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## INCOME POLARIZATION IN RURAL AND URBAN AREAS

**Summary:** The aim of the paper was to compare economic polarization (considering through the prism of income) in rural and urban areas in Poland, 2000-2015. The analysis allowed to answer the question whether middle income class in Poland is disappearing (what is connected with increase in income polarization) and whether the level of this phenomenon is associated with place of residence. There were considered three classes of households: low, middle and high income. To assess the level of income polarization the Wolfson polarization index was used. There was made an attempt to explain of direction of changes in values of polarization index in 2000-2015. The results of study were compared with results of other authors.

**Keywords:** Wolfson polarization index, middle income class, income distribution.

**JEL Classification:** D31, I31, I32.

### Introduction

The overall measure of standard living is gross domestic product (GDP) per capita. It should be noted that this measure does not reflect the differences in living standard between households. Living standard is very differentiated within each country. The most visible signs in the living standard are probably income inequality and income polarization. The level of household's income depends on many factors referring to the personal and household's characteristics such as gender, age and education of the household's head, the place of residence, number of household's members, biological family type, socio-economic group, labour force status and the presence of disabled person in household.

The main objective of the paper was to compare income polarization in Poland according to the place of residence, i.e. in rural and urban areas. There are studies referring to the income inequality in rural and urban areas in Poland (e.g. Household Budget Survey in 2014 [2015]), but (according to the authors' knowledge) there is no study concerning comparison of income polarization in urban and rural areas. Income polarization in Poland without division into rural and urban areas was studied by Kot [2008] and Panek [2017].

There are different income distributions in rural and in urban areas which is caused by different employment structure (higher percentage of farmers in rural areas) and different education structure (higher percentage of low educated people living in rural areas). The unemployment rate is only slightly higher in rural areas than in urban areas (6.1% versus 5.8% according to data from 3<sup>rd</sup> quarter 2016 (Labour Force Survey (LFS) in Poland [2017]), therefore factors connected with employment and education structures are probably the main causes of income differentiation in urban and rural areas. Taking into account the above considerations in the paper there are tested following hypotheses:

*H1: Mean income in rural areas is lower than in urban areas,*

*H2: Distribution of income in rural areas is characterized by higher polarization than distribution in urban areas,*

*H3: Shares of low income and middle income classes in rural areas are higher than in urban areas,*

*H4: Share of households ending meets easily is lower in rural areas than in urban areas.*

In the next part of the paper there are showed material and methods allowing to test the hypotheses.

## **1. Material and methods**

The analysis of income polarization was based on the data from Social Diagnosis project [Council for Social Monitoring, 2015]. Generally, Social Diagnosis project is based on panel research. The first sample was taken in 2000. The next sample took place three years later and since then measurement has been repeated every two years (eight waves in 2000-2015). The household was the study unit. Table 1 contains information on the number of households surveyed in subsequent waves of panel.

**Table 1.** Number on households in database of Social Diagnosis project

Year	2000	2003	2005	2007	2009	2011	2013	2015
Wave	I	II	III	IV	V	VI	VII	VIII
Number of households	3005	3962	3881	5532	12380	12359	12343	11738

Source: Based on data from Council for Social Monitoring [2015].

In all analysed years the number of households in rural areas was lower than the number of households in urban areas. In subsequent waves of panel representativeness of the sample on a national and voivodeship scale was ensured as well as six classes of residence places. Detailed information concerning rules of sample weighting is available in report from survey Social Diagnosis [Panek et al., 2015].

The basic variable is net income per household in Poland in March/June in subsequent waves of panel. In order to take account the differences in a household's size and its composition an equivalised income was calculated by dividing the household's income by its equivalent size. There was used the modified OECD (Organization for Economic Co-operation and Development) equivalence scale. This scale assigns 1 to the first adult of the household, 0.5 to each subsequent adult aged 14 or more and 0.3 to children (each person under 14).

The analysis of income polarization requires the division of income into three classes. There were created classes: low income class (income below 60% of the median equivalised income), middle income class (from 60% to 200% of the median) and high income class (above 200% of the median). The thresholds are chosen intentionally: 60% of the median equivalised income is a popular poverty threshold and 200% of the median is often used as richness threshold.

