DISTRIBUTION OF SOCIAL TRANSFERS IN V4 COUNTRIES WITH REGARD TO THE TYPE AND AMOUNT OF HOUSEHOLD INCOME

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Abstract

Despite signs of positive developments, governments of V4 member states, like all of Europe, are faced with the persistent impact of the global economic crisis, such as the stagnation of growth in the developed European economies and increased unemployment. These problems are exacerbated by the phenomenon of an aging population that threatens the stability of social systems. The aging population and the continuing effects of the economic recession raise concerns about the future costs of government pension systems, support for parental leave, unemployment and other social benefits paid for by the state. This adverse development undermines the sustainability of the population's living standards. The contribution presents analyses of the level and structure of household transfers received from the state in V4 countries with regard to the type and amount of household income. To compare the structures of social spending in the V4 countries we use Gatev's dissimilarity coefficient and cosine similarity coefficient of structures.

Key words: household type, social transfers, similarity of structures, V4 countries

JEL Code: C10, D31, D63

Introduction

One of the most important goals of European Union (declared in Strategy 2020) is, among others, an effort to reinforce social inclusion and to reduce poverty. Socio-economic and integration attempts of EU are weakened as a consequence of world-wide economic crisis. In the globalized developed world, the economic stagnation is accompanied not only by increasing unemployment and growth of poverty and social exclusion but also by population ageing phenomenon. An adverse demographic development mirrors in co called ageing of economies accompanied by growing dependence on expected labor activity of population (see, e.g., Fiala & Langhamrová, 2014). Demographic trends indicate that we can expect significant decrease of efficient capacity of workforce which can lead to serious consequences for the status and

development of social and health security systems. This development leads to concerns about government expenditures on pension systems, unemployment benefits, maternity care benefits, disability and sickness benefits, etc., and requires an intervention to the structure of economy and social policy in EU countries. European states thus face the necessity to implement particular measures which are able – in agreement with common strategy Europe 2020 – reduce the negative impact of economic crisis and process of population ageing on the social level of inhabitants. Topicality of the issue can be confirmed by a number of papers devoted to the analyses of demographic trends, unemployment, income inequality, polarization, risk of monetary poverty, material deprivation and low work intensity which were published in research papers on national and international level. Let us mention, e.g., work of Bílková (2016), Pauhofová & Želinský (2015), Stankovičová, Ivančíková & Vlačuha (2015), Želinský, Mysíková & Večerník (2015), Mysíková, Večerník & Želinský (2015), Sipková & Sipko (2014). Other numerous publications from related fields concern the modeling of income and expenditure distributions, identification of influencing factors or clustering according to various criteria. In last years, let us pick, e.g., Malá (2016), Marek (2016), Marek & Doucek (2016), Löster (2016), Řezanková a Želinský (2014), etc.

1 Level and structure of social benefits in V4 countries

The presented paper is focused on an analysis of government expenditures and costs of social security funds in Visegrad countries. Visegrad Four (V4) is a group of Central European post-communist states – Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK), which originated from the Visegrad Triangle founded in February 1991. It aims at the support of collaboration in the fields of culture, science and research, education, youth exchange, tourism development and cross-border collaboration. The main objective is support of stability, mutual relations and European integration.

The analysis of generosity of household benefits provided by particular state will be performed according to two perspectives – namely the viewpoint of

- different types of households,
- different income category.

The characterization of household structure used typology of Eurostat (summarized in Table 1). Percentage of particular household types in V4 countries is depicted in Figure 1. It is obvious, that the structure of households is different in V4 countries which to some extent influences the budget burdened by particular benefit types (old-age, maternity, sickness, etc.)

