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INCOME INEQUALITY OF POLISH RURAL AND URBAN HOUSEHOLDS IN 2010-2017

Key words: income inequality, Theil-L index, Theil-T index, Theil index decomposition, rural households

ABSTRACT. The aim of the study was to assess the level of income inequality of rural households against other classes of household residence: small, medium and large cities. The assessment of intra-group or internal inequality was based on Theil-L and Theil-T indices. Inter-group inequality was measured summarily by the inter-group (or 'between') component in the Theil decomposition, and more verbosely by income disparity analysis. Research drew on individual, non-identifiable data from the "Household Budget Survey", carried out by the Central Statistical Office in 2010, 2015 and 2017. It was found that despite rising income, rural households were still the poorest of all residence classes and lagged far behind average Polish households. Their internal income inequality was, throughout the study period, higher than in classes of households living in small-sized and medium-sized towns. This class was also most responsible for total income inequalities in Polish households.

INTRODUCTION

Total income inequality – inequality among all households – is often down to internal heterogeneity. It is often associated with different processes of income generation in different socioeconomic groups and may result from different sources of income received by household members. Indeed, the earliest studies on income inequality [Lewis 1954, Kuznets 1955], saw the economy as a dual organism, one part agricultural and rural, characterized by an inefficient use of resources, and the other industrial, urban, and efficient. This paper continues the tradition, aiming to study inequality in an arrangement of households taking not only rural and urban but also different sizes of urban household residences into consideration.

In 2005-2015, the class of household residence still played a significant role in shaping household income inequality. This period saw a considerable reduction in income disparity between all classes of household residences, although rural households experienced a very small one [Wołoszyn 2019]. Moreover, internal inequality of the class, in 2015, proved to be the highest of all residence classes, except for largest cities.

The main reason for such high levels of internal inequality was the fact that this class was very heterogeneous. It consisted of farmers, the "old" non-farming population, and

the newly migrated urban middle class. Farmers themselves were not egalitarian, though most cultivated small farmsteads of up to 5 ha and were indeed almost uniformly poor. On the other hand, those with farmsteads of over 30 ha received much higher, but also very unequal income [Wołoszyn, Wysocki 2014]. Still, income inequality that characterized farmer households was not the only part of rural inequality. Suburbanization caused the countryside that neighbored large urban centers to lose its agricultural function, taking on a residential and service-oriented character [Wołoszyn et al. 2016, Kozera, Głowicka-Woloszyn 2018, Kalinowski 2018]. New suburban residents were more affluent than "old" ones, and their influx exacerbated rural internal inequality. All in all, it is reasonable to claim that as of 2015, the Polish countryside still followed a form of the dual system described by Arthur Lewis and Simon Kuznets: a traditional agricultural economy with low productivity, and a modern economy that is a mixture of modern agriculture and services.

Recent changes in the demographic makeup of the country and socioeconomic policies include ongoing migration issues, the steady rise of the minimum wage and the 'Family 500+' programme. They are expected to further decrease income inequality, although some researchers believe reductions to be short-lived [Brzeziński 2017].

The research aimed to evaluate the income inequality of rural households within the framework of household residence classes. The level and changes between 2010 and 2017 of internal and inter-group inequalities were assessed. Also, the contribution of rural households to total income inequality among Polish households was estimated.

RESEARCH SOURCES AND METHODS

Research drew on unidentifiable microdata from the *Household Budget Survey* conducted by the Central Statistical Office (CSO) in 2010, 2015 and 2017. Over 35 thousand households were analyzed each year.

Survey-based studies typically assess household income by one of two measures: disposable income or total expenditure [Kot 2003]. Both have their advantages and drawbacks, but disposable income is, by far, more popular. However, CSO's Household Budget Survey studies a household for only a month [GUS 2011, p. 58], and monthly fluctuations of disposable income are more pronounced than monthly fluctuations of expenditure. Moreover, a rural household's income would, to a greater degree, rely on agricultural production than that of an average household, and that exacerbates monthly fluctuations [Wołoszyn 2013]. In such cases, total expenditure yields more reliable income distributions and are, consequently, better estimates of inequality [Wołoszyn 2019]. This study, the primary objects of which were rural households, also uses total expenditure as a measure of household income.

