

Wages of Czech Employees at the Beginning of the 3rd Millennium and the Impact of Economic Crisis on Wage and Income Development According to the Educational Attainment

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Abstract

The paper deals with the development of wage distribution by the educational attainment in the Czech Republic in the years 2003–2010, examining forty wage distributions as the object of research and the gross monthly wage in CZK as the research variable. It analyses the development of the wage distribution in time and the gross monthly wage in relation to the level of educational attainment. It also pursues the development of a minimum wage in the monitored period. The author gives special attention to the lowest guaranteed wage levels classified according to wage classes and work capability assessment, comparing the minimum wage to that of subsistence. The forecasts of future wage distribution are an integral component of the research, the financial standing of Czech households being evaluated in an international context within the European Union.

Keywords

Wage distribution, stages of education, characteristics of wage location and differentiation, development of wage, forecasts of wage distribution, impact of economic crisis on wages

JEL code

J31, G01, H24, E24, D31, O15

INTRODUCTION

In the Czech Republic, the development of employees' wages in the last two decades made us pay greater attention to their level and differentiation. Since the transition from command to market economy, the

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wage structure has changed, the level and differentiation increasing considerably. Groups of people with very high wages have increased in number and continue to grow markedly. When pursuing the development of wage differentiation, it has turned out that it is not enough to focus only on the evaluation of the current situation, estimating the future development on the basis of average wage classified according to various socio-economic, demographic and time-spatial aspects. It has proved useful to move from the level and differentiation characteristics to the entire frequency distribution. Estimates of the wage distribution development allow us to combine the wage differentiation of employees with socio-political aspects. It is not usually sufficient to estimate the level development of employees' wages, the compared numbers of workers with low, medium and high wages have to be estimated as well. The statistical analysis of employees' wages should form the basis for decisions in the state budget and social policy-making process. The direct relationship between the wages of employees and their purchasing power justifies monitoring of wage levels and their structure as well as the research of their distribution when tracking sales opportunities for products of both long- and short-term consumption. The distribution of wages should be, therefore, taken into account by entrepreneurs when they do market research. An estimate of the wage distribution supported by data indicating differentiation can determine the total amount of wages. The knowledge of the wage distribution of employees can be also used on other occasions, e.g. when setting the level of tax burden, etc.

Recently, many authors have dealt with the analysis of development and with modeling of wage and income distribution in the statistical literature, for example Bartošová and Bína (2007), Bílková (1995), Bílková (2012), Marek (2011), Malá (2011), Pacáková and Sipková (2007), Parker (1997) and more.

1 DATABASE

The article is divided into two parts. In the first part, the research variable is the gross monthly (nominal) wage in CZK monitored in the period between 2003 and 2010. This variable was studied in relation to the employees' educational attainment broken down into five levels of education: primary and incomplete, secondary without GCSE, secondary with GCSE, higher professional and undergraduate (first stage of tertiary) and graduate (second stage of tertiary) education. The necessary data were taken from the official website of the Czech Statistical Office. They are the data on sample sizes (see Table 1) and interval frequency distributions with extreme open intervals presented by the CSO website table "Percentages of employees in the bands of gross monthly wages by education". All calculations related to wages were based on the interval frequency distribution (incl. characteristics published by the Czech Statistical Office, calculated from the respective data) in order to ensure the comparability of the results obtained. The outcome accuracy can be compared from this perspective.

Table 1 Sample sizes of the wage distribution divided by the educational attainment

Stages of education	Year							
	2003	2004	2005	2006	2007	2008	2009	2010
Primary and incomplete	95 112	119 480	125 972	129 027	135 399	137 190	120 254	116 383
Secondary without GCSE	377 347	470 688	523 744	553 522	587 081	591 669	57 780	555 266
Secondary with GCSE	408 562	560 237	575 668	621 306	629 447	644 576	625 631	627 073
Higher professional and undergraduate	15 749	29 144	40 055	42 856	47 967	54 439	57 747	64 684
Tertiary (2 nd stage)	122 164	224 947	250 088	267 661	273 604	283 937	290 094	299 423

Source: www.czso.cz

The Czech Statistical Office draws the information on gross monthly wage growth from two sources – business reports and structural statistics. The former provide reliable data on wages in the national economy that can be classified by different criteria such as sectors and group sizes, not enabling, however, a more detailed classification. Structural statistics, on the other hand, provide the most detailed information on wages of individual employees, using various ways of sorting, particularly in terms of employment.

The second part of the paper focuses on the comparison of Czech households' financial position with that of the EU member states households, the net annual household income per consumption unit (equalised income) in EURO being the research variable, i.e. the nominal income again. We used this variable for international comparisons within the European Union because of a uniform methodology of the EU-SILC statistical survey (Statistics on Income and Living Conditions) being employed across the EU. The monitored period is 2005–2010, as the data on the median income for almost all EU member states have already been available (except for Bulgaria and Romania). The variable was studied in relation to the educational attainment of the head of household. In two-parent (husband-and-wife) families, the head of household is always a man regardless of the economic activity. In single-parent families (one parent with children) and non-family households, whose members are related neither by marriage nor partnership or parent-and-child relationship, the first criterion for determining who is the head of household is the economic activity, the second one being the individual incomes of household members. The latter criterion also applies for more complex types of households. Small sample sizes where the head of household is female are observable, a man being the most common head of household. The conversion of income per consumption unit is used as it reflects the situation of households better than that of income per person. The following units can be used for the conversion purposes:

- a consumer unit defined by an OECD scale with the following coefficients: first adult in the household = 1, a person older than 13 years (other adults) = 0.7, another 13-year-old or younger child = 0.5;
- a consumer unit defined by an EU scale (a modified OECD scale) with the following coefficients: first adult in the household = 1, a person older than 13 years (other adults) = 0.5, another 13-year-old or younger child = 0.3.

In this research, the consumer unit defined by the EU scale was applied. The values of the median (middle income) by the educational attainment were obtained from an official Eurostat website, median income values having been used in an international comparison within the European Union. Information on sample sizes is, therefore, not required for the income distribution. We know from experience, however, that these sample sizes are much smaller (thousands at maximum) than those of the wage distribution. (The three stages of education – based Eurostat terminology – are: pre-primary, primary and lower secondary education; upper- and post-secondary [non-tertiary] education; first and second stage of tertiary education.)

Microsoft Excel spreadsheet and Statgraphics and SAS statistical programs were used for data processing. The Internet data were tested from two or three independent sources. Because the nominal wage and nominal income are researched, Table 2 gives some idea of the development of the average annual inflation in the period.

Table 2 Average annual inflation rate in the years 2003–2010 (in %)

	Year						
	2004	2005	2006	2007	2008	2009	2010
Inflation rate	2.8	1.9	2.5	2.8	6.3	1.0	1.5

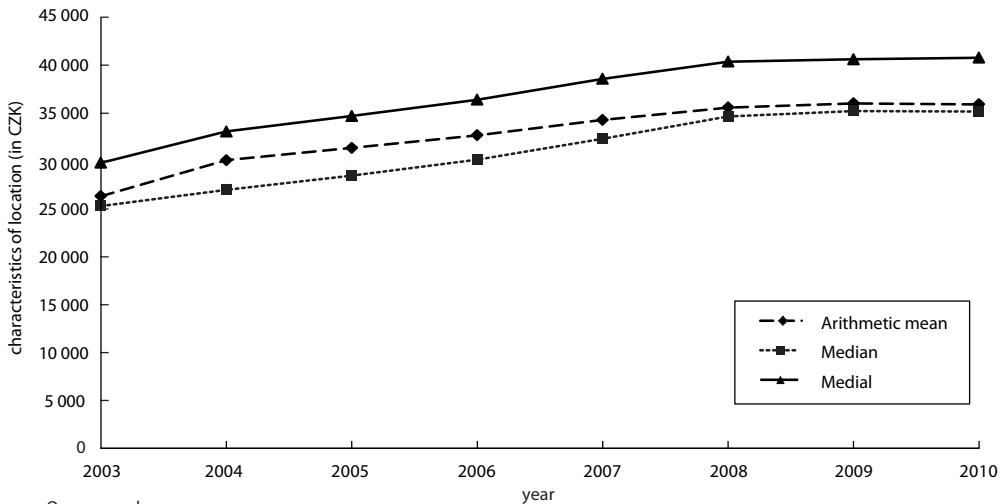
Source: www.czso.cz

2 DEVELOPMENT OF SAMPLE CHARACTERISTICS OF WAGE DISTRIBUTION

The construction of descriptive characteristics is explained in Triola (2003), or Bílková and Malá (2012). Sample characteristics of the location, variability and shape of the wage distribution were calculated in the research period.

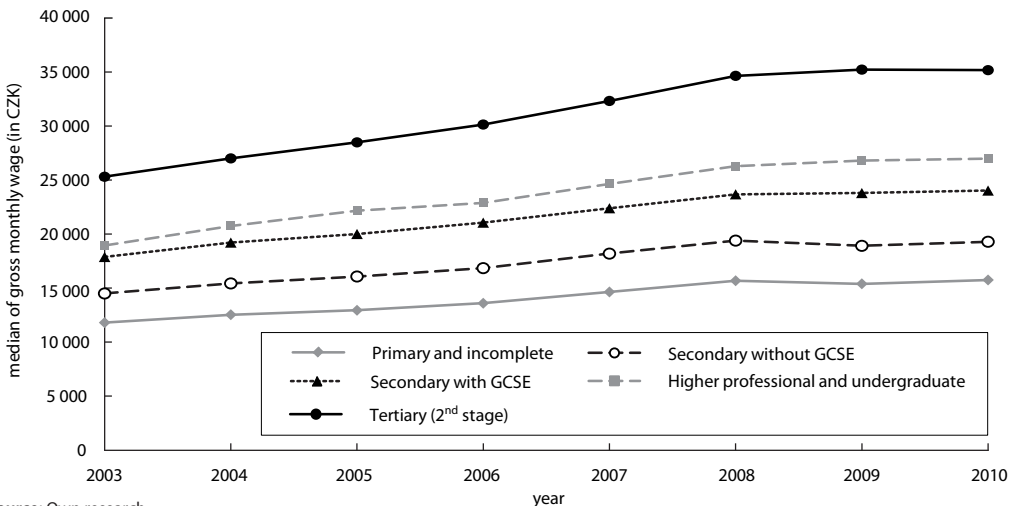
The arithmetic mean, median (middle wage) and medial represent the location characteristics. (The medial is a remarkable location characteristic; households with the wage lower or equal to the medial receive a half of the total wage in the sample, those with the wage higher or equal to the medial receiving the other half.) Figure 1 presents the development of the three location characteristics for tertiary education during the research period.

Figure 1 Development of characteristics of location of gross monthly wage (in CZK) in the years 2003–2010 for tertiary (2nd stage) education



Source: Own research

Figure 2 Development of median of gross monthly wage (in CZK) in the years 2003–2010 by the educational attainment



Source: Own research

It shows that for all researched wage distributions, the relation is valid. This relationship is typical of a positively skewed frequency distribution, the wage distribution being characterized exactly by positive skewness. The median is more often used as a wage location characteristic since the absolute majority of employees do not reach an average wage. The median is a less frequent characteristic of the wage distribution level. Figure 2 presents the development of the median of the wage distribution according to the level of education completed.

It gives an overview of the impact of educational attainment on the level of wages. Well-marked differences in the level of wages by the educational attainment are apparent. It can be concluded that the wage level rises with an increasing level of education. It is not, however, a linear rise. The largest difference between the last two levels of education, i.e. between higher professional or undergraduate and (the second stage of) tertiary education, is significant. Tertiary-educated employees are paid by far the highest salaries, their wage levels being markedly different from other groups. In 2010, the middle wage of employees with tertiary education was more than CZK 8 000 higher than that of workers who received higher professional education or bachelor's degree, and almost 2.25 times higher than that of workers with primary or incomplete education. It is also evident from Figure 2 that during the financial crisis which began in autumn 2008, the growth of wages in the Czech Republic practically stopped in all categories of employees researched in this study. Table 3 presents the growth coefficients and average annual growth coefficients of the arithmetic mean and median of the gross monthly wage in the period 2003–2010 in the Czech Republic according to the educational attainment. In terms of both the arithmetic mean and median, we can see a much smaller average annual growth rate of wages in the period 2008–2010 than in 2003–2008. In economic recession, only a slight increase in wages of employees with different levels of education has been recorded. (Even tertiary graduates' level of wages decreased between the years 2009 and 2010, the wages of employees with primary or incomplete education and secondary education without GCSE having gone down between 2008 and 2009.) We observe the highest average annual growth rate for the entire monitored period in the category of higher professional and undergraduate education (the average wage increasing by an average of 5.3% and the middle wage by an average of 5.2% per year) and the lowest average annual growth rate in the category of primary and incomplete education (the average wage increasing by an average of 3.7% and the middle wage by an average of 4.2% per year, respectively). On the other hand, we do not see striking differences between various categories of educational attainment in the average annual growth rate. Table 4 presents the average and middle wage forecasts for 2011 and 2012 in relation to the educational attainment. These forecasts are based on the past development of the wage distribution during the years 2003–2010 (see Chapter 5).

