

Inequalities in the European Union countries in the context of Sustainable Development Goal 10: a cluster analysis

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Abstract. Sustainable development is an important concept lying at the heart of the European Union policies that presents challenges related to the simultaneous satisfaction of the environmental, economic and social needs. The aim of the study presented in the article is to identify differences and similarities among the EU-27 in the context of Sustainable Development Goal 10 (SDG 10), which focuses on inequalities within and between countries, migration and social inclusion. The analysis was based on data for the years 2010 and 2022 from the Eurostat SDG database. Subgroups of countries were determined by means of cluster analysis.

The results of the research attest to heterogeneity among the EU-27 regarding indicators related to reducing inequalities, and highlight disparities between the old and new member states. What is more, differences among new member states are brought to light, with Bulgaria and Romania being outliers in this group. The analysis also shows discrepancies that have evolved over time between the EU-27 countries of the North and West and those of the South and East. The results of the study indicate the need for further action towards reducing the inequalities. To achieve satisfactory outcome in the problematic areas, this activity should be tailored individually to each country.

Keywords: inequalities, Sustainable Development Goal 10, SDG 10, cluster analysis, European Union countries

JEL: Q01, D63, I24, P52

Nierówności w krajach Unii Europejskiej w kontekście 10. celu zrównoważonego rozwoju – analiza skupień

Streszczenie. Koncepcja zrównoważonego rozwoju, znajdująca się w centrum polityki Unii Europejskiej, polega na jednoczesnym zaspokajaniu potrzeb środowiskowych, gospodarczych i społecznych. Badanie omówione w artykule ma na celu identyfikację różnic i podobieństw między 27 krajami UE w kontekście 10. celu zrównoważonego rozwoju (SDG 10), który dotyczy nierówności w krajach i między krajami, migracji i integracji społecznej. Analizę oparto na danych za lata 2010 i 2022 zaczerpniętych z bazy Eurostat SDG. Do wyodrębnienia podgrup krajów wykorzystano analizę skupień.

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Wyniki badania świadczą o heterogeniczności wśród 27 krajów członkowskich UE w odniesieniu do wskaźników SDG 10 i o utrzymywaniu się różnic między starymi i nowymi krajami członkowskimi. Ukazują też zróżnicowanie wśród nowych krajów członkowskich, szczególnie wyraźne w przypadku Bułgarii i Rumunii, znacznie odstających od reszty grupy. Ponadto uwidoczniają zmieniające się w czasie różnice między północą i zachodem oraz południem i wschodem UE-27. Wyniki badania wskazują na konieczność podjęcia dalszych działań w kierunku zmniejszenia nierówności. W celu uzyskania pożądanego efektu w obszarach, w których występują problemy, działania te powinny uwzględniać specyfikę poszczególnych krajów.

Słowa kluczowe: nierówności, 10. cel zrównoważonego rozwoju, SDG 10, analiza skupień, kraje Unii Europejskiej

1. Introduction

The concept of sustainable development, although not new, is still relevant to European Union (EU) countries. The term was introduced in 1987 by the World Commission on Environment and Development report as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (United Nations [UN], 1987). Since then, it has been present in the public debate and official documents. Commissioner Gentiloni stated, ‘Sustainable development continues to be further mainstreamed into the EU’s policymaking and economic coordination processes’ (Eurostat, 2022).

The most recent initiative is related to the 2030 Agenda for Sustainable Development adopted in 2015 by 193 United Nations member states (Carrillo, 2022). The Agenda introduced 17 Sustainable Development Goals (SDGs) and 169 related targets to be achieved by 2030. The integrated and indivisible goals cover the economic, social and environmental factors of sustainable development (UN, 2015). Thus, the goals comprise a wide variety of areas: no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice and strong institutions, and finally partnership for the goals (Eurostat, 2023). The EU had a significant role in shaping the Agenda and committed to implementing the SDGs (European Commission [EC], 2016, 2019, 2020; Lafortune et al., 2020).

Sustainable development is the priority of EU policies and constitutes a part of the EC President Ursula von der Leyen’s political programme (EC, 2020; Eurostat, 2023). Eurostat publishes regular reports monitoring progress towards the SDGs. However, the EU SDG indicator set whose purpose is to track progress towards the goals was designed in such a way as to consider only the EU’s perspective; thus, it does not

coincide exactly with the United Nations' set of indicators (Eurostat, 2023). The EU set was devised to follow the 17 SDGs and take into account the social, economic, environmental, and institutional aspects of sustainability. It also prioritises data availability, freshness and quality, as well as the comprehensiveness of a country's coverage. Each EU SDG covers a maximum of six main indicators complemented by multi-purpose indicators used to monitor more than one goal (Eurostat, 2023).

This article focuses on Sustainable Development Goal 10 (SDG 10), whose aim is to reduce inequalities. It is recognised that vast inequalities hinder social cohesion, the economic activity and democratic participation. Thus, SDG 10 addresses inequalities within and between countries, as well as migration and social inclusion (Eurostat, 2023).

EU policies take into account various aspects of sustainable development, imprinting the European perspective in the literature, especially that concerning SDGs. Ricciolini et al. (2024) used 77 SDG indicators from 2020, employing the Spatial Sustainability Assessment Model – a method that integrates multi-criteria analysis with a geographical tool – to classify the EU-27 into four categories related to the four dimensions of sustainability, namely the social, economic, environmental and institutional dimension. They found that Northern and Western European countries had better overall sustainability, except in the environmental dimension. Eastern European and Mediterranean countries, on the other hand, generally faced greater challenges, especially in the economic and institutional dimensions. That study also showed a gap between countries which joined the EU after 2004 and those that already were EU members.

Carrillo (2022) introduced and applied a new indicator to evaluate the sustainability performance and to assess the progress of the EU-27 towards SDGs in the period from 2010 to 2020. The study demonstrated that all countries made such progress, with Sweden and Denmark at one end of the spectrum (making the largest progress), and Romania, Malta and Estonia at the other (making the smallest progress). Szymańska (2021) analysed inequalities addressed by SDG 10, comparing changes in its indicators for the EU-27 between 2010 and 2019. Using cluster analysis, linear ordering and principal component analysis, she identified persistent disparities between Spain, Bulgaria, and Romania on the one hand and the remaining countries on the other, as well as ongoing differences between the old and new EU countries.

Cojocaru et al. (2022) also focused on the SDG 10 indicators, forecasting trends until 2030 on the basis of data for the period between 2010 and 2020, to assess the potential of EU countries for achieving the targets set by this SDG. The study analysed the dynamics of the indicators, but it did not identify any countries leading in terms of inequalities reduction, nor any significantly falling behind in fulfilling this task. It was possible, however, to observe progress towards SDG 10 for example in Poland,

whereas in Bulgaria and Greece, unfavourable trends became visible. Bąk and Kurz (2022) used selected SDG 10 and SDG 5 indicators to assess the socio-economic and gender inequalities in the EU-27 countries in 2020. Their ranking of countries showed the largest inequalities in Romania, and the smallest in Sweden.

Labella et al. (2020) introduced a novel approach to classifying EU countries on the basis of their progress in reducing inequalities, starting from 2005 and then examining them every three years until 2017. The study showed that the countries' performance in reducing inequalities depended on current macroeconomic conditions, among other things. It also indicated the persistence of disparities between Northern European countries (e.g. Sweden and Denmark) and Southern Europe (e.g. Greece and Italy) on the one hand, and between the former and Eastern European countries (e.g. Romania, Latvia and Lithuania) on the other.

Many other studies focused on different SDGs. For example, Bieszk-Stolorz and Dmytrów (2023a, 2023b) used multivariate statistical methods, including cluster analysis, to examine the progress towards SDG 8 in EU countries. Bąk and Barej-Kaczmarek (2024) investigated poverty and social exclusion in EU-27 countries using linear ordering to classify them into categories. Walesiak and Dehnel (2024) assessed the progress in achieving SDG 7 in the EU, while Firoiu et al. (2021) used hierarchical clustering based on selected SDG 7 indicators to identify key characteristics of different groups of EU countries.

