STATISTICS IN TRANSITION new series, Autumn 2014
Vol. 15, No. 4, pp. 573–590

VARIABILITY OF HOUSEHOLD DISPOSABLE INCOME *PER CAPITA* BY TYPES OF RESIDENCE IN POLAND

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ABSTRACT

The dispersion of household disposable income *per capita* in each class of residence (i.e. six) was estimated for households in Poland. Then, the dispersion of income between the classes was analysed. The computation was carried out separately for subsequent years from 1998 to 2012. The study shows that the households in Poland are differentiated with regard to income *per capita* by types of residence, however, the differences within the groups are much bigger than the differences between the groups. What is particularly surprising, the share of between-group variance in total variance in the population under study was negligible small (just a few percent) compared to the share of the mean within-group variance (more than 90 percent).

Key words: disposable income *per capita*, type of residence, within-group and between-group variance.

1. Introduction

The analysis of diversification in household disposable income *per capita* is a significant study area as it helps to understand the inhomogeneous nature of living standard within a certain social group. Undoubtedly, the income level is a key variable varying the living standard of Polish residents. The aim of this article is to estimate the differences in available income *per capita* across households in various classes of residence, as compared to the variation of household's disposable income *per capita* within classes. The nature of this article is the research one.

This article describes separately six classes of residence (hereinafter referred to as classes or groups):

- cities with 500,000 residents and more (on 24th July 2014 were in Poland 5 such cities);

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- cities with 200,000 to 499,999 residents (on 24th July 2014 were in Poland 12 such cities);
- towns with 100,000 to 199,999 residents (on 24th July 2014 were in Poland 23 such towns);
- towns with 20,000 to 99,999 residents (on 24th July 2014 were in Poland 183 such towns);
- towns with less than 20,000 residents (on 24th July 2014 were in Poland 691 such towns);
- and villages (on 1st January 2015 were in Poland 43,068 villages).

The above division is disjoint and exhaustive.

In order to meet the article objective, three research tasks were determined, namely:

1) to compare mean household disposable income *per capita* across certain classes with mean household disposable income *per capita* in Poland;
2) to compare the dispersion of household disposable income *per capita* within certain groups with the income dispersion in Poland;
3) to analyse the between-group variance against the mean within-group variance.

The analysis was carried out separately for each year from 1998 to 2012. The data come from the Household Budget Surveys (HBS) which are conducted annually by the Central Statistical Office of Poland, on a regular basis. The HBS data for the period from 1998 to 2012 were provided by the Central Statistical Office of Poland (GUS) pursuant to Contract No. 20/Z/DI-6-611/632/2013/RM concluded between GUS and the University of Szczecin. The said database includes detailed information on 31,756 Polish households in 1998, 31,428 in 1999, 36,163 in 2000, 31,847 in 2001, 32,342 in 2002, 32,452 in 2003, 32,214 in 2004, 34,767 in 2005, 37,508 in 2006, 37,366 in 2007, 37,358 in 2008, 37,302 in 2009, 37,412 in 2010, 37,375 in 2011 and 37,427 in 2012. The household budget survey was carried out by the Central Statistical Office of Poland with the use of representative method which makes it possible to generalise the results to all the households in Poland (*Budżety*... 2012, 2013, p. 13).

This article tests two research hypotheses. The first one states the highest mean household disposable income *per capita* in Poland is recorded in big cities and the less residents in a town there are, the lower the mean household disposable income *per capita* may be observed. But the lowest household disposable income is typical of villages. The second research hypothesis to be verified in this article states the variation of household disposable income *per capita* within classes of residence (i.e. groups) is significantly higher than the between-group variation.

2. Applied research tools

The subject of analysis in this article is the quantitative characteristic *X* which is household disposable income *per capita*. Household disposable income is defined as a sum of household current incomes from various sources reduced by prepayments on personal income tax made on behalf of a tax payer by a tax-remitter, by tax on income from property, taxes paid by self-employed persons and by social security and health insurance premiums. The disposable income covers both income in cash and in kind, including natural consumption (consumer goods and services taken to satisfy household's needs from self-employment – in and outside farming) as well as goods and services received free of charge. Disposable income is allocated to expenditures and savings increase (*Budżety…* 2012, 2013, p. 18).

The study concerns the distribution of the said variable *X* within the examined statistical population. First of all, in order to describe the structure, the analysis of central tendency was carried out with the use of such a classical measure as the arithmetic mean. Let the mean value of variable *X* be denoted by $\bar{x}$. On the other hand, to analyse the differences between individual observations of variable *X*, the variance will be applied as the classical measure of dispersion. The variance of variable *X* is denoted by $S^2(x)$. The variance is expressed in square units of the examined variable and is not interpreted (Pułaska-Turyna, 2005, p. 71). It is always non-negative (Bielecka, 2001, p. 134).

