



Munich Personal RePEc Archive

On the measurement of the income poverty rate: The equivalence scale across Europe

Mysíková, Martina and Želinský, Tomáš

Institute of Sociology of the Czech Academy of Sciences, Faculty of Economics, Technical University of Košice

2019

Online at <https://mpra.ub.uni-muenchen.de/108880/>
MPRA Paper No. 108880, posted 26 Jul 2021 14:16 UTC

On the measurement of the income poverty rate: The equivalence scale across Europe

Martina Mysíková¹, Tomáš Želinský^{1,2}

¹ Institute of Sociology of the Czech Academy of Sciences, Jilská 1, 110 00 Praha 1, Czechia

² Faculty of Economics, Technical University of Košice, Némcovej 32, 040 01 Košice, Slovakia

Corresponding author's email: martina.mysikova@soc.cas.cz

Abstract:

The methodology used to determine the at-risk-of-poverty rate commonly applied in the European context is often criticised for arbitrary steps in its construction. This study questions the first step – the equivalence scale applied to transform the disposable income of households of different sizes into comparable units. First, we hypothesise that economies of scale are lower in Central-Eastern European countries than in their Western counterparts. We assess the hypothesis using a simple descriptive analysis of the structure of household consumption expenditures based on Household Budget Survey data. Second, we demonstrate the sensitivity of the at-risk-of-poverty rate to an equivalence scale based on the Statistics on Income and Living Conditions data. We identify three different groups of countries according to the sensitivity of the income poverty rate to the relative adult and child household member weights assigned by the equivalence scale. The study contributes to the discussion on defining accurate, country-specific equivalence scales.

Keywords: Central-Eastern Europe, equivalence scale, income poverty rate, sensitivity, Western Europe

JEL codes: I32

INTRODUCTION

Income has been thoroughly analysed from numerous perspectives. For instance, total household income is examined in studies on income inequality and income sources, and individual income and earnings are included when researchers are interested in its contributory factors. However, calculating an equivalent income per household member is often a more convenient measure, for instance, in studies on income poverty indicators. Income poverty can be assessed using objective or subjective, and relative or absolute approaches. The objective and relative approach prevails 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 relevant national median income. The absolute level of the poverty threshold thus differs for each country. This relative approach, therefore, captures income disparity across countries “to some extent”. Determination of the poverty line and estimation of the poverty rate depend heavily on the equivalence scale used to obtain the “equivalised” household income.

The commonly used OECD-modified equivalence scale was adopted in the EU in the 1990s (as a modification of the original 1980s OECD scale), and even the authors of the scale warned that “...more research efforts should be devoted to the choice of equivalence scales which can be used for cross-country comparisons. One principal issue to be resolved is whether in the cross-country comparisons we should use a single equivalence scale for all the Member States, or whether a single methodology should be applied to estimate equivalence scales which can be different across different countries.” (Hagenaars et al., 1994, p. 194). It is understood that economies of scale can be strongly country-specific, depending on the national structure of living costs, consumption of durable and non-durable goods, and goods with different economies of scale in general.

The literature on the sensitivity of income-based poverty and inequality measures to equivalence scales was relatively rich up to two decades ago (Buhmann et al., 1988, Coulter et al., 1992, Jenkins et Cowell, 1994, Banks et Johnson, 1994, Lanjouw et Ravallion, 1995, Burkhauser et al., 1996; de Vos et Zaidi, 1997, Aaberge et Melby, 1998). Most of the 1980s and 1990s studies took into account a very limited number of equivalence scales, and only a minority considered analysing a wider range of weights. Recently, scholars have been more focused on construction of equivalence scales based on different approaches, while comparing their sensitivity to commonly adopted equivalence scales (see, e.g., Bishop et al., 2014), assessing the robustness of poverty rates (Cheung

et Chou, 2017), analysing differences in income characteristics between subpopulations (see, e.g., Posel et al., 2016), or cross-country comparisons with respect to the sensitivity to equivalence scales (Dhongde et Minoiu, 2013, Ravallion, 2015).

There is a wide range of possible scales between the extremes of ignoring household size (i.e., using a total household income) and applying income per capita. The scale can be derived according to equivalence elasticity, by a rule of thumb, or developed empirically based on survey data. The choice of the scale substantially influences cross-country comparisons, the ranking of countries on both poverty and inequality scales, and the demographic composition of poor populations (Buhmann et al., 1988). Scales have usually been estimated based on consumption/expenditure data (Lazear, et Michael, 1980, Van der Gaag et Smolensky, 1982) or subjective data such as income evaluation question (Kapteyn et al., 1988, Van Praag et al., 1982), minimum income question (Danziger et al., 1984), or income satisfaction (van Praag et Ferrer-i-Carbonell, 2004). The literature on equivalence scales in the CEE countries, or the Czech Republic particularly, is scarce. Partially, the topic has been examined by Brázdilová et Musil (2017) and previously by Želinský et Tartařová (2012), in the Czech and Slovak contexts, respectively; while empirical research has been focused on income poverty more generally (for instance, Bartošová et Želinský, 2013, Večerník et Mysíková, 2016, Mysíková et al., 2019).

The OECD (-modified) equivalence scale was established long before the current European Union was formed. Research in that period was mainly driven by the leading Western European countries. The former socialist Central and Eastern European block then adopted the “Western European” equivalence scale when they joined the EU, regardless of differences in the structures of household consumption expenditures which inevitably existed. Even if we assume that the 1990s equivalence scale fits the current Western European consumption structure, it is very likely that the scale does not accurately reflect the current structure of consumption in Central and Eastern European countries.

First, this paper aims to justify the hypothesis that the same set of equivalence scales should not be used uniformly across Europe. The methodological and empirical literature on equivalence scales was booming more than two decades ago, but has taken a backseat since. We highlight the differences between Central-Eastern and Western European regions to motivate the current research to focus specifically on national equivalence scales. We argue that equivalence scales

should reflect the economies of scale of a particular country, and thus should be based on the consumption structure of that particular country. In order to assess this hypothesis, we perform a descriptive analysis of consumption expenditure structures in Central-Eastern and Western European countries (Section 1). The second goal of this study is to demonstrate the sensitivity of the impact of the equivalence scale applied on the resulting at-risk-of-poverty rate. The sensitivity analysis aims to identify countries which should be cautious about interpreting their income poverty rate and applying anti-poverty policies based on the OECD-modified equivalence scale (Section 2). The final section summarizes, concludes, and describes further steps that should be undertaken in order to achieve more comparable indicator of income poverty across Europe.

