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POLARIZATION VERSUS JOB-SKILL MISMATCH. THE EVIDENCE FROM THE RELATIVE INCOME DISTRIBUTION OF WORKERS IN POLAND IN 1998-2009

Summary: The aim of the paper is to verify two hypotheses about changes in the structure of labor market: polarization and job-skill mismatch. The research uses the relative distribution and the measures of relative polarization – methods developed by Morris *et al.* [1994]. The analysis includes income from hired work or earnings. The micro-level data come from *Polish Household Budget Surveys* for years 1998-2009. The findings show that polarization was the pronounced profile of the changes in the income distribution. The movements of households from the middle to upper tail of the distribution, so-called "upgrading", were more visible than downgrading or the shifts from the middle to the lower tail of the distribution.

Keywords: polarization, job-skill mismatch, relative distribution.

1. Introduction

Since the 80s the debate on income inequality has turned to distinguishing the polarization of distribution (increases in both tails) from upgrading (increases in the upper tail), downgrading (increases in lower tail) or convergence (decreases in both tails) rather than the extent of overall increases in inequality. The character of shifts in inequality has occurred to be crucial for identifying causes of changes in the income distribution. In a country like Poland, which has experienced changes in its economic and political foundations (the transition process, the accession to the EU), the research on inequality requires to analyze the shifts in the income distribution.

The paper is aimed at verifying two hypotheses on the changes in the structure of labor market: polarization and job-skill mismatch. The analysis addresses the following issues: 1) How did the distributional inequality of earnings change in Poland in 1998-2009? 2) Were there any trends in the shifts in inequality in 1998--2009?

The research uses the relative distribution and the measures of relative polarization – methods developed by Morris *et al.* [1994]. The analyses include income from hired work. The micro-level data come from *Polish Household Budget Surveys* for 1998-2009.

The structure of the paper is as follows: in the first section two hypotheses about polarization and job-skill mismatch are presented together with the causes of inequality resulted from globalization; the methodology is described in the second section; the discussion of findings is included in the third section; finally, conclusions are drawn to summarize the paper.

2. Job-skill mismatch and polarization

The increase in the income inequality in developed countries in the 80s encouraged researchers to look for the causes of this phenomenon. The debate has been focused on two hypotheses: "job-skill mismatch" and "polarization". Both hypotheses refer to changes in the structure of labor market which were generated by the shift in an economy from industry to services. However, the mismatch theory emphasizes the supply-side of labor market while polarization seeks an explanation on the demand side.

The "job-skill mismatch" theory suggests that the new service-based economy generates a considerable increase in a number of high-skill and well-paid jobs and a stagnation in the lower tail of the job distribution As a consequence, one should expect an upgrading of the wage distribution. Rising inequality results from "undereducation". The investment in human capital can be a solution to the problem. The advocates of this theory predict that the increase in inequality is only temporary. The supply-side tools, like education and training programs, should adjust labor supply to demand and, finally, the inequality will decline.

The "polarization" theory gives quite a different explanation. It suggests that the shifts to the new service economy result in the increasing polarization of the job distribution: the increase in the upper tier of jobs with high wages and security as well as the increase in the bottom tier of low-skill, often temporary, and part-time jobs with low wages and security and the decline in a number of jobs in the middle. Workers move toward high- and low-wage jobs and away from the middle. The wage distribution has the U-shape. The inequality generated by the wage polarization can be relatively permanent because it results from labor demand; therefore, education and training programs cannot decrease inequality.

Moris *et al.* [1994] investigated the shifts in income inequality for the sample of workers in America in 1967-1987. They found more support for the changes in inequality predicted by the polarization theory than for the arguments suggested by the job-skill mismatch hypothesis.

Globalization, defined as open trade and investment liberalization, gives new arguments in the debate on polarization theory and mismatch hypothesis. Free trade is accused of reducing the number of jobs and boosting wage inequality. The Heckscher-Ohlin model [Heckscher, Ohlin 1991], the standard theoretical framework to investigate the impact of globalization on wage inequality, suggests that trade liberalization will increase the relative price of the abundant factor which is usually

taken to be skilled labour in the case of developed countries. This in turn should increase wage inequality [Leamer 1995].

