# OBJECTIVE AND SUBJECTIVE POVERTY OF HOUSEHOLDS IN CZECH REGIONS

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#### Abstract

This article is focused on the actual and required incomes of Czech households and their differences among regions (NUTS 3). The source data is taken from the SILC survey from 2005 to 2015. Equalised net annual income is selected as the income indicator. For the characteristics of poverty, the poverty rate, the poverty gap ratio and the depth of poverty are used. The required minimum subjective household income is modelled as a function of actual income, household size and region by a regression model with random effects. In addition, the objective and subjective conceptions of poverty and the degree of their compliance in regions are confronted.

Keywords: objective poverty, subjective poverty, regions, random effects

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#### INTRODUCTION

The research of poverty is based on the ability to define it and to measure it. As with other social phenomena, definitions and measurements of poverty are linked to a number of problems. It is therefore always about certain concepts of poverty. The method of defining poverty then determines who is poor and the extent of poverty in society (Mareš and Rabušic, 1996; Mareš, 2000; Zdeněk and Lososová, 2014). These concepts are further classified according to several criteria, absolute and relative; direct and indirect; prescriptive and consensual; objective and subjective. Objective poverty measures are those where poverty is defined by factors independent of those who are considered to be poor. The subjective poverty measures are based on the evaluation of their own experience by individual households. The subjective perception of the household often does not correspond to the official measurements of poverty through objective indicators, since "being poor" is not the same as "feeling poor" (García-Carro and Sánchez-Sellor, 2019). Mareš

and Rabušic (1996) stated that subjective poverty is wider than poverty expressed by objective rates in developed European countries. Furthermore, Mareš (2002) stated that investigation of the subjective poverty line is particularly important for comparing different social categories and environments, and the basic objective of detecting subjective poverty is, among other things, to identify the mismatch between approaches to measuring poverty (i.e. the proportion of households classified as poor by objective criteria but not feeling poor, and households, which according to objective criteria are not poor, but feeling poor). One way to determine the subjective poverty line is to answer the question about income, which allows the household to meet its basic needs. It can be assumed that the answer to this question is affected, inter alia, by the level of housing costs in the region. Therefore, it is necessary to investigate subjective poverty and its consistency with objective poverty at the regional level.

The aim of this paper is to compare the basic measures of objective and subjective poverty

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(according to the real and required minimum household income) and to identify the basic disproportions between the objectively and subjectively perceived poverty among Czech regions (NUTS3 level). The paper is organized as follows. The Data and Methods chapter specifies dataset (SILC database), variables, objective and subjective poverty lines, and poverty measures. The next section presents the main results of measuring the objective and relative poverty rates and their consensus in the regions. The final section contains conclusions.

## DATA AND METHODS

#### Data

After joining the EU, the Czech Statistical Office, in accordance with European legislation, has been providing a statistical survey called Statistics on Income and Living Conditions since 2005, a national modification of the EU-SILC survey. The implementation of this survey has become binding after accession to the European Union. In accordance with the Regulation of the European Parliament and the Council of the European Union, it is also ensured by other EU Member States (Regulation, 2003; Regulation, 2005). The purpose of the survey is to obtain representative data on the income distribution of particular types of households, the risk of poverty by different groups of people, the data on the type, the quality and the financial cost of housing, the household equipment and the working, material and health conditions of adults living in the household. The questionnaire consists of three parts, a questionnaire for an apartment, a household and a person over the age of 16, and a module, which extends one of the areas targeted by EU-SILC (e.g. intergenerational transmission of poverty, housing conditions, health and well-being). The survey is conceived as a rotational panel (Fig. 1) - selected households are repeatedly interviewed for four consecutive years, with approximately one-fourth replacements each year (Výběrové šetření, 2018).

The survey is carried out in all regions. The selection plan is based on a random two-stage selection for each region independently so that the total number of selected dwellings is proportional to the size of each region ( $\check{C}S\check{U}$ , 2017). Table 1 shows the number of surveyed households in individual



Source: Mysíková (2011).

regions (NUTS3; due to the size of the table only in odd years and the average number). With a more detailed division into districts (LAU1, 76 districts + capital city), the frequencies in individual districts are low, frequencies are often unitary for low-income households, so we had to choose regional division by NUTS3. A significant rate of non-response distorts the composition of the sample of households for which data are available. Therefore, the Czech Statistical Office calculates the conversion coefficients (the household calibration weights) to the total population ( $\check{C}S\check{U}$ , 2017). Details on the survey, the structure of the Czech SILC and descriptive statistics of household income are provided e. g. by *Stejskal – Stávková* (2010).