1. CONSUMPTION EXPENDITURE STRUCTURE

The Household Budget Survey (HBS) is conducted in EU countries every five years, and provides information on the detailed structures of household consumption expenditures.¹ The structure of household expenditures can serve as an appropriate tool to define at least the basic features of country-specific expenditure behaviour – and so is a clue in indicating country specific or regional differences in equivalence scales. First, we hypothesise that economies of scale are substantially different between the Central and Eastern (CEE) and Western (WE) European regions.² The Central-Eastern region is composed of post-communist countries distinguished by relatively low wages, while the Western region includes “old” EU-member states with typically higher wages. However, for the purposes of our study, the structure of consumption expenditures together with the related economies of scale of the most substantial consumption expenditures categories (COICOP classification) are of greater importance than income level.

Table 1 shows the differences in consumption structure between Central-Eastern and Western Europe according to the basic COICOP classification (twelve categories). The largest share of consumption expenditures is represented by “Housing, water, electricity, gas and other fuels” (“Housing” hereafter, COICOP 4), which comprises on average about 30% of household

¹ HBS is not fully harmonised by Eurostat, meaning that countries have a certain degree of freedom in the survey outcomes they deliver (e.g., CZ used quota sampling up to the HBS 2015; next HBS wave will have been conducted on random sampling). These possible differences must be taken into consideration.

² The division corresponds to the new and old EU member countries. However, we exclude Malta and Cyprus from the analysis, as they are not post-communist countries.

expenditures in both CEE and WE, with a statistically significant difference only in 2010. Though the housing consumption expenditures are relatively similar at the regional level, countries in the CEE region exhibit a substantially higher variance than those in WE. The bar charts in Figure 1 support this, suggesting a few different clusters of countries within the region. Clearly, one group would consist of CZ and LV, as these countries are located far below the CEE average in all three time periods observed. The opposite group of countries, which are always above or around the CEE average would include BG, HR, PL, and SK.³ The rest of the CEE countries are more difficult to evaluate at first glance as, for instance, the share of expenditure on housing was substantially decreasing over time in EE.

Housing expenditures can be expected to exhibit large economies of scale; for instance, the costs of a single individual change only marginally when a second person moves into the household. The structure of consumption expenditures is relevant for economies of scale: the larger the share of housing expenditures in the total household budget is, the higher the overall economies of scale are. Therefore, we suppose that at least a part of the CEE⁴ has lower economies of scale from cohabitation than is typical in WE countries. Consequently, with respect to the main idea of the equivalence scale concept, the weight of second (and additional) person/s in the household should be higher in these CEE countries than in WE countries.

The consumption expenditure on “Food and non-alcoholic beverages” (“Food” hereafter, COICOP 1) is the second largest item in household budgets. On average, across all European countries included in the analyses, it comprises 17% of household budgets, but the differences between the CEE and WE regions are substantial: “Food” accounts for roughly 25% of household expenditures in CEE countries, but only about 14% in WE (see Table 1), with the difference being highly statistically significant. As opposed to housing expenditures, food is expected to exhibit very low economies of scale. Though joint cooking might be more efficient than cooking separately, we can assume that individuals consume the same volume of food regardless of whether they live separately or in a shared household. With the higher share of expenditures on food in the CEE, we again assume that economies of scale arising from shared living situations are lower in CEE than in WE countries, with almost complete uniformity across all CEE countries.

³ Country abbreviations are stated in Table 2.

⁴ Countries with substantially lower shares of consumption expenditures on housing than are common in WE countries.

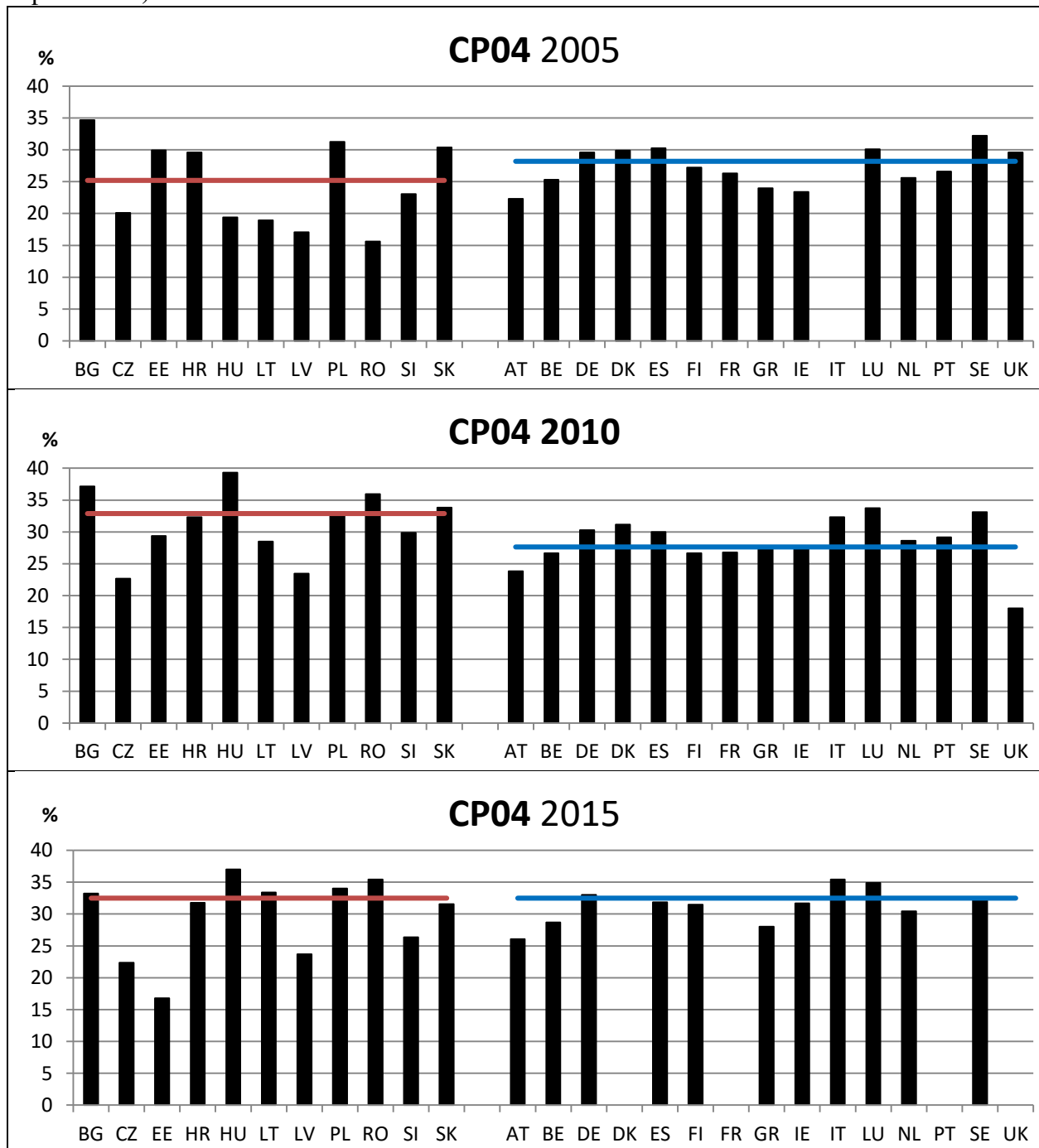
Table 1 Structure of consumption expenditure by COICOP (%) – regional averages (weighted by country population share)