On the other hand, unskilled labour is usually the abundant factor in developing countries. The standard trade theory predicts in such economies that open trade might contribute to the increase in low wages and reduction in wage inequality. The conclusion, however, may be contrary if a different form of globalization is taken into account. Feenstra and Hanson [1996], for example, include the transfer of production from developed to developing countries. The findings from their model reveal that the wage gap between skilled and unskilled workers in developing countries increases, pointing towards increased inequality. Increased offshoring contributes to shifting labour demand away from less skilled workers and hence to rising earnings inequality. The findings offered by Lorentowicz *et al.* [2005] show that outsourcing activities of foreign companies in Poland are associated with the large increase in the relative demand for skilled workers in Poland.

The skill-biased technical change connected with investment liberalization can be another factor responsible for increased demand for more skilled labor and explain rising wage inequality in developing countries.

If the technological differences are introduced into the Heckscher-Ohlin model, open trade and foreign direct investment can rise wages in the low-wage countries through technological transfers. The wage increase in these countries does not require to lower wages in technologically advanced countries.

Recently the Heckscher-Ohlin model has received renewed interest as a possible theoretical framework for investigating the effect of globalization on wages. The changes in wage inequality can be induced by globalization that results in lowering prices for labour-intensive products and increased international mobility of physical capital and technology as well as in immigration and wage competition.

Nielsen *et al.* [2005], appreciating the relevance of the patterns of distributional change for the research on inequality, investigated how exactly income inequality changed in the sixteen core countries from the late 1960s to 2000. They found that eleven out of sixteen countries experienced an increase in inequality in this period. Rising inequality resulted from polarization rather than upgrading or downgrading alone, in most countries. Among countries with the strongest polarization, upgrading was superior to downgrading. The convergence from the tails to the center of distribution took place only in two countries: Sweden and Canada.

3. Methodology

3.1. Methods

The research presented in this paper is based on the method developed by Morris *et al.* [1994]. There are three components of this method: 1) the relative distribution, 2) polarization index, and 3) lower and upper indices.

As a first step, the relative distribution is constructed as follows [Morris *et al*. 1994, p. 208]:

– the baseline year income distribution is divided into deciles;

– the median-ratio deflation is used to ensure that changes in shape are not confounded with changes in location – the fraction of households falling into each decile is tracked over time by deflating the income of the current year with the ratio of the baseline median to the current median and projecting the baseline decile cut points onto the current deflated income.

The relative distribution is defined as the ratio of the fraction of households in the baseline year to the fraction of households in the current year in each decile. When the fraction of households in a decile is higher or lower than the fraction in the baseline year, the relative distribution will rise or fall. Where there is no change, the relative distribution will be flat at the value 1. The relative distribution shows changes in the shape of income distribution. It focuses on the comparison between income distributions rather than on their individual shapes.

The second component of the method is a polarization index which summarizes the changes in the relative distribution. Morris *et al*. [1994, p. 209] call it "median relative polarization index" (MRP) and define as:

$$\text{MPR}_t = 4\int_0^1 \left| r - \frac{1}{2} \right| \cdot g_t(r)dr - 1$$

Where: r — the percentile rank that the income value y has in the baseline year;

$g_t(r)$ — the relative population density at income level y in year t, or the ratio of the population density at income level y in year t to the density in the baseline year;

$\left| r - \frac{1}{2} \right|$ — the absolute difference between the baseline rank of y and the median, as a weight, means that greater weight is given to deviations in the tails of the distribution [Morris *et al*. 1994, p. 217].

The constants are chosen in the formula to scale the index, so MPR varies between –1 and 1. The positive values of the MPR index represent relative polarization (increases in the tails of distribution). The negative values of the MPR index signify less polarization, i.e. relative convergence towards the centre of distribution. If the MPR index is equal to 0, it means no change in the income distribution relative to the baseline year.

