Prague Economic Papers
2024, Volume 33, Issue 4
https://doi.org/10.18267/j.pep.864

VŠE / PRAGUE UNIVERSITY OF ECONOMICS AND BUSINESS

# Incidence of Poverty in Working-age Population in EU Countries: A Gender Perspective*

Eva Kovářová, Tereza Vašenková

Faculty of Economics, VŠB-Technical University of Ostrava, Ostrava, Czech Republic,
email: eva.kovarova@vsb.cz

**Abstract:**

Poverty reduction has long been one of the political priorities of the European Union and its member states. Despite the political declarations and measures applied, poverty is still a phenomenon that affects the everyday lives of about 70 million Europeans. Moreover, trends in poverty incidence show how poverty risks are sensitive to overall socio-economic development and how they are more actual for some vulnerable population groups. Following the popular concept of poverty feminization, the analysis presented in the paper aims to identify gender perspective relationship between the poverty incidence and characteristics describing the situation on the labour market or the levels of attained education in EU-27 countries. Attention is paid to poverty incidence among women and men of working age (population aged from 25 to 54 years) and differences are examined in the relationship to the position of both genders on the labour market. Presented findings, based mainly on the results obtained from the panel regression analysis performed for the period 2007–2020, suggest that policymakers should integrate a gender perspective into all policies focused on poverty reduction.

**Keywords:** education, gender, gender equality, labour market, panel regression analysis, poverty, social exclusion

**JEL Classification:** I32, I38, I08

* The research presented partly in the paper was supported with the project SP2023/079, solved at the Faculty of Economics, VSB – Technical University of Ostrava, the Czech Republic.

## Introduction

The European Union (EU) is a world-unique alliance of 27 countries that can be generally considered developed industrialized countries. Despite the relatively high standard of living of most EU citizens, poverty is still a socio-economic phenomenon affecting their everyday lives, and thus the EU countries commit themselves to the fight against poverty. In 2020, nearly 73.3 million persons lived in the EU countries with incomes below the national poverty thresholds and the average poverty rate reached 16.7% (Eurostat, 2023). It means that nearly one-sixth of the EU citizens were at risk of poverty. Changes in poverty rates observed in most EU countries indicate that the incidence of poverty is sensitive to the overall socio-economic development. During the decade 2010–2020, poverty rates grew at first because of the economic crisis and migration inflows from third countries. Then, poverty incidence declined slightly, but due to the COVID-19 pandemic, which affected the EU countries from the spring of 2020, the poverty risks increased in most countries between 2019 and 2020. In 2022, the increase in poverty risks was again discussed a lot because of the increasing consumer prices and unprecedented security threat (the invasion of Russia into Ukraine) leading to new migration inflows from Ukraine. Therefore, reduction of poverty has been reaffirmed several times as a political priority of the EU institutions, and the EU countries have committed themselves to steps that would help reduce the numbers of persons living at risk of poverty.

Everyday evidence shows clearly that some EU citizens are more vulnerable to poverty risks than the population on average. Therefore, special political attention is paid in the EU countries to the incidence of poverty in specific age groups, or among populations with low or insufficient levels of attained education, single-parent households or among immigrants. However, poverty risks are, according to the official EU interpretation, also associated with (un) employment and (un)employability, and thus with the position of specific population groups on the labour market. The link between employment and poverty risks is straightforward and well-understood in the EU because of the EU's economic understanding of poverty, which connects poverty to income, material needs and work intensity. Of course, employment is still a primary source of income for most Europeans.

Our analysis, the results of which are presented here, was motivated by a popular concept of poverty feminization. This concept highlights the existence of higher poverty risks for women than for men. Although the first proof of poverty feminization was introduced in the United States in the late 1970s, data from some countries, particularly those less developed or developing, still indicate a higher incidence of poverty among women than among men because of existing gender inequality. In some EU countries, women's average poverty rates are also higher than men's poverty rates, which indicates that poverty feminization can be an actual concept for the EU.

Diana Pearce (1978), an author of the concept of poverty feminization, argued that the poverty rates of women had grown in the USA despite growing employment rates of women. Pearce (1978) connected a higher incidence of poverty among women with the gender inequality existing on the US labour market. The same inequality has been a long-lasting phenomenon in some EU countries as well. Therefore, a comparison of the poverty incidence among women and men in relationship to their positions on the labour market can offer new findings about gender inequality and can show possible ways of reducing persistent poverty in some EU countries. To make the findings more specific, research attention should be paid to specific population groups, primarily to the working-age population when the poverty incidence is considered to be related to the gender inequality existing on the labour market.

The paper introduces the results of an analysis that aimed to identify the existence of gender poverty gaps in the EU countries during the period 2007–2020, to estimate the relationship between poverty incidence and specified labour market characteristics, and to estimate the relationship between gender poverty gaps and gender differences existing on the labour market in the EU countries. Before the analysis, it was assumed that poverty was feminized in most EU countries and that the higher incidence of poverty among women was caused by their disadvantaged position on the labour market. Gender poverty gaps represent quite a new topic in the context of EU countries. Although some studies have already been published, they do not cover the most recent years and the period around the global economic crisis, which started to affect the socio-economic development in the EU countries in 2009, and its main consequences were visible in EU economies at least by 2014. Therefore, the analysis introduced here tries to fill this gap through a macro-level analysis dealing with the interrelationship between poverty, education and employment from a gender perspective over 14 years.

Panel regression analysis is used as the main analytical method. Fixed-effects models are designed to assess the relationship between poverty incidence and variables characterizing the position of both genders on the labour market. However, levels of education attained by both genders are considered in the analysis as well. The results indicate that the concept of poverty feminization is present only in 10 EU countries. The estimates from the panel regression analysis confirm the existence of a close relationship between poverty incidence (between women and men) and some characteristics describing the situation on the labour market. The relationship between gender poverty gaps and gender differences concerning the position of men and women in the labour market, particularly in terms of their overall employment rates, is also confirmed by the panel regression analysis.

The paper is structured as follows: Section 1 describes the importance of poverty reduction in the EU and interprets the EU's understanding of poverty. The statistical data and methods used are explained in Section 2. Results are introduced and interpreted in Section 3. The main findings are then summarized and discussed. Some implications for policymakers are formulated in the concluding section as well.

# 1. Theoretical Background

## 1.1 Poverty reduction as EU strategic agenda

The European Union has prioritized affairs related to poverty reduction since its early beginnings. The Treaty of Rome, signed in 1957 and establishing the European Economic Community, stated that the member states agreed upon *the necessity to promote the improvement of the living and working conditions of labour* (EU, 2023, Article 118). The term *poverty* itself was used in the EU treaties for the first time 35 years later in the Maastricht Treaty (1992). However, the Maastricht Treaty did not use the term *poverty* in the context of EU member states. The Treaty used this term in its part devoted to development cooperation, where the necessity of the *campaign against poverty in developing countries* was introduced (European Communities, 1992, Article 130u).

Besides the primary EU treaties, the term *poverty* was commonly used to speak about the living conditions in the member states. The first official EU definition of poverty was adopted by the EU Council of Ministers in the 1980s. It explained that 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* are poor (Council of the EU, 1985, Article 1, paragraph 2). This first official EU definition of poverty started the tradition of relative understanding of poverty in the EU because of the poverty thresholds' application (Hagenaars et al., 1994). However, particularly since the 1990s, the term *poverty* has been partly replaced in the official EU documents with the term *social exclusion*. In those days, it was thought by political authorities that poverty was eliminated in Europe, or that poverty was generally considered *a residual state of affairs* of the last decades (Commission of the European Communities, 1992, p. 6), despite the revival of poverty incidence in the 1980s due to slow economic growth and rising unemployment.

Atkinson and Davoudi (2000) explained that the term *social exclusion* became popular in the EU during the Presidency of Jacques Delors in the European Commission (1985–1995). In the 1990s, the European Commission introduced the concept of *social exclusion* as a dynamic and multidimensional phenomenon affecting social cohesion in the EU countries,

as a phenomenon going beyond insufficient incomes or participation in working life. Social exclusion was newly recognized in areas such as housing, education, health or access to services (Commission of the European Communities, 1992). This understanding of *social exclusio*n has acknowledged poverty as one of its causes, which reflected the fact that around the year 1990, nearly 50 million Europeans lived in poverty and during the 1990s, poverty rates were increased in most EU member states (Sainsbury and Morissens, 2006). Since the year 2000, the terms *poverty* and *social exclusion* have been used simultaneously in official EU documents, and the fight against the risks of poverty and social exclusion has been recognized among the highest political priorities of the EU institutions as well as EU countries.

The priority given to the fight against poverty and social exclusion was later highlighted by the two most challenging strategies adopted by the European Commission in the 2000s, the Lisbon Strategy and the Europe 2020 strategy. The former speaks about steps that must be taken to eradicate poverty (European Council, 2000), and the latter formulates the target to reduce the number of persons at risk of poverty by 20 million (European Commission, 2010). However, the EU and the majority of its member states did not meet their strategic plans regarding poverty reduction in the 2000s. Therefore, the European Commission (2021) reaffirmed the fight against poverty as the political priority with the European Pillar of Social Rights Action Plan in March 2021.

## 1.2 Gender differences in poverty incidence and gender inequality in EU

In 1978, Diana Pearce introduced her most famous work on feminization of poverty in the United States. Pearce (1978) explained that the incidence of poverty among women was higher than its incidence among men despite the growing rates of women's employment (Pearce, 1978; McLanahan and Kelly, 2006). Because of its popularity, the concept of poverty feminization attracted great political attention. In general, the term *poverty feminization* has been used in narratives describing the higher vulnerability of women to poverty risks. For instance, the Council of Europe (2007, Article 1) defined this term as follows *"feminization of poverty" means that women have a higher incidence of poverty than men, that their poverty is more severe than that of men, and that poverty among women is on the increase*.

