

Mysíková, Martina; Želinský, Tomáš; Jirková, Michaela; Večerník, Jiří

Working Paper

Equivalence scale and income poverty: Two approaches to estimate country-specific scale for the Czech Republic

GLO Discussion Paper, No. 948

Provided in Cooperation with:

Global Labor Organization (GLO)

Suggested Citation: Mysíková, Martina; Želinský, Tomáš; Jirková, Michaela; Večerník, Jiří (2021) : Equivalence scale and income poverty: Two approaches to estimate country-specific scale for the Czech Republic, GLO Discussion Paper, No. 948, Global Labor Organization (GLO), Essen

This Version is available at:

<https://hdl.handle.net/10419/242977>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Equivalence scale and income poverty: Two approaches to estimate country-specific scale for the Czech Republic

Martina Mysíková¹ – Tomáš Želinský¹ – Michaela Jirková^{1,2,3} – Jiří Večerník¹

This is a preprint of an article published as:

Mysíková, M., Želinský, T., Jirková, M., Večerník, J. (2021). Equivalence Scale and Income Poverty: Two Approaches to Estimate Country-specific Scale for the Czech Republic. *Social Indicators Research* 156(1):21–45. <https://doi.org/10.1007/s11205-021-02636-4>

Abstract: The at-risk-of-poverty rate, the relative income poverty indicator applied in the EU, can be highly sensitive to the equivalence scale used to transform household income to an equivalent for individuals. This study applies two well-established approaches to estimate the equivalence scale: an ‘objective’ one, based on consumption expenditures available in the national Household Budget Survey, and a ‘subjective’ one, based on the Minimum Income Question available in EU–Statistics on Income and Living Conditions data. The aim is to contrast the two estimated equivalence scales in the Czech Republic in the 2006–2016 period with the OECD-modified scale applied uniformly for decades across the EU countries. Our findings suggest that the adult weight in the equivalence scale is decreasing over time, while the child weight is relatively stable under both approaches. The estimated weights are lower than the officially applied ones, with the exception of the expenditure-based adult weight, which is very close to the OECD-modified weight. Applying the estimated scales affects the income poverty rate and leads to different rates than the official ones: while the trend of the rates is similar when the two estimated scales are used, the official income poverty rate deviates from those two.

Keywords: Czech Republic, equivalence scale, expenditures, income poverty rate, minimum income question

JEL codes: I32, P46

Acknowledgements: 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. 247/2019-EU-SILC-HBS 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. 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. 247/2019-EU-SILC-HBS 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. The national HBS datasets are available from the Czech Statistical Office under a contract for scientific purposes.

¹ The Institute of Sociology of the Czech Academy of Sciences, Prague, Czech Republic.

² Czech Statistical Office, Prague, Czech Republic.

³ Prague University of Economics and Business, Prague, Czech Republic.

1. Introduction

Income poverty indicators are among the most widely used measures of economic well-being, mainly because income represents an easily measurable proxy for utility. This study focuses on the relative income poverty indicator that is officially applied in the European Union: the at-risk-of-poverty rate (hereinafter just ‘income poverty rate’), which is constructed as a headcount ratio. How suitable it is for international comparisons has often been challenged because of two specific steps involved in its construction. First, the same equivalence scale is applied to all EU countries to transform the income of households of different sizes into a comparable unit; and second, the poverty line is set as 60% of the national median equivalised income. The latter issue is beyond the scope of this study, though we believe it deserves to be rigorously examined to scrutinise its suitability for international comparisons as well.

The poverty line depends heavily on the equivalence scale that is used to determine equivalised household income. The poverty line then influences the resulting income poverty indices and inevitably the composition of the ‘poor’, which should be a very important indicator for national social policies. The equivalence scale currently applied across all EU member states employs a weight of 1.0 for the first adult household member and assigns a weight of 0.5 to the second and every other adult household member (defined as a person 14 years old or over), while each child’s weight is 0.3 (defined as 13 years old or younger). This so-called OECD-modified equivalence scale was adopted in the 1990s as a modification of the previous ‘OECD’ scale (which used the weights 1; 0.7; 0.5, respectively) developed in the 1980s.

The authors of the scale warned when introducing it 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). The authors hence suggest that economies of scale can be strongly country-specific, depending on the national structure of household expenditure, living costs, and consumption of goods with different economies of scale. We strongly favour the approach of a ‘single methodology’ over a ‘single scale’.

In this paper, we use a country case-study of the Czech Republic to examine the (European) equivalence scale currently being applied. Past research has demonstrated that the current OECD-modified scale is suspected of being not suitable for international comparisons, which has also been confirmed on Czech data (Mysíková and Želinský 2019). Importantly, the Czech Republic, along with other East-Central European countries, was not included in the research behind the introduction of the modified OECD scale. The modified scale is based on a group of countries from Western Europe and other market-oriented OECD countries (see Hagenaars et al. 1994).

The Eastern European countries that three decades ago were in the Communist Bloc adopted the OECD-modified equivalence scale when they joined the EU (in 2004 or later). The remarkably distinct structure of household consumption expenditure in these countries before or in the mid-2000s was not taken into account. Moreover, the structure of consumption expenditures between Eastern and Western European countries, in general, continues to differ even now. In addition, the income poverty rate’s sensitivity to the equivalence scale proves to be most pronounced in the Czech Republic (Mysíková and Želinský 2019, p. 393).

We argue that once the income poverty rate is highly sensitive to the equivalence scale, an ‘arbitrarily’ selected scale is highly unsuitable. Moreover, the resulting income poverty rate can be easily influenced by changes in household size and composition over time. It follows that countries with high sensitivity should be particularly cautious about deciding to adopt this scale – and this is the case of the Czech Republic.

In this paper we attempt to demonstrate that the OECD-modified scale does not work well with Czech national statistics on income poverty. We do this by recalling methods of estimating equivalence scales based on representative micro-data (Household Budget Survey – HBS, and Statistics on Income and Living Conditions – EU-SILC). Equivalence scales can be constructed in numerous ways (see, e.g., a review by Buhmann et al. 1988). We estimate the weights used for adults and children in the same structure as the OECD-equivalence scale to offer a direct comparison. Our approach includes estimations based on both ‘objective’ and ‘subjective’ data. The objective approach is represented by expenditure-based estimations (Extended Linear Expenditure Systems method, see the methodological Section 3.1), while the subjective approach relies on the ‘intersection method’ to estimate the Subjective Poverty Line and derive an implicit equivalence scale based on the EU-SILC’s Minimum Income Question (Section 3.2).

This paper is organised as follows. The next section briefly recapitulates the approaches to equivalence scale estimations and summarises related literature. The third section is devoted to the methodological approach applied in our study. The fourth section describes the datasets that are used in different estimation approaches. The fifth section presents the estimated equivalence scales based on the two approaches and then demonstrates how the income poverty rate would be affected using the newly estimated scales. The last section concludes and discusses the appropriateness of the scale.

2. Conceptual background and literature review

The conceptual approaches to equivalence scale construction can be divided into objective and subjective methods. The objective ones, broadly established in the literature, are typically based on consumption expenditures. One of the most famous is the Engel method (1895). Engel observed that the proportion spent on food out of total household expenditures is higher for poor than for rich households. Households are considered to have reached the same level of

economic well-being when they have the same share of expenditures on food. This single-equation approach was later broadened (Watts 1967) to include the share of expenditures on household necessities (the iso-prop index) instead of just the share of expenditures on food. As well as food, necessities are deemed to include housing, clothing, and health care (Daley et al. 2020).⁴

The Engel method, considering food share only, would typically yield higher weights for both adults and children in the equivalence scale compared to other (e.g., multiple-equation) approaches, as food expenditures are supposed to exhibit relatively low economies of scale.⁵ Further, we impugn that adding other commodities into a single necessity consumption bundle is an appropriate step and leads to unbiased estimates, because each of them has different economies of scale; for instance, housing, unlike food, exhibits relatively high economies of scale. We believe that differences in the structure of consumption expenditures result in different equivalence scales in different countries and, thus, we prefer a multiple-equation approach.

