6. INCOME POLARIZATION IN ROMANIA

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Abstract

This article presents the results of a study devoted to the measurement of the income polarization in Romania. In the first part the key methodological issues of measuring polarization are addressed, with emphasis on the polarization indices. To measure the polarization of the household incomes in Romania, which is the subject of the second part of the study, several indices of bipolarization (Foster-Wolfson, Wang-Tsui, Milanovič, Esteban-Ray and Esteban-Gradin-Ray indices) and group polarization (Esteban-Ray and Gradin indices) have been used. All indicators show a higher degree of polarization in 2008 as compared with 1995 and 2000.

Keywords: *bipolarization, group polarization, income redistribution, disposable income*

JEL Classification: D31, D63

1. Introduction

The transition to the market economy in Romania has been accompanied by the growing income inequality, due to a certain extent to the transition from egalitarian distribution specific to the command economy to a distribution imposed by the labor market mechanisms, which involve an increase in the differentiation of income from work and property. But Romania has the highest degree of income inequality among the member states of the European Union, and there is a large gap between the living conditions of the majority population, especially of the poor, and the luxurious life of the rich. There are also large differences between the incomes earned by employers, employees or some independents and those earned by farmers or received by unemployed and by most of retired people, between the income and living conditions of households in urban and rural areas, and some of these differences are widening. This has led to the idea that there is a process of social polarization, suggested also by the fact that some categories of population traditionally belonging to the middle class (teachers, doctors, etc.) receive relatively low wage earnings.

Since there are various reasons to worry about the widening and polarization of the income distribution, and as there is high inequality sensitivity in the Romanian society,

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the increase in income inequality and polarization are trends that should concern the social and economic policy makers. Its prevention requires the promotion of appropriate policies, and the setting up of such policies requires information on the dimensions of these phenomena, the analysis of the determining factors and circumstances which favor or weaken them.

However, in Romania studies on the evaluation of income inequality and polarization have not been produced so far. Data on inequality, generally associated with those relating to poverty, were published in reports prepared under the aegis of national or international institutions, and in research papers. Results of the evaluation of the income polarization have not yet been published, although there were some concerns (Molnar 2005, Stefanescu 2008). This article presents some results of a research project on inequality and the polarization of the households' income. It is the first study aiming at the evaluation of the two characteristics of income distribution in Romania (Molnar, 2009).

The article is divided into three parts. The first part refers to the main methodological aspects of measuring the polarization. In the second and the third parts the results of the estimation of polarization indices and of the impact of income redistribution on polarization during 1995-2008 are presented.

2. The measurement of income polarization: methodological issues

There are two theoretical-methodological aspects to be considered when measuring the income polarization, namely: (i) definition of polarization and choice of indicators to be used, (ii) definition of the income concept and estimation of the individual income used in the calculation of indicators.

2.1. Definitions and indicators

To evaluate the polarization of the household incomes in Romania, I used several indices derived from both of the two approaches to defining and measuring the polarization largely present in the economic literature since 1990 years.

One of the two approaches is related to the contribution of J.M. Wolfson (1994, 1997). This is centered on **bipolarization**, namely the diminishing of the middle class, the decrease of the population situated in the centre of the distribution and the increase of the population situated at the extremes of the distribution. According to this approach, the polarization is defined by the spreading-out of the middle of the income distribution and bimodality. Three of the indices used in my study belong to this approach: the Foster-Wolfson index, the Wang-Tsui index and the index proposed by Milanovič. The population and the income shares of the 'middle class' are also indicators related to this polarization concept. All these indices measure the polarization with reference to the median income (*Me*).

The index proposed by **Foster and Wolfson** (1993, 1994) has the following form:

$$P_{FW} = 2[1 - 2L(0{,}5) - G]\frac{\bar{x}}{Me}, \quad (1)$$

where: *L(0.5)* represents the income share of the population whose income is lower than median (the poor half of the population), *G* is the Gini coefficient, $\bar{x}$ and *Me* are the mean and the median of the distribution.

The index ranges within the interval [0, 1], being equal to 0, in case of a perfectly equal distribution (all the incomes are equal), and equal to 1, for a perfect bimodal distribution, where half of the population has no income, and each member of the other half have income equal to twice the mean income.

The class of indices proposed by **Wang and Tsui** (2000) is measuring the distance of the actual distribution to the distribution with minimum polarization, where the entire population is concentrated at the median level of income. It is based on the absolute distance between individual income (x_i) and the median (*Me*):

$$P_{WT} = \frac{\theta}{n}\sum_{i=1}^{n}\left|\frac{x_i - Me}{Me}\right|^r, \quad (2)$$

where: θ is a positive constant and *r* is a parameter that takes values in the interval (0, 1).

The polarization measure developed by **B. Milanovič** (2000) is based on the distance between the income x_i of the persons/households (ranked upwards by the income level) and the hypothetical income level corresponding to the perfect polarization (zero for half of the population and twice the average for the other half),

$$P_M = 1 - \left[\sum_{i=1}^{n(Me)} w_i\left(\frac{x_i}{\bar{x}} - 0\right) + \sum_{i=n(Me+1)}^{n} w_i\left(2 - \frac{x_i}{\bar{x}}\right)\right], \quad (3)$$

Where:

$w_i = \frac{2}{n(n+1)}(n - i + 1)$ are weights that depend on the rank of each person *i* and the total number of population *n*. The two terms in brackets refer to the incomes lower and, respectively, higher than the median and the parenthesis represents the distance between the actual distribution and the one perfectly polarized. The range of the index is (0, 1), and distribution is more polarized as the index approaches 1.