In response to the political attention given to the higher incidence of poverty risks among women, *feminization of poverty* became soon a popular research concept. Most studies dealt with a higher incidence of poverty among women mainly because of the existing gender inequalities recognized in some countries. These studies confirmed that gender can be a source

of vulnerability to poverty (Botti et al., 2012). However, the term *poverty feminization* was connected not only to a higher incidence of poverty among women but also to other poverty issues, such as the depth of women's poverty and the barriers that women face in their fight against poverty (Gornick and Boeri, 2016).

Most studies dealing with the poverty incidence from a gender perspective in the EU countries have proved the existence of close links between gender inequality on the labour market (concerning mainly the employment status or women's discrimination) and gender differences in poverty incidence (Aisa et al., 2019; Zarkov, 2018; Filandri and Struffolino, 2018; Gornick and Boeri, 2016; Pena-Casas and Ghailani, 2011; Pantazis and Ruspini, 2006). However, the effects of attained education, traditional family roles or household structures have also been confirmed as being significant for the existence of the gender differences in poverty incidence and higher poverty risks for women (Polizzi et al., 2022; Aisa et al., 2019; Zarkov, 2018; Goernick and Boeri, 2016; Bennett and Daly, 2014; Barcena-Martin and Moro Egido, 2013; Pena-Casas and Ghailani, 2011; Gradin et al., 2010; Bastos et al., 2009; Pantazis and Ruspini, 2006). Women's discrimination as an argument for the existence of gender differences in poverty was presented as well by the European Network of Equality Bodies (2020). Similar findings on the role of women's discrimination on the labour market have been proved as well in recent research investigating gender poverty in the United States (see, e.g., Provencher and Carlton, 2018; Kramer et al., 2016).

These findings on the relationship between poverty risks and labour market characteristics viewed through the gender lens correspond to the findings on determinants of poverty incidence proven regardless of the gender. Many studies (e.g., Palova and Vejacka, 2018; Darvas, 2017; Herman, 2014; Daly, 2012; Atkinson, 2010) have considered employment, income and income inequality or levels of attained education to be significant factors having an impact on the incidence of poverty in the EU countries. However, the incidence of poverty has also been associated with other factors. For instance, Darvas (2017) and Leventi et al. (2019) have also considered the impact of economic growth and demographic characteristics.

In official strategies, the EU institutions do not link the gender differences in the incidence of poverty to gender inequality understood in general terms. However, the relationship between gender inequality and poverty risks can be regarded as tight because both phenomena have close links to employment, unemployment, earnings or the position on the labour market in general, and both phenomena express some form of social injustice that the EU tries to cope with. The EU institutions have particularly paid long-term attention to gender equality in earnings. The call for gender equality in earnings goes back to the Treaty of Rome, which committed member states to *ensure and subsequently maintain the application of the principle that men and women*

*should receive equal pay for equal work* (EU, 2023, Article 119). Today, the Treaty of Lisbon (amending the Treaty on European Union) recognizes general equality among the universal values of the EU, and the Treaty on the Functioning of the EU speaks about equality between women and men regarding employment and labour market (EU, 2012a, b).

Following the political recommendations to reduce gender gaps in earnings in the EU countries, greater research attention is still given to investigations of the gender inequality in earnings and unequal position of both genders on the labour market than to investigations of gender differences in the incidence of poverty (Glassman, 2020). However, when poverty is interpreted by the EU institutions in economic terms as a consequence of insufficient income (resources) or low work intensity, it is obvious that a tight link between gender inequality existing on the labour market and gender differences in poverty incidence exists. Therefore, this link should be examined to better understand the poverty incidence in the EU.

## 1.3 Statistical understanding of poverty in EU

Since the beginning of the 2000s, the EU institutions have tried to implement the same statistical understanding of poverty in all member states. Following the recommendations from the Nice Summit (held in December 2000), the EU countries were invited to define indicators to measure progress in poverty reduction (European Council, 2000). The first official set of EU indicators for poverty measurement was adopted at the Laeken Council in 2001. These so-called Laeken indicators emphasized the understanding of poverty in financial (monetary, income) terms as well as the multidimensionality of social exclusion. The indicators were designed to cover four dimensions of social exclusion, including financial poverty, employment, health and education (European Commission, 2003). The indicator *at risk of poverty rate* (AROP), measuring the proportion of persons living with less than 60% of the median of national equivalised disposable income, was introduced as one of the key Laeken indicators. AROP replaced earlier poverty understanding based on the poverty threshold defined with half of the average disposable income (Commission of the European Communities, 1992). Since 2001, the AROP rate has become the main indicator of poverty for Eurostat as well as for most national statistical offices in the EU countries, despite the quite common argument that it is rather a measure of income inequality than a measure of income poverty (Copeland and Daly, 2014; Nolan and Whelan, 2011).

A new composite indicator measuring the risk of poverty or social exclusion was introduced several years later to monitor the fulfilment of poverty targets declared in the Europe 2020 strategy and related national strategic documents of the EU countries. The concept of social

exclusion was narrowed somehow, and the European Commission started to use it as the headline indicator called *at risk of poverty or social exclusion* (AROPE). This indicator was designed to include three components: *at risk of poverty* (AROP), *severe material deprivation* (SMD) and living in a household with a *very low work intensity* (VLWI). The AROP was not changed in its nature, and it has been further used as an indicator of poverty. The concept of SMD was introduced to measure the proportion of persons with unmet needs or lacks, and VLWI was introduced to emphasize the interconnections between poverty/social exclusion and low work activity.

The components of SMD and VLWI were further modified by the European Commission in 2021 to be more in line with the current living conditions in the EU countries, to reflect more dimensions of social exclusion (the dimension of social deprivation was newly included in the metric dealing with deprivations) and to be in line with the European Pillar of Social Rights Action Plan (European Commission, 2010; European Commission, 2021). The Eurostat started to use this new methodology to measure poverty and social exclusion risks in 2021. The first data series respecting this modified methodology starts with the year 2021.

According to the EU methodology, concepts of poverty and social exclusion are used in relative terms. It means that AROP, SMD and AROPE refer to lower-than-standard levels specified for the EU countries. The incidence of poverty (AROP) is measured according to the poverty thresholds defined using national disposable incomes. Therefore, cross-country differences in the standard of living are reflected when the incidence of poverty is monitored in the EU. However, lower AROP rates are often reported in the EU countries with lower income inequality because of the AROP definition. Severe material deprivation (SMD) is defined in a more general way because SMD rates are based on the assessment of affordability of nine material items, the same in all EU countries. The incidence of very low work intensity (VLWI) is observed in all EU countries using the same criteria as well. However, the relevance of VLWI to poverty measurement is again discussed very much (Copeland and Daly, 2014; Nolan and Whelan, 2011).

The AROPE and its three components can be broken down according to specific criteria, including age and gender. Then, the rates of AROP, SMD or AROPE can be followed for specific age groups and/or separately for women and men. The assessment of gender differences in the incidence of poverty can be made either using so-called *gender poverty gaps* (see, e.g., Ichware et al., 2023; Glassman, 2020; Botti et al., 2012) or using the *gender poverty ratios* (see, e.g., Casper et al., 1994). Glassman (2020) and Botti et al. (2012) have defined a gender poverty gap as a difference between the values of the poverty rate reported for women and men.

A positive value of the gap then means that the incidence of poverty among women is higher than its incidence among men and *vice versa* for a negative gap value. If the equality in poverty risks is a co-objective in overall efforts in poverty reduction, the gender poverty gaps should be narrowed, which means that their mathematical values should be close to zero.

## 2. Research Objectives, Methods and Data

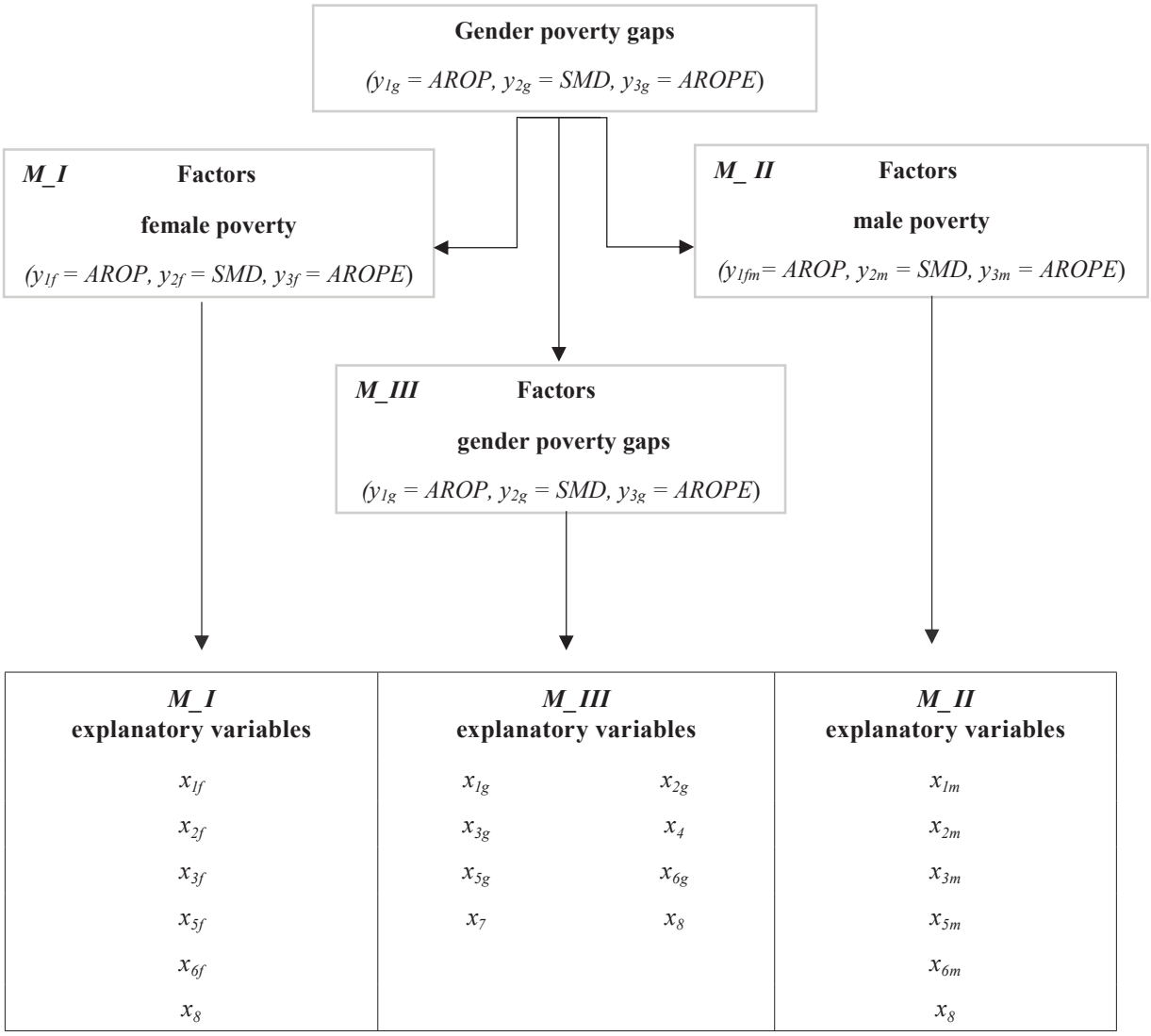
The analysis, the results of which are presented here, examined the gender differences in the incidence of poverty and gender poverty gaps in EU-27 countries between the years 2007 and 2020. The examined period was long enough to include the effects of the economic and financial crisis (which started to affect the economies of EU countries particularly in 2009), the increased migration inflows from third countries (with the peak in 2015) as well as the first consequences of the COVID-19 pandemic in the spring of 2020. The end of the period was determined by the data series availability for some variables (because of the introduced methodological modifications applied at first to the data reported for the year 2021). Therefore, the overall impact of the pandemic could not be reflected in the analysis.