Table 1. Humber of Sumplea Household's decording to regions							
Region (kraj)	2005	2007	2009	2011	2013	2015	Average
Hl. m. Praha	469	864	854	871	898	986	842
Středočeský	459	1,006	1,118	1,003	944	901	943
Jihočeský	249	612	688	630	598	554	580
Plzeňský	275	562	522	476	500	481	485
Karlovarský	118	328	326	214	183	160	234
Ústecký	362	787	821	720	661	604	689
Liberecký	174	391	417	348	331	332	345
Královéhradecký	229	513	500	460	421	428	443
Pardubický	207	513	509	419	391	387	424
Vysočina	233	510	532	486	437	403	454
Jihomoravský	425	948	984	955	857	847	873
Olomoucký	308	666	610	536	535	484	548
Zlínský	241	576	624	536	488	446	510
Moravskoslezský	602	1,399	1,406	1,212	1,031	901	1,149
Total	4,351	9,675	9,911	8,866	8,275	7,914	8,518

Source: SILC.

The SILC 2005 survey contains data current at the time of the investigation, i.e. in May 2005, the income is for the whole year of 2004, the SILC 2006 survey contains data current at the time of the investigation, i.e. in May 2006; the income is for the whole year 2005, etc. In this article, the labels represent the years of the SILC statistical survey. We used the following variables from the SILC survey:

• Household's net monetary income in CZK per year (SILC code *CP\_PRIJ*). It includes gross income from the work (employment and business) of all household members, social incomes and other income less health and social insurance and income tax. Czech Statistical Office uses disposable household income as internationally comparable household income indicator, which is modified by the inclusion or exclusion of certain components of income – regular cash transfers between households, income in kind and property tax ( $\check{C}S\check{U}$ , 2017). Valuation of income in kind is done by an estimate or fixed tariff<sup>3</sup>, which (and because the Minimum Income Question also focuses on net income) is why we work with net monetary income. As a result, our results may differ from those published (at the national level) by the Czech Statistical Office.

• Minimum subjective household income (reported) in CZK per month (SILC code *MIN\_PRIJ*). The value is determined by the

answer to the question: "What is the lowest net monthly income your household would have to have in order to make ends meet?". Its value is, therefore, a subjective estimate of the household's minimum monthly income due to the composition and conditions of the household that allows households to meet their basic needs.

- The number of consumer units (SILC code *EJ*) which represents the household size (the head of the household has the weight of 1, children under 13 have the weight of 0.3 and other members 0.5

   the OECD-modified scale<sup>4</sup>).
- The coefficient (calibration weight) for recalculation of results from the sample to the whole population (SILC code *PKOEF*).

#### **Objective poverty line**

Measuring poverty means primarily identifying the poor and determining their share or absolute number in the population. This is occurring for analytical purposes but is mainly for administrative reasons. It is necessary to identify those who have the right to receive social benefits and to determine the costs that redistribution of income through these benefits will require (*Mareš*, 2002). In the case of measurement of the relative poverty, various limits are used as low-income thresholds, for example, the first quintile, the third decile, or particular percentage of the average or of the median. In the Czech Statistical Office and Eurostat publications (*Fusco et al.*, 2010) the poverty line is defined as 60% of the median equalized disposable income.

*Bartošová* (2013:54) states that besides identifying the poverty rate of each individual (based on household equalized income, as officially calculated by Eurostat), it is possible to detect the poverty rate of the household as a whole (represented by its equalized income) or to use only part of the SILC database – e. g. only longitudinal data, data for selected groups, regions, etc.). *Bhorat* (1999) emphasizes that poverty measures at both individual and household level are important, and hence one approach should not be neglected in trying to understand the low income in society. *Meulders* and *O'Dorchai* (2011) and *Vijaya et al.*, (2014) apply a different approach to low-income analysis. They compare the differences between the usual method (based on the assumption that household members share their income) and the method when each individual is analysed independently, regardless of the household he/she belongs to; i. e. they take into account directly the income of the individual.

