How Poor Are the Poor? Looking beyond the Binary Measure of Income Poverty

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Abstract

This paper contributes to the literature by analysing how poor the income poor are in European countries. Using data from the European Union Statistics on Income and Living Conditions, I go beyond average estimates of the intensity of poverty and analyse the distribution of individual-level poverty gaps in each country of interest. As a next step, I identify which personal and household characteristics predict how far away incomes of the poor fall from the poverty line. The results indicate that, in most European countries, half of the poor have income shortfalls not exceeding 30% of the poverty line whereas only a few percent of the poor have income deficits of 80% and more. The results also suggest that traditional poverty correlates (e.g. age, gender, educational background) are not always significantly associated with the size of normalised poverty gaps at the individual level, or the nature of these associations differs as compared to when the same characteristics are linked to the probability of being poor.

Abbreviations

CDF   cumulative distribution function
EU   European Union
EU-SILC European Union Statistics on Income and Living Conditions
FGT   Foster-Greer-Thorbecke poverty index

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1 Introduction

Income poverty has been recently on the rise in many countries (OECD 2008; OECD 2013; Atkinson et al. 2017). In European Union (EU), for example, relative income poverty increased in 16 out of 27 member states between 2007 and 2014.[1] In response to these negative developments, the European Commission has set a target to reduce the population at risk of poverty or social exclusion (AROPE) by at least 20 million by 2020 (European Commission 2010; Frazer et al. 2010).[2]

Most of poverty-related policy targets as well as recent debates in academic literature focus on headcount measures of income poverty or social exclusion. Using absolute or relative indicators of poverty researchers and policy makers analyse, above all, the prevalence of poverty in a given country or across different population sub-groups. In this case, all income poor are treated in the same way regardless of how far away their incomes are from the poverty line. For example, a person whose income falls just one euro below the poverty threshold contributes the same to the poverty measure as someone with a zero income.

Recognizing the problem, a number or scholars proposed to estimate poverty indices, which could account not only for the incidence but also for the intensity of poverty, i.e. the distance of individual incomes from the poverty line (see, among others, Sen 1976; Thon 1979; Blackorby and Donaldson 1980; Kakwani 1980; Clark et al. 1981; Chakravarty 1983; Foster et al. 1984). The European Commission, on its side, introduced a measure of the relative median at-risk-of-poverty gap—the difference between the median equivalised disposable income of people below the at-risk-of-poverty threshold and the threshold itself, expressed as a percentage of the at-risk-of-poverty threshold—in the list of the key indicators to monitor social progress (Social Protection Committee 2015). Although these indices are useful for summarizing the intensity of income poverty in a given society, as aggregate measures, they hide individual experiences of poverty and provide limited possibilities for linking poverty outcomes to individual and household characteristics.

This paper aims to look beyond summary measures of income poverty and analyses how poor the poor are at the disaggregate level. To do that, I move away from the binary definition of poverty status (poor versus non-poor) to a continuous individual poverty measure, which represents the shortfall of equivalised disposable income from the poverty line. In the first step, I look at the distributions of such shortfalls across the European Union (EU) countries and examine whether countries with similar aggregate measures of poverty also face similar distributions of income shortfalls from the poverty line. As a next step, I identify which individual and household characteristics predict how far away income of someone who is poor falls from the poverty line and whether these are the same characteristics as the ones predetermining whether an individual is poor in the first place. The estimations are based on data from the European Union Statistics on Income and Living Conditions (EU-SILC).

The contribution of the paper to the literature is twofold: (1) it highlights the importance of the distributional approach in the analysis of the intensity of poverty, and (2) it assesses the relationship between socio-economic characteristics of individuals, on the one hand, and the size of their poverty gaps, on the other. I show that the distributional approach brings

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[1] The poverty threshold here is defined as 60% of the median equivalised income in a given country.

[2] The population at risk of poverty or social exclusion (AROPE) is the Europe 2020 headline indicator to monitor progress in terms of social inclusion. It combines three indicators, i.e. at-risk-of-poverty rate, the severe material deprivation rate, and the share of individuals living in (quasi-)jobless households (European Commission 2015).

additional insight into the degree of intensity of poverty, as compared to what one learns from the summary measures. Using a multiple-country setting, I demonstrate that quite often countries with similar summary measures of poverty have significantly different distributions of poverty gaps among the poor. Moreover, without the inspection of the entire distribution of poverty gaps it is impossible to identify which portion of the poor is close to the poverty line and which is relatively far from it.

As mentioned above, the paper also contributes to our knowledge on the correlates of poverty gaps at the individual level. Researchers usually focus on the analysis of the determinants of someone's poverty status (e.g., Dickens and Ellwood 2003; Hoynes et al. 2006; Haughton and Khandker 2009; Bárcena-Martín and Pérez-Moreno 2017), factors associated with the transitions across the poverty line (Bane and Ellwood 1986; Duncan et al. 1993; Stevens 1999; Devicienti 2011; McKernan and Ratcliffe 2005; Jenkins 2011; Arranz and Cantó 2012), or shifts in the composition of the poor while using different poverty thresholds (OECD 2008; Iacovou 2017). Although this work helps to identify socio-economic characteristics which make individuals more likely to experience poverty or transitions across the poverty line, it does not quantitatively explore the association of these characteristics with the size of poverty gaps.[3]

The paper has the following structure. Section 2 presents the estimation approach. Section 3 describes data used for the analysis. Section 4 provides the estimation results and Section 5 concludes.

2 Estimation Approach

In what follows, I will first present the distributional approach to characterize the intensity of poverty in a given population and then describe the econometric model which I use to link demographic and labour market characteristics of individuals to the size of their income shortfalls from the poverty line.

2.1 The Intensity of Poverty at the Aggregate Level

Consider a population of N individuals where each individual i ($i = 1, 2, …, N$) has equivalised disposable income of a given size y ($y = y_1, y_2, …, y_N$). Let z stand for the poverty line. Then, each individual i with $y_i < z$ can be characterized as poor and one can define how far away his or her income falls from the poverty line by:

$$g_i = z - y_i \tag{1}$$

where g_i is a shortfall of individual equivalised disposable income from the poverty line, the poverty gap. All individuals with $y_i > z$ are non-poor and have a poverty gap of zero.

In Eq. (1) g_i reflects the income deficit of an individual in absolute terms. This measure is not scale invariant and the magnitude of the estimates might change with the change of the

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[3] One can analyze, of course, the prevalence of various population sub-groups (e.g. children, single parents, unemployed) among the poor using different poverty thresholds. It will give some information on who is more prone to suffer from poverty when a more (less) demanding threshold is set. However, in order to identify to what extent certain individual and household characteristics are associated, ceteris paribus, with how far someone's income falls from the poverty line a multivariate analysis at the individual level is needed.

currency (Ziliak 2005). For comparative cross-country studies, it poses a further problem because, apart from the differences in costs of living, countries have different poverty lines. As a result, the same income shortfall of 500 Euros might be considered as big in one country but as small in another one. To overcome this issue, I follow the literature on poverty measurement and normalize individual poverty gaps with respect to the poverty line:

$$g_i^{norm} = \frac{z - y_i}{z} \tag{2}$$

where g_i^{norm} reflects the relative shortfall of income from the poverty line for individual i.

The vector of normalised poverty gaps for all individuals, $g_i^{norm} = \left(g_1^{norm}, g_2^{norm}, \dots g_N^{norm}\right)$, contains information on the prevalence and intensity of poverty in a given population. The traditional way to summarize this information is by using various indices of poverty (see, among other, the indices developed by Sen (1976), Thon (1979), Blackorby and Donaldson (1980), Kakwani (1980), Clark et al. (1981), Chakravarty (1983), Foster et al. (1984). In this paper, I calculate three summary measures of poverty, which are based on the Foster-Greer-Thorbecke (1984) poverty index (FGT) and are often used to characterize the prevalence and intensity of poverty on the country level:

$$I_c^a(y_c; z_c) = \frac{1}{N_c} \sum_{i=1}^{Q_c} \left(\frac{z_c - y_{ic}}{z_c}\right)^a \text{ with } \alpha = 0, 1, 2, \dots, \infty \tag{3}$$

where I_c^a is a poverty measure for country c; y_c is a vector of equivalised disposable income in country c; z_c is a poverty line in country c; and Q_c is a number of individuals with $y_i < z$ in country c. I also complement the FGT poverty measures with the measure of relative median at-risk-of-poverty gap (the difference between the median equivalised disposable income of people below the at-risk-of-poverty threshold and the threshold itself, expressed as a percentage of the at-risk-of-poverty threshold), which represents one of the key EU indicators for monitoring income poverty.