Table 3 Growth coefficients and average annual growth coefficients of the arithmetic mean and median of gross monthly wage in the period 2003–2010 in the Czech Republic according to the educational attainment

Year	Stages of education completed									
	Primary and incomplete		Secondary without GCSE		Secondary with GCSE		Higher professional and undergraduate education		Tertiary (2 nd stage)	
	Arithmet. mean	Median	Arithmet. mean	Median	Arithmet. mean	Median	Arithmet. mean	Median	Arithmet. mean	Median
2003	–	–	–	–	–	–	–	–	–	–
2004	1.009	1.062	1.044	1.064	1.082	1.074	1.121	1.095	1.142	1.067
2005	1.053	1.033	1.048	1.042	1.045	1.041	1.060	1.068	1.043	1.055
2006	1.086	1.050	1.062	1.048	1.052	1.052	1.045	1.032	1.042	1.058
2007	1.030	1.077	1.068	1.080	1.060	1.063	1.058	1.077	1.049	1.072
2008	1.077	1.071	1.070	1.066	1.061	1.058	1.064	1.066	1.038	1.072
2009	0.979	0.982	0.972	0.975	1.002	1.005	1.018	1.020	1.012	1.017
2010	1.027	1.023	1.020	1.020	1.006	1.010	1.006	1.007	0.997	0.999
∅ 2003–2008	1.051	1.058	1.058	1.060	1.060	1.058	1.069	1.068	1.062	1.065
∅ 2008–2010	1.003	1.002	0.996	0.997	1.004	1.007	1.012	1.013	1.005	1.008
∅ 2003–2010	1.037	1.042	1.040	1.042	1.044	1.043	1.053	1.052	1.045	1.048

Source: Own research

Table 4 Forecasts of the arithmetic mean (in CZK) and median (in CZK) for 2011 and 2012 based on the development in previous years

Stages of education	Arithmetic mean		Median	
	Year 2011	Year 2012	Year 2011	Year 2012
Primary and incomplete education	16 530	16 763	15 945	16 194
Secondary education without GCSE	20 367	20 473	19 113	19 163
Secondary education with GCSE	26 388	26 486	23 843	24 064
Higher professional and undergraduate education	29 759	29 849	26 673	26 746
Tertiary education (2 nd stage)	35 708	35 014	33 434	33 384

Source: Own research

Sample characteristics of absolute and relative variability (both the standard deviation and the coefficient of variation) were calculated. From an interpretation perspective, the standard deviation indicates how particular gross monthly wage values deviate on average from their arithmetic mean. The standard deviation is constructed as a quadratic average of these deviations. The coefficient of variation is the ratio of standard deviation to the arithmetic mean, indicating (and usually expressed – when multiplied by a hundred – as) a percentage of standard deviation to the arithmetic mean. The characteristic of absolute variability – standard deviation – increased during the years 2003–2008, i.e. from the beginning of the research period until the beginning of the global economic crisis, in all given categories of educational attainment, with the exception of tertiary education. In the category of tertiary education, the standard deviation of wages rose sharply between 2003 and 2004 and then, having declined gradually till 2009, it increased slightly again between 2009 and 2010. As the characteristic of absolute variability changes over time, the data cannot be considered homoscedastic within the meaning of the same variability of distributions. The characteristic of relative variability – the coefficient of variation – also increased substantially between 2003 and 2004 for all given categories of educational attainment. In the following years, the coefficient of variation rather fluctuated, showing a slightly decreasing trend for all given categories of educational attainment with the exception of secondary education without GCSE. We can also observe from the shape characteristics of the distribution that all researched wage distributions are positively skewed, which is typical just for the wage distribution.

3 DEPENDENCE OF THE WAGE ON THE LEVEL OF EDUCATIONAL ATTAINMENT

Table 5 provides an overview of the wage differentiation in terms of intragroup and intergroup variability. We can see from this table that in the process of decomposition of total variability into intragroup and intergroup components, intragroup variability clearly dominates over intergroup variability (the source of the wage dependence on the educational attainment). Total variability represents the variability of wages of individual employees around the total average wage calculated together for all categories of educational attainment. Intragroup variability, on the other hand, is the variability of wages of individual employees around the average wage in a respective category of educational attainment, intergroup variability being the variability of average wages in various categories of education attainment around the total average wage calculated together for all categories of educational attainment. The sum of intragroup and intergroup variability yields total variability; i.e. the sum of average variance and the variance of averages is equal to total variance. As already mentioned above, the source of dependence of the wage on the level of educational attainment is the variability of average wages in various categories of educational attainment around the total average wage for all employees altogether. This means that the more intergroup variability contributes to total variability, i.e. the less intragroup variability contributes to total variability (the sum of intra and inter-group variability yielding total variability), the stronger the wage depend-

ence on the level of educational attainment and vice versa. Thus, we can see from the decomposition of total variability into two individual components in Table 5 that the dependence of the wage on the level of educational attainment is not too strong in all monitored years.

Table 5 Total average (in CZK), variance components – intragroup and intergroup variance (both in CZK²), total variance (in CZK²), total standard deviation (in CZK) and the total coefficient of variation (in %)

Year	Total average	Average variance (intragroup)	Variance of averages (intergroup)	Total variance	Total standard deviation	Total variation coefficient
2003	17 938	41 563 482 73.71%	14 826 227 26.29%	56 389 708 100%	7 509	41.86
2004	19 943	71 110 787 72.33%	27 197 442 27.67%	98 308 230 100%	9 915	49.72
2005	20 884	73 917 878 71.19%	29 913 665 28.81%	103 831 543 100%	10 190	48.79
2006	22 052	78 945 914 71.98%	30 725 907 28.02%	109 671 820 100%	10 472	47.49
2007	23 221	86 807 711 71.89%	33 943 680 28.11%	120 751 391 100%	10 989	47.32
2008	24 694	91 773 158 73.05%	33 862 539 26.95%	125 635 697 100%	11 209	45.39
2009	27 101	99 768 934 72.51%	37 821 881 27.49%	137 590 815 100%	11 730	43.28
2010	25 130	92 616 356 71.69%	36 569 695 28.31%	129 186 051 100%	11 366	45.23

Source: Own research

Table 6 Hypothesis test about the independence of the gross monthly wage on the level of educational attainment

Year	Value of test criterion F	Critical value	Ratio of determination (in %)	P-value
2003	90 866	2.37193	26.29	0.00000
2004	134 292	2.37193	27.67	0.00000
2005	153 328	2.37193	28.81	0.00000
2006	157 079	2.37193	28.02	0.00000
2007	163 593	2.37193	28.11	0.00000
2008	157 906	2.37193	26.95	0.00000
2009	109 132	2.37193	27.49	0.00000
2010	164 142	2.37193	28.31	0.00000

Source: Own research

We can also conclude from Table 5 that the total standard deviation of wages (for all categories of educational attainment together) increased gradually from 2003 to 2009. A slight decline was recorded between 2009 and 2010. The characteristic of absolute variability of all employees' wages changes in time again. The total coefficient of variation representing the characteristics of relative variability increased markedly between 2003 and 2004, decreasing gradually until 2009. A slight increase was recorded be-

tween 2009 and 2010. We can still look at the development of the total average wage for all categories of employees altogether in Table 5. The average wage grew between 2003 and 2009, essentially in a linear way. Then it fell markedly between 2009 and 2010 probably due to the economic recession.

Table 6 is directly linked to Table 5 giving an overview of the statistical dependence of gross monthly wage on the educational attainment. Having applied a test analysis of variance known as ANOVA (one-factor), the above mentioned dependence was verified for each year of the period (see Roberts and Russo (1999), or Turner and Thayer (2001)).

In the test of ANOVA: H_0 : Gross monthly wage does not depend on the level of educational attainment; H_1 : Gross monthly wage depends on the level of educational attainment. Critical value is $F_{0.95}(k-1; n-k)$ – i.e. 95 percent quantile of F-distribution with $v_1 = k-1$ and $v_2 = n-k$ degrees of freedom, where k is the number of levels of educational attainment, which were considered ($k=5$), n being the sample size, see Table 1. P-value is $P(F \geq F_{\text{vyp}})$ – i.e. probability that the random variable F having the F-distribution with $v_1 = k-1$ and $v_2 = n-k$ degrees of freedom takes value at least equal to the calculated value of a test criterion.

The gross monthly wage dependence upon the educational attainment was demonstrated for virtually any commonly used significance level ($\alpha = 0.05$) with regard to large sample sizes typical for the research of the wage distribution. The critical value for a given number of five decimal places remains consistent in all years of the research period, probably due to large sample sizes used. The same is also valid for the so called P-value, which is the smallest significance level at which we can still reject the tested (null) hypothesis.

We can see from Table 6 that the values of test criterion F amply exceed the critical value in all cases. This is because such large sample sizes that are used in the case of wage distributions equate to a very high power of the test. Thus the test leads unambiguously to the rejection of the tested hypothesis, assuming the independence of wages on the level of educational attainment. The same conclusion has to be drawn from the comparison of P-value and the significance level. We can see from Table 6 that the significance level $\alpha = 0.05$ clearly exceeds the corresponding P-value in all cases. Let us add that the significance level α presents the probability of error of the first type, i.e. the probability that we reject the tested hypothesis (hypothesis of independence), although it is valid. It is evident from Table 6 that the tested hypothesis is rejected, using any significance level in this case ($\alpha = 0.10$ and even $\alpha = 0.01$). A one-way analysis of the variance test (known as ANOVA) clearly leads to the rejection of the tested hypothesis about the independence of the wage on the educational attainment. We can, therefore, conclude that the dependence of wages on the level of educational attainment is proved with 5% (as well as 1%) risk of error. Or, the dependence of the wage on the level of educational attainment is statistically significant at a 5% (as well as 1%) significance level. The ratio of determination then gives the intensity of dependence, i.e. the share of intergroup and total variability. It can take its value from the interval

The closer to one is the value of ratio of determination, the stronger the dependence and vice versa. The determination ratio is presented in percentage terms (when multiplied by a hundred), taking values from the interval The dependence of the wage on the level of educational attainment has been proved. From Table 6 we can see, however, that it is a considerably weak intensity dependence. The values of the ratio determination range from 26.29% to 28.81%.

