COMPARISON OF WAGES IN THE CZECH REPUBLIC ACCORDING TO DIFFERENT FACTORS

Luboš Marek

Abstract

We analyse the development of wages in Czech Republic in different groups of employees over years 2000 – 2014 in our article. We can divide our data file to many of groups with respect to following factors (in parentheses is the number of groups in category):

- gender (2),
- age (3) – till 30, 30-50, over 50,
- region (14),
- education (6) – primary, specialized school, high school, bachelor, master, PhD,
- sector (2) – business, non-business,
- domain IT (2) – technicians, developers.

In total, we have up to 2 x 3 x 14 x 6 x 2 x 2 = 2016 groups. There are the basic wage characteristics in each group – number of observations, average, standard deviation, some quantiles (10%, 25%, 50%, 75%, 90%), coefficient of variation and a fund of working time. These characteristics allow us a detailed comparison of employee wages. Given the large number of groups we public only some basic comparisons. The output will be mainly synoptic tables and graphs. Because the data are monitored over 15 years (but some categories are monitored already from year 1995), we can analyse the development in time – mainly growth rate and trend.

Key words: average wage, quantile measures, trend, growth rate

JEL Code: C530, F470

Introduction

We analyse wages in Czech Republic over years 2000 – 2014 in our article. We work with interval distribution of wages. The data are observed in great detail. The length of interval is 500 CZK. The sample size is great – over two million observations. The data source is firm Trexima, which conducts regular surveys regarding wages - see www.trexima.cz. We can

divide our data file to many of groups with respect to following factors (in parentheses is the number of groups in category):

- gender (2),
- age (3) – till 30, 30-50, over 50,
- region (14),
- education (6) – primary, specialized school, high school, bachelor, master, PhD,
- sector (2) – business, non-business,
- domain IT (2) – technicians, developers.

In total, we have 2016 groups of data. For each group we can compute basic characteristics. We work with next statistical characteristics – mean, standard deviation and quantile measures (10%, 25%, 50%, 75% and 90% quantile). Because we work with interval frequency distribution, we can construct a frequency polygon. The analysis of incomes carried out authors Bartošová (2014) or Bartošová, Bína (207), (2014).

It is not possible to show all results for all groups in one article. Therefore, we decided work with one group only in this article. The analysis of other groups will be published in the future in other papers. We will concentrate on sector business and non-business.

1 Methodology

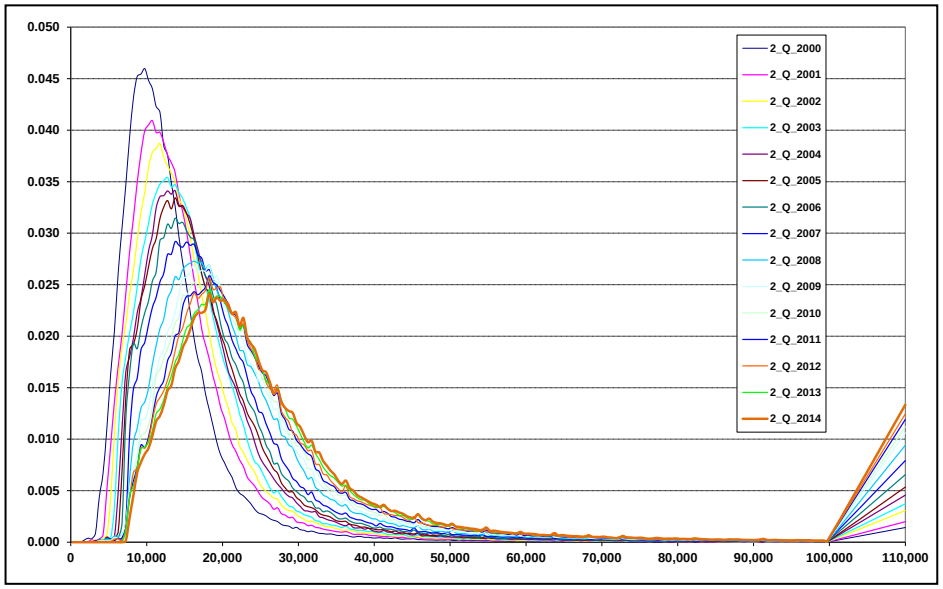
Our data are in MS Excel tables. So, whole calculations were made in this program. All graphs and tables were computed in this spreadsheet. We used basic statistical functions and procedures in our analysis. Because data are in the form of time series, we calculated trend functions and growth rate over time. The procedure *Add Trendline* was used for computing equations of trend function and *R*-square statistic. This statistic we use as a tool for quality model checking. We computed Gini index for our data. Details on the methodology of calculating the Gini index can be found in Gini (1955).

