SPATIAL ANALYSIS OF THE FINANCIAL SITUATION OF SLOVAK HOUSEHOLDS

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Abstract

The paper describes the level, variability, asymmetry and the relative inequality of households' finances. The quantitative analysis covers eight NUTS III regions of the Slovak republic and compares the financial situation according to various subgroups of households. The study analyses the relative net-wealth inequality between the groups as well as within the groups of households in the Slovak Republic using the decomposition of generalized entropy indices. The analysis procedure uses the official individual data of the second wave of the Eurosystem's Household Finance and Consumption Survey (HFCS), which collects household-level data in the year 2014.

At the beginning, the paper describes microdata and the methodology. It base on quantitative analysis mainly using quantile methods. What follows is a numerical and graphical comparison of various statistical measures of households' net wealth, total real assets and liabilities of subgroups of Slovak households. To compare results of the relative inequality we use the decomposition of Theil T measure of the components of households' finances by the eight geographic Slovak regions, the six levels of education, and the ten types of households on the subject of its composition.

Key words: household finance, net wealth, distribution, inequality decomposition, HFCS

JEL Code: D10, D14, D31

Introduction

There is considerable evidence for characterising the distribution of households' finances in the Eurosystem countries, leading to observations such as a large degree of heterogeneity with regards to the share of indebted households in total households and the level of debt across the eurozone member countries. Furthermore, the concentration of wealth distribution in the right tail is considerably higher in comparison to the inequality of income, holding only a tiny

fraction of the aggregate wealth of 50% of households in the wealth distribution. Besides the fact that non-financial assets outweigh financial assets and consist mainly of households' main residences, the alarming finding is that mostly households with relatively young household heads are indebted. Conclusions based on the 1st wave of Household Finance and Consumption Survey – HFCS, conducted between 2008 and 2011 in some Eurozone countries, were discussed in several earlier studies (ECB, 2013b; Fessler et al., 2014; Senaj and Zavadil, 2012).

The 2nd wave HFCS were completed in the same way under European Central Bank (ECB) coordination across the eurozone member countries in 2014 (for instructions about harmonized HFCS see ECB, 2013a and ECB, 2013b).

In Slovakia, political and social changes since 1989 have enabled notable change from a very limited private ownership and very low inequality to substantial redistribution of net financial assets per private household, as well as speedy growth of households' debt (Messner and Zavadil, 2015). Conclusions by Messner and Zavadil (2014) concerning regional differences in household wealth across Slovakia support data that around 90% of households in all regions own their main residence, which builds a key portion of total Slovak households' wealth; nonetheless, only about 10% of households in all regions have mortgage debt. Ownership of the main residence presents the most valuable household asset in the Bratislava region, where is correspondingly the highest wealth disparity. "The least indebted households are observed in Banská Bystrica and Prešov regions, which also have the lowest level of accumulated assets", concluded Messner and Zavadil (2014).

Similarly, the latest research based on the 2nd wave HFCS (HFCS 2014) refers generally to the participation, share, level, differentiation and heterogeneity of households' finances in Slovakia with comparison to the first wave HFCS results (for the comparison see Cupák and Strachotová, 2015). Our study is focused mostly on level and concentration measurement and provides an inequality analysis of households' finances with its decomposition according to region, level of household's reference person's education and household types based on HFCS 2014 microdata of the Slovak Republic.

1 Background on the measurement of households' finances

The stratified random sample of the HFCS was meant to be representative at the national level. However, the stratification from population, determination of quotas and calibration of weights were performed by the Statistical Office of the Slovak Republic (SO SR) with

regional representativeness of the microdata to the eight Slovak *regions* using information from Microcensus 2011 and agreeing to NUTS 3 level, e.g. Bratislava (BA), Trnava (TT), Trenčín (TN), Nitra (NR), Žilina (ZA), Banská Bystrica (BB), Prešov (PO) and Košice (KE).

The database is stored in several files that are distinguished according to the level of data and correspond to the structure of the Eurozone harmonized questionnaire. The observed data in the database were incomplete and originally included responds only of 2,135 out of 4,200 connected private households chosen according to the stratification quotas. Furthermore, because of the existence of the item nonresponse, erudite methods of imputations and weighing were implemented.

In all calculations in the article, *final weights* (*hw0010*) were used with calibration to gender and age structure of the population, regional households' size structure, as well as calibration according to the number employed, entrepreneurs, unemployed and pensioners in each of the eight Slovak regions. Overall, calibration in 2nd wave HFCS was confirmed by SO SR. The applied *multiple imputation method*[1] by National Bank of Slovakia (NBS) assigns five different values (*five implicates*).