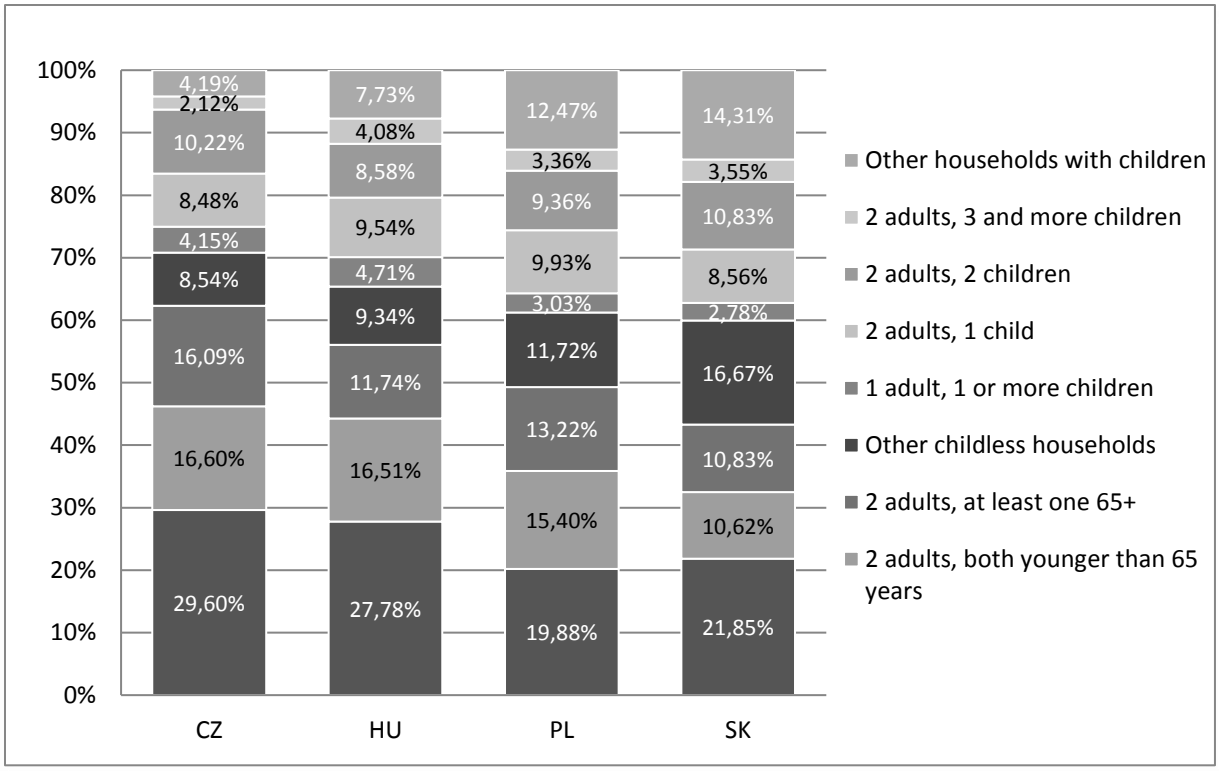
A significant amount represents childless households – in Czech Republic in total 70.83%, In Hungary 65.37%, in Poland 60.22% and in Slovakia 59.79%. The most important subgroup of childless households constitutes of individuals – in Czech Republic almost 30%, in Hungary 28%, in Poland 20% and in Slovakia 22%. The least frequent possibilities are households with 2 adults and 3 and more children (in Czech Republic 2.12%, in Hungary 4.08%, in Poland 3.36%, and in Slovakia 3.55%) and households with 1 adult and 1 and more children (in Czech Republic 4.15%, in Hungary 4.71%, in Poland 3.03%, in Slovakia 2.78%). Substantial interstate differences can be observed between other childless households (e.g., Czech Republic only 8.54%, but in Slovakia almost twice as much 16.67%) and other households with children (in Czech Republic 4.19%, in Slovakia 14.31%).

Tab. 1: Typology of households according to Eurostat

Household structure	Household structure
Individuals	2 adults, 1 child
2 adults, both younger than 65 years	2 adults, 2 children
2 adults, at least one 65+	2 adults, 3 and more children
Other childless households	Other households with children
1 adult, 1 or more children	Other (non-typical) households

Source: Based on Eurostat typology

Fig. 1: Proportion of particular household types in V4 countries – Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK).



