TREND ANALYSIS OF MONETARY POVERTY MEASURES IN THE SLOVAK AND CZECH REPUBLIC

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Abstract

The EU statistics on income and living conditions (EU SILC) is the reference source for comparative statistics on income distribution and social inclusion in the European Union (EU). We used Slovak and Czech EU SILC data for empirical analysis of monetary poverty measures. We computed monetary poverty measures, namely 3 FGT indexes and Watts index. The aim of this paper is to analyse trends for these indicators in Slovakia and the Czech Republic in the period 2008-2011 and compare results by NUTS2 regions.

At-risk-of-poverty rate (poverty headcount P_0) in Slovakia is around 11-13% and in the Czech Republic is lower, around 9-10%. Values of poverty lines are lower in Slovakia. Trends of poverty indexes are the same in the Slovak and Czech Republic, in both Republics poverty indices grow. This means that the number of people at risk of monetary poverty is growing from year to year and changes to their distribution. The depth of poverty (poverty gap P_1) increases, and it requires more funding for its removal in both Republics.

Key words: Monetary Poverty, FGT Indexes, Watts Index, EU SILC Database

JEL Code: O15, C46, I32

Introduction

According to the World Bank (2005), "poverty is pronounced deprivation in well-being." There are four reasons to measure poverty. First, to keep the poor on the agenda; if poverty were not measured, it would be easy to forget the poor. Second, one needs to be able to identify the poor if one is to be able to target interventions that aim to reduce or alleviate poverty. Third, to monitor and evaluate projects and policy interventions which are geared towards the poor. And finally, to evaluate the effectiveness of institutions whose goal is to help the poor.

From social researchers' point of view, poverty is a complex phenomenon influenced by a large number of factors which can be studied from many different perspectives. The

study and interpretation of poverty is not a simple task as there are as many ways of measuring poverty as there are ways of defining it (Kakwani et al. 2008, p. 2).

Poverty analysis is concerned with the lower part of the distribution of well-being. The measurement of poverty generally involves three steps: 1. selecting an appropriate indicator to represent individuals` well-being; 2. choosing a poverty line which identifies the lower part of the distribution to the object of the study and hence to categorize people into poor and non-poor; 3. selecting a function to aggregate individuals.

The application of a poverty measure requires the specification of a poverty line which separates population into poor and non-poor. In the literature, there are three distinct ways to specify a poverty line: the absolute, relative, and subjective methods. While absolute poverty lines have been used in most government poverty statistics, relative poverty lines have recently gained momentum in both international poverty comparisons and intra-national cross-time analyses of poverty.

The absolute method sets the poverty line as a minimum amount of resources at a point in time and updates the line only for price changes over time. The relative method specifies the poverty line as a point in the distribution of income or expenditure, and hence, the line can be updated automatically over time for changes in living standards. In practice, researchers often specify the relative poverty line as a percentage of mean income or expenditure but as a percentage of median income or expenditure. The subjective method derives the poverty line based on public opinion on minimum income or expenditure levels that the people have to "get along" or "make ends meet". Compared with the first two approaches, the subjective method is relatively less popular and has been used rarely.

1 Monetary Poverty Measures

Nowadays there is a large literature on monetary poverty measures. In this paper we will focus only on the most common poverty measures, namely the class of measures proposed by Foster, Greer and Thorbecke (1984) and Watts index (1968).

Let $\mathbf{y} = (y_1, y_2, ..., y_n)$ be a vector of household incomes in increasing order and n is the total number of households. Suppose that $z > 0$ is the predetermined poverty line, q is the number of poor households ($y_1 \leq y_2 \leq ... \leq y_q \leq z$). The Foster–Greer–Thorbecke (FGT) general poverty measure P_α for a non-negative parameter α is defined (Foster et al. 1984, 2010) as

$$P_\alpha(y, z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^\alpha \quad (1)$$

Equation (1) allows a range of aggregation procedures that depends on α. When α=0, equation (1) produces a simple poverty headcount; for α=1, equation (1) is the average proportionate poverty gap; and for α=2, equation (1) produces a weighted-average proportionate poverty gap, where the weights are the poverty gaps themselves, giving relatively more importance to relatively poorer individuals. The three indexes are referred to as P_0, P_1, and P_2, respectively.

The headcount index (P_0) measures the proportion of the population that is poor. It is popular because it is easy to understand and measure. But it does not indicate how poor the poor are. It indicates the proportion of the population for whom income y (or the level of another welfare indicator) is not greater than the poverty line z. A great advantage of this measure is its simplicity of calculation and understanding. But suppose that a poor person suddenly becomes much poorer. The value of P_0 will not change, i.e. it is totally insensitive to differences in the depth of poverty.

