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Trends in subjective income poverty rates in the European Union*

Tomáš Želinský[†] Martina Mysíková[‡] Thesia I. Garner[§]

Abstract

When developing anti-poverty policies, policymakers need accurate data on the prevalence of poverty. In this paper, we focus on subjective poverty, a concept which has been largely neglected in literature, yet remains a conceptually appealing way to define poverty. The primary goal of this study is to re-examine the concept of subjective poverty measurement and to estimate trends in subjective poverty rates in the European Union. Our estimations are based on a minimum income question using data from a representative survey, EU-SILC, and we find a decreasing trend in subjective poverty in 16 of 28 countries. Conversely, the official relative income poverty indicator exhibits increasing trends in eleven countries, with decreasing trends in only four countries. We believe that these trends may reflect changes in societies which have not been previously captured, and our results thus enrich the existing data on general poverty trends in the EU.

Keywords: Subjective poverty, Minimum Income Question, intersection approach, EU-SILC, European Union.

JEL Codes: I31, I32.

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I. INTRODUCTION

Identifying patterns in the development of crucial socio-economic indicators is a challenging task. The ways such developments are presented can influence policies and public opinions. There have long been discussions among researchers and practitioners on different dimensions of the quality of life. As noted by Stiglitz (2009, p. 15), “objective and subjective dimensions of well-being are both important.” Most empirical studies operationalise well-being using indicators of happiness or life satisfaction (see, e.g., Diener et al., 1999). The broad nature of overall life satisfaction/happiness reflects “people’s self-evaluation of their lives or feelings pertaining to their emotional state” (Wong et al., 2006, p. 409), while individual satisfaction domains relate to perceived satisfaction with different life aspects including health, financial situation, and jobs (van Praag et al. 2003, p. 30). In this work, we narrow the perspective to an economic dimension of subjective well-being – subjective perceptions of poverty.

Clearly, tracking the socio-economic progress of a society requires tracking developments in poverty levels. Different poverty indicators (see an excellent review by Ravallion, 2016) have been utilised and communicated, though a few specific poverty indices are more frequently chosen. Different conceptualization of poverty measurements can lead to different conclusions, which are sometimes contradictory. Numerous alternative poverty measures have been developed, some of which feature useful properties (see, e.g., Foster, Greer, and Thorbecke, 2010; Chakravarty and Silber, 2005). Nevertheless, the income poverty headcount ratio remains the most frequently communicated, primarily due to its simplicity and straightforwardness. Social policies on poverty generally ignore people’s perceptions of poverty.

The Europe 2020 headline indicators aimed to track trends in poverty and social exclusion in the European Union include three indicators: at-risk-of-poverty, severe material deprivation, and very low work intensity (and their aggregated version which is the indicator “at risk of poverty or social exclusion”). A key target related to the “Inclusive growth” priority as defined by the strategy: “[t]he number of Europeans living below the national poverty lines should be reduced by 25%, lifting over 20 million people out of poverty,” (European Commission, 2010, p. 11) is based on a relative income poverty measure. The at-risk-of-poverty rate, the official income poverty indicator in the EU as defined by the European Commission and applied by Eurostat, is based on an income threshold of 60% of the national median equivalised disposable income. Eurostat has recently introduced “experimental” statistics demonstrating links between household

income, consumption, and wealth. However, even this new measure ignores the subjective dimensions of well-being.

Some of the main concerns related to the subjective approach are its inherent “subjectivity”- the trustworthiness of respondents’ responses. This has also led to economists’ scepticism about subjective variables (Bertrand and Mullainathan, 2001), which are sometimes considered inauthentic rather than realistic self-reports (Lane, 1991; Vogel 2002). Nevertheless, skepticism about subjective data seems to be lessening (Deaton and Stone, 2013). Overall, a subjective approach is still relatively uncommon within the concepts of welfare measurement, though it remains a conceptually appealing way to define poverty (Ravallion, 2014). We posit that examining trends in subjective income poverty provides another useful perspective in addition to measurements of trends in objective relative income poverty and material deprivation.

Although subjective measures of poverty gained some limelight in the 1980s and 1990s (van Praag et al. 1982; Danzinger et al. 1984; Colosanto et al. 1984; Hagenaars and de Vos 1988; Deleek and van den Bosch 1992; Muffels et al. 1992), they have taken a backseat in more recent years as compared to “objective” measures of poverty in the European Union in official statistics and in academic research. This study contributes to the empirical literature on poverty trends in the European Union by presenting recent findings on trends in subjective income poverty.

The primary goal of this study is to re-examine the subjective concept of income poverty measurement and to estimate trends in subjective income poverty rates in the European Union. We believe that subjective concepts are an essential complement to estimates based on the relative income poverty measure. The perceptions of the poor are an essential component of the complex perspective of a country’s poverty profile, and ultimately is an essential element when forming social policies (Veenhoven, 2002). However, subjective income poverty indicators have not been incorporated into official EU statistics on poverty.

The European Union is one of the most highly developed regions in the world with an economy accounting for approximately 18% of global GDP according to 2019 World Bank data¹. Yet the EU is a union of heterogeneous countries with annual GDP per capita (PPP, current international dollars) ranging widely between 24,561 (Bulgaria) to 121,293 (Luxembourg). According to official statistics, the income poverty rate ranges between 10.1% (Czechia) and 24.5% (Romania);

¹ 2019 World Development Indicators databank.

severe material deprivation rates between 1.3% (Luxembourg) and 20.9% (Bulgaria); and the aggregate indicator of at-risk-of-poverty-or-social-exclusion rate varies between 12.5% (Czechia) and 32.8% (Bulgaria).²

The estimations performed in this study are based on an official micro-data-set of EU-SILC survey responses (European Union Statistics on Income and Living Conditions) provided for research purposes by Eurostat. The dataset contains a Minimum Income Question (henceforth MIQ), which is one of the typical ways to operationalise “*inherently subjective judgments people make about what constitutes a socially acceptable minimum standard of living in a particular society*” (Ravallion, 1992, p. 33).

The MIQ was introduced in a seminal study by Goedhart et al. (1977) and was intended to serve as a basis for estimating subjective income poverty lines.³ The MIQ methodology has been adopted by numerous researchers to examine subjective poverty and poverty lines. However, most studies have been limited to a small number of countries. For instance, de Vos and Garner (1991); and Garner and de Vos (1995) utilised the MIQ to compute poverty thresholds and compare U.S. and Dutch data from the 1980s, and found that subjective poverty thresholds lay in the range of 60% to 75% of the mean incomes in most family size groups. Saunders et al. (1994) estimated subjective poverty rates in Australia (21.5%) and Sweden (13.4%), which were significantly greater than the relative income poverty rates of 8.9% in Australia and 6.3% in Sweden. Similarly, large differences between subjective (40%) and relative income (20%) poverty rates were also identified in Spain in a recent study by García-Carro and Sánchez-Sellero (2019). Utilisation of MIQ in Chinese regions (although monthly “income” was substituted by “cost”) by Bishop et al. (2006) found declines in poverty between 1988 and 1995.

