THE EVOLUTION OF EARNINGS INEQUALITY IN ROMANIA

PhD. *Maria Denisa VASILESCU*[1], *PhD Larisa STĂNILĂ*[2], *PhD Amalia CRISTESCU*[3i]

Rezumat

In this paper we investigated the earnings inequalities in Romania. Our approach starts with a statistical analysis regarding the Gini index among several personal characteristics (level of education, seniority, economic activity), for males and females and for the major groups of occupation. Second, we estimated two panel data models corresponding to each gender, aiming at observing different influences upon gross monthly earnings at industry level. We included in the analysis the turnover and the employees by educational attainment level for each gender and obtained that the variables considered have a positive impact on earnings, but with different intensities.

Key words: *Gini index, wage distribution, inequalities, gender differences*

JEL Classification: J31, D63

1. INTRODUCTION

One of the main areas of interest for labour economists is wage inequality: evolution; factors of influence; inequality at the bottom of the distribution; inequality among high wage groups; geographical inequality, including labour mobility; international differences in the wage distribution, particularly at the top; skill-biased technological change; globalization; returns to education; gender differences in wage inequality; personal characteristics explaining inequality.

All of these aspects, but most of all the increase of wage inequality over the last decades, led to a considerable amount of research in the field of labour economics. Increased wage inequality in Britain, the United States, but also in other countries has been extensively studied (Author et al., 2008; Machin, 2011). When analysing the situation in the United Kingdom, Stewart (2012) observed a continuous increase of inequality inside 90/10 percentile, since 1978. However, wage inequality increase is found in both halves of the wage distribution. Also, the author argues that an important feature of increasing inequalities in the mid-1990s was the different behaviour of dispersion in the two halves of the distribution: the inequality in the upper half of the distribution (measured by 90/50 percentile) continued to increase, while the lower (as measured by the 50/10 percentile) did not.

Izquierdo and Lacuesta (2007) investigated the evolution of inequality in Spain and found that in the period 1995-2002 the inequality decreased. This evolution is associated with a higher concentration in the middle part of the wage distribution and, to a lesser extent, with a small dispersion in the lower part. At the same time, the authors identified an increase in the top distribution of wages. They analysed the changes in labour composition (increased participation of women, increased university graduates and reduced length of seniority) in order to identify their impact on the evolution of inequality. The results suggested that changes in education and age have a strong influence on the growth of inequality, while

[1] National Scientific Research Institute for Labour and Social Protection, Bucharest Academy of Economic Studies, mariadenisa.vasilescu@gmail.com
[2] National Scientific Research Institute for Labour and Social Protection, ap_larisa@yahoo.com
[3] National Scientific Research Institute for Labour and Social Protection, Bucharest Academy of Economic Studies, cristescu_amalia@yahoo.com

changes in the participation of women in the labour market have an impact on the total dispersion of wages. Analysing the changes in the wage structure by using the quantile regression the authors identified a reduction in wage dispersion, which offset the increase in inequality induced by changes in the composition of the workforce. Thus, the authors argue that the main factor underlying the decline in wage inequality in Spain is the compression of wages across groups.

Newell and Socha (2007) analysed the growth of wage inequality in Poland during 1998-2002, claiming that it was associated with rapidly increasing returns to education for highly skilled workers in high-skill occupations and a relative decrease in the wages of workers who had only primary education. Rising within-skill group wages variability was concentrated at the upper and lower ends of the wage distribution and was associated with privatization and an increased share of young people in some low-wage occupations.

Regarding the determinants of earnings, the basic human capital model (Mincer, 1974) emphasises the importance of schooling and years of experience in the evolution of wages.

Returns to education have been calculated for a large variety of countries and years. Stimulated by the need to draw worldwide conclusions about the benefits of education, a number of studies have analysed the causal relationship between the level of education and wages. The main message arising from them is that schooling investments have a significant impact on wages (Budria and Pereira, 2011).