The poverty gap index (P_1) measures the extent to which individuals fall below the poverty line (the poverty gaps) as a proportion of the poverty line z. The sum of these poverty gaps gives the minimum cost of eliminating poverty if transfers were perfectly targeted. The measure does not reflect changes in inequality among the poor. The value of P_1 depends on the distances of the poor below the poverty line, so it gives a good indication of the depth of poverty. We then obtain the mean proportionate poverty gap across the whole population. The measure is not sensitive to the distribution among the poor, i.e. the value of P_1 will be unaffected by a transfer from a poor person to someone who is very poor.

The squared poverty gap ("poverty severity") index (P_2) averages the squares of the poverty gaps relative to the poverty line. P_2 is the mean of squared proportionate poverty gaps. The measure's advantage is that it takes inequality among the poor into account (i.e. a transfer from a poor to an even poorer person would reduce the index). The main disadvantage of the measure is that it is not easy to interpret, but the measure can be thought of as a useful tool for comparing the situation of the poorest across countries or over time or for comparing policies aimed at reaching the poorest.

The first distribution-sensitive poverty measure was proposed in 1968 by Watts (see Zheng 1997), and in its discrete version takes the form:

$$W = \frac{1}{n}\sum_{i=1}^{q}[\ln(z) - \ln(y_i)] \qquad (2)$$

where the n individuals in the population are indexed in ascending order of income (or expenditure), and the sum is taken over the q individuals whose income (or expenditure) y_i falls below the poverty line z.

2 Axioms for Measures of Poverty

Poverty measures, as inequality indexes, should satisfy the following axioms or principles for evaluating (Hagenaars, 1986; Morduch, 2005; European Commission, 2003):

1. *Focus Axiom:* the poverty measure should be independent of the non-poor population.
2. *Weak Monotonicity Axiom:* a reduction in a poor person's income, holding other incomes constant, must increase the value of the poverty measure.
3. *Impartiality Axiom:* A poverty measure should be insensitive to the order of incomes.
4. *Weak Transfer Axiom:* An increase in a poverty measure should occur if the poorer of the two individuals involved in an upward transfer of income is poor and if the set of poor people does not change.
5. *Strong Upward Transfer Axiom:* An increase in a poverty measure should occur if the poorer of the two individuals involved in an upward transfer of income is poor.
6. *Continuity Axiom:* The poverty measure must vary continuously with incomes.
7. *Replication Invariance Axiom:* The value of a poverty measure does not change if it is computed based on an income distribution that is generated by the k-fold replication of an original income distribution.

The poverty rate satisfies the focus, impartiality, and replication invariance axioms but it violates the weak monotonicity and weak transfer axioms. Hence, many economists find the poverty rate unacceptable as poverty index since it captures the incidence of poverty but is insensitive to the depth of poverty. The average poverty gap ratio of the poor satisfies the focus, weak monotonicity, and impartiality axioms but not the weak transfer axiom — which means that captures the depth of poverty but is insensitive to the distribution aspect of poverty. The Watts index satisfies all axioms (Zehng, 1997). Many authors recommended using set of poverty indexes, namely 3 FGT indexes and Watts index.

3 Monetary Poverty in the Slovak and Czech Republics

The empirical analysis uses data from the EU SILC the years 2008 to 2011. The data contain detailed income and demographic information for individuals, families, and households and are used to generate official Slovak a Czech poverty rate estimates. In accordance with the

Eurostat methodology (Eurostat 2009) as poverty lines *z* was used poverty line for single person in EUR (Tab. 3), which is defined as 60 % of the national median equivalised disposable income.

According to the result (Tab. 3, Tab. 1 and Tab. 2) the poverty lines increase in both Republics and poverty indexes increase in the years 2008 to 2011, too (compare Bartošová and Želinský, 2013; Želinský and Stankovičová, 2012).

The pictures (Fig. 1 and Fig. 2) depict the main result of our analysis. We can see and compare values of all poverty indexes on the bar (P_0) and line charts (P_1, P_2, W) – 3 FGT indexes and Watts index by NUTS2 regions in the Slovak (Tab. 1) and Czech Republic (Tab. 2). The differences in poverty levels between both Republics are significant and differ by regions. While the share of poor (P_0) is around 9-9.8% in the Czech Republic, the share of poor Slovaks is higher; it increased from 10.9% to 13% in the years 2008 to 2011.