To our best knowledge, empirics on poverty estimates based on subjective concepts of poverty measurement in Europe are rather scarce. This suggests that people’s perceptions of their economic well-being is relatively unconsidered in policy development. This study addresses the gap by contributing to the empirical literature which paints a comprehensive picture of subjective poverty in Europe and its developments over time.

² 2019 Eurostat database data.

³ The MIQ and SPL were introduced together with the so-called income evaluation question and the corresponding Leyden Poverty Line. As the latter are not included on EU-SILC survey questionnaires, we are unable to estimate subjective poverty levels using this approach.

To identify subjectively poor households, we utilise a traditional intersection approach (Goedhart et al, 1977) employing control variables (for example, see de Vos and Garner 1991; Garner and Short, 2004). Unlike the traditional intersection approach, we do not estimate subjective poverty thresholds, but instead we use predicted minimum incomes to calculate subjective poverty rates. This allows us to directly identify each household as either subjectively poor or non-poor. We find that the lowest levels of subjective income poverty are reported in Northern Europe, while the highest occur in the East and South. We further identify decreasing trends in subjective poverty levels in 16 out of 28 countries, with an increasing trend reported only for Luxembourg. Conversely, the official relative income poverty indicator reports increasing poverty trends in 11 countries, with decreasing poverty observed in only four countries. Nevertheless, 26 of 28 EU countries experienced an increase in real terms of median disposable income. Overall, the trends in subjective poverty are consistent with trends in median disposable income, which is not necessarily true in official relative income poverty indicators.

II. DATA AND METHODS

2.1 The intersection approach

Our estimation of the numbers of subjectively poor is based on the so-called intersection approach. The logic behind this approach is demonstrated in Figure 1, in which each point $[\tilde{x}; \tilde{y}]$ represents a combination of actual income (\tilde{x}) and subjective minimum income (\tilde{y}) reported as a response to the minimum income question. In this model, minimum income is an increasing function of actual income, in empirical applications assumed to be curvilinear (increasing, concave function, see de Vos and Garner (1991, p. 269)). For the sake of simplicity, to describe the method, we adopt the standard approach – using natural logarithms of actual and subjective minimum income ($x = \ln \tilde{x}$ & $y = \ln \tilde{y}$; $\tilde{x} > 0$ & $\tilde{y} > 0$). This makes the description of the method more intuitive.

The line

$$\hat{y} = b_0 + b_1 x, \text{ with } 0 < b_1 < 1, \quad (1)$$

represents the estimated function describing the relationship between subjective minimum and actual income and line $y = x$ represents equality of subjective minimum and actual income. As suggested by the original approach (Goedhart et al, 1977), the subjective poverty line (z^*) is defined as the point where the two lines intersect: $\hat{y} = y$.

The subjective poverty line is then defined as:

$$z^* = \frac{b_0}{1 - b_1}, \quad (2)$$

and a household i is identified as subjectively poor if the following equation holds:

$$x_i < z^*. \quad (3)$$

For $0 < b_1 < 1$ and $b_0 > 0$ the inequality (3) is equivalent to:

$$x_i < \hat{y}_i \quad (4)$$

The inequality (4) is particularly useful if we employ control variables on the right-hand side of equation (1). The traditional approach proposes two ways to calculate subjective poverty thresholds (Garner and Short, 2004). The first method identifies a specific threshold for each household and then finds the average threshold using population weights. In the second method, a set of thresholds differentiated by the same variables holding the values of control variables at their national averages is calculated.

The aim of this study is to estimate the rates and trends in subjective poverty in the EU. As we do not necessarily need explicitly expressed subjective poverty lines, we base our approach on equation (4). Employing control variables in equation (1) we get:

$$\hat{y} = b_0 + b_1 x + \sum_{k=1}^K \delta_k v_k, \quad 0 < b_1 < 1, \quad (5)$$

where v_k , $k = 1, \dots, K$ are control variables with associated estimated coefficients δ_k , $k = 1, \dots, K$.

The estimated subjective poverty line is then estimated as:

$$z^* = \frac{b_0 + \sum_{k=1}^K \delta_k v_k}{1 - b_1}. \quad (6)$$

For instance, assuming a model with one (dichotomous) control variable, (a household located in an urban or rural area), we would end up with two different subjective poverty lines, as illustrated in Figure 2, in which z_r^* and z_u^* are subjective poverty lines for households located in rural (urban) areas, respectively.

Employing numerous control variables in equation (5) results in numerous possible subjective poverty lines. It can easily be shown that for $0 < b_1 < 1$ and $b_0 > 0$ equations (3) and (4) are also

equivalent for models employing a set of control variables. This simplifies identification of the subjectively poor, as it is not necessary to explicitly express the subjective poverty threshold (or a set of thresholds for different subpopulations).

Ultimately, equation

$$\hat{y}_i = b_0 + b_1 x_i + \sum_{k=1}^K \delta_k v_{ki}, \quad 0 < b_1 < 1 \quad (7)$$

can also be thought of as minimum required income “imputed” to household i based on its actual characteristics (including income). Put differently, given the set of characteristics of household i , equation (7) expresses the minimum income that is required on average by other households in a society with the same set of characteristics. Computing fitted values \hat{y}_i is straightforward, as it is a standard function in any statistical software and there is no need to perform any additional operations. Also, evaluating whether inequality (4) holds for household i is trivial.

We examine the robustness of our results by comparing results based on models with control variables to those generated by models without control variables. In the models without control variables we follow the original approach, using household size as a right-hand side variable in addition to actual income (Goedhart et al., 1977).

2.2 Data and variables

As noted, we adopt an approach that employs control variables (equation 7) as suggested, e.g., by De Vos and Garner (1991). The logic behind this approach is straightforward – people’s perceptions of minimum required household income are not solely based on their actual income, but also on the characteristics of their household.

The analyses in this study are based on subsamples of EU member states EU-SILC 2004 – 2017 household survey microdata (Cross UDB, September 2019 Version). Following the Eurostat methodology, the resulting shares of subjectively poor households are expressed in terms of individuals. Sample sizes vary between 3,143 (Cyprus-2009) and 24,081 (Italy-2004) observations. The list of abbreviations of countries used in the analyses are reported in Table A2 in the Appendix.

