

THE DEVELOPMENT OF INCOME AND INCOME DIFFERENTIATION IN THE CZECH REPUBLIC ACCORDING TO THE EU SILC

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Abstract

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The report deals with a brief description of the EU SILC (European Union – Statistics on Income and Living Conditions) statistical enquiry, which is pursued by the Czech Statistical Office accordingly to the European Union methodical instructions. The survey sampling proceeds in order to coordinate the methodical procedures in all EU countries according to the Regulation (EC) 1177/2003; and in the long term, it is meant to acquire the data on the income and social situation of inhabitants. The survey enables to obtain the representative data on the particular types of households income distributions, the way, quality and financial claims of living, the household equipment of things for long-time usage. Every year the survey is extended by the households living conditions modulus.

The object of the paper concerns the delimitation of Czech households income levels in the years of 2005–2008 with the basic income characteristics quantification. The primary data of EU SILC survey conducted in the years of 2005–2008 were used for the income and income differentiation analysis. The Czech economics development after the period of transformation refers to a low income differentiation, therefore the basic methodical tools of income differentiation (Gini coefficient, income deciles analysis, Theil index, Robin Hood index) will be used to prove such a matter of fact. The attention will be paid to the delimitation of the main factors influencing the income differentiation. The poverty and households endangered by poverty present a frequent topic of professional and laic discussions. The basic tools for the poverty level determination will be applied in the paper, as well as the low income group analysis in particular years with the principal characteristics delimitation. The typical sign of a low income group presents social security benefits, whose structure will be introduced in the paper. At the close, we will approach to the EU SILC survey results comparison in the particular member states with the emphasis on their risk of poverty level.

income, income differentiation, poverty, EU SILC, living conditions, income deciles

Income development belongs to significant indicator of economic and social level. Growing differentiation of income spectrum, which occurred in 90's, was not accompanied by significant increases in real incomes. The basic trends in terms of wage growth for the period of transformation were a gradual decline in the relative weight of wages in the structure of total income and deepening wage differentiation. (Spěváček *et al.*, 2002) Share of wages and salaries was, in 1995–2005, 40% of total income. Social transfers, compound income and rents repre-

sented additional part of household's income (www.mpsv.cz).

Statistic surveys are describing changes in development of social and income inequalities or stratification of society and their perception. The results are used to formulate objective indicators of income differentiation of whole society and its partial structures. The core aims of these social surveys are especially efforts to build social network and to scan social structure of society. Previous Mikrocensus surveys were replaced by EU SILC, which took

place for the first time in 2005, after joining the EU. Project EU SILC is focused on monitoring of income development and connected living conditions of households. This outcome will be used to create instruments of social policy of EU and its member states. Therefore it is necessary to ensure proper comparability and harmonization of the results. This paper is focused on determination of income differentiation of Czech population with emphasis on low-income and at-risk-of-poverty population between 2005 and 2008.

METHODS AND RESOURCES

The basic indicator used to determine the income inequality of the reference file is **coefficient of income inequality S80/S20** (S90/S10), which is based on a comparison of the income characteristics of upper and lower deciles. Comparison of income deciles for various periods, gives an overview of the dynamics of income differentiation in the relevant set. Prof. Kabát recommends using of income disparity indicator for monitoring and interpretation of dynamics of income changes, which is formulated as a cosine of directive angle Alfa between trendy lines (curves) of deciles stratification of population and income stratification (Kabát, 2007).

The Gini coefficient is basically used as an output of EU SILC project and is applied not only for the basic set, but is also applicable for the created segments. The Gini coefficient reflects the rate of income inequality for the whole monitored set, it means that we aren't able to determine the proportion of individual income segments of the value of this indicator and identify the sources of inequality. Mathematically for formulation of its value we use formula:

$$\text{Gini} = 0.5 - \int_0^1 F(x, d) dx. \quad (1)$$

Gini coefficient is also calculated according to Brown formula:

$$G = \left| 1 - \sum_{k=0}^{n-1} (X_k + 1 - X_k)(Y_k + 1 - Y_k) \right|, \quad (2)$$

where X_k and Y_k represent accrued abundance for population and income variable.