	2005				2010				2015			
	CEE		WE		CEE		WE		CEE		WE	
CP01 Food and non-alcoholic beverages	29.0*	(9.0)	12.7*	(2.6)	24.4*	(5.0)	14.0*	(2.6)	23.2*	(4.4)	14.0*	(3.0)
CP02 Alcoholic beverages, tobacco and narcotics	3.5	(1.4)	2.3	(0.6)	3.4	(1.4)	2.2	(0.5)	3.3	(1.6)	1.9	(0.5)
CP03 Clothing and footwear	5.3	(1.1)	5.6	(1.0)	4.5	(1.0)	5.1	(0.9)	4.6	(0.7)	4.7	(0.3)
CP04 Housing, water, electricity, gas and other fuels	25.2	(7.6)	28.2	(2.3)	32.9*	(5.0)	27.6*	(4.8)	32.5	(5.0)	32.5	(2.4)
CP05 Furnishings, household equipment and routine maintenance of the house	4.5*	(1.0)	5.8*	(0.7)	4.2*	(1.2)	5.4*	(1.0)	4.2	(1.0)	4.7	(0.7)
CP06 Health	3.8	(1.0)	3.1	(1.4)	3.9	(0.8)	2.9	(1.3)	4.0	(1.0)	3.9	(1.1)
CP07 Transport	8.6*	(2.8)	12.9*	(1.4)	8.1*	(2.5)	13.5*	(1.5)	8.2*	(2.7)	12.3*	(1.4)
CP08 Communications	4.9*	(0.6)	2.9*	(0.3)	4.2*	(0.5)	2.8*	(0.4)	4.4*	(0.6)	2.7*	(0.4)
CP09 Recreation and culture	6.2*	(2.3)	9.5*	(2.7)	6.2	(2.7)	9.1	(3.0)	5.6	(2.2)	7.9	(2.8)
CP10 Education	0.9	(0.3)	1.0	(0.5)	0.8	(0.4)	1.1	(0.7)	0.7	(0.3)	1.0	(0.6)
CP11 Restaurants and hotels	2.6*	(1.5)	6.2*	(2.2)	2.7*	(1.5)	6.5*	(2.1)	3.4*	(1.6)	6.1*	(1.8)
CP12 Miscellaneous goods and services	5.5*	(2.3)	9.9*	(2.9)	4.7*	(1.5)	9.8*	(2.7)	5.7*	(1.7)	8.4	(1.9)

Source: Eurostat database (variable hbs_str_t211) based on the Household Budget Survey; average population (Eurostat database, variable demo_gind) used for weights. Authors' calculations.

Notes: * The means in Eastern and Western Europe are statistically different at the 5% level (t-test). Standard deviations in parentheses.

Figure 1 Consumption expenditure on Housing, water, electricity, gas and other fuels (% of total expenditures)



Source: Eurostat database (variable hbs_str_t211) based on the Household Budget Survey; average population (Eurostat database, variable demo_gind) used for weighted mean (depicted by the horizontal lines). Authors' calculations.

Similarly to housing, the variability of food expenditures among CEE countries is somewhat greater than in WE (see Figure 2). The largest share of consumption expenditure on food is in RO,

BG, and LT, and the smallest in SI. No CEE country spends lower share on food than any WE country, except SI. Therefore, we assume that food consumption expenditures considerably support our hypothesis that there are lower economies of scale in CEE countries and, thus, the greater weight of the second (and additional) person/s in the household on the equivalence scale.