Source: Computation based on EU-SILC 2014

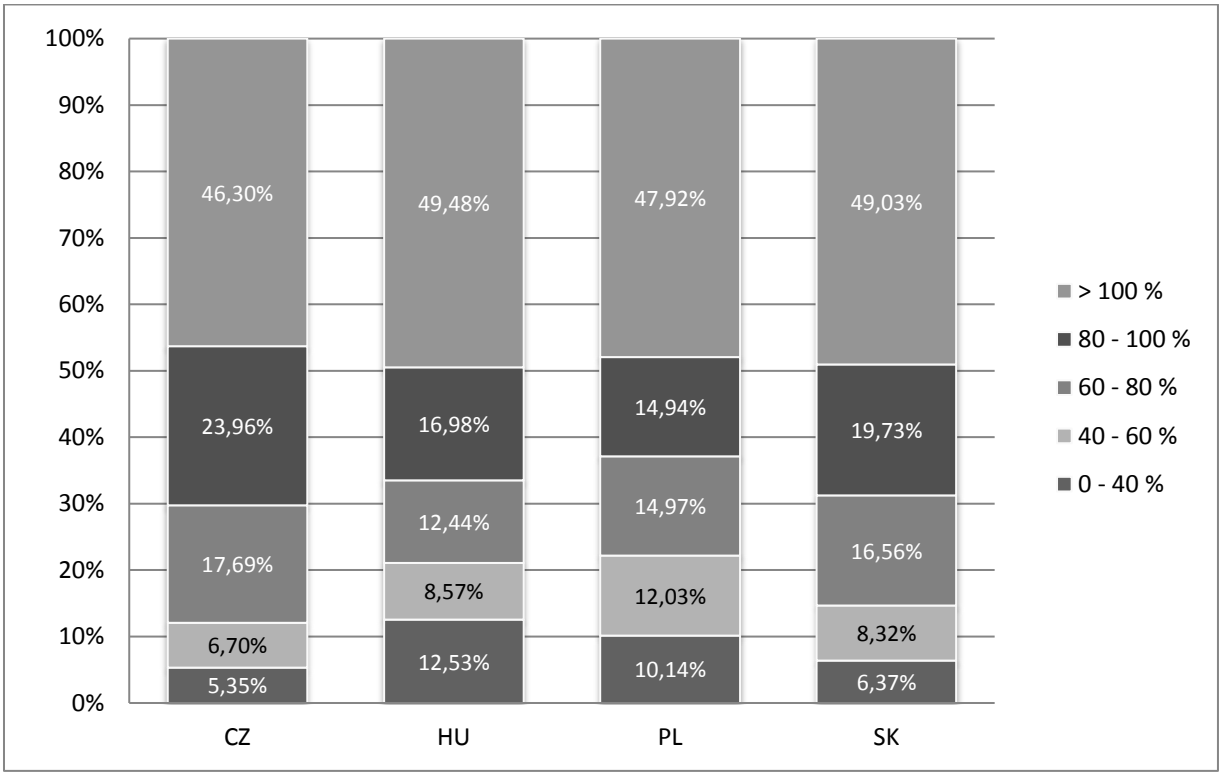
The level of incomes will be represented by the inclusion of household into the particular income category. The categorization is based on values of medians of national equalized income in purchasing power parity (upper boundary is included) – see Table 2. Percentage of households in income categories in V4 is presented on Figure 2. Again we can observe differences among V4 countries. E.g., the highest proportion of the poorest households (income up to the 40% of national median) is in Hungary (12.53%), followed by Poland (10.14%) and with some distance Slovakia and Czech Republic (6.37% and 5.35%). Similar situation appears in households between 40% and 60% of median, namely from 6.70% households (in case of Czech Republic) to 12.03% (in Poland). The income between poverty threshold (60% of national median) and median (100%) has in Czech Republic almost 42% households, in Hungary and in Poland approximately 29% and in Slovakia 36%.

