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REDUCTION OF POVERTY AND MATERIAL DEPRIVATION IN THE EU COUNTRIES: WHAT MATTERS THE MOST?[3]

Poverty reduction belongs to the long-term priorities of public policy actions in most countries. In 2010, the European Union and its member states aimed to reduce the number of people living at risk of poverty by 2020. However, most EU countries failed to achieve their targets concerning poverty reduction, partly because of the challenges they had to cope with (slow economic recovery after the crisis, migration, COVID-19). In 2022, poverty risks were increasing in the EU countries once again. Therefore, research focused on determinants of poverty can help policymakers to identify the areas in which policy measures will be useful for poverty reduction or at least its stabilisation in the EU countries. The paper introduces an analysis examining five determinants of poverty (related to employment, incomes, education, and social protection), when poverty was understood in terms of incomes as well as material deprivation. The panel regression analysis was done for cross-sectional data covering EU 26 countries and the period 2010–2019. Statistical results revealed the statistically significant relationships between poverty risks (measured with the use of at-risk-of-poverty rate and rate of material deprivation), and employment, work intensity, and income inequality (representing the determinants of poverty). Findings indicated that particularly the policy measures adopted within the employment and labour market policies must be used in the fight against poverty in EU countries.
Keywords: employment; income inequality; material deprivation; panel regression; poverty; work intensity
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1. Introduction

In 2010, the European Union (EU) adopted the Strategy Europe 2020, which put forward three mutually reinforcing priorities of the EU and its member states (European Commission, 2010). The third priority was formulated as inclusive growth, and it committed the EU and EU countries to reduce the number of people living at risk of poverty by 20 million by 2020. The fight against poverty was further strengthened with the European Pillar of Social Rights that was set out in 2017 as a shared political commitment for a stronger social Europe. This commitment included 20 principles divided into three main chapters, which explicitly or implicitly address poverty and social exclusion as well. Explicitly, the Pillar spoke about the protection of children against poverty and about the prevention of in-work poverty (European Commission, 2022a). However, other principles introduced there that concerned education, gender equality, employment, wages, social protection, and care were also closely related to the risks of poverty and social exclusion. Therefore, during the second decade of the 21st century, the reduction of poverty got higher attention in the EU agenda than at any time before. However, many commitments concerning the reduction of poverty remained only political commitments, and the EU and some EU countries were too ambitious in their plans focused on the reduction of poverty risks. However, the period between 2010 and 2020 was full of challenges the EU countries had to cope with, and these challenges limited the success of EU countries in the fight against poverty.

The Strategy Europe 2020 was launched for the period 2010–2020 and aimed to help the EU and EU countries to overcome the global economic and financial crisis that started in 2007. Despite common and national policy actions, the economic recovery after the crisis was too slow in most EU countries and was connected with some internal structural and economic imbalances (Tuca, 2014). However, some EU countries had to cope with migration and refugee crises as well. This crisis reached its peak in 2015 (UNHCR, 2015) and hit mainly countries located near the Mediterranean Sea (Spain, Italy, Greece) and Germany or Sweden. Finally, in 2020, the EU countries were hit by the pandemic of COVID-19. All these challenges posed barriers to stronger social progress in the EU.

At-risk-of-poverty rate calculated for the EU 27 countries reached in 2019 the same value of 16.5% as in 2010, and values of the rate even grew between 2010 and 2016. Between 2019 and 2020, the proportion of people living at risk of poverty in EU-27 countries grew only slightly (from 16.5 to 16.6%) despite the risks associated with the pandemic of COVID-19. So far, any significant progress in poverty reduction has not been observed in EU countries, but unfortunately, statistical data has not revealed any significant regress despite the challenges the EU faced in the last ten years. However, new challenges rising in the EU in 2022 make further social progress an ambiguous one, because they are accompanied by the rapid growth of consumer prices and costs of living across the EU countries. As a result, an increase of poverty risks can be expected in most EU countries, and most countries have already introduced particular policy measures to cope with rising energy and food prices. Therefore, the identification of areas where the policy measures can be useful for at least stabilisation of the prevalence of poverty or for the further reduction of poverty should have the highest research priority.

Several research studies addressing poverty have already been published. They introduced this issue at the macro- or micro-level, and they did the analyses for different countries and different periods of time. The analysis introduced in the paper examined poverty and its determinants at the macro-level of EU countries, and it covered the period 2010-2019. The aim of the analysis was to examine the relationship between poverty and its selected determinants in the EU countries during the specified period of years. Determinants of poverty were selected according to the EU's understanding of poverty and its interconnections with education and employment and according to the ability of the variables to capture the achievements of EU countries in areas which are under direct or indirect policy control of the national policymakers. Therefore, the analysis aimed as well to identify the areas where the policy measures can be useful for the fight against poverty in the EU countries. To address the issue of the relationship between poverty and its five selected determinants, the panel regression analysis was used. Reduction of poverty was considered in terms of the declining rates of monetary poverty as well as in terms of declining rates of material deprivation.

Before the analysis, the relationship between the decreasing poverty rates and increasing employment rates, values of the ratio expressing the expenditures on social protection to incomes, and levels of attained education were expected. At the same time, it was expected that the increasing proportions of people living in households with very low work intensity, and increasing income inequality would be associated with the increasing poverty rates. These research expectations were assessed according to the results of the panel regression analysis and were discussed. The findings that are presented in the paper were consistent with the recently published studies, although they addressed the issue of poverty in the EU countries during different periods of time. Presented results confirmed particularly the statistically significant relationship between decreasing poverty rates and increasing employment rates, respectively decreasing proportions of people living in households with very low work intensity. Therefore, the findings indicated that policy measures must be related mainly to employment and labour market policies to be useful in the fight against poverty.

The following text is structured in a way that corresponds to the structure of the analysis. First, poverty is interpreted in the EU context. The main attention is given to the EU indicators measuring poverty risks. Then, variables and methods used in the analysis are introduced and explained; particular attention is paid to the literature review concerning the determinants of poverty. The empirical results are presented in the next section of the paper with the use of tables and figures. The last section of the paper is devoted to the summary and discussion of the findings.

2. Understanding of Poverty in the European Union

Poverty reduction is a traditional and legitimate goal of public policy actions (Ravallion, 2019). Therefore, the reduction of poverty belongs to the long-term priorities of all stakeholders in the EU countries as well. The EU agenda focused systematically on poverty reduction date back to the 1970s and 1980s. Since the 1970s, poverty has been understood in the EU, like in other developed countries with advanced economies, in relative terms. The EU's understanding of poverty refers to the definition introduced by Townsend (1979).