Meaningful income comparisons between households of different sizes and demographic compositions are only possible through the use of equivalence scales [Dudek 2011]. When assessing income inequality, the modified OECD equivalence scale is usually applied, which assigns the first adult weight 1, each other adult weight 0.5 and each child 0.3. The equivalent income is the household's total income divided by the sum of these weights, and it gives a measure of household affluence that can be compared with other households. Thus, what is termed throughout the study as household income is, in fact, equivalent total expenditure.

Finally, any statistics that described income levels or income inequality levels are computed using double weights: sampling weights that guarantee representation and household sizes. This is the standard procedure used both by CSO and EUROSTAT and follows arguments laid out by Anthony Shorrocks [2004].

Income disparity, a form of inter-group inequality, was measured by applying the relative income index, calculated as a ratio of median income in the *k*-th class of households () and the overall median for all households (*Me) : Me_k / Me.* Median was chosen as the preferred measure of central tendency because, in highly skewed distributions, the mean is affected by the level of inequality within the analyzed class. Consequently, index values would not reflect pure inter-group inequality, but would also show some of internal inequality.

The latter was assessed with two Theil indices, separately within each class of household. They both belong to the generalized entropy index family GE(α), defined by Anthony Shorrocks [1980, p. 622] as:

$$GE(\alpha) = \begin{cases} \dfrac{1}{\alpha(\alpha-1)}\dfrac{1}{N}\sum_i \left[\left(\dfrac{y_i}{\mu}\right)^{\alpha} - 1\right] & \alpha \neq 0, 1 \\ \dfrac{1}{N}\sum_i \dfrac{y_i}{\mu}\ln\dfrac{y_i}{\mu}, & \alpha = 1 \\ \dfrac{1}{N}\sum_i \ln\dfrac{\mu}{y_i}, & \alpha = 0 \end{cases}$$

where: y_i denotes the income of the *i*-th household, μ – the mean, and *N* – the number of households. Two most important members of the family are GE(1), also known as the Theil-T index [Theil 1967], and GE(0) – the Theil-L index. They are both equal to 0 for an egalitarian distribution and grow with rising levels of inequality. The Theil-L index is more sensitive to income changes among less wealthy households and Theil-T among the more affluent [Cowell, Flachaire 2015, p. 456]. Therefore, if inequality changes are driven by a weaker (or faster) income growth of the poor, Theil-L will be more responsive. Conversely, if inequality is more affected by relative income changes of the wealthy, Theil-T will register larger differences.

Theil indices also have the important property of additive decomposition [Shorrocks 1980, p. 614]. The general decomposition formula for both is:

$$GE = \sum_{k=1}^{K} w_k GE_k + GE_B$$

where: w_k is the *k*-th class population share for Theil-L or its income share for Theil-T. The product $w_k GE_k$ is described as the contribution of the *k*-th class to the overall level of inequality; the sum of these products is the intra-group component and GE_B is the inter-group or 'between' component of total inequality. By developing the general formula, one obtains specific ones for each of the Theil indices [Khandker, Haughton 2005, p. 103]:

$$L = \sum_{k=1}^{K} \frac{N_k}{N} L_k + \sum_{k=1}^{K} \frac{N_k}{N} \ln\left(\frac{\mu}{\mu_k}\right)$$

$$T = \sum_{k=1}^{K} \frac{N_k}{N} \frac{\mu_k}{\mu} T_k + \sum_{k=1}^{K} \frac{N_k}{N} \frac{\mu_k}{\mu} \ln\left(\frac{\mu_k}{\mu}\right)$$

where: N_k is the population size of the k-th class, μ_k its mean income, and L_k, T_k are respective Theil indices evaluated for the k-th class.