Tab. 2: Income categories

Income category	Income category
up to do 40% of national median from 40% to 60% of national median from 60% to 80% of national median	from 80% to 100% of national median over 100% of national median

Source: Own categories relative to income median.

Fig. 2: Proportions of income categories in V4 countries – Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK).



Source: Computation based on EU-SILC 2014

2 Methods and data base

For the evaluation of generosity of social systems in V4 countries we use mean values of transfers obtained by households. The comparison of redistribution systems is based on similarity (or dissimilarity) measures (see, e.g., Löster, 2016). As a normalized measure of dissimilarity of pair of structures Gatev dissimilarity index can be used. It is given by formula

$$k_G(\vec{y}_i, \vec{y}_j) = \sqrt{1 - \frac{2\sum_{k=1}^{s} y_{ik} y_{jk}}{\sum_{k=1}^{s} (y_{ik}^2 + y_{jk}^2)}}, \qquad (1)$$

where y_{ik}, y_{jk} are values of k-th component ($k = 1,\ldots,s$) of vectors from i-th and j-th structure. Two identical structures have Gatev index equal to zero and in case of dissimilar structures approaches value of 1, for detail see, e.g., Bartošová (2013). Cosine similarity shows related properties, it is a cosine of angle $\varphi \in (0, \pi/2)$ of two vectors describing pair of structures y_i and y_j. It holds

$$k_{\cos}(\vec{y}_i, \vec{y}_j) = \frac{\sum_{k=1}^{s} y_{ik} y_{jk}}{\sqrt{\sum_{k=1}^{s} y_{ik}^2 \sum_{k=1}^{s} y_{jk}^2}}. \qquad (2)$$

Cosine similarity is equal to one in case of identical structures (angle of $\vec{y}_i$ and $\vec{y}_j$ equal to zero). In case of perpendicular vectors is the scalar multiplication equal to zero.

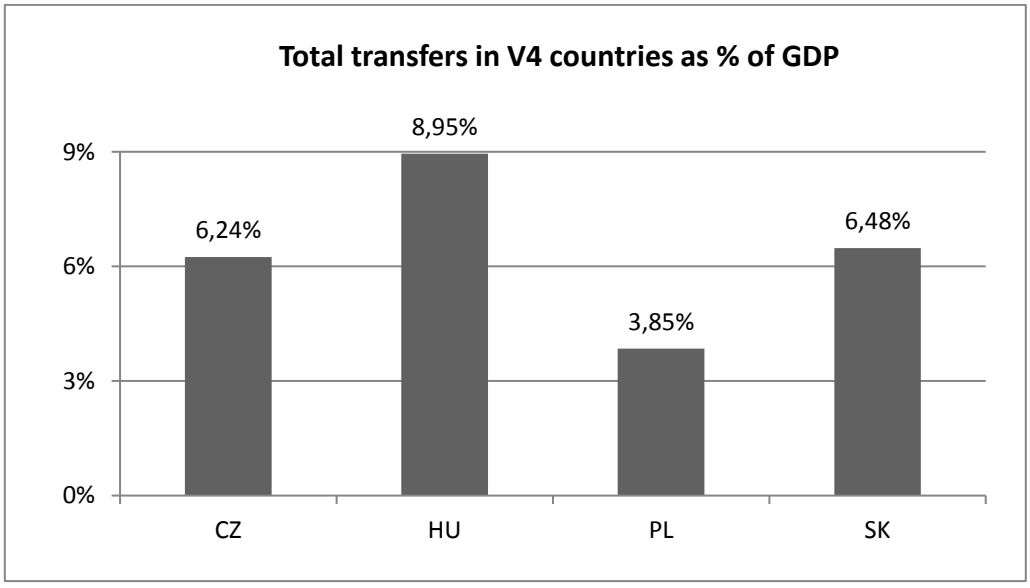
The data base is a result of the sample survey on incomes and living conditions EU-SILC (European Union Statistics on Income and Living Conditions, see EU-SILC 2014). It is an extensive survey mandatory for all member states of European Union and is carried out annually also in Norway, Iceland and Switzerland. The sample collected is representative and results of the analyses can be generalized and compared across the European Union.