Multiple-equation methods that incorporated more consumption bundles to reflect the variety of economies of scale were developed later (Prais and Houthakker 1955). The complete demand system considers a full market basket of expenditures. Lluch (1973) derived the Extended Linear Expenditure System (ELES) based on the assumption that households maximise a lifetime utility function under a lifetime wealth constraint. Van der Gaag and Smolensky (1982)

⁴ Another and somewhat similar approach is the Rothbarth (1943) method, which takes into consideration ‘adult goods’, such as alcoholic drinks, tobacco, or adult clothing. Two households reach the same economic well-being if their absolute levels of expenditures on adult goods are equal (this is also called the iso-level method). When there is a child in a household, the consumption of adult goods usually declines, and so does the well-being of adults; in other words, more income is needed to maintain a constant utility level. Needless to say that a potential drawback could be the inelasticity of adult goods with respect to income.

⁵ In terms of the OEC-modified scale, low economies of scale are reflected by the high weights for additional adult and child members in the scale, and vice versa.

showed that the same results can be gained based on a two-period model and, after adopting additional assumptions, applied the model to the current period.⁶

The subjective approach was introduced by Goedhart et al. (1977), who used the Income Evaluation Question (IEQ)⁷ to derive the individual welfare function of income. IEQ is used to estimate the Leyden Poverty Line (Kapteyn et al. 1988). Goedhart et al. (1977) also suggested using a Minimum Income Question (MIQ) to estimate the Subjective Poverty Line. More recent empirics have been supplemented with other subjective approaches that utilise minimum spending questions (Garner and Short 2004) or a question about a household's satisfaction with its financial situation (Bütikofer and Gerfin 2009). Given the nature of the data available in Europe, we decided to estimate the Subjective Poverty Lines (SPL) to derive the subjective equivalence scale.

The estimated equivalence scales and the weights they assign can substantially differ across different methods. For instance, Daley et al. (2000) estimated the weight of a second person in a household at roughly 0.8 by the Engel method and 0.5 by the iso-prop method (food, housing, clothing, and health care in a single equation) in Poland over 1999–2010. Merz et al. (1994) applied the ELES method on West German data from 1983 and estimated a corresponding weight of a second person at 0.48. Betti (2000) estimated the weight of a second adult at 0.23 for Italy in 1985–1994 using the complete demand system. As an example of the SPL method applied across Europe, Bishop et al. (2014) estimated the weight of the second adult at 0.34 for a pooled sample of Euro Zone countries in 2004–2007. Kalbarczyk-Steclik et al. (2017) estimated the weight of a second adult at 0.32 in Euro Zone countries in 2005–2012 and 0.49 in Eastern European countries.

⁶ ELES differs from the Linear Expenditure System in that it includes income as the explanatory variable (i.e., dis/savings are endogenous) instead of total consumption expenditure (van der Gaag and Smolensky 1982).

⁷ The IEQ asks respondents to state what level of income they regard as excellent/good...bad/very bad.

The empirics on equivalence scales in the Czech Republic is scarce and several first attempts naturally emerged only after the fall of the communist regime. During the communist era, the applied equivalence scale was based on what were called ‘nutrition units’, which drew on the criteria of gender, age, economic activity, and the character of a person’s work, with weights ranging from 0.4 for new-borns to 1.1 for men performing very hard manual labour, and 1.2 for boys aged 16–18. Večerník (1991, 1996) compared income poverty rates according to various definitions including SPL using data from small sociological surveys on economic expectations and attitudes. He derived the elasticity of the ‘expert programme’ and ‘subjective’ scales following the method described by Buhmann et al. (1988), considering only the size of households without distinguishing between adult and child members of the household.

The original OECD scale was adopted in the Czech Republic in the 1990s, and the OECD-modified scale in the 2000s. More recent empirics on the equivalence scale are also rather rare. Brázdilová and Musil (2017) applied a simplified method on Czech HBS data, where total household expenditures were regressed on the number of adults and children only, yielding a weight for adults of 0.76 and a weight for each child of 0.34. Kalbarczyk-Steclik et al. (2017) used the SPL method on pooled Czech EU-SILC data from 2005–2012 and estimated the weight of the second adult at 0.43.⁸

Estimated equivalence scales differ not only by the method used and across countries, they can also differ over time (Daley et al., 2020). Kalbarczyk-Steclik et al. (2017) showed that the subjective equivalence scale was stable in (the pooled data of) Euro Zone countries over 2005–2012, while it was decreasing in Eastern European countries. Therefore, we intend to estimate the equivalence scale consistently using two methods over the 2006–2016 period to indicate

⁸ In contrast to our study, which is based on total population samples, they restricted the sample to the six most frequent household types (e.g., excluding single-parent households) and did not control for any additional household characteristics.

that any equivalence scale, be it the OECD-modified scale or a country-specific one, should be updated once significant long-term changes in the estimated weights are identified.

3. Methodological approaches

First we will here use the Extended Linear Expenditure System to derive the ‘subsistence expenditures’ for various types of households, and then we will utilise the ‘intersection method’ to estimate the Subjective Poverty Lines for various types of households based on the Minimum Income Question. Both these approaches then can be used to derive the weights of adults and children in the equivalence scale, as described in Section 3.3.

3.1 Expenditure-based approach

Our approach follows that suggested by Van der Gaag and Smolensky (1982) (we will describe this method only briefly here, but further details can be found in the original paper). This approach requires that we estimate consumption expenditures as a function of total household disposable income and household characteristics. The right-hand side of the equation includes key variables that represent the different types of households necessary to derive an equivalence scale and a set of control variables. The basic idea behind this approach is that the consumption expenditure is estimated separately for different consumption bundles, because the structure of national consumption expenditure is of significance for the equivalence scale. A ‘subsistence expenditure’ is then derived for each consumption bundle for various household types. The expenditures for all consumption bundles are then added together to yield the total subsistence expenditure for a household type, from which we can derive the equivalence scale.

We estimate the expenditures spent on each of the twelve basic COICOP categories, $b \in \{1, \dots, 12\}$, separately (ignoring the subscripts for individual households):

$$\widehat{X}_b = \alpha_b + \beta_b Y + \sum_{l=1}^n \delta_{bl} H_l, (1)$$

where Y stands for total household disposable income, H_l denotes n household characteristics ($l = 1, \dots, n$) included in the model, and α , β , and δ are the associated regression coefficients. The regression results for 2016 are presented in Table A.1 in the Appendix.