The **population and income share of the 'middle class'** has been estimated as the proportion of population whose income is in the range of 85-130%, 75-150% or 50-200% of the median income, and its share in the total income.

The other approach, initiated by J. Esteban and D. Ray (1994), is based on the **relationship between polarization and conflict/social tension** and involves multipolarity, the formation of groups (two or more), whose members have income similar to the income of other members of the group and strongly differentiated from those of members belonging to other groups. Esteban and Ray's theory of polarization is based on a model of individual attitudes of people belonging to different groups, on the idea that each person is feeling *identification* with the other members of the group and *alienation* towards the members of the other groups. So all polarization indices developed in this framework are based on the identification and alienation functions. I estimated three indices derived from this approach (Esteban-Ray index, Esteban-Gradin-Ray and Gradin indices).

The first polarization index developed in the alienation-identification framework, the **Esteban-Ray index** has the form

$$P^{ER}(p,\alpha) = \sum_{i=1}^{n}\sum_{j=1}^{n} p_i^{1+\alpha} p_j \left|\log(\bar{x}_i) - \log(\bar{x}_j)\right|, \quad (4)$$

in which the function of alienation is the difference between the logarithms of the income of the population of groups *i* and *j* (in fact, there are logarithms of the average income in each group, on the assumption that all incomes in the group are equal to the average), and the function of identification is p_i^{α}, where p_i represents share of the population in the group *i* in the total population. α is a parameter expressing the aversion/the sensitivity to polarization, with the range of variation [1, 1.6]**.**

I applied this index to evaluate two different aspects of polarization: together with the Esteban-Gradin-Ray index, in order to complete the measurement of bipolarization; and jointly with the index proposed by Gradin for group polarization, to measure the income polarization by some socio-economic characteristics of households.

The **Esteban-Gradin-Ray index** of extended polarization (1999) contains a correction of the Esteban-Ray index for the lack of identification due to the within-group income inequality. The index formula is

$$P^{EGR}(f,\alpha,\beta) = P^{ER}(\alpha,\rho) - \beta[G(f) - G(\rho)], \quad (5)$$

where: $P^{ER}(\alpha,\rho) = \sum_{i=1}^{n}\sum_{j=1}^{n} \pi_i^{1+\alpha}\pi_j\left|\bar{x}_i - \bar{x}_j\right|$ is the Esteban-Ray index estimated for a ρ representation of the income distribution (by two, three or more groups/income intervals), $\varepsilon(f,\rho) = G(f) - G(\rho)$ denotes the error that occurs without taking into consideration the income inequality within the groups, *G(f)* and *G(ρ)* are the overall and the between-group Gini coefficients and β is a parameter that measures the weight (the importance) attributed to the error in the measurement of polarization.

In the special case of the evaluation of the bipolarization, with the mean income used as the benchmark between the two groups, the Esteban-Gradin-Ray index can be estimated as stated in the relationship (Esteban & Gradin & Ray, 2007)

$$P_{n=2}^{EGR}(f,\alpha,\beta) = [\pi_{\bar{x}}^{\alpha} + (1-\pi_{\bar{x}})^{\alpha}][\pi_{\bar{x}} - L(\pi_{\bar{x}})] - \beta\{G - [\pi_{\bar{x}} - L(\pi_{\bar{x}})]\}, \quad (6)$$

Where: $\pi_{\bar{x}}$ is the cumulative frequency corresponding to the mean income (the percentage of the population whose income is less than the average), L($\pi_{\bar{x}}$) is the value of the Lorenz curve for the population with the income lower than the average (the percentage of the sum of the incomes lower than the average in the total income), and G is the Gini coefficient estimated for the whole distribution.

The **group polarization index** proposed by Gradin (2000) is a variant of the Esteban-Gradin-Ray index, applicable to measure the income polarization by sub-population defined according to socio-economic characteristics other than the income. The index differs from the Esteban-Gradin-Ray index by the fact that the error term, $\varepsilon(f,\rho^c) = G(f) - G(\rho^c)$, measures the lack of identification derived from both the within-group income inequality and the overlapping of groups' income distributions,

and by the use of an element of normalization to avoid getting negative values (harder to interpret) of the index. Thus,

$$P^G(f,\alpha,\beta,\rho^c) = P^{ER}(\alpha,\rho^c) - \beta[G(f) - G(\rho^c) - 1], \quad (7)$$

where: ρ^c stands for the distribution of the population by groups formed according to one or another characteristic of the persons or household, *G(f)* and *G(ρ^c)* represent the overall and the between group Gini coefficients, respectively.

1.2. The data

In the study whose result are presented in the article, the indicators of the income polarization are based on the data on the household income collected by two surveys: the Integrated Household Survey (IHS) for the years 1995 and 2000, and the Household Budget Survey (HBS) for the years 2006-2008. There are two surveys conducted annually by the National Institute of Statistics (first during 1995-2000 and the second starting with 2001). Given that the income module has not been changed, this allows the evaluation of the indicators of the polarization in the period 1995-2008.

In estimating the income polarization indices the households' disposable incomes were used. It is the income concept whose content is best suited to express the welfare of the household and its members. Disposable income consist of all cash and in kind revenues earned by the household members from employment (the income from wage and the income from self-employment), property and social or private transfers (the income from social protection and the transfers between the households), minus the payments made in redistribution (taxes, social contributions and transfers to other households)[1].