In the analysis, poverty was understood in three different ways, namely as the *poverty risk*, or income poverty (the incidence of which is measured using the AROP rate), *severe material deprivation* (measured using the SMD rate) and the *risk of poverty or social exclusion* (measured with the AROP rate). These poverty indicators were defined according to the methodology used by Eurostat by the end of 2020. To highlight the links between gender differences existing on the labour market and gender differences in poverty incidence, the research attention was paid only to one age group – specific part of the working-age population – namely the population aged 25 to 54 years. Most variables were related to this population group, except those referring to the overall economic situation (approximated with annual changes in real GDP per capita), gender pay gaps (this indicator is not broken down by Eurostat according to working population age) or gender inequality considered in general terms (approximated with the *global gender gap index* – a metric calculated and reported by the World Economic Forum).

The analysis aimed to identify the existence of gender poverty gaps in the EU countries during the period 2007–2020, to estimate the relationship between poverty incidence and the labour market characteristics, and to estimate the relationship between the gender poverty gaps and gender differences existing on the labour markets in the EU countries. Before the analysis, it was assumed that poverty was feminized in most EU countries and that a higher incidence of poverty among women was caused by their disadvantaged position on the labour market.

The analysis was made in several steps. These steps are described in Figure 1.

**Figure 1: Research design**




Source: authors' processing

In the first step, attention was paid to the identification of the gender poverty gaps in the EU countries. Statistical significance of the differences between women's and men's poverty rates was tested using a non-parametric two-sample Wilcoxon rank-sum test (also known as Mann-Whitney test). The null hypothesis ($H_0$) was formulated as follows: there is no difference (in terms of central tendency) between the poverty incidence among women and men, while the alternative hypothesis ($H_A$) was formulated as follows: there is a difference between the poverty incidence among women and men. The test was made for each EU country and

each understanding of poverty during the period 2007–2020, at the 0.05 level of significance. In the second step, the effects of several factors on poverty incidence among women and men were estimated. In the last step, the relationship between gender poverty gaps and gender differences in variables describing the situation on the labour market or gender differences in levels of attained education was examined.

To examine the relationships between poverty rates or gender poverty gaps (regarded as the dependent variable) and the set of explanatory variables, three models were designed (*M_I, M_II, M_III*), each containing three parts because of three different poverty indicators used as the dependent variable. *M_I* examined the poverty of women and *M_II* did the same for the poverty of men. *M_III* was designed to assess the relationship between the gender poverty gaps and gender differences in selected explanatory variables. Data for all the variables were downloaded in March and April 2023 from the statistical database of Eurostat (European Commission, 2023) and reports published by the World Economic Forum (2023). Data were processed using *Stata* software.

A fixed-effects estimator (FE), called a within estimator as well, was used in *Stata* to perform the panel regression analysis. In general, fixed-effects models for panel data are designed to estimate the effects of explanatory variables on dependent variables. Fixed-effects models are widely recognized as convenient and powerful tools for longitudinal data analyses because they are developed to address the issue of omitted variable bias (Hill et al., 2020). Using the FE, the analysis did not consider the cross-sectional variation that is related to the unobserved heterogeneity of the examined countries.

The FE is built on the error components model and can be simply specified as follows (Pérez López, 2021; Bruderl and Ludwig, 2014):

$$y_{it} = \beta_0 + \sum_{j=1}^{k} \beta_j x_{jit} \alpha_i + \varepsilon_{it} \tag{1}$$

where $y_{it}$ denotes the observed outcome of an entity $i$ at a time $t$, $x_{jit}$ refers to the vector of covariates ($j = 1$ to $j = k$) of this entity, and $\beta_j$ is the corresponding vector of parameters that are estimated. The error term of the fixed-effects model is split into two components: $\alpha_i$ and $\varepsilon_{it}$. The first component represents the individual characteristics of each entity. This component is stable in time and is not observed in the model. The second component is an idiosyncratic error that varies across entities and over time. Therefore, the FE does a pure within comparison (Hill et al., 2020; Bruderl and Ludwig, 2014).

The FE was used to process the panel data containing the time series for EU-27 countries between the years 2007 and 2020. In each model, one dependent variable was controlled to find the relationship between this dependent variable (poverty rate, $y$) and the set of explanatory variables that represented factors with possible effects on the incidence of poverty ($x_1, x_2, \ldots, x_8$). Three different indicators of poverty were used as the dependent variable. The AROP rate was used as the dependent variable $y_1$. The AROP rate is used by Eurostat to measure the proportion of persons living in the EU countries with incomes below the official poverty thresholds. This financial understanding of poverty is quite narrow as it connects poverty only to low incomes. To bring the understanding of poverty nearer to material needs, the SMD rate was used as the dependent variable $y_2$. The SMD rate refers to the proportions of persons that cannot afford 4 out of 9 predefined material items and thus refers to unmet material needs of EU citizens. The AROPE rate, covering AROP and SMD, as well as VLWI, represents the broadest understanding of poverty in the analysis and was used as the dependent variable $y_3$.

The explanatory variables were chosen to reflect the gender differences existing on the labour market, mostly visible in employment or unemployment rates, employment status or differences in earnings (explanatory variables $x_1, x_2, x_3, x_4, x_7$), gender differences in the levels of attained education ($x_5, x_6$) and the overall economic situation ($x_8$). The impact of variables concerning labour market characteristics has been addressed, e.g., by Palova and Vejacka (2018), Darvas (2017), Herman (2014) and Atkinson (2010). Herman (2014) also highlighted the importance of differences in incomes to the poverty incidence. The relevance of gender differences existing on the labour market has been proved, e.g., by Barcena-Martin and Moro Egido (2013) or Aisa et al. (2019). Palova and Vejacka (2018) and Aisa et al. (2019) have also shown the importance of education to poverty incidence. The relationship between economic growth and poverty incidence has been examined, e.g., by Page and Pande (2018), Darvas (2017) and Leventi et al. (2017). However, as Michalek and Vybostok (2018) explained, positive economic growth does not have to be equally shared in society in terms of its effects on the reduction of income inequality (having links to the AROP and AROPE understanding of poverty).

Following the EU's recommendations calling for an increase in the employment rates and employability of EU citizens through higher levels of education to fight successfully against poverty and social exclusion (European Commission, 2010), it was assumed that the relationship between the poverty rates ($y_1, y_2, y_3$) and the variables $x_2$ and $x_6$ would be positive, while the relationship between poverty rates and the variables $x_1$, $x_5$ and $x_8$ would be negative. The relationship between the variables was tested before the regression analysis (see the correlation matrices in Table A1).

All the variables varied over time and countries and were defined as follows:

$y_1$ – *at risk of poverty rate, age group 25–54 years (in %*)
$y_2$ – *severe material deprivation rate, age group 25–54 years (in %)*
$y_3$ – *at risk of poverty or social exclusion rate, age group 25–54 years (in %)*
$x_1$ – *annual rate of unemployment, age group 25–54 years (in %)*
$x_2$ – *total employment activity rate, annual data, age group 25–54 years (in %)*
$x_3$ – *percentage of part-time employment of adults as a percentage of total employment, age group 25–54 years (in %)*
$x_4$ – *gender pay gaps, unadjusted, standard indicator used by Eurostat (in %)*
$x_5$ – *population with less than primary, primary and lower secondary education, age group 25–54 years (in %)*
$x_6$ – *population with tertiary education, age group 25–54 years (in %)*
$x_7$ – *global gender gap index, defined by the World Economic Forum (values from 0 to 1, missing values for 2019 were calculated as the mean of the values for 2018 and 2020)*
$x_8$ – *annual real GDP per capita, chain-linked volumes, percentage change from the previous period (in %)*

Panel datasets and models were tested using the standard statistical tests in *Stata* to consider the assumptions for the use of panel regression analysis and statistical interpretation of the estimates. As autocorrelation and heteroskedasticity were identified in some parts of *M_I*, *M_II* or *M_III*, the FE was adjusted by adding the *vce(robust)* option in *Stata* to make the results robust. The main statistical characteristics of all variables are presented in Table 1. The data panel was defined for EU-27 countries ($i = 27$) and the period 2007–2020 ($t = 14$). The panel was assessed as strongly balanced, and it contained some missing values of some variables ($y_1$, $y_2$, $y_3$, $x_3$, $x_4$) in some years because of missing data in the Eurostat database. A statistical description of the variables used is presented in Table 1.