The left-hand side variables in equation 7 are the responses to the MIQ framed in the EU-SILC survey as follows: “*In your opinion, what is the very lowest net monthly income that your*

household would have to have in order to make ends meet, that is to pay its usual necessary expenses? Please answer in relation to the present circumstances of your household, and what you consider to be usual necessary expenses (to make ends meet).” [EU-SILC variable HS130]

In addition to household size, we control for numerous other household-level characteristics:

- *Type of ownership of the dwelling* (categories: 1. outright owners including households with accommodation provided for free; 2. owners paying mortgage; 3. tenants paying either full market or reduced rent);
- *Size of the flat/house* (measured by the number of habitable rooms per household);
- *Degree of urbanisation* (1. densely-populated area; 2. intermediate area; 3. thinly-populated area);
- *Self-assessed ability to make ends meet* (1. with great difficulty; 2. with difficulty; 3. with some difficulty; 4. fairly easily; 5. easily; 6. very easily);
- *Material deprivation status of the household* (a binary variable used in official statistics indicating whether a household is severely materially deprived).

Also, we control for individual-level characteristics, capturing the composition of adults (aged 16+) in the household:

- share of adult females,
- share of currently working adults,
- share of adults with tertiary education,
- share of younger adults (aged 16-30).

As the data has been gathered over a relatively long time-span (2004-2017), certain variables have undergone modifications; this should be kept in mind. Prior to 2009, the variable “self-defined current economic status [PL030, or PL031 from 2009 onwards]” did not distinguish between employee and self-employed status, which, however, does not affect our estimates, as both employees and the self-employed are included in the “working” category. The type of ownership of dwelling [variable HH020/HH021: Tenure status] did not contain the category “owner paying mortgage” before 2010. We therefor created a category defined as “owners paying interest repayments on mortgage” [variable HY100G/HY100N]⁴. The highest number of missing values

⁴ However, the variable HY100G/HY100N, together with few other income components, were only mandatory from 2007. In cases where these values are missing (AT, EL, ES, IT, LU, PT: 2004-2006; CY, LV: 2005-2006; FR 2004), we use the original categories (excluding “owner paying mortgage”). Nevertheless, when we compare results based

in the dependent variable is in the UK data for 2017 (46%). In addition, high numbers of missing values occur in the data for the Netherlands (17-30%) and Sweden (24-34%). Values are completely missing for certain countries/years for the degree of urbanisation (DE 2015-2017; MT 2007-2008; NL 2005-2017; SI 2005-2017), while for Estonia and Latvia, only two categories are reported (densely/thinly-populated areas).

2.3 Identification of trends in the subjective poverty rates

In addition to estimating the rates of subjective income poverty across the EU member states, we aim to identify patterns in the developments of the rates over time. Although the time-span is relatively long (13-14 years in most cases), from the perspective of a rigorous time series analysis, this may be seen as somewhat short. We take this into consideration when interpreting the results of trend analyses.

We examine whether developments in subjective income poverty trends suggest the presence of one of three alternatives: 1. a linear trend; 2. a U-shaped trend; or 3. neither of these. Assessment of linear trends is based on estimating the coefficients of a linear trend function, whereas the presence of statistically significant coefficients associated with the linear term suggests a linear trend. When assessing the U-shaped trend, we do not rely on the traditional approach of testing the U-shaped relationship via quadratic regression (as statistical significance of both linear and quadratic terms does not necessarily imply a U-shaped curve). We follow the approach introduced by Simonsohn (2018), which proposes estimating a regression with two separate lines, one for ‘low’ and one for ‘high’ values of x with a break-point set using the Robin Hood algorithm (illustrated in Figure 3). A U-shaped curve is present if the two slopes are of opposite signs and, at the same time, are individually statistically significant. Although the time span is between 11 and 14 years in most cases, it is necessary to be careful with interpretations due to the relatively low number of observations used in the regressions.

III. RESULTS AND DISCUSSION

3.1 Poverty rates

As outlined in the previous section, our primary results are based on models with control variables. The estimated coefficients of determination lie between 0.27 (Bulgaria in 2011) and

on models with tenure status distinguishing between owners repaying a mortgage or not, the results remain unchanged.

0.76 (Cyprus in 2017), with the exception of certain years for Romania with significantly lower prediction power of models (decreasing from 0.42 in 2007 to 0.10 in 2017). In Table 1 we report the results for 2005, 2011, and 2017.

The 2017 results indicate that the lowest levels of subjective poverty are reported in the Nordic countries, British Isles, the Netherlands, Austria, and Malta (between 2.3 and 7.4 %). Conversely, the highest rates of subjective poverty are found in Eastern and Southern EU countries: Bulgaria, Greece, Latvia, Estonia, Croatia, Romania, Lithuania, Slovakia, and Spain (between 32.7 and 85.7 %). The results in Table 1 further suggest relatively high discrepancies between the official at-risk-of-poverty rates and subjective poverty rates. While considerably higher levels measured by the official income poverty indicator than the alternative subjective income poverty indicator are typical in Western EU countries, the opposite is true in Eastern and Southern EU countries. This observation is further reflected in the amount of overlap between households identified as poor using the official income poverty definition and the alternative subjective poverty definition (Table A1 in the Appendix).

The high degree of overlap across the officially poor based on income and the subjectively poor indicates a high degree of consistency across the two approaches. Less overlap indicates that the supplementary subjective poverty measure provides significant additional information to the official poverty rate. This can be thought of as a challenge for social policy development. As suggested by the data in Table A2 (2017 data), in 19 of 28 countries, the total overlap (i.e., individuals identified either as poor or non-poor by both approaches) is greater than 85%. Similar results are reported for officially non-poor households that were also identified as non-poor by the intersection method. Somewhat less overlap is reported for officially poor households.

Figure 4 suggests an indirect relationship between the share of officially poor (non-poor) households identified as poor (non-poor, respectively) by the intersection method. The results further suggest less overlap of households identified as poor in Western EU countries, while the same is true for non-poor households in the Eastern EU countries. This is primarily a result of higher levels of subjective poverty in the Eastern EU countries.

3.2 Trends in poverty rates and national income

If the subjective poverty rate is considered to be an alternative indicator for the assessment of income poverty in the EU, a legitimate question would be whether subjective poverty rates in the

EU have decreased or increased over time. To answer this question, we employ a simple trend analysis (assessing linear and quadratic trends). Our results in Table 2 suggest a decreasing trend in 16 of 28 countries. The fastest average annual rate of decrease (3.9%) is reported in Slovakia (from 84% in 2005 to 37% in 2017), followed by Portugal (2.7%) and Poland (2.4%). Conversely, increasing trends are observed only in Luxembourg (average yearly increase of 0.95%: from 4% in 2004 to 17% in 2017). The results further indicate a U-shaped curve for three countries: Greece (with a turning point in 2010), Croatia (inverted U with a turning point in 2013) and Hungary (inverted U with a turning point in 2010).