As can be seen from the above, the basis for calculating the relative poverty line can be determined in a wide variety of ways. As the title of the paper suggests, the authors focused on the comparison of objective and subjective poverty of household as a whole, i. e. they chose the household as the statistical unit. This is reflected both in the calculation of the median income and subsequently in the calculations of the poverty measures. Therefore, due to the different methodology, partial results may differ from those published by the Czech Statistical Office and Eurostat.

An international comparison of relative poverty rates can be based on the international poverty line or on the various national poverty lines, and similarly, the regional poverty line can be derived from the median income at the national or regional level (*Dvornáková*, 2012). The use of the median income at the level of the higher-level unit also includes the impact of income differences among sub-units (*Kangas* and *Ritakallio*, 2007). The proportion of the poor is then shifted downward in higher income areas, and upward in areas with a lower income by the use of regional poverty lines (*Mogstad et al.*, 2007). In this paper, authors work only with the national poverty line. Estimation of the median income ( $\tilde{y}$ ) is given by the relationship (*Želinský*, 2014: 49):

$$\widetilde{\gamma} = \begin{cases} \frac{1}{2} (y_j + y_{j+1}) & \text{if } \sum_{i=1}^{j} w_i = \frac{1}{2} \sum_{i=1}^{n} w_i \\ y_{j+1} & \text{if } \sum_{i=1}^{j} w_i < \frac{1}{2} \sum_{i=1}^{n} w_i < \sum_{i=1}^{j+1} w_i \end{cases}$$
(1)

where  $y_i$  is the equalized net income (calculated as  $CP\_PRIJ / EJ$ ) of the *i*-th household sorted into ascending row  $y_1 \le y_2 \le ... \le y_{n-1} \le y_n$ ,  $w_i$ 

http://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf

is the household's weight (variable marked as *PKOEF* in the SILC), and *n* is the total number of households.

The objective poverty line (z) is defined as:

$$z = 0.6 \ \widetilde{y} \tag{2}$$

#### Subjective poverty line

The subjective poverty can be expressed in different ways. One way to set the subjective poverty line is to determine the minimum amount of money needed to meet the basic needs according to the subjective assessment of the household (Mareš and Rabušic, 1996). Goedhart et al. (1977) conducted a survey on a sample of 2885 Dutch families in 1975 to find out the answer to the question: "We would like to know which net family income would, in your circumstances, be the absolute minimum for you. That is to say, that you would not be able to make both ends meet if you earned less.". The answer to this question depends on a number of household characteristics and does not determine the subjective poverty line. Since the answer to this question correlates, inter alia, with actual income, methods for deriving an estimate of the subjective poverty line, which is unbiased by this correlation, have been derived (Decanca et al., 2013). Parameters for its calculation must be obtained through linear regression (Mareš and Rabušic, 1996). It is assumed that the reported minimum required income is a function of the actual household income (Wollf (2009) states that estimates of household needs directly depend on its usual consumer habits with a given level of income) and the number of household members (that the minimum required income will increase with the household size). De Vos and Garner (1991) added several explanatory dummy variables that represent the composition of the household instead of logarithm of family size. Differences in cost of living can be expected between different geographic regions or between areas that differ in the degree of urbanization, hence De Vos and Garner (1991) adds regional dummy variables. Mareš and Rabušic (1996) allow and use the possibility of calculating parameters from non-logarithmized values. The reason is for a more straightforward interpretation and a high similarity of results. The individual subjective poverty line is calculated for each unit (household); and on

its basis, the subjective poverty line of the given type of households can be determined.

Due to the structure of the dataset which is conceived as a rotary panel (Fig. 1), and because the survey is performed over several consecutive years in individual households, a panel regression model with random effects is proposed (*Cipra*, 2008:202). A regression model of the minimum subjective annual household income ( $y_{ir}^{m}$ ) is defined as

$$y_{it}^{m} = a + b_{1}hs_{it} + b_{2}y_{it} + b_{3}t + \sum_{j=1}^{j-1} c_{j} dreg_{jit}$$
(3)  
+  $\omega_{ii}; \omega_{it} = \varepsilon_{it} + \eta_{i}$ 

where  $h_{s_{it}}$  is the size of the household *i* in the period *t*,  $y_{it}$  is the net annual income of the household *i* in period *t*, *t* is time variable,  $dreg_{jit}$  is the dummy variable of the *j*-th region according to the residence of the household *i* in period *t*, *J* is number of regions, *a*,  $b_1$ ,  $b_2$ ,  $b_3$  and  $c_j$  are estimated parameters,  $\eta_i$  is a random effect representing individual cross-sectional units (households) with distribution  $N(0, \sigma_a^2)$  and  $\varepsilon_{it}$  is a random error with distribution  $N(0, \sigma^2)$ .