**Table 1: Statistical description of variables**

| Variables with a gender dimension | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | Values for women (*f*) | | | Values for men (*m*) | | | Values for gaps (*f* – *m* = *g*) | | |
| | Max | Min | Mean | Max | Min | Mean | Max | Min | Mean |
| $y_1$ | 24.2 | 7.6 | 14.4 | 24.5 | 5.2 | 14.0 | 4.9 | –4.7 | 0.4 |
| $y_2$ | 52.5 | 0.6 | 14.4 | 51.6 | 0.5 | 8.9 | 9.5 | –13.8 | 0.4 |
| $y_3$ | 54.8 | 10.6 | 22.0 | 54.6 | 7.9 | 21.4 | 4.8 | –4.0 | 0.6 |
| $x_1$ | 30.2 | 2.1 | 7.6 | 22.6 | 1.4 | 7.0 | 9.6 | –6.6 | 0.6 |
| $x_2$ | 86.1 | 41.3 | 73.7 | 94.5 | 70.4 | 84.7 | 4.8 | –49.0 | –11.0 |
| $x_3$ | 74.3 | 1.3 | 20.7 | 20.1 | 0.7 | 5.3 | 15.4 | –0.4 | 60.2 |
| $x_5$ | 73.9 | 3.6 | 17.8 | 73.5 | 4.3 | 19.7 | 10.8 | –12.0 | –1.9 |
| $x_6$ | 62.1 | 12.7 | 36.1 | 48.8 | 11.6 | 28.0 | 23.0 | –6.0 | 8.1 |

| Variables without a gender dimension | | | |
|---|---|---|---|
| Variable | Max | Min | Mean |
| $x_4$ | 30.9 | –0.9 | 14.3 |
| $x_7$ | 0.9 | 0.6 | 0.7 |
| $x_8$ | 23.2 | –14.5 | 1.1 |

Source: authors' processing of data from Eurostat (European Commission, 2023) and World Economic Forum (2023)

## 3. Results and Findings

In 2010, when the European Commission adopted the Europe 2020 strategy, 71.5 million persons regardless of the age group lived with incomes below the official national poverty thresholds in EU-27 countries. In 2020, the number of persons at risk of poverty reached nearly 73.3 million. Between 2010 and 2020, the number of poor persons grew first very fast and reached a peak in 2016 (with a value of 76.6 million) and then the number was slightly reduced but it did not drop under 72 million. Partly due to the consequences of the COVID-19 pandemic, the number of persons living at risk of poverty grew once again from 72.1 million to 73.3 million between 2019 and 2020. During these 10 years, on average, 53% of the poor persons were women, which indicates that gender could play a role in the incidence of poverty risks. In 2010, the risk of poverty affected the lives of nearly 27.5 million persons from the working-age population (population aged from 25 to 54 years). This number exceeded the value of 29 or even 30 million

between 2011 and 2016, but finally in 2020, it was 1.8 million lower than in 2010. Women represented on average 51% of the poor persons from the working-age population during the period 2010–2020. Therefore, the average gender poverty gap (considering the AROP rate) was higher for the whole population than for this specific part of the working-age population. However, the gender poverty gaps differed across the EU countries. In some EU countries, women were at higher risk of poverty, while in other EU countries, men were more vulnerable to poverty risks than women.

## 3.1 Gender poverty gaps

When comparing the mean values of AROP rates (calculated as the arithmetic mean for the period 2007–2020) among the EU countries, it was found that countries with mean values above/below the EU median values of poverty rates were the same for both genders (see Table 2 and A1, containing the mean values used for country ranking). Therefore, it seemed at first sight that no significant gender differences in poverty incidence existed in the EU countries.

**Table 2: Rankings of EU countries according to mean values of poverty rates (countries with values lower than median)**

| AROP rate ($y_1$) | | SMD rate ($y_2$) | | AROPE rate ($y_3$) | |
|---|---|---|---|---|---|
| $y_{1f}$ | $y_{1m}$ | $y_{2f}$ | $y_{2m}$ | $y_{3f}$ | $y_{3m}$ |
| Finland | Czechia | Luxembourg | Luxembourg | Czechia | Czechia |
| Czechia | Netherlands | Sweden | Sweden | Finland | Netherlands |
| Denmark | Finland | Netherlands | Netherlands | Slovenia | Finland |
| Netherlands | Slovakia | Finland | Finland | Netherlands | Luxembourg |
| Slovenia | Cyprus | Denmark | Denmark | Denmark | Slovenia |
| Slovakia | Malta | Austria | Austria | Sweden | France |
| Austria | Slovenia | Slovenia | Czechia | Austria | Malta |
| Sweden | France | Germany | France | Slovakia | Sweden |
| France | Denmark | Estonia | Germany | Estonia | Austria |
| Cyprus | Ireland | Czechia | Slovenia | France | Slovakia |
| Hungary | Belgium | France | Malta | Luxembourg | Denmark |
| Ireland | Austria | Spain | Spain | Malta | Belgium |

Notes: *f* = mean values for women, *m* = mean values for men

Source: authors' processing

However, in some EU countries, e.g., in Czechia or Cyprus, women were on average at higher risk of poverty (AROP) than men because the mean values of the AROP rate calculated for women were higher than those calculated for men. These positive gender poverty gaps were annually reached in 10 EU countries, including Czechia, France, Luxembourg and Malta. Higher values of the SMD rates reported for women than those for men were met annually in 2 countries (Czechia and France). Women were permanently at higher risks of poverty or social exclusion (AROPE) in 9 EU countries, including Czechia, France and Luxembourg. For instance, in Czechia, the mean value of the AROPE rates calculated for women was 2.7 p.p. higher than the mean value calculated for men. These results indicate that gender could affect the incidence of poverty or social exclusion risks in Czechia.

The results presented in Table 2 and Table A1 also reveal that in some EU countries, including, e.g., Finland, Denmark or Slovenia, the incidence of poverty risks was higher among men than among women. The existence of higher poverty risks for men than for women in some EU countries was confirmed with the negative values of the gaps presented using the boxplots in Figure 2 (the gaps were calculated as the difference between the values of the poverty rates reported for women and men, $y_1$ represents AROP rates, $y_2$ SMD rates and $y_3$ AROPE rates).

**Figure 2: Boxplots – gender poverty rates and gender poverty gaps**

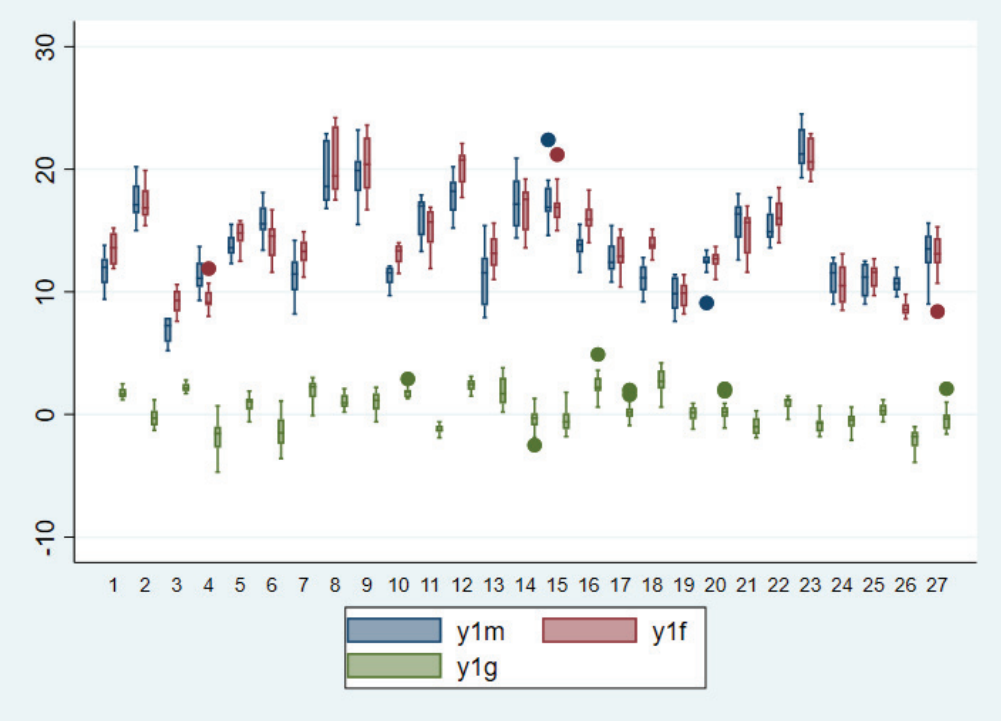
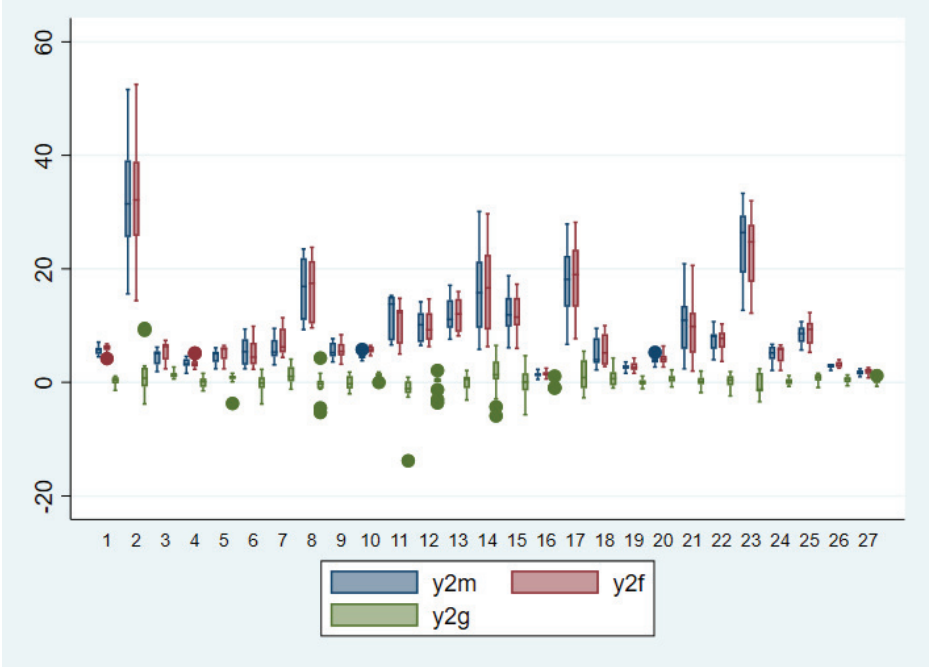
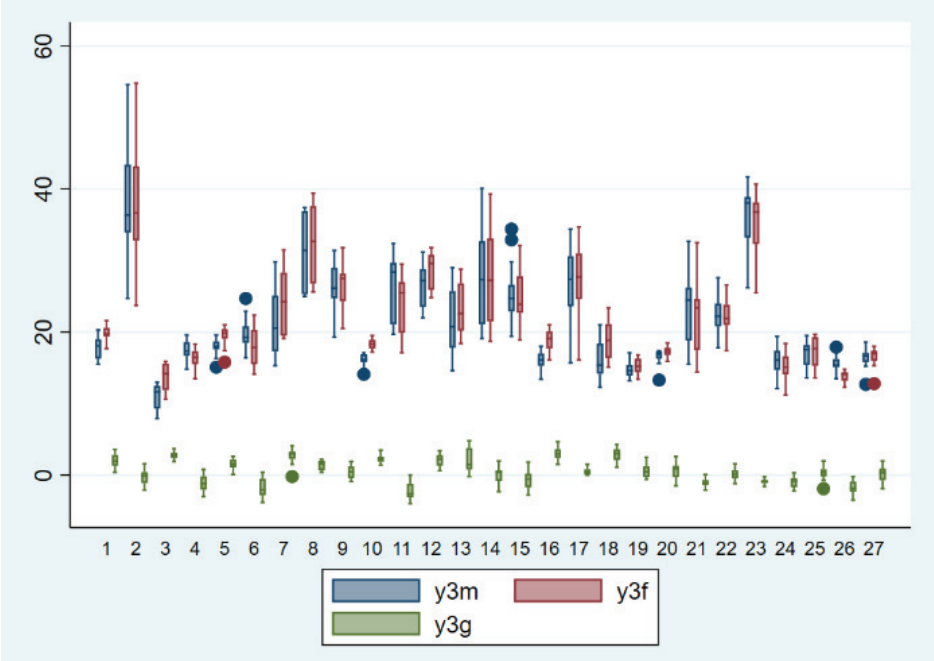