Townsend (1979, p. 31) understood poverty as a situation when individuals lacked resources to satisfy their needs in a way that excluded them from the participation in activities and living conditions and amenities "*which are customary, or are at least widely encouraged or approved*", in societies these individuals lived in. The first official EU definition of poverty was adopted by the EU Council of Ministers in December 1984. This definition considered to be poor those people "*whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the Member States in which they live*" (Council of the EU, 1985, Article 1, paragraph 2). In the 1990s, the EU's understanding of poverty was extended with the concept of social exclusion, which was introduced by the European Commission as a dynamic and multidimensional phenomenon affecting social cohesion in EU countries. The European Commission (1992) explained that social exclusion went beyond insufficient incomes or participation in working life and could be recognised in areas like housing, education, health, or accession to services. In general, the concept of social exclusion covers a wide range of socio-economic problems, because being socially excluded means to suffer from a combination of linked problems, including low incomes, unemployment, poor skills, poor housing, high crime environment, poor health, and family breakdowns (Social Exclusion Unit, 2001). However, low incomes are still understood as ones of the most important causes and consequences of social exclusion. Since the 1990s and particularly since the 2000s, the terms poverty and social exclusion have been used simultaneously in the EU official documents and combat with the risks of poverty and social exclusion has been recognised among the highest priorities of the EU institutions as well as the EU countries.

In general, two main approaches to the construction of poverty measures can be recognised – unidimensional, or multidimensional measures are then specified (Costa, 2003). The unidimensional measures refer to only one variable, while the multidimensional measures are based on several relevant dimensions of poverty (Alkire, 2007). Unidimensional poverty measures commonly observe poverty directly through consumption, or indirectly through incomes (Richardson, Bradshaw, 2012; Ringen, 1988). At the EU level, measures of income poverty have been well-established since 2001, when the Laeken indicators were agreed upon by the European Council. Laeken indicators were adopted with the aim to monitor the performance of EU countries and their progress towards the key EU targets stated by the European Council one year earlier (Atkinson et al., 2004). Laeken indicators included the first EU official at-risk-of-poverty rate (Rodrigues, 2014). The rate was defined as a proportion of persons with an equivalised total net income below 60% of the median of national equivalised income, which was officially recognised as the monetary (income) poverty threshold. This concept of monetary poverty is still essential in the EU's understanding of poverty, although it cannot satisfactorily capture the diversity of living conditions in EU countries (Fusco et al., 2010). Therefore, it is commonly argued that the at-risk-of-poverty rate monitors rather an income inequality more than poverty in the EU countries (Copeland, Daly, 2014; Nolan, Whelan, 2011). Therefore, the at-risk-of-poverty rate underestimates poverty in some countries, particularly in those countries having lower income inequality (Bradshaw, Mayhew, 2010; Bradshaw, Movshuk, 2019). As a result, countries with lower income inequality seem to have a lower occurrence of income poverty. However, the monetary understanding of poverty seems to be insufficient as well. If the emphasis is put on low incomes as the defining characteristic of poverty and the non-

monetary sources of the households' standard of living are not considered in relation to the risk of poverty, then the prevalence of poverty can be underestimated or overestimated. Being aware of these shortcomings, the European Commission measures poverty with the use of material deprivation rate as well. This later extension of the EU methodology for the poverty measurement shifts the EU understanding of poverty close to the multidimensional understanding of poverty (Alkire, Apablaza, 2016) that reflects poverty in a more complex manner and enables to identify of the most fundamental wants of households living in poverty.

The European Commission introduced, in relation to the Strategy Europe 2020, a composite indicator measuring the number of people living at risk of poverty or social exclusion (the indicator is further referred to as AROPE). This indicator expresses the sums or proportions of people who are affected at least by one of these three risks: (1) monetary poverty after social transfers; (2) severe material deprivation; (3) living in a household with very low work intensity. Therefore, the AROPE indicator compromises (Eurostat, 2022): (1) at-risk-of-poverty rate defined earlier as one of the Laeken indicators; (2) severe material deprivation rate defined as the proportion of persons who cannot effort at least four out of nine predefined material or monetary items regarded as desirable or necessary for the adequate life; (3) the proportions of persons living in households with very low work intensity. The AROPE can be characterised as the summary measure (Tsanov, Shopov, 2018) and its components measuring monetary poverty and material deprivation can be considered complementary (Copeland, Daly, 2014; Fusco et al., 2010), in spite of the fact that at-risk-of-poverty rate reflects poverty in the national socio-economic context because of the use of national monetary poverty thresholds, and material deprivation rate reflects poverty in the EU context because the set of items is commonly applied in all EU countries (Atkinson, 2010; Fusco, et al., 2010). The third component of AROPE measures the number of people living in households with very low work intensity that is defined to be equal or less than 20% of the total work potential during the previous year. However, the use of this measure reflecting the work intensity of EU households for poverty measurement is questioned, and some researchers argue that jobless or quasi-jobless households are not necessarily poor households (Copeland, Daly, 2014; Nolan, Whelan, 2011) even though the evidence from some EU countries suggests that the poverty risk is associated with household work intensity (Ward, Ozdemir, 2013). Despite the complex nature of AROPE that balances the direct and indirect approaches to poverty measurement, resp. unidimensional and multidimensional understandings of poverty, its shortcomings are accompanied by the shortcomings of its components that were indicated above. In addition, in general, the methodology of AROPE is not sensitive enough to consider the specifics existing in the EU countries, while such specifics can define the minimum or the average acceptable standard of living in these countries.

The construction of AROPE indicates that insufficient earnings from the labour market and total households' incomes after social transfers are key determinants of poverty risks. Other determinants of poverty recognised at the EU level can be deducted from the Strategy Europe 2020, which interprets the interrelations among poverty reduction and other headline targets, as for example the Strategy states, "*better educational levels help employability and progress increasing the employment rate helps to reduce poverty*" (European Commission, 2010, p. 9).

3. Data and Methods

In EU countries, the prevalence of monetary poverty is monitored through the number of persons (and their proportions in the total population) whose incomes are below the national poverty threshold. These persons are considered to live at risk of poverty. However, it does not necessarily mean that they are limited in or excluded from the minimum acceptable way of life in the countries they live in. They just have their incomes below the national poverty threshold. Reduction of poverty defined in this way poses a challenge for the policymakers, because at-risk-of-poverty rates observed in the EU countries reflect income inequality, and fight with poverty is then the fight against income inequality without the knowledge of the specific needs of people living at risk of poverty.