The differences between regions deepen in both Republics from year to year. In Slovakia, the risk of poverty rate (headcount index P_0) and the depth of poverty (poverty gap index P_1) are highest in Eastern Slovakia (SK04: Košice and Prešov Regions; 12.5-16.9%). In the Czech Republic there are 2 regions where there is a significantly higher risk of poverty rate than the national average, namely they are the Northwest region (CZ04: Karlovy Vary and Ústí nad Labem Regions; 13.9-17.1%) and also Moravian-Silesian Region (CZ08: 14.1-15.1%).

We found an interesting result when we computed the correlation coefficients between indices of poverty (Tab. 4). There is a high degree of positive correlation in Bohemia, all correlation coefficients reached values higher than 0.9. In Slovakia we have seen significant changes in the values of correlation coefficients in the first two years of the reference time series. In 2008 and 2009, the depth of poverty was relatively stable, i.e. indices of poverty gap (P1 and P2) achieved the same values in regions and were at the level of the Republic although in some regions, the poverty rate (P_0) was higher and was growing. In the years 2010-2011, however, correlation coefficients between indexes also have reached values higher than 0.9 in the Slovak regions.

We noticed an interesting development for Watts index (W) in Slovakia. While in 2008-2009 there was the lowest poverty rate (P_0) in Bratislava Region (SK01: 6.9% and 6.5%), so Watts index reached the highest values (0.066 and 0.093). In 2010-2011 Watts index follows the development of headcount index P_0 in SK01 region (SK01: P_0 =5.1% and 7.2%) and reached the lowest values among Slovak regions (SK01: W = 0.013 and 0.030). This trend of Watts's indexes means changes in income distribution by Slovak regions.

Conclusion

The aim of this paper was to compute and compare the set of monetary poverty measures in the Slovak and Czech Republic and its trends in the years 2008 to 2011. According to the standard Eurostat methodology based on relative concept of poverty, at-risk-of-poverty rate (poverty headcount P_0) in Slovakia is around 11-13 % and in the Czech Republic is lower, around 9-10 %. Values of poverty lines are lower in Slovakia in EUR and PPS (Tab. 3). Trends of poverty indexes are the same in the Slovak and Czech Republic, in both Republics poverty indices grow. This means that the number of people at risk of monetary poverty is growing from year to year and changes to their distribution. The depth of poverty (poverty gap) increases, and it requires more funding for its removal in both Republics.

There are also deepening regional differences in poverty and its depth. While in capital regions of both countries (SK01: Bratislava and CZ01: Prague) the incidence of relative poverty decreases, in other regions it is growing rapidly and poverty gaps deepen.

