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ANALYSIS OF POVERTY IN THE EUROPEAN UNION: A CLUSTER APPROACH

Abstract

The purpose of this paper is to group the countries of the European Union according to selected poverty indicators. To this end, a cluster analysis based on the most recent annual data available (2023) was applied, which divides all European Union Member States into four clusters, as homogeneous units. The results show that the most successful countries belong to Central, Western and Northern Europe, which form a separate cluster (Cluster 1). On the other hand, the countries of Southern Europe, the Balkan countries as well as the Baltic countries, achieve poor performance and are classified into three clusters (Cluster 2, Cluster 3, and Cluster 4). The results will be useful to the creators of economic and social policy at the level of the Member States, but also at the level of the entire European Union. It is a new study of poverty in the European Union, which uses an original set of indicators in a cluster analysis of this phenomenon.

Keywords: poverty, social exclusion, cluster analysis, European Union.

JEL classification: I32, C38

АНАЛИЗА СИРОМАШТВА У ЕВРОПСКОЈ УНИЈИ: КЛАСТЕРСКИ ПРИСТУП

Апстракт

Сврха рада је да групише земље Европске Уније према одабраним индикаторима сиромаштва. У том циљу, примењена је кластер анализа на основу најновијих доступних годишњих података (2023), која све земље чланице Европске Уније дели у четири кластера, као хомогене целине. Резултати показују да најуспешније земље припадају централној, западној и северној Европи које формирају засебан кластер (Кластер 1). Са друге стране, земље Јужне Европе, земље Балкана, као и Балтичке земље остварују лоше перформансе и класификују се у три кластера (Кластер 2, Кластер 3 и Кластер 4). Резултати ће користити креаторима економске и социјалне политике на нивоу држава чланица, али и на нивоу целе

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Европске Уније. Ради се о новој студији сиромаштва у Европској Унији, која користи оригинални сет индикатора у кластер анализи овог феномена.

Кључне речи: сиромаштво, социјална искљученост, кластер анализа, Европска Унија.

1. Introduction

Sustainable development of society is unthinkable without the eradication of poverty. Poverty reduction is one of the main Millennium Development Goals (Kalinowski & Kielbasa, 2017). The related global goals of sustainable development are eradicating hunger, achieving greater coverage of people through education, as well as improving the health status of the population. Poverty is a challenge faced by all countries of the world (Belu et al., 2024), so all countries are making efforts to reduce poverty. Social prosperity in the narrow sense relies on economic growth. However, an important link in achieving overall social development is social sustainability, in which solving the problem of poverty plays one of the main roles (Marković, 2024).

The main factor of poverty is a lack of income, i.e. material resources. Not having money to meet basic needs and ensure a decent standard of living is the first visible cause of poverty. However, poverty also implies the inability to have non-financial resources such as health, education, social and cultural resources (Iftimoaei, Baciuc & Gabor, 2021). Therefore, the observation of poverty without including other indicators of material deprivation (social exclusion) is inadequate. An important determinant of poverty in a country is the unemployment rate, which can be the result of inadequate education of individuals, labour market disruptions, global market developments, or poor government economic policies.

Observing and measuring poverty in the European Union is significant because of the nature of this economic integration. The complexity is reflected in the fact that enlargements took place slowly, over a longer period, as well as in the fact that countries differ in basic social and economic indicators. This was especially evident after the last largest enlargement of the European Union, when the countries of Eastern Europe joined this integration (Fahey, 2005). Although this economic integration is considered one of the most developed and advanced of all others, the risk of poverty and social exclusion persists, especially after the economic crisis of 2008, as well as the social crises of recent years. Just as the goal at the world level is to reduce the number of people living in poverty, so in the European Union it is one of the leading social goals. Unfortunately, the 2020 poverty targets were not met by even 20% (Aranguiz, 2022). Poverty also has a special place in the Europe 2030 strategy. By 2030, the number of people in poverty is expected to be reduced by 15 million people compared to 2020 (European Commission, 2021). In all earlier development strategies, the European Union focused on the social dimension of development, which is reflected in the constant promotion of full employment, fostering high social protection, emphasis on social inclusion, as well as increased participation in education, training, and health care services (Akarçesme et al., 2023).