**Figure 2: Continuation**




Notes: variables: $y_1$ – *AROP rate (in %),* $y_2$ *SMD rate (in %),* $y_3$ *AROPE rate (in %); m is used for men's and f for women's poverty rates, g for the gender poverty gaps (difference between poverty rates of men and women*

Country codes: *1 Belgium, 2 Bulgaria, 3 Czechia, 4 Denmark, 5 Germany, 6 Estonia, 7 Ireland, 8 Greece, 9 Spain, 10 France, 11 Croatia, 12 Italy, 13 Cyprus, 14 Latvia, 15 Lithuania, 16 Luxembourg, 17 Hungary, 18 Malta, 19 Netherlands, 20 Austria, 21 Poland, 22 Portugal, 23 Romania, 24 Slovenia, 25 Slovakia, 26 Finland, 27 Sweden*

Source: authors' processing

Figure 2 indicates as well that the values of the SMD and AROPE rates were more dispersed (comparing their maximum and minimum values) than the values of the AROP rates, which implies the drops or rises in the rates of SMD and AROPE in some EU countries. The highest dispersion was identified in Bulgaria (country 2 in Figure 2), which reflected the sharp drop in the incidence of SMD and AROPE in this country between 2007 and 2014. The dispersions of the poverty rates were similar for both genders in all countries, which again indicated similar trends in the incidence of poverty among women and men.

The significance of the differences between women's and men's poverty rates was tested using a two-sample Wilcoxon rank-sum test. The test helped identify that statistically significant differences between women's and men's AROP rates existed in 12 EU countries, particularly in countries where the mean AROP rates were higher for women than for men. In the EU countries where the mean AROP rates were higher for men than for women, the test mainly failed to reject the null hypothesis (see the results in Appendix 3).

The results of the descriptive statistical analysis opened a space for a deeper analysis of the gender differences in poverty incidence in the EU countries during the period 2007–2020, using panel regression analysis, designed to examine poverty incidence through the gender lens.

### 3.2 Factors affecting poverty incidence – a gender perspective

Models *M_I* and *M_II* were designed to examine the relationship between the values of poverty rates – the dependent variables ($y_{1f}$, $y_{2f}$, $y_{3f}$, resp. $y_{1m}$, $y_{2m}$, $y_{3m}$) and explanatory variables ($x_{1f}$, $x_{2f}$, $x_{3f}$, $x_{5f}$, $x_{6f}$, …, $x_8$ and $x_{1m}$, $x_{2m}$, $x_{3m}$, $x_{5m}$, $x_{6m,}$ …, $x_8$ respectively). The explanatory variables were chosen to assess the situation on the labour market ($x_1$, $x_2$, $x_3$) or to assess the levels of attained education ($x_5$, $x_6$). The overall economic situation of the EU countries was reflected in the analysis as well using the variable showing annual growth of GDP per capita ($x_8$). The FE in *Stata* was used to make the within estimates for EU-27 countries over 14 years (2007–2020). Each model was divided into three parts, dealing separately with the three different poverty rates (AROP, SMD, AROPE).

Tables 3 and 4 present the results of the models *M_I* and *M_II*. Both models were recognized using the *F-test* as statistically significant in all their parts. Tables 3 and 4 contain the *p-values* for all the explanatory variables. If the *p-value* was lower than 0.05, then the explanatory variable was identified as statistically significant, and thus a relationship between the dependent variable and this explanatory variable was confirmed in the regression analysis of the panel dataset using the FE. The values of coefficients then indicated whether the relationship between the dependent and explanatory variables was estimated as positive or negative. As the FE was

used in the regression analysis, the estimates referred to the within variation or the variation over time. So-called between variations remained beyond the scope of the analysis.

**Table 3: Results of regression analysis *M_I***

| Explanatory variable | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | $y_{1f}$ | | $y_{2f}$ | | $y_{3f}$ | |
| | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** |
| $x_{1f}$ | **0.000** | **0.3281** | **0.000** | **0.6679** | **0.000** | **0.7747** |
| $x_{2f}$ | 0.304 | −0.0425 | 0.160 | −0.1612 | **0.025** | **−0.2100** |
| $x_{3f}$ | 0.086 | −0.1171 | 0.825 | 0.0393 | 0.928 | 0.0160 |
| $x_{5f}$ | 0.123 | −0.0649 | **0.011** | **−0.3177** | **0.006** | **−0.2852** |
| $x_{6f}$ | 0.483 | 0.0211 | **0.002** | **−0.3337** | **0.009** | **−0.2282** |
| $x_8$ | **0.001** | **0.0580** | **0.012** | **0.0874** | **0.002** | **0.1076** |

Source: authors' processing

Estimations concerning the women's poverty are presented in Table 3. They show clearly that significant explanatory variables differed when the estimates for the three different poverty rates were compared. When poverty was conceptualized in terms of the AROP rate (dependent variable $y_1$), only two statistically significant explanatory variables were identified, namely $x_1$ (annual rate of unemployment) and $x_8$ (annual growth of real GDP per capita). While the positive value of the coefficient for $x_1$ matches the general expectations about the positive relationship between poverty risks and unemployment, the positive relationship between poverty and annual growth of real GDP per capita is considered quite unexpected in this step of the analysis; therefore, it was examined further (see the discussion in the next section).

A higher number of statistically significant explanatory variables was identified for the next understanding of poverty, represented in *M_I* with the SMD or AROPE rates. Estimations made for the dependent variables $y_2$ and $y_3$ revealed that the levels of attained education (represented with variables $x_5$ resp. $x_6$) also had a statistically significant relationship with the incidence of poverty among women. However, the dependent variable $y_3$ was further related to the employment rate ($x_2$). A positive relationship between the incidence of SMD or AROPE ($y_2$, resp. $y_3$) and real GDP growth ($x_8$) was identified as well, similarly to the first part of *M_I*.

Table 4 shows estimations made for the poverty incidence among men. The results slightly differed from the estimations made in *M_I*, examining the incidence of poverty among women.

**Table 4: Results of regression analysis *M_II***

| Explanatory variable | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | $y_{1m}$ | | $y_{2m}$ | | $y_{3m}$ | |
| | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** |
| $x_{1m}$ | **0.001** | **0.3132** | 0.105 | 0.4392 | 0.924 | −0.0175 |
| $x_{2m}$ | 0.455 | 0.0603 | **0.000** | **−0.9874** | **0.000** | **−0.7111** |
| $x_{3m}$ | **0.001** | **0.4268** | 0.078 | **0.4264** | **0.001** | **0.8103** |
| $x_{5m}$ | 0.835 | 0.0082 | 0.070 | −0.1463 | 0.381 | −0.0454 |
| $x_{6m}$ | 0.357 | 0.0408 | **0.003** | **−0.4055** | **0.024** | **−0.2442** |
| $x_8$ | **0.001** | **0.0709** | **0.001** | **0.1471** | **0.000** | **0.1867** |

Source: authors' processing

*M_II* indicated the existence of a positive relationship between the AROP rate ($y_1$) and the unemployment rate *($x_1$)*. The SMD and AROPE rates ($y_2$, $y_3$) were related to the employment rate ($x_2$) and the proportion of men with tertiary education ($x_6$). The AROPE rate was also associated with the variable $x_3$, expressing the proportions of part-time employment in total employment. The poverty rates were also significantly and positively associated with the growth of real GDP per capita ($x_8$), similar to the estimations made in *M_I*. The dependent variable ($y_3$) (AROPE rate) was again associated with the highest number of explanatory variables; these variables were $x_2$, $x_3$, $x_6$, $x_8$. These estimated results correspond to the fact that AROPE represented the broadest understanding of poverty in the analysis.