4 MINIMUM WAGE

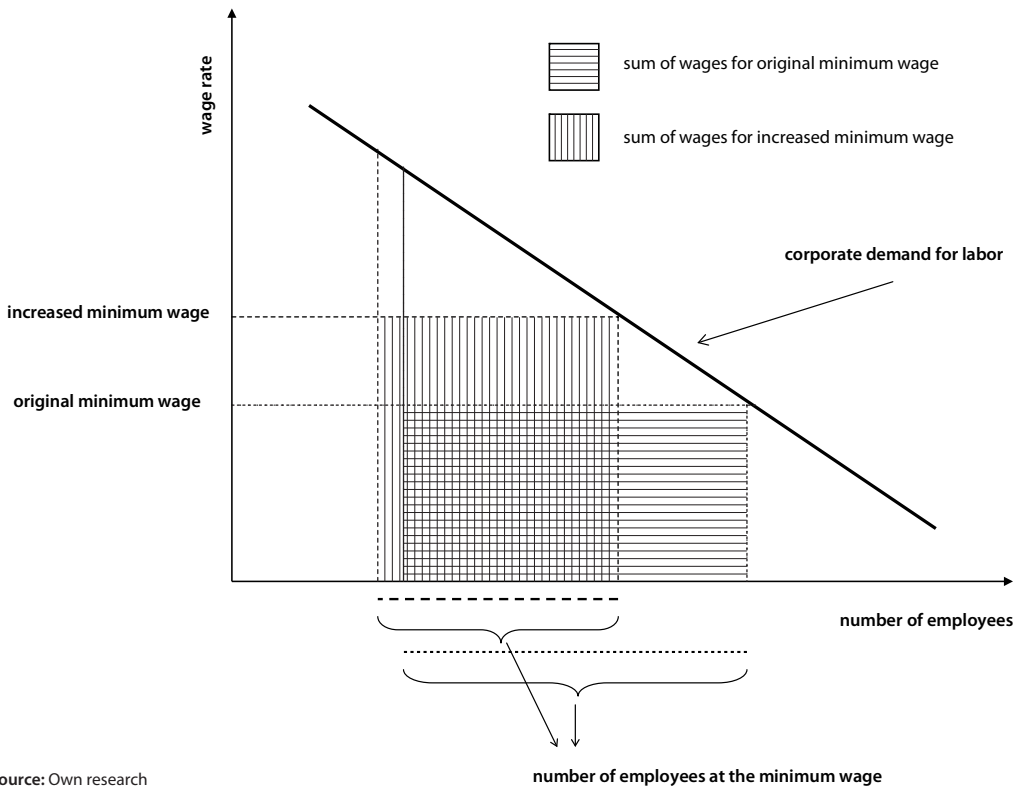
In statistical calculations, the first percentile is conventionally used as a characteristic of the minimum wage, the 99th percentile being then used as a characteristic of the maximum wage. The first decile is used to define low wages (those less or equal to the first decile), the 9th decile being then used for the definition of high wages (those at least equal to the ninth decile). The legislation, however, is different, the minimum wage being set by law.

The wage distribution is strongly influenced by the minimum wage. Workers' wages would presumably decline if the minimum wage was reduced or even abolished. The changes are naturally reflected in characteristics of the location, variability and shape of the wage distribution.

Fixing the minimum wage is a special case of price regulation. If the established minimum wage was lower than all market wages, the arrangement would have no effect. It is unlikely anyway. The minimum wage is fixed at a higher level than some market-set wages. This would affect those workers whose wages would otherwise be below the minimum wage. Their employers belong apparently to another affected group. If workers receive wages as a marginal product of labor before the implementation of minimum wage legislation, the introduction of the minimum wage may lead to reduction in their employers' profits. Under otherwise identical circumstances, the employer can increase the profit by making these workers redundant. The firm does not have to dismiss all the workers whose wages were initially below the minimum wage. It would be sufficient if such a number of workers were dismissed so that the marginal product of labor could increase to the minimum wage at least.

Finally, the growth of a relative price of goods results in the firm not having to reduce the number of workers to the point where their marginal product would correspond to the minimum wage at original prices. The introduction of the minimum wage leads to some redundancies of workers in a particular sector. This, however, results in an increase of the real value of wages in given sectors at the expense of real wages in other sectors. Table 7 presents the development of general rate of unemployment (in %), the number of job seekers registered and the number of vacancies in the years 2003–2010. Figure 3 presents the effect of minimum wage increasing to the number of workers employed.

Figure 3 Effect of minimum wage increasing to the number of workers employed



Source: Own research

Table 7 Development of general rate of unemployment (in %), the number of job seekers registered and the number of vacancies in the years 2003–2010

Year	2003	2004	2005	2006	2007	2008	2009	2010
General rate of unemployment	7.8	8.3	7.9	7.1	5.3	4.4	6.7	7.3
Number of job seekers registered	542 420	541 675	510 416	448 545	354 878	352 250	539 136	561 551
Number of vacancies	40 188	51 203	52 164	93 425	141 066	91 189	30 927	30 803

Source: www.mpsv.cz, www.czso.cz

Real wages of workers who receive the minimum (or nearly minimum) wage would probably decrease if it was reduced or completely abolished. Firms would hire new workers with a lower marginal product of labor and the price of goods would also decline. As a result, the conditions of current workers would deteriorate. Trade unions usually stand for this group of low-income workers, opposing minimum wage cuts. Employers and enterprise owners, on the other hand, are against (raising) the minimum wage as it lowers their profits. Political parties differ in their approach to the implementation and existence of the minimum wage, depending on which side of the political spectrum they represent.

Interaction between the minimum wage and social benefits is important. When deciding on the supply of labor for a given minimum-wage, workers have to compare the minimum wage with the amount of unemployment (or other social) benefits they would receive if they did not work. An increase of the minimum wage would make the difference between the wages and benefits bigger. That would lead to a new (higher) minimum wage of some previously unemployed people and a decline in the unemployment rate due to the minimum wage increase. This, however, does not explain why new jobs should be created. If no new jobs are created, some voluntarily unemployed people would just become involuntarily unemployed.

There are some measures taken in order to prevent wage increases, wage control being one of them. It is an extreme economic-political arrangement made only exceptionally by the governments in market economies.

The minimum wage is the lowest permissible level of remuneration an employer must pay to employees for their work. Its basic legal provision can be found in the Labor Code. The minimum wage applying to all employees or people hired on the basis of a work contract. Table 8 indicates the development of a minimum gross monthly wage in the years 2003–2010. It is evident from the table that the minimum wage has not changed since 2007, having stayed at CZK 8 000.

Table 8 Minimum gross monthly wage (in CZK) for a forty-hour working week ^[1] from 1 January 2006 to 30 June 2006, ^[2] from 1 July 2006 to 31 December 2006]

Year	2003	2004	2005	2006	2007	2008	2009	2010
Minimum wage	6 200	6 700	7 185	7 570 ¹⁾ 7 955 ²⁾	8 000	8 000	8 000	8 000

Source: www.mpsv.cz

The minimum wage concept is associated with some common misinterpretations. It seems obvious that the remuneration cannot be lower than CZK 8 000 per month (or CZK 48.10 per hour), i.e. the amount provided by government. However, a lot of people are unaware of the fact that most employees receive much higher minimum. This is the guaranteed wage, i.e. minimum tariffs for different groups of workers. The minimum wage, in fact, forms a real basis valid for the least skilled workers. Higher rates – the so called guaranteed wage levels – are crucial for most employees. There are higher levels of minimum

wages for specific occupations. The guaranteed wage has eight levels set by the Government Regulation No. 567/2006 Sb. They are known as the previous “minimum wage tariffs” or “wage groups”. Different levels are distinguished by the complexity, responsibility and strenuousness of work from the least-skilled and worst-remunerated work (the first group) to the most-qualified and best-paid (the eight group), see Table 9. The table provides an overview of minimum levels of the guaranteed wage for the given weekly working time of 40 hours graded according to the complexity, responsibility and strenuousness of work done, valid in 2012. The minimum amount set for the lowest group equals the minimum wage, other groups receiving a higher amount.

Table 9 Current minimum levels of guaranteed wage for the given weekly working time of 40 hours graded according to the complexity, responsibility and strenuousness of work performed – classified into eight income brackets (in CZK)

	Group work	Hourly wage	Monthly wage
1	Work in the first and second grade	48.10	8 000
2	Work in the third and fourth grade	53.10	8 900
3	Work in the fifth and sixth grade	58.60	9 800
4	Work in the seventh and eighth grade	64.70	10 800
5	Work in the ninth and tenth grade	71.50	12 000
6	Work in the eleventh and twelfth grade	78.90	13 200
7	Work in the thirteenth and fourteenth grade	87.10	14 600
8	Work in the fifteenth and sixteenth grade	96.20	16 100

Source: <http://business.center.cz>

In practice, remuneration may not be lower than the wage guaranteed for particular jobs by the government. This applies not only to people in employment, but also to employment agreements or contracts for work; no matter whether it is a contract for a fixed or indefinite period. It is not relevant either whether it is just a second job or an extra income. The entitlement to the minimum wage arises independently in such a case. All levels of the minimum (guaranteed) wage apply to all private entrepreneurs, the system of sixteen wage tariffs being applicable to a non-business sphere as well.

Table 10 Current gross minimum wage rates for workers with limited work ability

Percentage of the basic amount of gross monthly minimum wage	Limited work ability reasons
90% that is 7 200 CZK monthly, i.e. 43.30 CZK hourly	the first employment of a person aged from 18 to 21, namely a period of six months from the start of the employment
80% that is 6 400 CZK monthly, i.e. 38.50 CZK hourly	a young employee
75% that is 6 000 CZK monthly, i.e. 36.10 CZK hourly	an employee who receives a partial disability pension
50% that is 4 000 CZK monthly, i.e. 24.10 CZK hourly	an employee who receives a full disability pension, or a young employee who is totally disabled and is not entitled to a full disability pension

Source: <http://business.center.cz>

Table 10 presents current gross minimum wage rates for those with limited work ability in 2012. A monthly rate of the minimum (guaranteed) wage allows for a weekly working time of 40 hours. If an employee negotiates shorter working hours, the minimum wage is reduced in proportion to his/her real

hours of work. If this is the first employment of a person aged from 18 to 21, the corresponding minimum is reduced to 90 per cent, see Table 10. The reduction, however, is valid only in the first six months after the conclusion of the first employment contract. Juvenile employees who are under eighteen years of age are entitled to only 80 per cent of the corresponding minimum. The minimum is reduced for people receiving partial or full disability pension to 75 and 50 per cent respectively.

If in a particular calendar month the wage is lower than the minimum, the employer has to pay it up to the given minimum regardless of whether the employee him/herself has caused a poorer performance. It should be pointed out that various premiums (for overtime, holidays, weekends, night work, etc.) and wage compensations (including travel expenses and remuneration for operating emergency cases) are not included in the mentioned monthly amount.

Various social benefits are related to the minimum wage. The subsistence wage is a socially recognized amount of money covering basic personal needs. The subsistence level fulfills a crucial role in measuring material poverty and as a socio-protective value. A basic subsistence does not include the necessary housing costs that are covered by housing allowances. Jointly assessed persons are: parents and dependent minors (children under 15); a husband and wife or registered partners; parents and children (both minors and adolescents) if they share an apartment with parents and are not raised by other people; other persons sharing an apartment (if they do not supply evidence of neither living nor covering costs of living together permanently). Table 11 shows the subsistence monthly wages valid in the Czech Republic in 2011 and 2012.

Table 11 Current subsistence amounts valid in the Czech Republic (in CZK) per month

Type of household in terms of its members		From 1 January 2007 to 31 December 2011	From 1 January 2012
For individuals		3 126	3 410
For the first adult in the household		2 880	3 140
For the second and other adults in the household		2 600	2 830
For a dependent child aged up to:	6 years	1 600	1 740
	15 years	1 960	2 140
	26 years	2 250	2 450

Source: <http://portal.mpsv.cz>

5 FORECASTS OF WAGE DISTRIBUTION

Table 12 presents the forecasts of wage distribution according to the stages of education completed for 2011 and 2012. It shows the percentages of employees in the bands of gross monthly wages (in CZK) calculated on the basis of the development of wage distribution between 2003 and 2010, including the period of the global economic crisis since autumn 2008.

The process of these calculations is not presented here in detail. The three-parametric lognormal probability distribution has been used here as a theoretical distribution, see Bartošová (2006), and Kleiber and Kotz (2003). It is one of the most widely used probability distributions in wage and income modeling. A lesser-known method, the L-moments method, is employed to estimate parameters of this theoretical distribution, see Hosking (1990) and Kyselý and Pícek (2007). The advantages of this method of parameter estimation in terms of its accuracy are indisputable. L-moments are linear functions of data, thus being more resistant to the influence of sampling variability. They are more robust than conventional moments, being resistant to the existence of outliers in data and enabling better conclusions on basic probability distribution (even in the case of small samples). L-moments sometimes bring even more efficient parameter estimations of parametric probability distributions than the estimates made by a maximum likelihood method. It has been proved in practice that L-moments are less prone to the bias of estima-

tion compared to conventional moments, an approximation by asymptotic normal distribution being more accurate in final samples.