Standard deviation is the absolute measure of variation and it is calculated as the square root of the variance. It is expressed in the same units as the statistical data and therefore it is interpreted (Aczel, 2005, p. 26). The standard deviation of characteristic X is denoted by $S(x)$.

Based on the value of arithmetic mean $\bar{x}$ and the value of standard deviation $S(x)$, the classical coefficient of variation $V(x)$ may be calculated. It is defined as the quotient of standard deviation and arithmetic mean (Hoseini, Mohammadi, 2012, p. 1). Therefore it can be assumed as the relative measure of dispersion of statistical units in terms of analysed statistical characteristic (Podgórski, 2005, p. 68). The classical coefficient of variation is unitless, however, for interpretation purposes it is expressed as percentage (Kelley, 2007, p. 755). The higher coefficient $V(x)$ is, the more diverse statistical population is (Buga, Kassyk-Rokicka, 2008, p. 47). The coefficient of variation is particularly useful for comparing the level of dispersion of a few variables in the same population or for comparing the level of dispersion of one variable in various populations (Żyżyński, 2000, p. 68).

It is assumed that when the classical coefficient of variation is below 10%, the dispersion of the variable examined is statistically insignificant. On the other hand, in the population with high diversification, the classical coefficient of variance may be even higher than 100% (Kot and others, 2007, p. 179). The manner of determining the dispersion of examined statistical characteristic

depending on the value of classical coefficient of variation is shown in Table 1, but the thresholds determined there are only conventional.

(a)

Table 1. The manner of determining the level of dispersion based on the classical coefficient of variation

Range of coefficient $V(x)$	Interpretation (determining the level of variability)
0 − 10%	very low variability
10 − 20%	low variability
20 − 40%	moderate variability
40 − 60%	high variability
60% and more	very high variability

Source: own compilation based on: (Pułaska-Turyna, 2005, p. 78).

When the arithmetic mean and standard deviation are computed, then the typical data intervals may be determined. They include about 68% of all the observations in the statistical population (Makać, Urbanek-Krzysztofiak, 2001, p. 99). The typical data interval based on the classical measures is determined by the formula below (Liskowski, Tauber, 2003, p. 66):

$$\bar{x} - S(x) < x_{typ.} < \bar{x} + S(x).$$

Let the given population be divided into n separate groups. Then, the mean value of statistical characteristic X for each group may be computed. It is expressed as $\bar{x}_i$ (i = 1, 2, …, n) for the purpose of this article. Thus, the arithmetic mean of all the means in considered groups is expressed as $\overline{\bar{x}_i}$. Its value equals the total mean $\bar{x}$ computed for all the observations from n groups in total (i.e. $\overline{\bar{x}_i} = \bar{x}$).

For each i-th group, the within-group variance $S^2(x_i)$, within-group standard deviation $S(x_i)$ and classical within-group coefficient of variation $V(x_i)$ can be computed – they are the within-group measures of dispersion. If the means of considered groups are not the same, so if $\bar{x}_1 \neq \bar{x}_2 \neq ... \neq \bar{x}_n$, the variance computed for entire statistical population under study (i.e. $S^2(x)$) is higher than the mean within-group variance $\overline{S^2(x_i)}$, the total standard deviation $S(x)$ is higher than the mean within-group standard deviation $\overline{S(x_i)}$ and finally the total coefficient of variation $V(x)$ is higher than the mean within-group coefficient $\overline{V(x_i)}$.

Using between-group measures of variation we can determine the size of average differences between the observations of separate groups, i.e. the

differences between the means in the said groups (i.e. values $\bar{x}_1$, $\bar{x}_2$, …, $\bar{x}_n$). In order to determine the degree of this variability, between-group variance $S^2(\bar{x}_i)$, between-group standard deviation $S(\bar{x}_i)$ and between-group coefficient of variation $V(\bar{x}_i)$ have to be computed. Obviously, the values of $S^2(\bar{x}_i)$ (and also $S(\bar{x}_i)$ and $V(\bar{x}_i)$) are affected by not only the within-group means calculated, but also by the number of units in each group (Zeliaś, 2000, p. 62).

The variance has a property which is very important for the purpose of this article. Namely, the sum of the between-group variance and the mean within-group variance is always the same as the total variance computed for entire statistical population considered (Fabisiak, Kaźmierczak, 2012, p. 46). It may be expressed by the equation below (Western, Bloome, 2009, p. 4):

$$S^2(x) = S^2(\bar{x}_i) + \overline{S^2(x_i)},$$

where:

$S^2(x)$ – variance computed for the entire analysed population consisting of *n* groups;

$\bar{x}_i$ – arithmetic mean computed for *i*-th group (*i* = 1, 2, …, *n*);

$S^2(\bar{x}_i)$ – between-group variance;

$S^2(x_i)$ – within-group variance computed for *i*-th group;

$\overline{S^2(x_i)}$ – mean within-group variance.

