MEASUREMENT AND COMPARISON OF WELFARE IN THE OBSERVED EU COUNTRIES IN 2017 AND 2021

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Abstract

The paper presents an explanatory analysis of welfare aspects studied in the selected EU countries. The analysis includes variables inspired by the Global Goals such as net wealth medians, median income before social transfers, real GDP per capita representing the monetary aspect of welfare and non-monetary aspect represented by share of persons at risk of poverty or social exclusion in population and share of persons with tertiary educational attainment in the age group 25-34 years. In addition, to the mentioned aspects, the third time aspect is incorporated by the comparison of results between years 2017 and 2021. By using the cluster analysis, selected EU countries share similarities within the cluster and the improvements in the values of indicators have occurred interyearly. The Baltics and southern European countries resemble each other. Central European countries' welfares deserve the attention in both monetary and non-monetary welfare aspects.

The presented results contribute to the further work in terms of understanding and analysing welfare in the selected EU countries.

Key words: welfare, wealth, cluster analysis

JEL Code: D31, G51, D61

Introduction

There is a consensus in the society that wealth and welfare can be considered as synonyms. For longer period, the approach of assessing the welfare has been interpreted using the wealth level (Benham, 1930). In fact, welfare, as a broader term when compared to wealth includes other aspects and factors, even though wealth is perceived as the most visible one.

OECD's Better Life Initiative introduces 3 aspects of welfare in the form of the material wealth, other non-monetary attributes and long-term perspective. A unified approach to defining these indicators have not been set and definitions tend to include subjectivity, i.e. what poses happiness for one, does not have to do for others what casues measurement problem. Long-term sustainability is formulated as a prediction for a particular year (OECD, 2013).

The main aim of this paper is to create an overview of welfare and its aspects in the selected EU countries and to determine similarities and differences among them. Cluster analysis helps to describe the current situation in the EU countries while addressing the research question: Which of the observed countries share similarities in terms of welfare?

The detailed results of cluster analysis are intended to provide details to the responsible authorities and economists in order to improve the welfare. Last but not least, the paper contributes to the increasing number of publications addressing welfare. The stated hypothesis is that there exist statistical similarities among the observed EU countries, which is being verified separately for 2017 and 2021. The measures in the paper have been calculated adjusted to thousands of EUR and in % of a population or age group in case of non-monetary aspects.

1 Literature review

A further studying of wealth and welfare shows that the two different concepts cannot be fully defined without each other. Even though the number of definitions by world´s most prestige economists studying wealth is increasing, a unified comprehensive definition of wealth has not been formulated.

French author Thomas Piketty views wealth of household as net wealth consisting of all the nonfinancial assets and financial assets in ownership of household members net of any existing debts (Piketty & Zucman, 2015). Economist Gabriel Zucman follows in his other publications the same approach (Piketty & Zucman, 2015). Theoretical overview can be found in studies, i.e. by Brzezinski et al. (2020) and Brzeniski&Salach (2022).

Pigou looks at welfare in relation to change in society efficiency of wealth (Young, 1913). Welfare by OECD (2013) is explained as various essential human needs together with the goals bringing satisfaction into one´s life. Pigou thoughts related to differences and disharmony between wealth and welfare in economic literature were later transitioned into various initiatives dealing with the relationship of welfare and wealth (McLure, 2012).

Former French president Nikolas Sarkozy expressed his dissatisfaction with the measurement of welfare in the economy. The report of economic performance and social progress was divided into several areas focusing on production and welfare for the following generations created by Joseph Stiglitz and Amartya Sen (2009). The approaches drawing attention to the indicators "beyond GDP" are including other economic indicators, i.e. wealth, income or consumption (Stiglitz & Sen, 2009). Last but not least, the trend of using more

indicators when assessing welfare is incorporated to demonstrate its development and sustainability in this paper.

Welfare aspects have been studied in publications by Fessler, P. & Schurz, M. (2015). Lithuanian authors (Lauzadyte-Tutliene, et al., 2022) focused on welfare models and identified differences of Eastern European countries when compared with Central Europe or Western Europe. The publications presented in this section, i.e. written by Kirk Hamilton and Giles Atkinson (2006) combine the focus on welfare with the cluster analysis.