## 3.3 Factors affecting gender poverty gaps

In the analysis, gender differences were identified not only within the values of the poverty rates but also in the values of explanatory variables with a gender dimension. The gender differences in the values of explanatory variables ($x_1$ represents unemployment rates, $x_2$ employment rates, $x_3$ percentage of part-time employment, $x_5$ and $x_6$ percentage of population with low and high level of attained education respectively) are graphically presented using the boxplots

in Figure 3. The values of gender differences and their dispersions indicate the existence of gender differences in the employment and unemployment rates respectively, as well as in the levels of attained education. The highest dispersion was found for $x_2$ (employment rate) in the case of Malta (country 18 in Figure 3) because of the rapid growth of the women's employment rate in that country between 2007 and 2020.

**Figure 3: Boxplots – gender gaps of explanatory variables**


Notes: variables: $x_1$ – *rate of unemployment*, $x_2$ – *employment rate*, $x_3$ – *part-time employment*, $x_5$ – *less than secondary education*, $x_6$ *tertiary education, all variables expressed as gaps between the values of variables reported for women and men (all variables in pp)*

Country codes: *1 Belgium, 2 Bulgaria, 3 Czechia, 4 Denmark, 5 Germany, 6 Estonia, 7 Ireland, 8 Greece, 9 Spain, 10 France, 11 Croatia, 12 Italy, 13 Cyprus, 14 Latvia, 15 Lithuania, 16 Luxembourg, 17 Hungary, 18 Malta, 19 Netherlands, 20 Austria, 21 Poland, 22 Portugal, 23 Romania, 24 Slovenia, 25 Slovakia, 26 Finland, 27 Sweden*

Source: authors' processing

The relationship between the gender poverty gaps (gender differences in the values of poverty rates) and gender differences in the explanatory variables with a gender dimension (namely $x_1$, $x_2$, $x_3$, $x_5$, $x_6$) was examined in *M_III*. However, only the second and third parts of *M_III* (parts with dependent variables $y_2$ and $y_3$) were recognized as statistically significant using

the *F-test*. To enhance the gender perspective in the regression analysis, two additional explanatory variables with information on gender inequality were included in the analysis: the gender pay gaps reported by Eurostat ($x_4$) and overall gender inequality ($x_7$; approximated with the global gender gap index reported by the World Economic Forum). In general, the gender poverty gaps are narrower when they reach values around zero. These values can be achieved when the women's poverty rates *ceteris paribus* decrease (in the case of positive values of gender poverty gaps), or when the men's poverty rates *ceteris paribus* decrease (in the case of negative values of the gender gaps). Alternatively, poverty rates of both genders can be changed, but then the narrowing of the gaps depends on the levels of these changes, specifically on which change is higher or lower.

Estimations from the regression analysis made in *M_III* are presented in Table 5. Part of the *M_III*, estimating the relationship between the dependent variable $y_{1g}$ (gender poverty gaps defined using AROP rates) and specified independent variables (see Table 5) was assessed as insignificant when the *F-test* for the model was made. It means that none of the independent variables was identified to have a statistically significant relationship with $y_{1g}$.

**Table 5: Results of regression analysis *M_III***

| Explanatory variable | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | $y_{1g}$ | | $y_{2g}$ | | *y3g* | |
| | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** | ***p-value*** | ***Coef.*** |
| $x_{1g}$ | Overall insignificance of the model: F-test value higher than 0.05 | | **0.002** | **0.5153** | 0.684 | 0.0447 |
| $x_{2g}$ | | | 0.439 | −0.0284 | **0.035** | **−0.0643** |
| $x_{3g}$ | | | 0.917 | −0.0019 | 0.296 | −0.0319 |
| $x_4$ | | | 0.907 | 0.0065 | 0.154 | 0.0572 |
| $x_{5g}$ | | | 0.859 | −0.0149 | 0.927 | 0.0069 |
| $x_{6g}$ | | | 0.096 | 0.1190 | 0.647 | −0.0284 |
| $x_7$ | | | 0.256 | 8.5647 | 0.235 | −6.6506 |
| $x_8$ | | | **0.002** | **0.0733** | 0.335 | −0.0114 |

Source: authors' processing

Estimations presented in Table 5 show statistically significant relationships between gender poverty gaps and three explanatory variables ($x_{1g}$, $x_{2g}$, $x_8$). The negative relationship between $y_{3g}$ and $x_{2g}$ estimated using the FE suggests that increasing women's employment rates could lead to decreasing gender poverty gaps in countries where the poverty incidence among women is higher than the poverty incidence among men. The values of women's employment rates ($x_{2f}$) were lower nearly in all countries and years (except Latvia and Lithuania in some years) than the values of men's employment rates ($x_{2m}$), which was also visible in Figure 3. Therefore, the values of $x_{2g}$ were negative in most years and countries. The values of $x_{2g}$ increase mathematically when they grow to values close to zero, which means the existence of no gender differences in employment rates. Therefore, higher values of $x_{2g}$ would be reached *ceteris paribus* if the women's employment rates were increased.

However, the narrowing of gender poverty gaps in countries where men are at higher risk of poverty or social exclusion cannot be done with increasing employment rates of men as increasing men's employment rates will decrease the values of $x_{2g}$. According to the estimations in *M_III*, decreasing values of $x_{2g}$ can increase the gender poverty gap ($y_{3g}$). It implies the necessity for policymakers to take different steps concerning employment to fight against a higher incidence of poverty among women than to fight against a higher incidence of poverty among men.

The positive relationship between the gender poverty gaps $y_{2g}$ and $x_{1g}$ is indicated in the second part of the *M_III*. However, no dominant trend in the differences between the unemployment rates of women and men (i.e., in the values of variables $x_{1f}$ and $x_{1m}$) was identified during the examined period. Therefore, the estimates only confirmed that if $x_{1g}$ increased, the value of $y_{2g}$ increased as well, and *vice versa*. This finding matches the general expectations on the relationship between poverty incidence and unemployment rate. However, this finding does not enable the formulation of any general recommendations concerning unemployment for poverty reduction from a gender perspective.

## Discussion and Conclusion

Following the initial results of the descriptive statistical analysis, feminization of poverty was not visible in all EU countries. The assertion that the poverty incidence among women was roughly equal to the poverty incidence among men corresponds to the earlier findings of Aisa et al. (2019) and Pena-Casas and Ghailani (2011). When the AROP definition of poverty was used, feminization of poverty (understood in terms of the gender differences in poverty) rates was identified only in 10 EU countries. When poverty was measured using SMD rates, feminization of poverty was revealed only in 2 EU countries. In these countries, the gender pov-

erty gaps (defined using the AROP and SMD rates) annually reached positive values, which indicates the existence of higher poverty risks for women than for men. It implies that gender matters for the likelihood of poverty risks in these countries. In the rest of the EU countries, at least in one or several years, men were at higher risks of poverty than women or the risks were the same for both genders (no differences in poverty rates were identified). Therefore, in these countries, the gender poverty gaps reached negative or zero values.

The dispersions of the women's and men's poverty rates (defined as the difference between the maximum and minimum values reached over the examined period) were similar. This finding indicates that the incidence of poverty has similar trends for both genders in the EU countries. However, the regression analysis examining the effects of variables concerning the labour market and attained education on poverty incidence among women and men revealed that gender could matter for the poverty risks because the values of these variables could differ according to gender. As confirmed earlier by Schwarz (2023), some factors could underline gender patterns of poverty existing among the working population.

Estimations in *M_I*, *M_II* and *M_III* were made using the fixed-effects estimator. Models were designed to assess the relationship between the poverty rates (dependent variables) and the set of explanatory variables during the period 2007–2020. Main research attention was paid to factors that could affect the incidence of poverty in the working-age population. Therefore, the variables describing the situation on the labour market, or the levels of attained education were used in the regression analysis as the explanatory variables. Because of the use of FE, only variation over time was considered in the analysis, and the variation between EU countries remained beyond the scope of the analysis. Every model used in the analysis had three parts, each dealing with different poverty indicators (AROP, SMD or AROPE rates).

Nearly every part of the models *M_I*, *M_II* or *M_III* estimated the existence of a relationship between poverty incidence and some labour market characteristics ($x_1$, $x_2$, $x_3$), level of attained education ($x_5$, $x_6$) or the annual growth of real GDP per capita ($x_8$). Model *M_III* showed the possible existence of a relationship between the gender poverty gaps (poverty understood in terms of SMD or AROPE) and gender differences in employment rates ($x_2$) or unemployment rates ($x_1$). Estimations from the panel regression analysis are summarized in Table 6. All the findings concerning the relationship between poverty, employment and education viewed through the gender lens are in line with findings presented in other studies dealing with gender differences in poverty incidence.

Mostly, the relationship between labour market characteristics and poverty incidence was confirmed for both genders using regression analysis. However, the men's poverty rates

(AROP as well as AROPE) were identified to be positively related to the percentage of men in part-time employment (variable $x_3$), while the women's poverty rates had no significant links to the variable $x_3$ despite a higher prevalence of part-time employment among women. On the other hand, women's poverty rates (AROP, AROPE and SMD) were identified to be affected by unemployment rates (variable $x_1$) in each part of *M_I*, while men's poverty rates were affected by the unemployment rates only when the AROP understanding of poverty was used. The importance of higher education for a successful fight against poverty was confirmed for the AROPE rates in *M_I* as well as *M_II*. Similarities and differences between the estimates made separately for both genders are visible in Table 6, also containing the results of *M_III*.

