DECOMPOSITION OF INEQUALITY BY INCOME SOURCES: EVIDENCE FROM THE VISEGRAD GROUP COUNTRIES

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Abstract

Our paper aims at examining the sources of income inequality for the Visegrad Group countries by decomposing household income by factor sources at the micro level. We verify the influence of different sources of income on income inequality. In our study, we applied a decomposition rule based on the coefficient of variation. In the analysis on income inequality microdata obtained from the Eurostat (EU-SILC) were used. The factor sources that we considered include earnings, self-employment income and other market incomes as well as pensions, unemployment benefits, family/children related allowances, other social transfers and taxes. We identified which factors contribute positively/negatively to the level of income inequality.

The survey showed that the structure of income by sources is different in the studied countries. The analysis revealed that labour earnings dominate in determining inequalities. It is not a surprise, because according to the Shorrocks decomposition rule, labour earnings have the largest proportionate inequality contribution in all countries. However, the influence of this factor in each country is different. The other factors have different proportional contributions to general inequality.

Key words: income inequality; Shorrocks decomposition; decomposition by factor sources
JEL Code: D63, D31, C10

Introduction

The results described in the present work are a continuation of the survey presented during the 12th International Days of Statistics and Economics. The previous article covered the decomposition of income inequality by subgroups of household classified by characteristics such as the type and size of the household, the socio-economic group of the household, the educational level of the household head and the place of residence. Our study confirmed that differences in the level of education, describing the formal side of human capital and prevailing source of income, are the most crucial drivers of income inequality in the V4 countries. We also found that social transfers play a pivotal role in the reduction of income inequalities, especially for the poorest households (Muszyńska & Wędrowska, 2018).

The aim of our current paper is to examine the sources of income inequality in the Visegrad Group countries and to assess the extent to which different components of household income affect total income inequality. The contribution of our article consists in the decomposition of income inequality by factor sources at the micro level and in identifying which factors contribute positively/negatively to the level of income inequality. Our study includes the following components of household income: earnings, self-employment income and other market incomes as well as pensions, unemployment benefits, family/children related allowances, other social transfers and taxes. The applied method of analysing income inequality allowed us to identify the factors contributing to inequality and answer the question about the contribution of the different factor sources to income inequality. The survey was based on microdata obtained from the Eurostat (EU-SILC). In our study, we applied a decomposition rule based on the coefficient of variation.

The paper is organised as follows. The next section presents approaches to the decomposition of income inequality by factor sources. In Section 2 the methodology we applied to decompose inequality in disposable income is discussed. The next part describes the data used in the study. The empirical analysis is presented in Section 4. The last section offers our concluding remarks.

1 Decomposition by factor components

Income inequalities and their sources have been the subject of numerous studies for years. Nevertheless, it has still not been possible to fully determine the factors affecting inequalities or explain the reasons of their changes. According to Atkinson, economic theory does not at present provide an adequate basis to explain the inequality changes of recent years. In his opinion, there are six major reasons why theories of factor incomes (wages, profit and rent) do not provide a theory of personal distribution: heterogeneity of incomes, human capital, diversity of sources, intervening institutions, income from abroad, and the impact of the state budget (Atkinson, 1996). Many researchers have tried to solve this problem empirically, decomposing the income inequality and its changes (Bengtsson & Waldenstrom, 2015; Rani & Furrer, 2016).

When assessing the impact of various income components on income inequality, one can generally distinguish two different approaches: the standard approach (income accounting method) and the factor source decomposition method, as suggested by Shorrocks (1982,1983), termed the classic decomposition approach for the purpose of this paper.

As total disposable income can be expressed as the aggregate of incomes from all income sources as well as taxes, social insurance contributions and benefits, it is possible to

calculate the contribution of each factor to overall inequality. In standard approach income components are added one after another and inequality measures are computed at each step. The contribution of each factor is estimated as the difference (or relative difference) between the inequality indices before and after including a given source in total income (Immervoll et al., 2005), while with the classic decomposition approach, the inequality contribution of each factor component is determined simultaneously, based on the value of the disposable income.

Obviously, different approaches can lead to different results, sometimes even contradictory ones. The reason is that the accounting approach applies the different components sequentially, while the decomposition approach accounts for them simultaneously (Rani & Furrer, 2016). In the standard approach we assume there are no interactions between the different stages of redistribution. In reality, however, some benefits might also be taxable. By first adding benefits to factor income, we necessarily overestimate the redistributive effects of benefits (Fuest et al., 2009). With the classical approach, this type of overestimation is limited because the impact of various factors is determined simultaneously, at the same time.