Income distribution can be described by different kinds of measures. Before assessing the level of income polarization, there were calculated the basic statistics (the mean and the median income) and inequality measures (inter-decile ratio D9/D1 and Gini coefficient). The D9/D1 ratio is the ratio of the upper bound value of the ninth decile to the upper bound value of the first decile [www 1]. This measure ranges from 1 to infinity. The higher values of the D9/D1 ratio, the higher income inequality. The most popular measure of income inequality is the Gini coefficient defined as the relationship of cumulative shares of the population arranged according to the level of equivalised disposable income, to the cumulative share of the equivalised total disposable income received by them. In alternative approach the Gini coefficient is defined as half of the relative mean absolute difference which can be expressed by the formula [Sen, 1997]:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|}{2n^2\mu}, \quad (1)$$

where  $x_i$  is income of household  $i$  and there are  $n$  households,  $\mu$  is the mean income. The Gini coefficient ranges between 0 (perfect equality) to 1 (perfect inequality). It is popular to express the Gini coefficient in percentages.

Standard inequality measures do not give any information about polarization. A more polarized income distribution is one that has relatively fewer middle income class and more low- and/or high-income households (Alichu et al. 2016). In other words, rising income polarization relates to disappearance of the middle class. One of the measures of polarization is the Wolfson polarization index given by [Wolfson, 1994]:

$$P^* = 2(2T - G) \frac{\mu}{Me}, \quad (2)$$

where  $T$  is the difference between 0.5 and the income share of the bottom half of the population,  $G$  – Gini coefficient,  $\mu$  – mean income,  $Me$  – median income. The Wolfson polarization index ranges between 0 (perfectly equal distribution) to 1 (perfectly bimodal distribution). Wolfson index is commonly expressed in percentages.

The calculations were conducted in R [R Development Core Team, 2015] with affluenceIndex package [Wolny-Dominiak & Sączewska-Piotrowska, 2017].

## 2. Results

### Income inequality in urban and rural areas

In order to characterize income of households in rural and urban areas the basic statistics were calculated (Table 2).

**Table 2.** Basic statistics of income\*, 2000-2015 (in PLN)

Year	Rural areas		Urban areas	
	Mean	Median	Mean	Median
2000	828.34	642.86	981.67	800.00
2003	912.48	687.13	1044.71	901.85
2005	1037.96	742.57	1209.75	952.01
2007	1008.00	779.32	1277.41	1024.25
2009	1137.90	868.82	1406.08	1163.60
2011	1201.68	931.78	1481.97	1212.79
2013	1208.76	964.21	1486.12	1239.70
2015	1311.16	1091.23	1613.68	1390.11

\* Real income (2000 prices); income is adjusted according to OECD modified equivalence scale.

Source: Based on data from Council for Social Monitoring [2015].

From 2000 to 2015 the mean income was definitely higher in urban areas. Results of U Mann-Whitney test confirmed that the difference was statistically significant ( $p = 0.000$ ) in all years. There is also a clear difference between the median income in rural and urban areas. The analysis showed that mean and median income were systematically rising in observation period in both areas.

Basic statistics give general idea about income, but they are insufficient. The inequality measures – Gini coefficient and inter-decile ratio D9/D1 – provide very important information about income distribution (Table 3).

**Table 3.** Inequality measures, 2000-2015

Year	Rural areas		Urban areas	
	Gini (in %)	D9/D1	Gini (in %)	D9/D1
2000	37.26	4.11	31.12	3.86
2003	39.03	4.92	32.62	4.20
2005	40.20	5.50	35.74	4.63
2007	35.66	4.24	34.53	4.36
2009	36.86	4.20	33.46	4.00
2011	36.49	4.13	32.62	3.88
2013	35.42	3.93	31.77	3.69
2015	32.95	3.75	30.39	3.56

Source: Based on data from Council for Social Monitoring [2015].