Table 12 Forecasts of wage distributions for 2011 and 2012 according to the educational attainment – proportions of employees (in %) in the bands of gross monthly wage (in CZK)

		Stages of education									
		Primary and incomplete education		Secondary education without GCSE		Secondary education with GCSE		Higher professional and undergraduate education		Tertiary (2 nd stage) education	
Interval	Year	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
0 – 5 000		3.42	2.35	0.38	0.23	0.00	0.00	0.00	0.00	0.00	0.00
5 001 – 10 000		14.44	13.14	6.94	6.32	0.00	0.00	0.00	0.00	0.00	0.06
10 001 – 15 000		26.68	27.26	20.93	21.04	6.25	5.11	0.45	0.44	0.13	1.14
15 001 – 20 000		26.53	28.02	26.19	26.65	24.01	23.49	15.68	15.49	3.65	5.67
20 001 – 25 000		16.96	17.64	20.62	20.79	24.93	25.73	26.07	25.95	13.12	12.79
25 001 – 30 000		7.87	7.84	12.56	1.54	17.60	18.31	20.81	20.82	19.56	17.80
30 001 – 35 000		2.89	2.71	6.59	6.57	10.93	11.28	13.71	13.77	19.22	18.23
35 001 – 40 000		0.89	0.78	3.18	3.17	6.51	6.61	8.56	8.62	15.20	15.24
40 001 – 45 000		0.24	0.20	1.45	1.47	3.84	3.83	5.29	5.34	10.68	11.10
45 001 – 50 000		0.06	0.05	0.65	0.66	2.28	2.23	3.29	3.33	7.01	7.35
50 001 – 55 000		0.02	0.01	0.28	0.30	1.37	1.31	2.08	2.10	4.42	4.55
55 001 – 60 000		0.00	0.00	0.12	0.13	0.83	0.78	1.33	1.35	2.73	2.68
60 001 – 65 000		0.00	0.00	0.05	0.06	0.51	0.48	0.87	0.88	1.67	1.53
65 001 – 70 000		0.00	0.00	0.04	0.04	0.32	0.29	0.57	0.58	1.01	0.85
70 001 – 75 000		0.00	0.00	0.02	0.02	0.21	0.18	0.39	0.39	0.62	0.47
75 001 – 80 000		0.00	0.00	0.00	0.01	0.13	0.12	0.26	0.27	0.37	0.25
80 001 – 85 000		0.00	0.00	0.00	0.00	0.09	0.08	0.18	0.19	0.23	0.14
85 001 – 90 000		0.00	0.00	0.00	0.00	0.06	0.05	0.13	0.13	0.14	0.07
90 001 – 95 000		0.00	0.00	0.00	0.00	0.04	0.04	0.09	0.09	0.09	0.04
95 001 – 100 000		0.00	0.00	0.00	0.00	0.03	0.03	0.06	0.07	0.05	0.02
100 001 – 105 000		0.00	0.00	0.00	0.00	0.02	0.02	0.05	0.05	0.04	0.01
105 001 – 110 000		0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.04	0.03	0.01
110 001 – 115 000		0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.03	0.01	0.00
115 001 – 120 000		0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.02	0.01	0.00
120 001 – 125 000		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.01	0.00
125 001 – 130 000		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00
130 001 – 135 000		0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
135 001 – ∞		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (in %)		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

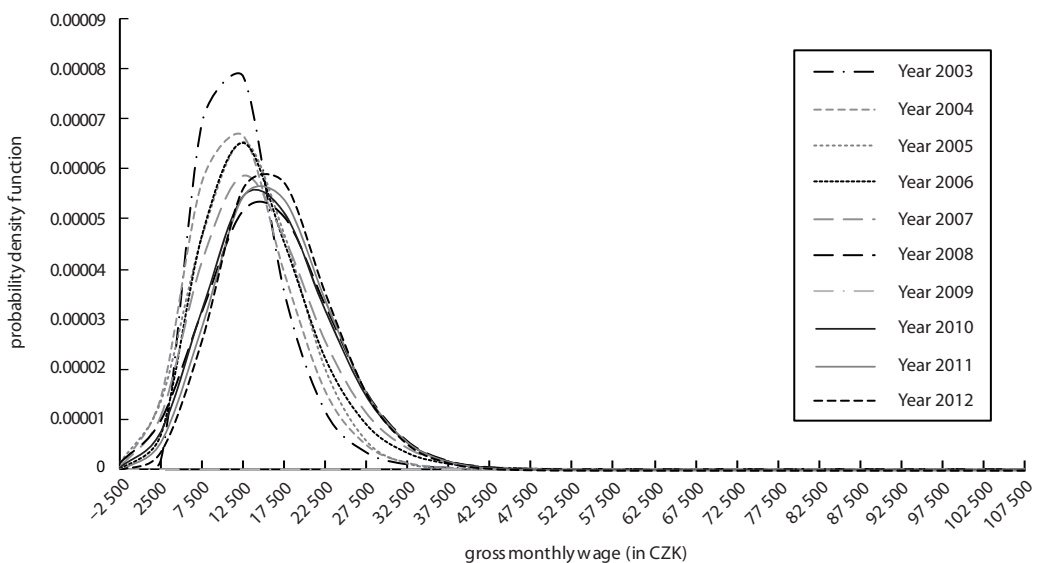
Source: Own research

The first three sample L-moments were calculated from sample data, see Hosking, (1990). The method of L-moments was used to estimate the parameters of theoretical lognormal distribution. The values

of Gini's coefficient were calculated having used these estimated parameters of lognormal distribution. The sum of all absolute deviations of the observed and theoretical frequencies of all intervals was used when evaluating the accuracy of the parameter estimation methods (moment, quantile, maximum likelihood and L-moments methods). The method of L-moments provides the most accurate results (other methods' outcomes are not listed here). The values of a well-known chi-square criterion were also calculated for each wage distribution. The problem is that for large samples, which are common in case of wage distributions, the power of the test is too high (for a given significance level), uncovering even the smallest differences between the observed and theoretical distribution. The test leads in almost every case to the rejection of the hypothesis about the tested distribution. From a practical point of view, however, negligible differences are not important, an approximate correspondence of the model with realities being sufficient. In these cases, we just "borrow" the model distribution. The chi-square criterion is applied only for indicative purposes, the most important aspect being the logical analysis and experience.

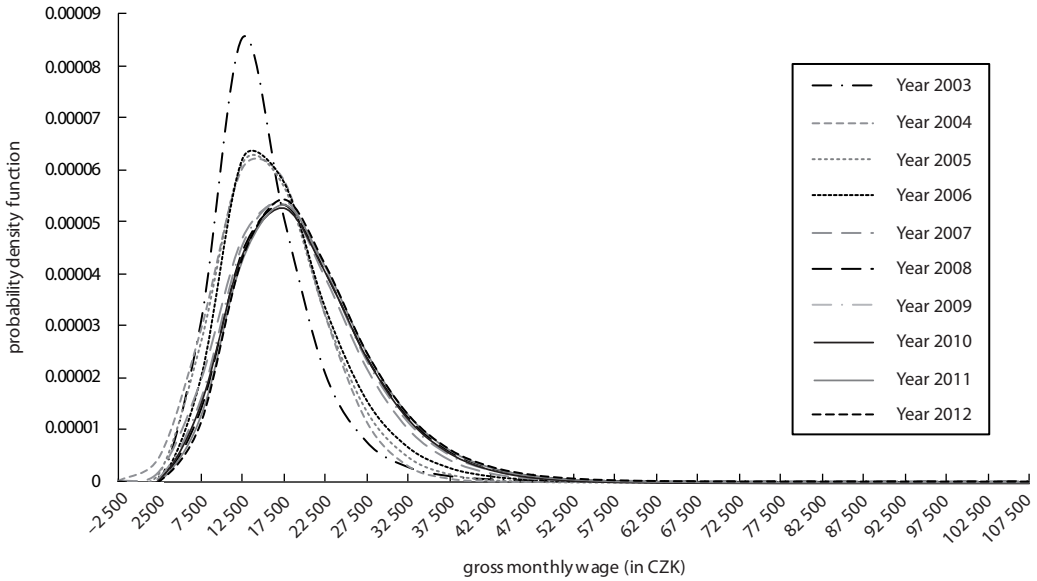
A trend analysis of the development of the first three sample L-moments in the period of 2003–2010 has been performed, see Brockwell and Davis (2002) and Cowpertwait and Metcalfe (2009). Having been based on the trend analysis, the forecasts of the first three sample L-moments development for the years 2011 and 2012 were calculated. Having been based on the forecasts of the first three sample L-moments with the use of the L-moments method, the values of parameters of three-parametric lognormal distribution for 2011 and 2012 were constructed. The values of Gini's coefficient were computed from the above parameter values for 2011 and 2012. Figures 4–8 present the development of model probability density functions of three-parametric lognormal distribution in the years 2003–2010, including the predictions for 2011 and 2012 by the educational attainment. These figures suggest that the development of probability density functions in the years 2011 and 2012 follows continuously the development in the years 2003–2010. The obtained predictions of wage distribution appear to be very accurate from this point of view, too.

Figure 4 Probability density function including the predictions by the educational attainment – Primary and incomplete



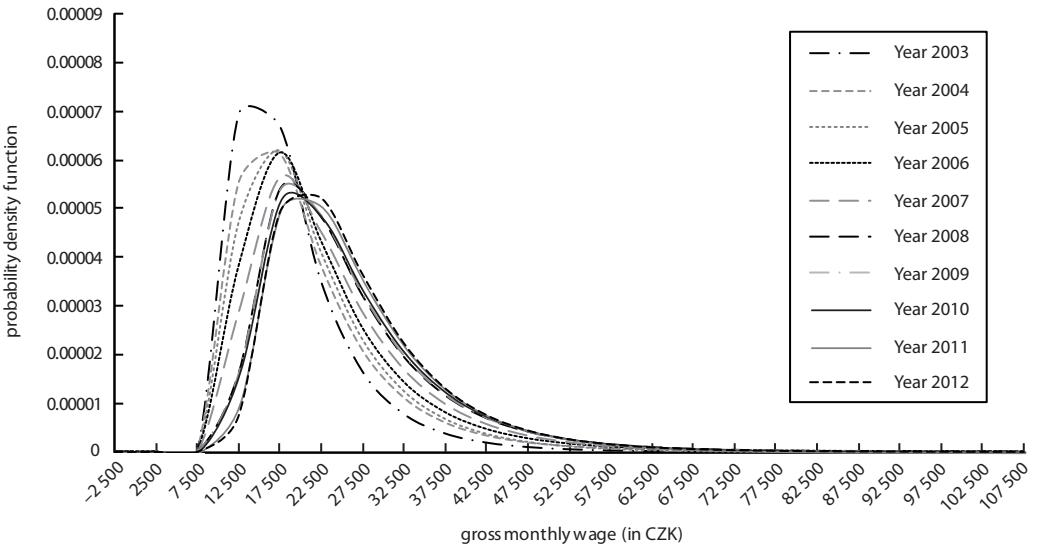
Source: Own research

Figure 5 Probability density function including the predictions by the educational attainment – Secondary without GCSE



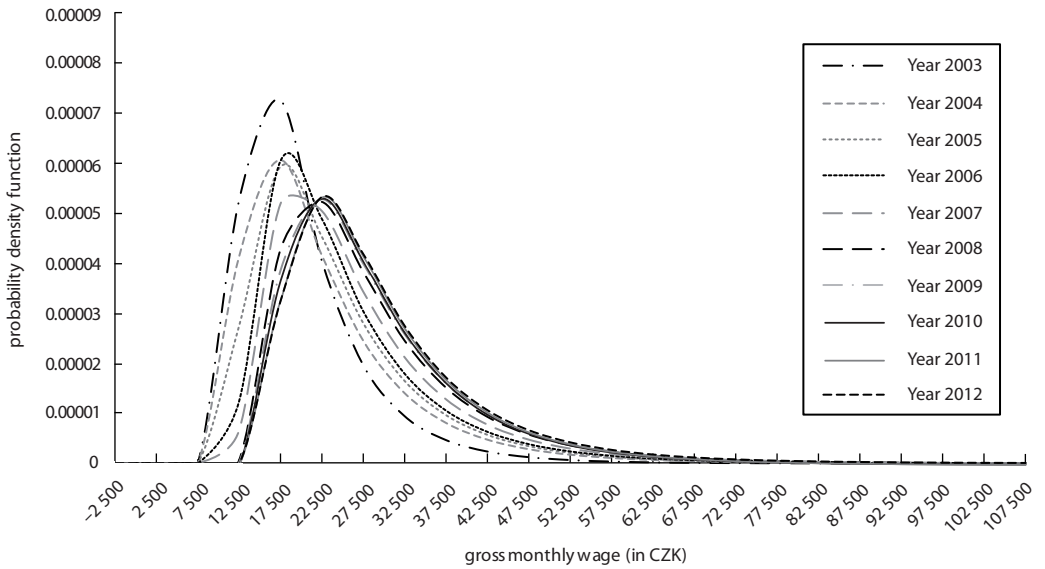
Source: Own research

Figure 6 Probability density function including the predictions by the educational attainment – Secondary with GCSE