Although a number of studies have considered the disaggregation of income into different factor components and proposed methods for decomposing the overall inequality into the corresponding components (Rao, 1969; Fei et al., 1978, Fields, 1979, Pyatt et al., 1980), Shorrocks is considered the author of the classical approach to decomposition. In his work "Inequality Decomposition by Factor Components" (Shorrocks, 1982), he proposed general principles that should be satisfied in a factor decomposition and created a unique decomposition rule, which is applicable to any inequality measure. Shorrocks (1983) also proved that the choice between the inequality measures largely depends upon the assumption that equal receipts for a given source are associated with a zero-inequality contribution or with a negative contribution. Based on the Shorrocks' results, Lerman and Yitzhaki (1985) formulated a similar decomposition rule for the Gini coefficient.

Since the global economic crisis, there has been renewed interest in understanding the drivers of income inequality. In the majority of studies Shorrocks's and Lerman and Yitzhaki's method along with the income accounting framework have been applied.

2 Methodology

The empirical aim of our study is twofold: to understand how various types of incomes contribute to the formation of inequalities and to assess the extent to which different components of income affect total income inequality. In order to achieve the aim, we follow Shorrocks' decomposition rule and decompose the coefficient of variation (denoted CV).

We chose the CV as a measure of inequality, because it is sensitive to extreme values, and this feature is particularly useful when we perform decompositions by factor incomes. In those decompositions there can be many observations with zero values, notably in the case of self-employment or capital income, and we want to use a measure that is sensitive to such extreme values. Bearing in mind the sensitivity of the index to the top incomes, we put special attention to the distributions of income.

When decomposing inequality by factor incomes, we assume that the household equivalised disposable income consists of K income components. The income from the source $k(k = 1, \dots, K)$ for the household $i(i = 1, \dots, n)$ equals Y_{ik}. The distribution of incomes from source k is $Y_k = (Y_{1k}, Y_{2k}, \dots, Y_{nk})$, the distribution of total incomes is $Y = (Y_1, Y_2, \dots, Y_n)$, where the total income for the household i equals $Y_i = \sum_k Y_{ik}$.

According to Shorrocks (1982), the proportional (relative) contribution of a given income from source k to total inequality (s_k) is expressed by the formula:

$$s_k = \frac{cov(Y_k;Y)}{var(Y)} = \rho_k \cdot \frac{CV_k}{CV} \cdot \frac{\mu_k}{\mu}, \quad (1)$$

Where cov is covariance and var is variance, CV is coefficient of variation, μ_k is the mean of the given income component, μ is the overall mean and ρ_k is correlation coefficient between Y_k and Y. It is worth noting that $\sum_k s_k = 1$.

In the Shorrocks decomposition the contribution of a given income type to total inequality can be either positive or negative and depends on inequality of the given income source, the share of the given income source in total income, and its correlation with total income. Using Shorrocks rule (1) the contribution s_k is negative only if there is a negative correlation between total income and income component k. Since $CV = \frac{\sigma}{\mu}$, (σ means standard deviation) then:

$$s_k = \rho_k \cdot \frac{\sigma_k}{\sigma}. \quad (2)$$

If the relative contribution of a given income k, is $s_k < 0$, income from source k has an equalising (negative) effect on inequality in the disposable income. It means that this source of income decreases the total inequality. In case of $s_k > 0$, the effect is positive (disequalising) and the component k contributes to the increase of the total inequality.

The Shorrocks decomposition rule is invariant to the choice of inequality index and it satisfies the axioms of symmetry, independence of the level of aggregation and consistency. This decomposition rule meets also additional property namely that equally distributed income sources should have a zero contribution to total inequality.

3 Data

In our research, we explore the sources of income inequality for the V4 countries by decomposing household income and personal income distribution by factor sources at the micro level. For our study we use micro-data from the European Union Statistics on Income and Living Conditions (EU-SILC) survey for V4 countries, namely Czech Republic, Hungary, Poland and Slovakia. We use data related to 2016, extracted from the cross-sectional EU-SILC data set (EU-SILC CROSS-SECTIONAL UDB 2016 – version of September 2018).

Our income concept is the annual equivalised household disposable income per household member. Total disposable household income can be calculated as: the sum for all household members of gross personal income components plus gross income components at household level minus taxes. We consider eight sources of income: earnings, self-employment income, residual categories of market income, old-age and survivor' benefits, unemployment benefits, family and children related allowances, residual categories of social transfers and taxes (table 1).