Psacharopoulos and Patrinos (2004) studied almost 100 countries over assorted ranges of years and found evidence that the OLS return to an additional year of schooling ranges from about 4 to 17 per cent and tends to be higher among low-income countries. Trostel et al. (2002) estimated returns to schooling in 28 countries using data from 1985 to 1995, founding average OLS estimates of 4.8 per cent for men and 5.7 per cent for women.

For the Romanian case there are some studies that have considered analysing the earnings, Cristescu et al. (2014), Aparaschivei et al. (2011), Antonie et al. (2010), Andreica et al. (2009), but they were more concentrated on the macroeconomic side, related to productivity and efficiency, than on inequalities and gender analysis of earnings.

Our study investigates the gender differences of Romanian earnings. We use two approaches to analyse earnings inequalities and the determinants of earnings for each gender. The dimension and the evolution of earnings inequalities are analysed using the Gini index and the percentile ratios for more information about the distribution. We consider the earnings inequality by level of education, seniority and economic activity. We continue our research with an econometric analysis, estimating two panel data models corresponding to each gender, in order to observe the factors influencing earnings in Romania and their magnitude depending on gender.

2. GINI INDEX

In order to assess the earnings inequalities we used the Gini index which measures the deviation of an individual's income distribution from a perfect egalitarian distribution. The Gini index was first described and published by the Italian statistician Corrado Gini in 1912. This index is frequently associated with the concentration graph introduced a few years earlier by Max Lorenz (1905). While the Lorenz curve gives a visual sense of the degree of inequality of income distribution, the Gini index gives a quantitative measure of inequality (Campano and Salvatore, 2006). The Gini index lies between 0 and 1, a value closer to zero meaning that the society has a more equitable income distribution, while if all income is concentrated in one income recipient the Gini index will be 1.

The Gini index calculated from a sample is a statistic and its standard error, or confidence intervals, should be reported, in order to have some information about the measure of bias. These can be calculated using bootstrap techniques (Karagiannis and Kovacevic, 2000).

It is known that the mean of earnings is not representative for the entire population; therefore the data can be grouped in order to obtain more homogeneity inside the groups. For the case of earnings, the criteria for grouping may be socio-economic (activity, occupation, residence, age, level of education) or statistical.

The most common statistical grouping is represented by the percentile - the value of a variable below which a certain percent of observations fall. In the analysis of earnings inequality one can study the insights of the distribution using a number of ratios between percentiles, more precisely p90/p10, p90/p50 and p10/p50. The 90/10 ratio indicates the gap between the richest and the poorest, the 50/10 ratio indicates the gap between the poorest and the median, and so on.

As for the socio-economic criteria, we chose to analyse the inequality of earnings grouped by level of education, experience and economic activity. When using grouped data we can obtain an underestimation of the inequalities, because grouping doesn't take into consideration intra-group inequality (Wodon and Yitzhaki, 2003). This problem can be solved by using either a parametric approach, which implies the association of a distribution to fill in the missing information about intra-group inequality (Gastwirth and Glauberman, 1976; Kakwani and Podder, 1973), either a non-parametric approach, which imposes assumption on the curvature of the Lorenz curve (Ogwang and Rao, 1996). In most practical cases, no assumption is imposed on the distribution of earnings and in cases that one has to rely on grouped data an important step is to test if the results are biased.

The data used in this analysis refers to the gross annual earnings of men, as well as women, and the study focuses on the inequalities between persons with different level of education, work experience in the company and sector of activity. Two years are taken into consideration, 2006 and 2010, the source of the data being the publication of the Romanian National Institute of Statistics "Wage disparities: factors of influence", publication released every 4 years, with 2 years delay compared with the analysed period. Also, for the year 2010 we analysed the inequalities between economic activities considering each major group of occupation.