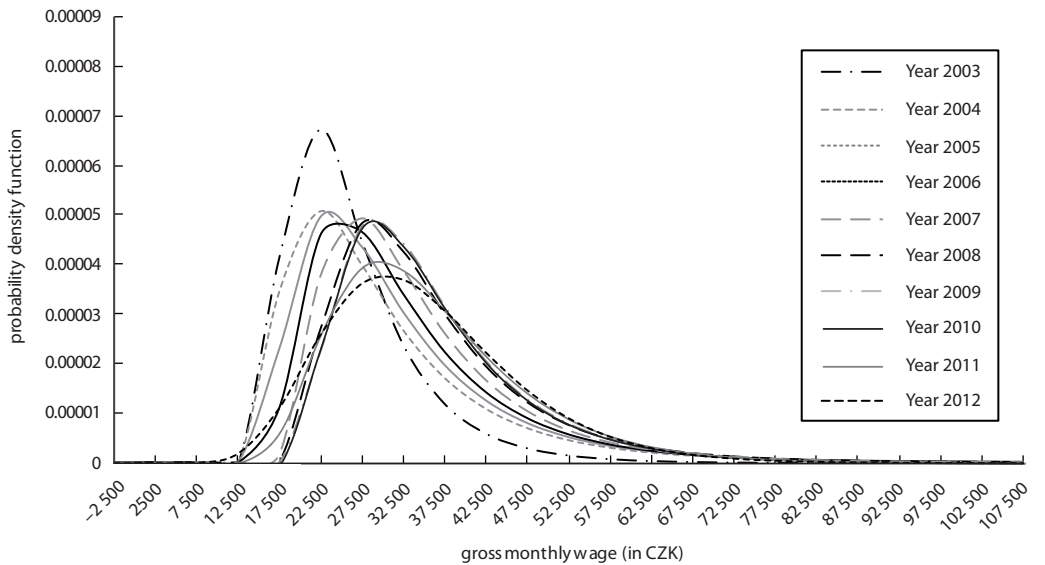
Source: Own research

Figure 7 Probability density function including the predictions by the educational attainment – Higher professional and undergraduate



Source: Own research

Figure 8 Probability density function including the predictions by the educational attainment – Tertiary (2nd stage)



Source: Own research

The forecasts of wage distribution according to level of educational attainment for 2011 and 2012 (in Table 12) were constructed from the probability density functions of three-parametric lognormal distribution calculated for 2011 and 2012.

The values of the arithmetic mean and median in 2011 and 2012 by the stages of education in Table 4 were also calculated from the model three-parametric lognormal curves computed for 2011 and 2012. Of course, we could have created a direct projection of an arithmetic mean and median development for 2011 and 2012 based on the development of these characteristics in the period 2003–2010. The advantage of the procedure used in this research lies in the fact that the predictions of any characteristics of wage distribution, having a theoretical basis in one distribution, can be calculated from those of wage distribution in Table 12. It is not, therefore, a separate research of the development of individual characteristics of wage distribution. Table 13 provides an overview of the differences between the arithmetic mean and median, including the forecasts. We can see from this table that these differences were likely to be greater in 2011 and 2012 compared to previous years. This means that the increasing skewness in the wage distribution can be expected. The average wage is receding from the middle wage, which remains at a lower level. A higher proportion of employees does not reach the growing average wage (with the exception of those with tertiary education); this trend being probably fuelled by the growth of extreme wages (the middle wage not being affected). It should be noted that both the periods of economic recession and previous economic growth are taken into consideration in this research; it cannot be expected, however, that the global economic crisis will last forever. It is necessary, therefore, to allow for some improvements in the area of wages and incomes in the future.

Table 13 Differences between the arithmetic mean and median (in CZK)

Year	Primary and incomplete education	Secondary education without GCSE	Secondary education with GCSE	Higher professional and undergraduate education	Tertiary (2 nd stage) education
2003	697	638	1 298	1 443	1 032
2004	82	377	1 541	2 121	3 081
2005	338	491	1 680	2 089	2 877
2006	836	738	1 749	2 463	2 548
2007	219	582	1 781	2 163	1 973
2008	318	701	1 960	2 251	946
2009	265	618	1 890	2 231	794
2010	341	633	1 819	2 236	749
2011	585	1 254	2 545	3 086	2 274
2012	569	1 310	2 422	3 103	1 630

Source: Own research

6 INTERNATIONAL COMPARISON WITHIN THE EUROPEAN UNION

The income is the variable strongly correlating with that of wage. The variable of income is thus used to compare the development of financial position of households in the Czech Republic with those in other EU countries. It is consistent with a uniform methodology employed in all EU countries when carrying out surveys and personal income calculations. The research variable is net annual household income per consumption unit in EURO (not per capita; the differences consisting in calculations applied – the methodology of the EU conversion having been employed in the research). The conversion to a consumer unit is used here as it is likely to reflect the situation of households better than the conversion per capita as a result of quantity savings.

Figure 9 represents the current states of the European Union. The original “European Twelve” (comprising Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom) enlarged by three countries (Austria, Finland and Sweden) in 1995; the development of income distribution in the Czech Republic being compared with that of the “European Fifteen”. Further EU enlargements brought in Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia in 2004 and Bulgaria and Romania in 2007; Croatia, Iceland, Macedonia and Turkey being the current EU candidates.



Source: <http://en.wikipedia.org>

Table 14 presents the development of the median of net annual income per consumption unit (nominal income) in the EU states in the years 2005–2010. The year 2005 was chosen as a starting point of the income time series as the first sample SILC survey was carried out in the Czech Republic then. The twelve new EU member states having acceded since 2000 (mostly post-communist states of the former Soviet block) are marked in dark.

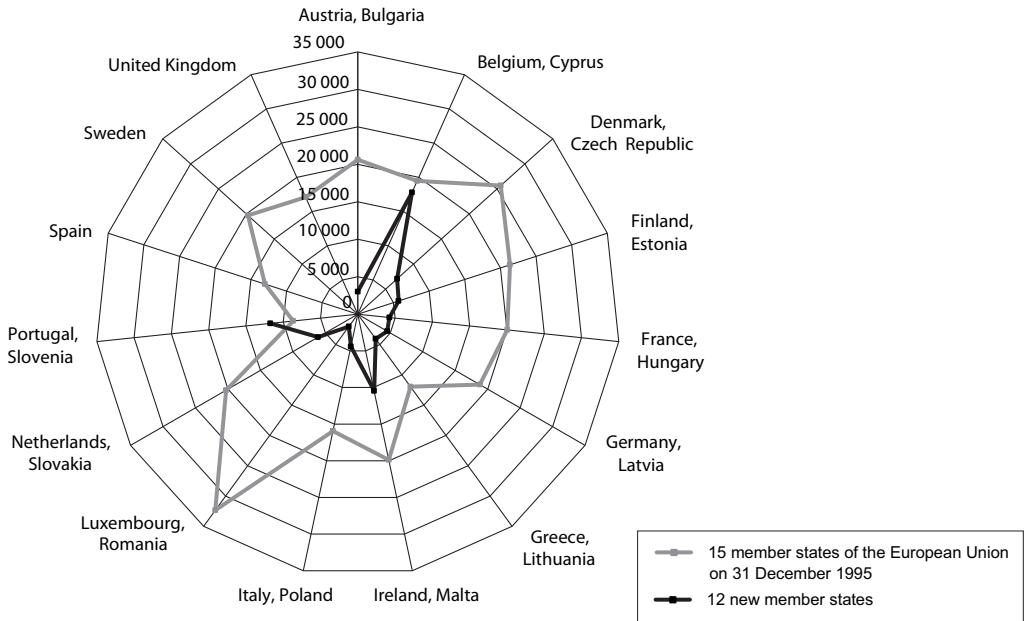
Figure 10 represents the median of net annual household income per consumption unit in 2010 for all current EU countries, the fifteen original members (having joined the EU by 31 December 1995) and twelve new member states. Their low net annual income, in comparison with the fifteen original member states, is clearly evident from the above mentioned figure. It can be calculated from Table 14 that the 2005 median net annual income in new EU member states accounted for about 19.45% of that of the fifteen original members, this share developing to around 21.28%, 19.64%, 22.38%, 26.36% and 23.61% in 2006, 2007, 2008, 2009 and 2010, respectively. Eurostat data on new EU members, however, have been available only since 2005 (with the exception of Bulgaria and Romania).

Table 14 The median of net annual household income per consumption unit (in EURO) in 2005–2010

EU Country	Year					
	2005	2006	2007	2008	2009	2010
European Union (all 27 countries)	13 613	13 617	13 885	14 598	14 626	14 748
European Union (15 countries) Member states on 31 December 1995	15 396	15 527	16 530	17 281	17 292	17 516
European Union (12 countries) New member states	2 994	3 304	3 246	3 868	4 558	4 135
Austria	18 001	17 854	18 156	19 011	19 886	20 618
Belgium	16 581	17 213	17 566	17 985	19 313	19 464
Bulgaria	–	1 384	1 481	2 171	2 828	3 016
Cyprus	13 157	14 536	16 014	16 765	17 432	17 780
Czech Republic	4 233	4 802	5 423	6 068	7 295	7 058
Denmark	22 124	22 663	23 341	24 161	25 029	25 668
Estonia	2 980	3 639	4 448	5 547	6 209	5 727
Finland	17 496	18 345	18 703	19 794	20 962	21 349
France	15 946	16 209	16 441	18 984	19 760	20 046
Germany	16 393	15 663	17 697	18 309	18 586	18 797
Greece	9 417	9 850	10 000	10 800	11 496	11 963
Hungary	3 447	3 849	3 936	4 400	4 739	4 241
Ireland	18 798	19 757	22 065	22 995	22 445	19 882
Italy	14 352	14 524	15 011	15 639	15 637	15 937
Latvia	2 204	2 534	3 242	4 832	5 474	4 537
Lithuania	2 058	2 534	3 276	4 169	4 815	4 059
Luxembourg	28 396	29 480	29 892	30 917	31 764	32 333
Malta	8 578	9 039	9 302	10 054	10 654	10 458
Netherlands	17 000	17 263	18 244	19 522	20 156	20 292
Poland	2 533	3 111	3 502	4 155	5 097	4 405
Portugal	7 195	7 311	7 532	8 143	8 282	8 678
Romania	–	–	1 658	1 953	2 162	2 037
Slovakia	2 830	3 313	3 880	4 792	5 671	6 117
Slovenia	8 797	9 317	9 907	10 893	11 864	11 736
Spain	10 600	11 480	11 939	12 950	13 300	13 030
Sweden	17 498	17 991	18 845	20 573	21 248	19 709
United Kingdom	18 540	19 495	21 143	18 923	16 262	17 106

Source: <http://epp.eurostat.ec.europa.eu>

Figure 10 Median of the net annual household income per consumption unit in 2010 (in Euro) – Total set



Source: Own research

It is obvious that the population (nominal) incomes in new EU member states are still almost five times lower than those in the “European Fifteen” countries, the three exceptions among the newly accepted countries being Cyprus Malta and Slovenia whose median net annual income is markedly higher, as indicated in Figure 10. Taking into account only an income factor of the living standard in 2010, it can be deduced from Table 14 and Figure 10 that the best-paid population is in Luxembourg, followed by Denmark, Finland, Austria, the Netherlands and France. (In 2010, the order was slightly different: Luxembourg, Denmark, Ireland [despite notorious financial problems], Sweden, Finland, and the Netherlands.)

Let us not forget, however, that this only refers to the nominal income. Financial problems of Greece, Ireland, Spain and Portugal are widely debated today. From Table 14 and Figure 10 we can conclude that the population of Portugal, Greece and Spain is the least affluent of the original fifteen EU states. The net annual household income per consumption unit decreased both in Ireland (sharply) and in Spain (slightly) between 2009 and 2010. As for the new EU members, Cyprus, Slovenia, Malta and the Czech Republic were the income leaders in 2009 and 2010. It is worth noting that the Czech Republic has the second highest net annual household income per consumption unit in the post-communist countries (after Slovenia). The inhabitants of Romania, Bulgaria, Lithuania, Hungary and Poland earned the lowest incomes across the European Union in 2010. In 2009, this order was almost the same – Romania, Bulgaria, Hungary, Lithuania and Poland. On the other hand, as it is indicated in Table 15, twelve new EU members show a higher average annual growth rate of median net annual income (an average growth of 6.67% per annum) than the original fifteen member states (2.61%) between 2005 and 2010. Considering just the period 2005-2009, however, twelve new EU members show a markedly higher average annual growth rate of median net annual income (average growth of 18.32% per annum), while the original fifteen member states show roughly the same average growth rate of median net annual income (average annual growth of 2.83%). Currently, we can register a strong decrease in the average growth rate of net annual household income in the twelve new EU member states.