The parameter a in Eq. (3) can take any value between zero and infinity, with larger values putting more weight on poorer individuals in the calculation of poverty indices. In this paper, I let a take the values of 0, 1, and 2 which yields three well-known measures of poverty – the headcount ratio (FGT (0)), the average normalised poverty gap (FGT (1)), and the average squared normalised poverty gap (FGT (2)).

When $a = 0$, Eq. (3) collapses to

$$I_c(y_c; z_c) = \frac{Q_c}{N_c} \tag{4}$$

and captures the proportion of individuals living in income poverty in a given country (the headcount ratio). The headcount ratio distinguishes whether individuals are poor or not but it ignores how far away incomes of the poor fall from the poverty line.

When $a = 1$, Eq. (3) yields the average normalised poverty gap and with $a = 2$, the squared normalised poverty gap is calculated. In contrast to the headcount ratio, these two measures of poverty account for the relative size of income shortfalls from the poverty line. The average normalised poverty gap shows the size of the income deficit per individual in a given population. Derived as a simple average, this measure treats large and small poverty gaps equally and, hence, does not account for inequality among the poor. The average squared normalised poverty gap accounts for such inequality by putting more weight on those who

have large income shortfalls from the poverty line before averaging the results across population.

As any summary measures of poverty, the indices from Eq. (3) provide only limited information on how poor the poor are. In order to shed further light on the intensity of poverty, I propose to construct and analyse the entire cumulative distribution function (CDF) of their income shortfalls from the poverty line, $F\left(g_c^{norm}\right)$:

$$F\left(g_c^{norm}\right) = \Pr\left(G_c^{norm} \leq g_c^{norm}\right) \qquad (5)$$

where G_c^{norm} is a random variable corresponding to g_i^{norm} in country c. If interpreted at the individual level, this function provides a set of probabilities that a randomly taken poor individual in country c has a normalised poverty gap smaller or equal to a certain value, g_c^{norm} (where $0 < g_c^{norm} \leq 1$). At the aggregate level, these probabilities reflect the shares of the poor with income shortfalls not exceeding a given value. For example, one might want to identify the percentage of the poor with income shortfalls not exceeding 10% of the poverty line, or the share of the poor who would need to double their income to reach the poverty line. The way how $F\left(g_c^{norm}\right)$ is constructed resembles the 'Three "I"s of Poverty' (TIP) curve of Jenkins and Lambert (1997), which plots the cumulative sum of poverty gaps per capita against the cumulative population share. The two, however, differ substantially in what they portray. Whereas the TIP curve depicts the incidence, intensity and inequality of poverty, Eq. (5) captures the cumulative distribution of the poor by the size of their income shortfalls from the poverty line.

2.2 Determinants of the Intensity of Poverty at the Individual Level

The CDF of normalised poverty gaps and summary measures of poverty provide information on how poor the poor are but they tell us nothing about the characteristics of the poor, which are associated with deeper poverty. In order to shed light on this question, I link the size of poverty gaps for those who are poor to a set of observed covariates, which have shown themselves as important predictors of poverty status or transitions across the poverty line in previous research.[4] I first do it for all European Union countries pooled together in order to identify how demographic and labour market characteristics of the poor are associated with the size of poverty gaps in the EU in general. As a next step, I analyse differences in these associations across EU member states by performing separate analysis for each country.

In the multiple-country context, the model is specified as follows:

$$g_{ihc}^{norm} = a_c + \beta X_{ihc} + u_{hc} + \varepsilon_{ihc} \qquad (6)$$

where g_{ihc}^{norm} is a normalised poverty gap of poor individual i from household h living in country c; a_c is a vector of country-specific intercepts (country fixed effects); X_{ihc} is a set of observed individual and household characteristics; β is a vector of parameters associated with

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[4] See, for example, Stevens (1999), Dickens and Ellwood (2003), Hoynes et al. (2006), Haughton and Khandker (2009), Devicienti (2011), Jenkins (2011).

X_{ihc}; u_{hc} is a household-specific error term, and and ε_{ihc} is an individual-specific error. The inclusion of country fixed effects is necessary to account for omitted variable bias, which can be induced by the correlation of country-specific conditions with individual characteristics.[5] One might worry, for example, that individuals with certain characteristics are more prevalent among the poor (or face larger income shortfalls) in some countries but not in others or that sub-group differences in the risk / intensity of poverty vary across countries as a result of differences in the welfare states and their targeting policies. Country fixed effects allow us to control for this cross-country heterogeneity since the estimation relies entirely on the variation in X_{ihc} among the observations for each country with β representing the average within-country effect (Murray 2006).

Given that g_{ihc}^{norm} is a continuous variable, I apply the Ordinary Least Squares (OLS) estimator to the model specified in Eq. (6) in order to derive the vectors of parameters a_c and β.[6] The OLS insures that the sum of the squared predicted errors is minimised so that the error term has zero mean (Wooldridge 2013). An important assumption for causal interpretation of parameters β is that characteristics they refer to are exogenous, i.e. not correlated with individual-specific error terms. Since my research design cannot guarantee that unobserved characteristics of individuals do not interact with the observed characteristics included in the model, β estimates from Eq. (6) should be interpreted in a non-causal way.

Equation (6) yields benchmark estimates of the associations between individual characteristics, on the one hand, and the size of normalised poverty gaps, on the other. The estimates are benchmark in a sense that they reflect the associations between the characteristics of the poor and the size of poverty gaps in the entire EU. In order to identify the extent to which the relationship between individual characteristics and the size of poverty gaps vary across EU countries I estimate Eq. 6 (without country fixed effects) for each country separately.

3 Data and Sample Construction

The empirical part of the paper is based on the scientific-use release of EU-SILC cross-sectional data covering 28 EU countries. In the main part of the paper, I present the results for the 2016 wave of EU-SILC, which I verify by replicating the same analysis to other periods (2014 and 2015) in Section 4.3. The reference population of EU-SILC comprises all private households and their current members residing in the territory of the member states at the time of data collection (European Commission 2017). Member states are allowed to use different instruments to collect data, which afterwards go through a process of harmonisation to insure data comparability across all countries (Iacovou et al. 2012). Albeit there have been a lot of discussions that heterogeneity in the ways of data collection and processing hampers data

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[5] If the dependent variable is affected by unobserved variables that systematically vary across countries, then the β coefficient on any variable, which is correlated with this variation, will be biased (Cameron and Trivedi 2005). The inclusion of country fixed effects accounts for the interaction between demographic and labor market characteristics of the poor and unobserved variables only at the country level. It does not account for the interaction of observed individual characteristics with any unobserved variables at the individual level.

[6] The OLS estimator will provide unbiased results only if the dependent variable in equation (6) is not truncated (incompletely observed data). Truncation results in shifting the sample average away from the population average, which should be taken into account to provide unbiased β estimates if this is the case (see Cameron and Trivedi 2005).

comparability across countries (see, among others, Berger and Schaffner 2015; Krell et al. 2017), EU-SILC remains the main dataset for monitoring poverty and well-being in the EU.

