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U.S. Department of Labor
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Working Paper 519
February 2020

Subjective Equivalence Scales and Income Poverty in Eastern vs Western European Countries

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Abstract:

This study uses the intersection approach to estimate Subjective Poverty Lines and implicit subjective equivalence scales for European countries. The subjective poverty lines are derived from the Minimum Income Question included in the 2017 EU–Statistics on Income and Living Conditions data. Subjective equivalence scales differ across the European region, showing lower economies of scale for Eastern European countries. When the estimated subjective equivalence scales are applied to derive the official at-risk-of-poverty (AROP) rather than the OECD-modified scale, the ranking of countries changes only moderately. However, subjective poverty (SP) rates based on the derived subjective lines change the ranking of European countries markedly. SP rates show a much clearer pattern of the East-West division of Europe. The results suggest that country-specific economies of scale should be considered in studies of economic well-being, particularly those focused on income poverty.

Keywords: Europe; equivalence scale, subjective poverty.

JEL codes: I32, P46.

Acknowledgement: The work of Martina Mysíková, Tomáš Želinský, and Kamila Fialová was supported by the Czech Science Foundation under Grant no. 18-07036S "Methodology and reality of poverty: Czech Republic in the European context". The EU-SILC datasets were made available on the basis of contract no. 247/2019-EU-SILC-HBS between the European Commission, Eurostat, and the Institute of Sociology of the Czech Academy of Sciences. The responsibility for all conclusions drawn from the data lies entirely with the authors.

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1. Introduction

Construction of the poverty line and ranking of countries by poverty rates depends heavily on the equivalence scale used to derive "equivalised" household income. This holds true in the European environment, where the at risk-of-poverty rate is derived as the share of people whose equivalised disposable household income falls below 60% of the median equivalised income. The equivalising of income is based on the so-called OECD-modified scale, a modified version of the original OECD (Oxford) scale developed in the 1980s, which has been widely used since the late 1990s. The modified scale gives a weight of 1 to the first adult, 0.5 to each additional adult, and 0.3 to each child in a given household.

The authors of the OECD-modified scale recommended attention to cross-country comparisons and argued that the key question of whether to use a single equivalence scale for all countries or a single methodology to estimate equivalence scales, which possibly differ across countries, should be resolved (Hagenaars et al., 1994, p. 194). It is recognized that economies of scale can be strongly country-specific, depending on the national structure of living costs, consumption rates of durable and non-durable goods, and goods with different economies of scale in general. This has been shown in previous research across countries and in studies based on different sets of consumption goods and services (among many, see Buhmann et al., 1988, Hagenaars et al., 1994, Goedemé et al., 2017).

The OECD (-modified) equivalence scale was established before Eastern European countries joined the European Union. As far as we can determine, it was based on the available research related to equivalence scales derived from various methods using data from Western European countries and other market-oriented OECD countries (see Hagenaars et al., 1994). Scales used

included those that were implicit in programs, derived from behavioural models using expenditure data, or based on subjective methods (Buhmann et al., 1988; Citro and Michael, 1995).

Probably the most famous behavioural method for estimating equivalence scales is based on Engel (1895), with food expenditures serving as the basis for calculation. These tend to result in equivalence scales with lower economics of scale than in studies where more expansive bundles of goods and services are considered (see Daley et al., 2014, Phipps and Garner, 1994).[1] It is questionable whether the OECD-modified equivalence scale, which appears to be based on these types of studies using data from Western or more market oriented economies, is applicable to the countries of Eastern Europe.

After joining the EU, the former socialist Eastern European block adopted the OECD-modified equivalence scale. Thus, the remarkable differences in the structure of household consumption expenditures that inevitably existed in the Eastern European countries were ignored. This study is motivated by the assumption that economies of scale that result from sharing a household may differ in Eastern European (EE) and Western European (WE) countries because of the different consumption structures in the two regions.[2]

According to analyses of European Union Household Budget Survey (EU-HBS) data, the highest shares of consumption expenditures are those on housing and food in both EE and WE (Mysíková and Želinský, 2019). While the share of housing expenditures – with relatively high economies of scale – tends to be only slightly lower in the EE region than in WE, shares of food – with relatively

[1] Another behavioural approach, the Rothbarth method, was used by Lazear and Michael (1988) to derive equivalence scales based on assumptions regarding the allocation of income for collective expenditures, and private expenditures for adults and children.

[2] Bishop et al. (2014), based on the minimum income question and the intersection approach for countries in Western Europe, noted that countries with well-developed welfare states show greater economies of scale than those with less well-developed welfare states, represented by three Southern European countries. Hence, the differences might also be apparent within the Western European region.

low economies of scale – are, on average, substantially higher in EE. Housing represented less than 30 percent of consumption expenditures, and there was no significant difference between the regions, while food represented 29 percent in EE and 13 percent in WE in 2005. The same structural difference existed in 2015: 33 percent was spent on housing in both regions, while 23 percent of expenditures in EE and 14 percent in WE were for food.[3] Thus, it follows that economies of scale, considering a full basket of goods and services, would be lower in EE countries than in WE countries in general. Therefore, we assume that the official income poverty indicator – the at-risk-of-poverty rate – commonly applied for European comparisons, may result in biased results. Ultimately, the choice of an equivalence scale can substantially influence cross-country comparisons, the ranking of countries on both poverty and inequality scales, and the demographic composition of the poor.

In much of the existing literature, equivalence scales have been estimated based on consumption/expenditure data (for example, see Muellbauer, 1980, Merz et al., 1994, Lazear and Michael, 1998, Phipps and Garner, 1994, Daley et al., 2014). However, there is a growing body of literature which uses data on subjective perceptions of economic well-being to derive equivalence scales. Examples include the use of income evaluation and/or minimum income questions (Bishop et al., 2014, Carbonnier, 2019, De Vos and Garner, 1991, Flik and Van Praag, 1991, Garner and De Vos, 1995, Hagenaars et al., 1994, Kapteyn at al., 1988, Martin, 2017), minimum spending questions (Garner and Short, 2003 and 2004), income satisfaction (Bütikofer and Gerfin, 2009), and personal evaluations of material well-being (Dang et al., 2019).

[3] Within EE, the food expenditure share was the highest in RO, BG, and LT throughout 2005-2015, while within the WE region, the shares were the highest in Southern European countries (Mysíková and Želinský, 2019).

In this study, we adopt the minimum income approach. This choice is primarily based on the potential availability of the data. Specifically, we use the internationally harmonised and comparable survey Statistics on Income and Living Conditions (EU-SILC), which has been published annualy since 2005, and which contains a Minimum Income Question (MIQ). We apply a model-based method to define the subjective poverty line (SPL), with intersecting responses to the MIQ with reported actual income, while controlling for other household demographic and economic characteristics. Using these estimated thresholds/lines[4], we derive specific equivalence scales for each country. We then compare our subjective-based scales with the officially used (country-uniform) OECD-modified scale by combining the marginal income needed for adults and children into two parameters, as in the OECD-modified scale. Poverty rates based on the SPL for each country are compared to the official at-risk-of-poverty (AROP) rates.

Overall, the main objective of this study is to develop subjective country-specific equivalence scales for European countries based on the minimum income required for households to feel they are able to make ends meet. First, our starting point is to estimate subjective income poverty lines for 26 EU countries. Using these, we derive implicit subjective equivalence scales for the countries analysed (Section 5.1). We assume that the estimated subjective equivalence scales based on the MIQ differ across countries and we argue that they better reflect country-specific conditions and consumer preferences. We hypothesise that there are apparent differences between the Eastern and Western European regions.

Second, we produce and compare: (1) poverty rates following the AROP method, but using implicit subjective equivalence scales and official at-risk-of-poverty rates based on the OECD-modified scale (Section 5.2); and (2) subjective income poverty rates compared to the official rates (Section

[4] Poverty line and threshold have equivalent meaning throughout this study.

5.3). We hypothesise that the overall ranking of European countries reflecting the SPL method will result in a more apparent East-West EU division. As the main contribution of our study has empirical value, we intend to employ a simple approach that leads to a compromise in terms of similarity, simplicity, transparency, and comparability of the estimated equivalence scales with OECD-modified ones.

2. Literature overview: Subjective poverty lines and equivalence scales

Generally, the subjective approach explicitly recognises that poverty lines are inherently subjective judgments people make about what constitutes a socially acceptable minimum standard of living in a particular society (Ravallion, 1992). The best-known methods for estimating subjective poverty lines usually compare actual income to the subjective perceptions of a household's situation (Hagenaars and de Vos, 1988). The seminal study by Goedhart et al. (1977) introduces two approaches to estimation of subjective poverty lines: the subjective poverty line based on survey responses to a minimum income question; and the Leyden poverty line, named for its place of origin, which is based on a so-called income evaluation question. Kapteyn at al. (1988) further elaborated on these two approaches and pointed out several methodological issues.

Taking into account the availability of European data, in this study we focus on the MIQ, asking the respondents to declare the amount of income they consider to be minimal to make ends meet. On Dutch data from the 1970s, Goedhart et al. (1977) showed that the welfare level associated with a respondent's minimum income is dependent on her/his actual income. It follows that "*richer people are more demanding with respect to their minimum income than are poor people, not only in money terms but also in welfare terms*" (pp. 513–514). The subjective minimum household income needed is dependent not only on income, but inevitably also on the household's size.