To reflect the welfare differences among households of different size and structure at the same income level the disposable income of households have been equalized. For this purpose, the sum of each household's disposable income is divided by the number of "adult equivalent" units of that household (*AE*). This number is determined according to an equivalence scale of the form $AE = (A + \alpha C)^{\theta}$, where: *A* and *C* refer to the number of adult persons and children living in each household, α is a measure of a relative cost of children, and θ is a parameter of the economies of scale in household consumption. This equivalence scale, whose parameters were estimated using the information on the consumption expenditure of Romanian households (α = 0.5 and θ = 0.9), is used in the national evaluation of the absolute poverty as well. The level of the equalized disposable income estimated for each household is assigned to each person in that household and the estimation of the polarization indicators is

[1] *It should be noted that in estimating the disposable income of households the value of consumption of agricultural products from own resources (from domestic production, mostly) is taken into account, but not the consumption represented by the use of housing owned by the household (the imputed rent), and also the fact that, for reasons concerning the organization of the survey sample and the seasonality of agricultural production, the expenditure on the households' production cannot be deducted from the income in cash earned from agriculture and from the value of the consumption from own production. This may have an influence on the size of the polarization indicators: they may indicate a lower degree of polarization than the real one.*

based on the distribution of persons/individuals by the equalized disposable income of the households to which they belong. It must be mentioned that in estimating of Wang-Tsui, Milanovič, Esteban-Ray and Esteban-Gradin-Ray indices of bipolarization the data on the percentiles of the income distributions and on the mean income in each percentile group have been used.

3. Estimations of the income polarization indices in Romania

To measure the degree of income polarization and its evolution, the indices mentioned above were estimated for 1995, 2000, 2006, 2007 and 2008. The period covered by the years for which the assessment was made includes a sub-period marked by economic decline and the fall of the households' income and a period of economic development and a growth in the income[2]. This makes possible to observe the evolution of polarization under different economic circumstances. Unfortunately, no comparable data on the disposable income before 1995 are available, so that an analysis of the polarization during the early years and throughout the whole period of transition to market economy cannot be made. Yet, there can be done no assessment of polarization in the current economic crisis either.

The set of the indices estimated in the study allows the measurement of bipolarization and of group polarization according to the different socio-economic characteristics of the households, to the area and region of residence. With the purpose of assessing the effect of the redistribution on the polarization, two indices (Foster-Wolfson and Esteban-Ray) were estimated for the total gross income, before and after social transfers, to be compared with those estimated for the disposable income.

3.1. Bipolarization

Three categories of indices were estimated to reflect the bipolarization: indices relating to size of the 'middle class' (the proportion of the population whose income is situated within an interval whith limits set in relation to the median distribution in the total population and the total income), the Foster-Wolfson, Wang-Tsui and Milanovič indices, which measures the polarization in relation to the median of the income distribution, as well as the Esteban-Ray and Esteban-Gradin-Ray indices in the case of two groups/income intervals, which measure the polarization in relation to the mean (*Table 1*).

All the indices show a higher degree of polarization in 2008 than in 1995. It increased in 2000 compared to 1995, and in 2006 compared to 2000, and it decreased in 2007 and in 2008.

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[2] *In 2000 the households' real disposable income was 25% lower than in 1995, due to the income loss generated by the economic decline and high inflation that took place during 1997-1999 years. Since 2001 the income increased year by year, so that in 2008 the mean income was twice that of the year 2000. During 2001-2008 the average annual growth rate of the households' income was of 9%, but in 2007 and 2008 the income increased more: by 13% and 18%, respectively.*

Table 1

Income bi-polarization indices

	1995	2000	2006	2007	2008
Population share (%) in the income range					
85-130% median	34.5	33.1	30.5	30.8	31.9
75-150% median	52.8	50.6	47.6	47.9	48.9
50-200% median	83.5	81.1	78.2	78.8	79.7
Income share (%) of the population in the income range					
85-130% median	31.7	30.7	27.0	27.9	29.4
75-150% median	49.5	47.8	43.0	44.0	45.9
50-200% median	77.5	76.2	70.4	72.0	74.4
Foster-Wolfson index	0.231	0.243	0.266	0.261	0.253
Wang-Tsui index					
r = 0.25	0.744	0.752	0.750	0.769	0.765
r = 0.5	0.592	0.603	0.634	0.627	0.616
r = 1	0.456	0.459	0.458	0.524	0.505
Milanovič index	0.349	0.360	0.383	0.378	0.372
Esteban-Ray index (2 income intervals, cutt-of income level = mean)					
$\alpha = 1$	0.206	0.208	0.230	0.225	0.216
$\alpha = 1.5$	0.149	0.150	0.167	0.162	0.156
Esteban-Gradin-Ray index (2 income intervals, cutt-of income level = mean)					
$\alpha = 1,\ \beta = 1$	0.116	0.120	0.133	0.129	0.124
$\alpha = 1.5,\ \beta = 1$	0.059	0.062	0.069	0.067	0.064

Source: Estimates based on NIS-IHS and HBS data.

Population whose income is within the central part of the distribution, within a range whose limits are set in relation to the median, which may be considered the 'middle class' in statistical terms, decreased in 2000, compared to 1995, and in 2006, compared to 2000, then increased in 2007 and in 2008, regardless of the range limits. During the period 1995-2008, the diminishing of the central part of the distribution is obvious. If in 1995, the share of population whose income were in the ranges of 85-130%, 75-150% and 50-200% median was 34.5%, 52.8% and 83.5%, respectively, in 2008 those whose incomes were in the same intervals were 31.9%, 48.9% and 79.7%, respectively. The data show an increase in the percentage of the population in both of the extreme intervals, which means the movement of a part of the population from the center to the extremes of distribution, by the 'impoverishment' of some and the 'enrichment' of others (*Annex 1*).