1.1 Microdata of HFCS 2014 variables with multiple imputations

Complete-case analysis procedures would result in biased estimates of population statistical measures in that situation. For the calculation of an average level of all presented measures in the article, the five values (five times the reported original value or 5 different implicates of a missing value) were used according to provided supportive instruction in ECB (2013a, Section 7.3; ECB 2016, Section 4) to avoid biased and less precise estimates of populations' parameters.

For the purpose of analysis in the article, data of euro-variables, explanatory variables and *final weights* (*HW0010*) were merged through H-file and P-file, M-file and D-file (constructed file with aggregate financial variables) by the household identifier (*SA0010*) and the implicate number (*IM0200*). Definitions of the used aggregate euro-variables, mainly from the D-file, related to households' finances are:

- *total real assets* (*DA1000=DA1110+DA1120+DA1130+DA1131+DA1140*) where *DA1110* is assets from ownership of the household main reside; *DA1120* is assets of others household properties as gardens, recreational houses, garages, lands, etc.; *DA1130* is assets

[1] A comprehensive study of the method is by Little and Rubin (2002). Multiple imputations were completed by NBS according to the unified methodology of the HFCS data processing, editing and imputing provided by ECB (2013a).

from ownership of vehicles, *DA1131* of valuables and *DA1140* is household assets from business as offices, hotels, other commercial buildings, farms, etc.

- *total liabilities* (*DL1000=DL1100+DL1200*) are sum of *unpaid mortgage loans* and the *outstanding balance of non-mortgage loans*,
- *total net wealth* (*DN3001=DA3001−DL1000*) is calculated as the difference between *total assets* and *total liabilities*.

1.2 Applied statistical methodology based on quantiles

The *Quantile function*, denoted by $Q(p)$, states the *p*-quantile x_p as a function of *p* $x_p = Q(p)$, $0 < p < 1$, where x_p is the value of X, for which $p = P(X \le x_p) = F(x_p)$.

Analyses in the article based on empirical quantile distribution of financial variables from HFCS 2014, which were described in the end of Section 1.1, where *n* = 2,135 Slovak households, meaning there are *n*-ordered statistics of every analyzed financial variable in the dataset. Because of 5-replicates from imputations, the corresponding averages were calculated for every statistical measure.

Inequality indices, which have the ability of decomposition to between-group and within-group inequality, are called Generalized entropy indices $I(\theta)$. The general formula for the calculation $I(\theta)$ is defined by by Janvry and Kanbur (2006) as:

$$I(\theta) = \begin{cases} \dfrac{1}{\theta(\theta-1)} \displaystyle\int_0^1 \left(\frac{Q(p)^\theta}{\mu} \right) \mathrm{d}p & \text{for } \theta \neq 0;\ \theta \neq 1 \\ \displaystyle\int_0^1 \ln\left(\frac{\mu}{Q(p)} \right) \mathrm{d}p & \text{for } \theta = 0 \\ \displaystyle\int_0^1 \frac{Q(p)}{\mu} \ln\left(\frac{Q(p)}{\mu} \right) \mathrm{d}p & \text{for } \theta = 1 \end{cases} \qquad (1)$$

Specific shapes in the formula (4) depend on the value of the parameter of elasticity $\theta = 1 - \varepsilon$. The Theil T index inequality is $I(\theta = 1)$ and Theil L index inequality is $I(\theta = 0)$. In the case when $I(\theta) = 0$, the "total relative equality" is in the population, but only regarding the analysed financial variable. Inequality within the k^{th} group is correspondingly expressed by equation (1) and thus it is the same expression as for the inequality of the overall population. The formula for $I(\theta)$ decomposition to *K* sub-groups is:

$$I(\theta)=\sum_{k=1}^{K}\phi(k)\left(\frac{\mu(k)}{\mu}\right)^{\theta} I(k;\theta) \quad + \quad \bar{I}(\theta) \ , \ k=1, 2, \ldots K \qquad (2)$$

where $\phi(k)$ is the proportion of the k^{th} group of the total population and $\mu(k)$ is the mean of distribution financial variable in the k^{th} group. It is often presented as a fraction in % of the first term of the formula (2). The first term in the equation (2) reflects to within-group inequality, measured as a weighted sum of inequality measures for each k^{th} group $I(k;\theta)$, $k=1, 2, \ldots K$. The second term $\bar{I}(\theta)$ of the sum in equation (2) reflects the contribution of inequality between-groups to total inequality.