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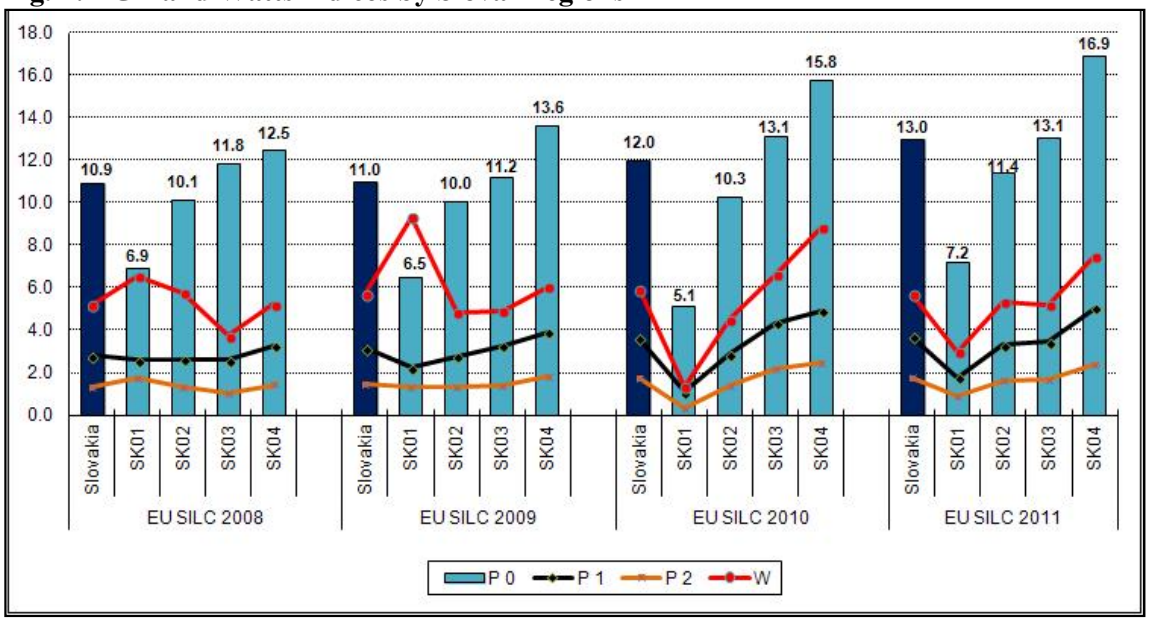
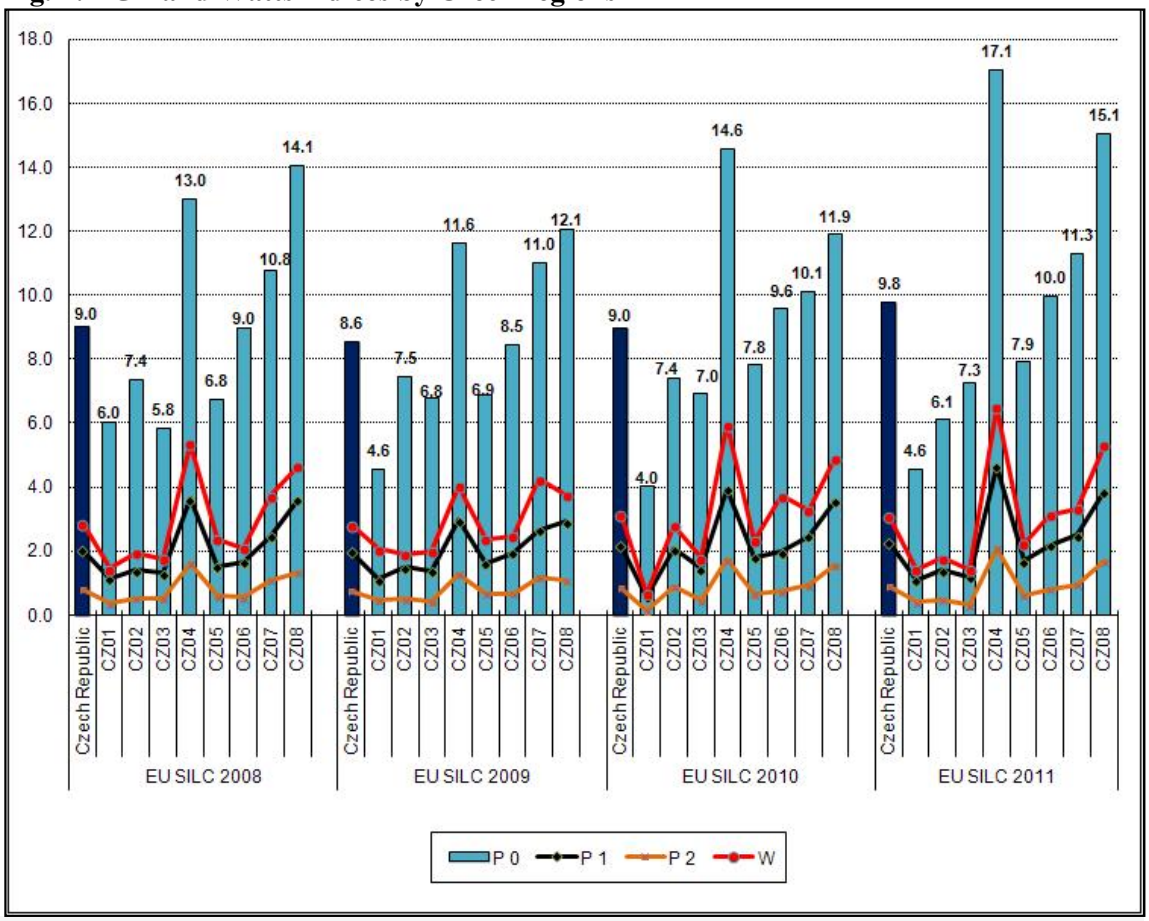
Fig. 1: FGT and Watts indices by Slovak regions



Source: Own calculations and representation based on Slovak EU SILC 2008–2011 microdata.

Fig. 2: FGT and Watts indices by Czech regions



Source: Own calculations and representation based on Czech EU SILC 2008–2011 microdata.