The above equation enables drawing a conclusion that if each statistical unit from the *i*-th group was the same value concerning examined variable as the *i*-th group mean, then the within-group variances would equal zero, so the mean within-group variance would equal zero as well, and then the total variance would be the same as the between-group variance.

If total variance $S^2(x)$ is the sum of two components, so by dividing each component by $S^2(x)$ we may compute the shares of $S^2(\bar{x}_i)$ and $\overline{S^2(x_i)}$ in the sum. Therefore, the ratio $\frac{S^2(\bar{x}_i)}{S^2(x)}$ is the share of the between-group variance in the total variance and the ratio $\frac{\overline{S^2(x_i)}}{S^2(x)}$ is the share of the within-group variance in the total variance.

3. Mean disposable income *per capita* in Poland and within the groups under study

Based on information on the level of household disposable income and the size of household, the income *per capita* may be calculated. Such a value may be computed for each household surveyed by the Central Statistical Office of Poland in the household budget surveys. The database information provided by GUS made it possible to assign every household to relevant residence class, which, in turn, enabled computing the mean value of household disposable income *per capita* in each of the six groups. Then, the mean household disposable income *per capita* was computed for all households (i.e. in total regardless of the residence class). Such calculations were repeated fifteen times separately for each year from 1998 to 2012. The obtained results are shown in Table 2.

Table 2. Mean household disposable income *per capita* by class of residence in years 1998-2012 (in PLN)

Years	Town by size in thousands of inhabitants					Rural	Total
	500 and more	200–499	100–199	20–99	less than 20		
1998	744.85	597.49	562.24	535.39	482.76	408.58	512.53
1999	843.59	642.91	613.58	574.83	522.85	436.31	554.87
2000	927.83	733.10	695.54	624.01	567.28	477.71	603.10
2001	960.25	786.35	736.90	689.06	591.06	508.33	649.45
2002	1,001.24	819.06	754.18	708.84	625.69	522.96	673.70
2003	1,068.05	824.53	754.36	721.55	661.49	529.12	693.86
2004	1,115.93	847.02	750.91	764.74	677.18	544.09	717.37
2005	1,124.06	912.08	800.65	775.77	695.16	581.44	731.61
2006	1,258.11	1,019.90	858.50	841.37	766.54	653.14	798.90
2007	1,416.02	1,128.12	978.85	937.18	844.55	742.94	899.20
2008	1,609.84	1,238.35	1,157.61	1,068.21	1,001.76	841.17	1,022.95
2009	1,765.16	1,301.87	1,242.92	1,167.13	1,061.35	904.34	1,099.80
2010	1,912.92	1,417.51	1,294.78	1,243.32	1,130.86	972.44	1,180.55
2011	1,955.99	1,465.86	1,349.00	1,273.10	1,197.04	998.15	1,219.25
2012	2,036.65	1,525.18	1,355.82	1,311.55	1,233.59	1,065.17	1,276.92

Source: own computation based on the household budget surveys carried by the Central Statistical Office of Poland.

Based on the data in respective columns of Table 2, the following conclusion may be drawn: the mean household disposable income *per capita* is higher in cities/towns than in villages and the more residents are, the higher income is. The comparison of the within-group means obtained with the mean of the entire statistical population also allows to state that the mean household disposable income *per capita* in towns with at least 20,000 residents exceeds the total mean income *per capita*, while in the towns with less residents than 20,000 and villages the mean household disposable income *per capita* is lower than mean income *per capita* computed for all the groups in total.

4. Dispersion of disposable income *per capita* in Poland and within the groups under study

As it was already mentioned, the mean value does not provide comprehensive information on the distribution of studied variable within the population. Since the mean is a measure of central tendency, it informs only on the value around which the observations are focused. Therefore – for example – two populations may have the same value of the arithmetic mean, although there are significant differences between the observed values of the variable in the first population, while such differences are very slight or even do not exist at all in the second one. Hence, in order to better know the structure of phenomenon concerned, not only the average was analysed but also the variation of units with regard to the statistical characteristic considered.

The objective is to compare the dispersion within six groups into which the population was divided with the dispersion between the groups. In order to achieve the said objective, relevant measures of variability were computed, namely the variance and the standard deviation, as well as the classical coefficient of variation based on the standard deviation. Table 3 shows the values of variance computed for each group out of six residence classes as well as for the total number of surveyed households.