2 Results of analyses

According to our results, only 6.93% of the 2,135 Slovak households at the time of the survey did not report any real assets, 51.48% stated assets of less than 52,500 euros, but 25% of households quantified their total real assets to be more than 2,234 thousand of euros due to ownership of valuable properties. Concerning liabilities, the average household had less than 5,400 euros and the maximum observed value of liabilities was only 168,000 euros.

The total household net-wealth of an average household in Slovakia was smaller than 60,327 euros, which is one and half times higher than the median value. The largest household debt was 43,000 euros, but the maximum net-wealth was reported in the amount of 8,696,124 euros. Despite the great variability of liabilities, the asymmetry was small. High positive asymmetry of total net-wealth distribution was a result of a similar degree for assets. The same conclusion applies to the relative inequality; high Gini coefficients for liabilities are due to the extensive occurrence of their zero values.

2.1 Total household net wealth, real assets and liabilities by Slovak regions

The basic statistical measures of *total real assets*, *total liabilities* and *total net wealth* by *regions* in 2013 are accessible in Tab. 1. We confirmed that the most valuable assets are held by households from the Bratislava region with small relative inequality. The lowest assets inequality is in the Trnava region, but is connected with the average level oppositely low in comparison to in the Bratislava region, but also with a negatively skewed middle part of the real asset distribution with a 0.96 mean to median ratio.

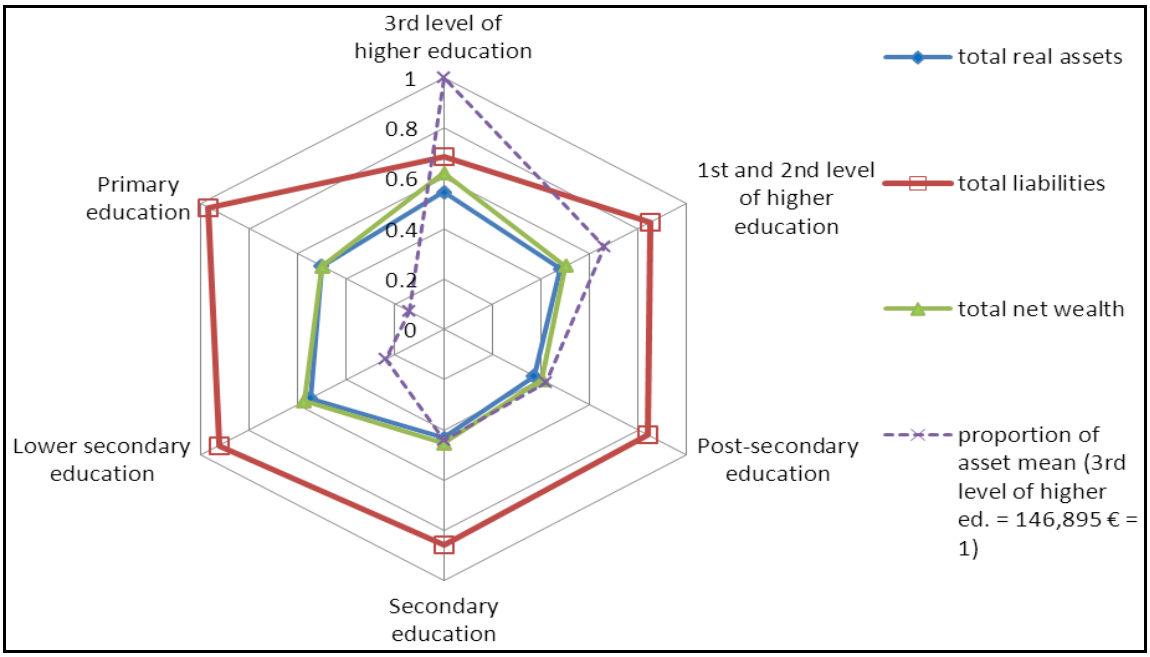
High positive skewness of household wealth distributions in the Trnava and Banská Bystrica regions, with high positive extremes causing excessive growth of relative net-wealth

inequality measured by the Gini and Theil T indices. According to the results of Theil T index decomposition, 95.98% of relative real assets inequality is due within-regions asset disparities. The highest is real-assets dissimilarity in inequality, skewness and also in average levels between Trenčín and Trnava regions.

2.2 Disparities in households' finances by education and household structure

On the graphical presentation on Fig. 1 Gini coefficients of *total real assets*, *liabilities* and *total net wealth* is compared by households' groups sorted according the International Standard Classification of Education (ISCED). To addition, we graphically presented also levels of real assets by means' proportions to the highest mean achieved in the group with 3rd level of higher educated household reference person (Fig. 1). The higher is the level of education of the reference person, the higher is the level of household mean real assets, the level of total liabilities, and also the higher is relative inequality of bought.