The EU has already made progress towards SDG 10 (Eurostat, 2023), however, a few years prior, the EC (2019) detected large differences between member states in this respect. Therefore, the aim of the study is to identify differences and similarities among the EU-27 in the context of SDG 10, which focuses on inequalities within and between countries, migration and social inclusion. We will try to achieve this aim by answering the following research questions:

- What groups of countries are characterised by comparable levels of inequality?
- What are the patterns of inequalities observed across the EU-27, particularly in relation to the characteristic variable levels within each identified group?

The present study contributes to the current knowledge in several dimensions. First, it focuses specifically on countries' performance with respect to SDG 10, in contrast to previous studies which evaluated countries' progress within a broader SDG framework. Secondly, while many studies rely on synthetic measures and rankings – which inevitably lead to the loss of information – this study not only conducts cluster analysis, but also provides a detailed insight into inequality patterns within individual economies forming each identified group. Finally, by using more recent data, this study offers an up-to-date assessment of the patterns of inequalities among EU countries.

The research relates directly to the EU core policies. The results may contribute to discussions about inequalities and the development of policies that consider country characteristics to effectively address the problematic areas.

2. Research method

The paper uses cluster analysis of the EU-27¹ to identify groups of countries with similar characteristics based on variables related to SDG 10. The analysis has been carried out twice, for the years 2010 and 2022. All data came from the Eurostat SDG database (<https://ec.europa.eu/eurostat/web/sdi/database>), which is specifically designed for the EU context and meets certain requirements (EC, 2023). This makes it a suitable data source for analysing EU countries. Data availability for all 27 countries limited the indicators and years used in the study. Based on the criteria, the first year analysed is 2010, and the last is 2022, with three significant exceptions:

- Croatia's 2010 value for the *Asylum* variable is set at the 2012 level due to data availability;
- the *Poverty_gap_urb_rul* variable in 2010 is at the 2015 level, as this is the first year available;
- in 2010, the *Emp_gap* variable is at the 2013 level for Bulgaria and 2018 for Romania due to data availability.

Additionally, for three variables (*Monet_poverty*, *Educ_leav*, *NEET*), indicators for the reporting economy were used instead of the citizenship gap, due to incomplete data for non-reporting EU-27 countries and non-EU-27 countries. This limits the usefulness of these variables as inequality indicators. The citizenship gap for the employment rate (*Emp_gap*) was calculated as the absolute difference in percentage points between the employment rate of citizens of the reporting country (rather than non-reporting EU-27 countries) and the employment rate of non-EU-27 citizens, due to data availability.

The final set of indicators consists of:

- *GDP* – purchasing-power-adjusted GDP per capita (index PPS_EU27_2020 = 100);
- *Inc_dispos* – adjusted gross disposable income of households per capita (% of the EU-27 average);
- *Poverty_gap_relat* – relative median at-risk-of-poverty gap (% of the distance to the poverty threshold);
- *Inc_distr* – income distribution (income quantile share ratio);
- *Inc_sh_40* – income share of the bottom 40% of the population (% of income);

¹ EU member states as of February 2020.

- *Poverty_gap_urb_rul* – urban-rural gap for the risk of poverty or social exclusion (absolute p.p. difference in the percentage of the population between cities and rural areas), authors' calculations;
- *Asylum* – positive first-instance decisions on asylum applications per million inhabitants;
- *Monet_poverty* – people at risk of monetary poverty after social transfers for the reporting country (% of the population aged 18 or over);
- *Educ_leav* – early leavers from education and training for the reporting country (% of the population aged 18 to 24);
- *NEET* – young people neither in employment nor in education and training (NEET) for the reporting country (% of the population aged 15 to 29);
- *Emp_gap* – citizenship gap for the employment rate (absolute p.p. difference between the employment rate of citizens of the reporting country and non-EU-27 citizens aged 20–64), authors' calculations.

Cluster analysis groups objects (countries in this case) into similar subsets (clusters) based on the features (variables) analysed (Frades & Matthiesen, 2010). This process ensures that objects within a cluster are more similar to each other than to those in other clusters (Friedman & Meulman, 2004). This study uses hierarchical cluster analysis (HCA), which is one of the most widely used clustering techniques (Ostasiewicz, 1999). It is particularly relevant when the number of clusters in the analysed data is unknown.

The starting point of the cluster analysis is to find the distance matrix of countries. The distances were calculated using the Euclidean metric, in which the distance between two objects (points) x and y in n -dimensional space can be expressed as

$$dist_{Euc} = \sqrt{\sum_{i=1}^n (x_i - y_i)^2},$$

where x_i and y_i are the i -th elements (dimensions) of objects x and y , respectively.

As the Euclidean distance requires the features to be uncorrelated (Mimmack et al., 2001, and the literature cited therein), the analysis was preceded by removing highly correlated variables.² The variables were selected using Hellwig's parametric method (implemented via the *helw* command in Stata by Panek & Zwierchowski, 2013) with the default threshold value of the correlation coefficient set at 0.75. As a result, the following variables were eliminated in 2010: *GDP*, *Poverty_gap_relat*, *Inc_sh_40* and

² The correlation matrices are presented in Table A in the Appendix.

Monet_poverty. To ensure comparability between the years, the same variables were excluded in 2022. The final list of variables for both years consisted of: *Inc_dispos*, *Inc_distr*, *Poverty_gap_urb_rul*, *Asylum*, *Educ_leav*, *NEET* and *Emp_gap*.³ To ensure all variables have equal weight during clustering, the data were pre-processed using z-score transformation. This technique subtracts the means of each variable and divides them by the standard deviation. This normalisation prevents the clustering from being biased by variables with high variability (Jajuga & Walesiak, 2000).

Agglomerative hierarchical clustering with Ward's linkage method was applied. The procedure starts with n (in this case, $n = 27$) clusters of size 1 (singletons) and then iteratively combines clusters to minimise the increase in the variance within each cluster. The process ends when all objects are combined into a single cluster at the root of the tree diagram. The graphical representation of this merging process is a dendrogram (Nielsen, 2016, pp. 21–62).

The analysis has been performed for the EU-27 and examined indicators linked to SDG 10. To provide some context for the research, Tables 1–3 present data on the variable level across the analysed countries and their changes between 2010 and 2022, measured using dynamic indices.

Inequalities between countries were monitored using purchasing power-adjusted GDP per capita (*GDP*) and adjusted gross disposable income of households per capita (*Inc_dispos*). These indicators are presented in Table 1.

Table 1. Purchasing-power-adjusted GDP per capita, adjusted gross disposable income of households per capita, relative median at-risk-of-poverty gap and income distribution

Country	<i>GDP</i>			<i>Inc_dispos</i>			<i>Poverty_gap_rel</i>			<i>Inc_distr</i>		
	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010
				in %			in %					
Austria	126	123	0.98	124	118	0.95	21.8	23.9	1.10	4.34	4.25	0.98
Belgium	120	119	0.99	115	114	0.99	18.0	18.2	1.01	3.92	3.56	0.91
Bulgaria	44	62	1.41	40	58	1.45	29.6	26.0	0.88	5.86	7.30	1.25
Croatia	61	72	1.18	59	70	1.19	27.6	25.3	0.92	5.54	4.57	0.82
Cyprus	101	98	0.97	100	100	1.00	18.0	16.0	0.89	4.54	4.28	0.94
Czechia	85	89	1.05	78	86	1.10	21.1	18.3	0.87	3.47	3.48	1.00
Denmark	130	135	1.04	106	100	0.94	21.6	19.4	0.90	4.41	4.03	0.91
Estonia	65	84	1.29	59	72	1.22	23.2	23.4	1.01	5.01	5.39	1.08
Finland	117	107	0.91	110	103	0.94	13.8	14.8	1.07	3.61	3.75	1.04

³ The coefficient of variation for the variables used in the analysis ranged from 22.48% (*Inc_distr*) to 145.17% (*Asylum*) in 2010, and from 22.46% (*Inc_distr*) to 104.75% (*Asylum*) in 2022.

Table 1. Purchasing-power-adjusted GDP per capita, adjusted gross disposable income of households per capita, relative median at-risk-of-poverty gap and income distribution (cont.)