These properties of Theil indices allow for the decomposition of overall income inequality and estimate its separate components corresponding to different classes of household residences and the inter-group inequality part. The last term is often expressed as a percentage of total inequality – the larger its value, the more homogenous the classes. If GE_B / GE is 1 then the classes are perfectly homogenous and one needs only know the class name to know the income of its every household. If it is 0, then the classes are perfectly heterogeneous, and no income information can be gained from the knowledge of class membership.

RESULTS

INTER-GROUP INEQUALITY

Rural households had the lowest income levels throughout the study period and, in this class, the median income constituted 87-89% of the national median. That ratio rose with residence town size and, in the class of small towns below 20 thousand inhabitants, it was 96-97%. The highest median income was found in the largest cities with at least 500 thousand inhabitants: 27-41% higher than the national median. Between 2010 and 2017 income disparities among the classes of household residences lessened a little. In the least affluent classes of rural and small town households, relative income grew modestly (by 1.5 and 0.8 p.p.), while in the wealthiest class of the largest cities, it decreased by as much as 14.5 percentage points. All of the income growth in rural households took place between 2015 and 2017, which suggests that the 'Family 500+' programme, rather than other factors, was instrumental in bringing changes.

Changes in inter-group inequality can be expressed in a different and more succinct way by the 'between' component of Theil decomposition. In 2010, GE_B was 0.014 for Theil-L and 0.015 for Theil-T and, in both cases, it dropped, in 2017, by 0.006 (Figure 3). It meant that in 2017, inter-group inequalities only amounted to 6% of total inequality – a drop from 2010 by roughly 3 p.p. Figure 4 shows that most changes took place in a short period of 2015-2017 when household residence classes lost much homogeneity.

Table 1. Median relative income of rural and urban households in Poland in 2010, 2015 and 2017

Household residence class		Median relative income [% of national median]			Changes [p.p.]		
		2010	2015	2017	2015/2010	2017/2015	2017/2010
Rural		87.2	86.5	88.8	-0.7	2.2	1.5
Urban [thousand residents]	below 20	95.8	96.6	96.6	0.8	0.0	0.8
	20-100	103.6	103.0	102.3	-0.6	-0.6	-1.3
	100-200	106.3	109.2	109.4	2.9	0.1	3.0
	200-500	111.1	113.9	112.4	2.8	-1.6	1.3
	500 or more	141.8	136.6	127.3	-5.2	-9.3	-14.5

Source: own elaboration based on unidentifiable microdata from the Household Budget Survey [GUS 2010, 2015, 2017]

INTRA-GROUP INEQUALITY

The study used the values of Theil-L and Theil-T indices to describe intra-group inequality for all residence classes (including the class of rural households). Both indices almost show the same picture of falling inequality levels, that differ in a few details (Figure 1 and 2). In 2010 inequality was most acute in the class of largest cities, followed by a group of classes that comprised large towns of up to 500,000 residents, rural areas and small towns, followed by a group of medium-small- and medium-sized towns (20-100,000 and 100-200,000). In 2017 this ranking did not change dramatically, except for large cities of up to 500,000 residents that showed the highest values of the Theil-T index. Moreover, the difference between the most unequal and most egalitarian classes was not so pronounced as in 2010, both in Theil-L and Theil-T index values. In a sense, in 2017, household residence classes became more equal in their inequality levels.

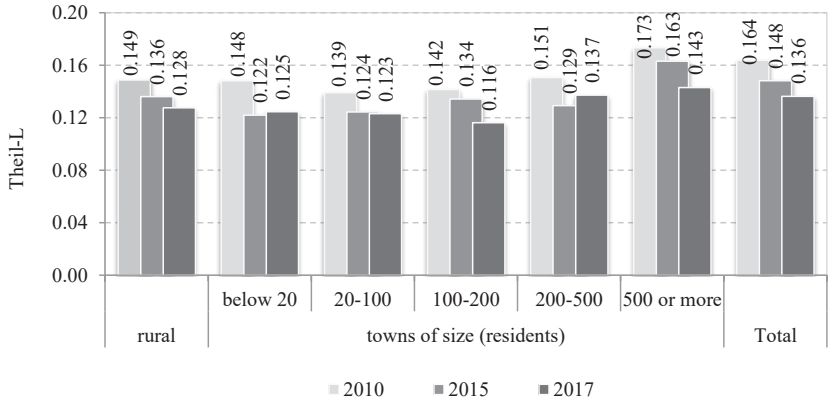

Figure 1. The Theil-L index in rural and urban household classes of residence in 2010, 2015 and 2017