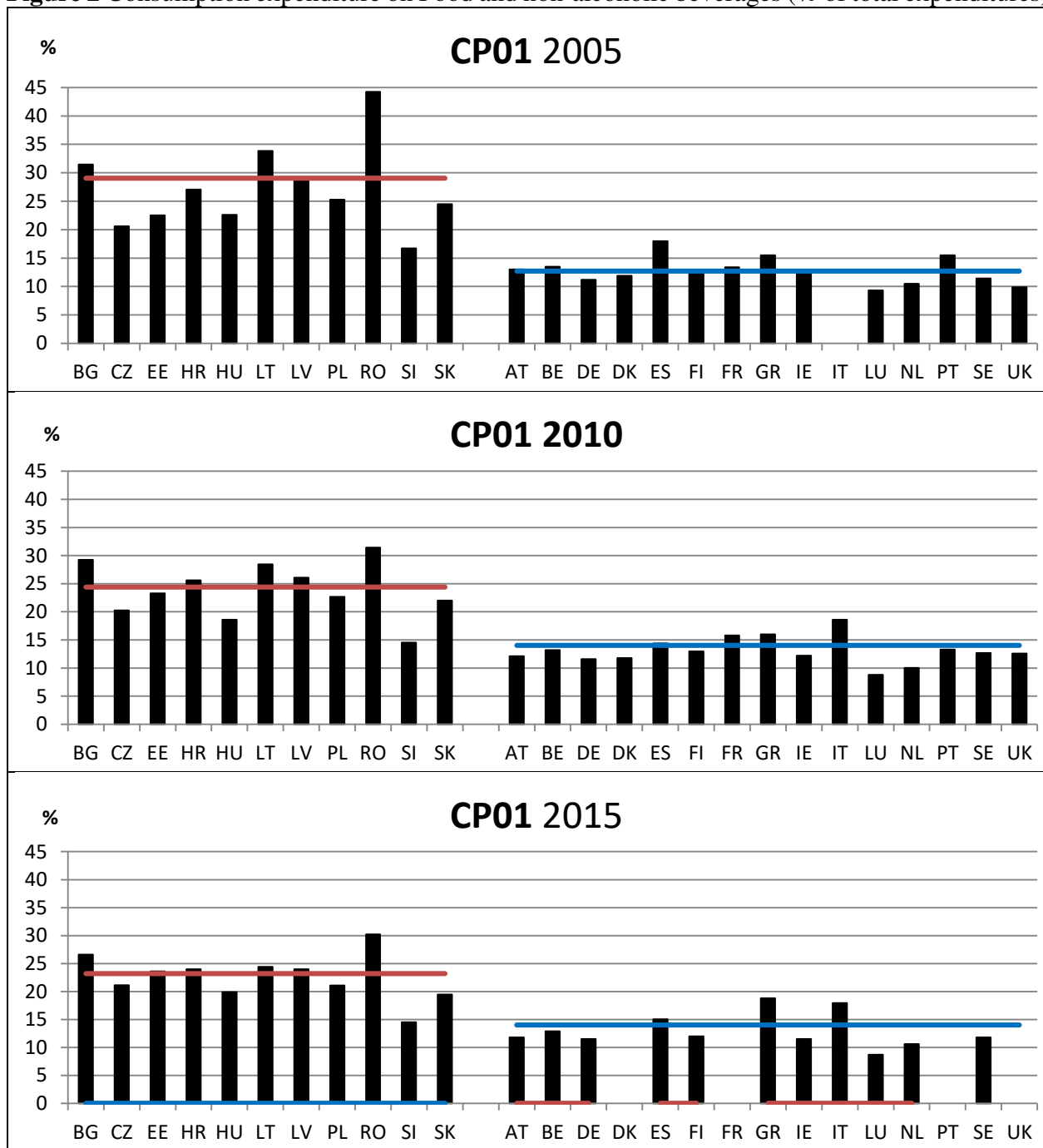
Each of the remaining categories of consumption expenditures comprise about 10% or less of household budgets. The following categories, in descending order of their share of the total expenditures, are: Transport (COICOP 7), Miscellaneous goods and services (COICOP 12), Recreation and culture (COICOP 9), and Restaurants and hotels (COICOP 11).⁵ Inhabitants of WE countries spend, on average, a larger share of their household budgets on these four categories than those living in CEE countries. These categories are miscellaneous in nature, and we do not intend to speculate about their economies of scale at this level of our analysis.

However, the two main consumption categories (Housing and Food), which have clearly predictable directions of economies of scale, account for about 55% of all household expenditures in CEE, and roughly 45% in WE. Though this descriptive analysis does not provide any “proof”, it clearly indicates that economies of scale can be expected to be lower in the CEE than in the WE region, and that the weight of the second (and additional) household member/s should be higher in CEE. The next section focuses on the consequences of using different equivalence scales.

The CEE countries with statistics that most strongly support our assumptions are those with below-average shares of expenditures on Housing and above-average expenditures on Food: LT and LV. In WE, the opposite direction of shares of expenditures conforming to our assumptions, i.e., above-average shares of expenditures on Housing and below-average expenditures on Food: LU, DE, DK, and SE play into our hands. On the other side, data on PL and SK in the Central-Eastern region and GR in the Western region contradict our assumptions.

⁵ The other six categories (COICOP 2, 3, 5, 6, 8, and 10) do not reach 5% of consumption expenditure share in either region.

Figure 2 Consumption expenditure on Food and non-alcoholic beverages (% of total expenditures)



Source: Eurostat database (variable hbs_str_t211) based on the Household Budget Survey; average population (Eurostat database, variable demo_gind) used for weighted mean (depicted by the horizontal lines). Authors' calculations.

2. SENSITIVITY ANALYSIS OF THE IMPACT OF EQUIVALENCE SCALES ON THE AT-RISK-OF-POVERTY RATE

In the previous section, we described clues that signal lower economies of scale in CEE than in WE. Now we proceed to illustrate the sensitivity of the resulting at-risk-of-poverty rates to equivalence scale. We focus mainly on the difference between the CEE and WE regions, though the CEE region seems to be more heterogeneous, and will require more focused distinctions in future analyses.

2.1 Data and methodology

We use the European Union – Statistics on Income and Living conditions (EU-SILC, known in CZ as “Životní podmínky”) survey data for 2016 (and partially for 2006 and 2011). The survey is compulsory for all EU member countries and is harmonised by Eurostat. It is thus a convenient data source for international comparisons, and is utilized to determine official poverty statistics. Information is collected at the household and individual levels, and includes core and basic socio-demographic characteristics along with detailed information on income sources and living conditions. The income reference period is the calendar year preceding the dates of the survey in most countries, hence, the income poverty rates from EU-SILC 2016 in fact correspond to 2015, so it fits the HBS 2015 data presented in the previous section of this paper.

The OECD-modified scale, used to calculate the official at-risk-of-poverty rate indicator (income poverty rate, hereafter), assigns a weight of 1 to the first adult household member. All other adults and household members older than 13 are assigned a weight of 0.5, while each child aged 13 or younger has a weight of 0.3. The sum of the weights of all household members then provides the “equivalised household size”. The total disposable household income is then divided by the equivalised household size to obtain the equivalised household income.

For a detailed example, imagine a two-adult household, in which each adult has a net monthly income of 10,000 CZK, for a total household income of 20,000 CZK.⁶ Their equivalised household size is 1.5, yielding an equivalised income of $20,000/1.5 = 13,333$; the equivalent of the income of each adult household member. Computing the income poverty rate as a percentage of persons in

⁶ The income poverty rate is calculated from annual income, but monthly income serves better for illustration.

the population below the poverty line thus takes into account the economies of scale from living together: the amount of 13,333 CZK is calculated for both adults (rather than the actual income of 10,000 CZK), since they save some costs by living together, though they would each have an income of 10,000 CZK if they lived separately and alone. The poverty line is then expressed as 60% of the median of the equivalised disposable income.