As it can be seen in Table 1 and in Annex 1, the same downward trend was recorded also by the income share of population located within the median interval, but the

income 'lost' in the center moved towards the rich part of the distribution. The income of the population in the income range of 75-150%, for example, represented 49.5% of total income in 1995 and only 45.9% in 2008, while the income share of those whose income is higher than 150% of the median increased from 37.0% to 40.2% and the proportion of those with income less than 75% remained practically the same (13.3% and respectively 13.8%). The increase in proportion of the population with income higher than 150% and lower than 75% of the median has been accompanied by an increase in the income gap between the two groups of people, from 4.1:1 in 1995 to 4.3:1, in 2008. There are two defining trends of the polarization process.

In the years 2007 and 2008, the increase in the proportion of median interval occurred on account of the higher one, whose proportion in the total of the population and in the total income fell, unlike the one of the lower interval that hasn't changed significantly. It is a result of relatively high growth of the low and medium level incomes (minimum wage and pensions, mainly), partly about the fact that those two years were electoral.

The increase in polarization is emphasized by the first and the second curves of income polarization in the years 1995, 2000, 2006 and 2008: the highest values of the two curves are estimated for 2006 and the smallest are those estimated for 1995 (*Annex 2*). The estimated values for 1995 and 2000, as those estimated for 2006 and 2008 are very close, so the first two curves, and the last two, almost overlap on the graphic representation, but the 2000 and 2006 years curves dominate the 1995 and 2008 years curves, respectively.

The **Foster-Wolfson, Milanovič and Wang-Tsui indices** are different in magnitude, since they are estimated based on different calculation formulas, but all three show the same tendencies: the increase of the polarization over the period 1995-2008, with stronger growth in 2006 compared to 2000, and the decrease in 2007 and 2008.

When analyzed by comparison with those estimated for other countries, the Foster-Wolfson and Wang-Tsui indices show a relatively high degree of polarization of the income in Romania. According to some studies, in 1995, the Foster-Wolfson index estimated for the households' disposable income was 0.350 and respectively 0.264 in the U.S. and Canada (Wolfson & Murphy, 1998), 0.228 in France (Echevin & Parent, 2002) and 0.288 in China (Zhang & Kanbur, 1999). In 2005, the average of the Foster-Wolfson indices estimated by M. Ravallion, for 91 developing countries, was 0.351, and of 0.389 in China and 0.255 in India (Ravallion, 2009). The Wang-Tsui index estimated for China (1995) by X. Zhang and R. Kanbur (1999) was 0.605.

The **Esteban-Ray index** shows an increase in polarization after 2000 and a diminishing of it in 2007 and 2008, while the change of the index is almost negligible in 2000 compared to 1995. Between 1995 and 2000, there was a slight change in the structure of the population (which affects the function of identification) by increasing the proportion of population with higher income than the average, but the gap between the averages of the income higher and, respectively, lower than overall mean (which defines the function of alienation) has not changed, so that polarization index remained at the same level (Table 1). Between 2000 and 2006, the gap between the two averages increased (from 2.3 to 2.6), which led to increased polarization, to some extent mitigated by increasing the share of population with income lower than the overall average. In 2007 and 2008, the decrease of polarization was determined by

the decrease of the gap between incomes, while the increase of the population with the income above the mean had a slight influence in the opposite direction, the attenuation of the decrease of polarization (*Table 2*).

The **Esteban-Gradin-Ray index** show a lower degree of polarization if compared with the Esteban-Ray index, as it considers the lack of identification, determined by the inequality in income within each of the two groups. It can also be noted, that the EGR index shows a slightly smaller increase of polarization in 2006 compared with 2000, given that the within-group inequality increased significantly, which means a decrease in the feeling of identification in the two population groups. However, the decrease in inequality within groups, which took place in 2007 and 2008, supported and amplified slightly the diminishing of the degree of polarization caused by the decreasing gap between incomes.

Table 2

Within group inequality and between group income gap

	1995	2000	2006	2007	2008
Within-group inequality	0.090	0.088	0.098	0.095	0.092
Mean incomes of groups, relative to the overall mean:					
Group with income above the mean	1.534	1.528	1.618	1.594	1.553
Group with income below the mean	0.664	0.657	0.632	0.639	0.645
Ratio between the two group's mean incomes	2.3	2.3	2.6	2.5	2.4
Group population shares (%):					
Group with income below the mean	61.4	60.6	62.7	62.2	60.9
Group with income above the mean	38.6	39.4	37.3	37.8	39.1
Group income shares (%):					
Group with income below the mean	40.8	39.8	39.7	39.7	39.3
Group with income above the mean	59.2	60.2	60.3	60.3	60.7

Source: Estimates based on NIS-IHS and HBS data.

The comparison with the indices estimated by Esteban, Gradin and Ray for several OECD countries show a lower degree of polarization in Romania than in the U.S. (EGR = 0.271 and ER = 0.157 in 2000) and in UK (0.259 and 0.151 in 1999) but higher than in Sweden (0.178 and 0.099) and Germany (0.193 and 0.111) in 2000 (Esteban & Gradin & Ray, 2007). Estimated for α = 1.3, in 1995, the ER and EGR indices (0.169 and 0.079) are higher than those estimated by Gradin (1999) for Belgium (0.134 and 0.063), Denmark (0.139 and 0.061), the Czech Republic (0.108 and 0.049) and Slovakia (0.099 and 0.043) in 1992, and lower than those estimated for the U.S. (0.220 and 0.109 in 1994), the United Kingdom (0.198 and 0.100 in 1991) and Russia (0.252 and 0.117 in 1995).

3.2. Income polarization by sub-population

To study the extent to which a process of group income polarization arises, the Esteban-Ray and Gradin indices were estimated by characteristics which have proved to be relevant for the income differences: the employment status of household head, the presence or the absence of at least one wage earner or employer in the household composition, the level of education of the household head, the household type, the area and the region of residence.