The aim of this paper is to identify advanced economies according to the level of poverty, and on the other hand, countries that need greater financial and social support to fight

poverty. Continuous monitoring and analysis of poverty is the first step in defining measures to alleviate it and build a fairer society and social sustainability, especially in the light of previous crises such as the COVID-19 pandemic and the military conflict in Ukraine.

The paper consists of several parts, respecting the usual structure in scientific research - IMRAD. After the introduction, the data sources, material, and approach are described in the Methodology section. The results of the research, in addition to presenting the findings, include tables and graphs based on the conducted cluster analysis, while the Discussion section reveals the most important findings. The paper ends with concluding remarks.

2. Methodology

Poverty is a multidimensional phenomenon, which means that it can be represented by many indicators (Palaščáková & Stepaniuk, 2016). In the European Union, persons are at risk of poverty (relative poverty) if they have an income lower than 60% of the national median equivalent disposable income (Iftimoaei, Baciú & Gabor, 2021). It is the “At-risk-of-poverty rate” indicator. However, the degree of poverty of an individual cannot be assessed solely on the basis on realized income (material factor), which is indeed the most common indicator of poverty. Access to health care services, the level of long-term unemployment, social exclusion, the percentage of people who are severely materially deprived, etc. are also important. That is why it is necessary to apply several indicators in the analysis of poverty (in addition to the “At-risk-of-poverty rate”), such as: “Severe material and social deprivation rate”, “Self-reported unmet need for medical examination and care”, and “Long-term unemployment rate”. One gets the impression that poverty is often associated with different forms of social exclusion, which can be economic, cultural, and political exclusion. These non-material factors can be seen as a consequence of poverty because individuals who are socially excluded have fewer opportunities to acquire adequate education, meet some medical needs, which leads them to marginalization in every sense (Marković et al., 2022). In addition, having a job does not mean that such individuals can afford to meet basic needs, so the inclusion of the “In work at-risk-of-poverty rate” indicator in this study is justified. This may be due to the increasing number of fixed-term contracts, as well as temporary and occasional jobs, which has been a widespread practice in recent years (Aranguiz, 2022). Because of all this, the concept of poverty is also described as a composite concept (Frączek, 2022).

Based on the available literature and the Eurostat database, the author selected the following indicators of poverty: “At-risk-of-poverty rate”, “Severe material and social deprivation rate”, “In work at-risk-of-poverty rate”, “Self-reported unmet need for medical examination and care”, and “Long-term unemployment rate”. The data for these indicators are in percentages and refer to the last available year in the database used (2023).

To group the countries of the European Union by clusters, the author applied hierarchical cluster analysis (Everitt et al., 2011), while Ward’s method (object grouping method) was used as the clustering method (Nardo et al., 2005), and the squared Euclidean distance was used as a measure of distance between objects (Janković-Milić, Lepojević & Stanković, 2019).

3. Research results and Discussion

Table 1 shows descriptive statistics of the poverty indicators used in the research. Descriptive statistics refer to data on the minimum, maximum and mean values of indicators. Also, the size of the standard deviation was calculated.

The data from Table 1 show that the largest deviations from the mean are in the “Severe material and social deprivation rate” indicator, while, on the other hand, the lowest standard deviation is present in the “Long-term unemployment rate” indicator. The countries of the European Union differ the most in terms of the percentage of severe material and social deprivation, from 2% in Slovenia to as much as 19.80% in Romania. The poverty risk rate is the highest in Estonia and Latvia, while the Czech Republic records the lowest value of the same indicator (9.80%). It must be pointed out that it is the only country in the European Union that in 2023 achieved a poverty rate lower than 10%. Furthermore, Finland has the lowest rate of poverty among people who are employed. On the other hand, Romania again has the worst value of this indicator. According to Eurostat data, Malta and Cyprus stand out as the countries where the highest percentage of the population has their needs for medical (health) care and protection met, while Estonia is at the bottom. The latter indicator measures the long-term unemployment rate. Long-term unemployment is the highest in Greece, while Denmark and the Netherlands both have the same long-term unemployment rate of just 0.50%. Romania and Estonia have the worst poverty scores for two indicators.