3 Results

The basic idea of social policy setting in V4 countries can be derived from Figure 3 where the share of GDP dedicated to transfers is depicted. Again we can observe differences. The most generous system is in Hungary with 8.95% then Slovakia and Czech Republic with 6.48% and 6.24% and with some distance Poland with 3.85%.

The means of particular types of social benefits on total household incomes are summarized in Tables 4 – 5. Types of incomes and transfers used for the structural estimation of social benefits proportion on total household incomes are listed in the Table 3. Values in Tables 4 – 5 represent average proportions of sum of all social benefits of considered type (see Table 3) which the household received in the considered year. The first column of the tables shows the average transfers received by the household (excluding pensions)

Fig. 3: Share of transfers on GDP in V4 countries – Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK).



Source: Eurostat 2014

Tab. 3: EU-SILC Variables used for estimation

Abbrev.	Description
HY020	Total disposable household income
HY022	Total disposable household income before social transfers other then old-age and survivor's
PY090N	Unemployment benefits
PY100N	Old-age benefits
PY110N	Survivor's benefits
PY120N	Sickness benefits
PY130N	Disability benefits
PY140N	Education-related allowances

Source: EU-SILC 2014

According to the expectations, the average values of particular benefits differ with regard to the country and factor considered. Table 4 summarizes the mean benefits in V4 countries according to the income category. The sum of all benefits (except of old-age benefits) lays between 208.07 EUR (households with income above 100% of median in Poland) to 4546.60 EUR households with income up to 40% of median in Czech Republic). Similar situation appears also in case of other types of transfers. E.g., average of old-age benefits varies from 113.68 EUR (households up to 40% of median in Hungary) to 4934.21 EUR (households with income between 80% and 100% of median in Czech Republic). Mean unemployment benefits vary from 21.28 EUR (households with income between 60% and 80% of median in Slovakia) to 236.68 EUR (households with incomes up to 40% of median in Hungary), etc. But differences can be observed also within the income classes.

Tab. 4: Mean values of transfers per household according to ratio of median of equalized household incomes (in %) in Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK)

country code	income category	average transfers	average PY090N	average PY100N	average PY110N	average PY120N	average PY130N	average PY140N
CZ	≤ 40	4546.60	149.08	370.46	83.75	190.44	2339.63	29.23
	(40;60]	2308.26	51.46	1831.87	125.58	107.67	1044.19	3.78
	(60;80]	929.42	26.38	3143.52	372.23	28.26	353.06	1.18
	(80;100]	701.04	25.95	4934.21	263.67	32.69	315.61	1.61
	> 100	490.10	25.38	3000.50	178.15	60.28	163.12	4.89
HU	≤ 40	3244.88	236.68	113.68	39.30	4.20	1097.99	18.05
	(40;60]	1955.63	149.45	901.77	66.13	18.37	602.62	19.65
	(60;80]	1161.47	92.23	1526.92	24.06	10.66	304.48	22.43

	(80;100]	689.94	42.32	2398.50	27.78	10.95	157.34	17.47
	> 100	506.53	26.79	2915.29	32.26	24.13	81.70	14.53
PL	≤ 40	1967.14	173.86	367.03	79.47	13.43	966.12	17.01
	(40;60]	920.70	63.91	1385.47	163.24	8.96	363.98	8.98
	(60;80]	540.42	59.08	1905.95	309.92	4.34	221.62	8.02
	(80;100]	355.03	33.04	2706.72	369.58	9.87	152.55	10.13
	> 100	208.07	28.40	3595.69	237.17	5.35	92.37	3.72
SK	≤ 40	3486.85	205.92	344.91	97.32	30.36	1602.71	26.29
	(40;60]	1752.97	91.51	1612.33	206.60	49.48	711.95	20.47
	(60;80]	819.42	21.28	2834.13	389.17	22.69	285.87	3.38
	(80;100]	672.33	52.32	3661.01	375.52	31.97	179.76	14.37
	> 100	570.48	44.07	2185.61	243.63	27.25	139.10	30.79