Table 3. Variance (in PLN^2)

Years	Town by size in thousands of inhabitants					Rural	Total
	500 and more	200–499	100–199	20–99	less than 20		
1998	289,882.3	124,008.3	105,593.3	137,196.1	79,962.0	110,273.8	145,271.6
1999	1,116,661.8	179,247.6	125,859.3	296,836.1	91,282.0	127,638.1	288,905.9
2000	472,804.2	234,433.8	202,372.1	155,563.3	160,070.0	446,940.9	332,198.6
2001	515,795.8	246,234.3	276,130.2	190,050.8	149,157.0	183,937.9	252,889.5
2002	638,100.8	278,382.4	235,645.4	320,345.1	156,969.4	509,405.5	421,817.3
2003	707,300.1	330,482.4	251,999.6	223,476.9	290,597.2	181,028.0	314,861.5
2004	867,142.6	320,211.5	237,952.6	260,458.0	193,048.2	315,556.0	380,900.0
2005	881,191.4	425,348.0	247,677.6	345,058.5	217,323.8	339,987.6	414,627.2
2006	1,198,118.1	534,721.1	288,783.3	287,785.5	246,490.5	311,525.8	439,307.7
2007	2,240,545.7	592,013.4	369,861.8	372,644.8	233,640.4	553,538.5	693,845.6
2008	2,210,778.4	602,373.7	656,123.0	506,675.9	334,292.5	1,381,298.5	1,159,241.9
2009	1,605,506.7	700,795.9	635,647.2	523,957.5	372,284.8	903,046.5	886,726.7
2010	3,287,239.3	5,199,600.5	621,372.9	572,342.3	666,130.4	906,183.7	1,460,063.2
2011	3,238,306.2	898,564.0	663,402.1	599,062.6	510,073.9	896,361.0	1,111,116.6
2012	3,505,695.7	953,054.9	640,851.7	639,113.3	525,278.8	1,212,367.8	1,307,952.1

Source: the same as in Table 2.

Next, the square root of each value of variance was taken to obtain the corresponding values of standard deviation. Table 4 shows computed 105 values of standard deviation.

Table 4. Standard deviation (in PLN)

Years	Town by size in thousands of inhabitants					Rural	Total
	500 and more	200–499	100–199	20–99	less than 20		
1998	538.41	352.15	324.95	370.40	282.78	332.08	381.15
1999	1,056.72	423.38	354.77	544.83	302.13	357.26	537.50
2000	687.61	484.18	449.86	394.42	400.09	668.54	576.37
2001	718.19	496.22	525.48	435.95	386.21	428.88	502.88
2002	798.81	527.62	485.43	565.99	396.19	713.73	649.47
2003	841.01	574.88	502.00	472.73	539.07	425.47	561.13
2004	931.20	565.87	487.80	510.35	439.37	561.74	617.17
2005	938.72	652.19	497.67	587.42	466.18	583.08	643.92
2006	1,094.59	731.25	537.39	536.46	496.48	558.14	662.80
2007	1,496.85	769.42	608.16	610.45	483.36	744.00	832.97
2008	1,486.87	776.13	810.01	711.81	578.18	1,175.29	1,076.68
2009	1,267.09	837.14	797.27	723.85	610.15	950.29	941.66
2010	1,813.07	2,280.26	788.27	756.53	816.17	951.94	1,208.33
2011	1,799.53	947.93	814.49	773.99	714.19	946.76	1,054.10
2012	1,872.35	976.25	800.53	799.45	724.76	1,101.08	1,143.66

Source: own computation based on Table 3.

Once standard deviation values were divided by relevant mean values, the coefficient values, which are relative measures of dispersion, were obtained. Since the numerator (the standard deviation) and the denominator (the mean) of the coefficient of variation are expressed in the same unit (PLN), then the obtained quotient will be a unitless measure, and in order to make the interpretation easier it was multiplied by 100%. The values of the coefficient of variation computed separately for each class of residence and for all statistical units examined are presented in Table 5.

Table 5. Coefficient of variation by type of residence

Years	Town by size in thousands of inhabitants					Rural	Total
	500 and more CV (%)	200–499 CV (%)	100–199 CV (%)	20–99 CV (%)	less than 20 CV (%)	CV (%)	CV (%)
1998	72.3	58.9	57.8	69.2	58.6	81.3	74.4
1999	125.3	65.9	57.8	94.8	57.8	81.9	96.9
2000	74.1	66.0	64.7	63.2	70.5	139.9	95.6
2001	74.8	63.1	71.3	63.3	65.3	84.4	77.4
2002	79.8	64.4	64.4	79.8	63.3	136.5	96.4
2003	78.7	69.7	66.5	65.5	81.5	80.4	80.9
2004	83.4	66.8	65.0	66.7	64.9	103.2	86.0
2005	83.5	71.5	62.2	75.7	67.1	100.3	88.0
2006	87.0	71.7	62.6	63.8	64.8	85.5	83.0
2007	105.7	68.2	62.1	65.1	57.2	100.1	92.6
2008	92.4	62.7	70.0	66.6	57.7	139.7	105.3
2009	71.8	64.3	64.1	62.0	57.5	105.1	85.6
2010	94.8	160.9	60.9	60.8	72.2	97.9	102.4
2011	92.0	64.7	60.4	60.8	59.7	94.9	86.5
2012	91.9	64.0	59.0	61.0	58.8	103.4	89.6

Source: own computation based on Table 2 & 4.