De Vos and Garner (1991, and Garner and De Vos, 1995) utilize the MIQ to compute poverty thresholds and compare the U.S. and Dutch data from the 1980s. They allow the SPL to differentiate not only by household size, but also by various household characteristics. They apply the intersection method introduced by Goedhart et al. (1977) and find that, for both countries, the subjective poverty thresholds lie in the range of 60 to 75 percent of the *mean* incomes in most family size groups. Compared with the currently applied definition of objective income poverty – 60% of *median* equivalised household income – the Dutch subjective poverty line would be higher. This indicates that the share of the population identified as subjectively poor will be higher than the official share. Garner and Short (2003, 2004) estimated subjective poverty thresholds using MIQ, with data collected in the U.S. As previously researchers have found, the implicit economies of scale from their estimation of subjective poverty thresholds were higher than those in the OECD-modified scale.

Saunders et al. (1994) follow the same seminal study by Goedhart et al. (1977) to derive the SPL using the MIQ in Australia and Sweden, but with additional restrictions. First, they included only the number of adults and children in their estimation; they did not include any control variables in the models. Second, as robustness checks, they ran the same exercise excluding respondents who indicated they made ends meet "very easily", and subsequently, they excluded these respondents plus those in the categories "easily" and "fairly easily" (the question was posed on a 6-point scale). The reason for excluding respondents with no difficulties making ends meet was that these respondents may have provided uninformed responses to the MIQ and, thus, may have biased the main estimates. However, the results were not sensitive to exclusion of these categories.

Saunders et al. (1994) found that the overall subjective poverty rate in Australia (21.5%) was substantially higher than in Sweden (13.4%). The objective income poverty rate with a poverty line

defined in the study as 50 percent of median equivalised household income using the OECD equivalence scale was markedly lower (8.9% in Australia and 6.3% in Sweden). This again indicates that subjective poverty lines may be higher than the official income poverty lines. Further, their results based on an SPL approach identified the weights of adults as 0.14 in Australia and 0.25 in Sweden, and the weights of the first child as 0.06 in Australia and 0.16 in Sweden. This strongly contrasts with the OECD scale at weights of 0.7 and 0.5 for adults and children, respectively. These results suggest that the estimated subjective equivalence scale will indicate lower weights than either the OECD and OECD-modified scales.

García-Carro and Sánchez-Sellero (2019) also applied a modified SPL approach – sometimes referred to as the CSP (Centre for Social Policy) or Deeleck poverty line approach – in which the SPL is established only for a sub-population which makes ends meet with some difficulty. The logic is similar to that of Saunders et al. (1994): only respondents whose income is close to the poverty line can credibly assess the level of minimum required income. They obtained very similar poverty lines for households with from one to five members when comparing the SPL and Deeleck approaches on Spanish EU-SILC data.

Similarly to the above studies, García-Carro and Sánchez-Sellero (2019) found the subjective poverty rate to be about 40 percent (35% based on the modified Deeleck approach) with the official income poverty rate being roughly 20 percent in Spain. Therefore, we expect the subjective poverty rate to be higher than the official income poverty rate in most European countries we analyse.

Bishop et al. (2014) provide an analysis similar to our study regarding the subjective equivalence scales. Based on pooled EU-SILC data for 2004-2007, they include 15 Euro-Zone countries (thus excluding most EE countries) and apply MIQ and the intersection method. In contrast to our study, they limit the sample to the six most common household types (e.g., excluding single-parent

families) and do not control for any additional household characteristics. Their study was further extended by Kalbarczyk-Steclik et al. (2017) who, employing the same sample and control variables restrictions, analysed 23 European countries, including EE countries, for a longer period (2005-2012). They showed that economies of scale were lower in EE than in WE, when pooled data for the two regions were used. Moreover, while the subjective equivalence scale was stable in WE, the estimated values were declining in the EE.

Based on both Saunders et al.'s (1994) and García-Carro and Sánchez-Sellero's (2019) results showing that the estimations on the total sample are valid, we provide estimates based on the whole sample, thus not excluding any observations. However, unlike Bishop et al. (2014) and Kalbarczyk-Steclik et al. (2017), we control for relevant demographic and economic characteristics in our estimations.

3. Data and variables

In this study we follow the stream of literature employing control variables in the regression model used for estimating the SPL (e.g., De Vos and Garner, 1991), whereas the originally proposed approach used only household size and actual income as the right-hand-side variables (Goedhart et al., 1977, Saunders et al., 1994, Bishop et al., 2014). The logic behind our approach is that people do not assess their living conditions solely based on income, but we assume that they also consider their costs and expenditures in their responses (Večerník and Mysíková, 2016). Even households with identical incomes and structures may require different minimum necessary incomes for various reasons. Therefore, in addition to actual income and household structure, we control for other household demographic and economic variables (note, however, that subjective equivalence scales estimated by models without controls are stated in Table A.2 in Appendix).

The analyses presented in this study are based on the 2017 version (2016 for the UK) of the EU-SILC[5] household survey, which has been conducted annually since 2005. It is collected by national statistical offices and harmonized by Eurostat, and is compulsory for all EU member countries. The survey collects data at the household and individual levels; household members older than 15 are surveyed. The analyses performed in this study are based on household level data but also utilise several individual characteristics. Households with non-positive or missing actual or subjective minimum income were excluded (about 5%). The data sample ranges from 3,800 households in Luxembourg to 22,500 households in Greece. As we focus on distinctions between Eastern (post-communist EU member countries) and Western Europe, we include all EU countries except Cyprus and Malta, as these do not conform to our definition of "Eastern Europe". Western European countries are defined as the "old EU member" states. A list of abbreviations of countries including indicating the East-West division is stated after the concluding section.

The dependent variable in our regression models is the MIQ framed as: "*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).*"[6] The minimum income thus represents monthly net income and is transformed into its natural logarithm form.

The key explanatory variables are the (log of) actual income and household size. The actual total disposable household income includes labour and non-labour income of all household members as well as various social benefits (including pensions) received at either individual or household level,

[5] This study is based on data from Eurostat, EU-SILC – Cross UDB 2017 Version September 2019.
[6] EU-SILC variable HS130. Respondents state all income variables in the survey in their national currency and Eurostat transforms it into EUR.

all income being net of taxes and social deductions.[7] Household size is specified in terms of dummy variables in order to facilitate the process of deriving the equivalence scale. We aim to derive the equivalence scale in the same structure as the OECD-modified equivalence scale which considers a single-adult household as a reference household. Though this might not be ideal (Betti et al., 2017), as single households are not the most common type, we intend to compromise in terms of similarity, simplicity and comparability of the construction of the equivalised household income.[8] As noted earlier, in the OECD-modified equivalence scale, the weight of the first adult is 1.0, while the weight assigned to all other adults is 0.5, and each child (defined as a person aged 13 or younger) has a weight of 0.3. The actual household income is then divided by the sum of the weights of all household members (the equivalised household size) in order to obtain the equivalised income applied in the income poverty rate construction.

One of our goals is to estimate the weights of adults and children separately in order to create a comparison to the OECD-modified scale. The most straightforward way is to include, first, the number of adult members (16 and older)[9] in the model as three dummy variables representing households that include two adults, three adults, and four and more adults; the reference group

[7] EU-SILC variable HY020 – as actual income corresponds to annual income, one twelfth of the reported value is taken into account. EU-SILC is usually conducted in the second quarter of the year in most countries, and the income reference period corresponds to the previous calendar year, while some questions including MIQ are related to the current situation. We are aware of possible inconsistencies between the current and previous year reference periods. However, the income reference period is considered to provide the best approximation of current income, as suggested by Eurostat (2010), and it is also used in this manner in official statistics.

[8] The literature includes examples in which a different type of household, e.g., the modal type, are considered as the reference. Among others, Betti et al. (2017) demonstrate on Turkish data that the sensitivity of the poverty measures to equivalence scales could be higher when more household types deviate from the reference type. According to Betti et al., the reference household type should then be the "central" household type. In the pooled EU-SILC 2017 data, one-adult households comprise 35%, while two-adult households are roughly 45% (regardless of the number of children). Childless households (regardless of the number of adults) account for 75% of households.

[9] Note that the OECD-modified scale defines children as those under 13, while we define it as under 15, for the sake of simplicity. However, as we question the appropriateness of the adoption of the OECD-modified equivalence scale without country-specific research, the age limit could be questioned in the same way and we consider the age limit to be essentially irrelevant at this stage of research.

consists of households with one adult.[10] Second, the number of children is translated into two dummy variables representing households with one child and with two or more children; the reference group includes households with no children.[11]

In addition to the key explanatory variables, we control for numerous household characteristics. In most of the seminal studies on SPL, individual characteristics of the head of the household or the reference person enter the model. We consider the concept of a definition of head of household unsustainable. Formerly, men were automatically regarded as household heads in nuclear families. With changing female labour market participation and changing gender roles in recent decades, such a definition has become less universally plausible. Reference persons (persons responding to the household questionnaire) in EU-SILC, on the other hand, tend to be overrepresented by women. We also hesitate to define the household head according to economic activity or individual income level, and, generally, we avoid assigning one household member's characteristics to the whole household and thus constructing an artificial status of the household (see Večerník and Mysíková, 2019, on the discussion of the difficulty of establishing a household status).

Instead, we define the control variables describing individual characteristics as shares within adult household members. We transform the original individual-level variables, which typically influence the individuals' earnings or household level earnings, were transformed to household-level ones as a share of adult household members possessing a specific characteristic from the total

[10] In the 2017 European pooled sample, households with 4+ adult members make up 7.7% of households, while households with 5+ adult members are only 1.7%. Similarly, households with 2+ children account for 10.6% of households, while households with 3+ children amount to only 2.2%. The dummy variables were thus constructed in order to obtain sufficiently large groups. We intend to apply a uniform method for all countries; otherwise, the number of dummies could have been selected according to the national household structures.