Our main hypothesis is that the weights assigned by the OECD-modified equivalence scale do not necessarily properly reflect the economies of scale from cohabitation and cost-sharing, particularly in Central-Eastern European countries. At this stage of the research, our aim is not to provide new, country-specific equivalence scales. We limit our contribution to providing evidence that the income poverty rates can be highly sensitive to the equivalence scale used. We believe that one of the requirements of a good equivalence scale is low sensitivity of the income poverty rate to the relative weights of adult and child household members. When the income poverty rate changes substantially in response to a moderate change in the equivalence scale, the explanatory power of the income poverty rate is very low and cannot be accurately used to inform social policies.

In order to demonstrate the sensitivity of income poverty to the equivalence scale, we compute the income poverty rates for a wide range of combinations of the weights assigned to adult and child household members. Specifically, we simulate poverty rates on a grid with adult and child weights ranging from 0 to 1 by 0.01 unit. Put differently, we estimate the income poverty rate for each combination of adult and child household member weights in $\{0, 0.01, 0.02, \dots, 1\}$, i.e., we generate a grid of 10,201 different combinations. For instance, were the weights of both (and additional) adults and children equal to zero, the income considered would correspond to total household income (the equivalised household size would equal one), and the economies of scale would be at their maximum (bottom left corners in figures 3). However, were the weights of both adults and children equal to one, the income considered would correspond to income per capita, meaning that there are no economies of scale at all (right top corners in figures 3).

Using this approach, we present the main results visually, i.e., we construct level plots with income poverty rate as the response variable, while adult and child household member weights are evaluated on a grid (as described above). We include only selected plots in this paper, but all available plots are available from the authors upon request.

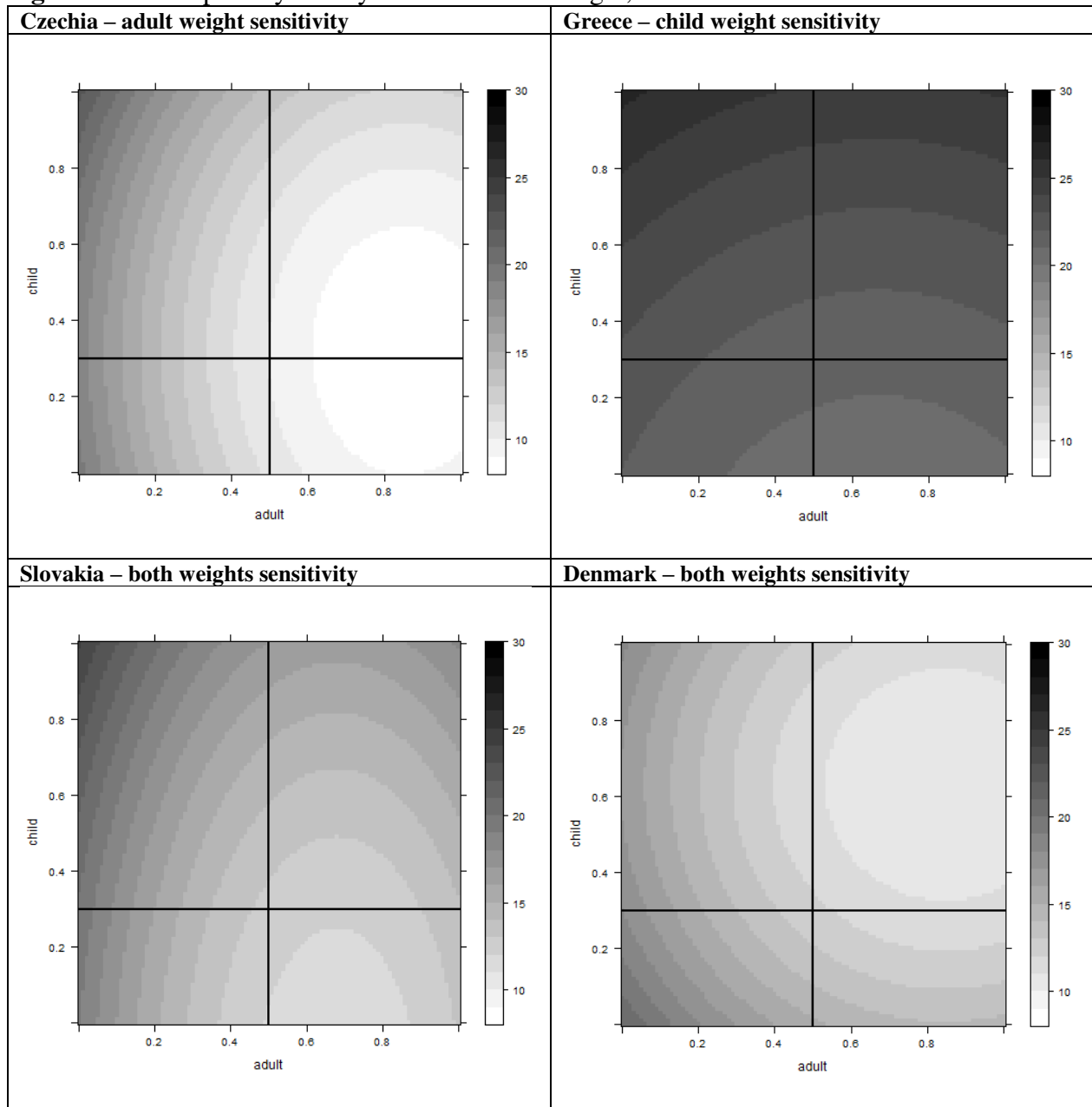
In addition to the visual outputs, for each country we report selected characteristics. We first show the official income poverty rate based on the OECD-modified scale, and the mean income poverty rate based on values of potential poverty rates from our grid of different combinations of adult/child household member weights. Next, we present two simple measures of the sensitivity of the income poverty rate to adult/child household member weights. (1) The overall coefficient of variation of the potential poverty rate (based on the grid) reflects the overall level of the sensitivity of the income poverty rate to adult/child household member weights. Higher values are associated with higher sensitivity to weights. This measure, however, does not allow us to identify whether the resulting level of sensitivity is primarily caused by greater sensitivity to adult or child household member weights. For that reason, we also (2) compute separate coefficients of variation of the income poverty rate for the adult household member weight ranging from 0 to 1, while keeping child household member weight constant (repeatedly for each value of the child weight), and report the mean coefficient of variation. Similarly, we also compute the mean coefficient of variation of income poverty rate with respect to child household member weight, while keeping adult household member weight constant. Comparing the latter two separate measures of variation (see the two last columns of Table 3) allows us to determine whether the income poverty rate is more sensitive to adult or child household member weights, or whether it is the case that the income poverty rate is sensitive to both weights.