Source: Computation based on EU-SILC 2014

Similar situation can be observed also in the case of dependence on household type (Table 5). E.g., the category of all benefits (except old-age benefits) obviously lays between 133.55 EUR (households with 2 adults, at least one 65+ in Poland) to 3713.56 EUR (households with 2 adults and 3 and more children in Hungary). Average old-age benefits vary from 0 EUR (2 adults and 3 and more children in Czech Republic) to 9545.34 EUR (2 adults, at least one 65+ in Czech Republic), etc.

Tab. 5: Mean values of transfers per households according to the household type in Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK)

country code	income category	average transfer	average PY090	average PY100	average PY110	average PY120	average PY130	average PY140
CZ	Individuals	340.54	19.47	3174.48	492.01	34.55	234.89	0.36
	2 adults, <65	1115.58	71.47	2492.51	98.17	110.10	872.07	16.66
	2 adults, 1 65+	409.75	16.01	9545.34	168.64	12.04	341.12	0.00
	Other childless	1505.43	121.76	3886.74	159.79	185.35	1172.82	3.33
	1 adult,children	1369.86	20.22	90.56	241.31	34.70	145.66	4.36
	2 adult, 1 child	1638.14	10.99	212.69	41.90	66.38	204.64	5.39
	2 adults, 2 children	1455.99	1.92	21.13	27.28	9.91	45.38	2.82
	2 adults,>2	2643.57	0.00	0.00	0.00	0.00	0.00	0.00
	Other with children	1811.10	35.55	589.12	126.91	90.37	270.10	14.18
HU	Individuals	288.20	41.97	2527.32	28.82	6.97	210.18	7.61
	2 adults, <65	934.44	145.89	1756.11	32.35	32.18	694.02	7.32
	2 adults, 1 65+	219.23	39.30	6813.42	5.90	4.98	132.16	0.54
	Other childless	1141.62	211.30	2705.59	25.08	53.42	742.95	17.17
	1 adult,children	1491.71	34.00	173.29	182.92	14.24	84.43	40.03
	2 adult, 1 child	1596.35	51.78	291.52	52.24	13.45	177.58	26.67
	2 adults, 2 children	2012.65	14.21	91.67	18.64	9.16	37.25	31.21
	2 adults,>2	3713.56	11.86	11.88	12.30	1.48	12.64	34.86
	Other with children	2240.39	78.02	548.96	28.16	20.74	151.33	43.66

PL	Individuals	175.86	19.28	2805.55	633.09	3.12	122.30	4.65
	2 adults, <65	697.99	151.26	2586.65	112.42	17.62	595.39	6.63
	2 adults, 1 65+	133.55	17.94	8121.22	330.81	1.28	107.22	0.96
	Other childless	729.45	123.04	3796.83	267.13	18.48	636.65	9.56
	1 adult,children	1055.87	19.15	197.56	344.30	11.13	95.01	15.51
	2 adult, 1 child	489.04	38.39	404.49	44.88	3.37	130.07	14.15
	2 adults, 2 children	486.86	4.82	48.91	6.87	0.52	20.54	5.03
	2 adults,>2	1328.64	0.00	7.52	0.00	0.00	7.77	4.84
	Other with children	926.45	21.49	590.89	54.61	3.47	101.53	8.76
SK	Individuals	250.28	25.68	2871.72	677.19	15.12	168.53	0.00
	2 adults, <65	736.92	105.50	2427.85	144.07	48.67	529.35	9.38
	2 adults, 1 65+	292.60	19.69	7687.74	343.84	9.04	248.81	0.22
	Other childless	1076.22	138.08	3191.59	223.07	58.69	731.05	35.30
	1 adult,children	900.66	29.53	131.61	364.22	17.44	139.90	49.05
	2 adult, 1 child	1212.73	11.70	319.59	104.70	15.26	255.82	16.82
	2 adults, 2 children	1189.72	30.36	74.34	26.61	19.82	74.05	9.76
	2 adults,>2	2035.50	0.00	107.76	7.23	6.49	31.82	2.34
	Other with children	1690.11	63.61	883.38	149.93	42.42	248.03	77.01