[11] An alternative method would be to include dummies for exact household types, e.g., 1 adult + 1 child; 1 adult + 2 children; 2 adults + 1 child; 2 adults + 2 children, etc., with households of singles as a reference group. This would, however, lead to high number of combinations at the expense of the transparency of deriving the subjective equivalence scales. Nevertheless, we provide the subjective poverty rates following a similar approach using partial subjective poverty lines for various household types in Table A.2 in the Appendix.

number of adult members. These include: the share of currently working members, females, members with tertiary education (defined by ISCED codes 5-6), and younger members aged 16 to 30.[12]

Household level control variables also enter the model. These include the type of ownership of the dwelling, the size of the flat/house, the degree of urbanization of the place of residence, and assessments of the economic situation of households. Type of ownership of the dwelling impacts the financial demands of a household. We distinguish between a dummy variable for outright owners (plus free accommodation, e.g., for those living at a relative's home rent free) and a dummy variable for owners paying a mortgage (the reference group being tenants paying either full market or reduced rate rent). The financial burden of paying a mortgage and rent can be similar in some countries, while it can differ in others, depending on the conditions of financial and housing markets. The size of the flat/house is measured by the number of habitable rooms.[13] The degree of urbanization is defined in terms of two dummies for densely and medium populated areas (with thinly populated as a reference group).[14]

We also use a self-assessment of the ability to make ends meet,[15] inspired by Saunders et al. (1994) and García-Carro and Sánchez-Sellero (2019), who used groups of households with different degrees of ability to make ends meet for robustness checks. Five dummy variables were

[12] The variable for younger respondents is included to capture earnings profile by age. Similarly, the share of older members aged 65 or more could be included (or the share of pensioners/disabled), however, we believe this is captured by the share of working adults.

[13] Bishop et al. (2014) prefer not to include control variables mainly because of their possible correlation with household structure. Number of rooms is a variable the most correlated with household size on our list of control variables, however, the Pearson coefficient is 0.3 at the European level (the highest correlation of 0.5 can be found in FI and SE). Similarly, correlation of number of adults/children with other control variables barely exceeds 0.4.

[14] The categories are derived based on the population size and density of the municipality (Eurostat, 2016).

[15] EU-SILC variable HS120 is stated as "A household may have different sources of income and more than one household member may contribute to it. Thinking of your household's total income, is your household able to make ends meet, namely, to pay for its usual necessary expenses?" with a 6-point scale (1 – with great difficulty, 2 – with difficulty, 3 – with some difficulty, 4 – fairly easily, 5 – easily, 6 – very easily).

constructed, with "making ends meet very easily" being the reference group. Finally, we included a binary indicator of "severely materially deprived" household,[16] provided by official EU statistics (see, Decancq et al., 2013, for definitions), to further capture financial strain on households.

This set of variables describes the housing, material, and working conditions of a household, serving as an overall proxy for household living standards In general, these characteristics are related to varying living costs, habits, aspirations and expectations, as well as different reference groups of individuals and families to whom the respondents might compare their situations. In all regression models, country household cross-sectional weights are employed. Subsequently, the resulting subjective poverty rates are weighted by individual cross-sectional weights, so that the poverty rates represent shares of subjectively poor individuals (not households), in line with the officially used AROP rate, referred to as the official or objective income poverty hereafter.

The dependent variable, MIQ, is missing for a relatively substantial number of households in some countries: Denmark (roughly 1/6), Croatia (1/8), Netherlands (1/4), and Sweden (1/4). In the United Kingdom the values (1/2) are missing only in 2017, therefore we used the previous wave 2016. Though we provide outcomes for the four countries with relatively high share of missing values, the results should be interpreted with caution. Further, in some countries, several other variables are either completely or substantially missing. The degree of urbanisation is not available for Germany, Netherlands, and Slovenia, and is modified to only two out of three values in Estonia and Latvia. The size of a flat/house is not provided for Germany. Regression models (see Table A.1 in the Appendix) were run without these control variables in these countries, which should be kept in mind.

[16] EU-SILC variable RX060.

4. Methodology

The methodology applied in this study includes two key steps. First, we identify the subjective poverty lines using the intersection method, and second, we derive the subjective equivalence scales from the estimated subjective poverty lines.

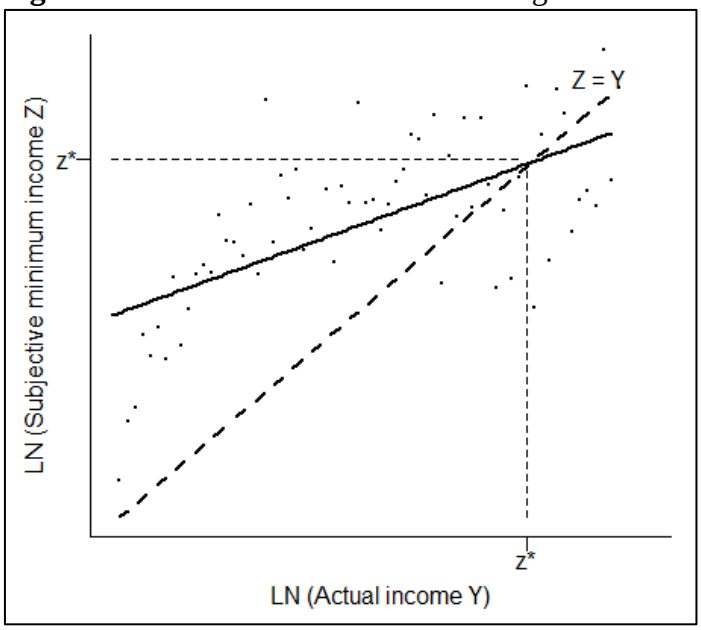
4.1 The Intersection method

In this study, the SPL estimations are based on survey responses to the MIQ. The minimum income is estimated as a function of actual income. Its intersection with the line representing the equality of minimum and actual incomes (i.e., the 45-degree line in Figure 1) determines the subjective poverty line. The intersection in the SPL approach assumes that only respondents with income equal to their subjective minimum income have a realistic idea of the minimum income level. Richer respondents tend to overestimate their minimum necessary income, while poorer respondents tend to do the opposite; and, therefore, the minimum income is increasing with actual income. "*Respondent's perception of the poverty line is distorted by the fact that his [her] actual income is not equal to his [her] minimum income level*" (Goedhart et al., 1977, p. 514). This misperception does not happen only at the intersection, the income level defining the poverty line. As Goedhart et al. (1977) argue, it is still not possible to include only those whose actual income covers only necessities. It is not a priori known which respondents have income equal to the poverty line and, thus, all respondents' answers are needed to obtain the estimated function.

Figure 1 depicts the intersection in double logarithmic form (see Goedhart et al., 1977, p. 513, and also de Vos and Garner 1991, p. 269, for a figure not in log form). The vertical axis represents the subjective minimum income (Z) and the horizontal axis the actual income (Y), while subjective minimum income typically rises with actual income. The intersection (Z^*), where $Z = Y$, determines income which can be regarded as the subjective poverty line. The SPL divides the

population into two parts: (1) poor: those whose actual household income is lower than the poverty line, and (2) non-poor: those whose actual household income is higher than the poverty line.

Figure 1 Intersection method – double logarithmic form



Following Goedhart et al. (1977), the subjective poverty line is thus calculated as the income level at which $Z = Y = Z^*$ given the function:

$$\ln(Z) = \alpha + \beta \ln(Y), \quad (1)$$

which yields

$$\ln(Z^*) = \frac{\alpha}{1-\beta}. \quad (2)$$

We estimate a single SPL (as well as SPLs for households with various numbers of adult and child members) and run an OLS regression model. The additional explanatory variables enter the right-hand-side of Equation (1):

$$\ln(Z) = \alpha + \beta \ln(Y) + \sum_{i=1}^{3} \gamma_i A_i + \sum_{j=1}^{2} \delta_j C_j + \sum_{l=1}^{n} \theta_l X_l, \quad (3)$$

where *A* stands for three (*i*) dummy variables for the number of adults, *C* stands for two (*j*) dummy variables for the number of children, and *X* represents the *n* number of control variables. $\alpha, \beta, \gamma, \delta$, and θ represents the corresponding regression coefficients.

Subsequently, the estimate of the SPL is given by an extension of Equation (2):

$$\ln(Z^*) = \frac{\alpha + \sum_{i=1}^{3} \gamma_i A_i + \sum_{j=1}^{2} \delta_j C_j + \sum_{l=1}^{n} \theta_l X_l}{1-\beta}. \quad (4)$$

Thresholds across the EU countries differ based not only on the intersection points, but also on differences in characteristics across the countries. To derive SPLs for various household types for each country (applied to derive the subjective equivalence scales presented in Section 5.1), the relevant household size variables are kept at the required values, with the rest of explanatory variables at their means; actual income does not enter equations (2) or (4).[17] For instance, SPL for a one-adult household is derived with values of the three dummies for adults set to zero, and the two dummies for children (and other explanatory variables) to their country means. The SPLs for adults are thus valid regardless of the number of children in a household.

To estimate the "total" single SPL for each country (applied in Section 5.3), the household size and other explanatory variables are kept at their country means. As noted earlier, household size enters the estimation in terms of dummy variables for adult and child household members; the averages for each thus reflect the national household structure.

4.2 Equivalence scale

[17] See Garner and Short (2004, pp. 331-332 and Table 8) for a discussion of whether to set the other characteristics to country means or to allow them to vary through the production of household-specific subjective thresholds.

Subjective equivalence scales (SES) are derived from the SPLs for various household types. For comparability with the OECD-modified scale, a uniform final weights W^A and W^C for adults and children, respectively, can be derived from the SPLs.