Graphic scheme of **Lorenz curve** is used for formulation of the rate of inequality, which is usually located under the line of ideal income distribution. Lorenz curve $F(x, d)$ represents graphic scheme of accrued values of population variable x_i and income variable d_i . If these two lines blend together, then there would be the ideal distribution of income without inequalities in the society.

In addition to indicators based on income variable is possible to use expletory **Laeken indicators**, which reflect indirect attributes of standard of living, from which the conclusions of the social situation of households and the quality of their lives are deducted. Indicators inform about unemployment of

population, number of households with long term unemployed members, number of children, who didn't complete primary education. One of indicators is for instance coefficient of income inequality S80 / S20, the poverty threshold or relative income decline.

Theil's index of discrepancy allows consideration of the income situation in the different income groups. This is a share of incomes of the group on the total income, which is weighted by the share of income of the group and the average income in society. If the index value is 0, everybody receives an average income. On the contrary, absolute inequality is achieved if the index is equal to $\ln(n)$. In this case, only one person receives the whole income.

Atkinson index is based on calculation of the average fair income y_e , which is defined as that income per group, which, if divided equally among the beneficiaries, ensures the same level of social welfare as the current income distribution. From a mathematical formulation we can use the following formula:

$$y_e = \left(\frac{1}{n} \times \sum_{i=1}^n y_i^{1-\epsilon} \right)^{\frac{1}{1-\epsilon}}, \quad (3)$$

where:

y_i well-balanced income of I group

ϵ inequality aversion parameter

n number of income groups.

Inequality aversion parameter indicates the preference intensity of society for equality and it take the value in the interval $<0, \infty)$. A value of 0 indicates the fact that the society has an indifferent attitude towards the distribution of income. The higher values of this parameter, means the higher emphasis the society places on transfers in the low income groups and the lower emphasis on transfers at the top of the income distribution. If this parameter reaches the extreme value $\epsilon = \infty$, the society would be interested only in individuals with the lowest income. While observing the Atkinson index there appears the rate of social sentiment in the society. As Lapáček mentions, in reality it usually takes values in the range of $<0.5, 2.5>$. Atkinson index itself is obtained from the relationship:

$$I = 1 - \frac{y_e}{\mu}, \quad (4)$$

where:

y_e average fair income

μ current average income per group.

Values of **Atkinson index** belong to the interval $<0;1>$. The value of the index will be the lower the closer current average income per capita is to the fair average. That results, if value of index reaches 0, then there is absolutely equal income distribution in the society (Lapáček, 2007).

Another instrument used to determine income inequality in society is a **Robin Hood Index**, which is based on the Lorenz curve model and is directly

linked to the Gini coefficient. Whereas the Gini coefficient records the relative inequality among households – measures the real Lorenz curve with the ideal curve in percentage expression, Robin Hood's Index attempts to identify and quantify the highest difference between ideal and real income distribution in society. In the graphic scheme it measures the longest absolute distance between real (empiric) Lorenz curve and a line of perfect equality (the line with 45° inclination). It represents how huge amount of income of the society would be redistributed from rich to poor, if we want to achieve absolute equality in society, absolutely egalitarian society (SCFM, 2010).

For calculation is necessary to sort the households according to their income from the richest to the poorest. The created group we divide into 10 same parts, for which we calculate the amount of percentage of the total income. To other calculations we include only the groups, which achieved at least 10% share of the total income. Finally we deduct n multiple of 10% from this amount, where n is a number of groups included into the amount. The result is a number lower than 1, which is multiplied by 100 and converted to percentage. The obtained value is directly the part of total income, which should be redistributed from households with above-average income to the households with below-average income, and then there is income equality (Lapaček, 2007).

The last-mentioned methodological instrument is the **coefficient of variation**. It is a dimensionless value, it's hundredfold indicates the variability of surveyed selection as a percentage. The higher is percentage of variability the higher is the disparity of the set and the higher is income differentiation. Mathematically we obtain its value:

$$V_x = \frac{s_x}{\bar{x}}, \quad (5)$$

where:

s_x .. standard deviation (square root of the variance)

\bar{x} .. arithmetic average.