In order to identify whether an individual is poor or not, as well as to calculate the size of normalised poverty gaps for those who are poor, I use information on total net household income assigned to each individual. This variable represents income received by all household members during the reference year from all sources after deducting taxes and social contributions paid. The income reference year is the calendar year prior to the survey year in all countries except the United Kingdom, where it is the current year, and Ireland, for which it is the last twelve months. To make the values of total net household income comparable across households of different size, I adjust them by the modified OECD equivalence scale. The scale assigns the value of 1 to the first adult in the household, the value of 0.5 to any subsequent adult, and the value of 0.3 to every child below 14.[7]

An individual is considered poor if his or her income falls below the poverty threshold set at 60% of the median equivalised disposable income in a given country. This is the official definition of income poverty in Europe widely used to monitor and compare the level of income poverty across EU countries.[8] The rationale behind it is to move beyond absolute destitution in defining whether someone is poor or not and to consider individuals' capacity to participate in the life of society they live in (United Nations 2017). One should keep in mind, however, that this approach to poverty measurement does not always reflect the standard of living: people can be classified as poor because they have incomes smaller than a chosen threshold, even if they do not suffer from the lack of food or other essentials. From the cross-country perspective, it implies that someone classified as poor in a rich country such as Luxembourg might have a better standard of living than someone classified as poor in a less well-off country as, for example, Romania.[9]

One of the challenges in working with income data arises from the presence of extreme income values because poverty indicators might be sensitive to them (Cowell and Victoria-Feser 1996). In the context of EU-SILC, Van Kerm (2007) has shown that, depending on the treatment of extreme income values, one might obtain poverty estimates of a different magnitude, although the overall ordering of the countries is normally not affected. In my sample of poor individuals, 1.3% of observations have negative values, 0.8% have zero values, and around 4% have values smaller than 10% of the national poverty threshold (see Table A.1 in Online Appendix A). The percentage of extreme income values also varies substantially across countries with the variation itself being induced by errors in income measurement and the mode of data collection (Van Kerm 2007).[10] Acknowledging this problem, I perform winsorizing of negative incomes in the data by recoding them to zeros (individuals with such incomes automatically receive the poverty gap equal to 1). As a robustness check, I also perform two types of trimming by removing from the sample: (1) all observations with negative and zero income values, and (2) all observations with income values smaller than

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[7] Previous research has shown that the choice of equivalence scales might influence the estimated level of poverty and composition of the poor (Förster 1994; Jenkins 2011). I test the sensitivity of the results to this choice in Section 4.3.

[8] For more details on the history of this definition as well as its advantages and disadvantages see Dvorak (2015).

[9] See Goedemé et al. (2019) for a detailed analysis of the cross-country differences in the standard of living at the level of the at-risk-of-poverty threshold.

[10] For instance, in the countries, which use administrative records to provide information for EU-SILC, it might be more likely to have negative income values if people are allowed to report negative incomes in their annual tax declarations.

10% of the national poverty line. The results of these robustness checks are presented in Section 4.3.

Another important feature of the EU-SILC, which should be taken into account while working with it, is differences in the sample design across countries. Whereas some countries use single-stage designs, others use complex sample designs involving multiple stages of clustering and stratification. Ignoring the complexity of the sample design might lead to a substantial underestimation of standard errors for any statistics estimated from such samples (Goedemé 2013). Given that the available sample-design information in EU-SILC is incomplete for some countries, I reconstructed sample design variables following the procedure developed by Goedemé (2013) and Zardo Trindade and Goedemé (2016), and used them to calculate standard errors and confidence intervals for all statistics in the paper.

Although I rely on household income to identify whether someone is poor and calculate the size of income shortfalls from the poverty line, the analysis is performed at the individual level. This choice comes in line with the traditional approach to poverty measurement, which is based on identification of the proportion of individuals (and not households) who live in poverty. Moreover, using individuals rather than households as a unit of analysis allows accounting for important personal characteristics (age and gender) while analysing the determinants of income shortfalls from the poverty line. Apart from individual characteristics, I also consider household type, the number of children, educational background, employment status and citizenship of household head as potential predictors of the size of income shortfalls from the poverty line.[11] These variables have proven themselves as important correlates of poverty status and transitions across the poverty line in previous studies (see, among other Duncan et al. 1993; Stevens 1999; Jenkins 2011). Household head is defined in the paper as a household member with the largest personal gross income or as the oldest person in the household, if several household members have personal gross income of the same size.[12] To ensure that my sample of individuals represents the EU population, I apply non-rescaled cross-sectional individual weights throughout the empirical part of the paper.[13] Table 1 provides descriptive statistics for the characteristics of the poor in all countries pooled together (for country-specific estimates, see Table B.1 in Online Appendix B).

An average poor is 39.5 years old, is a bit more likely to be female than male, and has one child. The majority of the poor live in couple-based households or are single whereas relatively few of them are single parents or live in other household types. The poor are also more likely to live in households where the head is employed, have only primary education and holds a citizenship of the country of residence. The average normalised poverty gap among the poor constitutes around 31% of the poverty line.

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[11] Because I have children in the sample, the use of individual level information on some covariates (e.g. education, employment, citizenship) was not possible. As a sensitivity check, I replicated the analysis on the sample of individuals aged 18 and more, for whom I used individual level information on education, employment, and citizenship. The results of this exercise were consistent with the main findings.

[12] For a sensitivity check, I also performed the analysis with data, where household head is defined as a person responsible for accommodation, but found no substantial differences in the results.

[13] The weighting factors are inbuilt in EU-SILC dataset and are designed to account for the units' probability of selection, non-response and the distribution of households and persons in the target population in line with external population data (European Commission 2015).

Table 1 Descriptive statistics for the characteristics of the poor (all countries together)

Covariates	Mean	95% Confidence intervals	
		Lower	Upper
Age of the individual	39.50	39.35	39.64
Female	53.04	52.72	53.35
Household type			
Single	21.51	21.25	21.77
Couple	50.24	49.93	50.56
Single parent	9.14	8.96	9.32
Other	19.10	18.85	19.35
Number of children	0.945	0.938	0.954
Employment status of the HH			
Employed	34.45	34.15	34.72
Self-employed	14.23	14.01	14.45
Unemployed	14.74	14.52	14.97
Retired	20.39	20.13	20.64
Inactive	16.19	15.95	16.42
Educational attainment of the HH			
Primary	46.68	46.36	47.00
Secondary	24.91	24.64	25.18
Vocational	14.25	14.03	14.47
Tertiary	14.15	13.93	14.38
HH is a citizen, in %	88.45	88.27	88.66
Average normalised poverty gap among the poor (in %)	31.28	31.12	31.45
Number of observations	95,115		

Notes: HH stands for the household head. All estimates are weighted using personal cross-sectional weights. Confidence intervals are derived accounting for the complex sample design

4 Results

4.1 The Intensity of Poverty at the Country Level

Figure 1 plots the Foster-Greer-Thorbecke indices of poverty and the median at-risk-of-poverty gap in each of the countries studied.[14] It shows that the countries differ substantially with respect to these four indicators. Looking at the poverty rate first, one can see that it is as low as 9.7% in Czech Republic and as high as 25.3% in Romania. The average normalised poverty gap and the squared poverty gap are also the lowest in Czech Republic and the highest in Romania whereas the relative median at-risk-of-poverty gap ranges between 14.8 in Finland and 32.3 in in Romania.

In general, countries with low poverty rates also have relatively low measures of the intensity of poverty and the other way around.[15] The relationship, however, does not always hold. For example, Belgium has a higher poverty rate than Austria but lower indicators of the intensity of poverty. Similarly, Cyprus and Sweden have very similar poverty rates, but the intensity of poverty is substantially higher in Sweden. In other words, although the percentage of people living in poverty serves as a good proxy for the intensity of poverty in a given country, the correlation between these measures is not perfect.

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[14] The values of the estimates and their 95% confidence intervals, derived while accounting for the complex sample design, are provided in Table C.1 in Online Appendix C.
[15] Figures D.1-D.3 in Online Appendix D visualize this relationship using scatter plots.
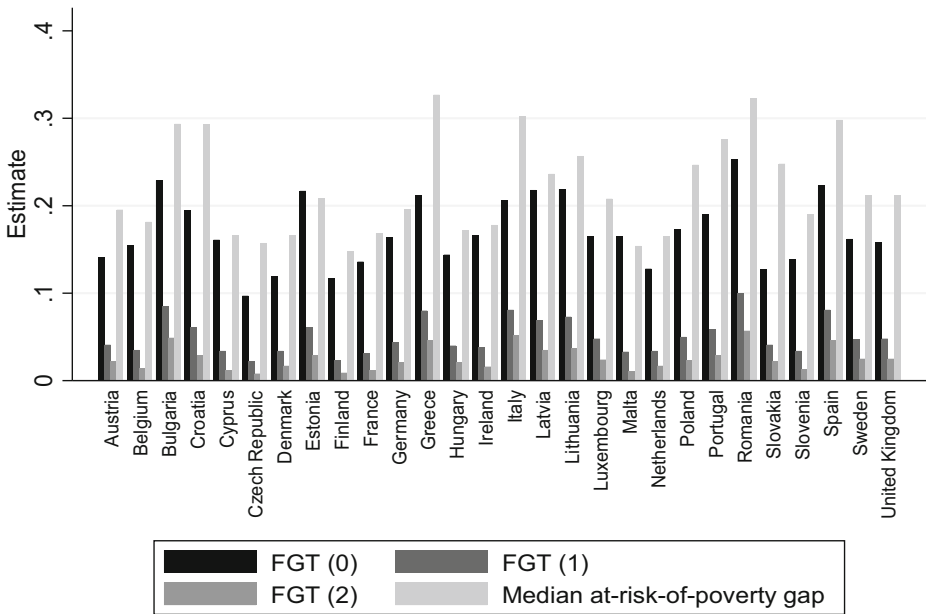
Fig. 1 The Foster-Greer-Thorbecke indices of poverty and the median at-risk-of-poverty gap, by country *Notes*: FGT (0): headcount ration (proportion poor); FGT (1): average normalized poverty gap; FGT (2): average squared normalized poverty gap. All negative incomes are recorded to zeros. The estimates and their 95% confidence intervals are provided in Table C.1 in Online Appendix C

This is not surprising given how these poverty measures are derived. The incidence of poverty, as it is calculated in the paper, represents the percentage of individuals living below the poverty threshold defined as 60% of the median income in a given country. As soon as someone's income falls below the poverty threshold, the person is counted as poor contributing to the aggregate measure of the incidence of poverty. For this measure, any further information on the size of income shortfalls from the poverty line of those who are poor is irrelevant.