As a first step, the partial weights, *w*, for adults and children are derived separately as the relative change in the adult and child specific SPLs when an additional person is added, as noted in equations (5) and (6) below. The weights are defined as the additional income needed to meet one's needs (or marginal costs in alternative terminology), relative to the minimum income needed by the reference group (SPL_0).

$$w_i^A = \frac{SPL_i^A - SPL_{i-1}^A}{SPL_0^A}, \quad (5)$$

$$w_j^C = \frac{SPL_j^C - SPL_{j-1}^C}{SPL_0^C}, \quad (6)$$

where *A* and *C* denote adults and children, respectively, and *i* stands for the additional adults, and *j* for each additional child (as in Equation (3)).

As a second step, we derive a weighted average of the partial weights *w* according to the shares of households with two-, three-, and four-and-more-adults, and one child and two or more children in each country.

This approach can be formalised by the following equations:

$$W^A = \sum_{i=1}^{3} w_i^A s_i^A, \quad (7)$$

$$W^C = \sum_{j=1}^{2} w_j^C s_j^C, \quad (8)$$

where *W* stands for the final, weighted average marginal income needed, which we intend to contrast with the weights assigned by the OECD-modified equivalence scale. *s* represents the share

of the corresponding households with their differing numbers of adults, and households with differing numbers of children in a country. Moreover, it holds that $\sum_{k=1}^{m} s_k = 1$, where m is the number of additional adults or children considered (i.e., the number of dummy variables used for adults or children).

Table 1 demonstrates this approach on the example of the Czech Republic, which has the lowest objective income poverty rate in the EU. Compared to a one-adult household, a household of two adults requires a 30 percent higher minimum income (w^A for the second adult).[18] A third adult member creates the need for 19 percent higher minimum income (w^A for the third adult), and, similarly, the fourth and next adult members require additional 21percent (w^A for fourth and next adults). The higher weight of fourth and next adults than that of the third adult is given by the fact that the first group of 4+ adults consists of up to 7 adults (however, 4-adult households represent 5.9 percent of households, while 5+ adult households are only 1.2 percent of households in the Czech Republic). As the final weight W is weighted by the household structure in a country, we consider the upward bias relatively negligible. The weights for children are similarly derived; for example, with the addition of a child to a childless household, an additional 10 percent higher minimum income is needed (w^C for first child).

Table 1 Monthly Subjective poverty lines (in Euros) and derived equivalence scale for the Czech Republic

Adults	SPL^A	Weight of additional adult (w^A)	Structure of households (s^A)	**Children**	SPL^C	Weight of additional child (w^C)	Structure of households (s^C)
1 adult	561			Childless	677		
2 adults	729	0.299	0.692	1 child	745	0.101	0.548
3 adults	836	0.191	0.206	2+children	810	0.097	0.452
4+ adults	951	0.206	0.101				
Final weight (W^A)		**0.267**	**∑ = 1.0**	**Final weight (W^C)**		**0.099**	**∑ = 1.0**

Source: EU-SILC 2017. Authors' computations.
Notes: SPL is estimated by OLS regression, see Section 3 for control variables.

[18] Regardless of the number of children.

Hence, as opposed to the OECD-modified scale where the economies of scale are assumed to be uniform (the weight of 0.5) for all additional adults, the marginal minimum income needed declines with adult household members and the weight for an additional person diminishes. In the specific case of the Czech Republic, this holds for adult weights only, while the weights of children seem to be constant.

The resulting single weight W^A of second and next adults is 0.267. The same exercise for children yields a weight W^C of 0.099. As expected, the subjective equivalence scale provides higher economies of scale (weights of 0.267 and 0.099) than the OECD-modified scale (0.5 and 0.3).

5. Results

The estimated SPLs for various household types allows us to derive subjective equivalence scales, which are assumed to exhibit lower economies of scale for Eastern European countries than for countries in the Western European region. The subjective poverty lines are expected to generally be higher than the official objective income poverty lines in all countries, as are the subjective income poverty rates compared to the objective rates. This section provides results confirming our assumptions and hypotheses. The SPLs are based on OLS regression models; the full-model results appear in Table A.1 in Appendix.

5.1 Subjective equivalence scales

As expected, the SES generally provides higher economies of scale than the OECD-modified scale, with few exceptions. Table 2 shows the derived partial and final uniform weights for the 26 European countries. The weights for the second adult range from 0.17 in the Netherlands to 0.60 in Bulgaria; however, about half are in the range of 0.30 to 0.45. For the third adult, it ranges

between 0.05 to 0.46.[19] Bishop et al. (2014), for a pooled sample of Euro Zone countries in 2004-2007, reported the weight of the second adult at 0.34, with the third adult coming in at 0.18 and the fourth at 0.21. Similarly, Kalbarczyk-Steclik et al. (2017), for 2005-2012, estimated the weight of second, third, and fourth adults as 0.32, 0.21, and 0.24, respectively, in WE, and 0.49, 0.44, and 0.30 in EE, respectively.[20] Garner and Short (2003), presenting results by the number of persons rather than by the number of adults and children separately, found similar results, with the addition of a second person resulting in a weight of 0.32 and a third person in a weight of 0.22.

Table 2 Subjective equivalence scales: weights for adults and children (2017)

	Weight of				Weight of		
	2nd adult	3rd adult	4th and next adults	**Adults - final**	1st child	2nd and next children	**Children - final**
Eastern Europe							
BG	0.598	0.357	0.447	**0.513**	0.159	0.139	**0.151**
CZ	0.299	0.191	0.206	**0.267**	0.101	0.097	**0.099**
EE	0.590	0.455	0.425	**0.546**	0.196	0.045	**0.128**
HR	0.447	0.327	0.241	**0.370**	0.148	0.133	**0.140**
HU	0.370	0.258	0.301	**0.336**	0.098	0.139	**0.115**
LT	0.412	0.371	0.426	**0.404**	0.172	0.063	**0.129**
LV	0.586	0.344	0.436	**0.515**	0.192	0.124	**0.166**
PL	0.431	0.235	0.278	**0.348**	0.045	0.106	**0.071**
RO	0.219	0.049	-0.057	**0.119**	0.124	0.086	**0.108**
SI	0.428	0.261	0.269	**0.366**	0.048	0.062	**0.055**
SK	0.362	0.303	0.340	**0.341**	0.138	0.097	**0.120**
Simple average				***0.375***			***0.117***
Western Europe							
AT	0.387	0.153	0.205	**0.319**	0.065	0.096	**0.079**

[19] Note that the weight for 4+ adults is negative in RO, the weight for 3rd adult is negative in the UK, and the weight for 2+ children is negative in DK. Though similar cases are known from the existing empirics (e.g., for a third adult in NL in Bishop et al., 2014), these countries should be cautious when deriving any implications from these results.

[20] This study leaves the time stability of the estimated subjective equivalence scale at the national level aside. Mysíková et al. (2019) show on the example of the Czech Republic and Slovakia, using the EU-SILC data 2005–2016, that subjective poverty rates (defined differently than in the present study) gradually reflect the economic performance of a country. Thus, we can expect subjective poverty rates to oscillate over time following the economic development, however, certain stability or a stable trend of the subjective equivalence scale is required should it be utilized to supplement the OECD-modified scale in national statistics. We computed the SES for these two countries for the whole available period (2005-2017, not stated here) and found out a steadily decreasing trend of both adult and children weight in the Czech Republic (adult weight was gradually decreasing from 0.365 to 0.267 and children weight from 0.163 to 0.099 over time), and a stability in Slovakia since 2007 (adult weight slightly oscillated around 0.34 and children weight around 0.10).

BE	0.364	0.141	0.247	**0.311**	0.142	0.083	**0.111**
DE	0.344	0.147	0.154	**0.303**	0.116	0.141	**0.127**
DK	0.389	0.309	0.209	**0.372**	0.125	-0.026	**0.044**
EL	0.357	0.259	0.233	**0.315**	0.087	0.073	**0.080**
ES	0.254	0.126	0.186	**0.216**	0.098	0.055	**0.080**
FI	0.203	0.182	0.252	**0.203**	0.157	0.100	**0.127**
FR	0.388	0.160	0.207	**0.339**	0.028	0.043	**0.036**
IE	0.284	0.130	0.163	**0.238**	0.134	0.016	**0.071**
IT	0.223	0.163	0.179	**0.202**	0.083	0.101	**0.091**
LU	0.304	0.085	0.320	**0.265**	0.078	0.082	**0.080**
NL	0.167	0.112	0.047	**0.151**	0.081	0.057	**0.067**
PT	0.306	0.163	0.189	**0.256**	0.086	0.148	**0.108**
SE	0.201	0.234	0.118	**0.201**	0.031	0.123	**0.083**
UK[a)]	0.257	-0.025	0.147	**0.203**	0.125	0.126	**0.126**
Simple average				***0.260***			***0.087***

Source: EU-SILC 2017 (2016 for the UK). Authors' computations.
Notes: a) Results for 2016. EE as a country abbreviation stands for Estonia (not Eastern Europe).

The constructed final uniform weight of adults, to be applied in the same way as the OECD-modified equivalence scale, is higher than the OECD-modified 0.5 weight only in Estonia (0.55), Latvia (0.52), and Bulgaria (0.51). The lowest weights are seen in Romania (0.12), Netherlands (0.15), and Italy (0.19). Except Romania, which is located at the tail of low adult weights, the ranking of countries roughly corresponds to the East-West division: the weights for adults are mostly higher and economies of scale lower in Eastern than in Western Europe (see also the simple averages in Table 2).