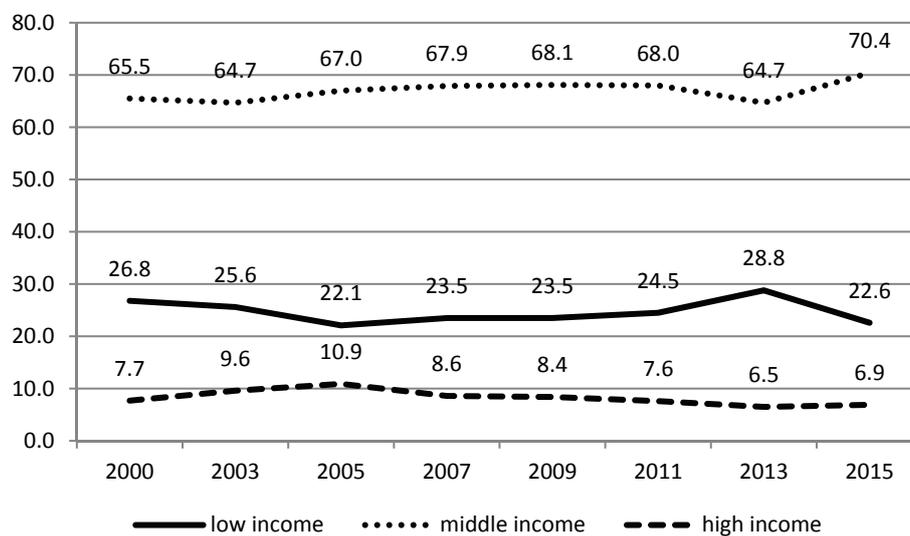
In 2000-2015 the higher values of inequality measures and simultaneously the greater income inequality were in rural areas than in urban areas. The values of inequality measures were rising to 2005 and in subsequent years the values were decreasing in both rural and urban areas. Gini coefficient can be easily interpreted, e.g. coefficient equals to 32.95 (2015, rural areas) means that the average absolute difference in incomes between any two randomly selected rural households is 65.9% of mean income. The D9/D1 ratio showed larger disparities in rural households than in urban households. In most years the values of D9/D1 ratio were about four which means income top decile four times higher than income bottom decile. The highest difference between top and bottom deciles was in 2005 – in rural areas 5.5 and in urban areas 4.63.

Higher income inequality and lower mean income of households in rural areas indicate worse economic situation of these households – low and differentiated income. Based on information obtained from inequality measures and from descriptive statistics, it can be expected that low income fraction of households in rural areas is higher than in urban areas (analysis in further part of the paper).

### **Income polarization**

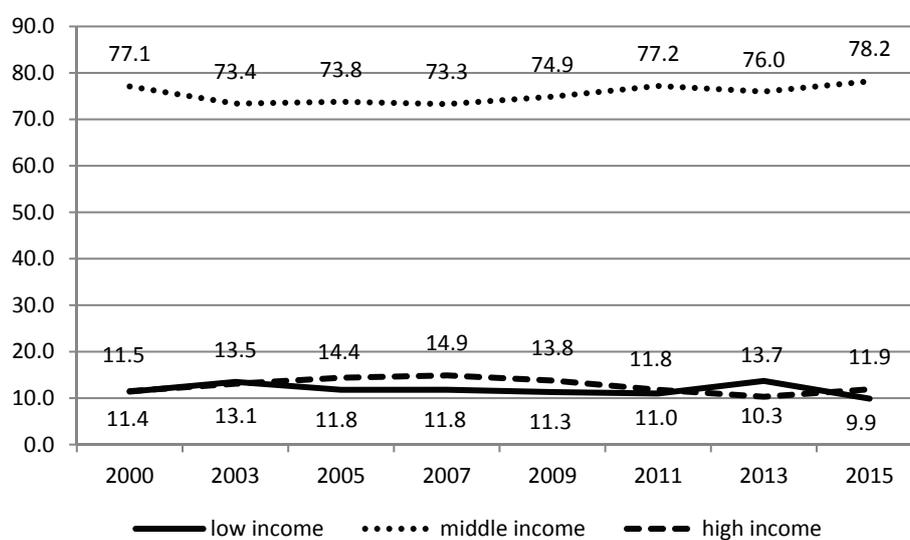
The calculated inequality measures does not inform about the level of income polarization. In the first step of the polarization analysis there were calcu-

lated the shares of low, middle and high income classes in rural and urban areas (Fig. 1 and Fig. 2).