Analysis of data presented in Table 5 allows stating that households in Poland vary significantly as far as household disposable income *per capita* is concerned. The variation is significant not only in entire statistical population studied in this article but also in each of six groups of the population. Special attention should be paid to exceptionally high value of the coefficient computed for villages and the largest cities. Risking a guess, with such a high dispersion, the mean looses its informative value. In order to prove such a conclusion, let us take data for any year within fifteen-year-study, say, 2012. So, lower and upper limits of the typical data intervals in the case of said groups in given year were the following:

- cities with 500,000 residents and more: PLN 164.30 and PLN 3,909.00;
- cities with 200,000 to 499,999 residents: PLN 548.93 and PLN 2,501.43;
- towns with 100,000 to 199,999 residents: PLN 555.29 and PLN 2,156.35;
- towns with 20,000 to 99,999 residents: PLN 512.10 and PLN 2,111.00;
- towns with less than 20,000 residents: PLN 508.83 and PLN 1,958.35;
- and villages: PLN −35.91 and PLN 2,166.25.

Indeed, the households in cities with more than 500,000 residents have the mean household disposable income *per capita* higher by as much as PLN 971.48 than the households in villages. However, the dispersion within the said two groups is so high that, for example, typical households from the cities with more than 500,000 residents are the households with income *per capita* in the amount of PLN 165, while simultaneously typical rural households are the households with income in the amount of even PLN 1,950. It provokes reflection, since the average differences between the households within given classes are much bigger that the differences between the households from various classes. Further part of this article will prove that statement, so the comparison of between-group and within-group variability will be carried out.

5. Dispersion of disposable income *per capita* between groups and within-group dispersion

Table 3 shows the results of computed within-group variances. The mean within-group variance may be calculated based on the above results and size of each group. Then the between-group variance may be estimated based on the means in these groups and the sizes of them. Table 6 shows the information on between-group variances and mean within-group variances in years concerned.

Table 6. Comparison of between-group and within-group variation

Years	Variance (in PLN^2)		Standard deviation (in PLN)		Classical coefficient of variation (in %)		The share in the total variance (in %)	
	between group	mean within-group	between-group	mean within-group	between-group	mean within-group	of the between-group variance	of the mean within-group variance
1998	11,623.8	133,647.8	107.81	365.58	21.0	71.3	8.0	92.0
1999	16,275.2	272,630.7	127.57	522.14	23.0	94.1	5.6	94.4
2000	18,853.5	313,345.0	137.31	559.77	22.8	92.8	5.7	94.3
2001	21,862.8	231,026.7	147.86	480.65	22.8	74.0	8.6	91.4
2002	24,165.4	397,651.9	155.45	630.60	23.1	93.6	5.7	94.3
2003	29,059.7	285,801.9	170.47	534.60	24.6	77.0	9.2	90.8
2004	32,591.5	348,308.5	180.53	590.18	25.2	82.3	8.6	91.4
2005	29,754.2	384,873.0	172.49	620.38	23.6	84.8	7.2	92.8
2006	35,451.9	403,855.8	188.29	635.50	23.6	79.5	8.1	91.9
2007	43,754.0	650,091.6	209.17	806.28	23.3	89.7	6.3	93.7
2008	55,568.7	1,103,672.4	235.73	1,050.56	23.0	102.7	4.8	95.2
2009	66,971.9	819,754.8	258.79	905.40	23.5	82.3	7.6	92.4
2010	80,118.0	1,379,945.2	283.05	1,174.71	24.0	99.5	5.5	94.5
2011	84,680.4	1,026,436.2	291.00	1,013.13	23.9	83.1	7.6	92.4
2012	86,145.9	1,221,806.2	293.51	1,105.35	23.0	86.6	6.6	93.4

Source: own computation based on Table 2 & 3.

Comparing the value of between-group variance with the mean within-group variance in each year concerned makes it possible to state that the dispersion of entries within the classes of residence is significantly higher than the dispersion of entries between the classes. Obviously, the same conclusion may be drawn when comparing relevant values of standard deviation. What is interesting, the ratio of mean within-group standard deviation to between-group standard deviation in each year concerned was almost the same and from 1998 to 2012 the mean within-group standard deviation was about four times higher than the between-group standard deviation.