YEAR	VARIABLE	GENDER	GINI INDEX	STANDARD ERROR*	PERCENTILE RATIOS		
					p90/p10	p90/p50	p10/p50
2006	Education	Male	0.3506	0.0809	7.630	3.821	0.501
		Female	0.3432	0.0783	6.081	3.746	0.616
	Seniority	Male	0.126	0.0644	2.540	1.061	0.418
		Female	0.1221	0.0546	2.259	1.064	0.471
	Economic activity	Male	0.2304	0.0581	2.487	1.763	0.709
		Female	0.2219	0.0541	2.370	1.436	0.606
2010	Education	Male	0.3356	0.0317	5.043	2.721	0.54
		Female	0.3445	0.039	4.326	2.538	0.587
	Seniority	Male	0.144	0.0647	2.875	1.148	0.399
		Female	0.1301	0.0585	2.646	1.193	0.451
	Economic activity	Male	0.2524	0.0453	3.200	1.995	0.623
		Female	0.255	0.0351	3.955	2.286	0.578

* All Gini indices were calculated by authors and are statistically significant at 1% level.

Table 1. Earnings inequality by education, seniority, economic activity

Table 1 shows that both before and after the crisis the education level (Gini index above 0.3) has the greatest influence on wage inequality, followed by the type of economic activity (Gini index above 0.2), while the last position is held by the length of activity in the company (Gini index above 0.1). The influence of education on wage differentiation is normal since high wages remunerate especially the highly skilled employees. Similarly, wage differences between fields of activity are normal because they reflect a normal distribution of the added value in favour of the more profitable economic sectors. The low value of the Gini index based on the seniority reflects both a tendency for performance pay (regardless of age) and the result of more frequent changes of the job and therefore a shorter duration of stability at the same job.

Generally speaking, during the period 2006 - 2010 the wage inequality for both genders increased slightly.

Depending on the level of education, the wage disparities among men decreased by 4.2% in 2010 compared to 2006 while in the case of women they increased by 0.37%. Based on the ratio between those with a high-income and those with low-income (p90/p10) we notice significant differences between the ends of earnings' distribution, in terms of education. The mostly educated male employees earn 7.6 times more than those with no education, while the highly skilled women have wages 6 times higher. Also we can see that the crisis has reduced this ratio by 34% among men and by 28.8% among women. The ratio between those with a high-income and those with an average-income (p90/p50) does not have significant differences between men and women in terms of the level of education and this difference between genders remains small even after the crisis despite the fact that it was reduced by 28.7% for men and by 32.2% for women.

Regarding the seniority, wage inequalities between men and women are not so obvious. The Gini index increased during the crisis both for men (by 14.2%) and for women (by 6.5%). The p90/p10 ratio also increased during the period 2006 - 2010, more for women (17.1%) and less for men (13.1%). The ratio between low wages and average wages (p10/p50) is higher for women than for men both before and after the crisis.

Considering the economic activities, wage inequalities increased during the period 2006 - 2010, although the differences in terms of gender are not significant. The Gini index increased among men from 0.230 to 0.252, and among women from 0.221 to 0.255. The wage differences between those with a high income and those with a low income (p90/p10) increased during the crisis for both genders (28.6% for men, 66.8% for women). The p90/p50 ratio increased by 13.1% for men and by 59.1% for women.

VARIABLE	Major group	GINI INDEX	STANDARD ERROR*	PERCENTILE RATIOS		
				p90/p10	p90/p50	p10/p50
Economic activity	MG1	0.2116	0.0371	3.048	2.172	0.712
	MG2	0.1899	0.0292	3.057	1.801	0.594
	MG3	0.1803	0.0325	2.618	1.837	0.702
	MG4	0.1286	0.0203	1.946	1.536	0.79
	MG5	0.1962	0.0311	2.831	2.029	0.717
	MG6	0.1008	0.0337	1.383	1.227	0.887
	MG7	0.2042	0.0365	2.793	1.933	0.692
	MG8	0.1914	0.0391	3.096	2.184	0.705
	MG9	0.1611	0.039	2.199	1.727	0.785

* All Gini indices were calculated by authors and are statistically significant at 1% level.