#### **Measures of poverty**

The basic indicator of poverty is the poverty rate (*Wolff*, 2008:99; *Bartošová*, 2013:56; *Želinský*, 2014:20), which refers to the number of households with incomes below the poverty line of the total population. This index is neutral to the intensity of the poverty; it is only sensitive to its extent. In the case of the use of calibration weights, the poverty rate ( $P_{0w}$ ) is given by the relationship (*Želinský*, 2014:50):

$$P_{0w} = \frac{\sum_{\forall i \mid y < z} w_i}{\sum_{i=1}^{n} w_i},$$
(4)

where  $y_i$  is the equalized net income of the *i*-th household,  $w_i$  is the calibration weight of the household and z is the poverty line.

The poverty rate measures the extent of poverty, but it does not indicate anything about its intensity. The poverty gap ratio (*Wolff*, 2009:100) expresses the average relative distance between households with incomes below the poverty line to that line. The poverty gap ratio is valued from 0 (when poor households have income at the poverty line) to 1 (all households in this group have zero incomes). The poverty gap ratio  $(R_{w})$  with the calibration weights is calculated as:

$$R_{w} = \frac{1}{\sum_{\forall i \mid y_{i} < z} w_{i}} \sum_{\forall i \mid y_{i} < z} \frac{z - y_{i}}{z} \cdot w_{i}$$
(5)

where  $y_i$  is the equalized net income of the *i*-th household,  $w_i$  is the calibration weight of the household and *z* is the poverty line (the summation is only for households below the poverty line).

These indicators measure either the extent or intensity of poverty; and belong to the Foster-Greer-Thorbecke (FGT) group of poverty measures (*Foster et al.*, 1984), defined by the relationship:

$$P_{w\alpha} = \frac{1}{\sum_{i=1}^{n} w_i} \sum_{\forall i \mid y_i < z} \left( \frac{z - y_i}{z} \right)^{\alpha} \cdot w_i.$$
(6)

where parameter  $\alpha$  expresses a measure of aversion to poverty. If  $\alpha = 0$ , then the FGT relation corresponds to the poverty rate (share of the poor households), if  $\alpha = 1$ , then the FGT relation corresponds to the product of the poverty rate and the poverty gap ratio, and is called the depth of poverty (*Bartošová*, 2013:56; *Želinský*, 2014:20),

$$P_1 = P_0 \cdot R. \tag{7}$$

The  $P_1$  indicator also expresses the proportion of income that would have to be transferred to households in the group below the poverty line in order to close the poverty gap; however, it does not take into account the distribution of income in this group. This can be captured by setting a higher value of  $\alpha$  (*Wolff*, 2009:101). When  $\alpha = 2$ , the indicator of poverty severity takes into account the degree of inequality among the poor.

#### **Consonance of objective and relative poverty**

Consonance (dissonance respectively) of the objective and subjective conception of poverty can be assessed by the consonance matrix. In the rows, households are broken down by objective classification of poverty, in the columns by subjective classification. The results arranged in this matrix can be subsequently evaluated using the measures usual for evaluation of classification tasks (e. g. *Hebák*, 2004).

#### RESULTS

#### Measures of objective poverty

As a low-income threshold (z), we chose 60% of the median of equalized annual net income of household (eq. 1 and 2) and this threshold was CZK 78,786 in 2005 (i.e. from the 2004 income) and grew continuously to CZK 118,743 in 2015 (i.e. the income of 2014; Table 2). At the national level, 9.1% of households were situated below the poverty line in 2005. The poverty rate of households is fairly stable over time, with 8.6% in 2015; and with an average of 8.3%.