During the 2004 to 2017 period, numerous important events occurred in the European Union – including adoption of the Euro currency (Cyprus in 2007; Estonia in 2010; Latvia in 2013; Lithuania in 2014; Malta in 2007; Slovakia in 2008 and Slovenia in 2006) and the economic consequences of the Great Recession (2008-2012). It would be interesting to assess the effects of these events on the subjective poverty rates. However, frequent overlapping of these and other influential events in many countries makes such analyses challenging. Nevertheless, we cautiously comment on significant deviations from the primary trends in selected EU countries in line with the recession period.

Austria has experienced stable subjective poverty trends (consistently around 8%), with two deviant values exceeding 12% in 2008 and 2010. Belgium's subjective poverty rate has been weakly decreasing with a slight deviation in 2008 from 23% in 2007 to 27% in 2008 and back to 22% in 2009. In Cyprus the rates decreased from 39% in 2005 to 22% in 2009, but later experienced a sharp increase to 30% and 29% in 2010 and 2011, respectively. Similarly, a decreasing trend in Czechia between 2005 and 2010 was followed by an increase to 20% and 22% in 2011 and 2012, respectively. Germany's rates decreased slightly between 2005 and 2009 (from 18% to 15%), followed by a weak increase between 2010 and 2014 (from 16% to 21%) and again decreased to 15% in 2017. Similar trends also occurred in Denmark, Ireland, and Estonia; with significantly less prevalence of subjective poverty in Denmark (deviating 2009-2010) and Ireland (deviating from decreasing in 2010 but returning to further decrease after 2013), and considerably higher in Estonia with a sharp increase between 2010 and 2011.

Greece experienced a U-shaped trend with rates decreasing between 2004 and 2011 from 83% to 66%, sharply increasing to 76% in 2012 and then continuing to grow slightly to 83% in 2017. Hungary's subjective poverty rate was somewhat unstable. A sharp decrease between 2006 and

2007 from 28% to 16% was followed by a severe increase to 37% and 47% in 2008 and 2010, respectively. In 2011, the share of subjectively poor in Hungary dropped to 20% and continued to decrease to 12% in 2017. The decreasing trends in Lithuania, Latvia, and Malta were interrupted by a sudden increase to 60% in Lithuania in 2011; to 79-81% in Latvia in 2011-2013; and to 14% in Malta in 2010. The fast decreases in the subjective poverty rates in Slovakia, from 84% in 2005 to 37% in 2012, were followed by a moderate increase in 2013-2015 and then returned to falling to 37% in 2017.

The deviations described above suggest potential effects of the economic recession on the levels of subjective poverty in the European Union. Nonetheless, investigation of any true effects of the crisis on subjective poverty levels would require rigorous econometric methods, and is beyond the scope of this paper.

Next, we compare subjective poverty trends with trends in the official indicator of income poverty – the at-risk-of-poverty rates (see Table 2). While an increasing trend in the subjective poverty rate is observed only in Luxembourg, increasing trends in the at-risk-of-poverty rate are reported in eleven countries. Conversely, decreasing trends in subjective poverty are reported in 16 countries, while decreasing trends in the at-risk-of-poverty rate are identified in only four countries. Interestingly, consistency across trends in the two types of rates is observed in only two countries: increasing trends in Luxembourg and decreasing trends in Poland.

Examining the trends in median income expressed in 2015 prices (Table 3), we observe that, with the exception of only two countries, all countries experienced increasing median income (there is no monotonous/U-shaped trend identified for Cyprus; an inverted U-shaped trend is identified for Greece). The results thus suggest that the positive changes in real median income and decreases in the subjective poverty rates are, in most cases, not captured by the official (relative) at-risk-of-poverty rate indicator. Ultimately, our findings suggest that poverty rates based on minimum required income better reflect changes in real disposable incomes than does the official income poverty indicator.

3.3 Subjective poverty in relation to national income and material deprivation

Next, we assess the extent to which poverty rates (both official and subjective) are correlated with national median disposable income. The official income poverty rate (based on the relative concept of poverty) is often criticised for its relativity and for making cross-country comparisons problematic. Ultimately, comparing the official income poverty rates from countries with

considerably different income levels may be of little practical use. For example, compare 2017 data for Czechia and Sweden: a 9.1% at-risk-of-poverty rate and median income of 12,632 PPS euro/year in Czechia, and a 15.8% at-risk-of-poverty rate and median income of 20,159 PPS euro/year in Sweden: the median income in Sweden is almost 60% higher than in Czechia, and the measured poverty rate in Sweden is considerably higher than in Czechia. Comparing poverty rates based on the subjective approach results in a reversal: 13.1% in Czechia and 7.3% in Sweden. Consequently, we believe that poverty rates based on the subjective approach better reflect the reality and are thus more suitable for international comparisons.

The applicability of subjective rates is also supported by a higher level of correlation between median equivalised income and poverty rates based on subjective poverty lines, than on poverty rates based on relative income poverty lines (see Fig. 5). The top left panel of Figure 5 demonstrates the relationship between the official poverty rate and median income (coefficient of determination: 0.221, equivalent to 0.470 Pearson coefficient of correlation), and the top right panel shows the relationship between the subjective poverty rate and median income (coefficient of determination: 0.557, equivalent to 0.746 Pearson coefficient of correlation). With the exception of Luxembourg (where, despite an increase in median monthly disposable income, the proportion of poor individuals increased), the relationship is negative in all EU countries. Excluding Luxembourg results in increased coefficients of determination to 0.249 and 0.588, respectively.

We also find similar relationships between the at-risk-of poverty/subjective poverty rates and the severe material deprivation rates (bottom left and bottom right panels of Figure 5, respectively). As suggested by the figures and the values of determination coefficients, the subjective poverty rates ($R^2 = 0.557$) are considerably more closely related to severe material deprivation rates than to rates of at-risk-of-poverty ($R^2 = 0.323$). These results further support the importance of measuring subjective poverty, as it is also tightly related to material deprivation rates, which represents yet another important dimension of poverty.

The comparisons in Figure 5 indicate that poverty rates derived based on the subjective approach are in remarkably tighter relationships with income levels and material deprivation rates than the official poverty rates are. One requirement of a “good” poverty indicator is that countries or regions with higher income levels should, on average, have lower levels of poverty. When conducting cross-country or cross-regional comparisons, the subjective income poverty concept

can yield more logical results than the official approach based on the concept of relative income poverty.

3.4 Robustness of results

A stream of literature utilising the intersection method estimates subjective poverty rates based on models without controls. We check the robustness of our results generated using models with control variables to results generated from models without controls.