**Fig. 1.** Shares of low, middle and high income classes in rural areas, 2000-2015

Source: Based on data from Council for Social Monitoring [2015].



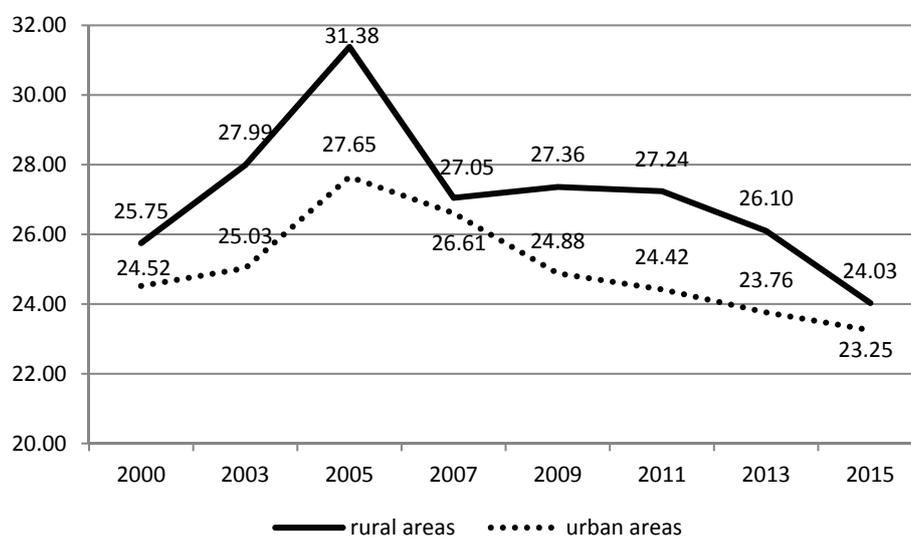
**Fig. 2.** Shares of low, middle and high income classes in urban areas, 2000-2015

Source: Based on data from Council for Social Monitoring [2015].

The share of middle income class was lower in rural areas for all years under the study. There was also definitely higher percentage of low income class and lower percentage of high income class than in urban areas. This means that in 2000-2015 income of rural households were more polarized than urban households.

The share of households with middle income were rising very slowly to 2011 in both areas. The clear breakdown took place in 2013 in both rural and urban areas – decrease in share of middle income class and share of high income class, and increase in share of low income households. It means that in 2013 income distribution was more polarized. This was an echo of economic recession – in the second and fourth quarters of 2012 and in the first quarter of 2013 GDP of Poland decreased (compared to the previous quarter). The negative changes in shares of income classes appeared already earlier and they manifested by decreasing share of high income class (from 2007 in rural areas and from 2009 in urban areas). This was an effect of economic slowdown. The income situation of households changed in 2015 – there was a significant decrease in income polarization in both rural and urban areas (increase in shares of middle and high income classes and decrease in share of low income share).

There were calculated the values of Wolfson index to evaluate and to compare the polarization level in rural and urban areas. The values of income polarization index are shown in Fig. 3.