In contrast, aggregate measures of the intensity of poverty rely, above all, on how far away incomes of the poor fall from the poverty line. The average normalized poverty gap and the average squared normalized poverty gap, for example, are derived by averaging individual poverty gaps across the entire population, including those who are non-poor. As a result of this measurement approach, countries that have a high poverty incidence but small poverty gaps (when many individuals are just below the poverty line) might end up having the same average (squared) normalized poverty gap as countries with low poverty incidence but large income shortfalls from the poverty line among the poor (Haughton and Khandker 2009). The relative median at-risk-of-poverty gap is an indicator showing the difference between the median equivalised disposable income of the poor and the poverty threshold itself. Calculated in this

Table 2 Pairwise correlations of the summary measures of poverty with the shares of the poor who have poverty gaps of a certain size

Summary measure of poverty	Percentage of the poor with poverty gaps			
	< 25% of the poverty line (the least poor)	Between 25 and 50% of the poverty line	Between 51 and 75% of the poverty line	> 75% of the poverty line (the most poor)
FGT (0)	−0.726***	0.360	0.684***	0.574**
FGT (1)	−0.897***	0.359	0.857***	0.771***
FGT (2)	−0.908***	0.274	0.864***	0.860***
Median at-risk-of-poverty gap	−0.945***	0.508*	0.874***	0.732***

Notes: FGT (0): headcount ratio; FGT (1): average normalized poverty gap; FGT (2): average squared normalized poverty gap. All negative incomes are recorded to zeros. All estimates are weighted using individual cross-sectional weights. * stands for significance at 0.05 level, ** stands for significance at 0.01 level, and *** stands for significance at 0.001 level

way, it does not take into account how many people live in poverty and how large their income shortfalls from the poverty line are.

A further question to ask is whether summary measures of the incidence and intensity of poverty can give us some information about the distribution of the poor by income shortfalls from the poverty line. Table 2 provides cross-country pairwise correlations of these measures with the shares of the poor, who have poverty gaps of a different size. It shows that countries with higher aggregate measures of poverty have a smaller percentage of the poor with poverty gaps not exceeding 25% of the poverty line and a higher percentage of the poor with poverty gaps above 50% of the poverty line. The significance of the relationship, however, disappears (at least, for the FGT measures of poverty) when one moves to the share of the poor with poverty gaps between 25 and 50% of the poverty line.

Figure 2 sheds further light on the capacity of summary measures of poverty to provide us with information on the composition of the poor. It does so by plotting the cumulative distribution function (CDF) of normalized poverty gaps among the poor in a set of countries, which share similar summary measures of poverty (the CDFs for each country separately are provided in Fig. E.1 in Online Appendix E).

Both Fig. 2 and Fig. E.1 in Online Appendix E show that, in most of the countries, the majority of the poor have income shortfalls not exceeding 30% of the poverty line whereas a relatively small percentage of the poor have poverty gaps greater than 50% of the poverty line. The exact composition of the poor in terms of the size of income shortfalls from the poverty line, however, differs substantially across countries, even when these countries have identical summary measures of poverty. For example, Luxembourg and Malta (Fig. 2) have exactly the same relative income poverty rate, but completely different distributions of the poor in terms of the size of normalized poverty gaps. Whereas 95% of the poor have income shortfalls not
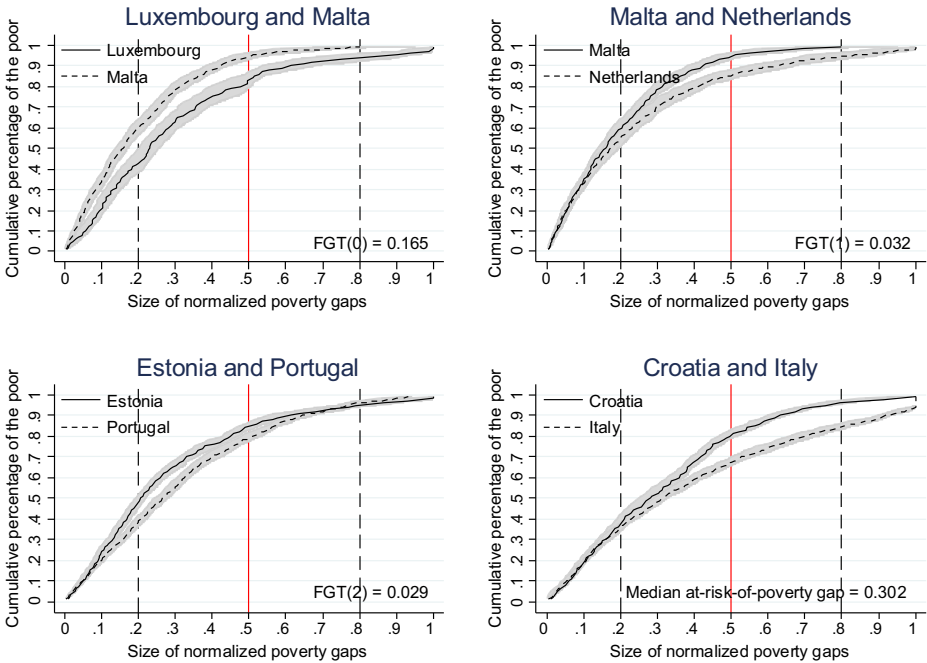
Fig. 2 Cumulative distribution functions of normalized poverty gaps among the poor in the countries with the same aggregate measures of poverty *Notes:* FGT (0) - headcount ratio; FGT (1) - average normalized poverty gap; FGT (2) - average squared normalized poverty gap. All negative incomes are recorded to zeros. The shade areas represent 95% confidence intervals derived via a bootstrapping procedure (with 250 replications) that accounts for the complex sample design

exceeding 50% of the poverty line in Malta, in Luxembourg the same applies only to about 80% of the poor.

Further inspection of Fig. 2 reveals that even countries with the same intensity of poverty at the aggregate level (regardless of the measure taken into account) might face significantly different distributions of the poor by the size of normalized poverty gaps.[16] Malta and the Netherlands, for example, score the same on FGT (1) measure, but the proportion of the poor with income shortfalls larger than 50% of the poverty line is only around 5% in Malta whereas it is 15% in the Netherlands. For Estonia and Portugal, who score the same on FGT (2) measure, significant differences emerge in the part of the distribution where poverty gaps are between 15 and 35% of the poverty line. The percentage of the poor with such poverty gaps is substantially smaller in Portugal than in Estonia. Quite large difference in the CDFs of normalized poverty gaps are also observed between the countries, which have the same median at-risk-of-poverty gap: Italy has significantly larger portion of the poor with big income shortfalls from the poverty line as compared to Croatia. In general, these results reveal

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[16] Note that not in all countries with the same summary measures of poverty the CDFs of normalized poverty gaps are significantly different. For example, I find no differences in the distributions of the poor by the size of normalized poverty gaps in Austria and Slovakia (who have the same value of FGT(1)), or in Germany and Hungary (who have the same FGT (2)), or in Austria and Germany (who have the same EU median-at-risk-of-poverty gap).