Once the system of demand equations is estimated, we get the following parameters:

$$\mu = \sum_{b=1}^{12} \beta_b, (2)$$

$$\gamma_b = \alpha_b + \beta_b \sum_{b=1}^{12} \gamma_b = \alpha_b + \frac{\beta_b}{1-\mu} \sum_{b=1}^{12} \alpha_b. (3)$$

Parameters γ_b are the ‘subsistence expenditures’ of consumption bundle b . For each of the estimated coefficients δ_{bl} , we can construct parameters d :

$$d_{bl} = \frac{1}{\gamma_b} \frac{\delta_{bl}(1-\mu) + \beta_b \sum_{b=1}^{12} \delta_{bl}}{1-\mu}. (4)$$

The total subsistence expenditure (TSE) is formulated as:

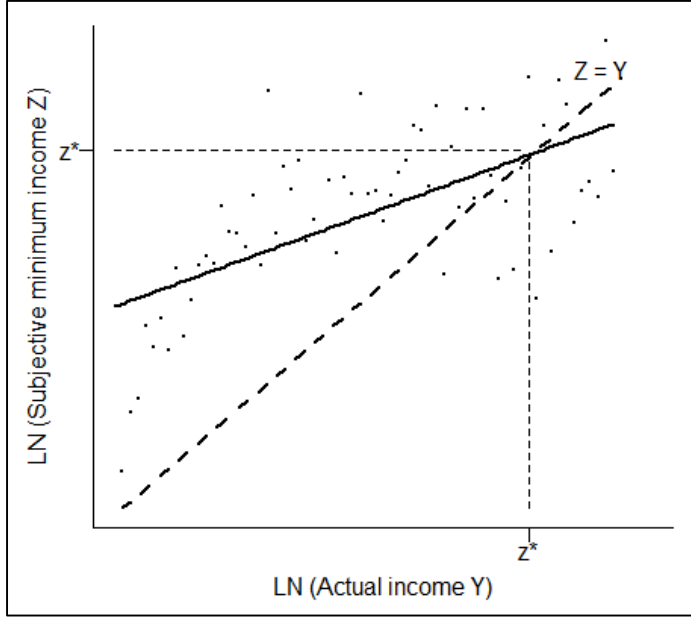
$$TSE = \sum_{b=1}^{12} \gamma_b (1 + \sum_{l=1}^n d_{bl} H_l), (5)$$

from which we can then derive the TSE for various types of households. Note that for a household with reference/zero household characteristics, the TSE equals the sum of individual subsistence expenditures γ .

3.2 The subjective poverty line approach

The subjective minimum income is estimated as an increasing function of actual income, as Figure 1 shows (in a log-log form), where the horizontal axis represents actual household disposable income (Y) and the vertical axis represents the subjective minimum income (Z). According to the ‘intersection method’, the Subjective Poverty Line (SPL) is determined as an income level where the estimated function intersects the 45-degree line (subjective minimum income and actual income equity) (see, e.g., Goedhart et al. 1977). The intersection (Z^*), where $Z = Y$, then determines the SPL.

Fig. 1 Intersection method – Subjective Poverty Line



Further, the subjective minimum income inevitably increases with household size, another variable that is crucial for estimating the equivalence scale, and other household characteristics could also be controlled for in this connection. Like the expenditure-based approach, the subjective minimum income is estimated by the function (ignoring the subscripts for individual households):

$$\ln(\hat{Z}) = \alpha + \beta \ln(Y) + \sum_{l=1}^n \delta_l H_l, (6)$$

where, again, Y stands for total household disposable income, H_l denotes n household characteristics ($l = 1, \dots, n$) included in the model, and α , β , and δ are the corresponding regression coefficients. The regression results for all years are reported in Table A.2 in the Appendix.

The intersection $Z^*=Z=Y$ yields:

$$\ln(Z^*) = \frac{\alpha + \sum_{l=1}^n \delta_l H_l}{1-\beta}, (7)$$

and from this it is possible to derive SPLs for various household types.

3.3 Deriving the equivalence scale

Both the expenditure and subjective approaches are based on similar logic: we estimate the TSEs with the former and the SPLs with the latter approach for various household types (HT), and then we compare them in order to derive the equivalence scale. Our method for deriving the equivalence scales is identical in both approaches; therefore, we decided to introduce a joint term HT, which represents the TSE in the expenditure approach and the SPL in the subjective approach.

We then begin by deriving the HTs for various household types. The methods for doing this differ in the literature and range from simply using the number of household members (Goedhart et al. 1977; Daley et al. 2020) in the regression models to defining specific dummy variables for household types of different number of adults and children (van der Gaag and Smolensky 1982; Bishop et al. 2014; Daley et al. 2020). We apply a slightly different method (see also Mysíková et al. 2019), where two sets of dummy variables are used to capture household size: (1) three dummies for the number of adult household members (two, three, and four or more; one-adult households being the reference group), and (2) two dummies for the number of children (one child and two or more children; childless households being the reference group). To obtain the HTs for various number of adults, we keep the dummies for the children and other control variables at their national means. For instance, the HT for a one-adult household is obtained when the three dummies for adults are held at zero, and the children dummies and control variables are kept at the national means. Similarly, for two, three, and four or more adults, the adult dummies are kept at corresponding (zero or one) values, while all the other variables are kept at their means. The same logic is applied to derive the HTs for childless households, households with one child, and households with two or more children. This gives us a straightforward way of calculating the equivalence scale comparable to the current OECD-modified scale.

To sustain the structure of the OECD-modified equivalence scale, the final weights, W^A for adults and W^C for children, are then derived as follows. First, the partial weights, w (separately for adults and children), are constructed as the relative change in the specific HTs when an additional person is added:

$$w_i^A = \frac{HT_i^A - HT_{i-1}^A}{HT_0^A}, \quad (8)$$

$$w_j^C = \frac{HT_j^C - HT_{j-1}^C}{HT_0^C}, \quad (9)$$

where A and C denote adults and children, respectively, and i stands for additional adults, j for additional children, and HT_0 stand for the reference group.

Second, we compute a weighted average of the partial weights w based on the shares of households with two-, three-, and four-or-more adults, and one child and two or more children in the population:

$$W^A = \sum_{i=1}^3 w_i^A s_i^A, \quad (10)$$

$$W^C = \sum_{j=1}^2 w_j^C s_j^C, \quad (11)$$

where W represents the final weight and s represents the share of the corresponding households in the population. Further, $\sum_{k=1}^m s_k = 1$, where m is the number of additional adults or children considered (i.e., the number of dummy variables applied for adults or children).

4. Data and variables

Data (un)availability has always been a factor that helps or hinders research, and this is also the case when it comes to constructing equivalence scales. We do not currently have any single representative dataset that has all the variables we would need to apply the well-developed approaches to equivalence scale estimations all at once. Therefore, we have to use the Household Budget Survey (HBS) for the expenditure-based approach, more precisely, its

national Czech version SRU (Statistika rodinných účtů), and Statistics on Income and Living Conditions (EU-SILC) for the subjective approach.

Both the expenditure and subjective approaches employ total household disposable income and household size as dummies. We also include a number of control variables. We try to define the explanatory and control variables in as similar a way as possible, but certain deviations are inevitable, as we will describe below.

All the regression models here use household cross-sectional weights. The resulting income poverty rates (see Section 5.3) are weighted with individual cross-sectional weights so that the poverty rates represent the shares of ‘poor’ individuals, not households, which is consistent with the income poverty indicator officially used in the EU.

4.1 Household Budget Survey

The Household Budget Survey (HBS) is fielded at the European level at five-years intervals, and the latest available microdata are for the year 2010. However, most of the countries utilise HBS for national purposes (e.g., to construct a Consumer Price Index) and conduct it more frequently. Czech national HBS data (SRU in Czech) used to be available annually until the sampling design changed (from a quota sampling to a random one) after 2016. Here we draw on data from the available national SRU surveys for the period of 2006–2016.