Source: own elaboration based on unidentifiable microdata from the Household Budget Survey [GUS 2010, 2015, 2017]

The levels themselves reduced significantly over the study period in all classes, except in the class of towns up to 500,000 residents. This fact, combined with an increase in relative income, meant a relatively rapid income growth in the entire upper half of class distribution. This type of growth may signal the beginnings of metropolization processes in this class - processes that were previously only characteristic of the largest cities [Wołoszyn 2019]. For the class of rural households, the drop in inequality levels between 2010 and 2017 was neither the largest nor the smallest of all residence classes. It was similar in magnitude to the class of small-town households but more gradual. In 2017, the value of the Theil-L index was 0.128 and for the Theil-T index 0.137. Both values were in the middle of their respective rankings: lower than those in most unequal classes of larger cities but higher in more egalitarian medium-sized towns (Figure 1 and 2). The latter fact may easily be explained by the growing heterogeneity of rural areas, driven by growing inequality among farmers and the already existing income gap between affluent suburbs and the impoverished periphery.

An almost uniform lessening of internal inequalities in all residence classes suggests some nation-wide factors responsible for such leveling. The author's earlier work [Wołoszyn 2019] suggests that it was likely due to a substantial decline in labor supply caused by mass migration, with a simultaneous increase in labor demand triggered by economic prosperity. Rising prices of labor also resulted in a weaker income growth of entrepreneurs (including farmers). Other broad social policy factors, such as minimum wage or universal child benefit programmes played supplementary roles.

Figure 2. The Theil-T index in rural and urban household classes of residence in 2010, 2015 and 2017

Source: own elaboration based on unidentifiable microdata from the Household Budget Survey [GUS 2010, 2015, 2017]

CONTRIBUTION TO TOTAL INEQUALITY

Theil decomposition not only provides a succinct measure of inter-group inequality, but also the contribution of household residence class to total income inequality. This contribution is a result of two factors, internal inequality of the class and its weight. For the Theil-L index, the weight is defined as class population share, for the Theil-T as the income share. Contributions of the rural class were by far the largest of all residence classes: for both Theil indices and the whole study period (Figure 3 and 4).

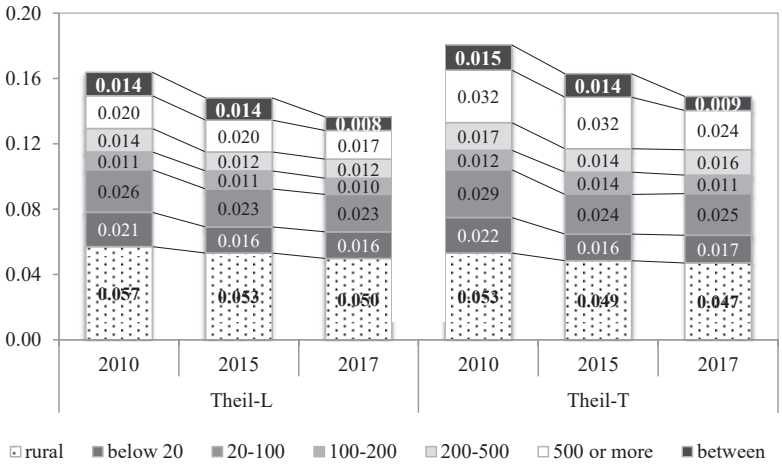

Figure 3. Decomposition of Theil-L and Theil-T indices

Source: own elaboration based on unidentifiable microdata from the Household Budget Survey [GUS 2010, 2015, 2017]