Table 3 Regression estimates for the size of normalised poverty gaps among the poor and the probability of being poor, all countries together

Covariates	OLS estimates for the size of normalised poverty gaps		Logit model estimates for the probability of being poor (with country fixed effects)
	without country fixed effects	with country fixed effects	
	(1)	(2) (3)	
Age of the individual	+0.0029 (0.000)***	+0.0030 (0.000)***	+0.0174 (0.001)***
Age squared	−0.0001 (0.000)***	−0.0001 (0.000)***	−0.0004 (0.000)***
Gender of individual (reference: male)	−0.0006 (0.005)	+0.0031 (0.005)	+0.1114 (0.027)***
Interaction between age and gender	−0.0002 (0.000)*	−0.0003 (0.000)***	−0.0015 (0.000)**
Household type (reference single)			
Couple	−0.0408 (0.006)***	−0.0576 (0.006)***	−0.8222 (0.027)***
Single parent	−0.0681 (0.009)***	−0.0678 (0.009)***	−0.1196 (0.055)*
Other	−0.0312 (0.007)***	−0.0688 (0.008)***	−0.9665 (0.038)***
Number of children	−0.0072 (0.002)**	−0.0069 (0.002)**	+0.2539 (0.017)***
Educational attainment of the HH (reference: primary)			
Secondary	−0.0331 (0.006)***	−0.0178 (0.006)**	−0.7240 (0.032)***
Vocational	−0.0704 (0.007)***	−0.0214 (0.007)**	−0.8015 (0.041)***
Tertiary	−0.0036 (0.007)	+0.0295 (0.008)***	−1.5731 (0.037)***
Employment status of the HH (reference: employed)			
Self-employed	+0.1351 (0.008)***	+0.1119 (0.008)***	+1.0866 (0.039)***
Unemployed	+0.1625 (0.008)***	+0.1629 (0.007)***	+2.3402 (0.049)***
Retired	+0.0227 (0.007)***	+0.0325 (0.006)***	+0.9476 (0.034)***
Inactive	+0.1132 (0.008)***	+0.1234 (0.008)***	+1.9266 (0.045)***
Citizenship of the HH (reference: citizen)			
Immigrant	+0.0344 (0.010)***	+0.0412 (0.010)***	+1.0016 (0.054)***
Constant	+0.2879 (0.008)***	+0.2534 (0.017)***	−1.3269 (0.076)***
R-squared	0.1008	0.1467	–
Pseudo R-squared	–	–	0.1887
Design degrees of freedom	29,808	29,808	135,194
N of observations	95,115	95,115	585,682

Notes: HH stands for the household head. The standard errors in the parentheses are derived accounting for the complex sample design. * stands for significance at 0.05 level, ** stands for significance at 0.01 level, and *** stands for significance at 0.001 level

the importance of complementing summary measures of poverty with the inspection of the distribution of poverty gaps while analysing the intensity of poverty at the aggregate level.

4.2 Determinants of Income Shortfalls from the Poverty Line at the Individual Level

Table 3 presents the results of the regression analysis for the determinants of poverty and poverty gaps at the individual level. The first column reports the estimates from an OLS model for all EU countries together, where I control only for individual and household characteristics of the poor. The second column provides the estimates from the model that also includes country fixed effects. Recall that these two models are estimated only for those who are poor. The third column reports the estimates of the association of the same individual and household

characteristics with the probability of being poor derived using logistic regression with country fixed effects.

Columns 1 and 2 in Table 3 reveal substantial differences in the estimates of the coefficients on the determinants of income shortfalls from the poverty line for those who are poor in the models that control and do not control for country fixed effects. The sign of the associations between covariates and the dependent variable is more or less consistent across the two models (with the exceptions of the estimates on gender and tertiary education) but the size of these associations differs for most of the household characteristics.[17] This evidence implies that there is a substantial association between the observed characteristics of the poor and country-specific context (e.g. economic conditions, institutional characteristics, public policies), which one needs to account for while estimating the associations between individual characteristics and the size of poverty gaps in the EU. This is also important for taking into account the compositional effects related to pooling all countries together, which might yield associations between poverty gaps and covariates that do not exist in separate countries.

Column 2 in Table 3 shows that almost all characteristics of the poor, which are included in the model, are significantly associated with the size of their income shortfalls from the poverty line. Looking at the age and gender first, one can see that both of them are important predictors of the size of normalised poverty gaps. Other things being equal, older poor have larger normalised poverty gaps than those who are younger but the positive effect of age decreases as people age and turns into a negative effect for those above 30. This is not surprising given that earnings of individuals usually stabilize after the age of 30 and reach their maximum at later stages of the life cycle (Böhlmark and Lindquist 2006; Haider and Solon 2006). The estimate for the interaction of gender with age further suggests that women benefit from getting older more than men do but the size of the estimated coefficient is relatively small. At the age of 50, for example, women living in poverty have normalized poverty gaps only 0.015 points smaller than men, other things being equal. There might be various potential explanations for this finding. Women, for example, might increase their labour supply as children grow or governments might provide some basic pension after the retirement age, which might improve their financial situation.[18] Finally, the dependent variable—the size of normalized poverty gap—is defined taking into account household and not individual income. Hence, the effects of age and gender might also be shaped by some factors operating at the household level.

The estimates for household composition show that the poor living in any type of non-single households are better off than those who live alone, which can be related either to pooling resources together (in the case of couples or multigenerational households) or some additional support received from the state or former marital partners (in the case of single parents). Furthermore, the association between the number of children and the size of poverty gap is negative, other things being equal, although the effect is relatively small (0.006 points for each child). This implies that, ceteris paribus, having more children is not associated with having larger income shortfalls from the poverty line once poor.

Column 2 in Table 3 also shows that the poor living in households where the head has secondary or vocational education have poverty gaps of a smaller size than those living in households where the head has only primary education. At the same time, the poor living in

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[17] For gender, the estimates are not significant in both models; for tertiary education, they turn the sign from negative to positive and gain significance as soon as I control for country fixed effects.

[18] It is important to stress that all findings in this paper refer to the relationship between individual characteristics and poverty risks / poverty gaps in the current population covered by the cross-sectional module of EU-SILC. It is difficult to predict how the situation would evolve from the dynamic point of view.

households with a tertiary educated head have larger income shortfalls from the poverty line than the reference group, other things being equal. I have looked for potential explanations of these results in EU-SILC data but have not found anything that could explain them in a quantitative manner.[19] Most likely, tertiary educated among the poor represent a very selective group of individuals, who might have ended up having low income due to, for example, a mismatch between the type of occupied job and education, or low labour supply in previous periods.[20] The results might also be driven by data limitations, for example, if individuals with a tertiary degree tend to underreport income or report implausibly low-income values. I explore some of these possibilities further in this Section.

While looking at the estimated coefficients for different types of employment status, one can see that, other things being equal, the poor living in households with a self-employed, unemployed, retired or inactive (other than retired) head have larger income shortfalls from the poverty line than those living in households with an employed head. Finally, the poor living in households where the head is not a citizen of the country of residence, on average, have a 0.041-point higher normalised poverty gap than their counterparts in households where the head is in possession of citizenship.

The estimates from the fixed effects logistic model for the probability of being poor in Column 3 provide further interesting results. In particular, they allow us to identify whether correlates of the size of normalised poverty gaps include the same individual and household characteristics which are associated with a higher probability of being poor. The estimates show that older individuals (after the age of 45), people living in multiple-person households, and those living in households where the head has secondary or vocational education are, on average, less likely to be found among the poor than their counterparts (younger individuals, single persons or those living in households where the head has only primary education). These are also the population sub-groups which, if poor, face smaller income shortfalls from the poverty line. In contrast, individuals living in households with a self-employed, unemployed, retired or inactive head, or where the head does not hold citizenship of the country of residence, are not only more prone to poverty but also, if poor, experience larger income shortfalls from the poverty line than their counterparts from the households with an employed or non-immigrant head.

Such consistency in the estimates for the size of normalised poverty gaps and the probability of being poor does not hold for other individual and household characteristics. In particular, women and households with more children have a much higher probability of being poor but, if poor, do not have bigger income shortfalls from the poverty line compared to men and households with fewer children. Similarly, members of households where the head has a tertiary degree have substantially lower chances of being poor than households where the head has only primary education, but if poor face relatively large poverty gaps.