The mean value of variable in the entire analysed statistical population is the same as the mean of the means in groups into which the population was divided. Hence, the denominator of between-group coefficient of variation and the denominator of mean within-group coefficient of variation are the same and are equal to the denominator of total coefficient of variation (and the denominator is the mean value of examined characteristic), then the quotient of the mean within-group coefficient and the between-group coefficient equals the quotient of relevant standard deviations and it will be around 4. Therefore, the average differences in the household disposable income *per capita* between two households of the same residence class are four times bigger that the average differences between two households with disposable income *per capita* at the mean level of two various classes.

As it was already mentioned in the first chapter of this article, the total variance equals the sum of the between-group variance and the mean within-group variance. So, the total variance consists of two components and determining the structure of total variance makes it possible to know precisely the significance of each component. Hence, the share of the first component in total variance may be computed by dividing the between-group variance by the total variance. By analogy, the share of the second component in total variance may be computed by dividing the mean within-group variance by the total variance. The last two columns in Table 6 show the information on the impact of the between- and within-group variances on the total variance in 15 successive years. So, in each year taken into consideration the mean within-group variance was over 90% of the total variance and the share of the between-group variance was always below 10%. Undoubtedly, the average difference between disposable income *per capita* between households of the same group of residence is very big comparing to the differences between the means for households from various classes.

6. Comparison of between-group variability of household disposable income in EU countries

For statistical purposes a common classification into three disjoint and exhaustive groups of areas was prepared to be used by all of the European Union countries. This classification indicates the character of an area due to the degree of its urbanization. It is based on the share of local population living in urban clusters and in urban centres. The three types of areas are as follows (Eurostat website [1], date of access: 19.01.2015):

- sparsely populated areas (alternate name: rural areas);
- intermediate density areas (alternate name: towns and suburbs or small urban areas);
- densely populated areas (alternate name: cities or large urban areas).

The rules of classifying local administrative units of countries into these three groups were specified precisely. The methodology is based on a combination of criteria of geographical contiguity and minimum population threshold applied to 1 km^2 population grid cells. This approach, based on mapping the territory by a grid square cell of 1 km^2, avoids distortions caused by using local administrative units varying in size and/or shape.

With information on average annual income *per capita* in each class and on the number of people falling within these classes, it is possible to calculate absolute and relative dispersion of income between the classes. Results of calculations on between-group standard deviation, which is the absolute measure of between-group variability, have been presented in Table 7. The said table also featured results obtained for between-group coefficient of variation, which is a relative measure of between-group variability. Calculations were carried out

separately for four consecutive years from 2010 to 2013 inclusive, and for all twenty-eight countries of the European Union.

Table 7. Comparison of between-group measures of income variation in all EU countries

Countries	Between-group standard deviation (in EUR)				Between-group coefficient of variation (in %)			
	2010	2011	2012	2013	2010	2011	2012	2013
Austria	967.96	811.89	480.73	449.09	4.1	3.4	2.0	1.8
Belgium	417.89	286.77	404.27	288.11	2.0	1.3	1.8	1.2
Bulgaria	758.80	777.77	645.67	845.21	21.8	22.7	19.6	23.8
Croatia	474.69	530.81	746.35	831.53	6.4	7.8	12.3	14.2
Cyprus	2,090.70	1,822.52	2,233.53	2,290.97	11.0	9.3	11.0	11.7
Czech Republic	635.68	611.20	680.83	570.33	8.0	7.3	7.8	6.6
Denmark	682.30	1,879.82	614.79	1,029.54	2.5	6.6	2.1	3.5
Estonia	714.57	559.44	693.79	767.27	10.6	8.5	9.7	9.8
Finland	2,015.82	1,912.60	1,848.94	1,418.26	8.6	7.9	7.2	5.5
France	780.34	1,359.16	1,404.84	1,533.12	3.3	5.7	5.7	6.2
Germany	1,097.35	926.79	872.85	770.79	5.1	4.3	4.0	3.4
Greece	1,933.76	1,065.04	1,020.62	1,043.57	13.9	8.5	9.4	10.8
Hungary	627.89	798.16	757.65	791.97	13.5	15.5	14.2	15.4
Ireland	(-)	(-)	2,618.31	(-)	(-)	(-)	11.9	(-)
Italy	1,114.97	1,146.21	1,421.84	1,535.18	6.1	6.3	8.0	8.8
Latvia	587.75	607.74	636.08	639.84	10.8	12.0	11.4	10.9
Lithuania	(-)	(-)	886.99	796.13	(-)	(-)	17.3	14.1
Luxembourg	2,607.49	2,197.65	3,701.28	3,883.74	7.1	5.9	9.9	10.0
Malta	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Netherlands	468.82	636.90	160.49	420.90	2.1	2.8	0.7	1.8
P o l a n d	**893.59**	**946.62**	**990.11**	**960.81**	**17.5**	**16.3**	**16.7**	**16.0**
Portugal	1,283.11	1,347.27	1,501.21	1,181.01	12.2	13.0	14.6	11.9
Romania	593.58	588.53	655.56	465.08	24.9	24.3	27.1	19.5
Slovakia	658.22	621.67	721.09	504.03	9.9	9.0	9.6	7.0
Slovenia	763.91	745.44	577.46	565.06	6.0	5.8	4.5	4.5
Spain	1,496.50	1,493.21	1,492.21	1,901.01	10.4	10.7	10.8	12.2
Sweden	1,568.46	1,372.77	1,455.33	1,195.35	7.5	5.6	5.3	4.3
United Kingdom	1,008.91	241.86	837.53	672.15	4.9	1.2	3.7	3.1
EU (28)	**2,547.71**	**2,526.74**	**1,436.92**	**1,730.17**	**15.1**	**14.8**	**8.2**	**9.8**