Source: Computation based on EU-SILC 2014

This analysis presented significant differences in the setting of social systems of V4 countries. To compare the structures of social spending in the V4 countries we use Gatev's dissimilarity coefficient and cosine similarity coefficient of structures. The comparison of structure will be performed only in case of two most important items, see Tables 6 and 7.

Tab. 6: Gatev coefficient of dissimilarity and cosine similarity of income categories in Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK)

Gatev dissimilarity, transfers without old-age				
	CZ	HU	PL	SK
CZ	0	0.2063	0.5220	0.1810
HU	0.2063	0	0.3902	0.0817
PL	0.5220	0.3902	0	0.3893
SK	0.1810	0.0817	0.3893	0

Gatev dissimilarity, old-age benefits				
	CZ	HU	PL	SK
CZ	0	0.3945	0.3114	0.1792
HU	0.3945	0	0.1519	0.3079
PL	0.3114	0.1519	0	0.2636
SK	0.1792	0.3079	0.2636	0

Cosine similarity, transfers without old-age				
	CZ	HU	PL	SK
CZ	1	0.9898	0.9973	0.9980
HU	0.9898	1	0.9931	0.9934
PL	0.9973	0.9931	1	0.9978
SK	0.9980	0.9934	0.9978	1

Cosine similarity. old-age benefits				
	CZ	HU	PL	SK
CZ	1	0.9493	0.9424	0.9958
HU	0.9493	1	0.9964	0.9345
PL	0.9424	0.9964	1	0.9319
SK	0.9958	0.9345	0.9319	1

Source: Computation based on EU-SILC 2014

Tab. 7: Gatev coefficient of dissimilarity and cosine similarity of household types in Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK)

Gatev dissimilarity, transfers without old-age				
	CZ	HU	PL	SK
CZ	0	0.1916	0.4700	0.1903
HU	0.1916	0	0.5690	0.3197
PL	0.4700	0.5690	0	0.3574
SK	0.1903	0.3197	0.3574	0

Gatev dissimilarity, old-age benefits				
	CZ	HU	PL	SK
CZ	0	0.2297	0.1011	0.1414
HU	0.2297	0	0.1522	0.1070
PL	0.1011	0.1522	0	0.0620
SK	0.1414	0.1070	0.0620	0

Cosine similarity, transfers without old-age				
	CZ	HU	PL	SK
CZ	1	0.9796	0.9685	0.9944
HU	0.9796	1	0.9470	0.9840
PL	0.9685	0.9470	1	0.9551
SK	0.9944	0.9840	0.9551	1

Cosine similarity. old-age benefits				
	CZ	HU	PL	SK
CZ	1	0.9990	0.9977	0.9974
HU	0.9990	1	0.9970	0.9984
PL	0.9977	0.9970	1	0.9981
SK	0.9974	0.9984	0.9981	1

Source: Computation based on EU-SILC 2014

Conclusion

Let us summarize that after 25 years of democratic development in Visegrad Four countries we observe substantial differences not only in GDP levels and income distributions but also in the structure of social benefits and pensions.

Analysis using Gatev's dissimilarity and cosine similarity in general shows that structure of social benefits substantially differs particularly in case of Poland. As we can expect, in Czech Republic and Slovakia structures of benefits and pensions are closely related.

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