According to Table 4, the correlation coefficients (both parametric and non-parametric) between the subjective poverty rates based on models with and without controls are high, in most cases exceeding the value of 0.9, indicating very strong relationships between the two versions of rates. In addition to these values, we also provide average relative differences between the two versions of rates and increases in the coefficient of determination resulting from including control variables in the model. The greatest differences are observed in countries with relatively low levels of subjective poverty: the United Kingdom, Luxembourg, and Finland. Although the two versions of rates are closely correlated in Luxembourg and Finland, the reported values of coefficient correlations are somewhat lower in the UK (Pearson's $\rho = 0.69$; Spearman's $\rho = 0.82$).

The robustness of the primary results (based on models with control variables) with secondary models (based on models without control variables) is further supported by the trend analyses reported in last two columns of Table 4. Comparing the results in Tables 2 and 4 yields very similar results in terms of trend types, average annual changes, and turning points (in cases of U-shaped curves). Consequently, we can conclude that both models with and without control variables provide comparable conclusions regarding trends in subjective poverty rates over time, which would clearly be useful for policymakers.

IV. CONCLUDING REMARKS

In this study, we argue that subjective poverty rates provide essential information and should be taken into account as a supplementary dimension for assessments of the poverty level in a society. Governmental policies have significant impacts on people's lives, which may not be fully captured by the so-called "objective" poverty indicators. Trends in subjective poverty may reflect changes in societies which are not captured by "objective" indicators.

This paper contributes to the existing literature on poverty by re-examining the subjective dimension, which has been somewhat neglected since the 1990s. Our aim is not to uncover deeper relationships between subjective poverty and other socio-economic phenomena, but rather it is purely empirical – to present the current situation regarding subjective poverty in the European Union. In addition, we also examine trends in subjective poverty over the last 11-14 years. We believe that this study is primarily useful for social scientists focusing on quality of life issues, and for policymakers seeking data on different aspects of poverty. Subjective poverty rates presented in this study fall within the income poverty concept, yet represent a different perspective.

Estimations in this paper are based on a standard methodology, and we are aware of its drawbacks, including a high level of variation in the key variables. However, we believe that this study can contribute to re-opening more vibrant and intensive discussions related to the study of subjective poverty. The approach used in this paper originated in the 1970s, and econometric methods have undergone rapid development since then. Our next goal will be to conduct a comparative study – assessing the robustness of trends in subjective poverty based on different (non-parametric and semi-parametric) techniques.

We hope that this study may serve to inspire other social scientists interested in uncovering potential factors in changes in subjective poverty rates. These may include factors related to adoption of the euro-currency, impacts of economic crises, and other potentially important events in the EU and its individual countries. Here, we have attempted to cautiously outline some of these events. Nonetheless, we believe that in order to comprehensively study relevant factors, implementation of rigorous econometric techniques allowing researchers to separate out various external factors is necessary. This is beyond the scope of this study.

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Figures and Tables

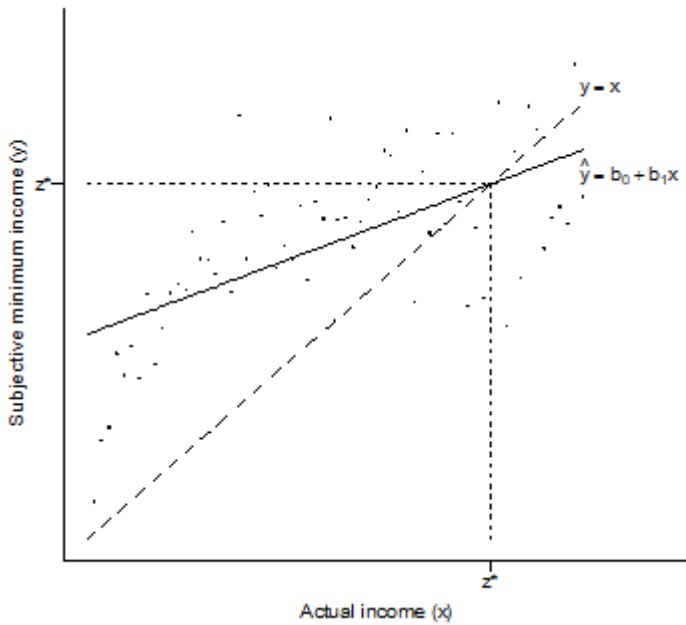


Figure 1: MIQ and the intersection method (in Log form)

Notes: Each point represents a combination of the log of actual (x) and the log of subjective minimum (y) income. \hat{y} represents the estimated function of the log of subjective minimum income regressed on the log of actual income. z^* is the log of the estimated subjective poverty line.

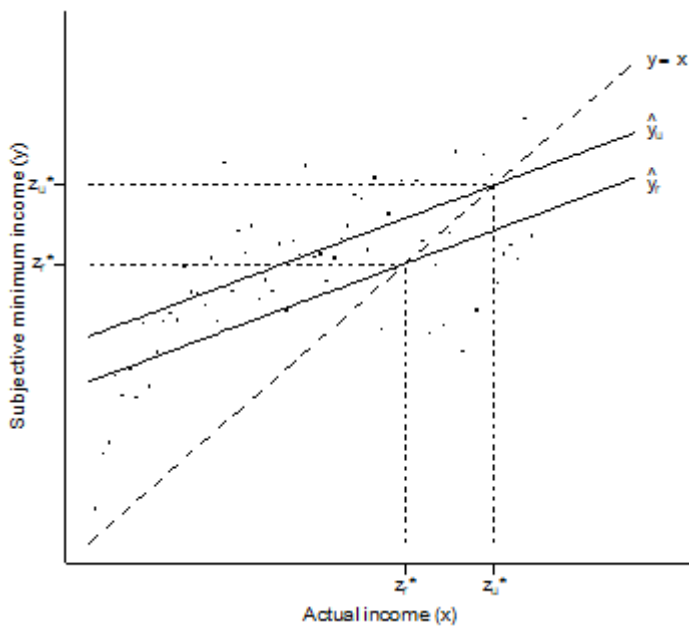


Figure 2: Estimation of two alternative thresholds (in Log form)