Table 15 Average annual growth coefficient of the net annual income median in European Union 2005–2010

Countries	European Union (27 countries)	European Union (15 countries) Member states on 31 December 1995	European Union (12 countries) New member states
Average growth rate	1.016145	1.026137	1.066706

Source: Own research

A decline in the median of net annual income reflected by the average growth coefficient in the years 2005–2010 is only the case of the United Kingdom (an average decrease of 1.60% per annum), the net annual income median for all the other countries indicating average growth experienced each year. Within the monitored period of years 2005–2010, we can distinguish a period of economic growth between 2005 and 2008 (before the global economic crisis) and that of global economic recession during the years 2008–2010. It can be seen from Table 16 that the average annual growth rate of the median of net annual household income per consumption unit indicates the growth in income in the period 2005–2008 for all EU member states. This does not apply for the economic crisis in the years 2008–2010.

Table 16 Average annual growth coefficient of the net annual income median in 2005–2010

European Union (15 countries) Member states on 31 December 1995				European Union (12 countries) New member states			
Country	Period			Country	Period		
	2005–10	2005–08	2008–10		2005–10	2005–08	2008–10
Austria	1.0275	1.0184	1.0414	Bulgaria	1.2150 (2006–10)	1.2525 (2006–08)	1.1787
Belgium	1.0326	1.0275	1.0403	Cyprus	1.0621	1.0841	1.0298
Denmark	1.0302	1.0298	1.0307	Czech Republic	1.1077	1.1275	1.0785
Finland	1.0406	1.0420	1.0385	Estonia	1.1396	1.2301	1.0161
France	1.0468	1.0599	1.0276	Hungary	1.0423	1.0848	0.9818
Germany	1.0277	1.0375	1.0132	Latvia	1.1553	1.2991	0.9690
Greece	1.0490	1.0467	1.0525	Lithuania	1.1455	1.2653	0.9867
Ireland	1.0113	1.0695	0.9299	Malta	1.0404	1.0543	1.0199
Italy	1.0212	1.0290	1.0095	Poland	1.1170	1.1794	1.0296
Luxembourg	1.0263	1.0288	1.0226	Romania	1.0710 (2007–10)	1.1779 (2007–08)	1.0213
Netherlands	1.0360	1.0472	1.0195	Slovakia	1.1667	1.1919	1.1298
Portugal	1.0382	1.0421	1.0323	Slovenia	1.0593	1.0738	1.0380
Spain	1.0421	1.0690	1.0031				
Sweden	1.0241	1.0554	0.9788				
United Kingdom	0.9840	1.0068	0.9508				

Source: Own research

The median of net annual income – reflected by the average annual growth coefficient of the original fifteen EU member states in the years 2008–2010 – was in decline in the case of Ireland (an average decrease of 7.01% per annum, presumably due to its notorious financial problems), Sweden (an average decrease of 2.12% per annum) and the United Kingdom (4.92% per annum), as indicated in Table 16 in black. Among the new twelve EU member states, decline in the median of net annual income was recorded in the case of Hungary (an average decrease of 1.82% per annum), Latvia (3.10% per annum) and Lithuania (1.33%), again indicated in black in Table 16. The decline was apparently caused by the global economic crisis. If we look at Table 16, we can see that the average annual growth rate of the median of net annual household income per consumption unit decreased in the period 2008–2010 compared to that of 2005–2008 for all the EU member states except for Austria, Belgium, Denmark and Greece, where the average annual growth rate increased, as marked by light gray shade of color.

Out of the twelve new EU member states, only Cyprus and Malta (indicated in dark gray in Tables 16 and 18) are not among the former Soviet bloc countries. Bulgaria, Slovakia, Latvia, Lithuania and Estonia demonstrate the faster growth of median net annual income in the given period (13.96–21.50% per annum on average). The Czech Republic is the seventh fastest growing country in this respect. We can see in Table 16 that in total, the median of net annual household income per consumption unit grew faster in the post-communist countries than in other current EU member states. It can be concluded that a very low income level in certain countries is not necessarily accompanied by an extremely low rate of income growth, while the countries with higher levels of income show a lower rate of income growth. A considerable difference in the level of net annual household income per consumption unit by the educational attainment for the whole research period in individual member states of the European Union is shown in Table 17 and Figures 11–16.

Table 17 The median of net annual household income per consumption unit (in EURO) in 2005–2010 according to the educational attainment

EU Country	Stages of education	Year					
		2005	2006	2007	2008	2009	2010
European Union (all 27 countries)	Primary	11 887	12 087	11 901	12 608	12 692	12 705
	Secondary	14 190	14 342	14 221	14 675	14 750	14 740
	Tertiary	19 873	20 108	20 474	21 287	21 690	21 492
European Union (15 countries) Member states on 31 December 1995	Primary	12 825	13 077	13 441	14 210	14 223	14 144
	Secondary	17 026	17 286	17 991	18 572	18 561	18 766
	Tertiary	21 421	22 102	22 817	23 626	23 824	23 974
European Union (12 countries) New member states	Primary	2 409	2 454	2 140	2 588	2 937	2 652
	Secondary	3 038	3 422	3 401	4 053	4 749	4 242
	Tertiary	4 700	5 208	5 447	6 343	7 399	6 595
Austria	Primary	15 819	15 428	15 611	15 878	16 634	17 596
	Secondary	19 129	19 086	19 383	20 495	21 276	21 948
	Tertiary	22 636	22 671	22 969	24 127	25 684	26 522
Belgium	Primary	14 600	15 147	15 444	15 633	16 675	16 310
	Secondary	17 264	17 862	18 211	18 870	20 167	20 397
	Tertiary	21 969	22 701	23 303	24 129	25 445	26 143
Bulgaria	Primary	–	999	979	1 557	2 072	2 032
	Secondary	–	1 569	1 706	2 620	3 233	3 338
	Tertiary	–	2 090	2 272	3 360	4 445	4 705

Source: <http://epp.eurostat.ec.europa.eu>

Table 17 The median of net annual household income per consumption unit (in EURO) in 2005–2010 according to the educational attainment Continuation

EU Country	Stages of education	Year					
		2005	2006	2007	2008	2009	2010
Cyprus	Primary	11 643	12 677	13 870	14 439	14 764	15 026
	Secondary	13 905	15 082	16 689	17 087	17 752	18 125
	Tertiary	19 212	20 499	22 073	23 205	23 577	24 319
Czech Republic	Primary	3 618	4 090	4 540	5 129	6 201	6 040
	Secondary	4 559	5 127	5 854	6 438	7 802	7 490
	Tertiary	6 246	7 030	7 860	8 673	10 258	10 168
Denmark	Primary	21 118	21 723	22 171	23 264	23 266	24 290
	Secondary	23 616	24 314	25 175	25 663	26 360	27 307
	Tertiary	27 433	27 969	29 439	29 350	30 883	31 996
Estonia	Primary	2 467	3 049	3 812	4 808	5 290	4 834
	Secondary	3 136	3 874	4 714	5 752	6 340	5 680
	Tertiary	4 386	5 100	6 185	7 743	8 775	8 360
Finland	Primary	16 751	17 361	17 508	18 753	19 693	19 719
	Secondary	17 445	18 320	18 770	20 004	21 262	21 261
	Tertiary	22 871	23 459	24 537	25 944	27 287	27 691
France	Primary	14 200	14 687	14 655	17 235	17 613	17 509
	Secondary	16 611	16 632	16 771	19 218	19 930	20 171
	Tertiary	21 290	21 715	21 399	24 342	25 282	25 444
Germany	Primary	15 369	14 984	15 236	15 960	15 745	15 298
	Secondary	17 293	17 370	18 059	18 639	18 952	19 228
	Tertiary	21 147	21 599	22 623	23 514	24 660	24 823
Greece	Primary	8 202	8 480	8 690	9 278	9 706	9 923
	Secondary	10 212	10 478	10 804	11 500	11 800	12 167
	Tertiary	15 029	16 094	16 500	17 120	17 600	18 289
Hungary	Primary	2 915	2 979	3 224	3 540	3 820	3 346
	Secondary	3 587	4 075	4 076	4 506	4 853	4 345
	Tertiary	5 260	6 077	5 833	6 252	6 849	6 092
Ireland	Primary	16 463	17 272	18 506	19 132	18 680	17 188
	Secondary	20 756	22 276	24 240	24 157	23 769	20 797
	Tertiary	27 778	29 596	34 150	34 057	32 122	27 930
Italy	Primary	13 283	13 248	13 548	14 120	14 063	14 391
	Secondary	16 566	16 669	17 340	17 959	17 999	18 083
	Tertiary	22 566	22 990	23 753	23 360	23 867	23 705
Latvia	Primary	1 768	1 825	2 585	3 903	4 261	3 368
	Secondary	2 335	2 698	3 559	5 152	5 811	4 604
	Tertiary	3 603	4 266	5 270	7 825	8 665	7 508

Source: <http://epp.eurostat.ec.europa.eu>

Table 17 The median of net annual household income per consumption unit (in EURO) in 2005–2010 according to the educational attainment Continuation

EU Country	Stages of education	Year					
		2005	2006	2007	2008	2009	2010
Lithuania	Primary	1 622	1 936	2 568	3 204	3 547	2 972
	Secondary	2 052	2 563	3 340	4 212	4 876	3 887
	Tertiary	3 709	4 198	5 307	6 363	7 656	6 472
Luxembourg	Primary	23 758	24 027	24 302	25 177	25 567	26 036
	Secondary	30 215	30 897	31 057	31 674	32 765	34 092
	Tertiary	41 198	41 746	44 225	44 614	46 422	48 066
Malta	Primary	8 599	8 918	9 098	9 887	10 119	9 866
	Secondary	11 234	11 482	11 450	12 697	13 578	12 599
	Tertiary	14 659	15 323	14 701	15 922	17 047	16 916
Netherlands	Primary	15 870	16 259	16 891	17 767	18 259	18 270
	Secondary	17 769	17 943	18 849	19 974	20 671	20 742
	Tertiary	21 986	22 883	24 027	25 274	26 031	25 949
Poland	Primary	1 863	2 310	2 659	3 211	3 938	3 296
	Secondary	2 526	3 065	3 459	4 151	5 070	4 372
	Tertiary	4 392	5 420	5 899	6 730	8 158	6 974
Portugal	Primary	7 016	7 046	7 292	7 822	7 930	8 158
	Secondary	10 046	10 043	10 698	10 343	10 451	10 765
	Tertiary	18 059	17 733	18 229	17 060	17 277	16 657
Romania	Primary	–	–	1 150	1 424	1 555	1 456
	Secondary	–	–	1 889	2 245	2 462	2 283
	Tertiary	–	–	3 784	4 405	4 440	4 135
Slovakia	Primary	2 474	2 845	3 268	4 073	4 645	4 960
	Secondary	2 982	3 455	4 177	5 021	5 858	6 374
	Tertiary	3 706	4 318	5 163	6 304	7 709	8 375
Slovenia	Primary	7 581	8 074	8 548	9 379	10 372	9 776
	Secondary	9 305	9 820	10 119	11 070	12 123	11 817
	Tertiary	14 051	14 314	14 616	15 615	16 486	16 547
Spain	Primary	9 741	10 480	11 045	11 731	11 900	11 424
	Secondary	12 213	12 893	13 411	14 343	14 709	14 402
	Tertiary	15 996	16 867	17 291	18 801	19 610	19 060
Sweden	Primary	18 189	18 139	19 241	20 670	20 399	19 153
	Secondary	18 384	18 831	19 944	21 528	22 172	20 478
	Tertiary	21 006	21 193	22 378	24 835	25 344	22 991
United Kingdom	Primary	15 086	15 880	16 951	14 467	13 411	13 794
	Secondary	20 375	21 161	22 873	19 845	16 840	17 801
	Tertiary	25 686	29 047	30 903	26 815	23 354	24 025

Source: <http://epp.eurostat.ec.europa.eu>

Table 18 Average annual growth coefficient of the net annual income median in 2005–2010 according to the educational attainment