While analyzing the income situation is usually attention paid to income groups with the lowest income. These groups are not able to provide basic needs (food, housing, clothing) and often get into the range of poverty. The concept of poverty is broadly understood and there is a huge amount of definition in the literature. There are numbers of methodological approaches of monitoring poverty. Many of them are based on poverty threshold. The World Bank defines poverty as \$ 1 per person per day. In most developed countries, poverty is identified with the minimum subsistence level (eg the USA). EU SILC project is based on theoretical knowledge of income variable distribution, specifically from lognormal distribution, which allows us to estimate the proportion of income vulnerable population as a median value of 0.6. PPOD indicator is a key indicator for the analysis of income differentiation of popula-

tion and for the analysis of income characteristics of selected groups of respondents (Kabát, 2007).

To estimate the depth and extent of poverty in society, we use coefficients of poverty, which was derived by A. Sen, a Bangladesh economist. This Nobel Prize winner in economy in 1998 established the concepts of absolute and relative poverty. The level of poverty **A** is identical with the median value of 0.6. Relative indicator POPHCH represents the proportion of below-at-risk-of-poverty threshold population. Average income of households below the level of median value 0.6 is indicated as **a**. The value (**A-a**) is called the **depth of poverty indicator**, it represents income deficit of the household, which is classified in at-risk-of-poverty cluster and is shown in following scheme. The value signify theoretical amount of financial sources needed for pulling household up to poverty threshold.

To formulate the extent of poverty is also possible to use **Sen Coefficient of poverty** (**A-a**)/**A**, which is relative indicator of depth of poverty and ranges between 0-1. Values close to 0 indicate moderate poverty and conversely the value close to 1 point to significant poverty.

RESULTS

The following table provides basic statistical parameters of descriptive statistics for the survey results in 2005–2008.

The table shows that both of monitored income in that period increased. Interesting findings are the decrease in the span between the highest and lowest income of households and the decrease of the mean error, which is determined by increasing number of surveyed households.

Comparison of the income deciles results the decline of Gini coefficient of income inequality. It signifies that the differences between low and high-income group reduces. In 2008 the number of household in low-income group increased, the proportion of eighth and ninth decile remained unchanged and conversely number of household in the highest decile decreased.

The value of Theil's index falls into the interval $\langle 0, \ln(n) \rangle$. In our case, 5 quintile income groups were created, so the interval ranges $\langle 0, 1.61 \rangle$. Inserting into the formula we get $T = 0.077608$, which indicates a low-income differentiation.

During calculating the Atkinson index for 2008 was chosen parameter of aversion to the inequality $\varepsilon = 2$, that signifies the society is not indifferent to the distribution of income. As Lapaček (2007) indicates this value in the best way reflects the high extent of levelling of income in society. Following finding was determined from the calculation. If each household achieved an annual well-balance income of CZK 204,583, there would be achieved the same level of welfare as in the current situation. If we take into account the average annual income per household, which is in the amount of CZK 294,657, then the value of Atkinson's index reaches 0.306. In this case,

I: Descriptive statistics

Year	2005		2006		2007		2008	
Parameter	Income per household member							
	EKV ¹	FYZ ²	EKV	FYZ	EKV	FYZ	EKV	FYZ
Mean value	12 232	9 152	12 629	9 455	13 620	10 184	14 627	10 901
Mean value error	118	98	88	71	79	62	75	57
Median	10 500	8 037	10 958	8 288	11 815	8 967	12 798	9 633
Modus	8 083	7 583	8 000	8 000	11 333	8 500	10 000	8 000
Standard deviation	7 812	6 437	7 649	6 124	7 727	6 126	7 941	6 066
Dispersion of selection	61 034 150	41 435 272	58 509 561	37 506 708	59 699 999	37 527 888	63 054 968	36 792 738
Sharpness	246	495	166	277	130	140	94	130
Skewness	10	15	8	11	7	8	6	7
Span	252 598	252 598	230 978	230 978	220 591	183 701	220 102	181 662
Number	4 351	4 351	7 483	7 483	9 675	9 675	11 294	11 294
0,6 Median	6 300	4 822	6 575	4 973	7 089	5 380	7 679	5 780