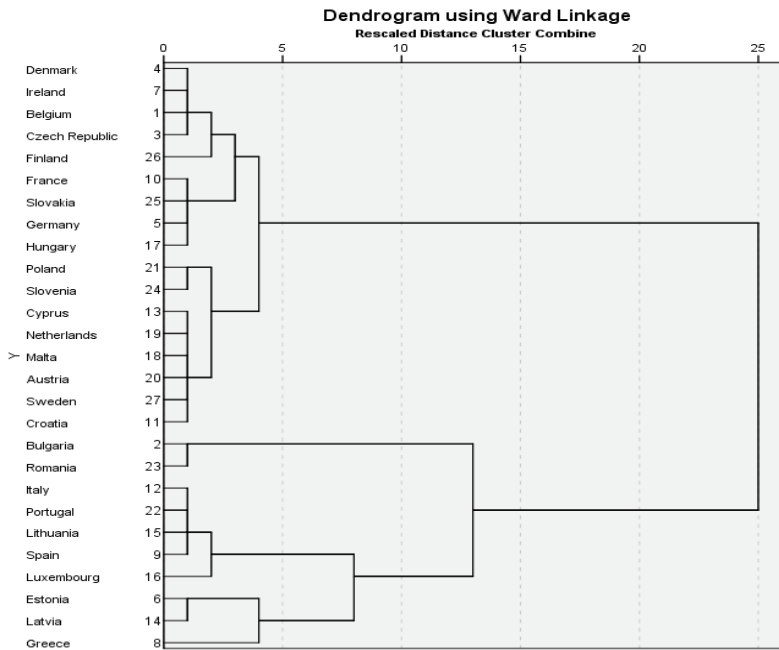
Table 1: Descriptive statistics of poverty indicators

Indicator	Minimum	Maximum	Mean	Std. Deviation
At-risk-of-poverty rate	9,80 (Czech Republic)	22,50 (Estonia, Latvia)	16,2556	3,62452
Severe material and social deprivation rate	2,00 (Slovenia)	19,80 (Romania)	6,0630	4,60695
In work at-risk-of-poverty rate	2,80 (Finland)	15,00 (Romania)	8,1444	2,98088
Self-reported unmet need for medical examination and care	0,10 (Malta, Cyprus)	12,90 (Estonia)	3,1148	3,36334
Long-term unemployment rate	0,50 (Denmark, Netherlands)	6,20 (Greece)	1,9630	1,31388

Source: IBM SPSS 22 according to Eurostat data, 2024.

Figure 1 displays the dendrogram, as a result of the applied hierarchical cluster analysis, Ward’s method and squared Euclidean distance. In the figure, at a distance of 5, four clusters of European Union countries can be clearly identified according to the state of poverty as a social indicator.

Figure 1: Dendrogram (Hierarchical cluster analysis)



Source: Authors' presentation based on Eurostat data (2024) and IBM SPSS 22 program

Table 2 presents the number of countries by formed clusters, i.e. the structure of clusters. The first cluster comprises the largest number of countries. It is also the cluster with the countries that achieve the lowest poverty rates because they have the most favourable value indicators. Other clusters include countries that have worse indicators. The worst is Cluster 2, which consists of Romania and Bulgaria.