Figure 3 presents the associations between the characteristics of the poor and the size of normalised poverty gaps derived by running a separate regression for each country. The estimates are the most consistent for age, household types, and employment status of household head. When it is significant, age is positively associated with the size of poverty gaps but this association lessens as a person gets older and reverses at a certain age point. For household

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[19] In particular, I did not find any significant differences in terms of health status, number of hours worked per week, or time spent in unemployment during 12 month preceding the interview between the tertiary educated and less educated individuals.

[20] As I discuss further in the text, tertiary educated have a much lower probability of becoming poor in the first place as compared with lower educated.
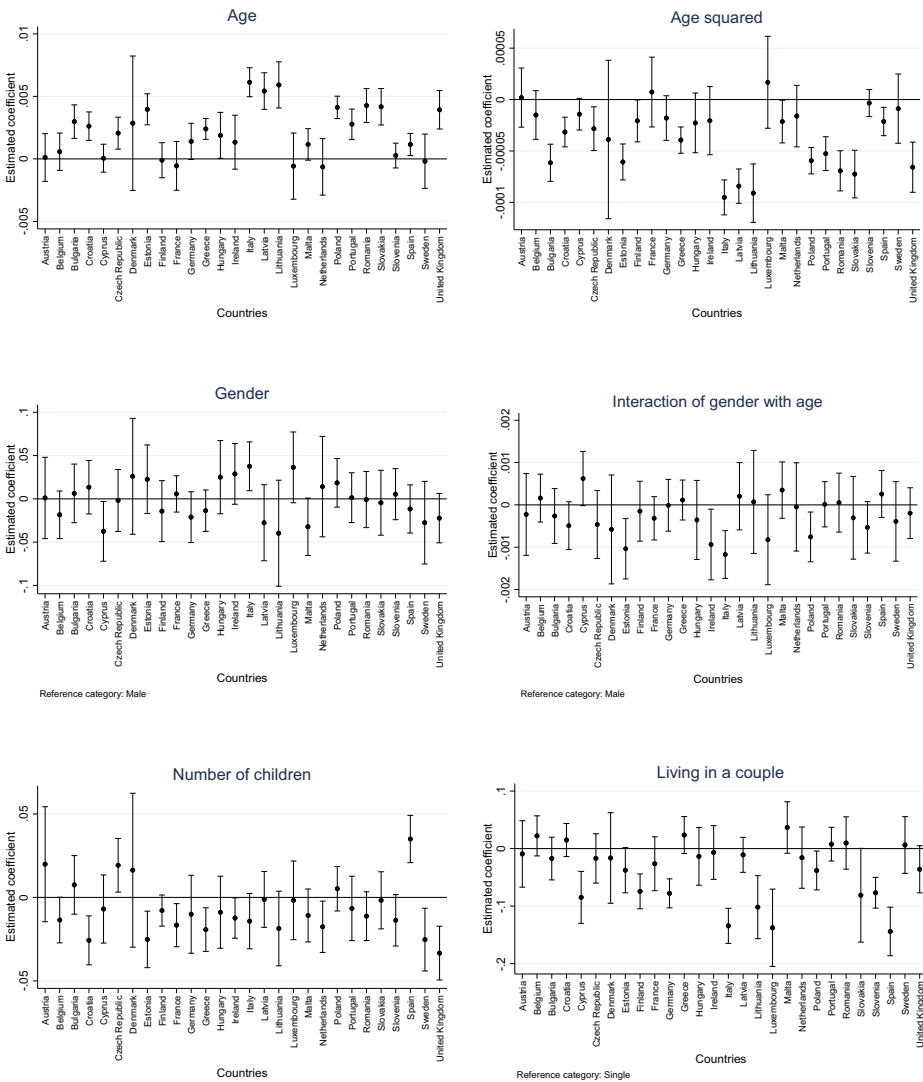
Fig. 3 Coefficient estimates for the determinants of the size of normalized poverty gaps among the poor, by country *Notes:* Vertical lines represent 95% confidence interval derived while accounting for the complex sample design

types, when statistically significant, the estimates are negative for individuals living in couples, single parents, or other types of households implying that, on average, they experience smaller poverty gaps than the poor living alone. The only exception is Greece, where individuals living in other (predominantly multigenerational) households have larger income shortfalls from the poverty line than those who live alone. With regard to employment status, if significant, the estimates suggest that the poor living in households with unemployed, self-employed, inactive, or retired heads have larger income shortfalls from the poverty line than those living in households with an employed head. The exception is Denmark, where, if poor, the
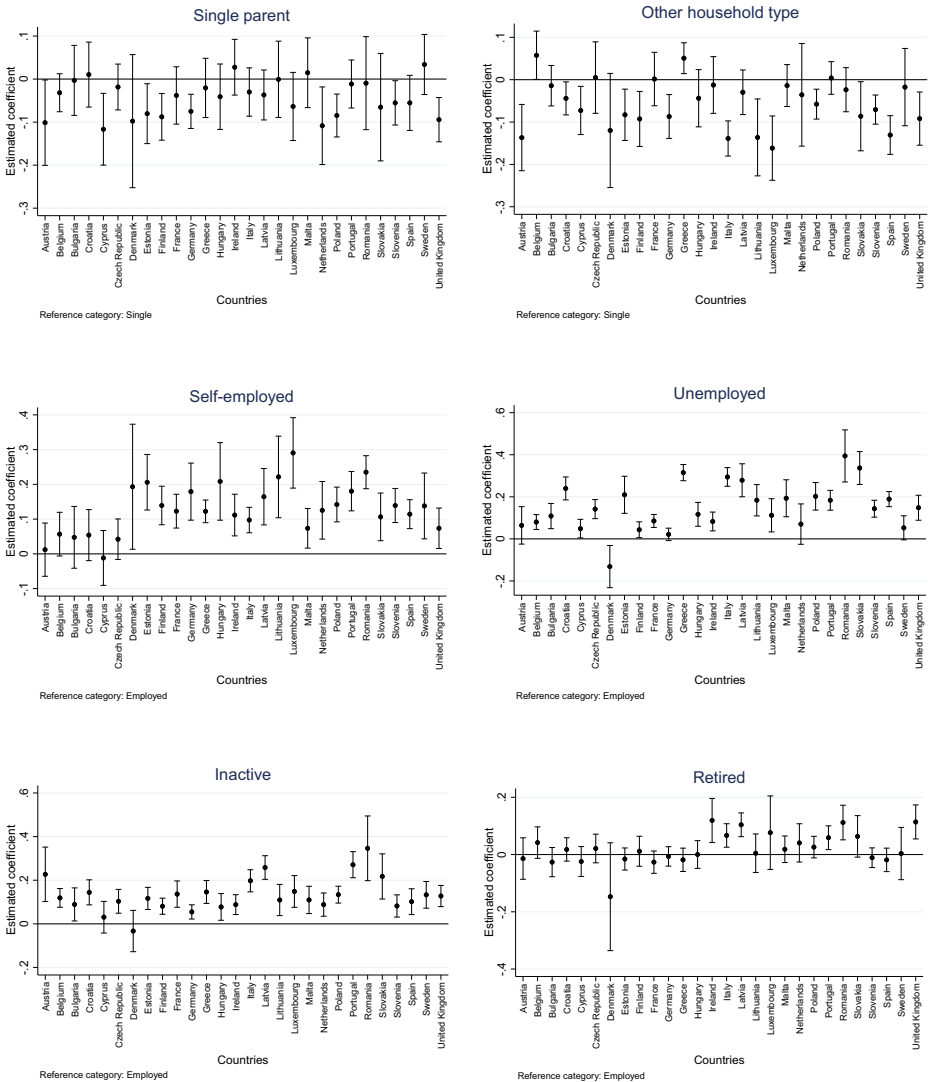
Fig. 3 continued.

unemployed face smaller poverty gaps than those who are employed, presumably due to generous unemployment benefit schemes.

The differences across countries are more noticeable for other characteristics. For example, I find that the size of poverty gaps differs significantly between women and men only in Cyprus and Italy. Whereas in Cyprus women have smaller poverty gaps than men, other things being equal, in Italy it is the other way around. In a number of countries, gender also has a significant negative interaction with age implying that the size of income shortfalls from the poverty line decreases for women as compared to men as they are getting older.