Country	GDP			Inc_dispos			Poverty_gap_rel			Inc_distr		
	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010
				in %			in %					
France	109	98	0.90	116	109	0.94	19.5	20.2	1.04	4.43	4.60	1.04
Germany	122	118	0.97	125	126	1.01	20.7	20.3	0.98	4.49	4.38	0.98
Greece	84	67	0.80	89	68	0.76	23.4	23.8	1.02	5.61	5.20	0.93
Hungary	65	77	1.18	61	72	1.18	16.5	19.4	1.18	3.41	3.99	1.17
Ireland	130	238	1.83	101	92	0.91	15.5	16.7	1.08	4.70	3.81	0.81
Italy	106	98	0.92	111	97	0.87	24.8	26.1	1.05	5.38	5.62	1.04
Latvia	52	69	1.33	51	63	1.24	28.9	27.7	0.96	6.84	6.33	0.93
Lithuania	60	88	1.47	62	84	1.35	32.6	22.8	0.70	7.35	6.39	0.87
Luxembourg	272	252	0.93	151	141	0.93	18.6	18.2	0.98	4.10	4.51	1.10
Malta	87	105	1.21	77	87	1.13	17.3	16.5	0.95	4.33	4.75	1.10
Netherlands	137	134	0.98	118	115	0.97	16.2	19.2	1.19	3.65	3.94	1.08
Poland	63	78	1.24	66	77	1.17	22.2	20.7	0.93	4.98	3.91	0.79
Portugal	82	77	0.94	86	82	0.95	22.7	21.7	0.96	5.56	5.13	0.92
Romania	52	74	1.42	47	70	1.49	31.3	32.0	1.02	6.11	6.00	0.98
Slovakia	76	71	0.93	72	71	0.99	25.7	18.4	0.72	3.80	3.12	0.82
Slovenia	83	89	1.07	80	86	1.08	20.2	17.1	0.85	3.42	3.28	0.96
Spain	96	88	0.92	92	83	0.90	26.8	27.8	1.04	6.16	5.63	0.91
Sweden	127	115	0.91	112	104	0.93	19.9	21.5	1.08	3.85	4.34	1.13

Source: authors' calculations based on data from Eurostat.

In 2010, the 'index of GDP per capita in PPS' indicator exceeded 100 in 12 out of the 27 countries, while in 2022, it did so only in 10, so the number of countries surpassing the EU average declined in the studied period. Luxembourg recorded the highest values of this indicator in both years, while the lowest values were observed in Bulgaria. The index dynamics varied significantly between 2010 and 2022, ranging from 0.80 in Greece (a 20% decline compared to 2010) to 1.83 in Ireland (an 83% increase). The index increased in 13 countries, most notably in Ireland, Lithuania, Romania, Bulgaria and Latvia. Despite these countries' high growth rates of the index, all of them except Ireland recorded values below 100. The data show ongoing differences between old and new member states in this respect, with the latter achieving poorer results.

As regards the 'adjusted gross disposable income of households per capita' indicator, Luxembourg ranked the highest in both years, while Bulgaria performed the poorest. The top four countries – Luxembourg, Germany, Austria and the Netherlands – achieved best results in both studied years. Romania, Bulgaria and

Lithuania noted the highest growth rates of the indicator (at 49%, 45%, and 35%, respectively), while Greece experienced the largest decline rate (–24%). Despite these changes, the old EU member states maintained higher indicator values than the new members.

Four indicators were used to monitor inequalities within countries: the relative median at-risk-of-poverty gap (*Poverty_gap_rel*), income distribution (*Inc_distr*), the income share of the bottom 40% of the population (*Inc_sh_40*), and the urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*). Data for the first two indicators are presented in Table 1, and for the remaining ones in Table 2.

Table 2. Income share of the bottom 40% of the population, urban-rural gap for the risk of poverty or social exclusion, positive first-instance decisions on asylum applications per million inhabitants, and people at risk of monetary poverty after social transfers for the reporting country

Country	<i>Inc_sh_40</i>			<i>Poverty_gap_urb_rul</i>			<i>Asylum</i>			<i>Monet_poverty</i>		
	2010	2022	2022/ 2010	2015	2022	2022/ 2015	2010	2022	2022/ 2010	2010	2022	2022/ 2010
	in %			in p.p.						in %		
Austria	22.6	22.7	1.00	10.0	14.5	1.45	412	1,831	4.44	11.5	10.2	0.89
Belgium	23.2	24.1	1.04	10.6	11.1	1.05	322	935	2.90	11.9	11.4	0.96
Bulgaria	19.5	17.0	0.87	25.2	19.4	0.77	19	676	35.58	19.4	22.2	1.14
Croatia	20.0	21.8	1.09	14.8	11.0	0.74	5	5	1.00	20.7	18.5	0.89
Cyprus	21.9	22.1	1.01	5.8	5.3	0.91	512	625	1.22	14.1	11.3	0.80
Czechia	24.9	24.6	0.99	1.2	1.0	0.83	17	30	1.76	7.8	9.4	1.21
Denmark	23.0	23.3	1.01	7.5	6.2	0.83	242	87	0.36	13.2	12.3	0.93
Estonia	20.6	19.5	0.95	4.0	0.6	0.15	11	1,557	141.55	14.5	23.5	1.62
Finland	24.2	23.7	0.98	0.7	3.2	4.57	297	222	0.75	13.2	13.1	0.99
France	22.2	22.0	0.99	2.4	9.3	3.88	79	524	6.63	10.6	12.1	1.14
Germany	22.0	22.1	1.00	6.4	7.9	1.23	128	1,533	11.98	15.0	12.7	0.85
Greece	19.8	20.5	1.04	4.6	8.1	1.76	9	1,844	204.89	17.8	17.3	0.97
Hungary	24.8	23.3	0.94	11.4	9.8	0.86	26	3	0.12	10.4	12.1	1.16
Ireland	21.2	23.3	1.10	3.2	9.4	2.94	5	689	137.80	13.7	13.0	0.95
Italy	20.2	19.8	0.98	1.3	0.4	0.31	72	435	6.04	16.3	17.8	1.09
Latvia	17.9	18.7	1.04	11.8	14.5	1.23	12	122	10.17	19.2	22.9	1.19
Lithuania	17.7	18.4	1.04	14.8	10.7	0.72	5	108	21.60	19.6	21.5	1.10
Luxembourg	22.5	21.5	0.96	2.3	3.2	1.39	138	1,592	11.54	7.4	11.2	1.51
Malta	22.2	21.3	0.96	12.8	16.3	1.27	531	358	0.67	13.8	15.7	1.14
Netherlands	24.2	23.2	0.96	7.5	6.9	0.92	482	858	1.78	8.9	14.1	1.58
Poland	20.9	23.5	1.12	13.9	11.6	0.83	13	105	8.08	16.7	13.6	0.81
Portugal	19.7	20.9	1.06	3.2	9.5	2.97	5	64	12.80	16.9	15.8	0.93

Table 2. Income share of the bottom 40% of the population, urban-rural gap for the risk of poverty or social exclusion, positive first-instance decisions on asylum applications per million inhabitants, and people at risk of monetary poverty after social transfers for the reporting country (cont.)

Country	Inc_sh_40			Poverty_gap_urb_rul			Asylum			Monet_poverty		
	2010	2022	2022/ 2010	2015	2022	2022/ 2015	2010	2022	2022/ 2010	2010	2022	2022/ 2010
	in %			in p.p.						in %		
Romania	19.0	19.4	1.02	26.3	29.0	1.10	3	54	18.00	19.1	19.9	1.04
Slovakia	23.9	26.0	1.09	6.0	8.9	1.48	17	13	0.76	10.6	11.7	1.10
Slovenia	24.9	25.2	1.01	0.9	3.2	3.56	12	97	8.08	12.3	12.2	0.99
Spain	19.2	19.8	1.03	8.6	3.4	0.40	13	735	56.54	16.4	16.0	0.98
Sweden	23.6	22.4	0.95	2.1	1.9	0.90	907	462	0.51	12.4	13.7	1.10

Source: authors' calculations based on data from Eurostat.

The relative median at-risk-of-poverty gap was the lowest in both analysed years in Finland, reflecting its best performance in this respect among the EU-27 countries. In 2010, the indicator was the highest in Lithuania, Romania and Bulgaria, while in 2022, Romania, Spain and Latvia topped the list. Between 2010 and 2022, the indicator increased (the situation worsened) in 13 out of the 27 countries, with the most notable rise in the Netherlands (by 3 p.p.), Hungary (by 2.9 p.p.) and Austria (by 2.1 p.p.). Lithuania and Slovakia experienced the highest declines in this indicator, at –9.8 p.p. and –7.3 p.p., respectively.