As noted in the methodological section, the dependent variable(s) in the ELES system are the consumption expenditures on the particular bundles defined by the COICOP classification. They are included as monthly values in CZK. Table 1 shows presents the categories of consumption bundles along with the consumption structure. Not surprisingly, households spend on average the largest share of their budgets on ‘Food’ (CO01) and ‘Housing’ (CP04), expenditures on each of which hover at around 20% of the budget over time. However, these two consumption bundles are supposed to have diametrically opposite economies of scale:

while the economies of scale for food expenditures are typically very low, living together usually means high savings on housing expenditures. The economies of scale of some other categories are harder to intuitively assume, which reinforces the justification for using the ELES approach, instead of considering either total expenditure or just the necessary bundles (the Engel method).

Table 1 Structure of consumption expenditure by COICOP (%)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CP01 Food and non-alcoholic beverages	20.1	20.1	20.1	19.3	19.3	19.1	20.0	20.2	20.3	20.0	19.8
CP02 Alcoholic beverages, tobacco and narcotics	2.9	2.9	2.7	2.8	2.8	2.9	2.8	2.8	2.9	2.9	2.9
CP03 Clothing and footwear	5.4	5.4	5.2	5.0	5.0	4.8	4.7	4.7	4.9	5.0	5.1
CP04 Housing, water, electricity, gas and other fuels	20.7	19.9	19.9	21.4	21.7	22.3	22.1	22.2	21.5	21.1	20.8
CP05 Furnishings, household equipment and routine maintenance of the house	6.9	7.1	6.8	6.7	6.2	6.2	5.8	5.5	5.7	6.0	6.1
CP06 Health	2.0	2.3	2.7	2.7	2.7	2.7	2.8	2.6	2.6	2.6	2.6
CP07 Transport	10.9	10.8	11.1	10.5	10.7	10.9	10.7	11.0	10.5	10.5	11.0
CP08 Communications	4.8	4.7	4.7	4.6	4.6	4.5	4.4	4.3	4.2	4.2	4.1
CP09 Recreation and culture	10.2	10.5	10.5	10.3	10.2	9.8	9.5	9.3	9.5	9.4	9.5
CP10 Education	0.5	0.6	0.6	0.6	0.7	0.6	0.7	0.6	0.6	0.6	0.5
CP11 Restaurants and hotels	5.0	5.2	5.2	5.2	5.0	5.1	5.3	5.2	5.3	5.6	5.7
CP12 Miscellaneous goods and services	10.4	10.8	10.6	10.9	11.1	11.0	11.2	11.6	12.0	12.1	11.8

Source: SRU (CZSO database).

The first key explanatory variable is total monthly household disposable income, which includes monetary net income and income in-kind in CZK. In the SRU survey, adults are defined as individuals aged 15+, while children are aged 0–14.⁹ This differs from the OECD-modified equivalence scale, where children are considered to be people 0–13 years old, but it also differs from our models based on EU-SILC where we define children as those aged 0–15. This difference must be kept in mind, as the age limit for defining who is a child can be could affect the weights.

⁹ The household file contains predefined age categories.

For our purpose of estimating the equivalence scale, we include three dummy variables for the number of adult household members: two, three, and four or more adults. For adults, one-adult households are the reference group, as they are in the OECD-modified equivalence scale. Two dummy variables were constructed for children: one child, and two or more children, with childless households being the reference group.

The control variables consist of individual-based and household-level variables. The data are organised in household files, where the individual demographic characteristics are represented by information about the household head and his partner, if there is one. Like Mysíková et al. (2019), we want to avoid using only the characteristics of the household head; therefore, we include the share of working adult members to capture the economic activity of households. For gender, we include a dummy variable for the female household head. The SRU always defines the household head in a nuclear family as the man, so this variable controls for household structure rather than gender. Education is represented by the share of tertiary-educated persons (ISCED codes 5–6) in the main couple (resulting in possible values of zero and one for singles). In order to capture the age structure of the adult household members, we include the share of adult members in the household aged 15–30 (note that adult members aged over 30 who are not part of the main couple are missing in the denominator, because we do not have information about their age).

The household-level control variables include two dummies for densely- and medium-populated areas (with ‘thinly-populated’ taken as the reference group) to capture urbanisation differences in consumption and living conditions. The size of the dwelling in terms of the number of habitable rooms is included to control for housing expenditures especially. The two dummy variables distinguishing between households paying a mortgage and households renting from owners are mainly intended to control for the fact that mortgage repayments are not included in any COICOP category.

4.2 Statistics on Income and Living Conditions

The Statistics on Income and Living Conditions (EU-SILC) is a household survey that has been conducted annually since 2005 in all EU member states. It is harmonised by Eurostat and fielded by national statistics offices. To ensure comparability with the HBS, we work with data from 2006–2016. The survey provides data at the household level as well as the individual level; respondents aged 16 and over are surveyed.

The dependent variable in our regression models is the Minimum Income Question (MIQ), which is formulated as follows: *‘In your opinion, what is the very lowest net monthly income that your household would have to have in order to make ends meet, that is to pay its usual necessary expenses? Please answer in relation to the present circumstances of your household, and what you consider to be usual necessary expenses (to make ends meet).’*¹⁰ Minimum income refers to monthly net income (and is transformed into its natural logarithm form in the regression models).

The key explanatory variables needed to construct the equivalence scale are actual household disposable income and household size. The (log) actual household income includes the labour and non-labour income of all household members, net of taxes and social deductions, including various social benefits and pensions.¹¹ We expressed household size with dummy variables separately for adults and children and we did this the same way it is done in the SRU data: three dummies for adults and two dummies for children.¹²

¹⁰ Respondents state all income variables in the survey in their national currency and Eurostat converts them to EUR.

¹¹ Actual income is annual; one-twelfth of the reported amount is thus taken into account. The EU-SILC is usually conducted in the second quarter of a year, while the income reference period corresponds to the previous calendar year, and some variables including the MIQ relate to the current situation. 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 way in official statistics.

¹² The top dummy variables for both adults and children were constructed according to the sample household structure in order to avoid dummies with a low share of observations. However, adding one more dummy variable for both adults and children changed the final estimated weights at the third digit only.

The analysis is performed at the household level; therefore, the originally individual-level variables were transformed to household-level variables. We want to avoid using the individual characteristics of the household head only and instead derive household characteristics according to the share of adult household members who possess a particular characteristic out of the total number of adult members. More concretely, we include the share of adults in the household who are currently working, the share who are females, the share with tertiary education, and the share of younger members aged 16 to 30.¹³

Additionally, several originally household-level control variables are included. Type of dwelling ownership distinguishes between outright owners (this includes those with free accommodation, e.g., those living at a relative's home for free) and owners paying a mortgage (the reference group being households that are paying either full market or reduced rate rent). The financial burden experienced by people paying a mortgage and people paying rent can be similar but both differ substantially from the situation of owners. The size of a flat/house is measured by the number of rooms. The degree of urbanisation is defined according to whether the place of residence is in a densely-populated or medium-populated areas (with thinly-populated areas as the reference group).

We also include control for a household's self-perceived ability to make ends meet. It is possible to find examples in the literature where, in order to check the robustness of the estimated subjective equivalence scales, only subsamples of households, for instance, those with some difficulty making ends meet, are used (Saunders et al. 1994; García-Carro and Sánchez-Sellero 2019). Though this did not alter the results of such studies, we include this as control variables: five dummy variables were constructed, with 'making ends meet very easily' being the reference group. The last control variable represents a dummy for severely materially deprived

¹³ The variable representing the share of younger members intends to capture the earnings profile and life cycle. The share of older members is not included as we believe this is captured by the share of currently working adults.

households, an indicator used by official EU statistics, to further capture the financial difficulties of households.