The third component of the method is the decomposition of the MPR index into halves, above and below the median. It allows constructing two indices – the lower index, LRP_t, and the upper index, URP_t, as follows:

$$\text{LRP}_t = 8\int_0^{\frac{1}{2}} \left| r - \frac{1}{2} \right| \cdot g_t(r)dr - 1$$

$$\text{URP}_t = 8\int_{1/2}^1 \left| r - \frac{1}{2} \right| \cdot g_t(r)dr - 1$$

LRP$_t$ and URP$_t$, as MPR$_t$, vary between 1 and –1, and equal 0, when no change.

$$MPR_t = ½ URP_t + ½ LRP_t$$

3.2. Income sources

The analyses in the paper refer to the household's income hired from work. The income from hired work (earnings) covers all the incomes gained from hired employment. The share of earnings in total revenue of households amounts to 34%, on average, (see Table 1). Total revenue covers an available income (income from hired work, income from a private farm in agriculture, income from self-employment outside a private farm in agriculture, from free profession, income from property, income from rental of a property or land, social insurance benefits, other social benefits) plus financial revenue and sale of buildings, lands, industry inputs, consumer goods.

Table 1. The shares of income sources in the total revenue of households, Poland, 1998-2009

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total revenue	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Income from hired work (%)	33.88	34.93	33.47	33.38	32.76	33.37	33.02	33.37	33.16	34.64	36.87	37.30
Income from a private farm in agriculture (%)	8.68	8.34	8.37	7.76	7.62	6.47	7.17	8.22	8.92	9.06	8.29	7.81
Income from self-employment (%)	5.39	5.65	6.06	6.09	5.84	5.74	5.85	5.83	5.82	6.04	5.96	6.33
Income from social security benefits (%)	18.13	19.17	18.90	20.04	20.63	20.15	18.98	19.60	19.06	17.62	17.52	18.56
Income from social-assistance benefits (%)	2.80	3.31	3.74	4.14	4.42	4.42	4.58	4.49	3.94	3.37	2.63	2.49

Comment: total revenue covers an available income plus financial revenue and sale of buildings, lands, industry inputs, consumer goods.

Source: *Polish Household Budget Surveys*, from 1998 to 2009, Poland.

The income from hired work (earnings) is a prevailing source of total revenue of households over the whole period (see Table 1 and Figure 1). The income from social security benefits is on the second position. The shares of other income sources are visibly lower. The income from a private farm takes the third place; the income from self-employment only the forth; last position is taken by the income from social-assistance benefits.
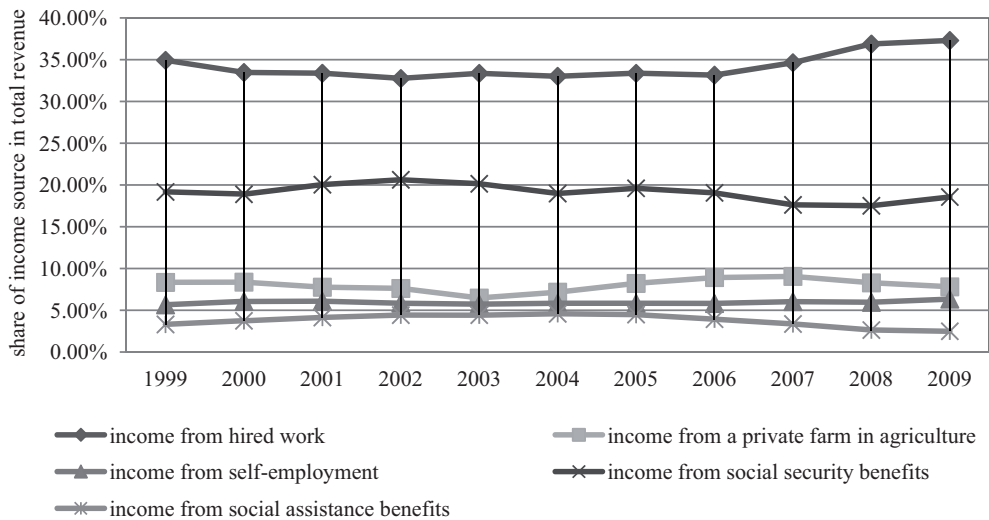

Fig. 1. The shares of income sources in the total revenue of households, Poland, 1999-2009

Source: *Polish Household Budget Surveys*, from 1998 to 2009, Poland.