Table 2. Earnings inequality between economic activities by major groups of occupations[4] in 2010

When considering the major groups of occupations, the highest wage inequalities occur in MG1 (Gini index 0.2116) and MG7 (Gini index 0.2042). This is explained by the great diversity of job specializations in these major groups of occupations and of skill gradations (Table 2).

The lowest level of wage inequality is found in MG6 – *Skilled agricultural and fishery workers* (0.1008) and this is maintained for the p90/p10 and p90/p50 ratios.

High values for p90/p10 are noticed among *Plant and machine operators and assemblers* - MG8 (3.096), *Professionals* - MG2 (3.057) and *Legislators, senior officials and managers* - MG1 (3.048).

The *Professionals* category (MG2) is the one with the lowest level of wage differences between low wages and average wages (0.594).

3. EARNINGS

In this chapter we intended to analyse the factors that influence the evolution of the earnings considering some of the Romanian economic activities, NACE Rev. 2. Therefore, we used data on: the turnover, the employees by educational attainment level by gender and the gross monthly earnings by gender. The educational attainment levels considered in the study are the upper secondary and post-secondary non-tertiary education (ISCED 3 and 4) and the first and second stage of tertiary education (ISCED 5 and 6). In order to ensure the comparability of the data, we used the consumer price index to deflate the average monthly earnings and the turnover. Also, in the estimation process we decided to use log values for all the variables.

The analysis was conducted over a period of nine years (2004-2012), using panel data for a selection of Romanian economic activities. For the males equation we included the following economic activities: Mining and quarrying, Manufacturing, Electricity, gas, steam and air conditioning supply, Construction, Transportation and storage, Information and communication, Wholesale and retail trade, Education, Health and social work, Other services. For the females equation we included the following economic activities: Manufacturing, Electricity, gas, steam and air conditioning supply, Water supply, sewerage, waste management, Construction, Transportation and storage, Information and communication, Wholesale and retail trade, Hotels and restaurants, Education, Health and social work, Other services. The sources of the data were the Romanian National Institute of Statistics and the Eurostat Database.

The econometric analysis is based on panel data estimation, using the Stata software. We decided to use the panel data estimation because it is known that panels provide more data variability, more degrees of freedom, eliminates the collinearity (time series analysis is overshadowed by multicollinearity), capture more dynamic phenomena (as opposed to cross-sectional analyses that are static) (Baltagi, 2008).

Out of the linear panel data models, we turned our attention to the fixed effect model in order to control for time-invariant industry specific unobservable effects, considering the individual effects to be correlated with the explanatory variables.

[4] MG1 - Major group 1: legislators, senior officials and managers; MG2 - Major group 2: professionals; MG3 - Major group 3: technicians and associate professionals; MG4 - Major group 4: clerks; MG5 - Major group 5: service workers and shop and market sales workers; MG6 – Major group 6: skilled agricultural and fishery workers; MG7 – Major group 7: craft and related trades workers; MG8 – Major group 8: plant and machine operators and assemblers; MG9 – Major group 9: elementary occupations.

Thus, the general form of the model is the following:

$$earn_{it} = c + \beta_1 * t_{it} + \beta_2 * e34_{it} + \beta_3 * e56_{it} + \varepsilon_{it}$$

where:

earn – real average monthly gross earnings for each industry in year t, in natural logarithm, for males and females

t – turnover for each industry in year t, in natural logarithm

e34 – employees with upper secondary and post-secondary non-tertiary education, in natural logarithm, for males and females

e56 – employees with first and second stage of tertiary education, in natural logarithm, for males and females

When estimating such models, the default standard errors are considered to be independent and identically distributed (Cameron and Trivedi, 2009), homoscedastic and not serially correlated. When heteroskedasticity and/or serial correlation is present the standard errors of the estimates will be biased and a robust estimation is needed. In our particular case, we had to use a robust estimation in order to obtain unbiased results.