Because of the shortcomings of the EU's understanding of monetary poverty, the European Commission introduced the concept of material deprivation, which enables better targeting of policy measures focusing on poverty reduction. Material deprivation rates are denoted to specific lacks the EU households have. In the EU, material deprivation is understood as a state defined as the enforced inability to pay for at least three of the nine items, including rents, utility bills, home warming, unexpected expenses, meat, holidays, TV, washing machine, car, telephone. Severe material deprivation is then defined as deprivation in at least four items (Eurostat, 2022). Both understandings of poverty are used in the presented analysis, it means poverty was measured in terms of insufficient incomes (when the at-risk-of-poverty rate was used as a measure of poverty), and as well in terms of material deprivation (when the material deprivation rate was used as a measure of poverty).

At-risk-of-poverty rates and material deprivation rates differ across the EU 27 countries, and their variability is also visible over time. Therefore, an investigation of poverty determinants gets specific attention in recent research studies, and various research methods are applied to address this issue. The most common methods include: (1) multi-criteria decision-making methods (e.g. Łuczak, Kalinowski, 2020; Bárcena-Martín et al., 2020; Herman, 2014); (2) methods measuring efficiency (e.g. Vall Fonayet et al., 2020; Habidov, Fan, 2010); (3) methods of regression and correlation analysis (e.g. Halaskova, Bednar, 2020; Bosco, Poggi, 2019; Dudek, Sedefoglu, 2019; Miežienė, Krutulienė, 2019; Kis, Gábos, 2016; Duiella, Turrini, 2014; Nolan, Whelan, 2011).

Determinants of poverty are commonly addressed at the micro (households) level or at the macro (national, countries) level (Labudová et al., 2019). The most common determinants of poverty recognised at the macro-level are presented in Table 1, which summarises the findings presented in the selected relevant studies dealing with poverty and its determinants.

In the presented analysis, poverty and its determinants were examined at the macro level, and the analysis covered the period between 2010 and 2019. The aim of the analysis was to examine the relationship between poverty and its selected determinants in the EU countries during the specified period of years. Determinants of poverty were selected according to the EU's understanding of poverty and its interconnections with education and employment and according to the ability of the variables to capture the achievements of EU countries in areas, which are under direct or indirect policy control of the national policymakers. Therefore, the analysis aimed as well to identify the areas where the policy measures can be useful for the

fight against poverty in the EU countries. To address the issue of relationship between poverty and its five selected determinants, the panel regression analysis was used.

Table 1. The most addressed determinants of poverty

| Determinants of poverty (rates)	Research study by
Employment, resp. unemployment	Paľová, Vejačka (2018); Darvas (2017); Herman (2014); Duiella, Turrini (2014); Daly (2012); Herman, Georgescu (2012); Atkinson (2010)
Earnings – incomes	Duiella, Turrini (2014); Daly (2012); Herman, Georgescu (2012)
Inequality in incomes, distribution of income	Duiella, Turrini (2014); Herman (2014)
Education	Paľová, Vejačka (2018)
Social spending programmes, redistributive social policies	Balvočiūtė (2019); Miežienė, Krutuliené (2019); Leventi et al. (2017); Daly (2012); Caminada et al. (2010)
Social investment policies	Van Vliet, Wang (2015)
Economic growth	Page, Pande (2018); Darvas (2017); Leventi et al. (2017)
Demographic characteristics of population	Leventi et al. (2017)

Zulfikar (2018) explains that regression analysis of panel data means a regression analysis of data combining the cross-section data and time series data. It means that the same cross-section units are measured at different times. If the data are available for all units (countries *i*) and times (years *t*), the panel is balanced. To meet the aim of the analysis, panel regression analysis was done for two slightly different models. Model I understood poverty in its unidimensional meaning, and the at-risk-of-poverty rates were used as the dependent variable ($y1_{it}$). Model II reflected the multidimensionality of poverty, and material deprivation rates were considered as the dependent variable ($y2_{it}$). Material deprivation was defined as the enforced lack of at least three out of nine material deprivation items. Both models (Model I and Model II) used the same five ($k = 1,.., k = 5$) explanatory variables (regressors xk) defined as follows:

- total employment rate for the population group aged from 20 to 64 years in the percentage of the total population ($x1_{it}$);

- percentage of the total population aged less than 60 living in households with very low work intensity ($x2_{it}$);

- ratio of the first quartile top cut-off point to the third quartile top cut-off point, quartiles respect the distribution of incomes expressed in PPS ($x3_{it}$);

- ratio of expenditure on social protection per inhabitant in PPS to adjusted gross disposable income of households per capita in PPS ($x4_{it}$);

- percentage of the population with at least upper secondary educational attainment for the population group aged from 25 to 64 years ($x5_{it}$).

It was assumed that regressors x_k differed over time (period of years 2010–2019) and across EU countries, and thus they can explain the variability of at-risk-of-poverty rates and material deprivations rates in the EU countries during the specified period.

Analysis was done for EU 26 countries; Malta was excluded because of the lack of data on incomes. Used data panels were balanced, but one improvement of data was done. Instead of missing Bulgarian values of the variable x4 in 2018 and 2019, the value calculated for the year 2017 was used. All data were downloaded from Eurostat during December 2021 and January 2022. A statistical description of the used data is presented in Annex 1. Stata software was used for all calculations. The structure of the analysis is introduced in Figure 1.

Figure 1. Design of the analysis
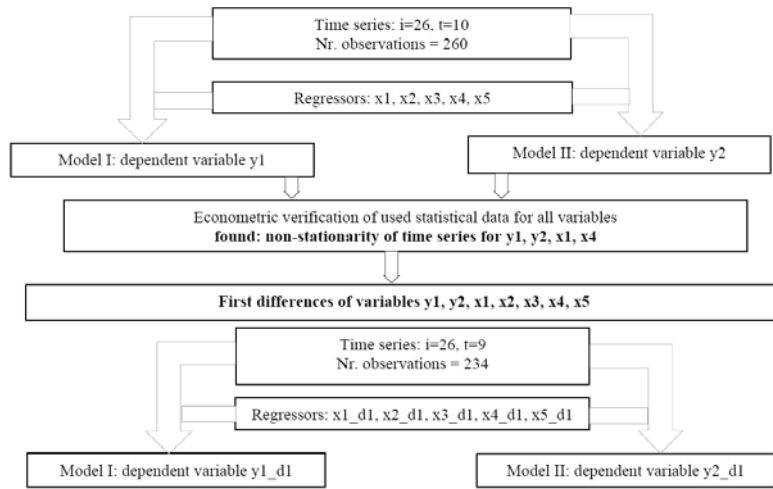
Because of the non-stationarity of time series for variables specified in Figure 1, first-difference models were constructed, where the first differences (*d1*) of all variables were used. The relationship between dependent variables (y1_d1, y2_d1) and regressors xk was defined to be in standard form, specified in Equations 1, 2, 3 and 4, defined as follows:

- *Fixed effect equation* (Zulfikar, 2018; Brüderl, Ludwig, 2015):

Model I: $y1\_d1_{it} = \beta_k xk\_d1_{it} + \alpha_i + \varepsilon_{it}$ (1)

Model II: $y2\_d1_{it} = \beta_k xk\_d1_{it} + \alpha_i + \varepsilon_{it}$ (2)

Where:

y1_d1 is used for the first differences of the variable y1;

y2_d1 – used for the first differences of the variable y2;

xk_d1 – used for first differences of variables x1, x2, x4, x5;

β_k – the vector of parameters to be estimated by the model;

α_i – the stable country-specific unobserved characteristics (so-called unknown intercept for a country i);

ε_{it} – the idiosyncratic error that varies across countries I and over time t (so-called error term).