5. Results

The OECD-modified scale assumes that economies of scale are uniform (not only across countries but also for all additional adult and child household members), with a weight of 0.5 for each additional adult and 0.3 for each child. They are also evidently assumed to be stable over time, as the scale has been used in the EU countries without any updates since the 1990s when it was introduced. In the following subsections, we show that neither of these assumptions is true in the case of the Czech Republic. But in order to better demonstrate the impact of equivalence scales on the income poverty measure, we work with the uniform weights for additional adults and children as designed by the OECD-modified equivalence scale, though the estimates stem from separate partial weights.

5.1 Expenditure-based equivalence scales

The partial weights for additional adults (or children) decrease as the marginal total subsistence expenditures diminish. Table 2 demonstrates the method by which the final weights described by Equations (8)–(11) were derived for 2016. The weight of a second adult is very close to the weight assigned by the OECD-modified scale; however, the weights for the other adults are substantially lower. The total subsistence expenditure for a two-adult household (regardless the number of children, or more precisely, with average number of children) is 1.505 times higher than for a one-adult household, yielding a weight for the second adult of 0.505. For a three-adult household, the TSE are 1.938 higher than for a one-adult household, i.e., a weight of 0.938 for the second and third adult together, meaning the weight of a third adult is 0.434. The fourth adult and additional adults beyond that in a household increase the TSE only moderately (a weight 0.081), and given that the share of these households in the population is very low (6.2%),

this does not significantly affect the final adult weight, which is 0.468. The same logic is applied to the child weights.

Table 2 Monthly Total Subsistence Expenditures (in CZK) and equivalence scale (2016)

Adults	TSE ^A	Weight of an additional adult (w ^A)	Share of households (s ^A)	Children	TSE ^C	Weight of an additional child (w ^C)	Share of households (s ^C)
1 adult	13,115			Childless	17,513		
2 adults	19,733	0.505	0.787	1 child	20,428	0.166	0.527
3 adults	25,423	0.434	0.151	2+children	22,033	0.092	0.473
4+ adults	26,479	0.081	0.062				
Final weight (W^A)		0.468	Σ = 1.0	Final weight (W^C)		0.131	Σ = 1.0

Source: SRU 2016. Authors' computations.

Notes: The TSE is estimated by OLS regression; see Section 4.1 for the control variables.

Including the control variables in the models lowers the resulting weights of both adults and children (Table 3).¹⁴ However, the control variables included in the model do not have any substantial impact on the trend. The average adult weight with controls yields 0.509 (0.614 without controls). More importantly, with some fluctuation in the middle, the adult weight exhibits a decreasing trend, which represents the increasing economies of scale over 2006–2016. It gradually changes from 0.587 (0.758 without controls) in 2006 to 0.468 (0.579 without controls) in 2016. The child weights reach values substantially below the OECD-modified 0.3. With an average value of 0.138 (0.182 without controls), the trend is rather stable.

Table 3 Expenditure-based estimated equivalence scale

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Models with control variables:											
Adult weight	0.587	0.528	0.504	0.535	0.475	0.517	0.549	0.484	0.478	0.477	0.468
Child weight	0.128	0.151	0.176	0.117	0.169	0.120	0.123	0.104	0.141	0.157	0.131
Models without control variables:											
Adult weight	0.758	0.632	0.617	0.633	0.546	0.651	0.591	0.628	0.575	0.544	0.579
Child weight	0.176	0.183	0.237	0.174	0.211	0.157	0.169	0.153	0.185	0.204	0.153

Source: SRU 2006–2016. Authors' computations.

¹⁴ The impact of including control variables in the models on estimated expenditure-based weights is much more profound than on the subjective MIQ-based weights (see next section). However, as the SRU applies a quota sampling design, it is essential to include the control variables.

5.2 Subjective MIQ-based equivalence scale

Table 4 again shows the complete set of steps taken to derive the final weights, based on the estimated Subjective Poverty Lines in 2016. A second adult household member represented an additional need of 30.7% more income. The weights of adults are then decreasing with the number of additional adults in a household. However, the weight of the second and more children is higher than for the first child in 2016 (and also in 2013 and 2014). There may be both technical and empirical reasons for this. First, note that the category of 2+ children includes also outlying households with up to 6 children (1 case of 6 children in the sample) in 2016, which could pull up the SPL for households with 2+ children. However, households with 3+ children made up only 1.9% of the population (141 cases in the sample) in 2016; therefore, we are reluctant to consider them separately.¹⁵ Second, like the OECD-modified scale, here we do not distinguish in detail between children's age. It is possible that the age structure of the children in the household could affect the subjective minimum income needed in a way that is not captured in the analysis. Naturally, when families have two or more children, the oldest one could be close to an adult age and the subjective assessments of minimum income needed could be closer to those of adults.

Table 4 Monthly Subjective Poverty Lines (in CZK) and equivalence scale (2016)

Adults	SPL^A	Weight of additional adult (w^A)	Share of households (s^A)	Children	SPL^C	Weight of additional child (w^C)	Share of households (s^C)
1 adult	14,882			Childless	17,989		
2 adults	19,444	0.307	0.681	1 child	19,909	0.107	0.547
3 adults	22,545	0.208	0.210	2+children	22,409	0.139	0.453
4+ adults	24,938	0.161	0.110				
Final weight (W^A)		0.270	Σ = 1.0	Final weight (W^C)		0.121	Σ = 1.0

Source: EU-SILC 2016. Authors' computations.

Notes: The SPL is estimated by OLS regression; see Section 4.2 for control variables.

¹⁵ Applying one more dummy for children in the model (with controls) yields the partial weights for children at 0.106, 0.117, and 0.134 for one, two, and three+ children, respectively. The final weight for children would be 0.113.

Table 5 shows that the inclusion of control variables substantially decreases the weights for children, while there is almost no effect on adult weights, which are even slightly higher in half of the analysed years once controls are included. With an average of 0.313 (0.314 without controls), the adult weight exhibits a clearly decreasing trend, from 0.335 (0.350 without controls) in 2006 to 0.270 (0.257 without controls) in 2016. Similarly, a decreasing trend was found by Kalbarczyk-Steclik et al. (2017) for Eastern European countries. Consistent with the expenditure-based child weight, the subjective approach yields a rather stable trend, with an average child weight of 0.115 (0.179 without controls).