Since 2006 some trends can be observed: the increase in the share of earnings, while the declines in the shares of social security benefits and social assistance benefits. Poland's accession to the EU in 2004 improved the position of farmer' incomes. After 20 years of structural changes in the Polish economy, the share of income from self-employment (from business activity and free profession) is lower than the share of income from a private farm. The visibly increasing tendency in the relevance of income from self-employment did not appear over the last decade.

3.3. Data

The data used in this paper come from *Polish Household Budget Surveys* for the period from 1998 to 2009. *Household Budget Surveys* (HBS) are based on the sampling method which allows for the generalization of the results to the whole population of households within a margin of an error. The survey unit is a household. The number of surveyed households in each year was approximately 34,300. In each

year the sample size is about 16,500 households for income from hired work and it amounts to 48% of the whole sample.

Income from hired work is considered equivalent income. The modified OECD scale is used: 1 for the first adult person in a household, 0.5 for each next member of a household (14 years and over), 0.3 for every child under 14 years.

Nineteen ninety-eight is chosen as the beginning of the analyses because some aspects of the HBS methodology was changed just in 1998, and the data before and after 1998 are not fully comparable. The choice of 1998 allows for analyzing the data from the longest, available, perspective.

4. Findings

4.1. Relative distributions and relative polarization in 2009 (1998 as the baseline year)

Figures 2 and 2a present the findings on the relative distributions and the measures of relative polarization in 2009, using 1998 as the baseline year. In general, the changes in the earnings distribution were attributable to polarization. The findings show the polarization in the distribution of income from hired work, with upgrading, or movement from the middle to the upper tail of the distribution being more pronounced than downgrading.

The shifts in the earning distribution are consistent with the polarization theory that predicts a symmetric dispersions of earnings, with disproportionate growth
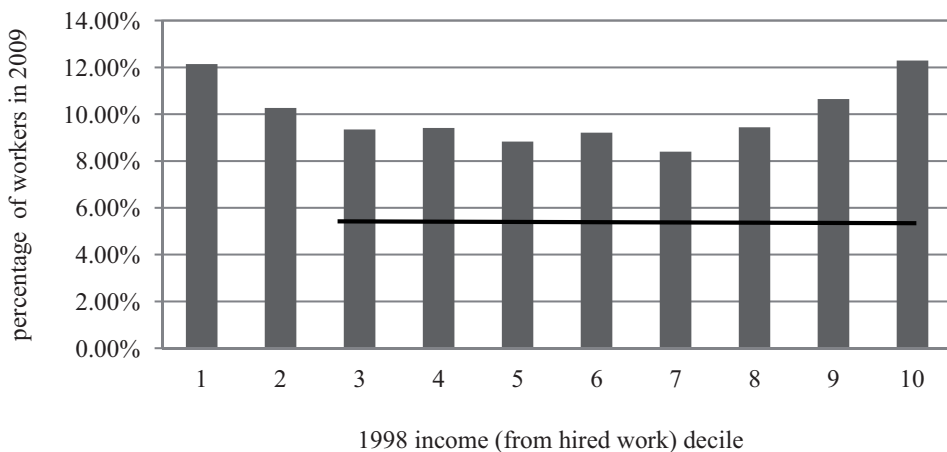