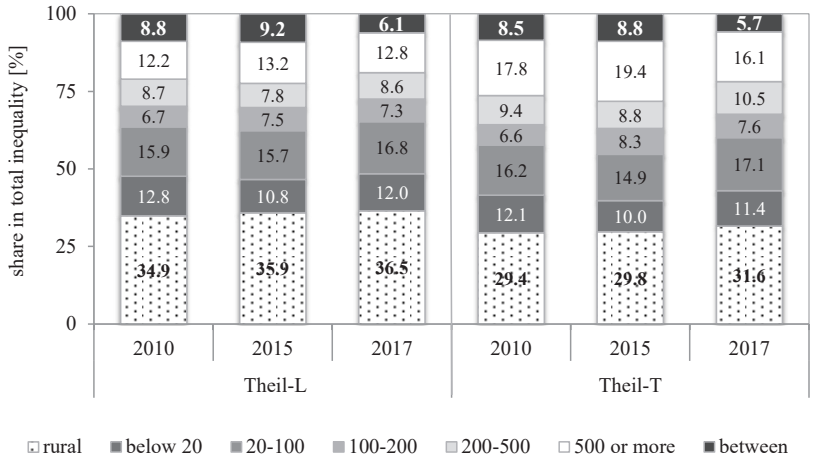

Figure 4. Decomposition of Theil-L and Theil-T indices – a percentage structure

Source: own elaboration based on unidentifiable microdata from the Household Budget Survey [GUS 2010, 2015, 2017]

The share that the class added to total inequality rose, in 2017, by 1.6 p.p. to be 36.5% for Theil-L and by 2.2 p.p. to be 31.6% for the Theil-T index. The sheer size of contributions and their continuous growing importance suggest that any efforts to combat household income inequality in Poland should always take the class of rural households into account.

CONCLUSIONS

Inter-group inequality within the framework of household residence classes was characterized by lessening income disparity and a diminishing inter-group component of inequality decomposition. Though still the poorest of all, rural households saw their median income rise in the study period faster than of all Polish households. Internal inequality levels fell sharply in almost all classes, but the fall did not alter the inequality ranking in 2017. Because of its heterogeneity, rural households were still more unequal than those in small- and medium-sized towns but less unequal than in large cities. Finally, even though internal inequality dropped markedly, the contribution of rural households to total inequality remained, by far, the largest of all household residence classes.

The general reasons for overall inequality leveling can be found in the raise of median wages, caused by two main factors: emigration that depleted the labor supply and prosperity that boosted demand. The relatively fast income growth of rural households between 2015 and 2017 can be ascribed to the implementation of the 'Family 500+' programme.

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NIERÓWNOŚCI DOCHODOWE WIEJSKICH I MIEJSKICH GOSPODARSTW DOMOWYCH W POLSCE W LATACH 2010-2017

Słowa kluczowe: nierówności dochodowe, indeks Theila-L, indeks Theila-T, dekompozycja indeksu Theila, wiejskie gospodarstwa domowe

ABSTRAKT

Celem artykułu jest ocena poziomu nierówności dochodowych klasy wiejskich gospodarstw domowych w stosunku do innych klas miejscowości zamieszkania, tj.: małych, średnich i dużych miast. Ocenę nierówności wewnątrzgrupowych oparto na indeksach Theila-L i Theila-T. Nierówności pomiędzy grupami mierzono sumarycznie za pomocą składnika międzygrupowego w dekompozycji Theila, a bardziej szczegółowo przez analizę dysproporcji dochodowych. Badanie opierało się na danych jednostkowych nieidentyfikowalnych, pochodzących z „Badania Budżetów Gospodarstw Domowych", prowadzonych przez GUS w latach 2010, 2015 i 2017. Stwierdzono, że pomimo rosnących dochodów, wiejskie gospodarstwa domowe były nadal najuboższe ze wszystkich klas miejscowości zamieszkania i pozostawały daleko za przeciętnymi polskimi gospodarstwami domowymi. Ich wewnętrzne nierówności dochodowe były w całym okresie badawczym wyższe niż wśród gospodarstw domowych zamieszkujących małe i średnie miasta. Klasa ta była również w największym stopniu odpowiedzialna za całkowite nierówności dochodowe polskich gospodarstw domowych.

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