2.2 Results

The intersection of the horizontal and vertical lines in Figure 3 corresponds to the actual income poverty rate based on the OECD-modified equivalence scale. The images typically show a part of a “reversed hill”: the brighter the area, the lower the resulting income poverty rate. The units of the scale are the same at all figures, which helps us to show the sensitivity of the income poverty rate to the weights assigned by the equivalence scale in an illustratively convenient way.

The countries can be roughly divided into three groups. First, countries which exhibit relatively high sensitivity to the adult weight but relatively low sensitivity to the child weight – Czechia is an example of this (see top left panel in Figure 3). Taking the intersection as a starting point (the OECD-modified scale), it is clear that moving along the horizontal line is accompanied by rapid changes in the income poverty rate. On the other hand, moving along the vertical line barely changes it.

Figure 3 Income poverty rate by adult and child weight, 2016



Source: EU-SILC 2016. Authors' calculations.

Note: Figures for all countries are not stated due to space restrictions, but are available upon request.

Greece serves as an example of the second type of countries – those with relatively high sensitivity to the child weights but very low sensitivity to the adult weights. Here, moving along the horizontal line barely results in a change in the income poverty rate, while moving along the vertical line exhibits rapid changes. The third group of countries can be characterised by a relatively strong

sensitivity to both of the weights: changes in either influences the income poverty rate substantially. Slovakia and Denmark form our examples.

Table 2 shows the basic rough division of countries according to their sensitivity to either of the weights, with the OECD-modified equivalence scale as the starting point. Prevailing sensitivity to child weight is rather uncommon - these patterns can be seen only in Greece and Italy. Relatively high sensitivity to adult weights is mildly prevalent in CEE countries, while fewer countries exhibit a sensitivity to both weights. The opposite seems to hold in WE, where sensitivity of the income poverty rate can be assigned to both weights in the majority of countries.

Table 2 Sensitivity of income poverty rate by adult and child weight – groups of countries, 2016

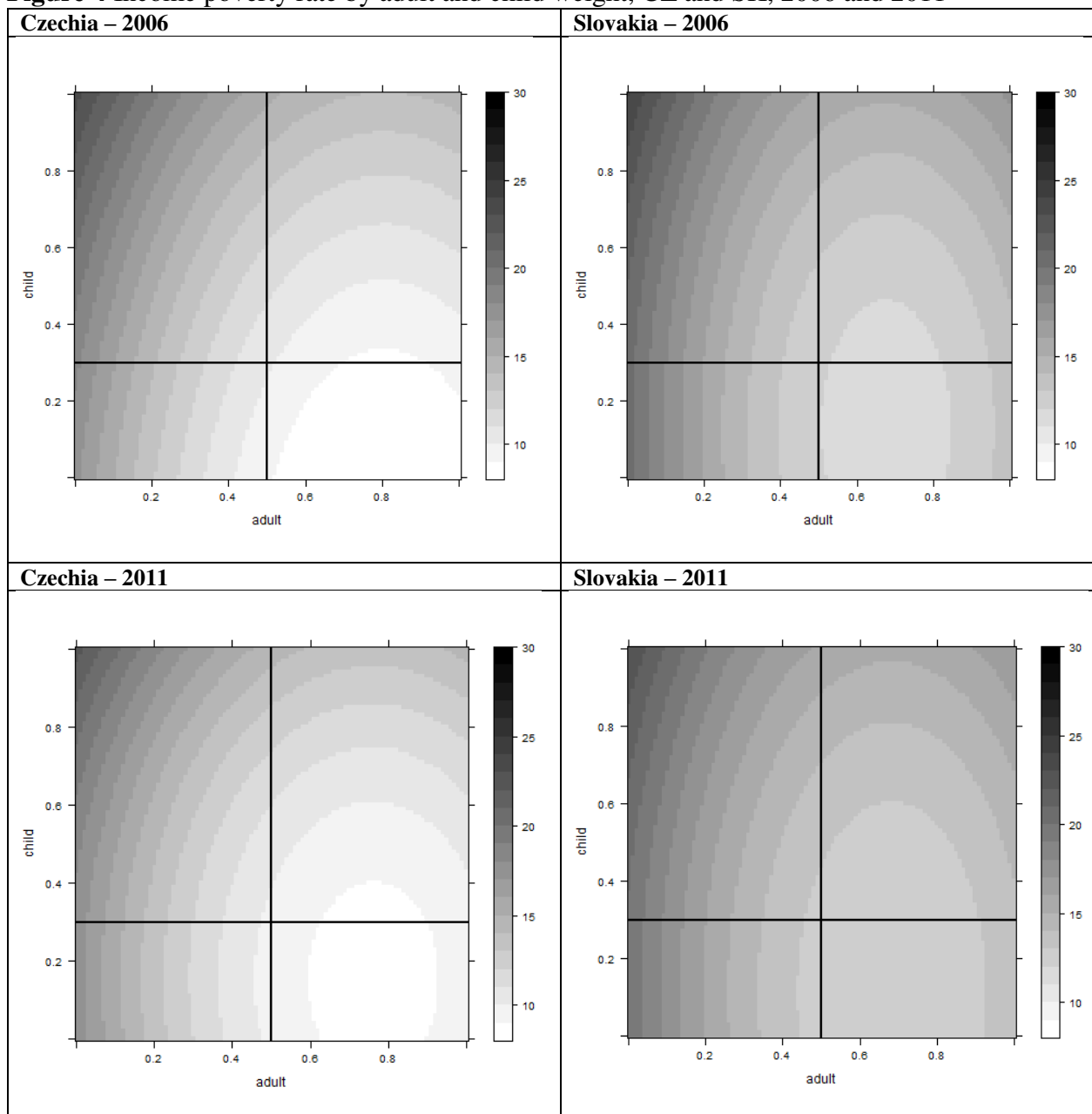
	Central and Eastern Europe (CEE)	Western Europe (WE)
Sensitivity to adult weight	Bulgaria (BG) Czechia (CZ) Estonia (EE) Lithuania (LT) Latvia (LV) Slovenia (SI)	Belgium (BE) Germany (DE) Finland (FI) Ireland (IE)
Sensitivity to child weight		Greece (GR) Italy (IT)
Sensitivity to both types of weights	Croatia (HR) Hungary (HU) Poland (PL) Romania (RO) Slovakia (SK)	Austria (AT) Denmark (DK) Spain (ES) France (FR) Luxembourg (LU) Netherlands (NL) Portugal (PT) Sweden (SE) United Kingdom (UK)

Source: Authors' classification based on EU-SILC 2016 data.