Fig. 1: Gini coefficients of households' finances and shares of real asset means according to level of education



Source: Author's graphical analysis

Tab. 1: Measures of the households' finances in 1,000s of euros in the Slovak regions

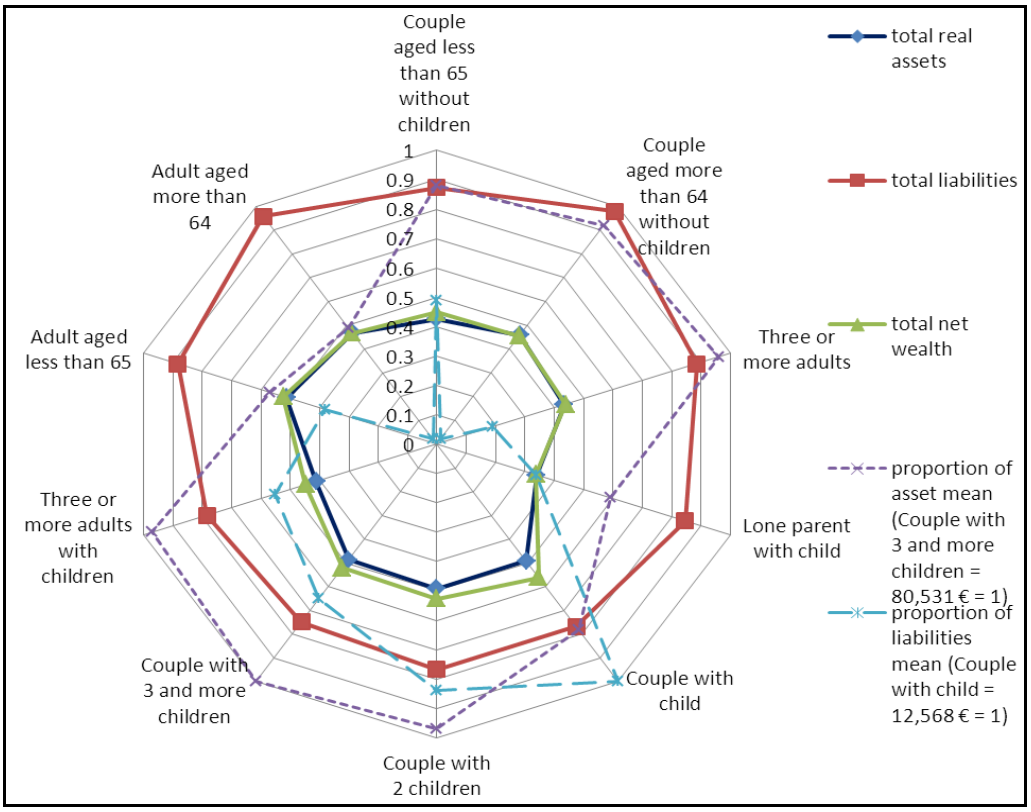
	Region	BB	BA	KE	NR	PO	TN	TR	ZA	SR
Total real assets	Mean	61.38	**96.02**	57.93	57.81	64.85	70.14	**51.80**	60.55	56.72
	Median	**40.50**	**94.00**	51.10	41.93	52.00	53.73	54.00	51.54	52.50
	Interquart. range	461	**462**	326	415	536	390	**148**	305	2,234
	Coef. of variation	**178%**	79%	105%	130%	151%	335%	**77%**	97%	191%
	Stand. skewness	13.70	2.15	14.34	5.82	19.55	**34.51**	**1.54**	4.46	43.78
	Mean to median	**1.52**	1.02	1.13	1.38	1.25	1.31	**0.96**	1.18	1.08
	Gini index	**0.54**	**0.40**	0.42	0.51	0.47	0.48	0.40	0.44	0.52
	Theil T index	0.54	0.26	0.28	0.43	0.40	**0.60**	**0.22**	0.30	0.39
	Decomposition of Theil T index by region	Within group inequality		Index	in % of total	Between group inequality		Index	in % of total	
				0.3763	95.98			0.0157	4.02	
	Region	BB	BA	KE	NR	PO	TN	TR	ZA	SR
Total liabilities	Mean	6.02	**9.21**	**3.40**	3.82	4.49	6.14	5.30	4.82	5.39
	Maximum	**168**	130	104	94	67	150	70	**59**	168
	Interquart. range	65	**84**	52	**40**	49	60	59	44	110
	Coef. of variation	**305%**	242%	282%	252%	245%	234%	230%	**227%**	267%
	Stand. skewness	**5.36**	3.00	5.16	3.96	3.58	3.17	2.89	**2.73**	4.43
	Stand. kurtosis	**40.84**	11.93	38.10	25.93	17.17	16.59	11.20	**10.47**	30.39
	Gini index	**0.89**	0.86	0.87	0.86	0.85	0.85	**0.85**	0.85	0.86
	Theil T index	**0.88**	0.84	0.64	0.70	0.67	**0.51**	0.64	0.55	0.74
	Decomposition of Theil T index by region	Within group inequality		Index	in % of total	Between group inequality		Index	in % of total	
				0.7034	95.19			0.0355	4.81	
	Region	BB	BA	KE	NR	PO	TN	TR	ZA	SR
Total net wealth	Mean	55.36	**86.81**	54.53	55.99	60.36	64.00	**46.50**	55.73	60.33
	Median	**36.51**	**80.00**	50.00	40.00	46.30	48.10	45.00	45.22	48.00
	Minimum	-19.9	-1.00	-8.93	-7.5	-3.59	-17.40	-15.33	**-43.00**	-43.00
	Maximum	2,597	572	2,234	1,123	3,080	**8,696**	231	731	8,696
	Lower quartile	-0.59	-0.42	-0.57	**-4.39**	-2.81	0.00	-2.00	-3.10	-15.33
	Upper quartile	461	**462**	326	415	536	343	146	293	2,234
	Stand. skewness	15.51	2.10	15.58	5.99	20.36	**34.99**	**1.38**	4.52	45.88
	Gini index	**0.55**	0.43	0.43	0.54	0.48	0.50	0.45	0.47	0.56
	Theil T index***	0.54	0.28	0.28	0.45	0.42	**0.62**	**0.24**	0.33	0.42
	Decomposition of Theil T index by region***	Within group inequality		Index	in % of total	Between group inequality		Index	in % of total	
				0.4077	99.97			0.0110	0.03	