Tab. 1: Income components used for the analysis

Variable	Definition		
Earnings	Gross employee cash or near cash income	Labour income	Market income
Selfemp	Gross cash benefits or losses from self-employment (including royalties)		
Othermark	• Non-Cash employee income • Pensions from individual private plans • Income from rental of a property or land • Regular inter-household cash transfers received • Interests, dividends, profit from capital investments in unincorporated business • Income received by people aged under 16	Residual categories of market income	
Oldsurv	• Old-age benefits • Survivor' benefits		Social transfers
Unemp	Unemployment benefits		
Famchild	Family/children related allowances		
Social	• Sickness benefits • Disability benefits • Education-related allowances • Social exclusion not elsewhere classified • Housing allowances	Residual categories of social transfers	
Taxes	• Tax on income and social insurance contributions • Regular inter-household cash transfer paid • Regular taxes on wealth		Taxes

Source: Authors' definition based on Description of SILC User Database Variables.

In order to better characterize the income under analysis, we present descriptive statistics[1]. Some descriptive statistics for factors of income are shown in table 2.

Tab. 2: Descriptive statistics for annual income per household member for V4 countries in 2016 [euro]

Country	Variable	Mean	Standard deviation	Coefficient of variation	Min	Max
Czech Republic	Earnings	6540.83	6629.34	1.0135	0	88124.30
	Selfemp	1479.07	4661.33	3.1515	0	122194.10
	Othermark	352.78	2292.13	6.4974	0	130885.00
	Oldsurv	1546.42	2547.60	1.6474	0	20015.40
	Unemp	47.86	334.37	6.9863	0	8797.98
	Famchild	212.03	576.88	2.7207	0	5432.75
	Social	355.90	914.97	2.5709	0	9774.54
	Total	8808.33	5254.78	0.5966	-6250.03	144565.50
Hungary	Earnings	4270.59	4424.75	1.0361	0	80051.47
	Selfemp	533.54	2382.92	4.4662	-175.48	96516.13
	Othermark	138.43	644.46	4.6556	0	24667.55
	Oldsurv	1275.90	2251.57	1.7647	0	31675.53
	Unemp	38.72	182.34	4.7094	0	3225.81
	Famchild	362.42	657.23	1.8134	0	7299.99
	Social	154.94	467.93	3.0201	0	6451.61
	Total	5395.73	3248.41	0.6020	-1534.13	66606.84
Poland	Earnings	5547.23	5746.34	1.0359	0	80462.70
	Selfemp	858.63	2211.72	2.5759	0	31639.05
	Othermark	120.04	715.94	5.9641	0	25817.86
	Oldsurv	1635.54	2603.54	1.5918	0	24635.17
	Unemp	40.66	322.74	7.9380	0	17264.89
	Famchild	128.98	423.09	1.9367	0	7785.82
	Social	211.59	612.47	3.1774	0	13492.03
	Total	6659.41	4021.83	0.6039	-10133.60	76614.08
Slovakia	Earnings	5909.54	5083.80	0.8603	0	81720.00
	Selfemp	1038.537	3490.141	3.3606	0	150000.00
	Othermark	84.68	397.93	4.6994	0	20000.00
	Oldsurv	1478.39	2331.04	1.5767	0	17372.00
	Unemp	24.76	169.62	6.8497	0	3055.56
	Famchild	226.58	419.17	1.8499	0	3600.00
	Social	230.22	625.59	2.7173	0	8196.00
	Total	7392.04	3879.47	0.5248	-2158.38	121887.50

Source: Authors‘ own calculations.

4. Empirical analysis

In the current section, we examine how different income sources affect total income inequality in the V4 countries using Shorrocks’s decomposition method. Table 3 shows the results from decomposing the CV using equation (1). Then, we compare the shares of various sources in inequality with their shares in the total income to reveal which income sources are relatively strengthening, and which are rather smoothing inequality.

[1] All the measures are estimated with the use of cross-personal weights.

As expected, labour earnings are by far the largest source of household disposable income in all V4 countries, comprising over three-quarters of total household income. The share of earnings in household disposable income is clearly the highest in Poland (83,3%), compared to about 80% in Slovakia and Hungary and only about 74% in Czech Republic.

Tab. 3: Inequality decomposition by factor components for V4 countries in 2016

Factor	Factor shares in disposable household income (%)	Relative contribution of components to overall inequality (%)	Factor shares in disposable household income (%)	Relative contribution of components to overall inequality (%)
	Czech Republic		Hungary	
Earnings	74.2573	77.2011	79.1476	87.0367
Selfemp	16.7917	44.3454	9.8883	29.1166
Othermark	4.0051	20.2277	2.5655	5.3143
Oldsurv	17.5564	-6.1905	23.6465	10.7772
Unemp	0.5434	-0.0849	0.7176	-0.8157
Famchild	2.4072	-0.2925	6.7168	-0.6924
Social	4.0405	-1.9585	2.8715	-0.6434
Taxes	-19.6015	-33.2479	-25.5537	-30.0933
Total	100.0000	100.0000	100.0000	100.0000
Factor	Poland		Slovakia	
Earnings	83.2991	115.8862	79.9446	86.6044
Selfemp	12.8935	7.9766	14.0494	37.7251
Othermark	1.8026	4.1653	1.1455	0.8526
Oldsurv	24.5599	6.1459	19.9998	2.4574
Unemp	0.6105	0.1332	0.3350	0.0294
Famchild	1.9367	-0.2601	3.0653	-1.0639
Social	3.1774	-1.5250	2.7173	-1.3458
Taxes	-28.2797	-32.5221	-21.6541	-25.2592
Total	100.0000	100.0000	100.0000	100.0000

Source: Authors‘ own calculations.