European Union (15 countries) Member states on 31 December 1995				European Union (12 countries) New member states			
Country	Stages of education			Country	Stages of education		
	Prim.	Sec.	Tert.		Prim.	Sec.	Tert.
Austria	1.0215	1.0279	1.0322	Bulgaria	1.1942 (2006–10)	1.2077 (2006–10)	1.2249 (2006–10)
Belgium	1.0224	1.0339	1.0354	Cyprus	1.0523	1.0544	1.0483
Denmark	1.0284	1.0295	1.0313	Czech Republic	1.1079	1.1044	1.1024
Finland	1.0332	1.0404	1.0390	Estonia	1.1440	1.1261	1.1377
France	1.0428	1.0396	1.0363	Hungary	1.0280	1.0391	1.0298
Germany	0.9991	1.0214	1.0326	Latvia	1.1376	1.1454	1.1582
Greece	1.0388	1.0357	1.0400	Lithuania	1.1288	1.1363	1.1178
Ireland	1.0087	1.0004	1.0011	Malta	1.0279	1.0232	1.0291
Italy	1.0162	1.0177	1.0099	Poland	1.1209	1.1160	1.0969
Luxembourg	1.0185	1.0244	1.0313	Romania	1.0818 (2007–10)	1.0652 (2007–10)	1.0300 (2007–10)
Netherlands	1.0286	1.0314	1.0337	Slovakia	1.1493	1.1641	1.1771
Portugal	1.0306	1.0139	0.9840	Slovenia	1.0522	1.0490	1.0332
Spain	1.0324	1.0335	1.0357				
Sweden	1.0104	1.0218	1.0182				
United Kingdom	0.9823	0.9734	0.9867				

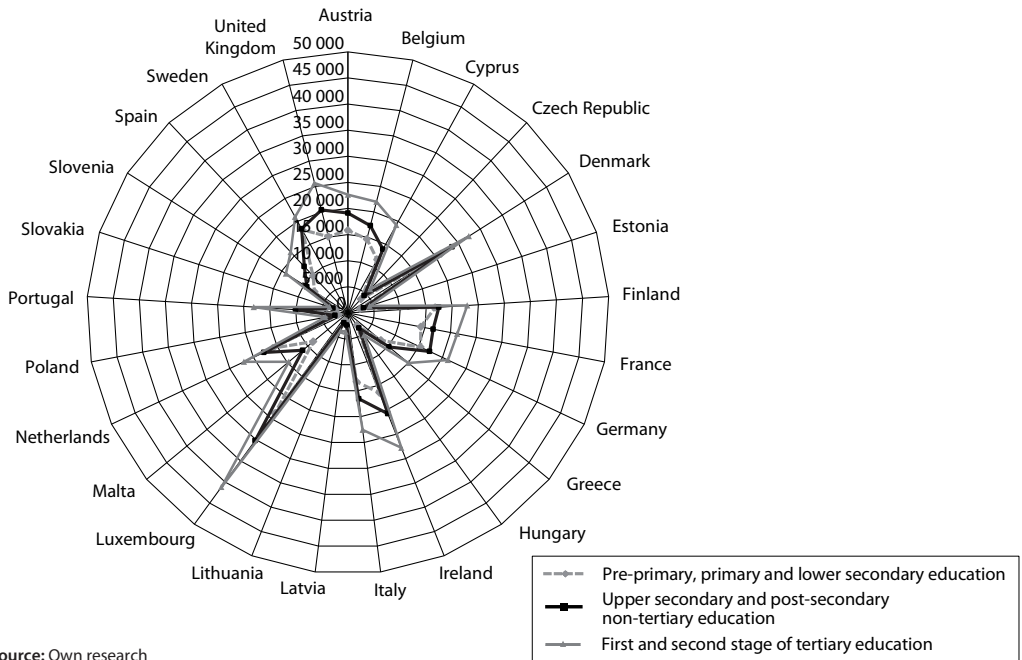
Source: Own research

Regarding all EU member states, we can notice – as expected – that both the level of education completed and that of income is higher. Table 18 allows for a comparison of an average annual growth rate of the median of net annual household income per consumption unit of all EU member states by educational attainment. The three stages of education are:

- Pre-primary, primary and lower secondary education;
- Upper secondary and post-secondary (non-tertiary) education;
- First and second stage of tertiary education.

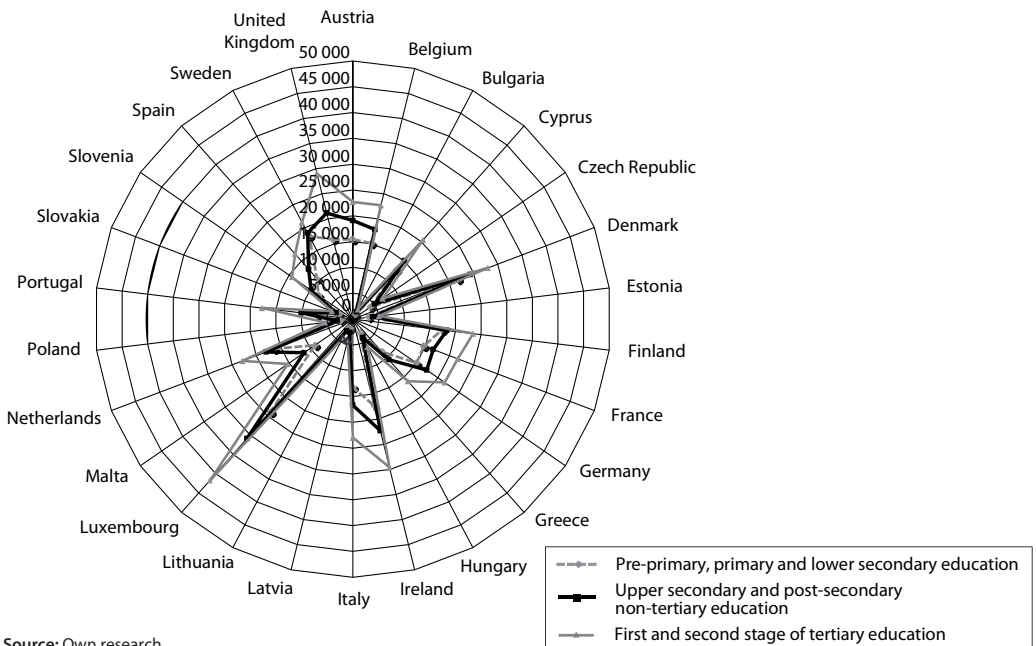
The division of households into categories is made according to the stages of education completed by the head of household (mal in overwhelming majority).

Figure 11 Median of the net annual household income per consumption unit in 2005 (in Euro) – According to the educational attainment



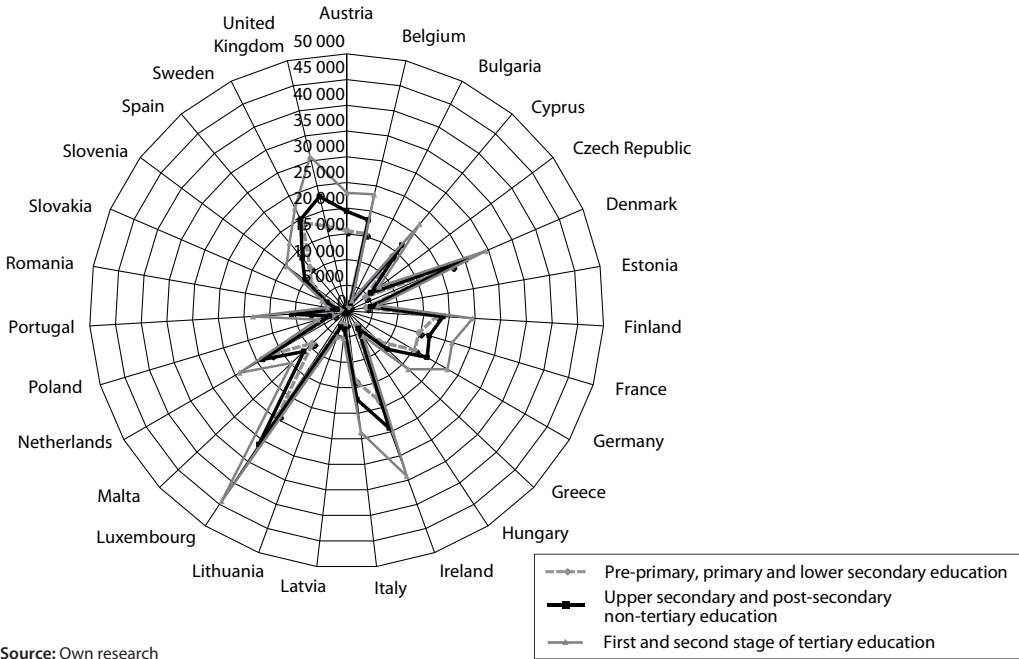
Source: Own research

Figure 12 Median of the net annual household income per consumption unit in 2006 (in Euro) – According to the educational attainment



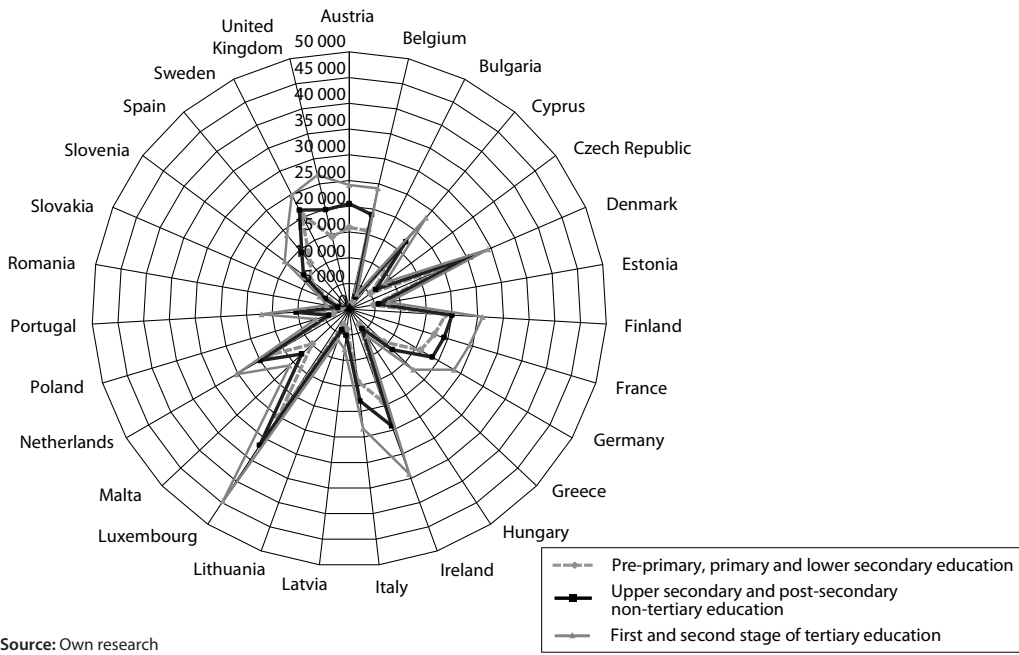
Source: Own research

Figure 13 Median of the net annual household income per consumption unit in 2007 (in Euro) – According to the educational attainment



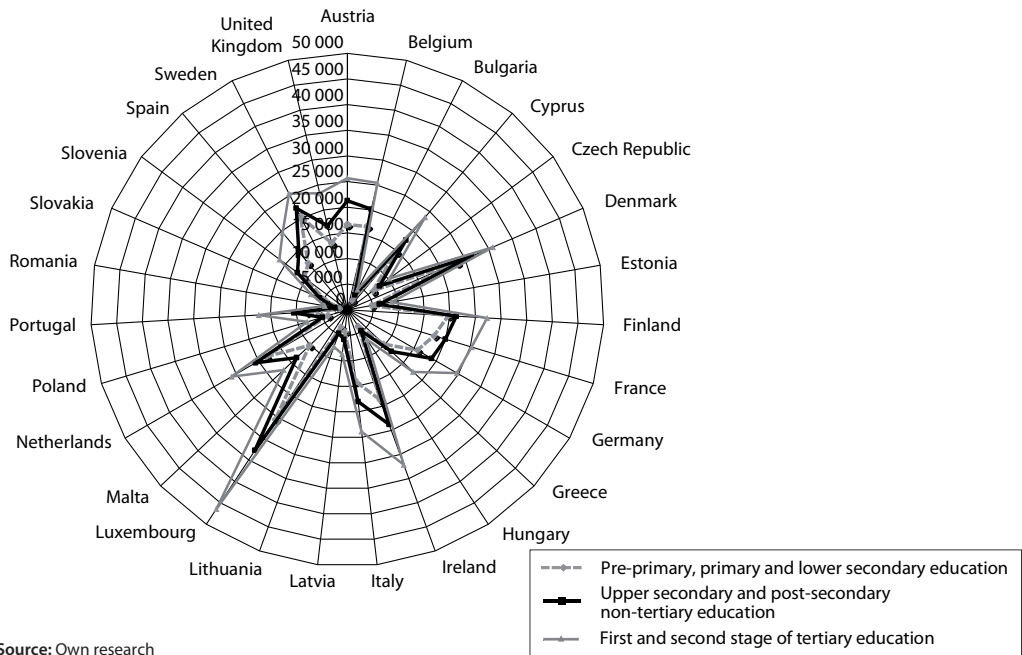
Source: Own research

Figure 14 Median of the net annual household income per consumption unit in 2008 (in Euro) – According to the educational attainment