Tab. 1: Values of FGT and Watts' indices in Slovak Republic (2008-2011)

Regions of SK	2008				2009				2010				2011			
NUTS 2 level	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W
SK01	0.069	0.026	0.017	0.066	0.065	0.022	0.014	0.093	0.051	0.011	0.003	0.013	0.072	0.018	0.009	0.030
SK02	0.101	0.027	0.013	0.058	0.100	0.028	0.013	0.048	0.103	0.029	0.014	0.045	0.114	0.033	0.016	0.054
SK03	0.118	0.026	0.011	0.037	0.112	0.033	0.014	0.049	0.131	0.044	0.022	0.066	0.131	0.035	0.017	0.052
SK04	0.125	0.033	0.014	0.052	0.136	0.039	0.018	0.061	0.158	0.049	0.025	0.088	0.169	0.050	0.024	0.075
SK	**0.109**	**0.028**	**0.013**	**0.052**	**0.110**	**0.032**	**0.015**	**0.057**	**0.120**	**0.036**	**0.018**	**0.059**	**0.130**	**0.037**	**0.018**	**0.057**

Source: Own calculations based on Slovak EU SILC 2008–11 microdata.

Tab. 2: Values of FGT and Watts' indices in Czech Republic (2008-2011)

Regions of CZ	2008				2009				2010				2011			
NUTS 2 level	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W
CZ01	0.060	0.012	0.004	0.015	0.046	0.011	0.005	0.021	0.040	0.006	0.002	0.007	0.046	0.011	0.004	0.015
CZ02	0.074	0.014	0.005	0.020	0.075	0.015	0.005	0.019	0.074	0.021	0.009	0.028	0.061	0.014	0.005	0.018
CZ03	0.058	0.013	0.005	0.018	0.068	0.014	0.004	0.020	0.070	0.015	0.005	0.018	0.073	0.012	0.003	0.014
CZ04	0.130	0.037	0.016	0.054	0.116	0.030	0.013	0.041	0.146	0.040	0.018	0.060	0.171	0.047	0.021	0.065
CZ05	0.068	0.015	0.006	0.024	0.069	0.016	0.007	0.024	0.078	0.018	0.007	0.023	0.079	0.017	0.006	0.023
CZ06	0.090	0.017	0.006	0.021	0.085	0.020	0.007	0.025	0.096	0.020	0.008	0.038	0.100	0.022	0.008	0.032
CZ07	0.108	0.025	0.011	0.037	0.110	0.027	0.012	0.043	0.101	0.025	0.010	0.033	0.113	0.025	0.010	0.033
CZ08	0.141	0.036	0.014	0.047	0.121	0.029	0.011	0.038	0.119	0.036	0.016	0.049	0.151	0.039	0.017	0.053
CZ	**0.090**	**0.021**	**0.008**	**0.029**	**0.086**	**0.020**	**0.008**	**0.029**	**0.090**	**0.022**	**0.009**	**0.032**	**0.098**	**0.023**	**0.009**	**0.031**

Source: Own calculations based on Czech EU SILC 2008–11 microdata.

Tab. 3: Poverty lines for single person in EUR and PPS (2008-2011)

Currency	Country	2008	2009	2010	2011
EUR	Czech Republic	3 641	4 377	4 235	4 471
	Slovakia	2 875	3 403	3 670	3 784
PPS	Czech Republic	5 835	5 666	5 803	5 915
	Slovakia	4 058	4 694	5 022	5 314

Source: Eurostat database.

Tab. 4: Coefficients of correlation among indices in Slovak Republic (2008-2011)

Coefficients of correlation (SK)	2008				2009				2010				2011			
	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W
P0	1.000				1.000				1.000				1.000			
P1	0.570	1.000			0.981	1.000			0.993	1.000			0.991	1.000		
P2	-0.752	0.112	1.000		0.764	0.858	1.000		0.994	1.000	1.000		0.988	0.999	1.000	
W	-0.778	-0.016	0.928	1.000	-0.704	-0.568	-0.081	1.000	0.998	0.989	0.988	1.000	0.980	0.997	0.999	1.000

Source: Own calculations.

Tab. 5: Coefficients of correlation among indices in Czech Republic (2008-2011)

Coefficients of correlation (CZ)	2008				2009				2010				2011			
	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W	P 0	P 1	P 2	W
P0	1.000				1.000				1.000				1.000			
P1	0.973	1.000			0.983	1.000			0.968	1.000			0.982	1.000		
P2	0.933	0.980	1.000		0.920	0.968	1.000		0.948	0.995	1.000		0.966	0.997	1.000	
W	0.943	0.985	0.998	1.000	0.903	0.947	0.983	1.000	0.982	0.969	0.964	1.000	0.979	0.999	0.997	1.000

Source: Own calculations.