- *Random effect equation* (Zulfikar, 2018):

Model I: $y1\_d1_{it} = \alpha + \beta_k xk\_d1_{it} + u_i + \varepsilon_{it}$ (3)

Model II: $y2\_d1_{it} = \alpha + \beta_k xk\_d1_{it} + u_i + \varepsilon_{it}$ (4)

Where:

> u_{it} *and* ε_{it} *again express the errors – so-called between-country error (u_{it}) and within-country error (ε_{it}).*

After the first differencing of all variables, Model I and Model II were considered new models and all the tests and calculations were done once again. Variables used for the calculations and obtained statistical results were verified with standard tests for normality, multicollinearity, heteroscedasticity, and stationarity (test for the normality of residuals; test of Variance Inflation Factor; White test, Levin, Lin, and Chu test). The decision between fixed and random effects was based on the results of the Hausman test.

4. Empirical Results

Traditionally, the European Union has been engaged in the promotion of inclusive economic growth and socio-economic progress in its member states, which was several times confirmed with the EU agendas focusing on the reduction of poverty and social exclusion. Reduction of poverty was reaffirmed among the highest political priorities of the European Commission and EU countries by the Strategy Europe 2020 as well as with the set of commitments entitled European Pillar of Social Rights. The Strategy was introduced with the Communication from the Commission in March 2010 with the subtitle "*A strategy for smart, sustainable and inclusive growth*". The Strategy represented a plan for the economic recovery after the crisis and formulated a vision of the EU economy for the 21st century. The Strategy proposed five measurable EU targets concerning employment, education, research and innovations, climate change and energy, and combating poverty. The main target in poverty reduction was formulated as "*20 million less people should be at risk of poverty*". This target meant to reduce "*the number of Europeans living below the national poverty lines should by 25%*" (European Commission, 2010, p. 3, 9).

4.1. Poverty and material deprivation in the EU countries during the period 2010-2019

The EU target formulated for the fight against poverty, introduced by the European Commission in 2010, was translated into national targets of the EU countries introduced within the European Semester framework. However, the EU countries were free to set their national targets for poverty reduction, and countries could even specify their own indicators they would use for the monitoring of their achievements. The AROPE, measuring the number of people at risk of poverty or social exclusion, was used for the formulation of national targets in 19 EU countries. Bulgaria, Denmark, Estonia, Germany, Ireland, Latvia, Netherlands, and Sweden used different indicators, either the components of AROPE or other indicators related to poverty. Bulgaria and Estonia formulated their targets with the use of at-risk-of-poverty rates, while Germany and Sweden focused their efforts on the reduction of

unemployment, or the growth of employment (European Commission, 2022b). However, only 9 out of 19 EU countries met their AROPE national target, when the values of AROPE monitored in 2019 were compared with the requested targeted values of the indicator. Bulgaria and Estonia did not meet their targets defined with the use of at-risk-of-poverty rates as well. Therefore, it is not surprising that the overall EU target adopted for the fight with poverty was not met, probably, the EU and EU countries were too ambitious in their plans for poverty reduction. On average, any stronger progress in poverty reduction was not observed in EU countries between 2010 and 2019, but unfortunately, statistical data did not reveal any regress despite the challenges the EU and its member states coped with during the period of years 2010–2019 (slow economic recovery after the crisis connected with internal structural and economic imbalances, migration crisis).

In all EU 27 countries (respecting the EU membership from 2020), around 103.7 million people lived at risk of poverty or social exclusion in 2010. During the period of years 2010–2019, first, the number of people at risk of poverty or social exclusion grew up to 108.7 million (in the year 2012). Then, they started to decline and reached a value of around 91.3 million in 2019. The EU target was defined to reduce the number of people living with incomes below the national monetary poverty threshold by 20 million by 2020. In 2010, around 71.5 million people were recognised as living at risk of monetary poverty in all EU 27 countries, and the overall trend of the prevalence of monetary poverty was like that one identified for the risk of poverty or social exclusion. First, the number of people at risk of poverty grew and reached the value of 76.6 million (in the year 2016), then number declined to 73.8 million (in the year 2018). However, between the years 2018 and 2019, new growth was evident, and in 2019, 75.5 million people lived with incomes below the national poverty thresholds in the EU 27 countries. The highest prevalence of monetary poverty was monitored in Romania in most years, while the lowest one was in Czechia (see the details about at-risk-of-poverty rates in Table 2).

Table 2. Values of at-risk-of poverty rates: average trend (in %)

Rate	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Max. value	21.6	22.3	23.1	23.1	25.1	25.4	25.3	23.6	23.5	23.8
Country	*Romania*	*Romania*	*Greece*	*Greece*	*Romania*	*Romania*	*Romania*	*Romania*	*Romania*	*Romania*
Min. value	9.0	9.8	9.6	8.6	9.7	9.7	9.7	9.1	9.6	10.1
Country	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*	*Czechia*
Mean value	16.0	16.3	16.3	16.4	16.9	17.1	17.1	16.8	16.7	16.5
Median value	15.5	15.4	15.3	15.9	16.4	16.3	16.5	15.9	16.4	17.1

Source: Eurostat.

The at-risk-of-poverty rates of EU 26 countries (without Malta) were used in Model I as the dependent variable y1. Its cross-sectional variability in 2010 and 2019 is visible in Figure 2. Figure 2 indicates that when these two years are compared, both extreme values (max. and min. value) were higher in 2019 than in 2010. The figure indicates as well that the risks of poverty were higher in Baltic, Southern and South-East EU countries than in the rest of the EU. The relatively better situation was monitored in Central and Western Europe, or in Sweden. The variability of dependent variable y1 across EU countries and over the period 2010–2019 is presented in Annex 2 as well, where the figures aim to demonstrate a high dispersion of the values of at-risk-of-poverty rates across the EU countries.