The number of children is also negatively associated with the size of poverty gaps in some countries (Croatia, Estonia, France, Greece, Netherlands, Sweden, and United Kingdom) but
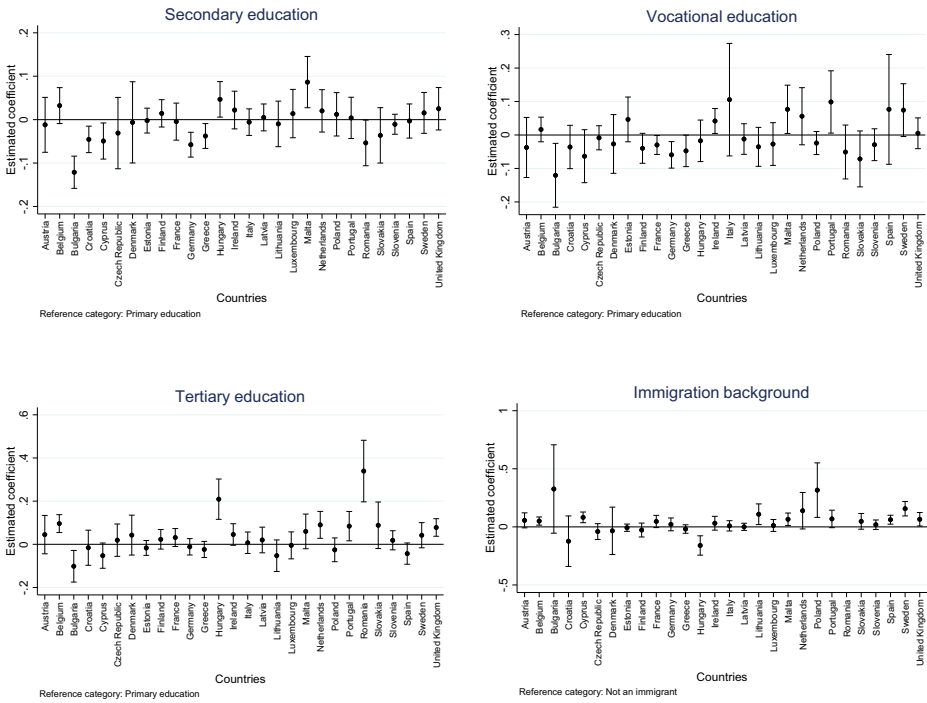
Fig. 3 continued.

positively associated in others (Czech Republic and Spain). Finally, the educational attainment of household heads has quite a heterogeneous association with the size of poverty gaps, depending on the country studied. It is remarkable that the coefficients for tertiary education remain positive and statistically significant in five countries whereas they are negative only in Bulgaria. The observed cross-country differences in the associations between the characteristics of the poor and the size of poverty gaps can be explained, in part, by cross-country differences in public policies and institutions. I discuss some of them further in the text.

4.3 Robustness Checks

In what follows, I test the sensitivity of the regression estimates in Section 4.2 to (i) the choice of the household equivalence scale, (2) the treatment of extreme values in household income, and (3) the period chosen for the analysis. The results of this exercise are summarized in Table 4 (EU estimates) and in Figs. F.1 – F.6 (country specific estimates) in Online Appendix F.

In order to test the sensitivity of the baseline estimates to the choice of the equivalence scale applied for equivalization of household income, I replicated the analysis using the OECD equivalence scale and the square root scale. The OECD equivalence scale assigns the value of 1 to the first adult in the household, 0.7 to each additional adult within the same household, and 0.5 to each child. The square root scale is defined as the square root of the household size.

Columns 1 and 2 in Table 4 reveal that most of the baseline estimates are robust to the choice of the equivalence scale. The differences emerge only for the estimates on the number

Table 4 Robustness analysis for the determinants of the size of normalized poverty gaps, all countries

Covariates	Sensitivity analysis for equivalence scales		Sensitivity analysis for extreme values in household income		Extension of the analysis to other survey years	
	Appling OECD equivalence scale for income equalization	Appling the square root scale for income equalization	Excluding observations with incomes below or equal to zero	Excluding observations with incomes <10% of the poverty line	Replicating the analysis for 2014	Replicating the analysis for 2015
	(1)	(2)	(3)	(4)	(5)	(6)
Age	+0.0025***	+0.0029***	+0.0025***	+0.0023***	+0.0019***	+0.0028***
Age squared	- 0.0001***	- 0.0001***	- 0.0001***	- 0.0001***	- 0.0001***	- 0.0001***
Gender (reference: male)	+0.0041	+0.0050	+0.0000	- 0.0027	+0.0060	+0.0066
Interaction of age with gender	- 0.0003**	- 0.0004***	- 0.0002*	- 0.0001	- 0.0003**	- 0.0003**
Couple	- 0.0608***	- 0.0568***	- 0.0408***	- 0.0360***	- 0.0257***	- 0.0357***
Single parent	- 0.0786***	- 0.0615***	- 0.0505***	- 0.0475***	- 0.0478***	- 0.0494***
Other	- 0.0715***	- 0.0749***	- 0.0453***	- 0.0345***	- 0.0348***	- 0.0567***
Number of children	- 0.0009	- 0.0130***	- 0.0027	- 0.0017	- 0.0066**	- 0.0071**
Secondary	- 0.0298***	- 0.0168**	- 0.0196***	- 0.0248***	- 0.0168**	- 0.0119
Vocational	- 0.0318***	- 0.0199**	- 0.0258***	- 0.0277***	+0.0034	- 0.0212**
Tertiary	+0.0102	+0.0243**	+0.0119	+0.0065	+0.0334***	+0.0402***
Self-employed	+0.1168***	+0.1087***	+0.1079***	+0.0977***	+0.1144***	+0.1272***
Unemployed	+0.1682***	+0.1588***	+0.1476***	+0.1305***	+0.1466***	+0.1523***
Retired	+0.0331***	+0.0318***	+0.0317***	+0.0255***	+0.0186**	+0.0213**
Inactive	+0.1284***	+0.1173***	+0.1100***	+0.0971***	+0.1161***	+0.1171***
Immigrant	+0.0497***	+0.0403***	+0.0323***	+0.0276**	+0.0407***	+0.0500***
Constant	+0.2914***	+0.2724***	+0.2425***	+0.2293***	+0.2154***	+0.2139***
R-squared	0.1416	0.1431	0.1388	0.1352	0.1225	0.1503
Model degrees of freedom	25,532	33,674	29,236	28,745	26,132	26,886
Number of observations	94,816	99,579	93,136	91,271	85,281	87,683

Notes: Income stands for total net household income. All models include country fixed effects. The standard errors in the parentheses are derived while accounting for the complex sample design. * signifies that the estimate is statistically significant at 0.05 level, ** signifies that the estimate is statistically significant at 0.01 level, and *** signifies that the estimate is statistically significant at 0.001 level

of children and households where the head has tertiary education. In particular, I do not find any association between the number of children in the household and the size of poverty gaps among the poor while applying the OECD equivalence scale. With this equivalence scale, I also do not find any evidence that the poor living in households with tertiary-educated heads, on average, have larger income shortfalls from the poverty line than those who live in households where the head has only primary education.

In order to test the sensitivity of the regression estimates to the presence of extremely small income values in the data, I replicated the analysis on two alternative samples. In the first sample, I exclude all observations for which total household equivalised disposable income is

either equal to zero or negative. In the second sample, I exclude all observations with incomes smaller than 10% of the national poverty line.

Table 4 shows that, once I trim observations with extreme income values in household income, the estimates for the number of children in the household become insignificant. The same applies to the poor who live in households with a tertiary-educated head. Finally, once I remove from the sample all observations with income values smaller than 10% of the national poverty threshold, the estimate on the interaction of gender with age also becomes insignificant.

In order to test to what extent my findings are sensitive to the choice of the year for which the analysis is performed I replicated the analysis on data from 2014 and 2015 survey years. The results show that the estimates for secondary and vocational education are sensitive to the period taken for the analysis. In particular, I find that the poor living in households where the head had vocational education did not have smaller poverty gaps than those living in households where the head had only primary education in 2014. Similarly, those living in households where the head had a secondary education did not have a smaller poverty gap than those who lived in households with a primary educated head in 2015.

Figures G.1 and G.2 in Online Appendix G also confirm my findings from Section 4.1 that the inspection of the entire distribution of poverty gaps brings additional insights into the intensity of poverty as compared to what one can learn from summary measures of poverty. Similar to 2016, in 2014 and 2015 countries with the same aggregate measures of poverty often faced significantly different distributions of poverty gaps among the poor.