The income distribution indicator is calculated by Eurostat as the ratio of the total income received by the highest-income 20% of the population to that of the lowest-income 20%. Between 2010 and 2022, the indicator increased in 11 countries, with the highest growth rates in Bulgaria (by 25%) and Hungary (by 17%). It declined in 16 countries, with the largest decrease observed in Poland (by –21%), Ireland (by –19%), and Slovakia and Croatia (by –18% each). These declines showed a favourable trend, as the disparity between the highest- and lowest-earning 20% of the population narrowed. In 2010, the highest values of the indicator were observed in Lithuania and Latvia, and the lowest in Hungary and Slovenia. In 2022, Bulgaria and Lithuania were the countries with the highest values of the indicator, and Slovakia and Slovenia were the ones with the lowest.

The average level of the income share of the bottom 40% of the population grew slightly, from 21.7% in 2010 to 21.9% in 2022, reflecting a positive trend. Increases were observed in 16 countries, with the highest one in Poland (by 2.6 p.p.). Among the countries that recorded a decline, Bulgaria experienced the sharpest one (by –2.5 p.p.), thus obtaining the lowest average proportion of the income of the bottom

40% of the population to the income of the total population of all the EU-27 in 2022. In Slovakia, on the other hand, this proportion was the highest in the same year.

The last indicator was the urban-rural gap for the risk of poverty or social exclusion. There were significant differences in those gaps across the EU-27. The worst situation, reflected by the highest values of the indicator in both 2015 and 2022, was observed in Romania and Bulgaria. In 2025, the gaps there reached 26.3 p.p. and 25.2 p.p., respectively, and in 2022, 29.0 p.p. and 19.4 p.p., respectively. Finland recorded the smallest gap in 2015 (0.7 p.p.), and Italy in 2022 (0.4 p.p.). In 2022, the gap compared to 2015 widened in 14 countries, with Finland showing the most notable increase.

The indicators presented in Tables 2–3 (*Asylum*, *Monet_poverty*, *Educ_leav*, *NEET*, *Emp_gap*) are used to monitor migration and social inclusion.

Table 3. Early leavers from education and training for the reporting country, young people neither in employment nor in education and training for the reporting country, and the citizenship gap for the employment rate

Country	Educ_leav			NEET			Emp_gap		
	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010
	in %			in %			in p.p.		
Austria	6.6	6.2	0.94	7.5	7.6	1.01	15.5	13.7	0.88
Belgium	11.0	5.7	0.52	11.6	8.4	0.72	26.2	24.4	0.93
Bulgaria	12.7	10.3	0.81	23.5	14.8	0.63	13.9	28.2	2.03
Croatia	4.4	2.1	0.48	17.3	13.0	0.75	30.9	6.3	0.20
Cyprus	7.6	3.2	0.42	11.5	12.0	1.04	6.2	6.2	1.00
Czechia	4.8	6.2	1.29	12.8	11.5	0.90	4.5	2.0	0.44
Denmark	11.3	9.8	0.87	7.8	7.8	1.00	20.0	10.1	0.51
Estonia	10.2	10.3	1.01	16.2	10.2	0.63	10.8	9.4	0.87
Finland	9.9	8.1	0.82	10.3	9.4	0.91	23.2	12.0	0.52
France	12.1	7.2	0.60	14.0	11.4	0.81	21.5	19.4	0.90
Germany	10.2	9.5	0.93	9.6	6.6	0.69	21.1	21.9	1.04
Greece	9.5	3.6	0.38	17.5	15.2	0.87	5.3	6.2	1.17
Hungary	10.7	12.2	1.14	17.7	10.7	0.60	8.5	10.2	1.20
Ireland	11.0	3.5	0.32	21.5	8.3	0.39	6.7	1.7	0.25
Italy	16.4	9.8	0.60	20.8	18.0	0.87	4.7	2.0	0.43
Latvia	12.6	6.6	0.52	19.9	10.8	0.54	11.4	8.5	0.75
Lithuania	7.9	4.8	0.61	16.9	10.8	0.64	4.7	1.6	0.34
Luxembourg	5.0	8.5	1.70	4.3	6.5	1.51	3.6	0.4	0.11
Malta	21.4	6.1	0.29	12.0	6.4	0.53	2.7	0.1	0.04
Netherlands	10.0	5.4	0.54	5.6	4.0	0.71	22.0	21.0	0.95
Poland	5.4	4.8	0.89	14.7	10.7	0.73	0.2	4.3	21.50

Table 3. Early leavers from education and training for the reporting country, young people neither in employment nor in education and training for the reporting country, and the citizenship gap for the employment rate (cont.)

Country	Educ_leav			NEET			Emp_gap		
	2010	2022	2022/ 2010	2010	2022	2022/ 2010	2010	2022	2022/ 2010
	in %			in %			in p.p.		
Portugal	27.8	6.1	0.22	12.9	8.3	0.64	1.3	3.3	2.54
Romania	19.3	15.6	0.81	18.9	19.8	1.05	8.6	2.2	0.26
Slovakia	4.7	7.4	1.57	18.9	12.3	0.65	3.5	8.5	2.43
Slovenia	4.8	3.5	0.73	8.9	7.7	0.87	9.3	1.4	0.15
Spain	25.3	11.3	0.45	17.6	11.0	0.63	4.5	9.0	2.00
Sweden	6.2	7.1	1.15	8.0	4.9	0.61	29.0	22.3	0.77

Source: authors' calculations based on data from Eurostat.

The number of positive first-instance decisions on asylum applications per million inhabitants increased significantly between 2010 and 2022, though the extent of the change varied considerably across the EU-27. The most significant increases were observed in Greece (from 9 to 1,844, a 20,388.9% rise), Estonia (from 11 to 1,557, a 14,054.5% rise), and Ireland (from 5 to 689, a 13,680.0% rise). In contrast, some countries recorded declines, including Hungary (−88.5%), Denmark (−64.0%), and Sweden (−49.1%). Accordingly, in 2022, the highest value of the indicator was observed in Greece, and the lowest in Hungary. Overall, the value range (the difference between the maximum and minimum values) expanded considerably between 2010 and 2022.

The 'people at risk of monetary poverty after social transfers' indicator grew between 2010 and 2022 (showing an unfavourable trend) in 14 countries, with increases ranging from 0.8 p.p. in Romania to 9.0 p.p. in Estonia. Declines were observed in 13 countries, varying from −0.1 p.p. in Finland and Slovenia to −3.1 p.p. in Poland. In 2022, the risk exceeded 20% in Estonia, Latvia, Bulgaria and Lithuania, whereas in 2010, this was the case only in Croatia. In 2010, Luxembourg, Czechia and the Netherlands boasted keeping that risk below 10%, while in 2022, only Czechia could do so.

The data on early leavers from education and training showed favourable changes between 2010 and 2022. The indicator decreased in 21 countries, with declines ranging from −21.7 p.p. in Portugal to −0.4 p.p. in Austria. However, in some countries (Luxembourg, Slovakia, Hungary, Czechia, Sweden and Estonia) the trend was unfavourable. Accordingly, in 2022, Portugal, which experienced the most significant decline in the number of early leavers from education and training, was no longer the

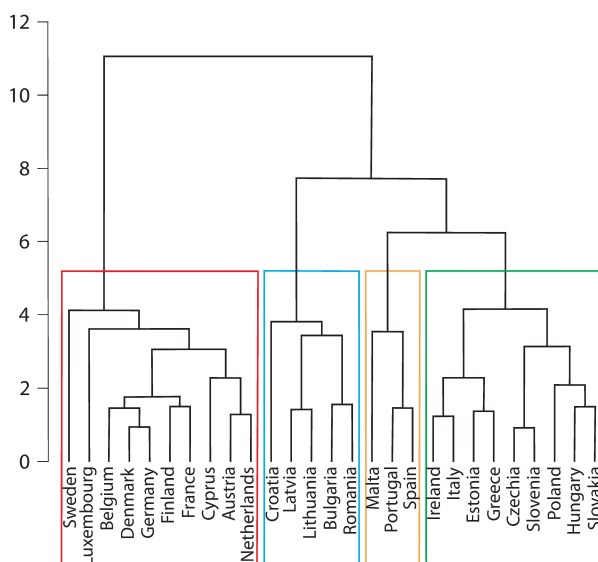
country with the highest percentage of them. This percentage was now the highest in Romania, followed by Hungary, Spain, Estonia and Bulgaria. Croatia remained the country with the lowest value of the indicator.