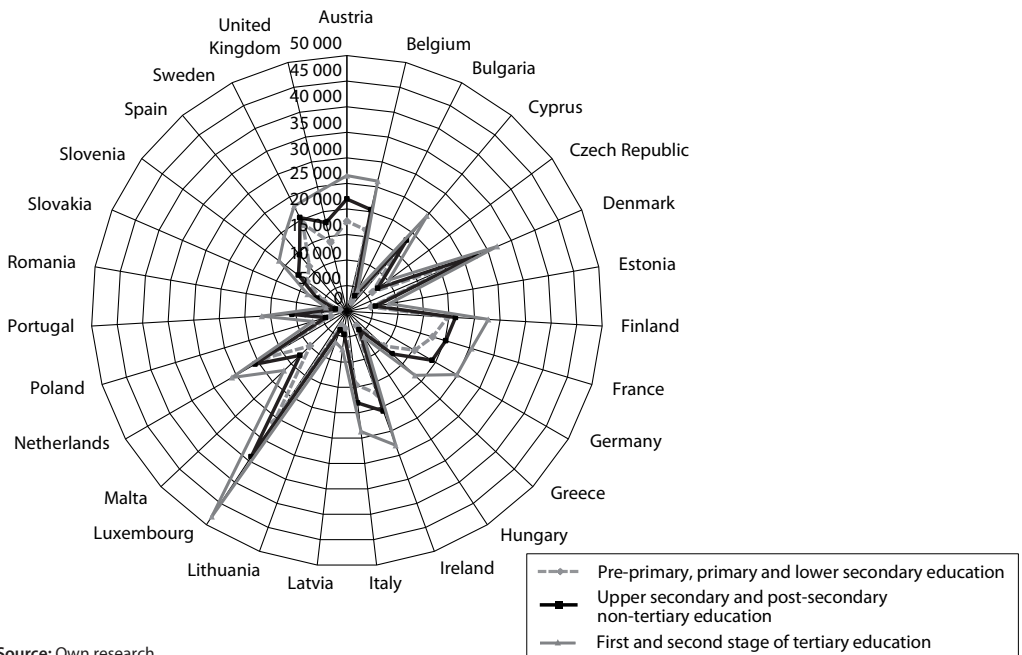
Source: Own research

Figure 15 Median of the net annual household income per consumption unit in 2009 (in Euro) – According to the educational attainment



Source: Own research

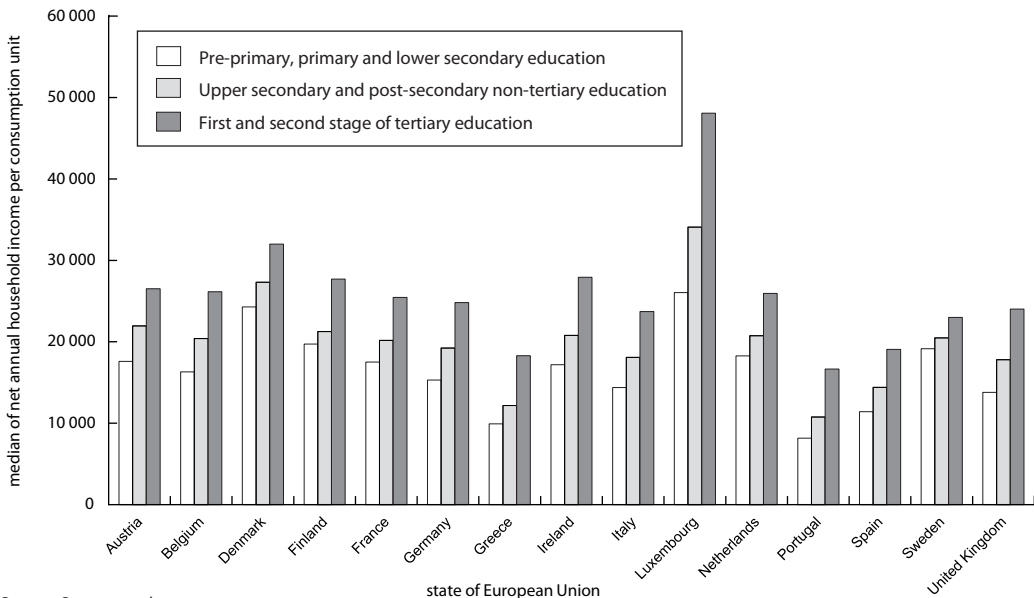
Figure 16 Median of the net annual household income per consumption unit in 2010 (in Euro) – According to the educational attainment



Source: Own research

In the period between 2005 and 2010, we can see the growth of net annual household income per consumption unit in all three differentiated categories of educational attainment for all European Union member states apart from Germany, Portugal and the United Kingdom, which corresponds with the data in Table 18. In case of Germany during the years 2005–2010, the median net annual household income per consumption unit fell by an average of 0.09% annually for households whose head has finished pre-school (i.e. pre-primary) or lower secondary education. As for Portugal in the years 2005–2010, the median net annual household income declined by an average of 1.60% per annum for households whose head has finished the first or second stage of tertiary education. Regarding the United Kingdom in the given period, the median net annual household income per consumption unit decreased for all differentiated categories of the stages of education completed. An average 1.77% decline per year was recorded for households whose head has finished pre-school or lower secondary education, an average 2.66% decline for those whose head has upper secondary or post-secondary (non-tertiary) education and an average 1.33% decline for households whose head has the first or second stage of tertiary education. As far as the Czech Republic is concerned, the growth rate of median income was balanced for all three categories of educational attainment. During the years 2005–2010, the median of net annual household income per consumption unit increased by an average of 10.79% per annum for households whose head has pre-school or lower secondary education, an average 10.44% increase being recorded for those whose head has upper secondary or post-secondary (non-tertiary) education and an average 10.24% increase for households whose head has the first or second stage of tertiary education. Bulgaria has the highest growth rate of all the EU countries. During the years 2005–2010, median net annual income increased by 19.42% per year on average for households whose head has pre-school or lower secondary education, by 20.77% on average for those whose head has upper secondary or post-secondary (non-tertiary) education and by 22.49% on average for households whose head has the first or second stage of tertiary education. The fastest growth of incomes was experienced in tertiary education in Bulgaria.

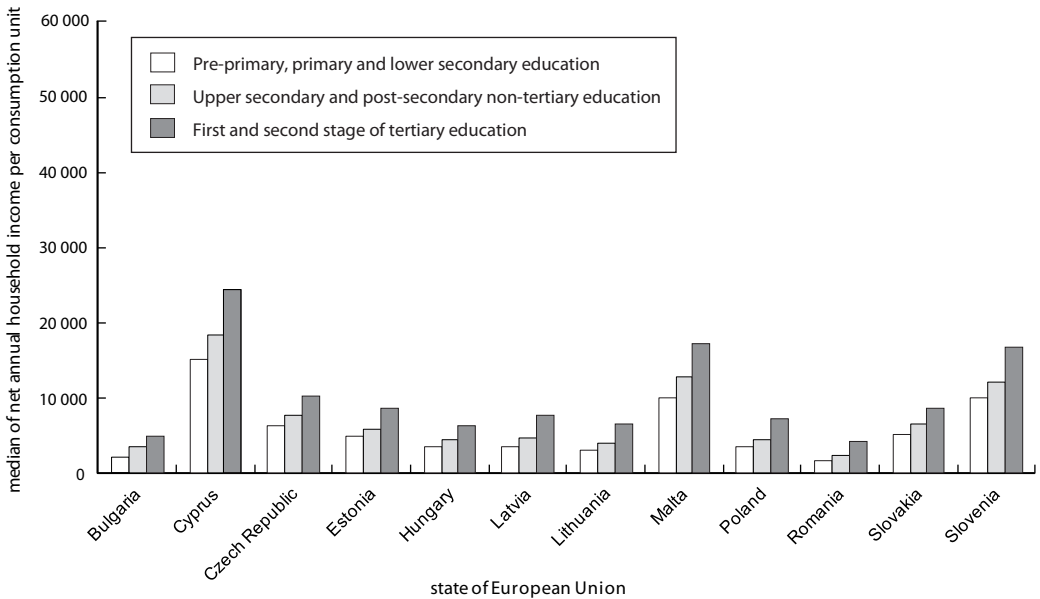
Figure 17 Median of the net annual household income per consumption unit according to the educational attainment in 2010–15 member states of the European Union on 31 December 1995



Source: Own research

Figures 17 and 18 allow a very illustrative comparison of income levels by the educational attainment between the fifteen original and twelve new EU member states in 2010. High income of Luxembourg is noticeable compared to the original fifteen EU countries. Among the twelve new EU member states, incomes in Cyprus, Malta (none of them being a former Soviet bloc country) and Slovenia clearly exceed those in other countries, the other nine states having markedly lower incomes.

Figure 18 Median of the net annual household income per consumption unit according to the educational attainment in 2010–12 new EU member states



Source: Own research

CONCLUSION

The paper starts with a development analysis of descriptive characteristics of wage distribution over the last years, monitoring particularly the changes of wage distribution in the context of economic recession at the end of the research period. We can conclude that wage growth has virtually stopped. Wage distributions are classified by the level of educational attainment. Differences between particular wage levels were assessed on the basis of given stages of education. The arithmetic mean, median and modal were applied. Since most employees do not reach an average wage, the median was employed as a fundamental characteristic of the level of wage and income distribution. The research results show a clear impact of educational attainment on wage, this dependence being proved by test at any significance level. Both the wage range and distribution are strongly influenced by the amount of the minimum wage. Workers' wages would presumably decline if the minimum wage was reduced or even abolished. The changes are naturally reflected in characteristics of the location, variability and shape of wage distribution. It is noteworthy that the number of extremely well-paid people was increasing gradually over the whole research period 2003–2010. The level of wage distribution was rising until 2008, wage growth having almost stopped in the year when economic recession began. Also having increased until the onset of the financial crisis, wage differentiation started to decline later. The dual dimension of wage differentiation by the educational attainment – both within and between the groups – had to be taken into account, the

latter dimension being already indicated by differences in wage growth rates. It is expected that the deceleration in the growth rate of nominal and real wage level may cause structural changes in household budgets, leading to cuts in money spent on food, clothes and other durable and nondurable goods while energy, housing and transport costs may rise due to relative price changes.

The research results prove that despite a much faster growth of nominal incomes, the new EU member states do not even begin to compare with the income level of the original fifteen EU countries. Weak income differentiation was a distinctive feature of former communist regimes, having manifested itself in wage discrepancy between skilled and less-skilled work and undifferentiated staffing and position appointment policies. Since the transition to market economy, income differentiation has been deepening significantly. A group of people with very high incomes has been growing gradually. The Czech Republic's standing among the new EU member states in terms of income is not bad at all. The country boasts of the fourth highest income level, the growth rate of the income median being approximately in the middle of the ranking list. The population of neighbouring Slovakia has a slightly lower income than that of the Czech Republic. This is mainly due to the division of former Czechoslovakia. Having lost its industrial capacity and resources located in the more advanced western part of the common state, the Slovak Republic adapted to a significant reduction in the wage level as well as a deeper exchange rate depreciation. Various countries suffered different effects of the financial crisis, some of them (e.g. the United Kingdom) having gone into an income level decline, others (e.g. Ireland) having virtually stopped their income level increase.

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