Regarding the child uniform weight, its maximum (in LV) barely reaches half of the OECD-modified weight (0.3). It is highest in Latvia (0.17), Bulgaria (0.15), and Croatia (0.14), and lowest in France (0.04), Denmark (0.04), and Slovenia (0.06). Again, with some exceptions (SI and PL, for instance), Eastern European countries reflect lower economics of scale as represented by higher weights of children compared to those for the Western European countries. Our results for child weights are less comparable with the findings of Bishop et al. (2014) and Kalbarczyk-Steclik et al.

(2017), as their studies are based on two-adult households with child(ren) only (i.e., single-parent and three-and-more-adult households with children are excluded from the sample).

Another deviation from Bishop et al. (2014) and Kalbarczyk-Steclik et al.'s (2017) studies is that they do not include control variables in their models as we do.[21] Table A.2 (in Appendix) presents the same results as Table 2 but based on models *without* control variables. While controls increase or decrease adult weights only moderately, rarely by more than 0.05, they decrease the children weights by about 0.1., with a more apparent impact in WE. We have not identified any single control variable that would alone cause a substantial change in the resulting weights; rather the contrary – adding the controls step by step alters the weights gradually.

As our results confirm, economies of scale, in fact, differ across countries and for households with differing numbers of adults and children. These results confirm our assertion that the OECD-modified equivalence scale should not have been simply adopted by Eastern European countries without advance research. Though it is obvious that the subjective weights are typically lower than the OECD-modified ones, we hesitate to conclude which ones are more "correct" based on our analysis. However, our doubts about the appropriateness of the OECD-modified scale for both EE and WE countries today remain.

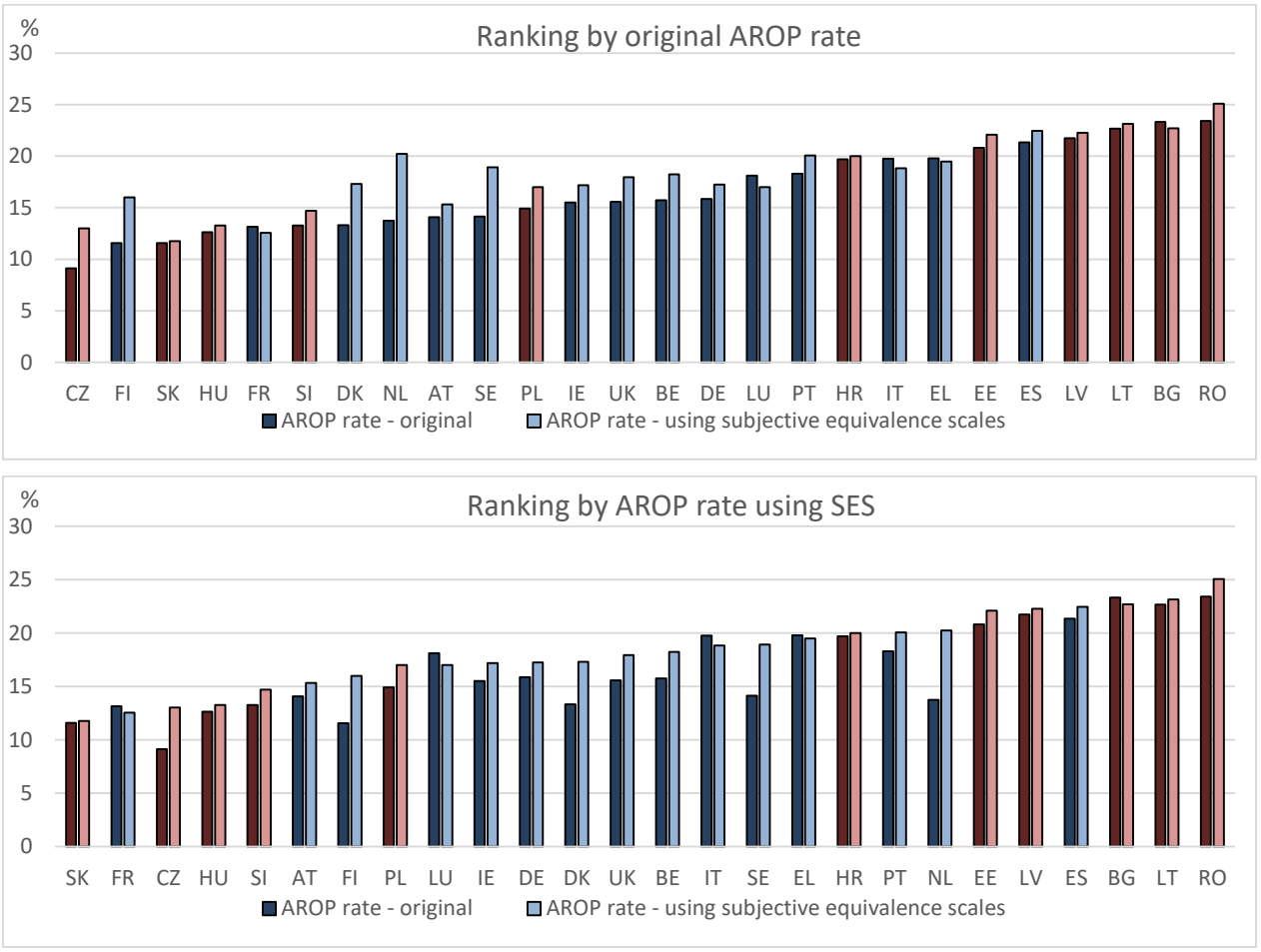
5.2 Income poverty rates based on subjective equivalence scales

Next, we compare the original AROP rate with an AROP rate were the country-specific subjective equivalence scales used instead of the (country-uniform) OECD-modified scale, keeping the rest

[21] Bishop et al. (2014, p. 270) argue that controls correlated with household structure, e.g. marital status or age of household head, could contaminate the results. We do not apply these particular controls.

of the steps of AROP rate construction unchanged.[22] Figure 2 displays the same information twice, making the difference in country ranking more visual.

Figure 2 Objective income poverty rates using OECD-modified and subjective equivalence scales (2017)



Source: EU-SILC 2017 (2016 for the UK). Authors' computations.
Notes: AROP – at-risk-of poverty; SES – subjective equivalence scale. Share of individuals in the populations. Results for 2016 in the UK. EE countries in red, WE countries in blue. EE as a country abbreviation stands for Estonia (not Eastern Europe).

The change of the ranking is only moderate. The lower and upper tails of both rankings are essentially occupied by the same countries, though their order has partially changed.[23] The most

[22] Note that the equivalised income of each household changes, and so does the national median equivalised income.
[23] Similarly, Bishop et al. (2014) concluded that using subjective weights for poverty rates did not alter the rankings of Euro Zone countries. However, as opposed to our study, they applied fixed exogenously determined poverty lines.

substantial shift can be seen in the Netherlands, which jumped from 8th to 20th position. In the opposite direction, Luxembourg changed the positions most considerably, from 16th to 9th.

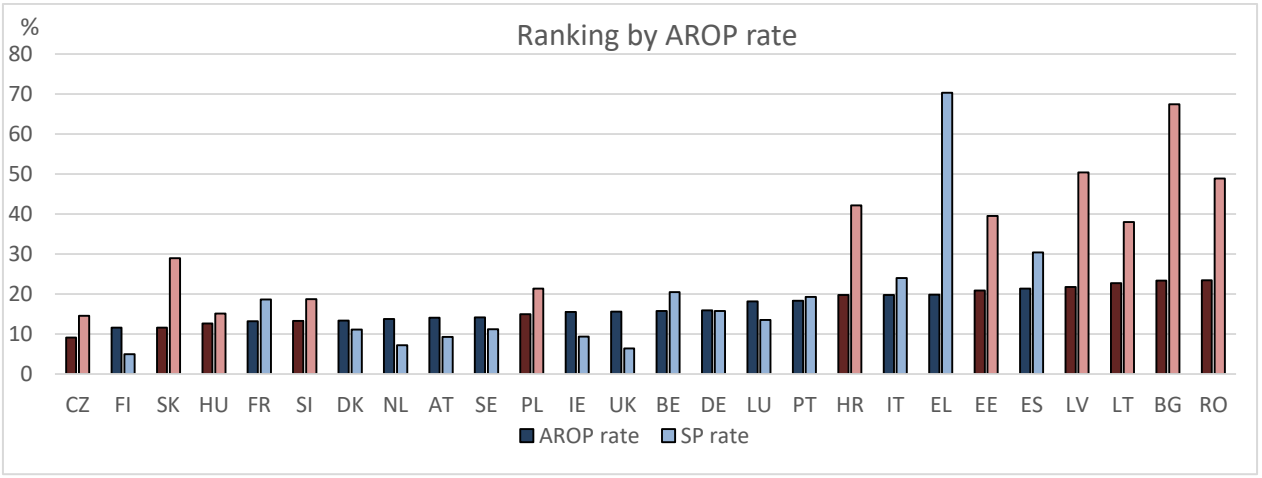
Nevertheless, even moderate changes in the ranking indicate a sensitivity of the AROP rate to the equivalence scale used. Needless to say, more substantial changes might be revealed when we take a closer look at the demographic structure of the AROP (De Vos and Zaidi, 1997, Bishop et al., 2017, Morawski and Domitrz, 2017). Moreover, some countries are more sensitive than others to the equivalence scale. For instance, in the Netherlands, the AROP using SES increases by 6.5 percentage points, while in Luxembourg, it decreases by 1.1 percentage point. As stated by Mysíková and Želinský (2019), both these countries are among those whose AROP rate is relatively sensitive to both adult and child weights, however, in different directions.