Table 3

Group polarization indices, by household characteristics

	1995	2000	2006	2007	2008
Esteban-Ray index (α = 1)					
Occupational status of household head (1)	0.048	0.060	0.070	0.078	0.065
Households with/without at least one wage earner	0.060	0.086	0.101	0.111	0.088
Education of household head	0.038	0.042	0.057	0.060	0.056
Household type	0.026	0.027	0.028	0.030	0.029
Residence area (urban/rural)	0.054	0.063	0.102	0.103	0.104
Region:					
8 regions (2)	0.014	0.013	0.016	0.016	0.017
3 regions (3)	0.029	0.025	0.042	0.056	0.040
Gradin index (α = 1, β = 1)					
Occupational status of household head (1)	0.830	0.871	0.861	0.888	0.865
Households with/without at least one wage earner	0.820	0.874	0.870	0.894	0.863
Education of household head	0.855	0.873	0.902	0.918	0.916
Household type	0.824	0.828	0.803	0.814	0.821
Residence area (urban/rural)	0.812	0.828	0.872	0.883	0.896
Region:					
8 regions (2)	0.772	0.766	0.756	0.767	0.779
3 regions (3)	0.748	0.765	0.778	0.801	0.795

(1) wage earner, employer, self-employed in non-agricultural activities, farmer, unemployed, retired, other; (2) North-East, South-East, South, South-West, West, North-West, Centre, Bucharest-Ilfov; (3) (i) North-East, South-East, South and South-West; (ii) West, North-West and Centre; (iii) Bucharest-Ilfov.
Source: Estimates based on NIS-IHS and HBS data.

The **Esteban-Ray indices** show that the intergroup polarization increased for all the characteristics of the group until 2007 and declined in 2008, except the ones related to the area of residence and household type. In 2008, the highest degree of intergroup

income polarization was the one generated by the urban or rural residence. The presence or absence of at least one employee or employer in the household composition is also an important factor of the income polarization, as also the employment status of the household head and his education. The type of the household, defined by its composition, has a less polarizing impact. The income polarization is linked to the lowest extent to the residency in one or other of the eight regions of development. If the Esteban-Ray index is estimated for three groups, consisting of the eastern and southern regions of the country (with average income less than the national average), the western and the central regions of the country (with average income slightly higher than the national average) and the Bucharest-Ilfov region (with income well above average), its level is more than double that estimated for the eight regions.

The household income is influenced by the socio-economic characteristics of the household, and that is witnessed by the gaps between the mean incomes estimated by groups formed on the basis of these characteristics and reflected by the intergroup Gini indices. However, these groups are not homogeneous in terms of income levels, with significant differences between the incomes of the people in each group. Also, the distributions of the income of the different groups overlap to some extent[3]**.** This considerably diminishes the sense of identification within the group and the correction term (ε) proposed by C. Gradin for the group polarization (which expresses the lack of identification) is relatively high compared with the between-group Esteban-Ray index. The lack of identification is higher for the regions and the group related to the presence/absence of at least one employee/employer in the household composition and much lower in the case of the group formed according to the education of the household head. The data show in general, that the lack of identification is lower in 2008 than in 1995, especially in the case of the groups formed according to the level of education and the area of residence. As a result, the **Gradin index** of the income group polarization[4], estimated by subtracting from the Esteban-Ray index the error term related to the lack of identification, shows a lower increase in polarization. According to this index, the most important factor of the income polarization is education, followed by the area of residence. The region of residence has the lowest

[3] *For example, the income of the households which have an employee as reference person varies significantly depending on the number of employees in the household, the level of wages earned by each of them and the presence of other active persons (self-employed or unemployed) or inactive (retired persons, children, etc.) in the household composition. Also, there are many households of retired persons whose income is equal to the income of the households with employees, given that some pensions exceed the minimum wage, and the households with retired persons in their composition, in general, have fewer people than the households with employees.*

[4] *The absolute level of the Gradin indices is not comparable to the Esteban-Ray indices, meaning that a Gradin index equal to 0.865 (for the group depending on the employment status) doesn't show a degree of polarization higher than the Esteban-Ray index equal to 0.065 (estimated for the same groups). The highest level of the first index is derived from its normalization by adding the parameter β (equal to 1, in the estimation of this study) to the result obtained by the correcting of the Esteban-Ray index with the lack of identification, to avoid the difficulties in interpretation of some negative results.*

impact on the income polarization[5]. The degree of group polarization has increased throughout the period under the impact of education and the urban or rural residence, given that the gap between the incomes of groups has increased and the dispersion of the income within the groups has decreased.

Table 4

Between-group Gini coefficient and the lack of identification within groups

	1995	2000	2006	2007	2008
Overall Gini	0.296	0.296	0.328	0.320	0.308
Between-group Gini by:					
Occupational status of household head (1)	0.078	0.107	0.119	0.130	0.108
Households with/without at least one wage earner	0.057	0.083	0.096	0.103	0.083
Education of household head	0.113	0.127	0.173	0.178	0.168
Household type	0.095	0.097	0.103	0.104	0.101
Residence area (urban/rural)	0.053	0.062	0.098	0.100	0.100
Region					
8 regions (2)	0.054	0.049	0.068	0.071	0.071
3 regions (3)	0.015	0.036	0.064	0.066	0.063
Lack of group identification (ε)*					
Occupational status of household head (1)	0.218	0.189	0.209	0.190	0.200
Households with/without at least one wage earner	0.239	0.213	0.232	0.217	0.225
Education of household head	0.183	0.169	0.155	0.142	0.140
Household type	0.201	0.199	0.225	0.216	0.207
Residence area (urban/rural)	0.243	0.234	0.230	0.220	0.208
Region					
8 regions (2)	0.242	0.247	0.260	0.249	0.237
3 regions (3)	0.281	0.260	0.264	0.254	0.245

(1) wage earner, employer, self-employed in non-agricultural activities, farmer, unemploded, retired, other; (2) North-East, South-East, South, South-West, West, North-West, Centre, Bucharest-Ilfov; (3) (i) North-East, South-East, South and South-West; (ii) West, North-West and Centre; (iii)Bucharest-Ilfov.