Fig. 2. Decile-based relative income (from hired work) distribution of workers in 2009, using 1998 as the baseline year
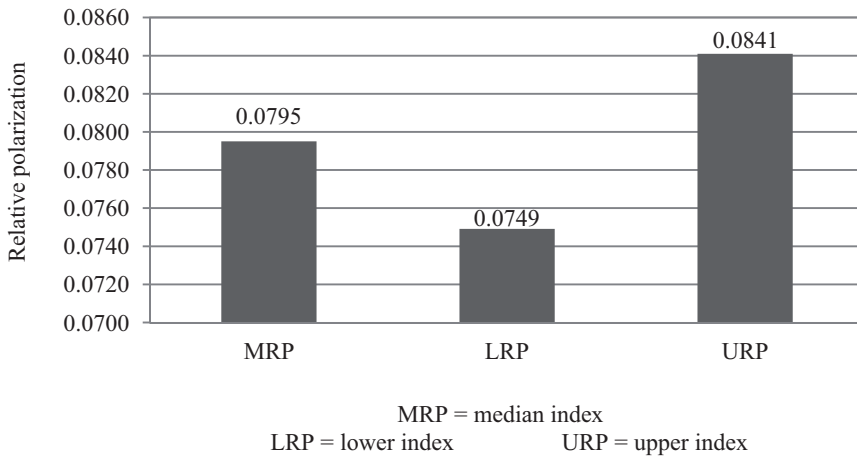
Source: author's own calculations.

MRP = median index
LRP = lower index   URP = upper index

Fig. 2a. Median, lower, upper polarization indices, workers, 2009, using 1998 as the baseline year

Source: author's own calculations.

in both low- and high wage jobs and a shrinking group of middle class worker. Therefore, the findings suggest that the main cause responsible for the distributional shifts in earnings is the type of jobs being generated by the structural changes in the Polish economy, not workers attributes. The polarization of the earning distribution suggests that the structural changes in the Polish economy have not created the conditions under which the stabile middle class could arise.

4.2. The dynamics of the distributional changes (the previous year as the baseline year)

In 1996-2009 the Polish economy experienced the decline in the real GDP growth rate (1997-2000), the stagnation (2001-2002), and the recovery and good prosperity until 2008, and finally the stagnation once again in 2009 (see Figure 3). The changes in growth can be useful as a framework to analyze the trends in the distribution movements.

Figure 4 presents the measures of relative polarization in 1999-2009. The median, lower and upper indices are calculated using the previous year as the baseline year. The question is whether it is possible to identify any trends in the distributional changes.

The economic stagnation in 2001-2002 created the polarization of the earning distribution, driven at the beginning more by downgrading (the movement of workers into the lower tail of the earning distribution) than by upgrading. Under the conditions of the low economic activity, demand for middle-wage jobs tended to diminish. Contrary during the period of the highest GDP growth (2006-2007),
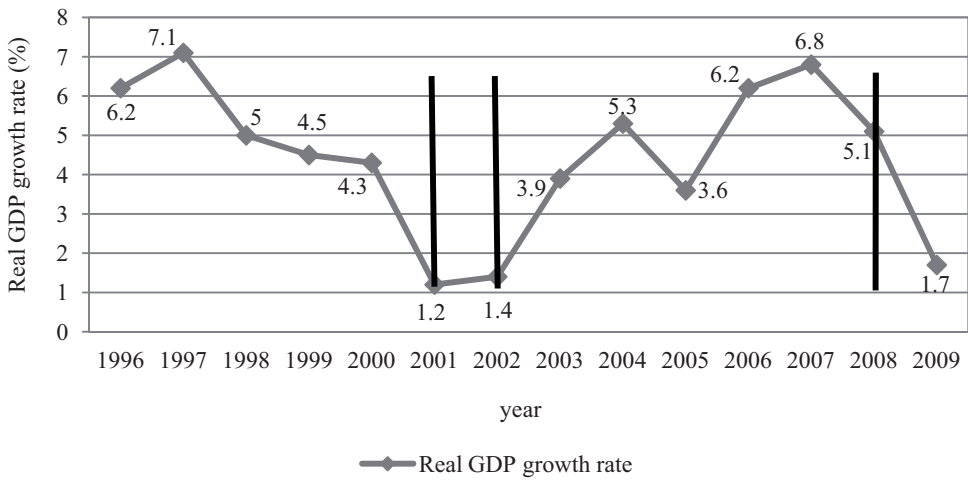
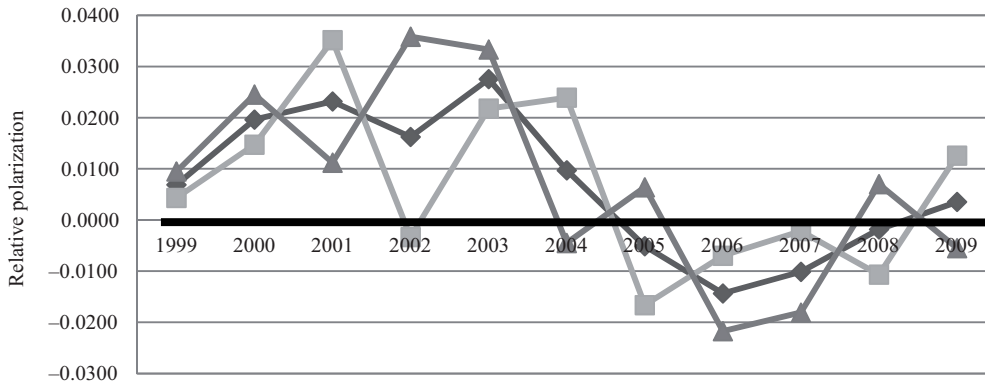**Fig. 3.** Real GDP growth rate, Poland, 1996-2009