2 Data analysis

2.1 Frequency polygon

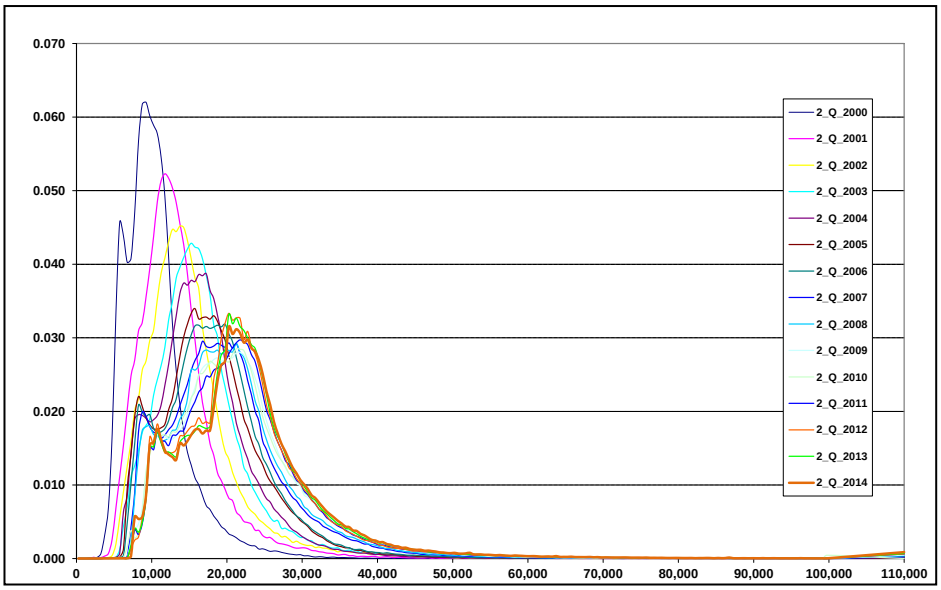
Let's first look, what shape have frequency polygons for both sectors over years 2000-2014. At Figure 1 are frequency polygons for sector business over all observed period. The same picture is at Figure 2, but for sector non-business. Frequency polygon is the empirical counterpart probability density function. We can see that at the both graphs the basic statistical characteristics are changed.