Year	60% median
2005	78,786
2006	83,052
2007	89,630
2008	97,390
2009	105,906
2010	109,375
2011	110,886
2012	112,674
2013	114,241
2014	116,229
2015	118,743

Tab. 2: National poverty line, 60% of the median of equalized annual net income of household, in CZK

Source: SILC, own calculation.

From a regional perspective, there is some variability in the poverty rate. The lowest value in all years is traditionally in the capital city of Prague, on average 4.3%. Other regions with a low household poverty rate include Vysočina (5.7%) and Plzeňský (6.0%). On the other hand, there are regions with a value above 12%, namely Ústecký (13.0%), Moravskoslezský (12.7%) and Olomoucký (12.2%). Fig. 2a shows the average values of the poverty rate in 2005–2015.

Using the poverty gap ratio, the relative distance of households below the low-income threshold to this threshold can be expressed. At the national level, its value decreased from 23.3% in 2005 to 20.9% in 2015, with an average of 22.0%. Only Plzeňský kraj (18.2%), Jihočeský (18.8%), Jihomoravský (19.0%) and Vysočina (19.7%) show a poverty gap ratio under 20% (based on the average of 2005-2015, Fig. 2b). In the Ústecký kraj, the poverty gap ratio of 25.9% is greater due to the high share of the poor, which is reflected in a depth of poverty of 3.4% (Fig. 2c).

### Measures of subjective poverty

The subjective poverty line for each household is fitted using a linear model with random effects, where the household's actual income, household size (number of consumer units), year and region are taken as regressors (eq. 3). The final estimate of the parameters is given in Table 3, where the effects show a high degree of significance. The estimated values of the regression coefficients result that the estimated subjective minimum income for the (average) household of an individual with zero income living in Královehradecký kraj was CZK 113,471 (i.e. 14,061 + 99,410 for one consumer unit) in 2005 and grew by CZK 4,637 per year and CZK 135 for every 1,000 CZK of net income.

Tab. 3: Linear random-effects model fit				
Regressor	Estimated value	Std. Error	<i>p</i> -value	
Intercept	14,060.5	2,368.5	0.000	
Household size (hs)	99,410.0	783.7	0.000	
Actual income (y)	0.135	0.002	0.000	
Year (t)	4,637.2	119.3	0.000	
Královéhradecký kraj (dreg)	reference			
Jihočeský kraj	-4,174.8	2,624.6	0.111	
Jihomoravský kraj	4,502.3	2,416.5	0.062	
Karlovarský kraj	-6,856.4	3,423.9	0.045	
Liberecký kraj	6,864.8	2,970.6	0.020	
Moravskoslezský kraj	-13,119.7	2,333.7	0.000	
Olomoucký kraj	981.0	2,662.5	0.712	
Pardubický kraj	-2,059.8	2,835.5	0.467	
Plzeňský kraj	23,452.5	2,727.9	0.000	
Hl. m. Praha	53,784.0	2,381.8	0.000	
Středočeský kraj	25,446.4	2,389.9	0.000	
Ústecký kraj	-11,272.8	2,527.3	0.000	
Vysočina	-11,714.7	2,784.3	0.000	
Zlínský kraj	-5,908.2	2,715.7	0.029	

Source: SILC, own calculation.

The poverty rate based on the estimated subjective poverty line is significantly reduced over time, from 45.1% in 2005 to 30.1% in 2015. The highest proportion of the households below subjective poverty line (on average for the whole period) is shown in the Plzeňský kraj (38. 9%) and Prague (38.7%). The lowest share of households below the subjectively defined poverty line is recorded by the Vysočina (25.5%), Jihočeský (29.5%) and Zlínský kraj (29.7%, Fig. 2).

The average value of the relative distance of actual income from the subjective poverty line is 21.7%, decreasing from 24% (2005) to 20.1% (2015). The highest poverty gap ratio is recorded by the Ústecký kraj (24.1%) and Prague (23.9%). In the Vysočina, the relative distance is only 18.2%. Low values are recorded also by the Královehradecký (19.5%) and Jihočeský kraj

(19.6%). The low values of both measures of subjective poverty result in a lower depth of poverty, in the Vysočina on average 4.6%, in Jihočeský kraj (5.8%) and in Královehradecký kraj (5.9%). Household requirements are the most distinctly distant from real income in the capital city. The high proportion of households that are below the estimated subjective poverty line, with a large distance to this limit, is associated with a high combined level of subjective poverty.