**Table 6: Significant explanatory variables *M_I* versus *M_II***

| Dependent variable | *M_I* | *M_II* | *M_III* |
|---|---|---|---|
| $y_1$ | $x_1(+), x_9(+)$ | $x_1(+), x_3(+), x_9(+)$ | --- |
| $y_2$ | $x_1(+), x_5(-), x_6(-), x_9(+)$ | $x_2(-), x_6(-), x_9(+)$ | $x_1(+)$ |
| $y_3$ | $x_1(+), x_2(-), x_5(-), x_6(-), x_9(+)$ | $x_2(-), x_3(+), x_6(-), x_9(+)$ | $x_2(-)$ |

Source: authors' processing

Following the political targets of the European Commission (2010), which were reaffirmed through the national plans for poverty reduction, poverty rates of both genders should be as low as possible to confirm a successful fight against poverty risks. If the elimination of gender inequality in poverty risks was targeted too, the poverty gaps should have reached values close to zero. The estimations from *M_I*, *M_II* and *M_III* suggest possible ways to reduce the poverty risks for women and men and how to narrow gender poverty gaps. Primarily, the results indicate the necessity to integrate a gender perspective in suggesting the appropriate tools and measures for poverty reduction because of the different effects of employment and education on poverty incidence among men and women.

In the EU countries where poverty is feminized, the measures should focus primarily on increasing women's employment rates, and thus the main activities should aim to increase the proportion of women in the labour force. Appropriate measures can be designed and implemented not only as part of labour market policies or employment policies but also as part of pro-family policies. Here, the measures can be designed in the form of financial and in-kind benefits, or services easing childcare and household duties. The positive effects of childcare

services and family policies were proved earlier by Misra et al. (2007). They showed that such measures could be more effective for lone mothers because, as was proved earlier, e.g., by Barcena-Martin and Moro Egido (2013), single motherhood could increase the poverty risks.

In the EU countries where men are at higher poverty risks than women, attention should be paid to the measures that would improve the position of men on the labour market: among other things, such measures should focus on increasing men's education to increase their earnings. Similar findings on the effects of education on the incidence of poverty among men were identified by Aisa et al. (2019), who explained how education could be important to prevent falling into poverty. They showed that higher education is a more effective measure for the fight against men's poverty than for the fight against women's poverty.

As was briefly mentioned above, the estimated positive relationship between poverty rates and annual changes in real GDP per capita is quite a surprising finding, which was confirmed using regression analysis, despite the general expectation about the effects of economic growth on poverty reduction. However, the relationship between economic growth and poverty reduction is not as straightforward as it is generally interpreted. The interconnections between economic growth, poverty and income inequality have been discussed in relevant literature several times (see, e.g., Dudek, 2019; Whelan and Maitre, 2012; Kenworthy, 2011; Nandori, 2010; Adams, 2003; Lustig et al., 2002). However, it is hard to find any unambiguous consensus on this relationship among economists. While positive effects of economic growth on poverty reduction were proved by Nandori (2010), who examined the situation in Eastern Europe, a negative one was indicated by Michalek and Vybostok (2018), who investigated the relationship between economic growth and poverty in the EU countries during the period 2005–2015. Michalek and Vybostok (2018) explained that in most EU countries, only a minority of people benefited from economic growth. They argued with the distribution of growth effects to show that income inequality increased because of the economic growth.

Particularly when the understanding of poverty is close to the income inequality, which is typical of the AROP (and partly AROPE, including AROP as a component), the well-known Kuznets hypothesis on the inverted U-shape curve (expressing the relationship between economic development and income inequality) should be considered. However, statistical data for EU-27 countries did not reveal any unambiguous relationships between the values of the Gini coefficient and annual growth rates of real GDP per capita during the period 2007–2020 (see Appendix 3). In some countries, the values of the Gini coefficient were quite stable over time despite the fluctuations in the values of real GDP per capita. In most EU countries, the values of the Gini coefficient fluctuated, but their fluctuations did not copy the trends in GDP changes.

This finding on the relationship between poverty incidence and economic growth opens a space for deeper research examining the verity of the Kuznets hypothesis in the EU countries. However, this research remains beyond the scope of the analysis presented above in this paper as it is obvious that a longer period must be analysed, and the stages of countries' development and some other relevant cross-country differences must be reflected in such research as well. Therefore, this remains a challenge for further research dealing with poverty in the EU countries.

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# Appendix 1

**Table A1: Correlation matrices for *M_I*, *M_II* and *M_III***

| ***M_I*** | $y_{1f}$ | $y_{2f}$ | $y_{3f}$ | $x_{1f}$ | $x_{2f}$ | $x_{3f}$ | $x_{5f}$ | $x_{6f}$ | $x_8$ |
|---|---|---|---|---|---|---|---|---|---|
| $y_{1f}$ | 1.0000 | | | | | | | | |
| $y_{2f}$ | 0.5061 | 1.0000 | | | | | | | |
| $y_{3f}$ | 0.7882 | 0.8913 | 1.0000 | | | | | | |
| $x_{1f}$ | 0.5274 | 0.3505 | 0.5252 | 1.0000 | | | | | |
| $x_{2f}$ | −0.5245 | −0.3091 | −05157 | −0.5835 | 1.0000 | | | | |
| $x_{3f}$ | −0.1839 | −0.4689 | −0.3186 | −0.2718 | 0.0829 | 1.0000 | | | |
| $x_{5f}$ | 0.2984 | −0.0009 | 0.1834 | 0.1830 | −0.5844 | 0.1424 | 1.0000 | | |
| $x_{6f}$ | −0.1789 | −0.2647 | −0.2257 | −0.0326 | 0.4233 | 0.0200 | −0.4586 | 1.0000 | |
| $x_8$ | −0.2707 | −0.3856 | −0.3290 | −0.2260 | 0.4713 | 0.3014 | −0.3094 | 0.6106 | 1.0000 |

| M_II | $y_{1m}$ | $y_{2m}$ | $y_{3m}$ | $x_{1m}$ | $x_{2m}$ | $x_{3m}$ | $x_{5m}$ | $x_{6m}$ | $x_8$ |
|---|---|---|---|---|---|---|---|---|---|
| $y_{1m}$ | 1.0000 | | | | | | | | |
| $y_{2m}$ | 0.5764 | 1.0000 | | | | | | | |
| $y_{3m}$ | 0.8185 | 0.9047 | 1.0000 | | | | | | |
| $x_{1m}$ | 0.5586 | 0.4428 | 0.6206 | 1.0000 | | | | | |
| $x_{2m}$ | −0.6192 | −0.5372 | −0.7239 | −0.9116 | 1.0000 | | | | |
| $x_{3m}$ | −0.0207 | −0.2394 | −0.0912 | −0.0268 | −0.0159 | 1.0000 | | | |
| $x_{5m}$ | 0.1913 | −0.0241 | 0.1343 | 0.1683 | −0.0957 | 0.0153 | 1.0000 | | |
| $x_{6m}$ | −0.2128 | −0.4344 | −0.3190 | −0.0492 | 0.0603 | 0.5009 | −0.2083 | 1.0000 | |
| $x_8$ | −0.1256 | −0.3918 | −0.2589 | −0.0981 | −0.0106 | 0.4085 | −0.1885 | 0.5744 | 1.0000 |

| M_III | $y_{1g}$ | $y_{2g}$ | $y_{3g}$ | $x_{1g}$ | $x_{2g}$ | $x_{3g}$ | $x_4$ | $x_{5g}$ | $x_{6g}$ | $x_7$ | $x_8$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $y_{1g}$ | 1.0000 | | | | | | | | | | |
| $y_{2g}$ | 0.1070 | 1.0000 | | | | | | | | | |
| $y_{3g}$ | 0.8989 | 0.1515 | 1.0000 | | | | | | | | |
| $x_{1g}$ | 0.2230 | 0.1369 | 0.1660 | 1.0000 | | | | | | | |
| $x_{2g}$ | −0.5164 | −0.0562 | −0.5028 | −0.4770 | 1.0000 | | | | | | |
| $x_{3g}$ | 0.2881 | −0.0232 | 0.3851 | 0.0712 | −0.1800 | 1.0000 | | | | | |
| $x_4$ | −0.1522 | 0.0901 | −0.0462 | −0.0326 | 0.2003 | 0.0600 | 1.0000 | | | | |
| $x_{5g}$ | 0.1139 | 0.0248 | 0.1756 | 0.0638 | −0.2748 | 0.2041 | 0.0566 | 1.0000 | | | |
| $x_{6g}$ | −0.4706 | 0.0360 | −0.5112 | −0.2842 | 0.5341 | −0.5731 | −0.0111 | −0.6169 | 1.0000 | | |
| $x_7$ | −0.1002 | 0.0416 | 0.0208 | −0.3429 | 0.3203 | 0.1431 | 0.2516 | −0.3184 | 0.3134 | 1.0000 | |
| $x_8$ | −0.3330 | 0.0735 | −0.2411 | −0.2741 | 0.4854 | 0.2459 | 0.0941 | −0.3487 | 0.3292 | 0.3604 | 1.0000 |