Figure 4 shows how the sensitivity of the poverty rate to equivalence scales developed over time in Czechia and Slovakia. Compared with Figure 3 for CZ and SK, the pictures exhibit relatively stable results. However, from our simple perspective, the income poverty rate was sensitive to both adult and child weights in CZ in 2006, when the intersection is considered a starting point, and the sensitivity to child weights diminished somewhat over time. The Slovakian income poverty rate, on the other hand, gained sensitivity to the child weights (see figures 3 and 4). The results can be influenced by the combination of the structure of consumption expenditures and household

composition in a country. This only supports our idea that equivalence scale should not only be country-specific, but should be updated.

Figure 4 Income poverty rate by adult and child weight, CZ and SK, 2006 and 2011



Source: EU-SILC 2006, 2011. Authors' calculations.

Note: Figures for all countries are not stated due to space restrictions, but are available upon request.

It is clear that our simple sensitivity assessment is highly dependent on the starting point, i.e., the currently applied OECD-modified equivalence scale, the validity of which this study questions.

Table 3 shows both the income poverty rate for 2016, and its coefficient of variation. In both regions, the lowest income poverty rates are accompanied by the highest coefficient of variation (CZ, SK, and SI in the CEE region, and FI, DK, NL in the WE region), and *vice versa* (RO and BG in CEE, and ES, IT, GR, PT in WE). In Central-Eastern Europe, the coefficient of correlation of income poverty rate and its variation is -0.81, while it is -0.91 for Western Europe. This means that countries with low income poverty rates tend to have rates that are more sensitive to the equivalence scale applied, while countries with high income poverty rates have rates that are almost insensitive to the scale.

Table 3 Income poverty rate characteristics, 2016

	Poverty rate	Coefficient of variation (CV)	Mean poverty rate	Mean CV with respect to adult weight	Mean CV with respect to child weight
CEE					
BG	22.9	0.08	23.2	0.08	0.01
CZ	9.7	0.28	12.1	0.26	0.09
EE	21.7	0.16	20.7	0.16	0.05
HR	19.5	0.09	20.9	0.08	0.04
HU	14.5	0.13	17.1	0.09	0.09
LT	21.9	0.11	22.8	0.11	0.02
LV	21.8	0.12	21.4	0.12	0.04
PL	17.3	0.10	19.1	0.08	0.06
RO	25.3	0.03	25.7	0.03	0.02
SI	13.9	0.17	15.3	0.17	0.04
SK	12.7	0.18	15.3	0.14	0.10
WE					
AT	14.1	0.14	16.8	0.10	0.10
BE	15.5	0.13	16.8	0.13	0.04
DE	16.4	0.11	17.6	0.10	0.04
DK	11.9	0.18	13.1	0.16	0.09
GR	21.2	0.06	22.6	0.02	0.06
ES	22.3	0.03	23.1	0.03	0.02
FI	11.7	0.23	13.6	0.23	0.06
FR	13.6	0.11	15.5	0.08	0.08
IE	16.6	0.14	17.8	0.13	0.05
IT	20.6	0.05	21.8	0.02	0.04
LU	16.5	0.14	19.1	0.08	0.11
NL	12.7	0.16	14.4	0.15	0.05
PT	19.0	0.07	19.8	0.06	0.03
SE	16.2	0.15	16.9	0.14	0.05
UK	15.9	0.13	18.6	0.09	0.08

Source: EU-SILC 2016. Authors' calculations.

When it comes to particular sensitivity to adult household member weights, the CZ substantially exceeds other CEE countries (followed by SI and EE). Similarly, in the WE region, sensitivity to the adult weight is substantially higher in FI, followed by somewhat lower values in DK and NL. The lowest sensitivity to the adult weight can be seen in RO within the CEE region, and in IT, GR, ES, and PT within the WE region.

Regarding the sensitivity to child household member weights, SK, HU, and CZ are at the top of the ladder in the CEE region, as are LU and AT in the WE region. The bottom of the ladder is occupied by BG, LT, and RO in CEE, and ES and PT in WE. It follows that when we abandon the starting point of the OECD-modified equivalence scale, but consider the whole possible spectrum of weight combinations, Czechia exhibits relatively high sensitivity to both adult and child weights compared to other countries, though the sensitivity to the adult weight prevails in absolute terms.

Though, at this stage of research, we primarily assess the sensitivity of income poverty to equivalence scales using visualisation techniques, our modest results indicate that European countries can be classified into different groups. Our results, showing that the consumption expenditure structure differs across countries, suggest that countries should consider establishing their own national equivalence scales. Moreover, the results described in this section suggest that countries with a high sensitivity of income poverty rate to equivalence scale should pay attention to the selection of adult/child household member weights when defining their national equivalence scales. Otherwise, their official income poverty rates may not necessarily reflect the true nature of income poverty in the country.

CONCLUDING REMARKS AND IMPLICATIONS FOR FOLLOW-UP RESEARCH

This study questions the cross-country comparability of the main, most commonly used indicator of income poverty, the at-risk-of-poverty rate. The construction of this indicator applies a uniform equivalence scale to transform the disposable income of households of different sizes into comparable units. We discuss two different views of reasons to re-examine the OECD-modified equivalence scale and to verify its validity across European countries. First, we provide some

insights into why a uniform equivalence scale adopted by all countries should not be used to derive “equivalised” household disposable income, focusing on the apparent differences in consumption expenditure structures between Central and Eastern (CEE) and Western (WE) European regions. Second, we offer a simple analysis of the sensitivity of the income poverty rate to the weights of adult and child household members assigned by the scale in order to identify countries with higher sensitivity to either weight.

Regarding the consumption expenditure structure, the two main categories of goods and services, defined by highest shares of consumption expenditures according to the basic COICOP classification – “Housing” and “Food” – comprise on average half of household expenditures. The share of Housing expenditures, where large economies of scale can be expected, does not exhibit significant differences at the regional level; however, a smaller group of CEE countries with a lower share of expenditures on housing can be identified. Regarding Food, where, on the contrary, relatively low economies of scale are usually expected, CEE countries exhibit substantially higher shares of expenditures than WE countries. These findings strongly indicate lower economies of scale in the CEE than in the WE region. Therefore, it can be concluded that a uniform equivalence scale is not appropriate for all European countries. Moreover, countries with a dynamic change of the structure of consumption expenditures should not only consider to establish their own national equivalence scale, but also to adjust it regularly.