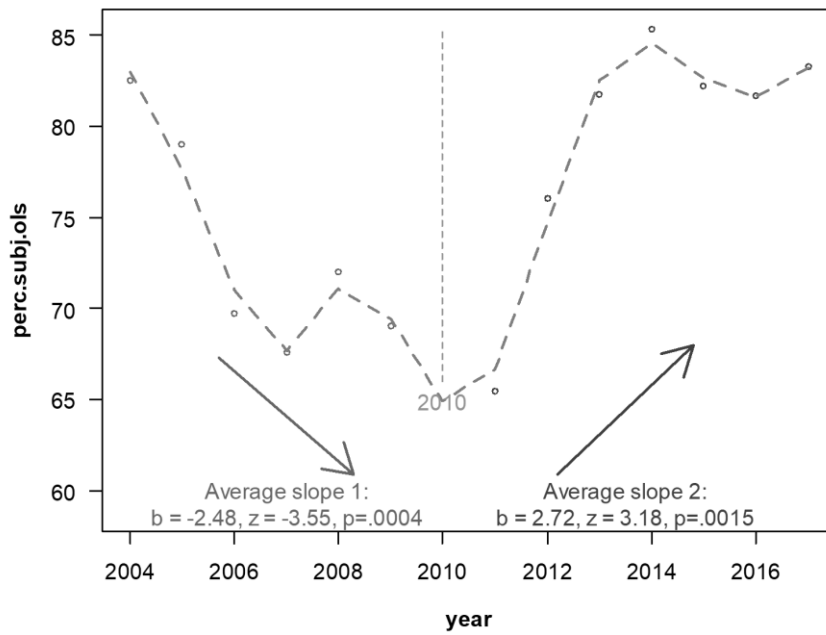


Figure 3: An illustration of identification of a U-shaped trend (data on Greece)

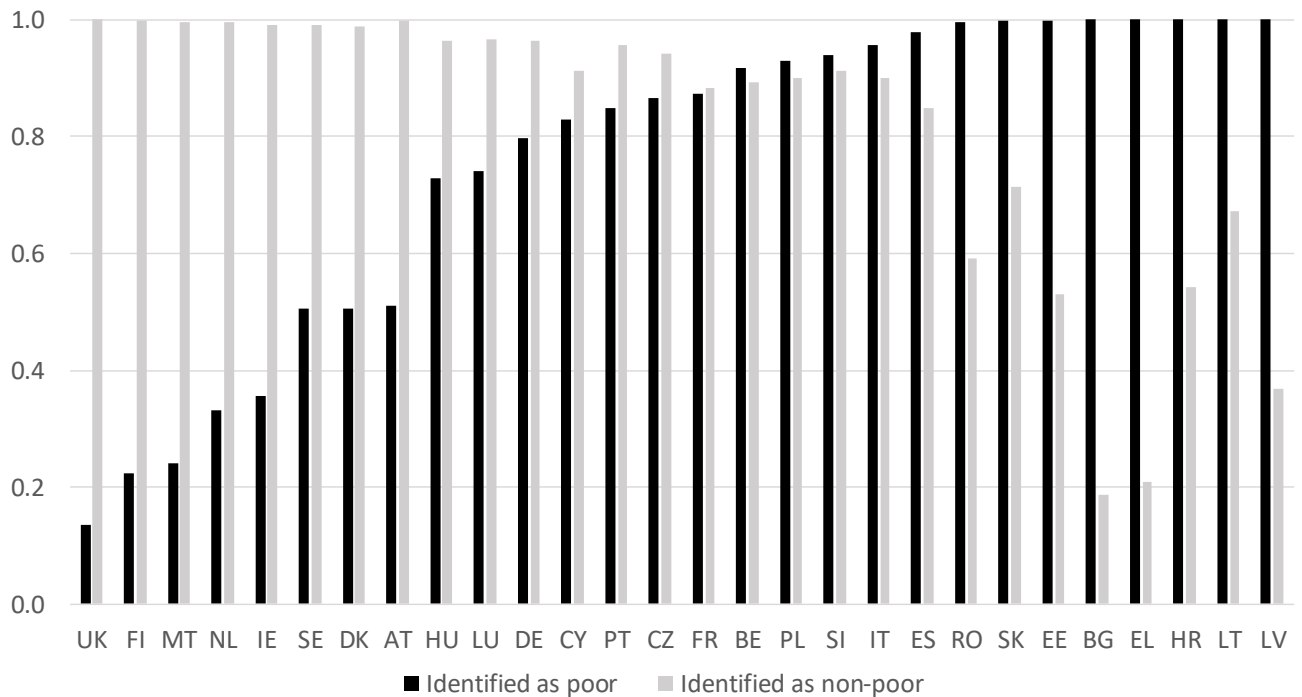


Figure 4: Overlap between officially poor/non-poor households also identified as poor/non-poor by the intersection approach

Source: EU-SILC 2017. Authors' computations.