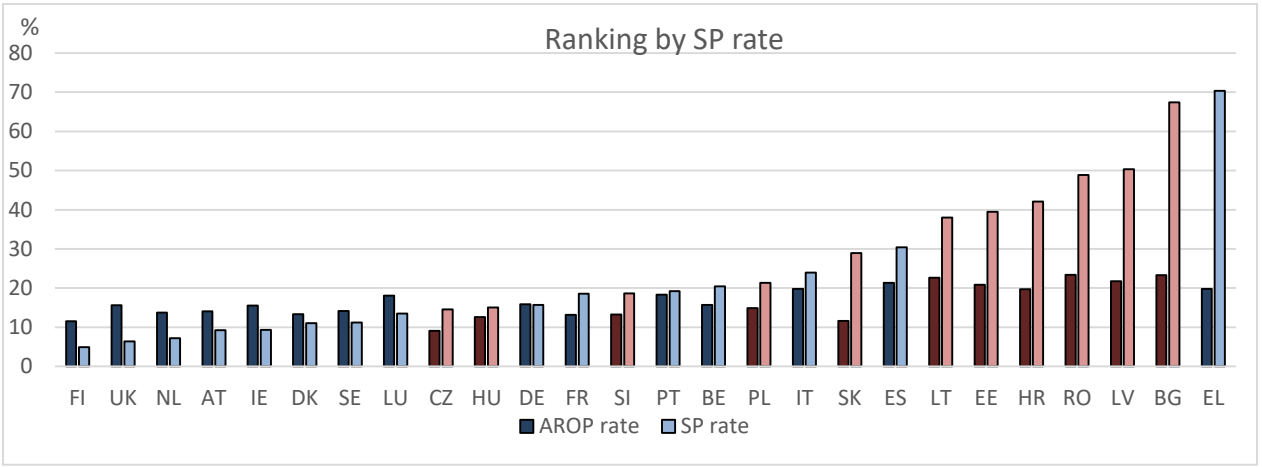
5.3 Subjective and objective income poverty rates

Once we apply the intersection method to derive the single or total SPLs (presented in Table A.3 in Appendix), we can depict the differences between the SP and AROP rates. Though the top and bottom panels of Figure 3 bear exactly the same information, we depict the countries ranked by AROP and SP rates, respectively, to highlight the different rankings. Here, the changes in rankings is much more dramatic than when we compared the AROP rates using OECD-modified scales and SES (Figure 2). While the rates are similar in some countries (e.g., DE and PT), the differences are extreme in others, given the very high SP rates (especially in EL and several Eastern European countries, e.g., BG, LV, RO, HR, EE).

Figure 3 Subjective and objective income poverty rates

With estimated economies of scale higher than the OECD-modified one, their poverty rates inevitably results to lower values.





Source: EU-SILC 2017 (2016 for the UK). Authors' computations.
Notes: AROP – at-risk-of poverty; SP – subjective poverty. Share of individuals in population. EE countries in red, WE countries in blue. Results for 2016 in the UK. EE as a country abbreviation stands for Estonia (not Eastern Europe).

In all Eastern European countries, the SP rate is uniformly higher than the AROP rate. In Western European countries, the opposite mostly holds, with the exception of France, Belgium, Portugal, Italy, Greece, and Spain; there is also an apparent deviation of the Southern European countries from the rest of the WE region. While the AROP-rate ladder is occupied by Eastern European countries at both tails, the SP-rate ranking reveals a much clearer East-West division with more EE countries to the right. Specifically, there appears to be an Eastern-plus-Southern versus Western division. The Czech Republic and Hungary violate this division, nevertheless, their position in the

ladder changed substantially. As we hypothesised, the SP rates result in a more apparent division of European regions.

6. Conclusion

The income poverty rate is a measure that is highly dependent on various steps in its construction, such as the scale used to equivalise the total income of households of different sizes to comparable units. This study questions the use of the current official OECD-modified equivalence scale, which was derived prior to the time when Eastern European countries joined the EU, as the sole scale for cross-national comparisons. The justification for using a single scale is to provide uniformity across European countries. Focusing on the difference between the Eastern European countries – post-communist countries undergoing three decades of economic transition – and Western European countries – "old EU member" states – we argue that the uniformity of this equivalence scale may not be ideal.

Primarily, we base our assumptions on the different consumption expenditure structures of the Western and Eastern European regions, which lead to different economies of scale. Housing and food accounts for more substantial shares of consumption expenditures, creating extremely opposite economies of scale. In countries where housing accounts for relatively less of household income and with food accounting for relatively more, economies of scale are expected to be lower. While shares spent on housing are similar in the two regions, relative expenditures on food are considerably higher in the East (Mysíková and Želinský, 2019), thus, potentially leading to lower economies of scale there.

We confirm our assumption based on our estimations of subjective poverty lines, derived subjective equivalence scales, and comparisons of objective and subjective income poverty rates. This leads to several recommendations. First, we recommend that for cross-national comparisons, country-

specific equivalence scales should be considered along with the official OECD-modified scale. We demonstrate this by showing that the subjective equivalence scales generally differ between Eastern and Western Europe. Moreover, we can confirm that Eastern European countries generally exhibit lower economies of scale than Western European countries when the subjectively assessed minimum income needed by households is considered; ultimately this result is in accordance with statistics on consumption expenditures structure.

Second, we compared the official at-risk-of-poverty (AROP) rates with AROP rates if the subjective equivalence scales derived by this analysis were used instead of the OECD-modified scale, while all other steps in the construction of the AROP rate were kept the same. The change of country rankings is not so dramatic in this case, as the lower and upper tails generally remain occupied by the same countries. Nevertheless, the changes in AROP rates range up to seven percentage points. This study leaves an analysis of the sensitivity of the AROP rate in individual countries to equivalence scales in a more technical way for the future.

Finally, using estimated subjective poverty lines to directly derive subjective poverty (SP) results in rates that considerably change the ranking of European countries. While the official AROP rates lead to a rather random order of countries regardless of regional, economical, or historical or cultural factors, the ranking of countries that results from using our estimated subjective poverty lines shows much clearer patterns. Though we see that our hypothesis of a clear East-West division of the European Union according to the SP rate needs to be slightly modified – not very surprisingly, to an Eastern-plus-Southern versus Western division – we can generally confirm that such divisions do exist.

We hesitate to conclude this study by evaluating whether the subjective equivalence scales are "better" than the OECD-modified scale or whether the subjective income poverty rates "better"

reflect the situation of households than the objective ones, but we do not hesitate to conclude that country-specific equivalence scales would be more appropriate for country-specific purposes, for instance in terms of informing effective social policies, and also for cross-country comparisons.

Country abbreviations

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

References:

Betti, G., M.A. Karadag, O. Sarica, and B. Ucar, "How to Reduce the Impact of Equivalence Scales on Poverty Measurement: Evidence from Turkey," *Social Indicators Research*, 132, 1023–1035, 2017.

Bishop, J.A., A. Grodner, H. Liu, and I. Ahamdanech-Zarco, "Subjective Poverty Equivalence Scales for Euro Zone Countries," *Journal of Economic Inequality*, 12, 265–278, 2014.

Bishop, J.A., J. Lee, and L.A. Zeager, "Adjusting for Family Size in the Supplemental Poverty Measure," *Applied Economics Letters*, 25, 553–556, 2017.

Buhmann, B., L. Rainwater, G. Schmaus, and T.M. Smeeding, "Equivalence Scales, Well-Being, Inequality, and Poverty: Sensitivity Estimates across Ten Countries Using the Luxembourg Income Study (LIS) Database," *Review of Income and Wealth*, 34, 115–142, 1988.

Bütikofer, A. and M. Gerfin, "The Economies of Scale of Living Together and How They Are Shared: Estimates Based on a collective Household Model," IZA Discussion Paper No. 4327, Institute for the Study of Labor, Bonn, 2009.

Carbonnier, C., "Estimating Local Basic Standard of Living Impact on Overall Poverty and Inequality Measures," Paper prepared for and presented at the 8th Meeting of the Society of the Study of Economic Inequality, Paris, France, July 3-5, 2019.

Citro, C. and R. Michael (eds.), *Measuring Poverty: A New Approach*, National Academy Press, Washington, D.C., 1995.

Daley, A., T.I. Garner, E. Sierminska, S. Phipps, and P. Ruggles, "Cross-National Comparisons of Changes in Expenditure Patterns over Time," Paper prepared for the 2014 IARIW 33rd General Conference, Rotterdam, the Netherlands, August 24-30, 2014.

Dang, H.-A., K. Abanokova, and M. Lokshin, "The Important Role of Equivalence Scales: Household Size, Composition, and Poverty Dynamics in Russia," Paper being prepared for the IARIW conference in Moscow, Russia, September 17-18, 2019.

De Vos, K. and T.I. Garner, "An Evaluation of Subjective Poverty Definitions: Comparing Results from the U.S. and the Netherlands," *Review of Income and Wealth*, 37, 267–285, 1991.

De Vos, K. and M.A. Zaidi, "Equivalence Scale Sensitivity of Poverty Statistics for the Member States of the European Community," *Review of Income and Wealth*, 43, 319–333, 1997.

Decancq, K., T. Goedemé, K. Van den Bosch, and J. Vanhille, "The Evolution of Poverty in the European Union: Concepts, Measurement and Data," ImPRovE Methodological Paper No. 13/01, Herman Deleeck Centre for Social Policy – University of Antwerp, Antwerp, 2013.

Engel, E., "Die lebenkosten Belgischer Arbeiter-Familien früher und jetzt," *International Statistical Institute Bulletin*, 9, 1–74, 1985.

Eurostat, "Algorithms to Compute Social Inclusion Indicators Based on EU-SILC and Adopted under the Open Method of Coordination (OMC)," Doc. LC-ILC/39/09/EN-rev.1 1, Eurostat, Luxembourg, 2010.