The ‘young people neither in employment nor in education and training’ indicator also showed a positive trend between 2010 and 2022. It dropped in 22 countries, most notably in Ireland (by –13.2 p.p.), Latvia (by –9.1 p.p.) and Bulgaria (by –8.7 p.p.). Only in four countries, namely Luxembourg, Romania, Cyprus and Austria, this indicator grew in the examined period. In Denmark it remained unchanged. Ireland, having ranked the second-worst country in terms of NEETs with only Bulgaria behind it in 2010, had significantly improved by 2022. In 2022, Romania had the highest percentage of NEETs, while the Netherlands had the lowest.

Likewise, there was an overall improvement in the ‘citizenship gap for the employment rate’ indicator between 2010 and 2022, which decreased in 18 countries, increased in eight and remained unchanged in one. As regards this indicator, however, there are significant disparities within the EU-27. In 2010, the gaps ranged from 0.2 p.p. in Poland to 30.9 p.p. in Croatia, and in 2022, from 0.1 p.p. in Malta to 28.2 p.p. in Bulgaria.

3. Results

Figures 1 and 4 show the results of the cluster analysis for 2010 and 2022, respectively, while Tables 4 and 5 list the identified clusters for the corresponding years, assigning a number to each of them. The number of clusters is, to a large degree, arbitrary, as there is no universal stopping rule that determines the appropriate number (Ostasiewicz, 1999). Clusters were detected by cutting branches off the dendrogram for both years at the height of 4.8, resulting in four clusters for 2010 and five for 2022. The selection of the cluster number for 2010 was done by means of four criteria implemented in the *NbClust* package (Charrad et al., 2014), namely the Krzanowski and Lai (*kl*), the Hartigan (*hartigan*), the Milligan and Cooper (*tracew*) and the Milligan (*ptbiserial*) criteria. For 2022, we retained the same level of relative dissimilarity to make a meaningful comparison of structural differences over time possible. To provide a more comprehensive overview, Figures 2 and 5 (maps) offer a visual presentation of the classification of EU member states into clusters, while Figures 3 and 6 present cluster-level means of the scaled (z-transformed) values of the variables used in the analysis for 2010 and 2022, respectively.

Figure 1. Results of cluster analysis: dendrogram for 2010

Source: authors' work using R software.

Table 4. Cluster composition – 2010

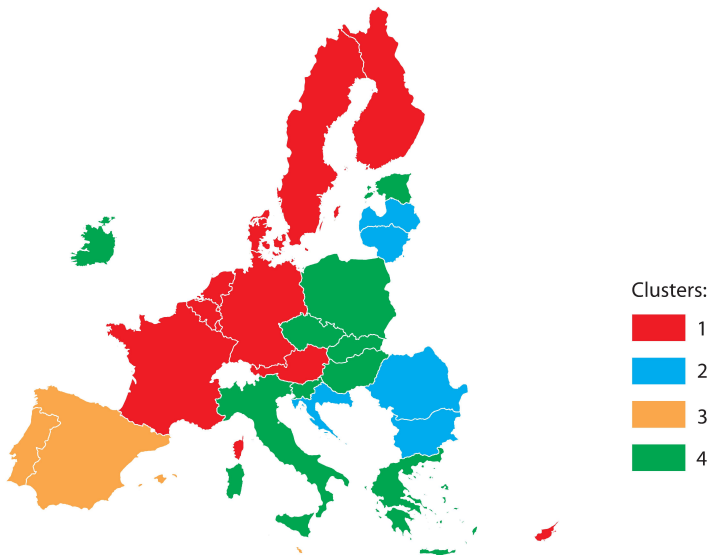
Cluster 1	Cluster 2	Cluster 3	Cluster 4
Sweden, Luxembourg, Belgium, Denmark, Germany, Finland, France, Cyprus, Austria, the Netherlands	Croatia, Latvia, Lithuania, Bulgaria, Romania	Malta, Portugal, Spain	Ireland, Italy, Estonia, Greece, Czechia, Slovenia, Poland, Hungary, Slovakia

Source: authors' work based on Figure 1.

Figure 3 (and Figure A1 in the Appendix) shows that countries in Cluster 1 in 2010 were characterised by a high mean value of adjusted gross disposable income of households per capita (*Inc_dispos*). While all the countries in this cluster exceeded the EU average for this indicator, the highest values were observed in Luxembourg, Germany, Austria, the Netherlands, France, Belgium and Sweden. On the other hand, countries in this cluster saw values for the income quantile share ratio (*Inc_distr*) below the EU average. Additionally, they had relatively small shares of young people neither in employment nor in education and training (*NEET*), with the smallest values for this indicator in Luxembourg, the Netherlands, Austria, Denmark and Sweden. This cluster also recorded the highest average number of positive first-instance decisions on asylum applications per million inhabitants (*Asylum*), with Sweden leading the group. Cluster 1

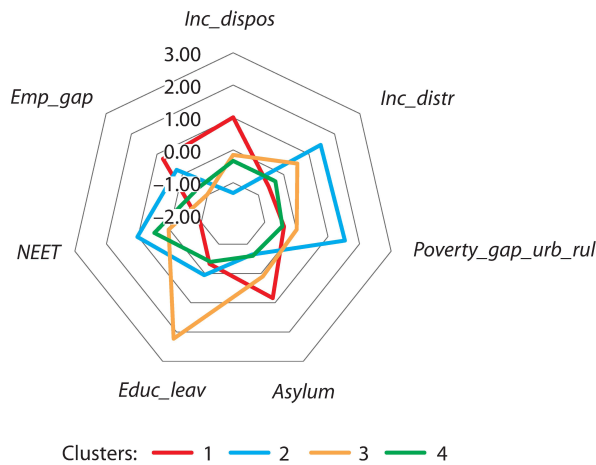
was also characterised by the highest average citizenship gap for the employment rate (*Emp_gap*), although this indicator varied across individual countries. Moreover, countries in this cluster had relatively low (mostly below the EU average) shares of early leavers from education and training (*Educ_leav*) and a relatively small urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*).

Figure 2. Results of cluster analysis: map for 2010



Source: authors' work based on Table 4.

Figure 3. Cluster-level means for 2010 (z-score transformed variables)



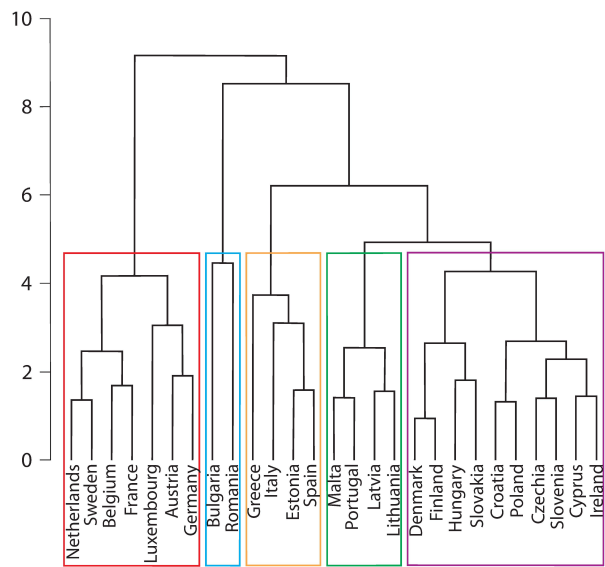
Source: authors' work.