** Within-group inequality and groups'overlapping across income distribution.*

Source: Estimates based on NIS-IHS and HBS data.

The polarization related to the employment status of household head and the presence/absence of employees in the household composition increased, however,

[5] *According to a study by C. Gradin, in 1990, in Spain, the Esteban-Ray and Gradin indices of polarization of the household expenditure were 0.049, and respectively 0.877, for the group formed according to education, 0.050 and 0.808, in the case of the grouping by area of residence, of 0.012 and 0.739, depending on the household composition, and 0.019 and 0.795, by region (Gradin 2000).*

there was a decrease of it in 2006, compared to 2000, and in 2008, compared to 2007. This evolution is explained by the fact that the significant increase in the overall level of income in 2006 compared to 2000 took place at the same time with an increase in the gap between the income of the households grouped by the employment status of household head and with a more marked increase in the dispersion of the income within groups. In 2008, the significant increase in pensions led to the reducing of the gap between the income of the groups and to the decrease in the income polarization, but this was mitigated by a slight increase in the dispersion of the income within groups and by the increase in the overlap of the income distribution for the retired persons and the employees. The polarization by household type and regions was practically the same in 1995 and 2008, but lower in 2006, the year of the largest dispersion of income within the household types and regions.

4. The impact of the redistribution on income polarization

The analysis of the differences between the polarization indices, estimated for different income concepts, allows the evaluation of the effect of the income redistribution (social transfers, taxes and social contributions) on the income polarization, specifically the measurement of the difference between the degree of polarization under the hypothesis of the absence of redistribution and the actual one. Two indicators of polarization were estimated: the Foster-Wolfson index, to assess the effect of redistribution on the bipolarization, and the Esteban-Ray index, to assess the effect on the group polarization.

The large difference, and growing, between the Foster-Wolfson indices estimated for the gross total income without social transfers (the income of the households before redistribution) and the disposable/net income (the income after the redistribution) shows a large contribution of the redistribution to achieve a lower income polarization.

In 2008, according to the **Foster-Wolfson indices**, the actual level of disposable income polarization was by 46% lower than the one which would have been achieved in the absence of redistribution hypothesis (0.253 to 0.465), and the difference increased compared with 1995 and 2000 (37%), 2006 (44%) and 2007 (45%). The most important contribution to mitigating the polarization is given by the social transfers, particularly the pensions. In 2008, 82% of the impact of the redistribution was due to social benefits, of which 73% to pensions and 9% to other social benefits. Almost a fifth (18%) of the 'diminishing' of the polarization derived from taxation (taxes and social contributions). It is a relatively large contribution because only a part of the income (wages, income from self-employment, property income, and little part of pensions) are subject to tax and social contribution levy.

The results of the estimations show a growth in the contribution of all components of the redistribution to 'reduce' polarization in absolute terms, but only the contributions of pensions have increased over the whole period. The contribution of the other social transfers fell in 2007 and 2008 and the one of fiscality decreased in 2000 compared with 1995 and in 2008 relative to 2007. Regarding the evolution of the latter, it may seem paradoxical that it fell in 2000, when the progressive income tax was set, and

doubled by 2006, when a flat tax had already been established. The explanation for this development is related to the evolution of the wages and of the number of employees, given that the wage earnings are almost the exclusive source of income tax revenue and of contributions to the social security systems, and to the high tax and social contribution rates on wages. The large decrease in the number of employees and in the proportion of wages in the households' income during the period between 1995 and 2000 led to the decrease in the impact of taxes and social contributions on the polarization, as the increase in wages and in their share in the income have led to the increase in the impact of taxes and social contributions.

Table 5

The impact of redistribution on income bipolarization

	1995	2000	2006	2007	2008
Foster-Wolfson indices estimated for:					
Disposable income	0.231	0.243	0.266	0.261	0.253
Gross income	0.257	0.262	0.304	0.303	0.291
Gross income, before social transfers (pension included in social transfers)	0.365	0.385	0.473	0.470	0.465
Gross income, before social transfers (pension excluded from social transfers)	0.272	0.279	0.327	0.324	0.309
Absolute polarization lessening due to redistribution					
Total , out of which	-0.134	-0.142	-0.207	-0.210	-0.212
- due to social transfers, total	-0.108	-0.122	-0.170	-0.167	-0.174
- pensions	-0.093	-0.106	-0.146	-0.146	-0.156
- other social transfers	-0.015	-0.017	-0.023	-0.021	-0.019
- due to income taxes and contributions to social protection schemes	-0.026	-0.019	-0.038	-0.042	-0.037
As % of total absolute lessening of polarization due to redistribution					
Total , out of which	100	100	100	100	100
- due to social transfers, total	81	86	82	80	82
- pensions	69	75	71	70	73
- other social transfers	11	12	11	10	9
- due to income taxes and contributions to social protection schemes	19	14	18	20	18
Relative polarization lessening due to redistribution, total (%)	-37	-37	-44	-45	-46

Source: Estimates based on NIS-IHS and HBS data.