Inspiration for studying the topic was set mainly by the United Nations' The Global Goals defined to improve the global situation by 2030 consisting of various areas (UN Environment Programme, 2023).

The goal of the paper is to bring an innovative approach when addressing the gap in the literature, as there are not many publications present with a detailed overview of the situation. The paper intends to expand the cluster analysis on various welfare aspects, years and datasets in order to provide a deeper understanding of categorisation of EU countries and their comparison.

2   Description of Data and Methods

When attempting to analyse welfare, measurable monetary variables are included in the most cases. However, for every one of us, different non-monetary factors could be added, i.e. health, education, happiness. This section provides an overview of variables used in the paper.

The wealth related indicator values are used from the European Central Bank's the Household Finance and Consumption Survey (HFCS), from the Third Wave in 2017 and the Fourth Wave in 2021 (ECB, 2023). The survey is recommended by authors, i.e. Fessler, P. & Schurz, M. (2015), as the basis and exclusive source of wealth related characteristics in the EU member states.

From 2015, the Eurostat collects data of various variables closely connected to the Global Goals as they create the baseline for analysis of the development and improvements of welfare retrieved on an annual basis.

By following a standardized approach to collection and analysis, the comparison of cross-country and cross-wave results is enabled. According to the HFCS methodology, these years represent the base for data collection and by using historic data for mentioned variables derived from the Eurostat's from years 2017 and 2021, the analysis is possible.

Tab. 1 summarizes the variables used in the cluster analysis and their unit of measurement.

Tab. 1: Summary of variables included in the analysis

Variable	Variable Name	Unit of measure
x_1	Median net wealth	Thousands of EUR
x_2	Median income before social transfers	Thousands of EUR
x_3	Real GDP per capita	Thousands of EUR
x_4	Share of people at risk of poverty or social exclusion	% of population
x_5	Share of persons with tertiary educational attainment	% of population in the age group 25-34

Source: Author's own work

Median net wealth is defined according to the ECB (2023) methodology as the sum of total financial and non-financial assets of household subtracting the sum of total debt. The variable excludes public and occupational pensions.

Eurostat´s *median of income before social transfers* is inspired by the Global Goal and is incorporated in the analysis due to playing a significant role as one of the ways how creation of wealth is possible. The variable describes incomes received from employment, received pension and aids from the state are not included.

The *real GDP per capita* is calculated as the ratio of real GDP compared to the population of an observed country. The addition of GDP into the analysis is essential due to representing the economic growth and innovation (Stiglitz & Sen, 2009).

The second of OECD´s aspects of welfare included are non-monetary ones focusing on quality of life. *Share of persons at risk of poverty or social exclusion* presents the share of the country's population living at risk of poverty after receiving social transfer or being severely materially deprived. Worldwide, reducing the number of deprived people is one of the most visible initiatives to ensure welfare in society (UN Environment Programme, 2023).

Global Goal of quality education contributing to the overall welfare is represented by the *share of persons with tertiary educational attainment* between young people having the most significant impact on the income and wealth level (UN Environment Programme, 2023). All variables are scaled before being entered in the cluster analysis. Cluster analysis points not only to similarities, but also to the difference between the countries, as homogenous clusters of countries sharing similarities are created from the analysed data.

The classification into clusters was performed using K-Medians method. The method focuses on classification of each of n objects in into k clusters. As entering the cluster analysis were quantitive values, the population was divided into the strictly set number of clusters.

The optimal number of clusters is based on the silhouette test. K - Centre medians are determined and the classification of objects into clusters is based on the nearest median representing the centre of cluster. The iterative process is performed, and the function is minimized (Hebák et al., 2013):

$$f_{KP} = \sum_{j=1}^{k} \sum_{i=1}^{n} u_{ij} \|x_i - \bar{x}_j\|^2 \tag{1}$$

The preconditions required to be fulfilled are formulated as follows:

$$\sum_{j=1}^{k} u_{ij} = 1 \,, \; for \; i = 1; 2; \dots; n$$

$$\sum_{i=1}^{n} u_{ij} > 0 \,, for \; j = 1; 2; \dots; k$$

$u_{ij} -$ inclusion of i object into the cluster j, $u_{ij} \in \{0, 1\}$

$\bar{x}_j -$ vector composed of average values of cluster j

By minimizing the function and fulfilment of preconditions, the clustering is performed. The value of $u_{ij} = 1$ when the object i belongs to the cluster j and $u_{ij} = 0$ when the object i does not belong to the cluster j (Hebák et al., 2013).