Countries in Cluster 2 were characterised by the lowest average adjusted gross disposable income of households per capita (*Inc_dispos*), with the lowest values in the whole EU observed in Bulgaria, Romania, Latvia and Croatia. Lithuania also fell below the EU average for this variable. Additionally, all the countries of this cluster saw income quantile share ratios (*Inc_distr*) higher than the EU average, with the highest values in the whole EU observed in Lithuania and Latvia. The cluster also recorded extremely high values for the urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*), the highest of which were observed in Romania, Bulgaria, Croatia and Lithuania. Cluster 2 saw the lowest average number of positive first-instance decisions on asylum applications per million inhabitants (*Asylum*), with the smallest values in the whole EU in Romania, Croatia and Lithuania. Countries within this cluster recorded relatively high shares of young people neither in employment nor in education and training (*NEET*), with Bulgaria observing the highest share in the whole EU. On average, moderate values were reported for early leavers from education and training (*Educ_leav*) and for the citizenship gap for the employment rate (*Emp_gap*), with the exception of Croatia, where extreme values were observed: the lowest *Educ_leav* and the highest *Emp_gap*.

The distinguishing feature of countries in Cluster 3 was the highest shares in the whole EU of early leavers from education and training for the reporting country (*Educ_leav*). This cluster also recorded the lowest average value of the citizenship gap for the employment rate (*Emp_gap*) compared to other clusters, with all countries falling below the EU average for this indicator. While the values of the other variables showed no clear pattern, the situation varied across indicators.

Cluster 4 was characterised by the lowest mean urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*). Although there were differences among the countries, all of them except Hungary and Poland recorded values below the EU average. Additionally, this cluster saw the lowest mean value of the share of early leavers from education and training (*Educ_leav*), with all the countries recording values below the EU average except Italy. Countries in this cluster also observed relatively low values for positive first-instance decisions on asylum applications per million inhabitants (*Asylum*) and for the citizenship gap for the employment rate (*Emp_gap*), with both variables falling below the EU average. The cluster generally saw a higher-than-average share of young people neither in employment nor in education and training (*NEET*). There was no clear pattern for the income quantile share ratio (*Inc_distr*), although Hungary, Slovenia, and Czechia recorded the lowest values of this indicator in the whole EU. The adjusted gross disposable income of households per capita (*Inc_dispos*) was close to the EU average in this cluster.

Figure 4. Results of cluster analysis: dendrogram for 2022



Source: authors' work using R software.

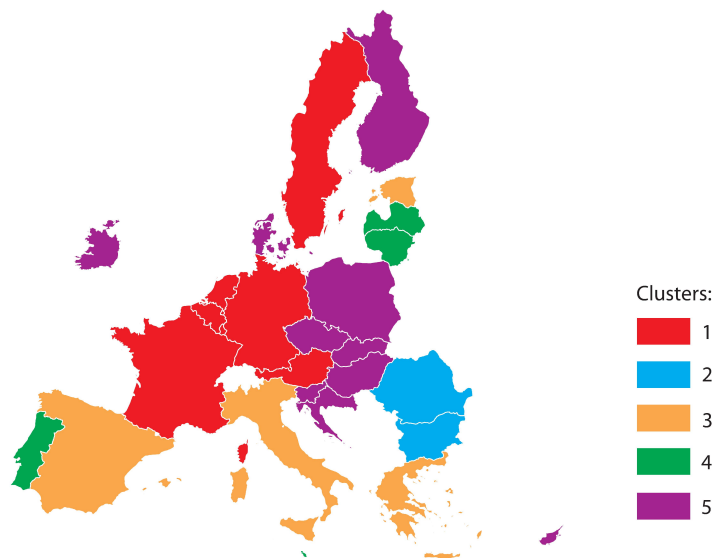
Table 5. Cluster composition – 2022

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
the Netherlands, Sweden, Belgium, France, Luxembourg, Austria, Germany	Bulgaria, Romania	Greece, Italy, Estonia, Spain	Malta, Portugal, Latvia, Lithuania	Denmark, Finland, Hungary, Slovakia, Croatia, Poland, Czechia, Slovenia, Cyprus, Ireland

Source: authors' work based on Figure 4.

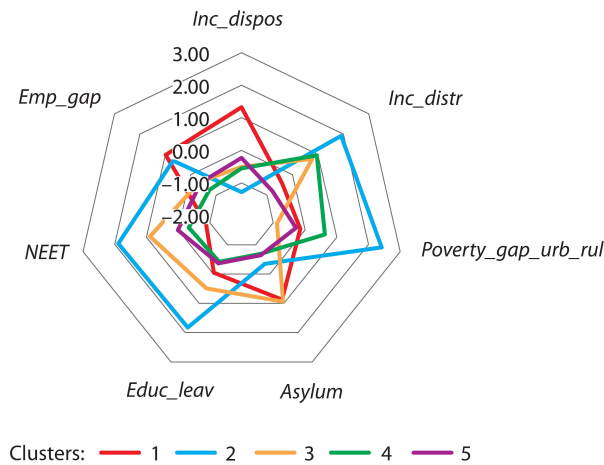
The analysis for 2022 identified five clusters. With the change in the number of clusters, their composition also changed, and most notably so when Romania and Bulgaria formed a separate group in 2022. Most countries that were in Cluster 1 in 2010 remained in the same group for 2022, with three exceptions, namely Cyprus, Denmark and Finland, which joined Cluster 5. In 2022, Cluster 5 mostly consisted of countries from the 2010 Cluster 4, including the whole Visegrad Group (Czechia, Hungary, Poland and Slovakia) plus Ireland and Slovenia. Also Croatia, which was part of Cluster 2 in 2010, moved to Cluster 5 in 2022. Meanwhile, Estonia, Greece and Italy, which were previously in Cluster 4, moved to Cluster 3 alongside Spain. Cluster 4 in 2022 was formed by two pairs of countries that belonged to separate groups in 2010: Latvia and Lithuania plus Malta and Portugal. The characteristics of the 2022 clusters are shown in Figure 6 (and Figure A2 in the Appendix).

Figure 5. Results of cluster analysis: map for 2022



Source: authors’ work based on Table 5.

Figure 6. Cluster-level means for 2022 (z-score transformed variables)



Source: authors’ work.

Cluster 1 in 2022 comprised countries with the highest adjusted gross disposable income of households per capita (*Inc_dispos*) in the whole EU. These countries also saw relatively low income quantile share ratios (*Inc_distr*), with most of them falling slightly below the EU average. This group was additionally characterised by relatively

high values of citizenship gap for the employment rate (*Emp_gap*), with all the countries except Luxembourg exceeding the EU average. The cluster also recorded relatively high numbers of positive first-instance decisions on asylum applications per million inhabitants (*Asylum*), with the exception of Sweden and France, which were slightly below the EU average in this respect. Countries in this group also observed low mean shares of young people neither in employment nor in education and training (*NEET*). The Netherlands and Sweden had the lowest share of NEETs in the whole EU. France was the only country in this cluster which exceeded the EU average for this indicator. The pattern of urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*) and the share of early leavers from education and training (*Educ_leav*) is less clear, although the mean values for both variables were slightly below the EU average in this cluster.

Bulgaria and Romania formed a separate cluster characterised by extremely high values of the urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*). Additionally, these countries observed high income quantile share ratios (*Inc_distr*), with the former ranking first and the latter fourth in the EU. Both countries recorded adjusted gross disposable income of households per capita (*Inc_dispos*) significantly below the EU average. Bulgaria ranked first and Romania fourth among the EU countries with the lowest values of this indicator. Romania also saw the highest share of young people neither in employment nor in education and training (*NEET*) and the highest number of early leavers from education and training (*Educ_leav*) in the whole EU. Bulgaria recorded high values for these indicators as well. No clear pattern emerged for the other analysed indicators, except for Bulgaria observing the highest citizenship gap for the employment rate (*Emp_gap*) in the whole EU.

Countries in Cluster 3 saw the lowest mean urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*), with Italy and Estonia recording the lowest values in the EU for this indicator. Other countries in this cluster also saw these values below the EU average. This cluster additionally observed the highest mean numbers of positive first-instance decisions on asylum applications per million inhabitants (*Asylum*), and although the situation varied across the countries, Greece was the EU leader in this respect. Furthermore, this cluster was characterised by relatively low citizenship gaps for the employment rate (*Emp_gap*) (all cluster members below the EU average) and by the adjusted gross disposable income of households per capita (*Inc_dispos*) close to the EU average. Their income quantile share ratio (*Inc_distr*) was slightly above the EU average. Countries in this cluster observed the shares of young people neither in employment nor in education and training (*NEET*) mostly above the EU average, with Italy ranking second and Greece third in the whole EU in this

respect. The shares of early leavers from education and training (*Educ_leav*) were relatively high for all countries except Greece.