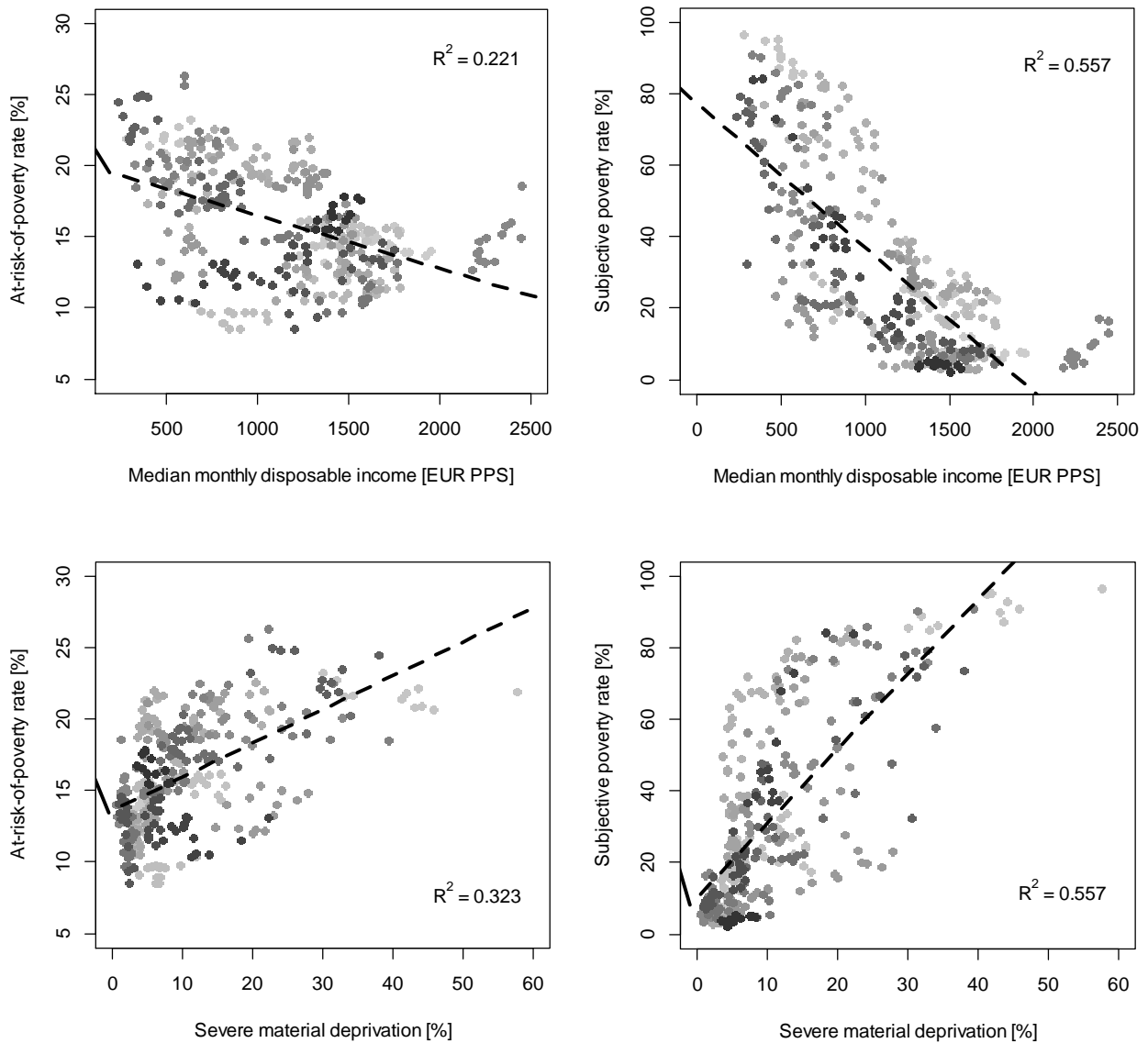


Fig. 5: Relationship between at-risk-of-poverty / subjective poverty rates, and median disposable income / deprivation rates

Source: EU-SILC 2004-2017. Authors' computations.

Notes: Each data point represents a country in a particular year (pooled data set). Different shades of grey denote different countries.

Table 1: Estimated rates of subjective poverty in EU countries [%]

Country	2005		2011		2017	
	AROP ^a	SUBJ	AROP ^a	SUBJ	AROP ^a	SUBJ
AT	12.3	6.6	14.0	7.5	14.0	7.4
BE	14.5	24.6	15.2	23.8	15.8	23.5
BG	21.9 ^b	96.9 ^b	22.2	87.6	23.3	85.7
CY	16.1	39.1	14.8	29.2	15.7	20.3
CZ	10.3	32.5	9.8	19.5	9.1	13.1
DE	12.0	18.3	15.3	18.0	15.2	15.1
DK	10.9	5.8	11.3	6.2	12.7	7.4
EE	17.3	77.1	17.1	68.0	20.7	57.9
EL	19.1	79.0	20.5	65.5	19.6	83.3
ES	19.4	46.1	20.1	34.4	21.2	32.7
FI	11.1	3.6	13.1	3.2	11.3	2.7
FR	12.8	34.6	14.0	26.2	13.4	21.7
HR			21.4	71.4	20.8	57.0
HU	13.3	23.3	14.0	20.3	12.5	12.3
IE	19.6	8.5	15.1	10.6	15.2	6.2
IT	18.4	35.5	19.2	26.4	19.5	26.7
LT	20.1	76.0	18.6	59.7	22.6	47.8
LU	13.3	4.8	13.4	5.9	18.6	16.6
LV	18.5	91.0	18.7	79.2	21.8	71.3
MT	14.7 ^b	9.1 ^b	15.2	12.0	16.6	4.3
NL	10.6	9.5	10.6	6.5	13.2	4.7
PL	20.3	57.7	17.6	21.5	14.8	22.3
PT	19.2	43.1	17.9	39.9	18.2	18.9
RO	24.5 ^b	73.8 ^b	22.2	78.1	23.3	54.5
SE	8.6	11.8	14.3	8.6	13.0	7.3
SI	12.3	28.7	13.6	18.8	13.3	20.0
SK	13.1	84.2	13.1	39.7	11.5	36.9
UK	17.3	5.6	15.5	3.6	16.6	2.3

Source: EU-SILC 2005, 2011, 2017. Authors' computations.

Notes: AROP: At-risk-of-poverty rates; SUBJ: Rates of subjective income poverty based on models with control variables.

^a Estimates of AROP are based on subsamples with complete observations employed in the models, thus they may differ from the official estimates published by Eurostat.

^b No data available for 2005, values reported for 2007.

Table 2: Identified trends in poverty

Country	Subjective poverty		At-risk-of-poverty rate	
	Trend	Average yearly change [p.p.]	Trend	Average yearly change [p.p.]
AT	None		Increasing	+0.12
BE	Decreasing	-0.23	Increasing	+0.08
BG	Decreasing	-1.06	Increasing	+0.24
CY	Decreasing	-1.09	None	
CZ	Decreasing	-1.26	None	
DE	None		Increasing	+0.31
DK	None		None	
EE	None		None	
EL	U (2010) ^a	-2.48 / +2.72	Ambiguous ^d	
ES	Decreasing	-1.09	Increasing	+0.18
FI	Decreasing	-0.10	Inverted U (2009)	+0.57 / -0.28
FR	Decreasing	-1.17	None	
HR ^a	Inverted U (2013) ^b	+4.46 / -5.66	Decreasing	-0.15 ^c
HU	Inverted U (2009) ^b	+4.32 / -3.35 ^c	None	
IE	None		Decreasing	-0.27
IT	Decreasing	-1.39	Increasing	+0.10
LT	Decreasing	-1.55	Increasing	+0.16 ^c
LU	Increasing	+0.95	Increasing	+0.33
LV	Decreasing	-1.17	None	
MT	Decreasing	-0.66	Increasing	+0.19
NL	Decreasing	-0.22	Increasing	+0.21
PL	Decreasing	-2.43	Decreasing	-0.22
PT	Decreasing	-2.70	None	
RO	None		U (2010)	-1.05 / +0.46 ^c
SE	Decreasing	-0.43	Increasing	+0.48
SI	None		Ambiguous ^d	
SK	Decreasing	-3.90	None	
UK	None		Decreasing	-0.25

Source: EU-SILC 2004-2017. Authors' computations.

Notes: The identification of increasing/decreasing trends is based on evaluation of the significance (significance level 0.05) and signs of coefficients resulting from linear regression models. 'Average yearly changes' represent the average yearly changes in subjective poverty rates across the period. "None" refers to lack of evidence for either trend.

^a Based on 8 observations only.

^b For U-shaped curves we also report turning points in parentheses.

^c Coefficient statistically significant at 0.10.

^d Indicating both increasing and inverted U-shaped trends.