This paper focuses on 13 selected EU countries from Southern, Central Europe and 3 Baltic states. Data from countries not using the common currency, such as Czech Republic or Poland are not present due to limited availability in the HFCS. In fact, Hungary joined the surveys on the voluntary basis and as a result is included in the analysis.

3   Results of the cluster analysis and discussion

Despite the EU being an economic union, sharing many similarities among the member states, its composition of many heterogenous states with various differences cannot be overlooked.

With each member country being different in terms of size, population, cultural and political aspects, the cluster analysis divided countries using normalised values of variables into 5 separate clusters supported by the silhouette chart as the optimal number in 2017 and in 2021.
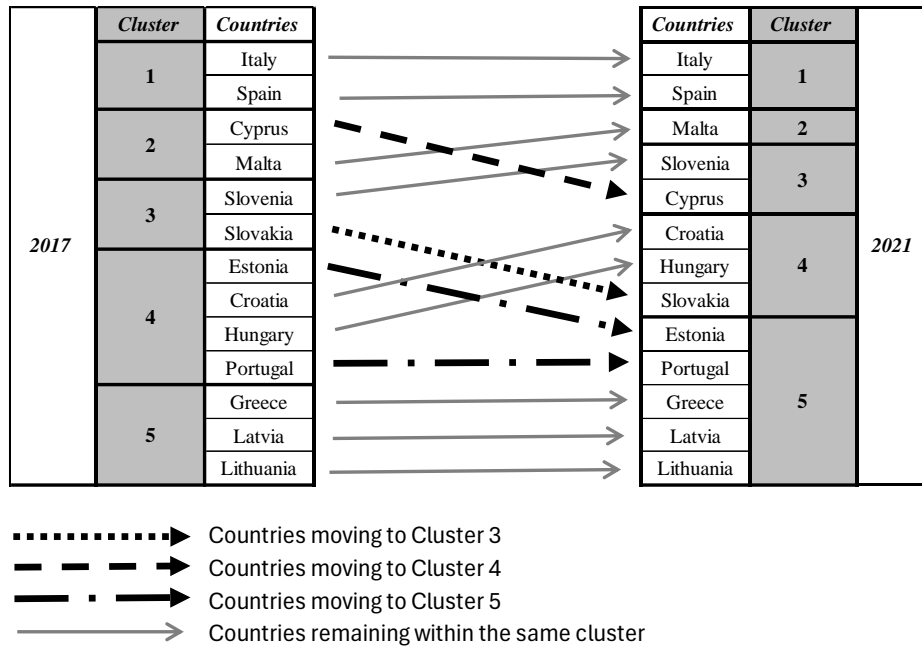
Tab. 2: Cluster analysis results for selected EU countries in 2017 and 2021

Year	Cluster	Countries	Number of countries in each cluster	Median value of net wealth (thousands of EUR)	Median income before social transfers (thousands of EUR)	Real GDP per capita (thousands of EUR)	Share of persons at risk of poverty or social exclusion (% of population)	Share of persons with tertiary educational attainment (% of population in age group 25-34)
2017	1	Spain, Italy	2	126.05	10.38	25.59	26.70	34.75
	2	Malta, Cyprus	2	211.75	11.54	22.62	20.40	45.95
	3	Slovenia, Slovakia	2	80.95	7.30	17.22	16.20	39.80
	4	Estonia, Croatia, Hungary, Portugal	4	54.90	5.35	13.22	23.55	33.35
	5	Greece, Latvia, Lithuania	3	45.90	4.56	12.76	29.80	42.50
2021	1	Spain, Italy	2	143.35	10.52	25.40	26.50	38.50
	2	Malta	1	273.60	13.98	23.33	20.30	42.50
	3	Slovenia, Cyprus	2	159.60	12.47	23.94	15.25	53.10
	4	Croatia, Hungary, Slovakia	3	64.90	5.89	13.69	19.40	35.70
	5	Estonia, Portugal, Greece, Latvia, Lithuania	5	66.20	7.16	16.35	23.50	45.50