—, "Methodological Guidelines and Description of EU-SILC Target Variables, 2015 Operation (Version August 2016)," Eurostat, Luxembourg, 2016.

Flik, R. J. and B. van Praag, "Subjective Poverty Line Definitions," *De Economist*, 139, 311–331, 1991.

García-Carro, B. and M.C. Sánchez-Sellero, "Measurement and Spatial Localisation of Subjective Poverty in Spain," *Revista Española de Investigaciones Sociológicas*, 165, 83–100, 2019.

Garner, T.I. and K. Short, "Personal Assessments of Minimum Income and Expenses: What Do They Tell Us About "Minimum Living" Thresholds and Equivalence Scales?," in J.A. Bishop and Y. Amiel, eds., *Inequality, Welfare and Poverty: Theory and Measurement*, Series Research on Economic Inequality, 9, 191–243, UK: Elsevier Science, Oxford, 2003.

—, "Economic Well-Being Based on Income, Consumer Expenditures and Personal Assessments of Minimum Needs," in J.A. Bishop and Y. Amiel, eds., *Studies on Economic Well-being: Essays in the Honor of John P. Formby*, Series Research on Economic Inequality, 12, 319–36, UK: Elsevier Science, Oxford, 2004.

Garner, T. I. and K. De Vos, "Income Sufficiency vs. Poverty: Results from the United States and the Netherlands," *Journal of Population Economics*, 8, 117–134, 1995.

Goedemé, T. et al., "What Does It Mean to Live on the Poverty Threshold? Lessons from Reference Budgets," Herman Deleeck Centre for Social Policy Working Paper No. 17.07, University of Antwerp, Antwerp, 2017.

Goedhart, T., V. Halberstadt, A. Kapteyn, and B.M.S. van Praag, "The Poverty Line: Concept and Measurement," *The Journal of Human Resources*, 12, 503–520, 1977.

Hagenaars, A. and K. de Vos, "The Definition and Measurement of Poverty," *Journal of Human Resources*, 23, 211–221, 1988.

Hagenaars, A., K. de Vos, and A. Zaidi, *Poverty Statistics in the Late 1980s: Research Based on Micro-Data*, Office for Official Publications of the European Communities, Luxembourg, 1994.

Kalbarczyk-Steclik, M., R. Mista, and L. Morawski, "Subjective Equivalence Scale – Cross-Country and Time Differences," *International Journal of Social Economics*, 44, 1092–1105, 2017.

Kapteyn, A., P. Kooreman, and R. Willemse, "Some Methodological Issues in the Implementation of Subjective Poverty Definitions," *The Journal of Human Resources*, 23, 222–242, 1988.

Lazear, E. and R. Michael, *Allocation of Income within the Household*, The University of Chicago Press, Chicago, 1988.

Martin, H., "Calculating the Standard of Living of a Household: One or Several Equivalence Scales?," *Economics and Statistics*, 2017, 93–108, 2017.

Merz, J., T.I. Garner, T.M. Smeeding, J. Faik, and D. Johnson, "Two Scales, One Methodology – Expenditure Based Equivalence Scales for the United States and Germany," MPRA Paper No. 7233, 1994.

Morawski, L. and A. Domitrz, "Subjective Approach to Assessing Poverty in Poland – Implications for Social Policy," *Statistics in Transition New Series*, 18, 501–520, 2017.

Muellbauer, J., "The Estimation of the Prais-Houthakker Model of Equivalence Scales," *Econometrica*, 48, 153–176, 1980.

Mysíková, M. and T. Želinský, "On the Measurement of the Income Poverty Rate: The Equivalence Scale across Europe," *Statistika: Statistics and Economy Journal*, 99, (No. 4, forthcoming), 2019.

Mysíková, M., Želinský, T., Garner, T. I., Večerník, J. Subjective Perceptions of Poverty and Objective Economic Conditions: Czechia and Slovakia a Quarter Century After the Dissolution of Czechoslovakia. *Social Indicators Research*, 145, 523–550, 2019.

Ravallion, M., "Poverty Comparisons: A Guide to Concepts and Methods," LSMS Working Paper No. 88, The World Bank, Washington DC, 1992.

Saunders, P., B. Halleröd, and G. Matheson, "Making Ends Meet in Australia and Sweden: A Comparative Analysis Using Subjective Poverty Line Methodology," *Acta Sociologica*, 37, 3–22, 1994.

Phipps, S. and T.I. Garner, "Are Equivalence Scales the Same for the United States and Canada?," *The Review of Income and Wealth*, 40, 1–17, 1994.

Večerník, J. and M. Mysíková, *Poverty in the Czech Republic: A Critical Look at EU indicators*, Institute of Sociology of the Czech Academy of Sciences, Prague, 2016.

—, "Setting Social Status in Couples and Partners' Discretionary Spending in Central European Countries," *Czech Sociological Review*, 55, (No. 6, forthcoming), 2019.

Appendix

Table A.1 Regression model results (2017)

	AT	BE	BG	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Actual income ln(Y)	0.20**	0.31**	0.16**	0.25**	0.31**	0.24**	0.21**	0.17**	0.13**	0.33**	0.40**	0.23**	0.15**
2 adults	0.26**	0.22**	0.39**	0.20**	0.20**	0.25**	0.37**	0.25**	0.20**	0.12**	0.20**	0.28**	0.27**
3 adults	0.35**	0.28**	0.56**	0.30**	0.27**	0.40**	0.57**	0.40**	0.28**	0.22**	0.26**	0.44**	0.41**
4+ adults	0.45**	0.39**	0.74**	0.40**	0.34**	0.49**	0.72**	0.51**	0.39**	0.33**	0.34**	0.54**	0.56**
1 child	0.05**	0.09**	0.12**	0.07**	0.08**	0.09**	0.14**	0.07**	0.08**	0.10**	0.02	0.11**	0.08**
2+ children	0.12**	0.14**	0.22**	0.14**	0.16**	0.07*	0.17**	0.12**	0.12**	0.15**	0.04*	0.19**	0.18**
Working - share	0.14**	0.03*	0.30**	0.14**	0.07**	0.20**	0.31**	0.09**	0.12**	0.12**	0.09**	0.17**	0.09**
Female - share	-0.02	0.01	-0.08**	-0.07**	0.03**	-0.04	-0.11**	-0.04**	-0.05**	0.04*	-0.01	-0.04*	0.00
Tertiary education - share	0.07**	0.11**	0.05**	0.04**	0.10**	0.14**	0.14**	0.14**	0.15**	0.10**	0.10**	0.16**	0.09**
Young 16-30 - share	-0.12**	-0.07**	0.06*	-0.04*	-0.14**	-0.28**	0.01	-0.06**	-0.03	-0.11**	-0.12**	0.00	-0.02
Owners	-0.12**	-0.00	-0.05	-0.05**	-0.03**	-0.03	-0.01	0.01	-0.05**	-0.15**	-0.00	-0.05	-0.03
Mortgage	0.02	0.08**	0.04	0.05**	0.13**	0.10**	0.09**	0.10**	0.06**	0.03	0.09**	0.00	0.05*
Rooms	0.05**	0.01**	0.03**	0.04**	---	0.04**	0.01**	0.06**	0.03**	0.03**	0.04**	0.02**	0.04**
Dense area	0.09**	0.02	0.12**	0.11**	---	0.07**	---	0.09**	0.07**	0.10**	0.10**	0.16**	0.08**
Medium area	0.07**	-0.04**	0.08**	-0.00	---	0.03	---	0.07**	0.04**	0.04*	0.05**	0.11**	0.02
Great difficulty to MEM	0.11**	0.25**	0.07	0.13**	0.13**	0.24**	0.23**	-0.04	0.14*	0.28**	0.19**	0.18*	-0.02
Difficulty to MEM	0.06*	0.23**	0.09	0.16**	0.14**	0.22**	0.23**	-0.07	0.14*	0.29**	0.16**	0.19*	0.04
Some difficulty to MEM	0.10**	0.20**	0.08	0.12**	0.17**	0.17**	0.20**	-0.06	0.16**	0.22**	0.08*	0.14	0.06
Fairly easily MEM	0.06**	0.11**	0.07	0.06	0.05**	0.10**	0.08	-0.09	0.12*	0.12**	-0.01	-0.00	0.03
Easily MEM	-0.02	0.02	-0.02	-0.00	0.02	0.06**	-0.02	-0.08	0.10	0.06**	-0.05	0.00	0.01
Material deprivation	0.02	0.00	-0.01	-0.01	-0.06**	-0.05	0.04	-0.03**	-0.05*	-0.03	-0.01	-0.06**	-0.05**
Constant	5.38**	4.84**	4.94**	4.48**	4.78**	5.16**	4.95**	5.66**	5.84**	4.29**	4.03**	4.64**	4.65**
Observations	5,958	5,717	7,339	8,698	12,843	4,780	6,119	22,467	13,620	9,536	10,523	6,694	8,040
R-squared	0.51	0.55	0.68	0.53	0.55	0.50	0.61	0.52	0.37	0.48	0.58	0.60	0.45
F	222.8	257.8	504.9	420.2	526.2	165.1	350.6	697.7	205.5	283.5	336.5	346.7	192.7
p	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A.1 Regression model results (cont.)