Table 2: Grouping of European Union countries into clusters according to poverty indicators

Clusters	Countries
Cluster 1 (17 countries)	Denmark, Ireland, Belgium, Czech Republic, Finland, France, Slovakia, Germany, Hungary, Poland, Slovenia, Cyprus, Netherlands, Malta, Austria, Sweden, Croatia
Cluster 2 (2 countries)	Bulgaria, Romania
Cluster 3 (5 countries)	Italy, Portugal, Lithuania, Spain, Luxembourg
Cluster 4 (3 countries)	Estonia, Latvia, Greece

Source: Authors' presentation, IBM SPSS 22

Table 3 offers a more detailed insight into the clusters, by calculating the mean, minimum and maximum values of the observed indicators within each of them.

Table 3: Mean, maximum and minimum values of poverty indicators within individual clusters

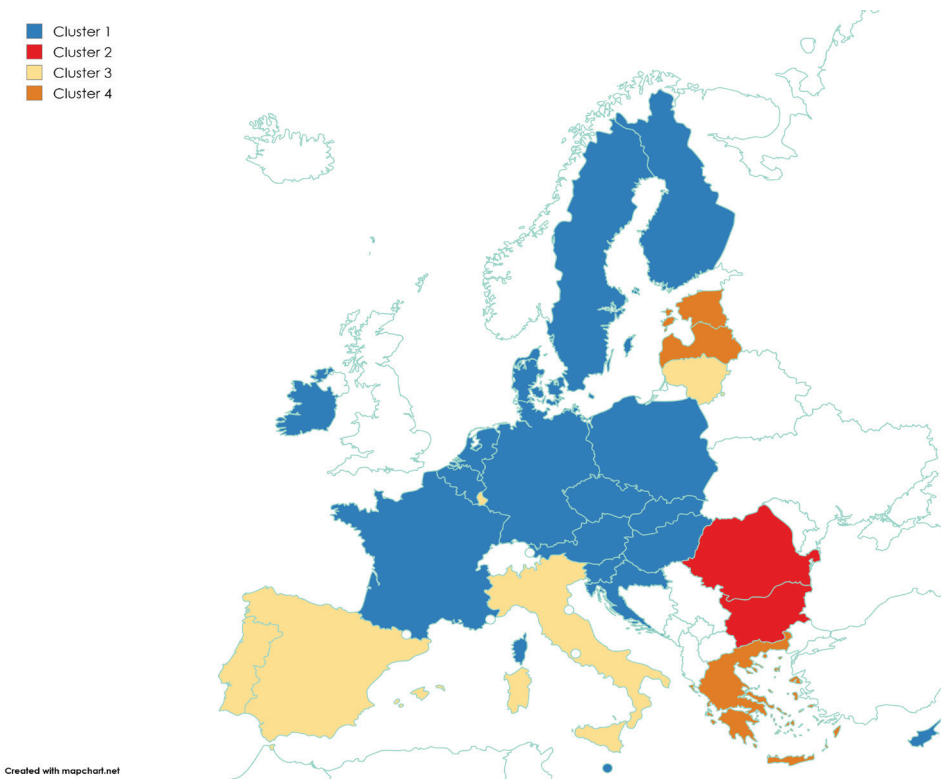
Cluster	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5
Cluster 1					
Mean	13,99	4,5	6,42	2,03	1,42
Max	19,3	10,4	9,1	7,9	3,8
Min	9,8	2,0	2,8	0,1	0,5
Cluster 2					
Mean	20,85	18,9	13,35	3,15	2,25
Max	21,1	19,8	15,0	5,2	2,3
Min	20,6	18,0	11,7	1,1	2,2
Cluster 3					
Mean	19,1	5,44	10,82	2,2	3,0
Max	20,6	9,0	14,8	3,8	4,3
Min	17,0	2,5	8,1	0,8	1,7
Cluster 4					
Mean	21,3	7,4	9,97	10,77	3,1
Max	22,5	13,5	10,6	12,9	6,2
Min	18,9	2,5	9,5	7,8	1,3

Source: Authors' calculations

Note: Indicator 1 - At-risk-of-poverty rate; Indicator 2 - Severe material and social deprivation rate; Indicator 3 - In work at-risk-of-poverty rate; Indicator 4 - Self-reported unmet need for medical examination and care; Indicator 5 - Long-term unemployment rate.