***Note: Theil T indices and decomposition were calculated only from positive values of total wealth.

Source: Author's calculation based on HFCS 2014

Classification of households by variable *Type of household* (*DHHTYPE*) allows for comparison of households' finances by groups of households of different persons' composition (Fig. 2). The higher level of the three monitoring financial variables was in households composed of more adults aged less than 65 years old and with more children. In contrast, a lone parent with child households and households with retired persons had the least wealth and were the least indebted. Surprising is the highest mean level of total liabilities of couples with a child (12,568 euros), where relative inequality of real assets and therefore also of net-wealth is the lowest.

Fig. 2: Gini coefficients of households' finances and shares of real asset means according to type of household



Source: Author's graphical analysis

The inequality decomposition of Theil T indices of households' finances by *education* and *type of household* confirmed that the between-groups component (TB) does not exceed 10% of the total inequality. The largest impact of between-group components on *total wealth* relative inequality and *total real assets* relative inequality was in the case of variables *education* (wealth 7.04%, assets 7.77%) and *type of household* (wealth 4.89%, assets 5.13%). The smallest was between-*regions* impact of wealth TB = 4.89% and of assets TB = 5.13%.

In decomposition of relative inequality were achieved comparable results, but only positive liabilities were analysed (for *education* TB = 6.56%, for *type of household* TB = 9%, for *region* TB = 4.81%).

Conclusion

According to the results of the analyses, we confirmed that in the Slovak Republic more than 93% of households own real assets, with over 86% ownership of the main property. The total real assets were the most influenced by the price of the main property. In addition, regions differ not only in the amounts of assets, but also in the size of the inequality in the asset ownership. Differences in the average levels and rates of inequality also depend on the level of education of the reference person of the household, as well as on the composition and size of households.

Shapes of asset distributions in groups of households in the eight geographic Slovak regions, the six levels of education, and the ten types of households decisively determine features of levels, variability, asymmetry and the degree of relative inequality of their total net wealth. Total liabilities are not determinant of total net wealth, even being the highest in the Bratislava region, in the household group with a reference person educated to the highest level and also in households composed of a couple with a child, but these structures of households own more assets and therefore have higher total net wealth. To conclude, the level and also inequality of liabilities in Slovak households are relatively low in comparison to Eurozone countries.

Acknowledgment (Times New Roman, 14 pt., bold)

Research was partially supported and funded by projects: VEGA 2/0026/15, VEGA 1/0092/15 and VEGA 2/0005/16.

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