	IE	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	UK[a)]
Actual income ln(Y)	0.28**	0.08**	0.11**	0.15**	0.25**	0.27**	0.19**	0.31**	0.15**	0.16**	0.21**	0.21**	0.28**
2 adults	0.18**	0.19**	0.31**	0.22**	0.35**	0.11**	0.29**	0.18**	0.17**	0.15**	0.28**	0.24**	0.17**
3 adults	0.25**	0.30**	0.51**	0.28**	0.49**	0.18**	0.41**	0.27**	0.20**	0.30**	0.41**	0.40**	0.15**
4+ adults	0.33**	0.41**	0.70**	0.45**	0.65**	0.21**	0.54**	0.35**	0.16**	0.37**	0.53**	0.55**	0.23**
1 child	0.09**	0.07**	0.14**	0.06*	0.13**	0.06**	0.04**	0.06**	0.10**	0.03	0.04*	0.10**	0.08**
2+ children	0.10**	0.16**	0.19**	0.13**	0.21**	0.09**	0.11**	0.15**	0.16**	0.12**	0.08**	0.17**	0.16**
Working - share	0.11**	0.14**	0.22**	0.02	0.24**	0.02	0.13**	-0.01	0.09**	0.16**	0.19**	0.18**	0.12**
Female - share	0.06*	-0.05**	0.00	-0.01	-0.07**	-0.01	-0.00	-0.06**	-0.01	-0.02	-0.05**	-0.08**	-0.01
Tertiary education - share	0.18**	0.11**	0.09**	0.19**	0.10**	0.14**	0.10**	0.24**	0.03	0.09**	0.08**	0.07**	0.20**
Young 16-30 - share	-0.11*	-0.02	0.01	-0.07*	0.08*	-0.14**	-0.06**	-0.00	0.12**	-0.12**	-0.07**	-0.02	-0.06
Owners	-0.01	-0.00	0.03	-0.18**	0.01	-0.05	-0.09**	-0.07**	0.04	-0.12**	0.00	-0.05*	-0.07**
Mortgage	0.17**	0.10**	0.18**	0.11**	0.20**	0.09**	0.10**	0.11**	0.19*	0.01	0.15**	0.04	0.16**
Rooms	0.02*	0.03**	0.02*	0.03**	0.01*	0.02**	0.03**	0.03**	0.03*	0.03**	0.03**	0.03**	0.05**
Dense area	0.07**	0.08**	0.01	0.05	---	---	0.13**	0.11**	0.24**	0.10**	---	0.08**	-0.02
Medium area	0.05	0.04**	0.15**	0.11**	---	---	0.08**	0.06**	0.20**	0.06**	---	0.04*	-0.03
Great difficulty to MEM	0.31**	0.03	-0.23	0.10*	0.42**	0.04	-0.03	0.23**	0.15	0.31**	0.20**	0.22**	0.22**
Difficulty to MEM	0.23**	0.06	-0.13	0.14**	0.43**	0.11**	0.01	0.25**	0.04	0.23**	0.21**	0.21**	0.15**
Some difficulty to MEM	0.15*	-0.05	-0.12	0.12**	0.39**	0.10**	0.02	0.20**	0.02	0.22**	0.21**	0.18**	0.09**
Fairly easily MEM	0.11	-0.08	-0.23	0.00	0.27*	0.06**	-0.02	0.12	-0.07	0.12**	0.08	0.16**	0.04
Easily MEM	0.11	-0.07	-0.14	0.02	0.15	0.01	-0.01	0.06	-0.05	0.07**	0.03	0.13*	0.02
Material deprivation	-0.08	-0.08**	0.00	-0.02	-0.07**	0.03	-0.04*	-0.05*	-0.08*	-0.01	-0.04	-0.10**	-0.11**
Constant	4.61**	6.47**	5.46**	6.27**	4.37**	4.92**	4.75**	4.06**	4.72**	5.66**	4.97**	4.80**	4.54**
Observations	4,331	21,967	4,839	3,771	5,733	9,787	12,540	11,929	7,275	4,277	8,801	5,418	9,541
R-squared	0.41	0.30	0.46	0.38	0.62	0.35	0.51	0.41	0.10	0.38	0.48	0.50	0.43
F	92.21	302.4	93.43	68.15	384.4	156.0	368.8	195.5	37.19	134.5	360.6	185.5	231.2
p	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: EU-SILC 2017 (2016 for the UK). Authors' computations.

Notes: * statistically significant at the 5% level, ** statistically significant at the 1% level. MEM – make/ing ends meet. a) Results for 2016. EE as a country abbreviation stands for Estonia (not Eastern Europe).

Table A.2 Subjective equivalence scales: weights for adults and children (2017) – *WITHOUT controls*

	Weight of				Weight of		
	2nd adult	3rd adult	4th and next adults	**Adults - final**	1st child	2nd and next children	**Children - final**
Eastern Europe							
BG	0.672	0.433	0.465	**0.579**	0.304	0.160	**0.248**
CZ	0.278	0.200	0.211	**0.255**	0.189	0.149	**0.171**
EE	0.638	0.488	0.383	**0.582**	0.329	0.071	**0.213**
HR	0.472	0.356	0.194	**0.379**	0.243	0.150	**0.195**
HU	0.399	0.259	0.331	**0.359**	0.127	0.163	**0.142**
LT	0.414	0.371	0.366	**0.399**	0.316	0.073	**0.221**
LV	0.646	0.371	0.403	**0.557**	0.341	0.136	**0.263**
PL	0.437	0.150	0.168	**0.305**	0.128	0.128	**0.128**
RO	0.221	0.052	-0.090	**0.114**	0.182	0.041	**0.123**
SI	0.441	0.305	0.272	**0.385**	0.173	0.144	**0.159**
SK	0.434	0.313	0.318	**0.375**	0.233	0.143	**0.194**
Simple average				***0.390***			***0.187***
Western Europe							
AT	0.395	0.197	0.195	**0.332**	0.185	0.169	**0.178**
BE	0.309	0.145	0.242	**0.273**	0.251	0.139	**0.192**
DE	0.293	0.122	0.077	**0.255**	0.201	0.228	**0.214**
DK	0.341	0.277	0.061	**0.321**	0.295	0.189	**0.238**
EL	0.390	0.290	0.248	**0.344**	0.174	0.092	**0.133**
ES	0.235	0.087	0.182	**0.194**	0.211	0.099	**0.163**
FI	0.123	0.178	0.217	**0.135**	0.438	0.272	**0.350**
FR	0.392	0.212	0.199	**0.349**	0.178	0.141	**0.159**
IE	0.254	0.023	0.110	**0.191**	0.322	0.085	**0.196**
IT	0.197	0.166	0.201	**0.190**	0.168	0.140	**0.156**
LU	0.255	0.068	0.373	**0.237**	0.289	0.152	**0.225**
NL	0.175	0.064	-0.005	**0.147**	0.137	0.132	**0.134**
PT	0.316	0.186	0.217	**0.271**	0.213	0.216	**0.214**
SE	0.162	0.256	0.046	**0.167**	0.177	0.218	**0.200**
UK[a)]	0.317	-0.050	0.167	**0.246**	0.310	0.274	**0.292**
Simple average				***0.243***			***0.203***

Source: EU-SILC 2017 (2016 for the UK). Authors' computations.
Notes: a) Results for 2016. EE as a country abbreviation stands for Estonia (not Eastern Europe).

Table A.3 Subjective poverty rates using total and partial subjective poverty lines (2017)

	Total SPL (EUR monthly)	**Mean DI** (EUR monthly)	**SP rate (based on total SPL)**	**rank**	**SP rate (based on partial SPLs)**	**rank**	**Difference in SP rate**	**rank**
EE:								
BG	**801**	630	67.4	25	80.7	26	-13.3	-1
CZ	**699**	1234	14.5	9	13.3	8	1.2	1
EE	**1200**	1334	39.5	21	52.8	21	-13.4	0
HR	**942**	997	42.1	22	53.2	22	-11	0
HU	**410**	757	15.1	10	13.8	9	1.3	1
LT	**723**	962	38.0	20	45.3	20	-7.3	0
LV	**1069**	1011	50.4	24	63.9	24	-13.6	0
PL	**658**	1036	21.3	16	24.4	16	-3.1	0
RO	**455**	449	48.8	23	53.6	23	-4.7	0
SI	**1188**	1855	18.7	13	20.0	14	-1.3	-1
SK	**937**	1155	28.9	18	35.9	19	-7	-1
WE:								
AT	**1488**	3591	9.3	4	8.1	4	1.2	0
BE	**1985**	3206	20.5	15	21.9	15	-1.4	0
DE	**1570**	3004	15.7	11	15.2	11	0.6	0
DK	**1766**	3889	11.1	6	9.0	7	2	-1
EL	**1714**	1273	70.3	26	79.3	25	-9	1
ES	**1556**	2316	30.4	19	33.6	18	-3.2	1
FI	**1129**	3203	4.9	1	3.0	1	1.9	0
FR	**1967**	3296	18.6	12	19.1	12	-0.5	0
IE	**1595**	3955	9.3	5	8.5	6	0.8	-1
IT	**1593**	2565	23.9	17	26.4	17	-2.5	0
LU	**2847**	5857	13.5	8	14.0	10	-0.6	-2
NL	**1283**	3273	7.2	3	5.4	2	1.8	1
PT	**781**	1535	19.2	14	19.6	13	-0.4	1
SE	**1463**	3344	11.2	7	8.2	5	2.9	2
UK[a)]	**1133**	3307	6.4	2	5.7	3	0.7	-1

Source: EU-SILC 2017 (2016 for the UK). Authors' computations.

Notes: DI – household disposable income. "Total SPL" considers a single subjective poverty line for the whole population. "Partial SPLs" consider different subjective poverty lines for twelve various household types (combinations of 1 to 4+ adults and 0 to 2+ children). Rank – from lowest to highest rate within 26 European countries.

a) Results for 2016. EE as a country abbreviation stands for Estonia (not Eastern Europe).