Cluster 1 achieves the lowest mean values for all indicators, so since all the attributes of poverty are of the cost type, this cluster is in the best position regarding poverty. This cluster of countries is the largest and includes most of the countries of the European Union (17), which is a positive circumstance. Cluster 3 consists of five countries. It performs slightly worse compared to the group of countries from the previous cluster. The countries in this cluster have particularly good indicators for Indicator 2 (At-risk-of-poverty rate) and Indicator 4 (In work at-risk-of-poverty rate). Cluster 4 and Cluster 2 gather the countries with the worst poverty indicator rates. They include most of the Baltic countries, as well as the Balkan countries (Greece, Bulgaria, and Romania). Figure 2 clearly shows the spatial distribution of countries by cluster in order to more easily see the extent of poverty at the level of the European Union.

Figure 2: Geographical distribution of clusters on the map of the European Union



Source: The map was generated using Map Chart (mapchart.net)

According to other research, the countries of Southern Europe are also the most affected by poverty in the European Union (Sompolska-Rzechuła & Kurdyś-Kujawska, 2022). In addition to the Southern European countries (Spain, Portugal, Italy, Greece), the Baltic countries (Estonia, Latvia, and Lithuania), as well as Bulgaria and Romania, are in a bad position. The last two countries are the Balkan countries that (excluding Croatia) joined the European Union at the latest.

Although underdeveloped countries are more vulnerable, it is necessary to point out that poverty affects all countries, regardless of their level of economic development (Janković-Milić, Lepojević & Stanković, 2019). An interesting example is Luxembourg. Luxembourg stands out in terms of poverty compared to the other Benelux countries and had worse indicators in the earlier period (2016) according to the results of the cluster analysis of other researchers, who used a similar set of poverty indicators in the European Union (Palaščáková & Stepaniuk, 2016). Many readers would expect Luxembourg to be classified in Cluster 1. But, on the other hand, we should be careful in drawing conclusions, because being poor in Luxembourg and Spain is not the same (given the different absolute values of the poverty thresholds). Future research should focus on the interdependence of the level of poverty and inequality in income distribution since Luxembourg has a relatively high GINI coefficient. Other studies show similar results. Portugal, Greece, and Italy have still

not recovered from the public debt crisis triggered by the 2008 global economic and financial crisis. It should be noted that the state of poverty may be the result of ineffective income redistribution measures or inadequate policies to combat poverty in these countries. The level of social benefits, the degree of economic development and the measures of social and economic policy of individual countries are factors that significantly influence the differences in the level of poverty and social exclusion among European countries (Frączek, 2022).

Conclusion

Social progress is often conditioned by the prevention of social risks, including poverty. Tackling poverty is the key to sustainable socio-economic development. The at-risk-of-poverty rate focuses on relative poverty, therefore, often this indicator alone is not adequate in international comparisons. That is why other indicators were also considered in this analysis. For example, material deprivation considers absolute poverty, as do most of the other indicators used that refer to some non-economic factors. It is highly likely that individuals living in poverty will have lower human rights, face the impossibility of finding a well-paid job, and more difficult to meet their health needs.

The paper assessed poverty in the European Union based on the classification of member countries into clusters. It is a problem that creates social costs and makes it impossible to achieve sustainable development of society. Social costs are most often reflected in social benefits (social aid, unemployment benefits and increased health care expenditures). Secondly, the increase in taxes, to finance public expenditures for the fight against poverty, can act as a disincentive on economic activities. It is especially dangerous if there is an inefficiency of social transfers, i.e. if they are not allocated to the most vulnerable population categories. Therefore, it is necessary to constantly monitor the state of poverty in the country and at the supranational level (European Union) and take appropriate financial and non-financial measures. Of course, improving the economic environment is imperative for the poverty relief in the long term.

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