Cluster 4 consisted of countries with the citizenship gaps for the employment rate (*Emp_gap*) below the EU average, with Malta recording the lowest value in the whole EU. Additionally, this cluster was characterised by relatively low (the lowest mean) values of positive first-instance decisions on asylum applications per million inhabitants (*Asylum*) and shares of early leavers from education and training (*Educ_leav*). These countries also saw the adjusted gross disposable income of households per capita (*Inc_dispos*) below the EU average, and Latvia had the second-lowest value of this indicator in the whole EU. Additionally, the cluster observed values of income quantile share ratios (*Inc_distr*) above the EU average, with Lithuania and Latvia ranking second and third in the whole EU, respectively. Cluster 4 was also characterised by the values of the urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*) above the EU average. The share of young people neither in employment nor in education and training (*NEET*) did not follow a clear pattern in this cluster, with two countries slightly above the EU average and two significantly below (Malta ranking the third-lowest in the whole EU).

Countries in Cluster 5 were characterised by the lowest mean income quantile share ratio (*Inc_distr*), with all of them reporting values below the EU average. The three lowest EU scores in this respect were recorded in Slovakia, Slovenia and Czechia. The countries in this cluster also saw mostly low values for the positive first-instance decisions on asylum applications per million inhabitants (*Asylum*). Hungary, Croatia, Slovakia and Czechia recorded the four lowest values of this indicator in the whole EU. Similarly, countries in this cluster observed the values of the citizenship gap for the employment rates (*Emp_gap*) mostly below the EU average, with Slovenia ranking the third-lowest in the whole EU. Their values for the share of young people neither in employment nor in education and training (*NEET*) and for the adjusted gross disposable income of households per capita (*Inc_dispos*) were close to the EU average, and likewise were their values for the urban-rural gap for the risk of poverty or social exclusion (*Poverty_gap_urb_rul*), with the exception of Czechia, which ranked the third-lowest in the whole EU in this respect. The share of early leavers from education and training (*Educ_leav*) showed no definite pattern, with Croatia, Cyprus, Slovenia and Ireland reporting the four lowest values of this indicator in the whole EU, while Hungary recording the second-highest value in the EU.

4. Discussion and conclusions

Sustainable development is a current focal point that underpins the EU policies targeted at building ‘a more sustainable, safer and better world for all’ (EC, n.d.). This

study clustered the EU-27 countries on the basis of indicators assigned to the SDG 10 (reduced inequalities) in the Eurostat SDG database. Seven variables were analysed independently for 2010 and 2022. The clustering process identified groups of countries with a similar level of inequality and showed key characteristics of each group, allowing the identification of patterns of inequalities across the EU-27 and addressing the research questions. The results show that the EU-27 countries do not form a homogeneous group regarding the variables analysed. Using the same height criterion to determine clusters resulted in different numbers of groups: four in 2010 and five in 2022. This caused significant changes in the composition of clusters, which can be attributed to shifts in the countries' characteristics.

Cluster 1, identified in both studied years and comprising almost exclusively old EU countries, underwent relatively minor changes in composition and retained its attributes in the most part. It was characterised by the highest mean of adjusted gross disposable income of households per capita, the highest citizenship gap for the employment rate, the lowest mean of young people neither in employment nor in education and training, and consistently high numbers of positive first-instance decisions on asylum applications per million inhabitants. However, three countries (Denmark, Finland and Cyprus) joined Cluster 5 in 2022, which primarily consisted of new member states. The countries forming Cluster 5 in 2022 could be defined as moderate performers. This group was characterised by the lowest average income quantile share ratio, a low mean value of positive first-instance decisions on asylum applications per million inhabitants, and a low share of early leavers from education and training. Romania and Bulgaria formed a separate cluster in 2022, partly due to their deteriorating performance compared to that of other countries, particularly in relation to the following indicators: the 'citizenship gap for the employment rate', 'income quantile share ratio' (Bulgaria), 'share of young people neither in employment nor in education and training', and 'urban-rural gap for the risk of poverty or social exclusion' (Romania).

The formation of Cluster 3 in 2022, comprising Greece, Italy, Estonia and Spain, could be partly explained by the growing differences in the number of positive first-instance decisions on asylum applications per million inhabitants. Greece, Estonia and Spain saw a huge growth in this indicator. Additionally, countries in this cluster recorded the lowest values of the 'urban-rural gap for the risk of poverty or social exclusion' indicator.

The remaining EU-27 countries (Malta, Portugal, Latvia and Lithuania) formed Cluster 4 in 2022, which was characterised by the lowest average values of the 'positive first-instance decisions on asylum applications per million inhabitants' and the 'share of early leavers from education and training' indicators.

Overall, the analysis highlights the heterogeneity of the EU-27 countries, especially the persistent division between the old and the new member states. This disparity is particularly pronounced in the case of certain countries within the latter group, especially Bulgaria and Romania, which are outliers. The study also shows some differences between the group of Northern and Western EU countries and that of Southern and Eastern ones, although these differences varied over time. Similar findings can be found in Labella et al. (2020), Szymańska (2021), and – to some extent – in Cojocar et al. (2022).

The study contributes to the scientific discussion on inequalities and policy implementation. The persistence of inequalities highlights the weaknesses in the EU Cohesion Policy and thus should attract the attention of policymakers. Mitigating these disparities requires multidimensional action, and the complexity of individual economies necessitates the development of tailored policies for both the specific dimensions of inequalities and for individual countries. For example, some countries experienced an unprecedented surge of immigration, reflected in the sharp increase in asylum applications. There are also significant differences across the EU-27 concerning the urban-rural gap for the risk of poverty or social exclusion, with Bulgaria and Romania recording extremely high values of this indicator. Additionally, our study shows varying dynamics across different areas of disparity. Some countries saw greater improvements in the case of certain indicators, while others experienced declines, which emphasises the need for continuing the monitoring process.

Our paper demonstrates that reducing inequalities is a complex challenge. Despite the fact that many years have passed since the most significant enlargement of the EU, much remains to be done to bridge the gap between the old and the new member states.

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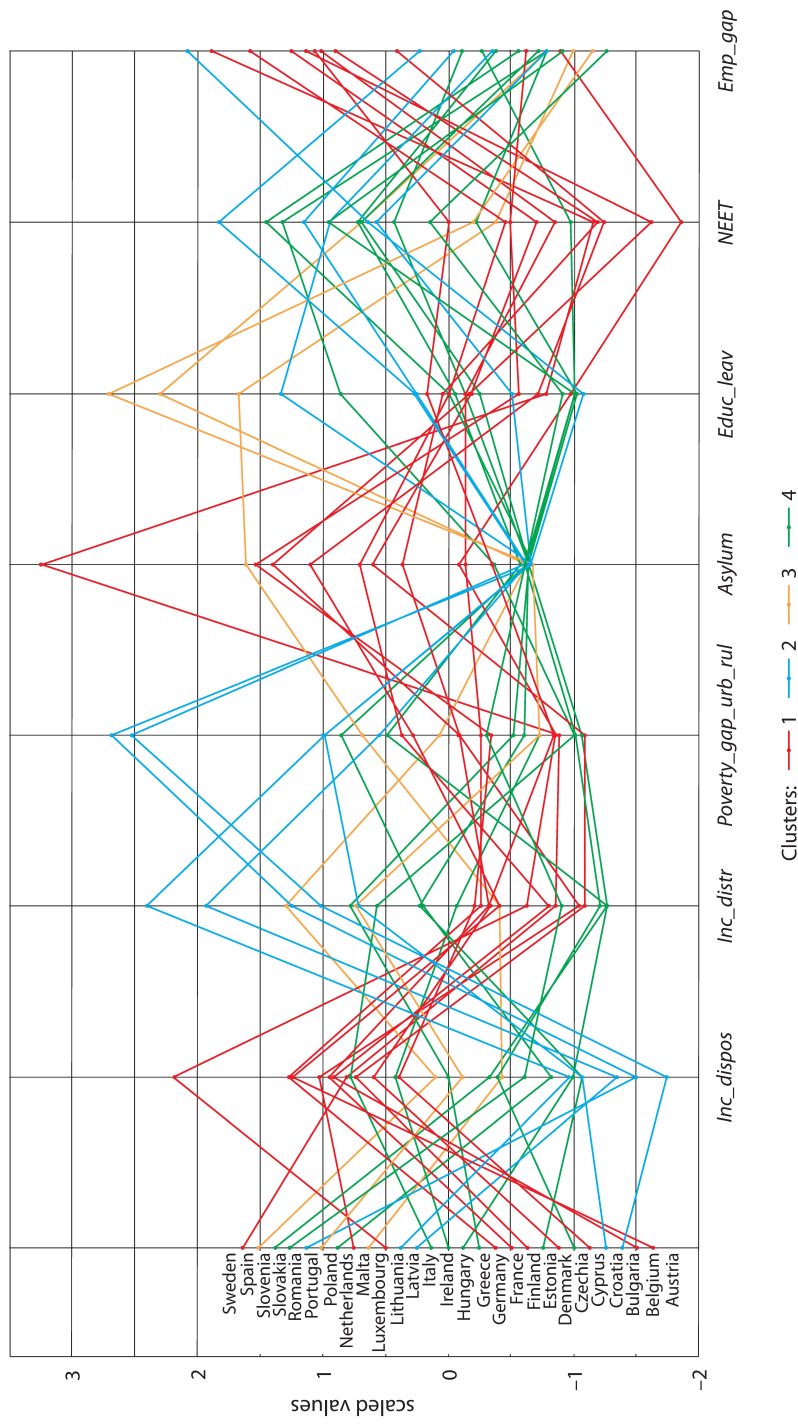
Appendix