(-) no reliable data disposable

Source: own computation based on Eurostat database: "Mean and median income by degree of urbanisation": http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di17&lang=en [*date of access: 19.01.2015*]*; "Annual population by sex, age, degree of urbanisation and labour status": http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_pgauws&lang=en* [*date of access: 19.01.2015*].

When considering all countries of the European Union jointly, it is possible to see a significant decrease in the dispersion of income *per capita* – coefficient of variation of more than 15% in 2010 dropped in 2013 below 10%. It is also worth noting that during the period under study, most of the twenty-eight countries

reported the value of the coefficient lower than 10%, i.e. this measure was at a level that may indicate very low between-group variability (see Table 1).

Out of all countries of the European Union the smallest income variability *per capita* between regions with different degrees of urbanization could be observed in the case of Belgium. The classical coefficient of between-group variation was 1 to 2% in the case of this country for each of the four years under analysis. The coefficient turned out to be at a similar level also in Austria and the Netherlands.

The data summarized in Table 7 also allows drawing a conclusion that in Poland the fact of living in a given class of residence in a much greater extent affects the size of income achieved than in the case of other countries of the European Union. However, it should be borne in mind that in Poland – like in the entire European Union – dispersion of *per capita* income between regions differing in the degree of urbanization dropped dramatically over the period of 2010–2013. The value of the classical coefficient of variation of 16.0% in 2013 enables an observation that, although mean relative differences between average income of persons from sparsely populated areas, intermediate-density areas and densely populated areas were much higher in Poland than in most other EU countries, eventually, the variability in Poland should be assessed as low.

Between-group dispersion of income higher than in Poland was only recorded in Romania and Bulgaria. Interestingly, in these countries the between-group standard deviation remained at a very low level, which in each year under analysis was lower than the between-group standard deviation observed in Poland. In Poland, however, the average income *per capita* is approximately 70% higher than in Bulgaria and more than 150% higher than in Romania; therefore, in relation to the average level of income in a given country, variability of the investigated variable in Poland was lower than in other two mentioned countries.

7. Discussion on the need to mitigate social inequalities

The following dimensions of inequality can be determined on the basis of social sciences (Wójcik-Żołądek, 2013, p. 2):

- the economic dimension (including categories such as income, property, living conditions);
- the social dimension (concerning education, lifestyle, participation in culture, social prestige);
- the political dimension (referring to differences in participation in power and in civic engagement).

Treating the economic aspect as the only dimension of inequality in society is therefore too much of an oversimplification. Income stratification is, however, construed in the literature on the subject as one of the most important measures of inequality, because the level of income is widely recognized as the most important determinant of social status. It is also stressed that income is a factor which influences the activity of individuals and households in almost all spheres

of life – from the development of material conditions through access to health care, provision of appropriate education, participation in culture, access to technological achievements, up to access to power. Therefore, encountering income limitations does not only narrow down the decision-making field of a household in terms of the size of realized consumption, but also determines the degree of failure to satisfy many other needs, including non-economic needs (Leszczyńska, 2014, p. 410). We may even be tempted to state that the size of income, having an impact on the achievement of a wide range of material and non-material objectives, is a major determinant of a sense of satisfaction with the overall quality of human life (Bal, 2012, p. 252).