The **Esteban-Ray group polarization indices**, estimated according to the socio-economic characteristics of the households, also show a large contribution of the income redistribution to alleviate the income polarization (*Annex 3*). In 2008, the real

degree of polarization was by 63%, 70%, 43% and 40%, respectively, lower than expected under the hypothesis of the absence of redistribution, in the case of the households' grouping according to the employment status, the presence of at least one employee/employer in the household composition, education level and the area of residence.

5. Conclusions

The results of the estimation of a set of indices show a process of income polarization in Romania and its rise between 1995 and 2008. The level of the bipolarization indices is higher than the one estimated for Sweden, Denmark, Norway, the Czech Republic and Slovakia, countries known to have a low income inequality, and lower than the one expected for the U.S., the UK or the Russian Federation, whose incomes distribution are characterized by a higher inequality.

All indices show a degree of bipolarization higher in 2008 compared to 1995 and 2000 but its growth was higher between 2000 and 2006, and then declined in 2007 and 2008. The increase in the degree of polarization and its decline over the last two years were caused by the increase and, respectively, the decrease in the gap between high and low incomes, while the changes in the structure of the population had little influence and acted only in the direction of the decrease of the polarization.

As regards the group polarization of the income, the highest degrees of polarization are related to the educational level of the household head and the area of residence. They have increased throughout the period, including 2007 and 2008. The employment status of the household head and the presence/absence of at least one employee/employer in the household composition are also factors with a relatively large impact on the income polarization.

The redistribution of the income has a high and growing impact on the income polarization. The degree of polarization is reduced by half compared to the one recorded under the hypothesis of the absence of redistribution, and the most important contribution is the one of the social transfers, particularly pensions. Obviously, the redistribution of income is an important tool to prevent the polarization of income. Therefore, its effective use requires the deepening of research on the relationship between its components and polarization.

The increase of the employment, particularly of the salaried one, is also important, as well as the development of agriculture and of the rural economy so that the income of the farmers come near to those of the employees, the policies to prevent the expansion of poverty and some aimed at supporting the formation and the strengthening of the middle class, at supporting the liberal professions and the appropriate remuneration of highly skilled workforce, and policies to support the human development, particularly education, targeting the poor and non-poor population too.

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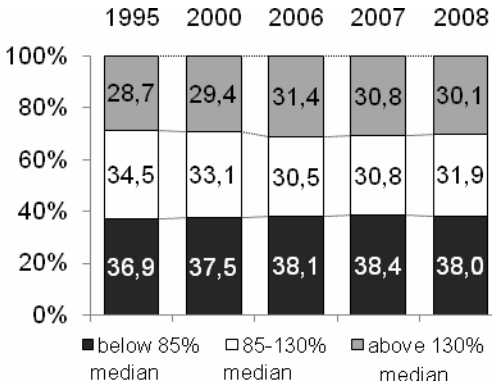
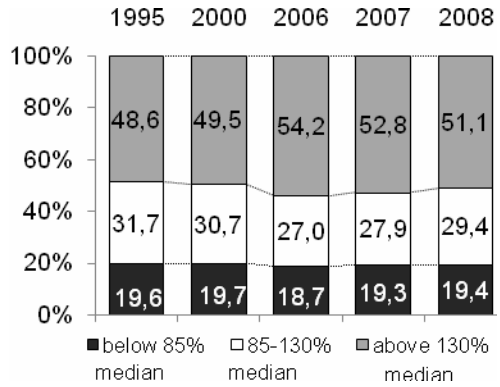
Annex 1