The estimation results for the males' case are presented below:

$$earnm_{it} = -9.05 + 0.35 * t_{it} + 1.30 * e34m_{it} + 0.86 * e56m_{it}$$

[-4.29]* [5.87]* [4.57]* [4.43]*

where between brackets are the t-Statistics values and * stands for 1% significance; the "m" in the variables refers to the males.

The results for the case of males largely confirm the results based on Gini index, in previous section of this paper. Thus, the turnover at industry level exerts a strong positive influence on the gross monthly earnings of males, indicating a demand effect. In other words, an increase in the turnover will lead to an increase in the labour demand and hence an increase in the earnings. The contribution of education to the earnings growth, which is positive and of large amplitude, also confirms the previous findings, but points out an apparent paradox through a higher value of the coefficient for the employees with upper secondary and post-secondary non-tertiary education (1.30) than that of the employees with first and second stage of tertiary education (0.86). The reason for this can be related on one hand to the large share of workers with a medium level of education, and on the other to the fact that both categories of workers (those with medium level of education, as well as those with higher level) are paid above the average wage.

The estimation results for the females' case are:

$$earnf_{it} = -7.42 + 0.39 * t_{it} + 0.67 * e34f_{it} + 0.72 * e56f_{it}$$

[-4.63]* [5.10]* [8.63]* [8.31]*

where between brackets are the t-Statistics values and * stands for 1% significance; the "f" in the variables refers to the females.

The results obtained in the case of females' earnings equation reflects similar influences, but with lower intensities in the case of education. In this case, the coefficient associated to the employees with first and second stage of tertiary education (0.72) is higher than that of the employees with upper secondary and post-secondary non-tertiary education (0.67). This shows that the investment in education pays off better in the case of females, particularly as a result of a more accentuated growth in the share of services (tertiary sector) in the Romanian economy in the analysed period. The structural changes that accompanied this phenomenon were favourable to the high skilled female work force. This aspect is confirmed also by the higher influence of the turnover (the coefficient in this case, 0.39, is higher than that obtained for the males' equation, 0.35).

4. CONCLUSIONS

Researchers have long documented the rise of wage inequality, the differences between

wages of college degree and high school diploma holders, as well as the increase in wage differentials measured within education and experience groups. Also, an issue that extensively caught the attention of labour economists was the gender pay gap and its determinants.

This paper broadens the international literature by bringing light on the situation of earnings inequality in Romania. We analysed the evolution pre and after the crisis regarding wage inequalities of men and women by level of education, seniority and sector of activity. Using Gini index, we found significant earnings inequality between different levels of education, both for males and females (Gini indices over 0.33). An important conclusion was drawn regarding the distribution of wages by level of education, the p90/p10 ratio indicating that high-skilled workers earn up to 7.6 times more than those with no education (males, 2006). These differences have diminished over time, so that the gap between the highly educated employees and those with no education dropped to 5 in 2010.

When grouped by economic activity, the Romanian earnings registered a moderate inequality, with Gini indices ranging from 0.22 (women, 2006) to 0.26 (women, 2010). The first thing that worth mentioning is that the inter-sectoral differences are higher for females and that the inequalities increased during the analysed period for both genders.

Regarding seniority, it seems that the number of years worked in the company doesn't give a great advantage in pay, the highest value for the calculated Gini indices was 0.14 (males, 2010). Compared to 2006, in 2010 the inequality slightly increased for males, as well as for females. The conclusion is that wages are mostly set according to performance and that seniority matters less than maybe we would expected.

As for the econometric analysis in which we estimated two panel data models, one for each gender, the factors that turned out to be statistically significant in determining the earnings for were the turnover and the level of education (expressed as number of employees in a sector with tertiary education and, respectively, upper secondary and post-secondary non-tertiary education). The turnover at industry level exerts a positive influence on the gross monthly earnings, stronger in the case of males. The level of education has a greater impact on earnings in the case of men. The interesting difference is that the coefficient for tertiary education is greater than the one for upper secondary and post-secondary education only for females, indicating a stronger influence of higher education on wages in the case of women.

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