Table 3: Average annual change in median income (2015 prices)

Country	Trend	Average annual change [%]
AT	Increasing	+4.8
BE	Increasing	+4.7
BG	Increasing	+9.4
CY	None	
CZ	Increasing	+5.7
DE	Increasing	+3.8
DK	Increasing	+4.1
EE	Increasing	+12.2
EL	Inverted-U (2010)	+8.2 / -7.1
ES	Increasing	+3.8
FI	Increasing	+4.8
FR	Increasing	+4.3
HR	Increasing	+2.4
HU	Increasing	+7.6

Country	Trend	Average annual change [%]
IE	Increasing	+1.6
IT	Increasing	+2.8
LT	Increasing	+10.1
LU	Increasing	+4.0
LV	Increasing	+10.6
MT	Increasing	+6.2
NL	Increasing	+3.8
PL	Increasing	+8.7
PT	Increasing	+3.2
RO	Increasing	+9.4
SE	Increasing	+4.8
SI	Increasing	+4.5
SK	Increasing	+8.9
UK	Increasing	+5.0

Source: EU-SILC 2004-2017. Authors' computations.

Notes: The table reports trends in median equivalised disposable income and the associated average annual change (in %).

Table 4: Robustness checks: Estimates based on models with and without controls

Country	Average relative differences ^a		Correlations ^b		Trend analyses ^c	
	Subjective poverty rate	R ²	Pearson	Spearman	Trend	Avg. yearly change
AT	0.047	0.163	0.969	0.956	None	
BE	0.036	0.108	0.964	0.952	Decreasing	-0.212 ^d
BG	0.007	0.096	0.993	1.000	Decreasing	-1.183
CY	0.073	0.073	0.986	0.989	Decreasing	-0.887
CZ	0.069	0.080	0.998	0.984	Decreasing	-1.246
DE	0.028	0.091	0.954	0.879	None	
DK	0.158	0.194	0.909	0.890	None	
EE	0.016	0.106	0.994	0.984	None	
EL	0.005	0.123	0.998	0.996	U (2010)	-2.547 / +2.693
ES	0.013	0.271	0.996	0.996	Decreasing	-1.096
FI	0.260	0.188	0.896	0.890	Decreasing	-0.066
FR	0.055	0.087	0.998	0.960	Decreasing	-1.246
HR	0.014	0.069	0.997	1.000	Inv-U (2013)	+4.750 / -5.974
HU	0.021	0.084	0.999	0.989	Inv-U (2009)	+4.251 / -3.132 ^d
IE	0.114	0.230	0.947	0.956	None	
IT	0.015	0.182	0.999	0.996	Decreasing	-1.315
LT	0.013	0.097	0.998	0.984	Decreasing	-1.572
LU	0.415	0.324	0.991	0.943	Increasing	+0.979
LV	0.006	0.103	0.997	0.995	Decreasing	-1.218
MT	0.116	0.287	0.989	0.955	Decreasing	-0.764
NL	0.148	0.127	0.930	0.846	Decreasing	-0.260
PL	0.016	0.094	1.000	0.984	Decreasing	-2.506
PT	0.029	0.169	0.997	0.996	Decreasing	-1.747
RO	0.011	0.285	1.000	1.000	None	
SE	0.037	0.198	0.982	0.938	Decreasing	-0.438
SI	0.034	0.087	0.996	0.995	None	
SK	0.009	0.123	1.000	0.995	Decreasing	-3.948
UK	0.723	0.285	0.688	0.819	None	

Source: EU-SILC 2004-2017. Authors' computations.

Notes:

^a Average relative differences calculated as the average across differences between estimates of subjective poverty rates (R², respectively) based on results from models with and without controls, divided by the subjective poverty rate (R², respectively) based on results from models without controls. The values thus represent the average percentage difference between the rate of subjective poverty based on results from models with and without controls (increase in the explanatory power of the model with controls in comparison to the model without controls).

^b Correlation coefficients between the subjective poverty rates based on results from models with and without control variables.

^c Refer to Notes in Table 2.

^d Statistically significant at level 0.10.

Appendix

Table A1: Overlap between official and subjective poverty

Country	2011			2017		
	Overall overlap ^a	Overlap: poor ^b	Overlap: non-poor ^c	Overall overlap ^a	Overlap: poor ^b	Overlap: non-poor ^c
AT	0.924	0.495	0.994	0.929	0.512	0.997
BE	0.900	0.951	0.890	0.896	0.917	0.892
BG	0.347	1.000	0.160	0.376	1.000	0.187
CY	0.825	0.895	0.813	0.900	0.829	0.914
CZ	0.896	0.968	0.889	0.936	0.866	0.943
DE	0.925	0.844	0.939	0.939	0.797	0.965
DK	0.931	0.470	0.989	0.928	0.506	0.989
EE	0.490	1.000	0.385	0.628	0.999	0.531
EL	0.550	1.000	0.434	0.364	1.000	0.208
ES	0.848	0.978	0.815	0.876	0.978	0.849
FI	0.898	0.231	0.998	0.910	0.224	0.998
FR	0.866	0.958	0.851	0.883	0.874	0.884
HR	0.500	1.000	0.363	0.638	1.000	0.543
HU	0.914	0.914	0.914	0.935	0.730	0.964
IE	0.907	0.541	0.971	0.894	0.357	0.991
IT	0.913	0.961	0.902	0.911	0.956	0.900
LT	0.589	1.000	0.495	0.747	1.000	0.674
LU	0.912	0.393	0.992	0.924	0.742	0.966
LV	0.394	1.000	0.255	0.505	1.000	0.368
MT	0.908	0.592	0.965	0.871	0.240	0.996
NL	0.917	0.411	0.977	0.909	0.332	0.997
PL	0.908	0.848	0.920	0.904	0.929	0.900
PT	0.777	0.991	0.730	0.938	0.848	0.958
RO	0.441	1.000	0.281	0.686	0.995	0.592
SE	0.921	0.522	0.987	0.928	0.505	0.991
SI	0.927	0.923	0.928	0.917	0.939	0.913
SK	0.734	1.000	0.694	0.746	0.998	0.714
UK	0.876	0.216	0.997	0.856	0.137	1.000

Source: EU-SILC 2011, 2017. Authors' computations.

Notes: Official poverty defined as: household equivalised income below 60% of national median income. Subjective poverty refers to: household identified as subjectively poor using the approach described in Section 2.

^a The share of households identified as poor or non-poor by both approaches.

^b The share of officially poor households also identified as subjectively poor.

^c The share of officially non-poor households also identified as subjectively non-poor.

Table A2: Country abbreviations

AT	Austria	EE	Estonia	IE	Ireland	PL	Poland
BE	Belgium	EL	Greece	IT	Italy	PT	Portugal
BG	Bulgaria	ES	Spain	LT	Lithuania	RO	Romania
CY	Cyprus	FI	Finland	LU	Luxembourg	SE	Sweden
CZ	Czech Republic	FR	France	LV	Latvia	SI	Slovenia
DE	Germany	HR	Croatia	MT	Malta	SK	Slovakia
DK	Denmark	HU	Hungary	NL	The Netherlands	UK	The United Kingdom