Concerning the sensitivity of the resulting income poverty rates to the equivalence scale, our primary aim was to perform a visual analysis, and to identify groups of countries with similar patterns. We have distinguished three basic groups based on the most recent data. First, countries with relative sensitivity to the adult weights and insensitivity to child weights, which includes most CEE countries. Second, the set of countries with relative insensitivity to adult weights and sensitivity to child weights, which includes only two South-Western European countries. And, third, countries with relative sensitivity to both adult and child weights – WE countries prevail in this group. Ultimately, a uniform pattern can be identified in both regions: the lower the income poverty rate, the higher its variation, and, thus, sensitivity to the equivalence scale. Countries considering establishment of their own country-specific equivalence scale should focus especially on the weights to which their national income poverty rate is sensitive.

Though we do not conclude this study by proposing new country-specific equivalence scales, we believe that a uniform methodology to establish more tailored equivalence scales would be a better way to achieve comparative income poverty indicators than the current use of a uniform equivalence scale. This study only offers reasons and motivation for research which necessarily must continue with identification of national equivalence scales. Our future research studies thus aim to, first, assess the sensitivity of income poverty rates to equivalence scales in a more technical way, and, second, to compare various approaches, methodologies, and estimation techniques for establishment of national equivalence scales, in conjunction with testing their reliability and validity.

Acknowledgement: This work 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. 265/14 between the European Commission, Eurostat, and the Institute of Sociology of the Czech Academy of Sciences. Responsibility for all conclusions drawn from the data lies entirely with the authors.

References:

- Aaberge, R., Melby, I. The sensitivity of income inequality to choice of equivalence scales. *Review of Income and Wealth*, 1998, 4, pp. 565–569.
- Banks, J., Johnson, P. Equivalence scale relativities revisited. *The Economic Journal*, 1994, 425, pp. 883–890.
- Bartošová, J., Želinský, T. The extent of poverty in the Czech and Slovak Republics 15 years after the split. *Post-Communist Economies*, 2013, 1, pp. 119–131.
- Bishop, J. A., Grodner, A., Liu, H., Ahamdanech-Zarco, I. Subjective poverty equivalence scales for Euro Zone countries. *The Journal of Economic Inequality*, 2014, 2, pp 265–278.

- Brázdilová, M., Musil, P. Impact of consumption unit's scale on credibility of the income indicators in the Czech Republic. *Statistika: Statistics and Economy Journal*, 2017, 2, pp. 15–24.
- Buhmann, B., Rainwater, L., Schmaus, G., Smeeding, T.M. Equivalence scales, well-being, inequality, and poverty: Sensitivity estimates across ten countries using the Luxembourg Income Study (LIS) database. *Review of Income and Wealth*, 1988, 2, pp. 115–142.
- Burkhauser, R. V., Smeeding, T. M., Merz, J. Relative inequality and poverty in Germany and the United States using alternative equivalence scales. *Review of Income and Wealth*, 1996, 4, pp. 381–400.
- Cheung, K.C.K., Chou, K.L. Measuring child poverty in Hong Kong: Sensitivity to the choice of equivalence scale. *Social Indicators Research*, 2017, 3, pp. 909–921.
- Coulter, F. A. E., Cowell, F. A., Jenkins, S. P. Equivalence scale relativities and the extent of inequality and poverty. *The Economic Journal*, 1992, 414, pp. 1067–1082.
- Danziger, S., van der Gaag, J., Taussig, M.K., Smolensky, E. The direct measurement of welfare levels: How much does it cost to make ends meet? *The Review of Economics and Statistics*, 1984, 3, pp. 500–505.
- de Vos, K., Zaidi, M.A. Equivalence scale sensitivity of poverty statistics for the Member States of the European Community. *Review of Income and Wealth*, 1997, 3, pp. 319–333.
- Dhongde, S., Minoiu, C. Global poverty estimates: A sensitivity analysis. *World Development*, 2013, C, pp. 1–13.
- Hagenaars, A. J. M., De Vos, K., Zaidi, A. *Poverty statistics in the late 1980s: Research based on micro-data*. Luxembourg: Office for Official Publications of the European Communities, 1994. ISBN 92-826-8982-4.
- Jenkins, S. P., Cowell, F. A. Parametric equivalence scales and scale relativities. *The Economic Journal*, 1994, 425, pp. 891–900.
- Kapteyn, A., Kooreman, P., Willemse, R. Some methodological issues in the implementation of subjective poverty definitions. *The Journal of Human Resources*, 1988, 2, pp. 222–242.
- Lanjouw, P., Ravallion, M. Poverty and household size. *The Economic Journal*, 1995, 433, pp. 1415–1434.
- Lazear, E., Michael, R. Family size and the distribution of real per capita income. *American Economic Review*, 1980, 1, pp. 91–107.

- 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*, 2019, online first. <https://doi.org/10.1007/s11205-019-02102-2>
- Posel, D., Casale, D., Grapsa, E. Re-estimating gender differences in income in South Africa: The implications of equivalence scales. *Development Southern Africa*, 2016, 4, pp. 425–441.
- Ravallion, M. On testing the scale sensitivity of poverty measures. *Economics Letters*, 2015, pp. 88–90.
- Van der Gaag, J., Smolensky, E. True household equivalence scales and characteristics of the poor in the United States. *Review of Income and Wealth*, 1982, 1, pp. 17–28.
- Van Praag, B., Ferrer-i-Carbonell, A. *Happiness quantified. A satisfaction calculus approach*. New York: Oxford University Press, 2004.
- Van Praag, B., Hagenars, A.J., van Weerden, H. Poverty in Europe. *Review of Income and Wealth*, 1982, 3, pp. 345–359.
- Večerník, J., Mysíková, M. *Poverty in the Czech Republic: A critical look at EU indicators*. Prague: SOÚ AV ČR, 2016. ISBN 978-80-7330-290-0.
- Želinský, T., Tartal'ová, A. Impact of equivalence scale on at-risk-of-monetary poverty rates in the regions of Slovakia. In Pauhofová, I.; Želinský, T. (Eds.), *Inequality and Poverty in the European Union and Slovakia* (pp. 57-66). Košice: Technical University of Košice, 2012.