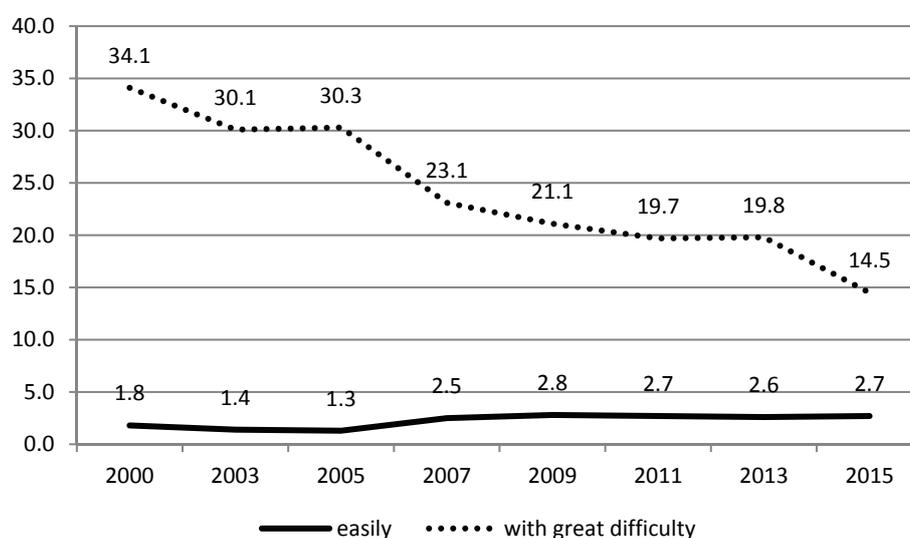
**Fig. 3.** Polarization index in rural and urban areas, 2000-2015

Source: Based on data from Council for Social Monitoring [2015].

In the first years of the observation period (from 2000 to 2007) the changes of income polarization index were similar in rural and urban areas. There was a clearly increase in values of Wolfson index from 2000 to 2005 and a decrease in 2007. There was a stagnation of values of polarization index in further years in rural areas and from 2013 the values were clearly decreasing. In urban areas from 2007 there was a gradual decrease in Wolfson index, which means decreasing income polarization. The obtained results allow to state that the middle income class in rural and urban areas in Poland does not disappear. It should also be noted that in all studied years income polarization in rural areas was higher than in urban areas, which indicates the lower share of middle class (as stated above). Comparing Gini coefficient (Table 3) and polarization index it can be notice that in both cases there is a clear peak in 2005. The lowest inequality and the lowest polarization took place in 2015 (the lowest values of measures).

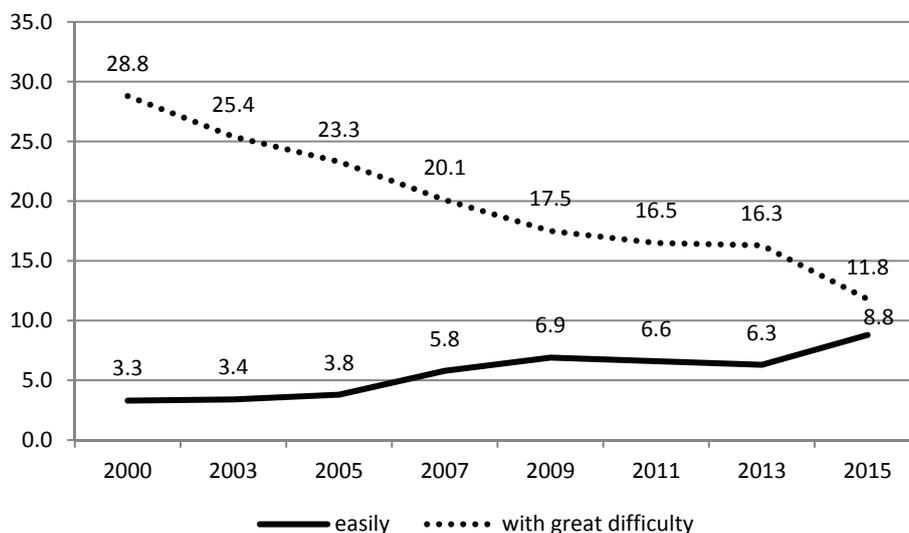
### Subjective perception of the financial situation

The households were also asked to evaluate subjective perception of their financial situation. Special attention was paid to households extremely evaluating their income – income allows to make ends meet easily and with great difficulty. Fig. 4 and Fig. 5 present the results of subjective perception in rural and urban areas, respectively.



**Fig. 4.** Subjective perception of the household financial situation – the shares of households making ends meet easily and with great difficulty, rural areas, 2000-2015

Source: Based on data from Council for Social Monitoring [2015].



**Fig. 5.** Subjective perception of the household financial situation – the shares of households making ends meet easily and with great difficulty, urban areas, 2000-2015

Source: Based on data from Council for Social Monitoring [2015].