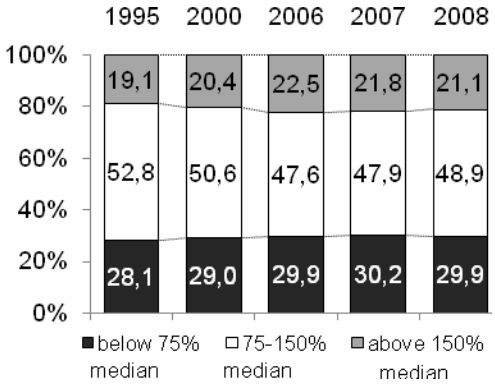
Bottom, middle and top groups shares

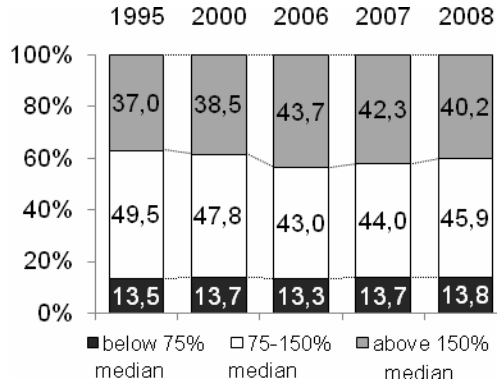
Population shares

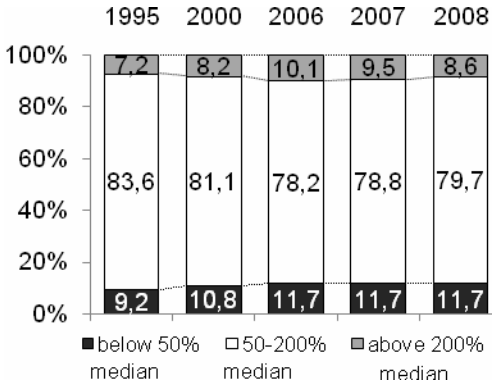


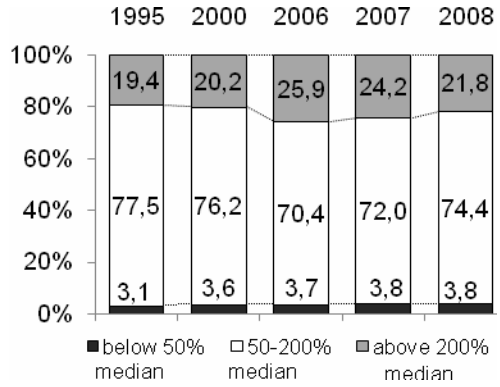
Income shares









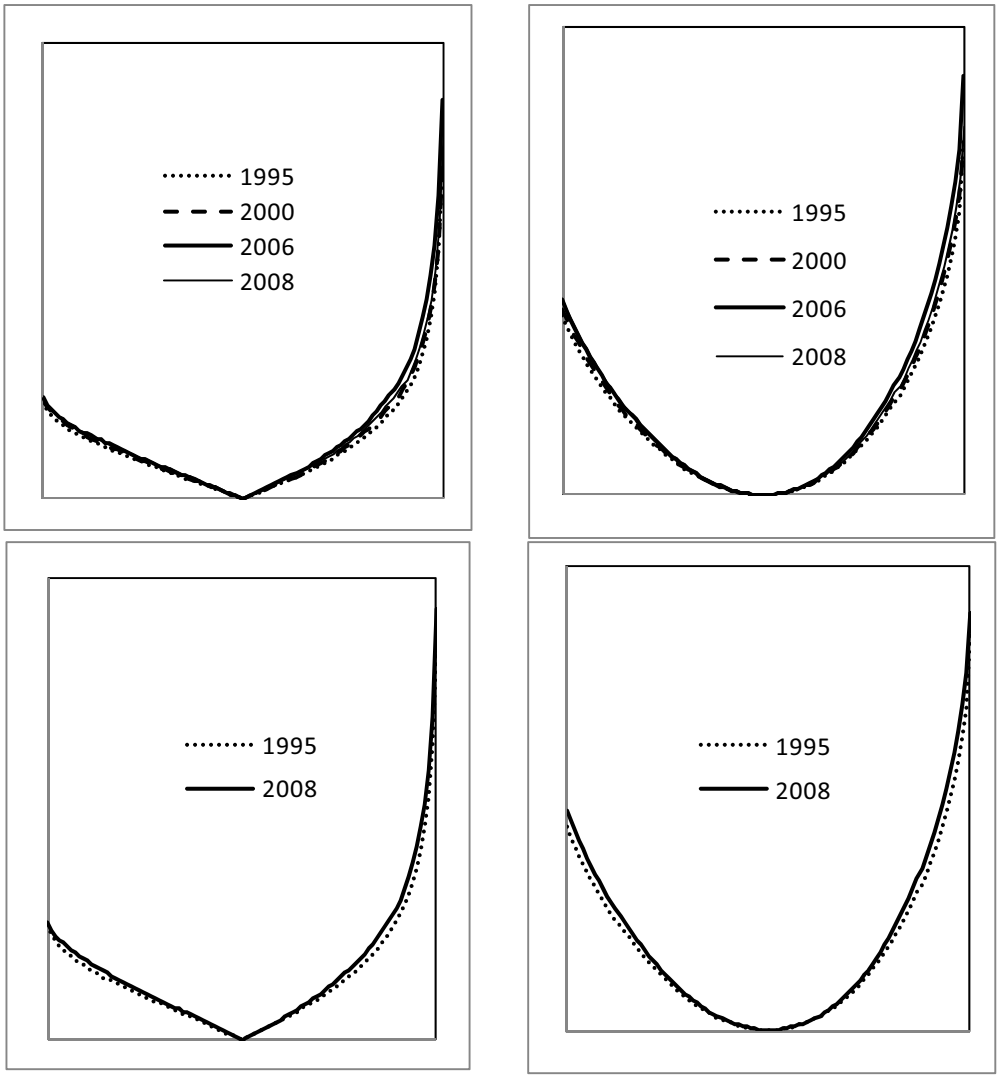


Source: Estimates based on NIS-IHS and HBS.

Annex 2

Income polarization curves (1995-2008)

First polarization curves **Second polarization curves**



Source: Estimates based on NIS-IHS and HBS.

Annex 3

The impact of redistribution on income polarization by sub-population

(estimated on the basis of the Esteban-Ray indices, α = 1)

	1995	2000	2006	2007	2008
Occupational status of household head (1)					
Relative polarization lessening due to redistribution, total (%)	-66	-54	-58	-56	-63
Contribution of the main components, as % of the total redistribution impact					
Total	100	100	100	100	100
Social transfers, total	71	78	72	72	73
- pensions	66	69	66	66	67
- other social transfers	5	9	6	6	6
Taxes and social contributions	29	22	28	28	27
Households with/without at least one wage earner					
Relative polarization lessening due to redistribution, total (%)	-69	-59	-62	-63	-70
Contribution of the main components, as % of the total redistribution impact					
Total	100	100	100	100	100
Social transfers, total	69	79	73	75	76
- pensions	66	75	70	72	73
- other social transfers	3	4	3	3	3
Taxes and social contributions	31	21	27	25	24
Education of household head					
Relative polarization lessening due to redistribution, total (%)	-43	-39	-38	-38	-43
Contribution of the main components, as % of the total redistribution impact					
Total	100	100	100	100	100
Social transfers, total	61	71	65	67	70
- pensions	58	68	59	58	62
- other social transfers	3	3	6	9	8
Taxes and social contributions	39	29	35	33	30

(1) Wage earner, employer, self-employed in non-agricultural activities, farmer, unemploed, retired, other.
Source: Estimates based on NIS-IHS and HBS data.