Table 5 Subjective MIQ-based estimated equivalence scale

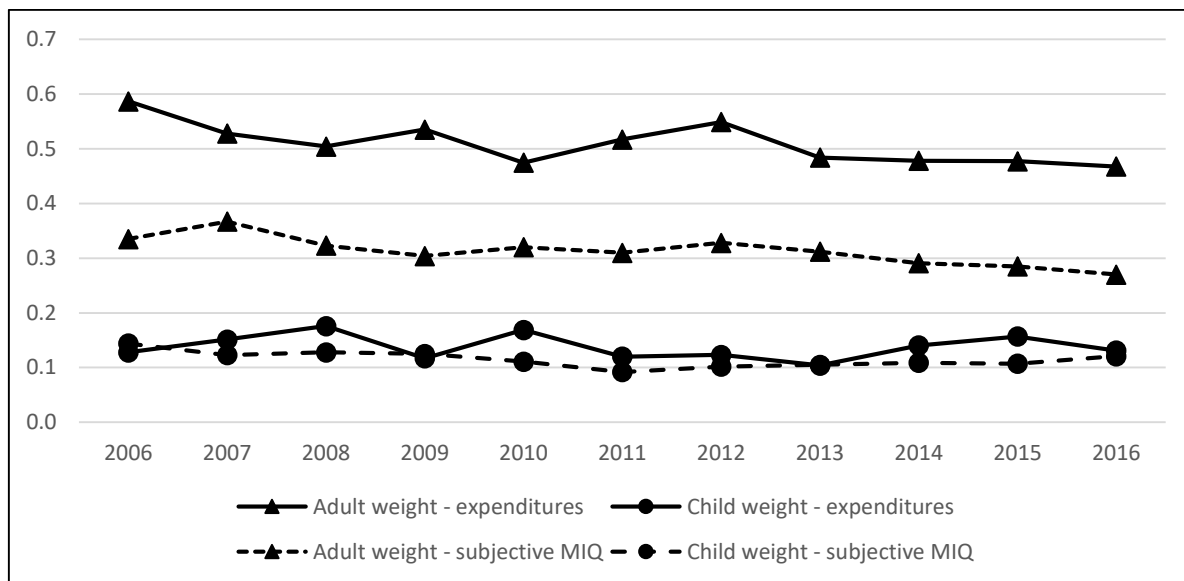
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Models with control variables:											
Adult weight	0.335	0.367	0.323	0.304	0.320	0.310	0.328	0.312	0.291	0.285	0.270
Child weight	0.144	0.123	0.128	0.125	0.111	0.092	0.102	0.105	0.109	0.107	0.121
Models without control variables:											
Adult weight	0.350	0.377	0.347	0.311	0.308	0.316	0.329	0.304	0.276	0.279	0.257
Child weight	0.198	0.175	0.173	0.182	0.176	0.158	0.178	0.188	0.177	0.170	0.194

Source: EU-SILC 2006–2016. Authors' computations.

5.3 Implications of the estimated equivalence scale

The main aim of this study is to show that applying the OECD-modified equivalence scale to derive the equivalised income used to construct the income poverty rate might be inappropriate for national purposes, and, thus, potentially also for cross-country comparisons. Figure 2 first summarises the results from previous subsections in order to display the difference of estimated adult and child weights from the OECD-modified (0.5; 0.3) ones more visually. We can make two conclusions: (1) regardless of the method used, the adult weight is decreasing over time, (2) regardless of the method used, the child weight is substantially lower than the weight assigned by the OECD-modified scale in the Czech Republic.

Fig. 2 Adult and child weights – expenditure-based and subjective MIQ-based equivalence scale

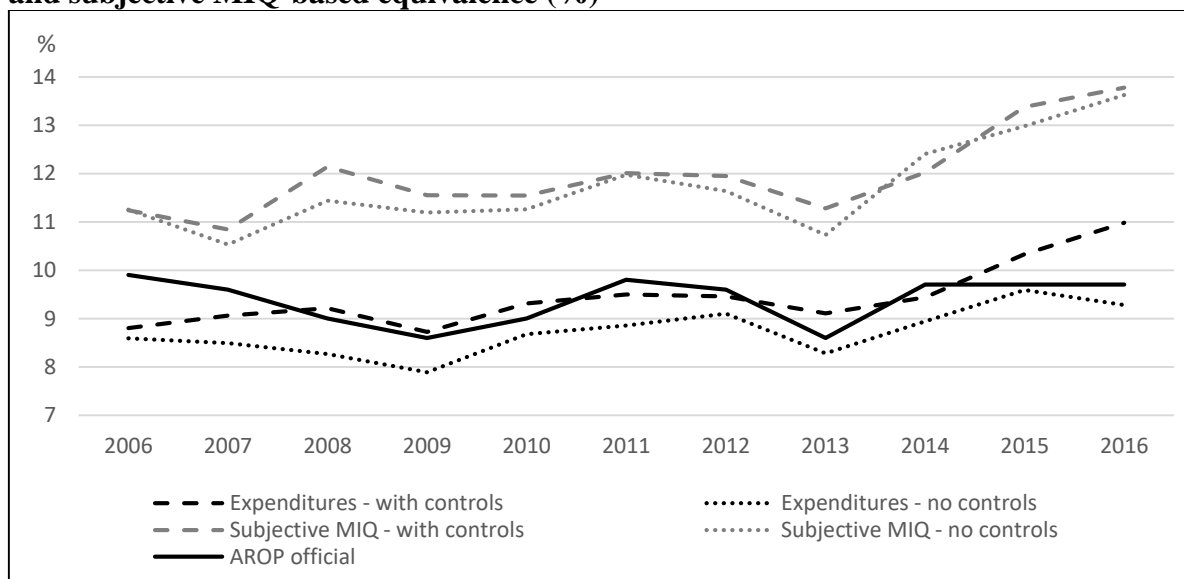


Source: SRU 2006–2016, EU-SILC 2006–2016. Authors' computations.

Notes: Models with control variables.

The equivalence scale affects the equivalised income of individuals and so does the income poverty rate. However, a change in equivalised income also leads to a different national median, and, hence, to a different poverty line (60% of median). Figure 3 simulates the income poverty rates when the expenditure-based and subjective MIQ-based equivalence scales are applied instead of the OECD-modified scale, while taking into account the correspondingly changed poverty lines.

Fig. 3 Income poverty rates – official and simulated using estimated expenditure-based and subjective MIQ-based equivalence (%)



Source: Eurostat database for AROP official rate (variable `ilc_li02`); SRU 2006–2016, EU-SILC 2006–2016. Authors' computations.

Mysíková and Želinský (2019) claimed that the income poverty rate in the Czech Republic is highly sensitive to the adult weight, and our findings support this. The crucial difference in our two sets of estimates lies in the adult weight, which ends up much lower using the subjective MIQ-based than the expenditure-based approach, while the child weights are very similar under both approaches. As a consequence, the income poverty rates jump up once the subjective weights are applied (Figure 3), i.e., the lower the adult weight, the higher the income poverty rate.

It is beyond the scope of this paper to decide which of the two approaches is more ‘correct’ and which of the two approaches should be used in official estimates (we discuss this issue in the concluding section). Nevertheless, Figure 3 not only demonstrates how sensitive the income poverty rate is to the (adult) weights, but also questions the appropriateness of the OECD-modified equivalence scale for the Czech income poverty measure. Though at substantially different values, the expenditure-based and subjective MIQ-based weights (from models with controls) lead to very similar development of the income poverty rate over time, the coefficient of correlation is 0.93.¹⁶ By contrast, the official income poverty rate, with the rigid OECD-modified weights, deviates from the income poverty rates we simulated throughout the observed period: its correlation to the expenditure-based income poverty rate is 0.42 and its correlation to the subjective MIQ-based income poverty rate is 0.32.¹⁷

6. Conclusion and discussion

¹⁶ The Johansen (1995) test with two lags confirms the cointegration of a series of income poverty rates based on estimated equivalence scales.

¹⁷ No cointegration of the official income poverty rate with either rate based on the estimated equivalence scales was found by the Johansen test.

The equivalence scale plays an important role in the construction of the at-risk-of poverty (income poverty) rate applied in the EU. As confirmed by the literature, poverty lines and rates can be highly sensitive to the way the household disposable income is equivalised to comparable units. The currently applied OECD-modified scale (the weight of the first adult being 1; additional adults 0.5; and children 0.3) is used uniformly across EU countries and has not been updated since the 1990s. We apply two approaches to estimate the equivalence scale in the Czech Republic over the period 2006–2016 to demonstrate that the equivalence scale: 1) develops over time, and 2) substantially affects the income poverty rate in the Czech Republic.