Source: Eurostat.

Fig. 4. Median, lower, upper polarization indices for workers, 1999 to 2009, baseline = previous year

Source: author's own calculations.

when the economy created mostly demand for middle-wage jobs and less jobs both with the lowest and highest wages. The decline in the percentage of workers with the highest wages was more pronounced. This can signal that the economy is not enough innovative to create jobs for the professionals even during the high prosperity.

The findings suggests that the Rybczynski's effect does not work. The Rybczynski's effect predicts that if there is an increase in skilled-labour supply, the economy does not respond by lowering wages of skilled workers but by a change in sectoral output.

Table 2. The employment in the technology and knowledge-intensive sectors, by the level of education, as percentage of total employment, 2007-2004, Poland

	2007	2006	2005	2004
High-tech sectors (high-tech manufacturing and knowledge-intensive high-technology services)				
• Primary education	0.94	0.82	0.65	0.47
• Secondary education	2.77	2.45	2.54	2.39
• Tertiary education	**5.61**	**5.42**	**4.75**	4.77
High technology manufacturing sector				
• Primary education	–	–	–	–
• Secondary education	0.77	0.61	0.60	0.54
• Tertiary education	**0.55**	**0.62**	**0.56**	**0.56**
Medium high technology manufacturing sector				
• Primary education	2.63	2.22	2.05	2.00
• Secondary education	5.43	5.16	4.98	4.92
• Tertiary education	3.93	3.67	3.46	3.91
Low and medium low technology manufacturing sector				
• Primary education	15.07	14.59	14.21	13.12
• Secondary education	17.98	18.16	17.84	18.00
• Tertiary education	7.00	6.81	6.98	7.56
Total knowledge-intensive services				
• Primary education	10.23	10.40	9.62	10.84
• Secondary education	17.40	17.40	17.80	18.02
• Tertiary education	52.97	52.91	53.00	54.32
Knowledge-intensive high-technology services				
• Primary education	0.59	0.53	0.46	–
• Secondary education	2.00	1.84	1.94	1.86
• Tertiary education	**5.09**	**4.80**	**4.18**	**4.21**
Other knowledge-intensive services (excluding market, financial intermediation and high-tech services)				
• Primary education	5.90	6.18	6.15	6.59
• Secondary education	9.43	9.81	9.74	10.25
• Tertiary education	33.15	34.73	35.71	36.86
Total less-knowledge-intensive services				
• Primary education	14.35	13.83	12.56	13.06
• Secondary education	32.19	31.86	31.35	32.22
• Tertiary education	27.60	27.50	28.32	26.24

Source: Eurostat; the classification of high-tech sectors is presented on Eurostat's website.