Figure 2. At-risk of poverty rates: variability in 2010 and 2019 (in %)
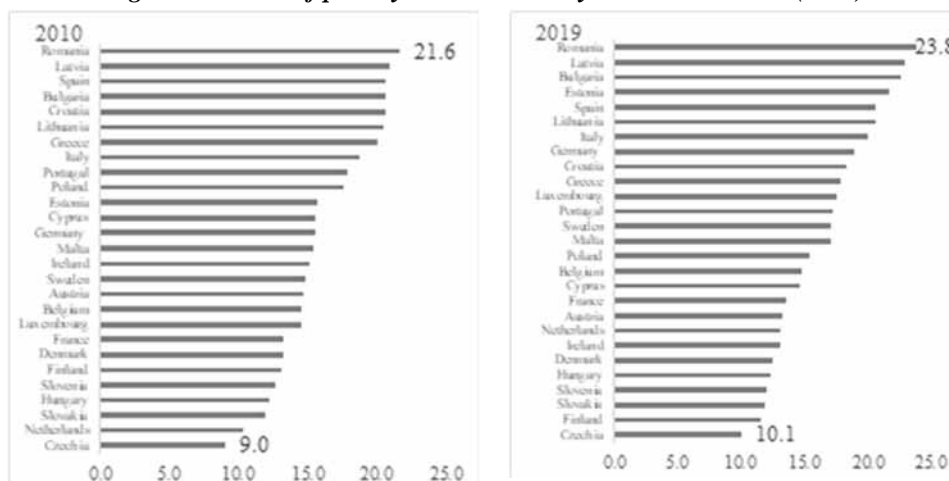
Source: Eurostat, own data processing.

Statistical data available in Eurostat enable us to examine material deprivation to various extents and depths. Table 3 presents material deprivation rates expressing the proportions of people living in enforced lack of at least three out of nine defined items. In all EU 27 countries, 18.5% of people were materially deprived in 2010. Like the at-risk-of-poverty rates, material deprivation rates grew first up to 20.2% (in the year 2012), then the rates started to decline and reached the lowest value in 2019 (12.0%). This development indicated strong progress in the reduction of material deprivation in some EU countries. This strong positive progress was visible mainly in the EU countries occupying the worst positions in countries' ranking in 2010. The highest rates of material deprivation were reached in Bulgaria in most years, where nearly 60% of citizens in 2010 and nearly 33% of citizens in 2019 lived in conditions of material deprivation. However, the material deprivation rate of Bulgaria was reduced by nearly 50% between 2010 and 2019, which revealed the most significant achievement among the EU countries. Details about the material deprivation rates are presented in Table 3 and in Annex 2.

Material deprivation rates were used as the dependent variables y2 in Model II. The cross-sectional variability of material deprivation rates is presented in Figure 3, which compares values of the rate monitored in 2010 and 2019.

Table 3. Values of material deprivation rates: average trend (in %)

Rate	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Max. value	59.4	60.1	61.6	58.0	46.8	49.1	46.9	43.8	33.6	32.6
Country	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Bulgaria*	*Greece*	*Bulgaria*
Min. value	4.1	4.7	4.5	5.4	4.4	4.0	3.7	4.2	4.5	3.7
Country	*Luxembourg*	*Luxembourg*	*Luxembourg*	*Sweden*	*Sweden*	*Sweden*	*Sweden*	*Sweden*	*Sweden*	*Luxembourg*
Mean value	21.7	22.4	23.2	23.1	21.7	19.9	18.3	16.7	14.9	13.4
Median value	16.1	20.9	21.3	19.9	19.9	16.5	15.0	12.8	11.0	11.1

Source: Eurostat.

Figure 3. Material deprivation rates: variability in 2010 and 2019 (in %)
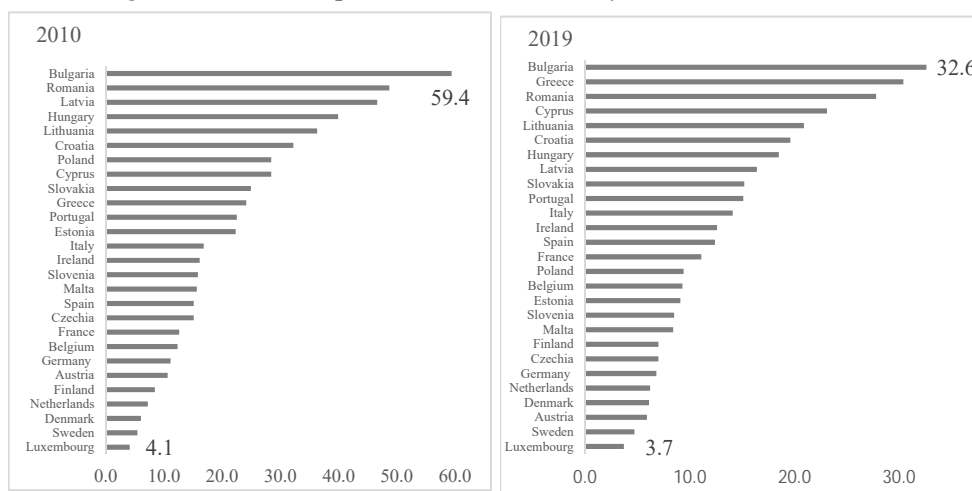
Source: Eurostat, own data processing.

Figure 3 reveals that, unlike the at-risk-of-poverty rates, the extreme values of material deprivation rates declined between the years 2010 and 2019, particularly the maximum value was reduced significantly. Figure 3 indicates as well that material deprivation was higher in some countries accessing the EU after the year 2003, but progress was visible, for instance, in Poland and Latvia. Thus, in 2019, material deprivation affected mainly citizens in the South-East EU countries. The variability of dependent variable y2 across EU countries and during the period of years 2010–2019 is presented in Annex 2, where the figures aim to demonstrate a high dispersion of the values of material deprivation rates across the EU countries.

4.2. Determinants of poverty in the EU countries during the period 2010-2019

The relationship between dependent variables (y1_d1, y2_d1) and regressors xk (x1_d1, x2_d1, x3_d1, x4_d1, x5_d1) was investigated with the use of panel regression analysis. Two models were constructed. The model I was designed to show the relationship between y-o-y changes in at-risk-of-poverty rates (y1_d1) that were considered as the depended variables, and y-o-y changes in five selected regressors (xk_d1).

It was expected before the analysis that:

- *positive effects on poverty reduction, represented by declining values of at-risk-of-poverty rates, will have:*
  1. Increasing employment rates – Generally, as deduced from the Strategy Europe 2020, increasing rates of employment (variable x1_d1) should have positive effects on the reduction of poverty risks.

2. Increasing values of the ratio expenditures on social protections to incomes (variable x4_d1) – Social expenditures are commonly used by the policymakers in the EU countries to reduce income inequality and thus poverty understood in monetary terms.