The first, ‘objective’ complete demand system approach provides expenditure-based estimates, while the second, ‘subjective’ approach utilises households’ self-assessed minimum income needed to make ends meet. Our findings suggest that: 1) the adult weight is decreasing over time, while the child weight is relatively stable under both approaches; 2) the expenditure-based adult weight is higher than the subjective one and is very close to the OECD-modified weight (0.5); 3) the child weight is substantially lower than the OECD-modified weight (0.3) with similar estimated values under both approaches.

The impact on the resulting income poverty rate is enormous: 1) while the trend of income poverty rate is similar when the two estimated scales are used, the official income poverty rate with the rigid OECD-modified scale substantially deviates from both of them; 2) as the two estimated equivalence scales differ only in the adult weight, the considerably higher rates with the subjective scale confirm that the income poverty rate is highly sensitive to the adult weight (the lower the adult weight, the higher the income poverty rate). We are thus inclined to conclude that the OECD-modified scale is not appropriate for national purposes. Moreover, we have demonstrated here the impact of the equivalence scale only on the total income poverty

rate, while the effect could be much more significant when the demographic or economic structure of the ‘poor’ is analysed.

A question that is yet unanswered is what is the most suitable approach for estimating equivalence scales. We would argue that this might depend on what purpose the equivalence scale or income poverty rate is supposed to serve. If the aim is to decide how to allocate food stamps or housing allowances among poor families, the Engel method that considers only expenditures on food or housing may adequately reveal how the family structure affects the household needs of a particular commodity. However, our aim here is to consider how to compare people’s income to indicate who might be at risk of income poverty, and, consequently, to inform policy-makers about the structure of the ‘poor’ and (how it) changes over time. The complete demand system method reflects the real consumption expenditures of households and thus provides an ‘objective’ picture. However, expenditures can already be affected by households’ dis/savings patterns and their individual propensity to borrow/save. On the other hand, under the subjective approach, people are not limited by how much debt they have or by circumstances and they can freely indicate what their financial needs are, irrespective of whether they are higher or lower than their actual income. Common scepticism may prevail, however, about people answering subjective questions, which may reflect different desires or aspirations.

Our results indicate that the economies of scale of adults are lower when based on expenditures than on subjective assessments. In other words, additional adults in a household ‘cost’ more than people ‘perceive’ them to cost. They suggest that people truly consider their necessary needs and disregard non-necessary expenses when subjectively evaluating the minimum income they need. If so, the question remains: in a modern developed society, do we want to consider people’s necessary needs or more decent conditions including non-necessary consumption?

Our research has limitations and could be further extended and checked for robustness. First of all, we would propose distinguishing children by age as both child-related expenses and subjectively assessed needs can vary substantially for pre-school children and teenagers. Second, it might be helpful to repeat the estimations on a sample containing both expenditures and subjective minimum income needed, so that the relation between expenditures, minimum income needed, and actual income can be directly observed.

References:

- Betti, G. (2000). Quadratic Engel curves and household equivalence scales: the case of Italy 1985-1994. Statistics Research Report LSERR50, Department of Statistics. London: London School of Economics.
- Bishop, J. A., Grodner, A., Liu, H., & Ahamdanech-Zarco, I. (2014). Subjective poverty equivalence scales for Euro Zone countries. *Journal of Economic Inequality*, 12(2), 265–278.
- Brázdilová, M., & Musil, P. (2017). Impact of consumption unit's scale on credibility of the income indicators in the Czech Republic. *Statistika: Statistics and Economy Journal*, 97(2), 15–24.
- Buhmann, B., Rainwater, L., Schmaus, G., & Smeeding, T. M. (1988). 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(2), 115–142.
- Bütikofer, A., & Gerfin, M. (2014). The economies of scale of living together and how they are shared: Estimates based on a collective household model. *Review of Economics of the Household*, 15(2), 433–453.
- Daley, A., Garner, T. I., Phipps, S., & Sierminska, E. (2020). Differences across countries and time in household expenditure patterns: implications for the estimation of equivalence scales. *International Review of Applied Economics*, <https://doi.org/10.1080/02692171.2020.1781798>
- Engel, E. (1895). Die lebenskosten Belgischer Arbeiter-Familien früher und jetzt. *International Statistical Institute Bulletin*, 9(1), 1–74.
- Eurostat (2010). 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.
- Goedhart, T., Halberstadt, V., Kapteyn, A., & van Praag, B. M. S. (1977). The poverty line: Concept and measurement. *The Journal of Human Resources*, 12(4), 503–520.
- Hagenaars, A. J. M., De Vos, K., & Zaidi, A. (1994). *Poverty statistics in the late 1980s: Research based on micro-data*. Luxembourg: Office for Official Publications of the European Communities.

- García-Carro, B., & Sánchez-Sellero, M. C. (2019). Measurement and spatial localisation of subjective poverty in Spain. *Revista Española de Investigaciones Sociológicas*, 165, 83–100.
- Garner, T. I., & Short, K. (2004). Economic well-being based on income, consumer expenditures and personal assessments of minimum needs. In J. A. Bishop, & Y. Amiel (Eds.), *Studies on Economic Well-being: Essays in the Honor of John P. Formby*, Vol. 12 of the Series Research on Economic Inequality (pp. 319–361). Oxford, UK: Elsevier Science.
- Johansen, S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*. Oxford: Oxford University Press.
- Kalbarczyk-Steclik, M., Mista, R., & Morawski, L. (2017). Subjective equivalence scale – cross-country and time differences. *International Journal of Social Economics*, 44(8), 1092–1105.
- Kapteyn, A., Kooreman, P., & Willemse, R. (1988). Some methodological issues in the implementation of subjective poverty definitions. *The Journal of Human Resources*, 23(2), 222–242.
- Lluch, C. (1973). The extended linear expenditure system. *European Economic Review*, 4(1), 21–32.
- Merz, J., Garner, T. I., Smeeding, T. M., Faik, J., & Johnson, D. (1993). Two scales, one methodology-expenditure based equivalence scales for the United States and Germany. Cross-National Studies in Aging Program Project Paper No. 8, All-University Gerontology Center. Syracuse. NY: Syracuse University.
- Mysíková, M., & Želinský, T. (2019). On the measurement of the income poverty rate: The equivalence scale across Europe. *Statistika: Statistics and Economy Journal*, 99(4), 383–397.
- Mysíková, M., Želinský, T., Garner, T. I., & Fialová, K. (2019). Subjective equivalence scales and income poverty in Eastern vs Western European countries. BLS Economic Working Paper No. WP-519. Washington: Bureau of Labor Statistics.
- Prais, S. J., & Houthakker, H. S. (1955). *The Analysis of Family Budgets*. Cambridge: Cambridge University Press.
- Rothbarth, E. (1943). Note on a method of determining equivalent income for families of different composition. In C. Madge (Ed.), *War-time pattern of saving and spending*. Cambridge: Cambridge University Press.
- Saunders, P., Halleröd, B., & Matheson, G. (1994). Making ends meet in Australia and Sweden: A comparative analysis using Subjective Poverty Line methodology. *Acta Sociologica*, 37(1), 3–22.
- van der Gaag, J., & Smolensky, E. (1982). True household equivalence scales and characteristics of the poor in the United States. *The Review of Income and Wealth*, 28(1), 17–28.
- Večerník, J. (1991). Úvod do studia chudoby v Československu. *Sociologický časopis*, 27(5), 577–602.
- Večerník, J. (1996). *Markets and people. The Czech reform experience in a comparative perspective*. Aldershot: Avebury.
- Watts H., (1967). The ISO-prop index: an approach to the determination of differential poverty thresholds. *Journal of Human Resources*, 2(1), 3–18.