Table A. Correlation matrix

Variable	GDP	Inc_dispos	Poverty_gap_rel	Inc_distr	Inc_sh_40	Poverty_gap_urb_rul	Asylum	Monet_poverty	Educ_leav	NEET	Emp_gap
2010											
GDP	1	.	.	.	.	.	.	.	.	.	.
Inc_dispos	0.879	1	.	.	.	.	.	.	.	.	.
Poverty_gap_rel	-0.531	-0.612	1	.	.	.	.	.	.	.	.
Inc_distr	-0.430	-0.479	0.818	1	.	.	.	.	.	.	.
Inc_sh_40	0.375	0.429	-0.753	-0.980	1	.	.	.	.	.	.
Poverty_gap_urb_rul	-0.491	-0.620	0.594	0.510	-0.483	1	.	.	.	.	.
Asylum	0.357	0.470	-0.472	-0.423	0.410	-0.170	1	.	.	.	.
Monet_poverty	-0.622	-0.598	0.715	0.857	-0.858	0.569	-0.347	1	.	.	.
Educ_leav	-0.190	-0.122	0.159	0.397	-0.433	0.184	-0.106	0.334	1	.	.
NEET	-0.665	-0.696	0.559	0.586	-0.592	0.419	-0.604	0.613	0.262	1	.
Emp_gap	0.124	0.269	-0.189	-0.251	0.263	0.002	0.434	-0.059	-0.272	-0.318	1
2022											
GDP	1	.	.	.	.	.	.	.	.	.	.
Inc_dispos	0.689	1	.	.	.	.	.	.	.	.	.
Poverty_gap_rel	-0.421	-0.450	1	.	.	.	.	.	.	.	.
Inc_distr	-0.312	-0.417	0.755	1	.	.	.	.	.	.	.
Inc_sh_40	0.229	0.336	-0.714	-0.985	1	.	.	.	.	.	.
Poverty_gap_urb_rul	-0.235	-0.351	0.447	0.406	-0.342	1	.	.	.	.	.
Asylum	0.364	0.452	0.030	0.070	-0.167	-0.150	1	.	.	.	.
Monet_poverty	-0.414	-0.618	0.690	0.852	-0.842	0.331	-0.049	1	.	.	.
Educ_leav	-0.111	-0.073	0.450	0.353	-0.325	0.230	-0.014	0.216	1	.	.
NEET	-0.491	-0.580	0.605	0.481	-0.422	0.347	-0.202	0.443	0.320	1	.
Emp_gap	-0.105	0.230	0.021	0.037	-0.019	0.067	0.281	-0.048	0.159	-0.240	1

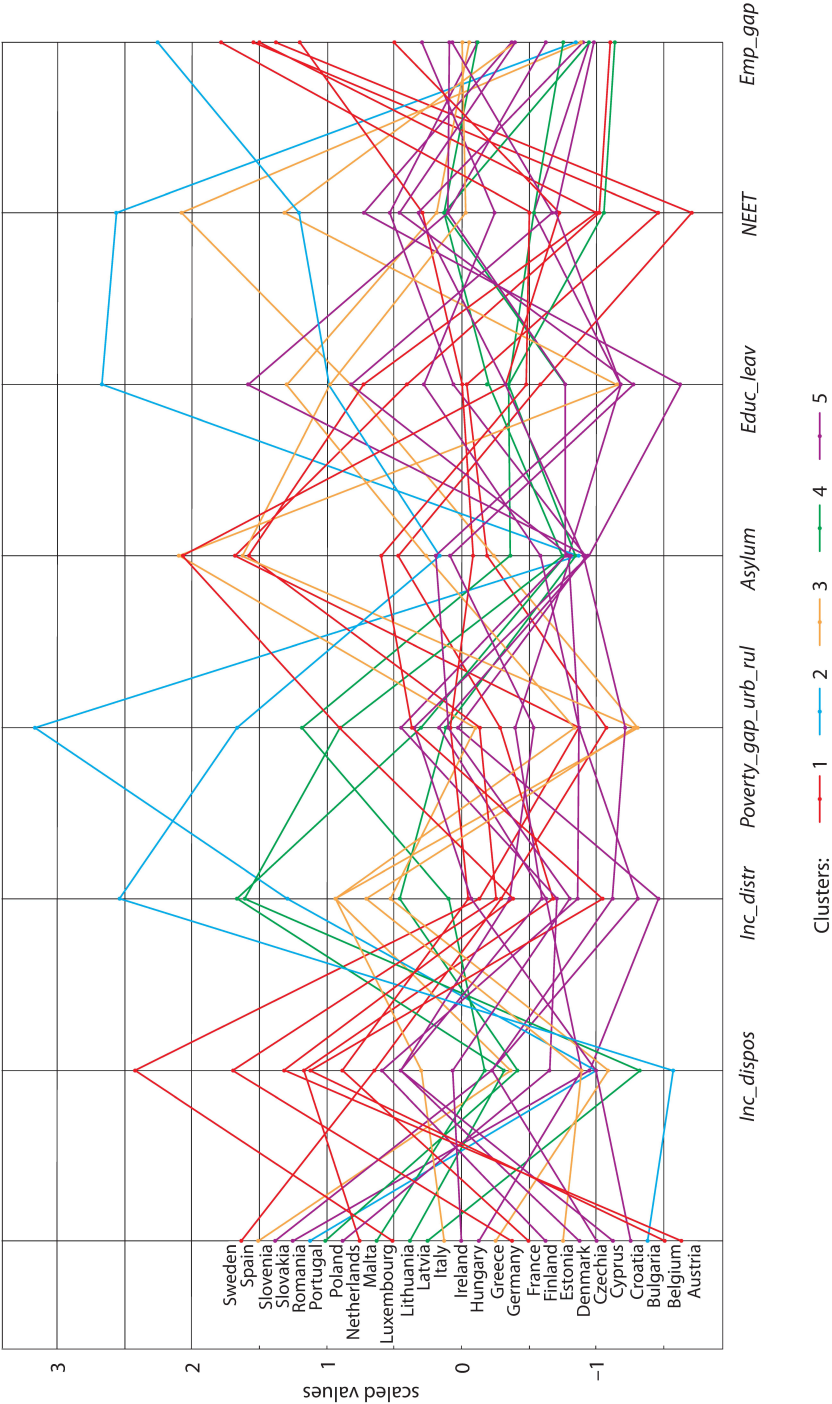
Source: authors' work using Stata.

Figure A1. Variable values by cluster – 2010



Note. The lines do not represent temporal dependencies. Their purpose is to illustrate the multivariate profiles of countries by connecting the variables within each observation, thereby facilitating comparison of the profiles and clusters.
Source: authors' work using R software.

Figure A2. Variable values by cluster – 2022



Note. As in Figure 1A.
Source: authors' work using R software.