Based on Table 2, it can be stated that inequalities in earnings are the lowest of all sources – the CV is about 1 in Czech Republic, Hungary and Poland and 0,86 in Slovakia. Having obtained insight into the share of earnings in disposable income in the four countries, we now turn to the contribution of this income source to total inequality. The dominant positive influence on inequality is the employee cash or near cash income in all four countries. It needs to be highlighted that, inequality contributions tend to be more closely related to factor shares than to factor inequalities or correlations. The relative contribution of earnings to total inequality varies far more widely in Poland and is considerably higher there than in the other countries (some 116% of total inequality). In Poland the relative contribution of earnings to total inequality is disproportionately high compared to its share in disposable income. Earnings are a disequalising source in all the V4 countries, but in Czech with a smaller marginal effect.

Although earnings are the largest source of household income, income from self-employment and residual categories of market income can also play a significant role. As we can see in the table 3 the share of self-employment income in household income is lower in Hungary than in other countries (9,89%), but the relative contribution of this source to total inequality is disproportionately high (29,12%). The lowest relative contribution of self-employment income to total inequality is observed in Poland (7,89%). The share of residual categories of market income in disposable household income is the highest in Czech Republic (4%) and the lowest in Slovakia (1,15%). This factor, as well as earnings and self-employment income, is the disequalising source. In the case of Czech Republic, the relative contribution of other market incomes to total inequality (20,23%) is disproportionately high compared to its share in disposable income. The next largest components of income are old-age and survivor' benefits (in Czech Republic 17,56%, in Hungary 23,65%, in Poland 24,56%, in Slovakia 20%). What's more, old-age and survivor' benefits contribute negatively to the inequality of disposable income only in the Czech Republic (the relative contribution of this source to total inequality is –6,19%). Unemployment benefits have a very small share to household disposable income and to total income inequality in the V4 countries (see table 3). Unemployment benefits generate negative contributions in Czech Republic and Hungary (equalising effect). In Slovakia, similarly to Poland, the contribution of unemployment benefits is positive. Family and children related allowances vary between 1,94% and 6,72% of total household income. The share of these transfers is the highest in Hungary (6,72%), followed by Slovakia (2,71%) and Czech Republic (2,41%), and the lowest is in Poland. Family and children related allowances contribute negatively to the inequality of household disposable income in all four countries, but the relative contribution is disproportionately low compared to its share in disposable income. The shares of residual categories of social transfers in total income vary between 2,72% (Slovakia) and 4,04% (Czech Republic). These transfers generate negative contributions in all countries. The residual categories of social transfers account only for between 0,64% (Hungary) and 1,96% (Czech Republic) of the income inequality across the countries. Taxes help to mitigate income inequality in all the V4 countries. The contribution of tax-transfers is of similar magnitude in Czech Republic, Poland and Hungary, oscillating between -33,25% and -30,09%.

Conclusions

The results of the study reveal important cross-country differences in the contribution of the various sources to overall household income inequality.

As it is was expected gross employment income is the income component, which contributes most to the disparities in disposable income and social transfers play a crucial role in the reduction of income inequality. However, our analysis reveals that labour income, both earnings and self-employment income, is the most important factor contributing to inequality, irrespective of the country while all social transfers (old-age and survivor' benefits, unemployment benefits, family/children related allowances and residual categories of social transfers) and taxes reduce income inequality only in Czech Republic. In Hungary social transfers, except old-age and survivor's benefits, as well as taxes negatively contribute to income inequality, decreasing their level. In Poland, similarly to Slovakia, only taxes, family/children related allowances and residual categories of social transfers reduce inequality. The other income components are additional, besides income from employment, sources of inequality. Our results are in line with many studies on the relationship between share of labour income in total income and the level of income inequalities (e.g.: Bengtsson & Waldenstrom, 2015; Income inequality, 2015; Rani & Furrer, 2016). Based on them it can be pointed out the relationship between the share of labour income and inequalities is not clear-cut and depends largely on how market incomes are distributed as well as the magnitude of other sources of household incomes and the impact of taxes and social transfers.

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