3. Increasing proportions of people with at least upper secondary education (variable x5_d1) – Deducted from the Strategy Europe 2020, higher levels of education should reduce the poverty risks because higher education increases employability.

- *negative effects on poverty reduction or the growth of poverty, represented by increasing values of at-risk-of-poverty rates, will have:*

1. Increasing proportions of people living in households with very low work intensity (variable x2_d1) – Full-time jobs and jobs or employment, in general, are the main sources of incomes of EU households.

2. Increasing income inequality, represented with the variable x3_d1. – Poverty itself is understood in terms of income inequality in AROPE.

All the calculations were done in Stata. Statistical results for Model I, examining the relationship between at-risk-of-poverty rates and five selected determinants of poverty, are presented in Table 4. Based on the results of the Hausman test, Model I was designed as the model with random effects.

Table 4. Model I: results of the panel regression analysis

y1_d1	Coef. β	St. Err.	t-value	p-value	[95% Conf. Interval]		Sig.
x1_d1	.039	.047	0.83	.407	-.054	.132	
x2_d1	.101	.046	2.18	.029	.01	.192	**
x3_d1	9.589	.963	9.95	0	7.701	11.477	***
x4_d1	8.763	6.507	1.35	.178	-3.99	21.516	
x5_d1	-.015	.05	-0.31	.76	-.114	.083	
Constant	.03	.065	0.45	.649	-.098	.158	

Mean dependent var	0.050	SD dependent var	0.835
Overall r-squared	0.343	Number of obs.	234
Chi-square	119.251	Prob > chi2	0.000
R-squared within	0.338	R-squared between	0.423

*** p<.01, ** p<.05, * p<.1

Results presented in Table 4 clearly showed that in Model I, two explanatory variables were considered significant (for p = 0.05). These were variables x2_d1 and x3_d1. These results indicated that when poverty was understood simply in monetary terms, explanatory variables concerning work intensity and incomes were significant, and the relationships between their y-o-y changes were positive (see the values of β_2 for x2, and β_3 for x3). It means that if the government aims to reduce poverty, it should lower the number of people living in households with very low work intensity. However, the positive value of β_3 indicated that decreasing at-risk-of-poverty rates were accompanied by decreasing values of variable x3, expressing income inequality. Decreasing values of x3 meant widening of the gap between the first and third quartile top cut-off of incomes, and thus rising income inequality in a

country. This result indicated that the declining prevalence of poverty was related to rising income inequality, which differed from the expectations formulated before the analysis.

Model II was designed to identify the relationship between y-o-y changes in material deprivation rates (y2_d1, and y-o-y changes in five selected regressors (xk_d1). The interpretation of the relationships between material deprivation rates and determinants of poverty was expected to be the same as in Model I because the material deprivation rate was understood Model II to be the measure of poverty. Based on the results of the Hausman test, the model was designed to have fixed effects. Statistical results of Model II are presented in Table 5.

Table 5. Model II: results of the panel regression analysis

y2_d1	Coef. β	St. Err.	t-value	p-value	[95% Conf. Interval]		Sig.
x1_d1	-.491	.134	-3.65	**0**	-.756	-.226	***
x2_d1	.713	.124	5.74	**0**	.468	.959	***
x3_d1	2.06	2.575	0.80	.425	-3.017	7.136	
x4_d1	-5.928	17.911	-0.33	.741	-41.244	29.388	
x5_d1	.232	.155	1.50	.135	-.073	.537	
Constant	-.622	.179	-3.48	**.001**	-.974	-.269	***

Mean dependent var	-0.926	SD dependent var	2.262
R-squared	0.334	Number of obs.	234
F-test	20.332	Prob > F	0.000
Akaike crit. (AIC)	912.130	Bayesian crit. (BIC)	932.862

*** p<.01, ** p<.05, * p<.1

Results presented in Table 5 showed that two explanatory variables were considered significant (for p = 0.05) in Model II. These were y-o-y changes in employment rates (x1_d1) and y-o-y changes in the proportions of people living in households with very low work intensity (x2_d1). The value of β_2 again indicated the positive relationship between the reduction of material deprivation and lowering proportions of people living in these households. The relationship between the material deprivation rate and the employment rate was identified to be negative (negative value of β1), which indicated that increasing employment rates were related to declining material deprivation rates. Both identified relationships between the dependent variable and these two regressors met the expectations formulated before the analysis.

5. Discussion and Conclusion

The persistent poverty is one of the most serious socio-economic phenomena that influence individuals' well-being around the world. Therefore, the European Union considers poverty reduction relevant to its policy agenda as well and in 2010, the European Commission formulated the target to reduce the number of EU citizens living at risk of poverty by 20 million by the year 2020. Despite the policy efforts made at the EU level as well national level in the EU countries, the target was not met. However, the second decade of the 21st century was full of challenges the EU countries faced. First, most EU countries had to cope

with slow economic recovery after the global financial and economic crisis that revealed their internal structural and economic imbalances. The recovery, understood here in terms of economic growth, was not visible in most EU countries until 2014. Then, some EU countries – especially those located around the Mediterranean Sea (like Spain, Italy and Greece), or Germany and Sweden, were affected by the peak of the migration and refugee crisis in 2015, followed by increased migration inflows also in other years. The end of the decade was influenced by the pandemic of COVID-19 starting in the EU countries in spring 2020.

According to the EU official documents, poverty is understood in most EU countries in terms of insufficient incomes, and the poverty cut-off point is defined with 60% of the median of national equivalised income. This measure of poverty is discussed a lot because it reflects rather income inequality than poverty and it omits the non-monetary aspects of the living standards. Therefore, the prevalence of the risks of poverty or social exclusion is monitored by the European Commission with the use of a summary or complex indicator called AROPE that also includes two other components, capturing the proportions of people living in conditions of material deprivation, and the proportions of people living in households with very low work intensity. Respecting the EU's understanding of poverty, the presented analysis aimed to examine the relationship between poverty and its five selected determinants. As the determinants of poverty were chosen variables that had the ability to capture the achievements of EU countries in policy areas controlled by the national policymakers (employment, work intensity, income inequality, public expenditures on social protection, education). Panel regression analysis was used to investigate the relationship between poverty and these determinants. The analysis examined for expected relationships between poverty reduction and these five determinants. Two models were used. The model I understood poverty in terms of monetary poverty, and Model II dealt with material deprivation.