4.4 Reconciling the Differences in the Determinants of Poverty and Poverty Gaps at the Individual Level

An important question arising from the presented regression results is why the determinants of poverty and poverty gaps sometimes differ at the individual level. For example, why individuals with more children have a higher risk of being poor but, once poor, do not experience larger income shortfalls from the poverty line as compared with those who have fewer children, other things being equal? To answer this question, one needs to turn to the design of public policies and institutions that underlie the formation of household income.

In general, each household can receive income from the market (via gainful employment or capital utilization), government (social benefits), or other sources (inter-household transfers). Out of all income sources, earnings constitute the largest share of total gross household income. They are followed by social transfers, capital, and inter-household transfers (see Table H.1 in Online Appendix H). The size of household disposable income also depends on taxes and social security contributions, which households have to pay on incomes they receive.

The ability of employment related income to secure households from poverty depends, on the one hand, on the factors operating at the household level, such as the intensity of labor supply, the number of dependent household members, etc. and, on the other hand, on institutional features of the labor market (Salverda and Haas 2014). Previous research has shown that high levels of minimum wage protection, strong collective bargaining, more extensive public and subsidized employment, and well-developed active labor market programs, on average, are associated with higher levels of employment and smaller earnings disparities (Bassanini and Duval 2006; Marx and van Rie 2014; Sologon and O'Donogue 2014). The impact of these institutions on poverty, however, largely depends on how they

affect employment and incomes of households at different points of the household income distribution (Neumark and Wascher 2002; Lang 2012; Salverda and Haas 2014; Matsaganis et al. 2015; Atkinson et al. 2017).[21] However, even if labor market regulations are not sufficient to keep all working households out of poverty, they still might help them to avoid large income shortfalls from the poverty line by setting the floor below which labor cannot be remunerated (Neumark and Wascher 2002). This might serve, to a certain extent, as an explanation of why women, who are often a subject to wage discrimination on the labor market, are more likely to be poor but once poor do not have larger income shortfalls from the poverty line than men.[22]

Apart from labor market institutions, welfare states also play an important role in shaping inequality and poverty in the society by redistributing incomes via taxes and benefits. A large body of literature has shown that provision of social benefits can reduce poverty by mediating the impact of demographic and economic events (e.g. job loss, childbirth, sickness, retirement) on individual incomes. The degree and the nature of this reduction, however, depends on the type and generosity of benefits as well as on where their recipients are located in the distribution of household income (see, among other, Heady et al. 2001; Brady et al. 2009; Polin and Raitano 2014; Kyzyma and Williams 2017).

In general, most of social benefits are nowadays of a size that is not sufficient to keep those who rely on them out of poverty (Nelson 2013; Cantillon et al. 2018; Penne et al. 2018). This especially refers (but is not limited) to the social assistance schemes, which use disposable incomes of minimum-wage earners as a glass ceiling to preserve incentives to work (Cantillon et al. 2018). As a result, the beneficiaries of these (or any other benefit) schemes often find themselves in poverty but the receipt of benefits still helps them avoid large income shortfalls from the poverty line.

Apart from the direct impact on the size of household income, labor market institutions and social policies also influence it indirectly by modifying individual behavior (Danziger et al. 1981; Moffitt 1998; Cantillon et al. 2018). For example, Cantillon et al. (2018) found an inverse relationship between the adequacy of the minimum protection for jobless households and the financial incentives to work. Similarly, Moffitt (1998) found that generous family benefits encourage individuals to have more children or establish single-parent households. Taken together, these factors predefine the size and composition of equivalised income at the level of households and its distribution at the level of society.

5 Conclusions

This paper analyses how poor the poor are in the EU countries and investigates how socio-economic characteristics of the poor are associated with the size of their income shortfalls from the poverty line. To do that I move from a binary measure of poverty at the individual level to a continuous measure, which captures the shortfall of equivalised disposable income from the poverty line. Using EU-SILC cross-sectional data for 2016, I first analyse the distribution of individual poverty gaps in each country of interest and examine whether countries with similar aggregate measures of poverty also have similar distributions of poverty gaps. As a next step, I

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[21] It also depends on how they influence the relative poverty threshold itself.
[22] See Blau and Kahl (2017) for an excellent overview of the factors standing behind the gender wage gap on the labor market.

estimate the associations between individual and household characteristics of the poor and the size of their income shortfalls from the poverty line in the EU, and analyse whether these associations differ across countries.

The results show that, in most European countries, half of the poor have income shortfalls not exceeding 30% of the poverty line whereas only a few percent of the poor have income deficits of 80% and more. The composition of the poor in terms of income shortfalls from the poverty line, however, varies substantially across countries, even if these countries have the same aggregate measures of poverty. For example, in two countries with an identical relative median at-risk-of-poverty gap (or FGT indices), one can find significantly different distributions of the poor by the size of normalized poverty gaps. These results point at the importance of the distributional approach to the analysis of poverty and its capacity to yield additional evidence on the intensity of poverty as compared to what we can learn from aggregate poverty measures.

The regression analysis further reveals that, in the EU, older individuals (but not before they turn 30) and people who do not live alone are, on average, less likely to be poor and, once poor, face smaller income shortfalls from the poverty line than their counterparts (younger individuals and single persons). The opposite applies to individuals from households where the head is unemployed, self-employed, retired or inactive, or where the head does not hold citizenship of the country of residence. Such individuals are not only more likely to be poor compared to those living in households with an employed head or where the head is a citizen of the country of residence, but also experience larger income shortfalls from the poverty line.

One of the most important findings from the multiple-country regression analysis is that women, on average, have a higher probability of being poor but, once poor, do not have larger poverty gaps compared to men. The same applies to individuals living in households with more children: they do have a higher probability of being poor but, once poor, do not experience larger income shortfalls from the poverty line than those who have fewer children. In contrast, members of households where the head has tertiary education face much lower chances of becoming poor but, once poor, do not have smaller income shortfalls from the poverty line than those with only primary education. These results imply that traditional poverty correlates (such as gender, age, education etc.) are not always significantly associated with the size of normalized poverty gaps, or that the nature of these associations differ.

While looking across countries, I find some similarities but also substantial variation in the associations between the characteristics of the poor and the size of normalised poverty gaps. The cross-country results are the most consistent for the estimates on age, household types, and employment status. The differences become more noticeable for other characteristics, such as gender, number of children, and educational attainment.

From a policy perspective, the findings of the paper have two main implications. First, one can obtain a much better picture of poverty by complementing the analysis of summary measures of poverty with a distributional approach. The inspection of the entire distribution of poverty gaps can help to identify the composition of the poor by the size of poverty gaps, elaborate poverty reduction goals that account for this composition, and trace improvements in the standard of living of the poor even if these improvements are not sufficient to move them above the poverty line. This is especially important for fighting poverty at the EU level, where none of the official indicators which are used to monitor poverty and social progress takes a full account of the reductions in the size of income shortfalls from the poverty line. Alternatively, one

might think about developing a new poverty indicator, which could combine information on the incidence and intensity of poverty and be sensitive enough to capture even small improvements in the financial situation of the poor.[23]

Second, by analysing the associations between socioeconomic characteristics of the poor and the size of poverty gaps, the paper identifies sub-groups of the poor, which are especially prone to large income shortfalls from the poverty line. This information can be further used for reconsideration of public policies affecting incomes of these sub-groups. For instance, the finding that individuals living in households where the head is unemployed have larger income shortfalls from the poverty line than those living in households where the head is employed hints at the necessity to revise policies related to unemployment if the target is to decrease the intensity of poverty among the unemployed.[24]

Of course, the paper does not answer all the questions related to the analysis of the intensity of poverty. For instance, I do not measure empirically the impact of country- specific characteristics and public policies on the risk of poverty or the size of poverty gaps at the individual level. Nor do I perform an analysis allowing identification of the causal impact of individual characteristics on poverty outcomes. I leave these questions for future research.

Compliance with Ethical Standards

Conflict of Interest   The authors declare that they have no conflict of interest.

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[23] An excellent overview of the existing aggregate poverty measures, including those trying to combine information on the incidence and intensity of poverty (e.g. Sen index, Sen-Shorrocks-Thin index, Watts index) is provided in Haughton and Khandker (2009). The main limitation of these measures is related to the difficulties with their interpretability, especially in the context of policy evaluation.

[24] The effect of such policy revisions on the aggregate measures of the incidence or intensity of poverty, however, will depend on how these policies affect the entire distribution of household equivalised income in general and the median income in particular, which is used to derive the relative poverty threshold.

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