measure to GDP. Although it provides precise information on income levels, GDP manifests certain limits in terms of determining a complete picture of the citizens' welfare elements over which changes in income produce effects. Unlike GDP, HPI examines welfare through three sub-indicators, giving an insight into the welfare sustainability: i) Life expectancy; ii) Life satisfaction; and iii) Ecological footprint.

Considering theoretical aspects mentioned in the literature, the empirical study focused on testing the correlation between GDP, GDP/capita, and HPI, as well as HPI subindicators. Analysis of a longer period was not possible due to data set of inconsistencies when referring to Life satisfaction and Ecological footprint indicators.

The research results strongly harmonise with those at the international level, and conclusions show that there is no correlation between GDP and HPI, whereas GDP/capita strongly influence life satisfaction and life expectancy, and GDP affects the ecological footprint to a great extent. Therefore, the perceived welfare changes in a positive way due to increased life expectancy, reduction of ecological footprint, and an increase in revenues, by strictly using GDP. The effect of random factors, which were not quantified in the model, has small influence.

Identification and quantification of subjective and objective factors with international economic implications that impact well-being creates the possibility to compare the welfare levels. The nationally created opportunity allows policymakers to identify new actions for improvement of the quality of life. These actions could cover the increasing GDP/capita, given the extent to which it determines the change in "Life satisfaction" and "Life expectancy" indicators.

Given strong correlations between the indicators of "Life satisfaction", "Life expectancy", "Ecological footprint" and GDP / capita or GDP in Romania, the public policies may cover the increasing individual earnings by maintaining relatively low inflation rates, developing the public health system for improvement of individual health, allocating additional funds in education so that to increase support for activities that involve citizens, ensuring development of volunteering, and also reconsidering environmentally friendly allocations.

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GEROVĖS RUMUNIJOJE MATAVIMAS: ALTERNATYVIEJI IR PAPILDOMIEJI BENDROJO VIDAUS PRODUKTO MATAVIMO VIENETAI

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Santrauka

Tyrimas atliktas, siekiant pateikti alternatyvius valstybės gerovės matavimo kriterijus, nustatant ryšius, tarp *bendrojo vidaus produkto* (BVP) ir kito gerovės kriterijaus – *laimingos planetos indekso* (LPI). Analizė atlikta Rumunijoje 2012–2016 metų laikotarpiu. Tyrimo metodologijoje taikyta paprastoji linijinė regresija, naudojami gerovės kintamieji matai: BVP, BVP / gyventojui, LPI ir jo subkomponento: gyvenimo pasitenkinimas, gyvenimo trukmė ir ekologinis pėdsakas. Aspektų, darančių poveikį piliečių gerovei, nustatymas leidžia tarptautiniu mastu palyginti skirtingus gerovės lygmenis, o nacionaliniu lygiu – nustatyti pagrindines tobulintinas sritis. Atsižvelgiant į šias aplinkybes, pagrindinė tyrimo išvada: nors gerovės lygis, didėjant BVP, kyla, šį pokytį lemia ir ilgesnė gyvenimo trukmė, pasitenkinimas gyvenimu, padidėjusi ekologinio pėdsako įtaka. Tyrimo rezultatai sutampa su tarptautiniais duomenimis, daroma išvada: nėra koreliacijos tarp BVP ir HPI, tačiau BVP / gyventojui daro didelę įtaką pasitenkinimui gyvenimu ir gyvenimo trukmei, o BVP – ekologiniam pėdsakui.

Nors suvokiama gerovė teigiamai keičiasi dėl ilgėjančios gyvenimo trukmės ar mažėjančio ekologinio pėdsako, ji keičiasi ir dėl didėjančių pajamų, tai analizė rodytų naudojant tik BVP. Modelyje nenaudojamų atsitiktinių veiksnių įtaka yra maža. Matant didelę *pasitenkinimo gyvenimu*, *gyvenimo trukmės*, *ekologinio pėdsako* rodiklių koreliaciją ir BVP / gyventojui ar BVP Rumunijoje, viešoji politika gali padėti didinti atlyginimus, palaikyti santykinai mažą infliacijos lygį, stiprinti asmeninę sveikatą, plėtojant sveikatos sistemą, skiriant papildomai pinigų edukacijai ir taip remiant veiklą, kuri įtraukia piliečius ir skatina savanorystę, rūpinantis ir ekologija.

PAGRINDINIAI ŽODŽIAI: *rodikliai, BVP, LPI, pasitenkinimas gyvenimu, gerovė.*

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