Appendix

Table A.1 Regression results: Consumption expenditures (2016)

COICOP:	CP01	CP02	CP03	CP04	CP05	CP06	CP07	CP08	CP09	CP10	CP11	CP12
Income	0.021***	0.003*	0.023***	0.031***	0.046***	0.009***	0.077***	0.005***	0.062***	0.003**	0.031***	0.051***
2 adults	1,791.902***	270.459***	171.545**	1,031.723***	-57.849	176.317***	142.978	300.973***	-104.281	19.925	-140.727	627.528***
3 adults	3,118.893***	117.160	499.419***	1,570.927***	-151.053	178.274***	-101.015	640.124***	385.463	124.998**	483.362**	1,000.478***
4+ adults	4,018.782***	63.825	730.125***	1,645.635***	-675.865***	370.164***	-302.570	914.032***	-79.076	200.252**	1,155.392***	501.392
1 child	466.088***	-109.607	455.635***	44.232	22.458	5.490	250.376	89.320**	312.335**	130.422***	182.982	12.983
2+ children	997.478***	-236.199***	605.032***	-205.308	-317.021*	-161.995***	112.450	142.000***	642.801***	348.489***	877.468***	83.467
Working	289.028***	235.775***	433.025***	-86.146	70.853	-106.521***	705.383**	284.962***	50.376	-7.129	307.320***	958.716***
Females	-215.377**	-330.768***	95.825*	277.725**	-56.866	30.261	-739.592***	31.302	-16.270	80.856***	-283.199***	40.630
Tertiary	148.509	-161.696**	296.105***	51.183	35.105	235.615***	397.742	-84.304*	969.794***	151.480***	853.303***	618.049***
Young	-940.581***	-68.350	227.023**	-824.170***	-218.182	-276.881***	722.044**	124.707**	-34.822	85.497***	446.903***	-157.822
Dense area	198.402**	53.606	47.386	1,521.775***	-400.100***	106.015**	-511.061**	140.457***	433.878***	6.058	35.924	184.189
Medium area	-58.517	-28.276	31.925	701.125***	-260.990**	-23.242	-188.057	7.956	150.906*	13.772	80.870	81.258
Rooms	54.258*	-27.422	16.041	238.915***	55.276	25.941*	29.707	11.529	46.582	-7.897	-76.190***	132.166***
Mortgage	-306.448***	58.802	-197.484***	-239.868*	-217.553	-116.223***	-159.138	53.013	-342.104**	30.783	-71.599	-189.273
Rent	-245.273**	109.836	-185.827***	2,847.188***	-301.912***	6.762	-187.040	120.759***	-391.476***	-58.616***	-204.697**	-273.515*
Constant	2,221.734***	520.172***	-169.707**	1,262.217***	190.620	173.980***	-38.346	225.501***	-204.061	-87.305***	240.517*	-352.500*
N	1,582	1,582	1,582	1,582	1,582	1,582	1,582	1,582	1,582	1,582	1,582	1,582
R ²	0.564	0.118	0.468	0.367	0.186	0.138	0.163	0.364	0.387	0.218	0.410	0.453
F	161.6	16.09	88.55	41.34	18.03	14.78	23.67	58.56	40.08	19.94	51.77	97.61

Source: SRU 2016. Authors' computations.

Notes: See Section 4.1 for variables description. ***denotes the 1% significance level, **denotes the 5% significance level, *denotes the 10% significance level.

Table A.2 Regression results: Subjective MIQ (2006–2016)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ln Income	0.252***	0.220***	0.234***	0.244***	0.275***	0.255***	0.203***	0.192***	0.246***	0.277***	0.270***
2 adults	0.252***	0.291***	0.252***	0.233***	0.236***	0.230***	0.263***	0.256***	0.217***	0.201***	0.195***
3 adults	0.362***	0.384***	0.365***	0.329***	0.340***	0.327***	0.376***	0.374***	0.339***	0.322***	0.303***
4+ adults	0.461***	0.510***	0.455***	0.443***	0.426***	0.445***	0.466***	0.451***	0.410***	0.390***	0.377***
1 child	0.104***	0.106***	0.108***	0.109***	0.094***	0.081***	0.082***	0.074***	0.060***	0.077***	0.074***
2+ children	0.189***	0.166***	0.170***	0.161***	0.139***	0.121***	0.146***	0.155***	0.153***	0.140***	0.160***
Working	0.141***	0.154***	0.141***	0.136***	0.129***	0.133***	0.166***	0.168***	0.137***	0.106***	0.119***
Females	-0.062***	-0.048***	-0.073***	-0.032**	0.005	-0.014	-0.034**	-0.052***	-0.044***	-0.041***	-0.059***
Tertiary	0.079***	0.101***	0.102***	0.101***	0.089***	0.058***	0.087***	0.084***	0.063***	0.038***	0.040***
Young	0.019	0.001	0.033**	0.022	-0.028*	-0.005	-0.017	-0.020	-0.001	-0.005	-0.027*
Owner	0.003	-0.001	0.010	-0.021**	-0.043***	-0.059***	-0.045***	-0.056***	-0.037***	-0.030***	-0.051***
Mortgage	0.037**	0.072***	0.057***	0.025*	0.046***	0.053***	0.066***	0.067***	0.070***	0.057***	0.048***
Rooms	0.024***	0.023***	0.026***	0.027***	0.025***	0.022***	0.029***	0.027***	0.014***	0.027***	0.031***
Dense area	0.104***	0.101***	0.095***	0.074***	0.080***	0.056***	0.089***	0.109***	0.073***	0.114***	0.113***
Medium area	0.023**	0.019**	0.001	0.022**	0.028***	0.007	0.019**	0.022**	-0.014	0.003	-0.001
Great difficulty	0.166***	0.179***	0.137**	0.038	0.188***	0.147***	0.140***	0.229***	0.165***	0.210***	0.211***
Difficulty	0.148***	0.153***	0.121**	0.054	0.189***	0.170***	0.168***	0.202***	0.180***	0.228***	0.181***
Some difficulty	0.117***	0.110***	0.098*	0.021	0.140***	0.121***	0.133***	0.178***	0.140***	0.172***	0.144***
Fairly easily	0.038	0.047	0.013	-0.055	0.086**	0.062	0.063	0.095**	0.067*	0.096***	0.080**
Easily	0.004	-0.000	0.002	-0.064	0.060	0.016	0.035	0.111**	0.070*	0.121***	0.051
Mat. deprivation	-0.007	-0.040**	-0.028*	-0.055***	-0.032	-0.050***	-0.017	-0.053***	-0.042**	-0.023	-0.093***
Constant	4.179***	4.438***	4.463***	4.583***	4.199***	4.468***	4.781***	4.817***	4.541***	4.216***	4.303***
Observations	7,474	9,658	11,115	9,908	9,096	8,861	8,767	8,269	8,052	7,906	8,503
R-squared	0.509	0.510	0.523	0.507	0.497	0.499	0.512	0.508	0.516	0.550	0.556
F	337.3	433.6	494.7	401.6	374.5	347.9	366.4	331.4	313.7	373.5	424.3

Source: EU-SILC 2006–2016. Authors' computations.

Notes: See Section 4.2 for variables description. ***denotes the 1% significance level, **denotes the 5% significance level, *denotes the 10% significance level.