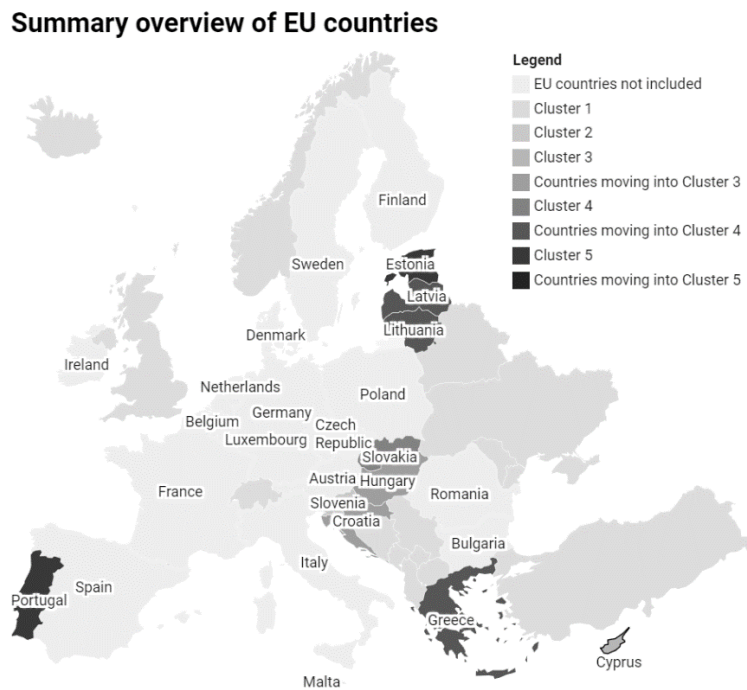Source: Authors' own calculations based on data

Overall, the situation in the EU is presented in Tab. 2. Relatively stable situation in the short-term encountered some countries changing clusters as shows Fig.1 and Fig.2

Fig. 1: Changes of the structure of clusters

	Cluster	Countries			Countries	Cluster	
	1	Italy			Italy	**1**	
		Spain			Spain		
	2	Cyprus			Malta	**2**	
		Malta			Slovenia	**3**	
	3	Slovenia			Cyprus		
		Slovakia			Croatia	**4**	
2017	**4**	Estonia			Hungary		**2021**
		Croatia			Slovakia		
		Hungary			Estonia	**5**	
		Portugal			Portugal		
	5	Greece			Greece		
		Latvia			Latvia		
		Lithuania			Lithuania		

▸ Countries moving to Cluster 3
▸ Countries moving to Cluster 4
▸ Countries moving to Cluster 5
→ Countries remaining within the same cluster

Source: Author's own work based on HFCS and Eurostat data for years 2017 and 2021

Fig. 2: Summary overview of EU countries

Summary overview of EU countries

Legend
EU countries not included
Cluster 1
Cluster 2
Cluster 3
Countries moving into Cluster 3
Cluster 4
Countries moving into Cluster 4
Cluster 5
Countries moving into Cluster 5

Source: Author's own work based on HFCS and Eurostat data for years 2017 and 2021

Source: Author's own work based on HFCS and Eurostat data for years 2017 and 2021

Spain and Italy, two huge southern European economics are often viewed as similar in many of the economic characteristics (Pilar, M. & et al., 2012) shared Cluster 1 in 2017 and 2021. According to the monetary aspects, these two countries belonged to the better half of all of the observed clusters. What deserves the attention in 2021, is the fact that the share of people living at risk of poverty was the highest among all clusters, while the share of tertiary educated persons was one of the lowest among the observed clusters. The values of these non-monetary aspects were determined by the situation in southern regions Italy and in Spain.

In addition, the cluster analysis also reflected the situation as the Spanish economy hit hard in the recession period preceded by boom. The situation has an improving tendency supported by a slight improvement of the non-monetary aspects contributing to the welfare (Lauzadyte-Tutliene et al., 2018).

Malta and Cyprus represented the cluster with the best welfare variables among all clusters in 2017. On the other hand, Malta between 2017 and 2021 encountered a rise of persons at risk of poverty and of monetary variables. Therefore, Malta represented a single-country cluster in 2021 dominating the analysis with the best welfare among of al 13 countries.