Statistical results calculated for Model I indicated that a significant relationship existed during the period of years 2010-2019 between the at-risk-of-poverty rates as the dependent variable, and the proportion of people living in households with very low work intensity, and the income inequality as two explanatory variables. Values of β-coefficients indicated positive relationship between y-o-y changes of the dependent variable (at-risk-of-poverty rate) and y-o-y changes in these two explanatory variables. Results calculated for Model II indicated a significant relationship between y-o-y changes in material deprivation rates as the dependent variable, and employment rates, and proportions of people living in households with very low work intensity as two explanatory variables. The relationship between y-o-y changes in material deprivation rates and changes in rates of employment was identified to be negative; hence the increasing employment rates were accompanied by declining rates of material deprivation. The relationship between material deprivation and very low work intensity was again positive, similarly to Model I.

The results of the analysis were limited by the applied statistical method (panel regression analysis), the length of the examined period (2010–2019), and selected dependent and independent variables. Therefore, it is crucial to discuss the presented findings in the context of other relevant studies examining poverty in EU countries. However, despite the indicated limitations, the presented findings were consistent with findings presented in other recently published studies dealing with poverty in the EU context (Paľová, Vejačka, 2018; Duiella,

Turrini, 2014; Herman, Georgescu, 2012). For instance, Duiella and Turrini (2014) analysed poverty in EU countries between the years 2005 and 2012, and they did not identify any clear drivers of at-risk-poverty rates, but they discovered a significant relationship between severe material deprivation rate as a dependent variable, and two explanatory variables – incomes and unemployment rates. Herman and Georgescu (2012) showed that employment and incomes were essential for the combat against poverty in Romania. The importance of other selected determinants of poverty, particularly the very low work intensity, was shown by other researchers, such as Goerne (2011), Mysikova et al. (2015), Horemans (2017) or Gerlitz (2018). For instance, Mysiková at al. (2015) found a significant relationship between work intensity and poverty in Central European countries for the period of years 2006–2013. Horemans (2017) associated poverty with part-time jobs that can be statistically captured by an indicator of very low work intensity. Repeatedly confirmed associations between poverty and low work intensity pose a serious policy challenge because studies with microdata showed that low work intensity of households resulted from the configurations of households (Marx, Nolan, 2014), and low work intensity was mainly related to households with a single parent and dependent children (Šoltés, Šoltésová, 2016; Raitano et al., 2019).

Relationships between poverty and its five selected determinants identified in the empirical analysis presented in the paper were mostly consistent with expectations formulated before the analysis and were in line with the EU's official understanding of poverty. Quite surprising was the positive relationship between y-o-y changes in at-risk-of-poverty rates and changes in a variable expressing income inequality. However, also here, the analysis confirmed the findings of previous studies, which were not unambiguous about the relationship between poverty and income inequality. For instance, Beker (2020) considered the relationship between poverty and income inequality as complex; McKnight (2019) showed that the relationship between poverty and inequality was dependent on the extent to which the inequality measure was sensitive to the dispersion of incomes; and finally; and Beteille (2003) argued that relationship between poverty and income inequality was neither clear nor direct, and the poverty and inequality could even change in the opposite direction.

Results presented in the paper indicated that policy measures concerning employment, work intensity and incomes could matter for the reduction of poverty in the EU countries. These findings enable to formulate of specific political recommendations. The main policy attention should be paid in the EU countries in the next years to employment and labour market policies. They should be focused primarily on people with insufficient attained education as they are the most vulnerable ones in the labour market. These policies can be oriented toward strengthening the business environment and generating new job opportunities. The employability of individuals with low or insufficient skills and working habits should be boosted through the public support provided to the social entrepreneurship. Special policy measures should be then focused on single-parent households with dependent children as well. In 2020, nearly 8 million households consisting of single parent and dependent children lived in the EU countries, and these families were at the most serious risk of low work intensity because of the necessity to take care of children. If low work intensity was identified as a significant determinant of the poverty risk as well as the risk of material deprivation, then the policymakers must focus as well on measures that will ease the childcare to offer parents the option to have full-time jobs. These measures should be adopted within the pro-family policies and should include material (financial) and immaterial support. The

immaterial support should be targeted at the accessibility of adequate social services of childcare and the prevention of the families' breakdowns. It seems that they will be useful for the reduction of poverty (or at least for the stabilisation of the current socio-economic situation) in EU countries in the next years as well.

Since 2020, the EU countries have had to cope with newly arising challenges affecting the standard of living of EU citizens, as well as the macroeconomic situation in the EU and its member states (the COVID-19 pandemic, Russian attack in Ukraine accompanied by new migration wave and rapid growth of energy and food prices). An increase in poverty risks and risks of material deprivation is expected in most EU countries. Some EU countries have already adopted specific policy measures to protect households against poverty and social exclusion in the next years. Therefore, the current situation opens a venue for further research dealing with more determinants of poverty, including also consumer prices in the EU countries.

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Annex 1
Description of used variables

Variable		Mean	Std. dev.	Min	Max
y1	overall	16.63	3.85	8.6	25.4
	between		3.78	9.49	23.65
	within		1.00	12.52	19.08
y2	overall	19.75	12.78	3.70	61.60
	between		12.02	4.75	49.12
	within		4.89	2.98	35.58
x1	overall	70.19	6.18	52.50	82.40
	between		5.50	57.08	80.47
	within		3.01	62.12	78.09
x2	overall	9.89	3.53	4.20	26.9
	between		3.13	6.20	19.74
	within		1.73	2.77	17.05
x3	overall	2.00	0.23	1.62	2.53
	between		0.22	1.67	2.40
	within		0.05	1.83	2.16
x4	overall	0.34	0.08	0.21	0.52
	between		0.08	0.22	0.50
	within		0.01	0.30	0.37
x5	overall	79.54	11.88	31.70	95.00
	between		11.83	42.87	93.75
	within		2.44	68.37	88.87