Source: ČSÚ, own calculation

II: Decile distribution according to income of FYZ

Year	2005			2008		
Percentile [%]	Average FYZ [CZK]	Proportion of income [%]	Cumulative Proportion of income [%]	Average FYZ [CZK]	Proportion of income [%]	Cumulative Proportion of income [%]
10	3704	4.05	4.05	4917	4.51	4.51
20	5483	5.99	10.04	6 980	6.41	10.92
30	6541	7.15	17.18	7 990	7.33	18.25
40	7190	7.85	25.04	8 683	7.96	26.21
50	7750	8.47	33.50	9 298	8.53	34.73
60	8317	9.09	42.59	10 008	9.18	43.91
70	9087	9.93	52.51	10 896	9.99	53.90
80	10268	11.22	63.73	12 233	11.22	65.12
90	12318	13.46	77.19	14 663	13.46	78.58
100	20836	22.81	100.00	23 343	21.42	100.00

Source: ČSÚ, own calculation

III: Comparison of deciles according to average income

Compared deciles	Survey				
	Mikrocensus 2002	EU SILC			
		2005	2006	2007	2008
10 : 1	5.65	5.63	5.45	5.19	4.75
(10 + 9) : (1 + 2)	3.74	3.61	3.52	3.39	3.19
(10 + 9 + 8) : (1 + 2 + 3)	2.86	2.76	2.71	2.64	2.53
(10 + 9 + 8 + 7) : (1 + 2 + 3 + 4)	2.36	2.29	2.25	2.21	2.14
(10 + 9 + 8 + 7 + 6) : (1 + 2 + 3 + 4 + 5)	2.03	1.98	1.96	1.93	1.88

Source: ČSÚ, own calculation

- 1 EKV – Because of account of savings of span, addition of needs of other adult members of household and of children decreases. The first adult member of the household is counted by coefficient 1, all others adults are counted by coefficient 0.5 and children below 13 are counted by coefficient 0.3.
- 2 FYZ – Every member of the household is counted by coefficient 1.0 (adult member and children are counted same coefficient).

IV: Gini coefficient for 2005–2008

Indicator	EU SILC			
	2005	2006	2007	2008
Gini coefficient	0.248	0.244	0.239	0.228

Source: own calculation

the society would have to equally distribute only 70% of current income to achieve the same level of welfare.

During calculating Robin Hood Index the core set was ranked from the highest annual incomes of households to the lowest and was divided into ten equal sized groups. Only the groups with the proportion of total income higher than 10% were included for calculation. Amount of these proportions was subsequently humiliated by 10% four times.

$$RHI = (0.242 + 0.154 + 0.128 + 0.108) - (4 \times 0.1) = 0.233.$$

For the purpose of absence of income inequality, 23.3% of income should be in 2008 redistributed from household with above average income to households with below average income.

The coefficient of variation achieves in 2008 value 68.34%.

The table represents a decrease of households below the poverty threshold. In table V is presented the relative decline of household which are at risk of poverty. The cause of this phenomenon is in increasing number of households, changes in the system of social transfers and also in decreasing income differentiation of Czech households.

Eurostat published the results of EU SILC survey for 2008, according to which 17% of the EU27 population is below the poverty threshold⁴ and is directly at-risk-of-poverty. Most vulnerable population at-risk-of-poverty is in Lithuania (26%), Romania (23%), Bulgaria (21%) and Greece, Spain and Latvia (20%). The lowest level of risk of poverty, was reported by the Czech Republic (9%), the Netherlands and Slovakia (11%), Denmark, Hungary, Austria, Slovenia and Sweden (12%). When interpreting these results, it should be emphasized that those shares are in relation to national medians and do not signify the real living standard of the popu-

lation. In the case of the Czech Republic, which reached the lowest risk of poverty, the result is determined by the low level of income differentiation and a relatively low span between low and high income groups. A large number of households circulate around the median, which is however in comparison especially with Western nations, low.

For complex assessment of standard of living it is important to know more than indicators of level of income. The factors, which have an effect on differentiation and size of poverty in society, have to be added. These may be those that are directly affected by government intervention and regulations, and conversely the factors that are the result of market forces and are influenced only indirectly. For example the factors are:

- differentiation of income from employment and business in accordance with,
- government fiscal policy, particularly national tax system,
- social policy, structure of social benefits and subsidies,
- absolute and relative threshold of poverty, including its size,
- savings from the joint business of households,
- structure of households – by age, education, number of people, occupation,
- the current distribution of wealth,
- the chosen form of equity and other scales.