Cyprus experienced a drop of share of persons at risk of poverty and an increase of share of tertiary educated persons reaching to 45.95%. With Slovenia having low values, respectively high values of these indicators, Cyprus was sharing more similarities with Slovenia in Cluster 3 in 2021 than with Malta in Cluster 2.

Cluster 3 originally included Slovakia and Slovenia in 2017, with Slovakia joining Hungary and Croatia in Cluster 4 for 2021. Slovakia being the richest of these countries was not able to keep up with Slovenia for 2021, especially due to median income of 5.89 thousands of EUR.

Previously, Slovakia and Slovenia shared relatively high values of median net wealth, median income and real GDP per capita (Zarkovic Bookman, 2007). Influencing welfare in 2017, was also the lowest share of persons at risk of poverty of 16.20%.

Slovenia had higher values of monetary aspects in the observed years reflecting the level of development and net outflows from the country. With Slovakia and Hungary being more dependent, i.e. having strong economic ties with Germany, Central European countries share similarities in terms of welfare.

Estonia and Portugal which shared Cluster 4 with Croatia and Hungary moved to Cluster 5 and joined Greece, Latvia and Lithuania. The shift was determined by higher values of monetary variables and by higher share of persons at risk of poverty together with higher share of persons with tertiary educational attainment in Cluster 5 when compared with Cluster 4. In

Cluster 4, the countries were not keep up with another clusters in terms of monetary variables – net wealth value of 64.90 thousand of EUR was representing approximately 24% of the highest net wealth median from Cluster 2 for 2021.

Moreover, Hungary and Croatia experienced the deepest recessions within the region recently and as a result the lowest share of persons with tertiary educational attainment was present (Lauzadyte-Tutliene et al., 2018). Therefore, welfare in the smaller countries in Central Europe in Cluster 4 was comparable between each other deserving the attention of the responsible authorities. The gap between Cluster 4 and all other clusters can be considered as significant.

Despite the economic downturn of Greece in the last decades, being considered as the poorest country of the EU and balancing on the brink of collapse in late 2000s, the values of median net wealth remained higher when compared to Latvia and Lithuania in Cluster 5 or Cluster 4 in 2017. Lithuania as one of the poorest countries started catching up Greece, therefore it is not surprising that the countries are included in one cluster. When compared to 2017, in 2021, Cluster 5 countries experienced a boom caused by significant increase in monetary variables. In case of the economic measures being implemented to enhance welfare in the society, the focus was laid on real GDP per capita.

The development supported by economic variables was present in the studied data, as Estonia had higher values of variable when compared with poorer Latvia and Lithuania in 2017, due to differences in productivity and education in the long-term. Estonia still being the richest of the Baltic countries due to innovation and economic growth, Lithuania and Latvia rapidly improved and shared Cluster 5 in 2021 (Aidukaite, 2009).

As Estonia and Portugal were sharing many similarities in terms of income, GDP, but differed in terms of net wealth with Portugal reaching higher values. The case of Portugal being much bigger country with area and population like Estonia, both countries experienced a sharp increase of monetary variables together with a significant increase in terms of tertiary education. The Baltics and southern European countries shared similarities in terms of monetary and non-monetary aspects and similar measures should be implemented to their welfare.

Conclusion

The aim of the paper was to provide an overview of welfare studied monetary and non-monetary indicators in the selected EU countries using cluster analysis by incorporating time aspect by

short-term comparison of results between years 2017 and 2021. There changes in the short-term period between clusters detected and overall increase of values of studied indicators as well.

The formulated hypothesis claiming that statistical similarities exist among the observed EU countries is accepted as the cluster analysis outcomes support the assumptions for both years. Spain and Italy's welfare was determined by non-monetary factors. Malta's welfare in Cluster 2 was influenced by share of persons at risk of poverty. Cluster 3 consists of countries which experienced an improvement of monetary variables. Central European countries deserve the biggest attention, while the Baltic states and smaller southern countries deserve the attention due to share of persons living at risk of poverty. By an increase of the monetary variables, an increase of welfare was detected interyearly.

The paper additionally contributed to filling the gap in the studied literature, as there are not many publications dealing with the details introduced for each country or group of countries published yet. The presented overview is intended to be an inspiration for other future publications.

Acknowledgment

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