A combination of higher output in the skill-intensive sector and lower output in the unskilled-intensive sector can potentially absorb the rise in skilled supply. Whereas

the Rybczynski's effect does not work if the change in sectoral output is not large enough to absorb the extended skilled supply and the economy can absorb the extra skilled labor only through relative wage changes [Rybczynski 1955].

The analysis of the employment in technology and the knowledge-intensive sectors, by level of education (see Table 2) shows that in 2004-2007, with dynamic growth, the high-tech sectors absorbed only small fractions of workers with tertiary and secondary education, respectively around 5% and 2.5% of total employment. A similar situation took place in the knowledge-intensive high-technology services. The relatively large fraction of tertiary-educated workers was employed in other knowledge-intensive services (excluding market, financial intermediation, and high-tech services), but this fraction was declining in 2004-2007. Moreover, wages in such services (health, education, public administration) do not depend on market forces. Seven percent of high-educated people were employed in low and medium low technology manufacturing sector and almost 30% in less-knowledge-intensive services.

If dynamic growth skill-intensive sectors were not developing intensively and absorbing skilled-labour supply, the skill premium could not increase. The analyses presented earlier do not support the "job-skill mismatch" theory, which suggests that the new service-based economy generates a considerable increase in the number of high-skill and well-paid jobs.

5. Conclusions

Polarization was the pronounced profile of changes in the earnings distribution in Poland in 2009, using 1998 as the baseline year. The movements of households from the middle to upper tail of the distribution, so-called "upgrading", were more visible than downgrading or the shifts from the middle to the lower tail of the distribution. The "job-skill mismatch" theory did not hold in the period between 1998 and 2009.

The findings suggest that the main cause responsible for the distributional shifts in earnings was the type of jobs being generated by the structural changes in the Polish economy, not workers attributes.

The analysis of the changes in the measures of relative polarization over time reveals that the profile of the earning distribution is influenced by business cycle. In the period of slower growth, the economy creates demand for lower and higher wage jobs (polarization), while under good prosperity a number of middle-wage jobs increases (convergence). The relatively lower demand for the professionals can mean that the economy is not innovative enough to absorb the skilled and educated, even during the high growth period.

The EU accession opened labour market for Polish workers and stimulated migration, referring considerably to unskilled labour. The Polish economy, dynamically growing in 2004-2007, has responded by the increase in lower-skill wages. The immigration of the lower skilled together with the relatively lower

demand for professionals resulted from low-developed high-tech sectors could be identified as the important factors responsible for relative convergence to the center of the earnings distribution observed in 2005-2007.

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POLARYZACJA A NIEDOPASOWANIE KWALIFIKACJI. WYNIKI NA PODSTAWIE WZGLĘDNEGO ROZKŁADU DOCHODÓW PRACOWNIKÓW W POLSCE W OKRESIE 1998-2009

Streszczenie: Celem artykułu jest zweryfikowanie dwóch hipotez dotyczących zmian w strukturze rynku pracy: polaryzacji i niedopasowania kwalifikacji. Badanie wykorzystuje względny rozkład oraz miary względnej polaryzacji – metody zaproponowane przez Morrisa, Bernhardta i Handcocka [1994]. Analiza obejmuje dochód z pracy najemnej, czyli zarobki. Źródłem danych są Badania Budżetów Gospodarstw Domowych w latach 1998-2009. Wyniki wskazują, że polaryzacja była dominującym wzorcem zmian w rozkładzie dochodów. Przesunięcie gospodarstw ze środka do górnej części rozkładu było bardziej widoczne, niż przesuniecie ze środka do dolnej części rozkładu. Rezultaty badania nie potwierdzają teorii niedopasowanych kwalifikacji. Analiza zmian miar względnej polaryzacji w czasie ujawnia wpływ cyklu koniunkturalnego na wzorzec rozkładu zarobków.