Representatives of various trends in economics present different, often radically extreme, approaches to the problem of occurrence of income inequalities in society. The differences in approach are based usually in personal beliefs on philosophical, ethical, sociological and psychological foundations of economics (Umiński, 2013, p. 210). The discussion on consequences of social inequality – especially the stratification of income – takes place not only on the ground of social sciences, but also in the public debate, often causing a lot of emotion. Nevertheless, there is a general consensus among researchers that excessive income inequality infringes the principle of social justice and has a negative impact on economic growth (Pliszka, 2004, p. 354). Often in scientific and political debates, it is also stressed that exceeding a certain threshold of income stratification threatens the maintenance of social cohesion (Kołodko, 2014, p. 32). Thus, determining which income inequalities must be considered excessive and which optimal becomes a key issue. The aim of social policy should be to eliminate only the unjustified, and not all, social inequalities. It seems that helpful in this regard will be addressing the issue of causes of the occurring inequalities. Now, the source of income stratification of society is the differences in environmental and genetic conditions and differences in preferences and ambitions. Reducing inequalities resulting from the first group of conditions is undeniable – it does not arouse much controversy and involves wide social acceptance. In turn, reduction of income disparities related to differing decisions of individuals is at least debatable.

Thus, the basis for answering the question of which social inequalities are justified and which are not should be a distinction between two categories – possibilities and preferences. Justified inequalities are those for which the responsibility is borne exclusively by individuals through their autonomous decisions – whether educational, professional or those related to the degree of commitment to the improvement of their living conditions. On the other hand, unjust social inequalities are those independent of the will of a given individual, ones he or she cannot influence, does not control and is not able to change. There is no doubt that factors such as place of birth, environment of growing up, socio-economic situation of parents, immediate environment, abilities and aptitudes largely influence the size of income that this individual will achieve during his or her adult life, and cause the principle of equal opportunities to be undermined.

Thus, in order for disparities in income to be fully justified, the playing field should be levelled. On the other hand, the way the players will behave on the field depends entirely on them and they alone bear responsibility for their actions (Bartak, 2014, p. 224). We can perceive as justified only a situation where personal effort determines the success in life rather than inherited wealth or favourable family environment in childhood, which equips the child with appropriate cultural capital right from the start and allows him or her to access better education (Woźniak, 2012, p. 27–28).

The subject of analysis in this paper are income inequalities due to different conditions of life in big cities, in small towns and villages. These inequalities should undoubtedly be mitigated through the application of appropriately selected tools. A well-designed social policy should therefore limit inequalities arising from the fact that people do not start at the same position in the race for a better financial situation, a higher social status and the associated convenience. The best way to reduce income inequalities is to provide all social groups with access to modern education adapted to the requirements of a knowledge-based economy. It is also necessary to allow individual entities access to adequate infrastructure, to the use of achievements of technical and technological progress and to the entire spectrum of achievements of civilization. The priority of state policy should always be to give equal opportunities, eliminate barriers, stimulate innovation and ensure fair competition. In the modern economy, government policy cannot be reduced, therefore, to redistributive activities, as it is obvious that it would only strengthen demanding attitudes, reinforce learned helplessness, restrict professional activity and self-responsibility of people (Bartak, 2014, p. 220). Proper state policy as regards reducing income inequalities does not slow down the pace of modernization processes that are being carried out in the economy; on the contrary – it leads to their acceleration. Disparities between large urban agglomerations, small towns and rural areas should therefore be mitigated by supporting well-designed investment in human capital and improvement of infrastructure.

8. Conclusions

The aim of this article was to assess the dispersion of disposable income *per capita* between households in Poland from various classes of residence in comparison to the dispersion of income within these classes. The said objective was achieved by execution of three research tasks.

In the article, two research hypotheses were verified. The first hypothesis stated that the highest household disposable income *per capita* in Poland is recorded in the cities with above 500,000 residents and the amount of the said income decreases with decreasing number of residents as well as the rural households have the lowest mean disposable income *per capita*. The hypothesis was verified positively on the basis of data from 1998 to 2012. The comparison of

the within-group means allowed drawing a conclusion that the said regularity is permanent as it occurred throughout fifteen years.

The second tested hypothesis stated that in terms of disposable income *per capita* the households in Poland vary to a larger extent within all the classes of residence than between the classes. The above hypothesis was verified positively as well. The mean within-group standard deviation was a few times higher than the between-group standard deviation and the share of between-group variance was only a few per cent of the total variance. Hence, without any doubt, the amount of household disposable income is affected by many other factors which are more important than the class of residence.

In conclusion, it should be also emphasized that the location of household (city, small town or village) is clearly significant for the level of household disposable income *per capita*, which has been proven by the occurring differences in the means computed for each group determined in the study. However, the differences between the said means should be considered slight, as compared to the average differences of the observed values between households of the same classes of residence. Therefore, the division for classes of residence proposed by the Central Statistical Office of Poland seems to be not a good one to show the variation of income *per capita* among Polish households because assigned class of residence explains at minimum extent the differences in the income levels. Therefore, a more appropriate way of division should be considered, namely the one better explaining the dispersion of household disposable income *per capita*. The authors of this article have already carried out such a study, and the results will be presented in further articles.

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