In low income group households reached in 2008 the average monthly income per adjusted household member in the amount of CZK 8099. Head of most of the household is male and then the widowed persons, skilled workers. The highest representation of household is households including individual over 65 years and individual younger than 65 years. Most of households are childless or with one or two dependent children. In 60% there is in the head of household a pensioner without economically active members. Most respondents do not have problems with housing and is relatively well equipped with long-term use items. Approximately one fifth can not afford a personal computer or car.

V: Threshold of poverty and proportion of households below the threshold of poverty

Year	2005	2006	2007	2008
Total number of households	4 351	7 483	9 675	11 294
Threshold of poverty (0,6 of median EKV ³) in CZK	6 300	6 575	7 089	7 679
Number of households below the poverty threshold	295	486	578	628
Proportion of households below the poverty threshold %	6.78	6.49	5.97	5.56

Source: ČSÚ, own calculation

3 EKV – the modification of equalised scale according the OECD below 60% of the national median for the country. All EU aggregates are calculated as population-size weighted averages of national figures.

4 60% of median of equalized income expressed in national currencies.

SUMMARY

Information about the development of revenue and income differentiation is newly provided by ČSÚ in the survey Living Conditions (EU SILC), which is published in response to membership in the EU and cooperation with Eurostat. There is used unified methodology of surveys of income conditions and standards of living, which provides an international comparison of results within the Member States. Czech society is characterized by a declining level of income differentiation and the lowest poverty rate in comparison with the Member States. In the Czech Republic was in 2008 only 5.56% households which are at risk of poverty. According the result EU SILC by Eurostat was this level of risk of poverty in the Czech Republic 9%. The Gini coefficient was in this year 0.228, the value of Atkinson's index reaches 0.306 and the Robin Hood Index achieves value 0.223.

This paper deals only with selected analyses and methodological instruments focused on income characteristics and coefficients of income inequality. The applicability of the results will be reflected in the long term development. Results will be used by academics and managers from public sector, who deals with social and income issues. Extent of this survey does not tend to detailed analysis, but primarily identify the potential of provided investigation and processing of data.

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REFERENCES

- ČSÚ, 2009: *Analýza cenového vývoje, vývoje příjmů a spotřebních vydání domácností v letech 1993 až 2003* [online]. [cit. 2009-10-26]. Cited from [http://notes2.czso.cz/csu/2004edicniplan.nsf/t/5B0034354E/\\$File/T2.pdf](http://notes2.czso.cz/csu/2004edicniplan.nsf/t/5B0034354E/$File/T2.pdf).
- ČSÚ, 2006: *Metodické vysvětlivky EU SILC 2005* [online]. [cit. 2009-10-26]. Cited from [http://www.czso.cz/csu/2007edicniplan.nsf/t/6F002A030E/\\$File/301207mc.pdf](http://www.czso.cz/csu/2007edicniplan.nsf/t/6F002A030E/$File/301207mc.pdf)
- ČSÚ, 2009: *Metodické vysvětlivky EU SILC 2008* [online]. [cit. 2009-03-24]. Cited from [http://www.czso.cz/csu/redakce.nsf/i/zivotni_podminky_\(eu_silc\)](http://www.czso.cz/csu/redakce.nsf/i/zivotni_podminky_(eu_silc)).
- EUROSTAT, 2010: *17% of EU27 population at risk of poverty* [online]. [cit. 2010-11-09]. Cited from http://epp.eurostat.ec.europa.eu/cache/ITY_
- PUBLIC/318012010-AP/EN/3-18012010-AP-EN.PDF.
- KABÁT, L., 2007: *Příjmová situácia a životné podmienky obyvateľstva Slovenska podľa štatistiky SILC 2005*. Slovenská štatistika a demografia, 3/2007. 36 s. ISSN 1210-1095.
- LAPÁČEK, M., 2007: *Ekvivalenční stupnice a příjmová nerovnost*. [online]. [cit. 2010-02-09]. Cited from <http://nf.vse.cz/download/veda/workshops/inequality.pdf>.
- SCFM, 2010: *Robin hood index* [online]. [cit. 2010-03-20]. Cited from <http://www.finance-management.cz/080vypisPojmu.php?X=Robin+Hood+Index&IdPojPass=104>.
- SPĚVÁČEK, V. a kol., 2002: *Transformace české ekonomiky: politické, ekonomické a sociální aspekty*. 1. vyd. Praha : Linde nakladatelství, s. r. o. 525 s. ISBN 80-86131-32-7.

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