The percentage of households making ends meet with great difficulty was decreasing from 2000 to 2015. This trend was visible in both rural and urban areas. There were observed a little different patterns of changes in percentages of households making ends meet easily: there was an increase in both areas, but in urban areas this increase was definitely more visible. These results confirm that in the analysed period middle income class was increasing. In 2000-2015 the share of households extremely evaluating their income (together, easily and with great difficulty) was decreasing – from 36% to 17% in rural areas and from 32% to 25.5% in urban areas. It should be noted that the percentage of making ends meet easily is definitely lower in rural areas than in urban areas. It can therefore be noted that the worse perception of financial situation is correlated with real worse income situation of households in rural areas.

### 3. Discussion

It should be noted that the share of middle income class in Poland measured by Panek [2017] is similar (e.g. 73.61% in 2011 and 74.81% in 2013) to the results obtained in our analysis despite of the different method used to define this class. The share of middle income class in neighbouring Czech Republic

[Turčínková & Stávková, 2011] is also similar to share in Poland (68% in 2008) despite using also the different method of defining this class. In the United States the share of middle income class is definitely lower than in Poland or in Czech Republic – the share less than 50% [Alichi et al., 2016].

The obtained results of income polarization research are similar to results of research presented by Panek [2017]. Panek has conducted research based on yearly data from LFS for the whole Poland (without division into rural and urban areas) for the period 2000-2014. The values of Wolfson index are similar to values obtained in this analysis. The polarization trend measured by Wolfson index was also increasing from 2000 to 2005, in the next few years there was a stagnation and from 2011 there was a decrease in polarization. Panek has presented results referring to Gini coefficient (for the whole Poland). The inequality trends are also similar but the values of coefficient differ from each other (values presented by Panek are lower). In compared researches there were used different OECD equivalence scales – original and modified. This is the cause of different values of Gini coefficient. In the United States the values of Wolfson index and Gini coefficient index are definitely higher (0.5 and 0.45 in 2014, respectively) [Alichi et al., 2016]. The higher values of index in the United States are caused by high shares of low- and high income classes.

## Conclusion

The main aim of this study was to compare income polarization in rural and urban areas in Poland. The results indicate that income situation in rural areas is worse than in urban areas, because:

- rural households achieve lower income,
- income of households in rural areas are characterized by higher inequality and polarization,
- share of low income classes in rural areas is higher than in urban areas, but the share of middle income class is lower,
- subjective perception of the household financial situation is worse in rural areas.

Generally, income of households in rural areas are lower and more polarized than in urban areas. It should be noted that the values of income polarization index in both areas were changing over the time. Negative changes in the income situation were taken place in the first years of the observation period (from 2000 to 2005) and definitely the best income situation in rural and urban areas was in 2015 (the last year of the observation period).

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## POLARYZACJA DOCHODOWA NA OBSZARACH WIEJSKICH I MIEJSKICH

**Streszczenie:** Celem artykułu było porównanie zjawiska polaryzacji ekonomicznej (postrzeganej przez pryzmat dochodów) w Polsce w latach 2000-2015 na obszarach wiejskich i miejskich. Przeprowadzone badanie pozwoliło odpowiedzieć na pytanie, czy w Polsce zanika klasa średnia (co wiąże się ze wzrostem polaryzacji dochodowej) oraz czy stopień tego zjawiska jest związany z obszarem zamieszkania. W analizie wyróżniono trzy klasy gospodarstw domowych: o niskich, średnich i wysokich dochodach, a do oceny stopnia polaryzacji wykorzystano wskaźnik polaryzacji Wolfsona. W artykule podjęto również próbę wyjaśnienia kierunku zmian zachodzących w wartościach wskaź-

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nika polaryzacji na przestrzeni 15 lat objętych analizą. Wyniki przeprowadzonego badania porównano z wynikami badań przeprowadzonych przez innych autorów zajmujących się problematyką polaryzacji ekonomicznej.

**Słowa kluczowe:** indeks polaryzacji Wolfsona, klasa średnia, rozkład dochodów.