Source: authors' calculations

# Appendix 2

## Table A2: Ranking of EU countries according to mean values of poverty rates

| Country | Mean values of AROP rates *(y1)* | | | Mean values of SMD rates *(y2)* | | | | Mean values of AROPE rates *(y3)* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *f* | *Country* | *m* | *Country* | *f* | *Country* | *m* | *Country* | *f* | *Country* | *m* |
| **Finland** | 8.62 | Czechia | 6.89 | Luxembourg | 1.54 | Luxembourg | 1.34 | Czechia | 13.77 | Czechia | 11.07 |
| **Czechia** | 9.10 | Netherlands | 9.81 | Sweden | 1.95 | Sweden | 1.75 | Finland | 13.79 | Netherlands | 14.74 |
| **Denmark** | 9.41 | Finland | 10.66 | Netherlands | 2.76 | Netherlands | 2.66 | Slovenia | 15.10 | Finland | 15.50 |
| **Netherlands** | 9.83 | Slovakia | 10.96 | Finland | 3.16 | Finland | 2.84 | Netherlands | 15.33 | Luxembourg | 15.91 |
| **Slovenia** | 10.61 | Cyprus | 11.15 | Denmark | 3.38 | Denmark | 3.26 | Denmark | 16.35 | Slovenia | 16.03 |
| **Slovakia** | 11.31 | Malta | 11.15 | Austria | 4.16 | Austria | 3.81 | Sweden | 16.62 | France | 16.04 |
| **Austria** | 12.64 | Slovenia | 11.19 | Slovenia | 4.96 | Czechia | 4.51 | Austria | 17.27 | Malta | 16.08 |
| **Sweden** | 12.96 | France | 11.25 | Germany | 5.26 | France | 4.53 | Slovakia | 17.33 | Sweden | 16.40 |
| **France** | 13.10 | Denmark | 11.31 | Estonia | 5.26 | Germany | 4.69 | Estonia | 18.04 | Austria | 16.54 |
| **Cyprus** | 13.14 | Ireland | 11.37 | Czechia | 5.52 | Slovenia | 5.03 | France | 18.33 | Slovakia | 16.96 |
| **Hungary** | 13.17 | Belgium | 11.78 | France | 5.73 | Malta | 5.14 | Luxembourg | 18.94 | Denmark | 17.44 |
| **Ireland** | 13.33 | Austria | 12.33 | Spain | 5.74 | Spain | 5.56 | Malta | 19.01 | Belgium | 17.85 |
| **Belgium** | 13.51 | Hungary | 12.85 | Malta | 5.79 | Estonia | 5.57 | Germany | 19.41 | Germany | 17.88 |
| **Malta** | 13.86 | Sweden | 13.30 | Belgium | 6.00 | Belgium | 5.71 | Belgium | 19.76 | Estonia | 19.74 |
| **Estonia** | 14.26 | Luxembourg | 13.68 | Ireland | 7.21 | Ireland | 5.99 | Poland | 22.19 | Cyprus | 21.36 |
| **Germany** | 14.59 | Germany | 13.72 | Portugal | 7.46 | Portugal | 7.55 | Portugal | 22.46 | Ireland | 21.66 |
| **Poland** | 14.94 | Portugal | 15.29 | Slovakia | 8.76 | Slovakia | 8.36 | Cyprus | 23.39 | Portugal | 22.32 |
| **Croatia** | 15.11 | Estonia | 15.72 | Poland | 9.44 | Italy | 9.92 | Croatia | 23.81 | Poland | 23.29 |
| **Luxembourg** | 16.14 | Poland | 15.85 | Italy | 9.80 | Poland | 10.28 | Ireland | 24.41 | Lithuania | 25.44 |
| **Portugal** | 16.23 | Croatia | 16.29 | Croatia | 10.35 | Cyprus | 11.87 | Lithuania | 24.83 | Spain | 26.09 |
| **Latvia** | 16.84 | Latvia | 17.26 | Cyprus | 11.94 | Croatia | 11.87 | Spain | 26.62 | Hungary | 26.21 |
| **Lithuania** | 17.00 | Bulgaria | 17.44 | Lithuania | 12.29 | Lithuania | 12.64 | Hungary | 26.70 | Croatia | 26.53 |
| **Bulgaria** | 17.13 | Lithuania | 17.44 | Latvia | 16.71 | Latvia | 16.11 | Latvia | 27.60 | Italy | 26.59 |
| **Italy** | 20.26 | Italy | 17.88 | Greece | 17.10 | Greece | 17.01 | Italy | 28.65 | Latvia | 27.58 |
| **Spain** | 20.51 | Spain | 19.46 | Hungary | 18.02 | Hungary | 17.46 | Greece | 32.93 | Greece | 31.47 |
| **Greece** | 20.56 | Greece | 19.57 | Romania | 22.69 | Romania | 24.26 | Romania | 34.85 | Romania | 35.75 |
| **Romania** | 20.89 | Romania | 21.74 | Bulgaria | 31.31 | Bulgaria | 31.24 | Bulgaria | 37.00 | Bulgaria | 37.34 |

Source: authors' calculations

# Appendix 3

## Table A3: Test of statistical significance of difference between women's and men's poverty rates

| | AROP | | SMD | | AROPE | |
|---|---|---|---|---|---|---|
| | Sig. dif. | PF on average | Sig. dif. | PF on average | Sig. dif. | PF on average |
| **1** | ✓ | ✓ | x | ✓ | ✓ | ✓ |
| **2** | x | x | x | x | x | x |
| **3** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **4** | ✓ | x | x | x | x | x |
| **5** | ✓ | ✓ | x | ✓ | ✓ | ✓ |
| **6** | ✓ | x | x | x | x | x |
| **7** | ✓ | ✓ | x | ✓ | x | ✓ |
| **8** | x | ✓ | x | x | x | ✓ |
| **9** | x | ✓ | x | x | x | x |
| **10** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **11** | x | x | x | x | x | x |
| **12** | ✓ | ✓ | x | x | x | ✓ |
| **13** | ✓ | ✓ | x | x | x | ✓ |
| **14** | x | x | x | x | x | x |
| **15** | x | x | x | x | x | x |
| **16** | ✓ | ✓ | x | x | ✓ | ✓ |
| **17** | x | ✓ | x | ✓ | x | x |
| **18** | ✓ | v | x | x | ✓ | ✓ |
| **19** | x | x | x | x | x | ✓ |
| **20** | x | x | x | ✓ | x | ✓ |
| **21** | x | x | x | x | x | x |
| **22** | x | ✓ | x | x | x | x |
| **23** | x | x | x | x | x | x |
| **24** | x | x | x | x | x | x |
| **25** | x | ✓ | x | x | x | ✓ |
| **26** | ✓ | x | x | ✓ | ✓ | x |
| **27** | x | x | x | x | x | x |

Notes: Sig. dif. = statistically significant difference; meaning of the symbols: ✓ *test rejected* $H_0$, *x test failed to reject* $H_0$

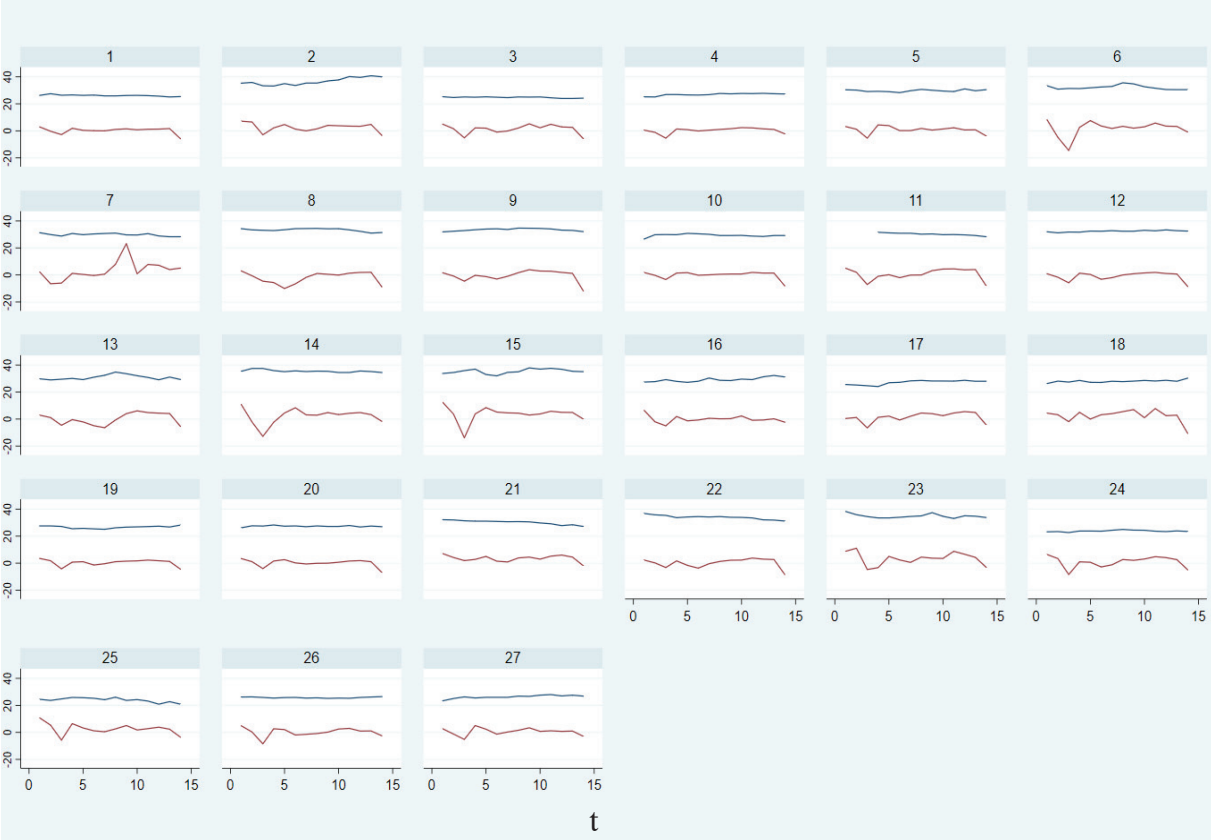
PF on average = poverty feminization on average, when the mean value of women's poverty rate is higher than men's poverty rate, the symbol ✓ is used, and vice versa for the symbol x.

Country codes: *1 Belgium, 2 Bulgaria, 3 Czechia, 4 Denmark, 5 Germany, 6 Estonia, 7 Ireland, 8 Greece, 9 Spain, 10 France, 11 Croatia, 12 Italy, 13 Cyprus, 14 Latvia, 15 Lithuania, 16 Luxembourg, 17 Hungary, 18 Malta, 19 Netherlands, 20 Austria, 21 Poland, 22 Portugal, 23 Romania, 24 Slovenia, 25 Slovakia, 26 Finland, 27 Sweden*

Source: authors' calculations

# Appendix 4

**Figure A1: Trends of values of Gini coefficient and percentage changes in real GDP per capita in EU countries**




Notes: lines – blue line – values of Gini coefficient; red line – percentage changes in real GDP per capita

Country codes: *1 Belgium, 2 Bulgaria, 3 Czechia, 4 Denmark, 5 Germany, 6 Estonia, 7 Ireland, 8 Greece, 9 Spain, 10 France, 11 Croatia, 12 Italy, 13 Cyprus, 14 Latvia, 15 Lithuania, 16 Luxembourg, 17 Hungary, 18 Malta, 19 Netherlands, 20 Austria, 21 Poland, 22 Portugal, 23 Romania, 24 Slovenia, 25 Slovakia, 26 Finland, 27 Sweden*

Source: authors' calculations