Source: Eurostat, own data processing.
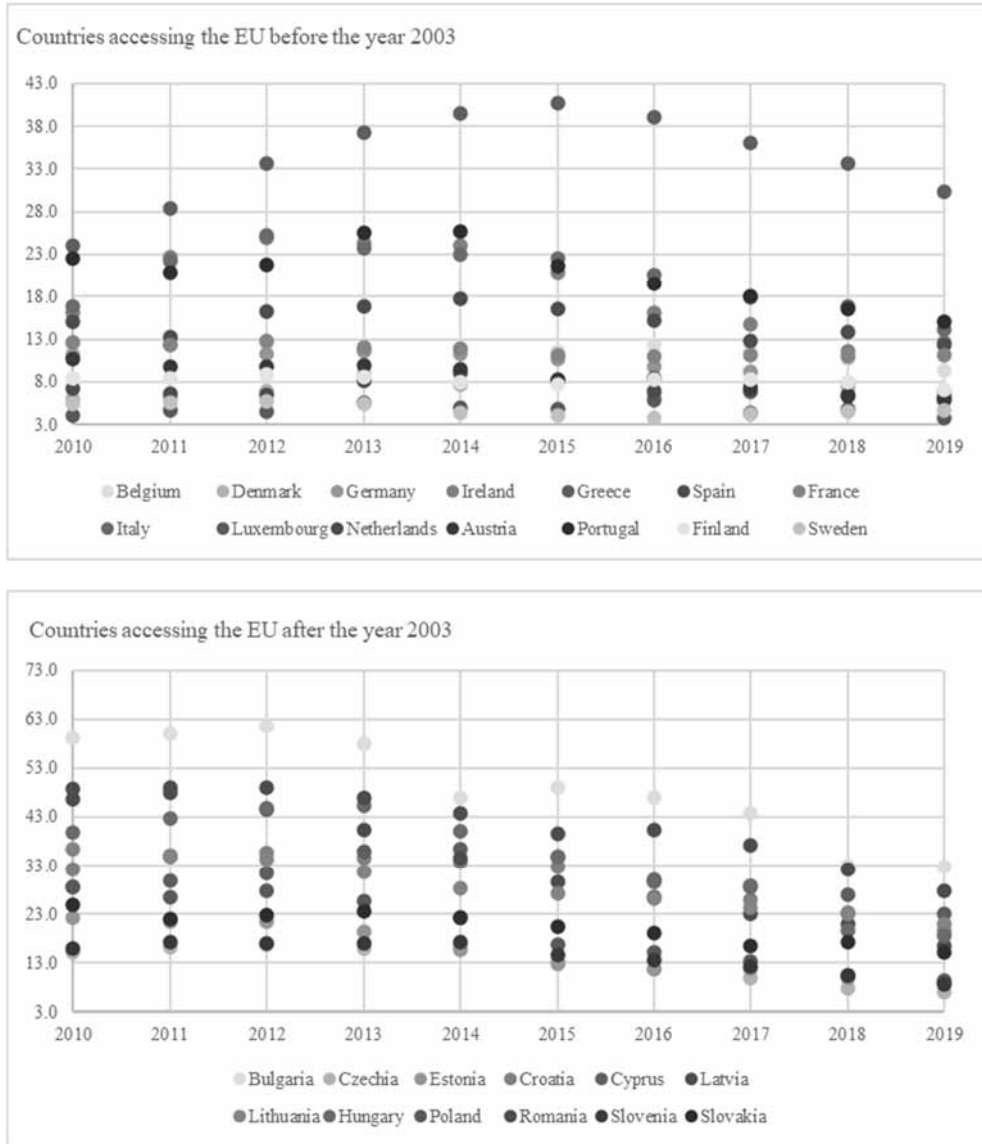
Annex 2
At risk-of-poverty and material deprivation rates in EU countries

At-risk of poverty rates, EU 27 countries, period 2010-2019 (in %)
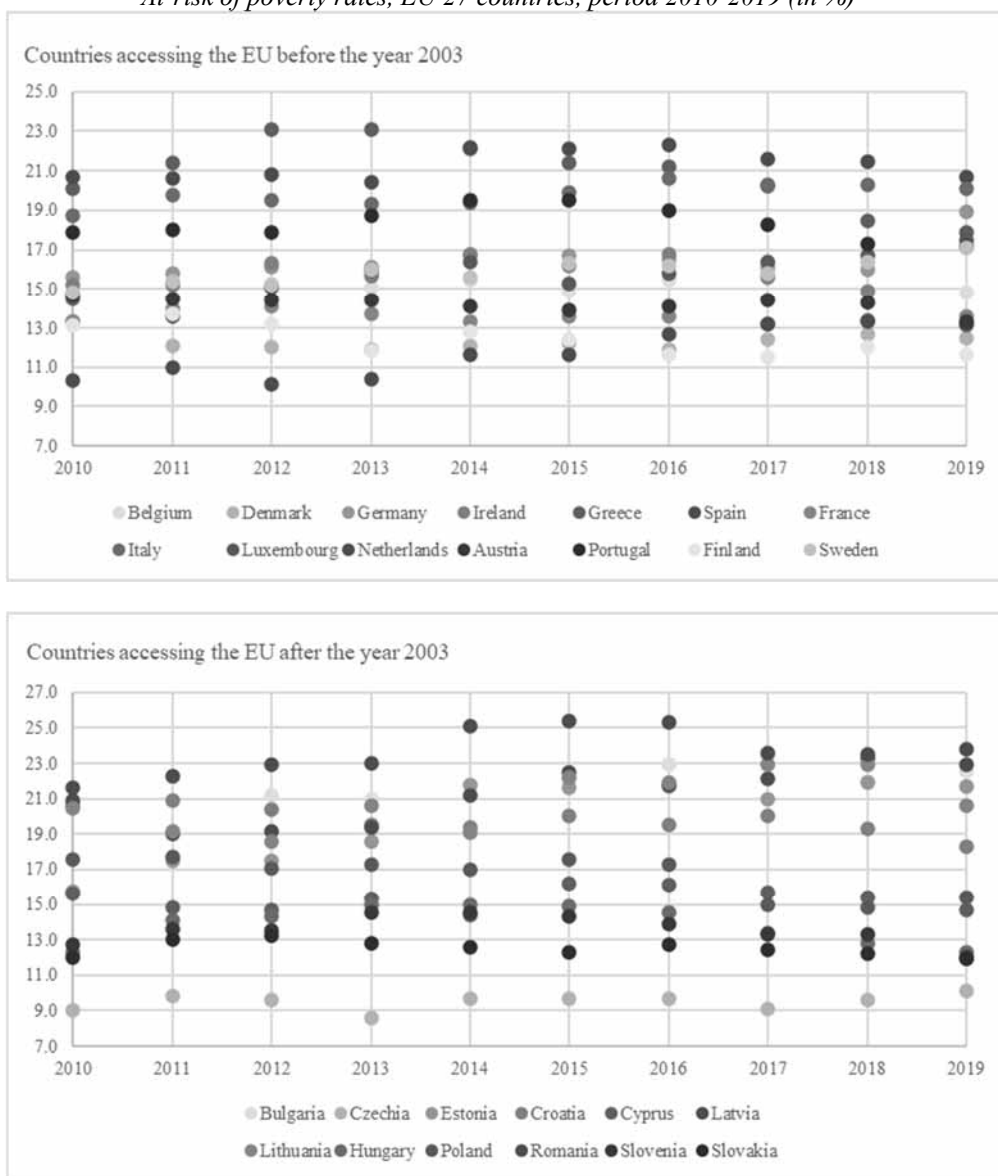
Source: Eurostat, own data processing.

Material deprivation rates, EU27 countries, period 2010-2019 (in %)

Source: Eurostat, own data processing.