Source: SILC, own calculation

Note: based on 2005-2015 averages; all values in %; 2a) the poverty rate with the objective poverty line; 2b) the poverty gap ratio with the objective poverty line; 2c) the depth of poverty with the objective poverty line; 2d) the poverty rate with the subjective poverty line; 2d) the poverty gap ratio with the subjective poverty line; 2f) the depth of poverty with the subjective poverty line.

# The consonance of objective and subjective poverty

Confronting the subjective and objective approach to poverty measurement is provided by the consonance matrix. The share of households, whose subjective view on poverty is in consensus with the objective criterion, is 73.6% on average. The proportion of households whose income is below 60% of the median income and is sufficient to satisfy basic needs has reached 6.3% on average (from the number of households below the objective poverty line). The reasons why households objectively classified as poor do not feel poor are discussed in detail by Mareš (2002). It can be a group of households with a certain way of life, where low incomes are sufficient for them, of households are voluntarily modest or less ambitious. From the regional point of view (Table 4), it is highest in Jihočeský kraj (10.1%) and Moravskoslezský kraj (8.5%). On the opposite

side is Praha, where only 0.3% of households have low incomes sufficient to meet basic needs.

The share of households whose income exceeds the threshold of objective poverty and still does not reach the level that households consider necessary to satisfy basic needs (to the number of households above the boundary of objective poverty) was on average 28.2%. In terms of regions, the lowest level of dissonance between objective and subjective criterion is shown by Vysočina (21.4%) and Ústecký and Moravskoslezský kraj (23.0%); the highest degree of dissonance is shown by the capital city (35.9%) and the Plzeňský kraj (35.1%). The demands of households in these groups may seem immodest, as Řihák (2015) says, "the fact that I want something is not enough in itself to be considered deprived, poor or socially excluded". However, a closer look shows that most of these households are located between the line of objective poverty and average income.

Tab. 4: Consonance of objective and subjective criteria (proportions in %)					
	Households bel	ow objective PL	Households above objective PL		
Region	and below subjective PL	and above subjective PL	and below subjective PL	and above subjective PL	
	of households be	elow objective PL	of households above objective PL		
Hl. m. Praha	99.7	0.3	35.9	64.1	
Středočeský	97.9	2.1	32.1	67.9	
Jihočeský	89.9	10.1	24.8	75.2	
Plzeňský	98.0	2.0	35.1	64.9	
Karlovarský	91.8	8.2	24.9	75.1	
Ústecký	92.0	8.0	23.0	77.0	
Liberecký	95.3	4.7	29.9	70.1	
Královéhradecký	92.3	7.7	25.9	74.1	
Pardubický	92.0	8.0	26.9	73.1	
Vysočina	93.3	6.7	21.4	78.6	
Jihomoravský	96.1	3.9	28.0	72.0	
Olomoucký	91.7	8.3	29.6	70.4	
Zlínský	93.3	6.7	23.8	76.2	
Moravskoslezský	91.5	8.5	23.0	77.0	
Czech Republic	93.7	6.3	28.2	71.8	

Tab. 4: Consonance of	objective and subjective criteri	a (proportions in %
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Source: SILC, own calculation.

Note: PL stands for Poverty Line.

# CONCLUSION

The aim of this paper was to compare the basic measures of objective and subjective poverty of households and to identify the disproportions among Czech regions at NUTS3 level. The share of households, whose subjective view is in consensus

with the objective criterion, averaged 73.6%. The proportion of households whose income is below 60% of the median income and is sufficient to meet basic needs, i.e. is above the subjective poverty line, is 6.3% on average and shows considerable variability from a regional point of view (with minimum 0.3% in Praha and maximum 10.1% in Jihočeský kraj). On the other hand, the second type of dissonance, i.e. the proportion of household whose income exceeds the objective poverty line and still does not reach the level that households consider necessary to satisfy basic needs, was on average 28.2% (with minimum 21.4% in Vysočina and maximum 35.9% in Praha). High rates of subjective perception of poverty are reflected in richer regions where low-income households have a greater sense of exclusion from the social group. In the traditionally rural regions, where the population is more closely associated with agricultural production and the use of natural resources, the perception of poverty is smaller, and households in these regions are better able to cope with lower incomes with a more modest way of living.

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