Fig. 1: Polygons - sector business



Source: own calculation

Fig. 2: Polygons - sector non-business



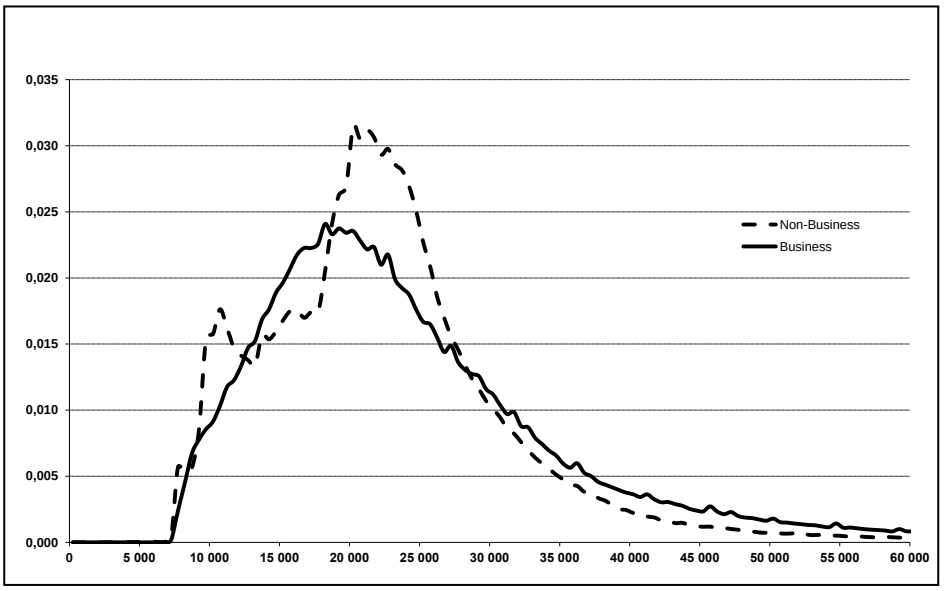
Source: own calculation

Average wage (measure of level) is growing, the variability of distribution and skewness increas, and significantly decreases kurtosis. So, individual differences between wages are more and more great. The wage development over time we can be relatively good describe by the various probabilistic models – more in articles Malá (2013), (2014), (2015) or Marek (2013). The level, variability and skewness are greater for business sector, the kurtosis is smaller. It means that the wages are greater in business sector and difference between

individual wages is greater in this sector, too. At the Figures 3 we can compare one scale frequency polygon for year 2014 only. The scale is cutted in the point 60.000. It is clear that both distribution are different.

When we carefully study Figure 1 and Figure 2 we have to notice the tail of the distribution. This tail is more significant in sector businnes. The wages over 100.000 CZK are there. While in the sector business, there are 1.334% of wages, in non-business sector there are 0.0867% only.

Fig. 3: Polygons - sector business and non-business 2014



Source: own calculation

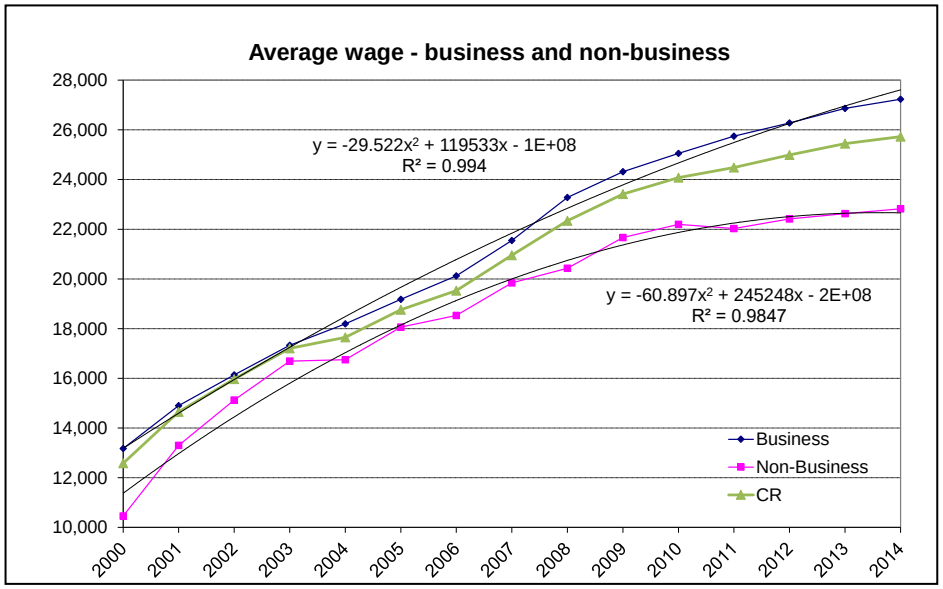
2.2 Average wage

Now we can look, how it developed average wage both sectors. The average wage for the whole country is added for comparison. The question of average wage is detailed described in Marek (2010). At the first look, we can see, that there is a significant difference between both groups. The average wages in sector business are higher. The wage level for non-business sector is smaller. When we compare both group with average wage for whole country, the difference between CR and non-business is greater than between CR and business. The scissors between both groups are more and more opened over time.

Trend function is the same for both groups. We used polynomial of second degree. The value of R-square is published. This value is very near to one, therefore the quality of

trend function is very good. But we have data only up to 2014 and we can expect that due to the favorable development of Czech economy will grow wages much faster in the next years.

Fig. 4: Wages - sector business and non-business



Source: own calculation

Tab. 1: Wages - sector business and non-business

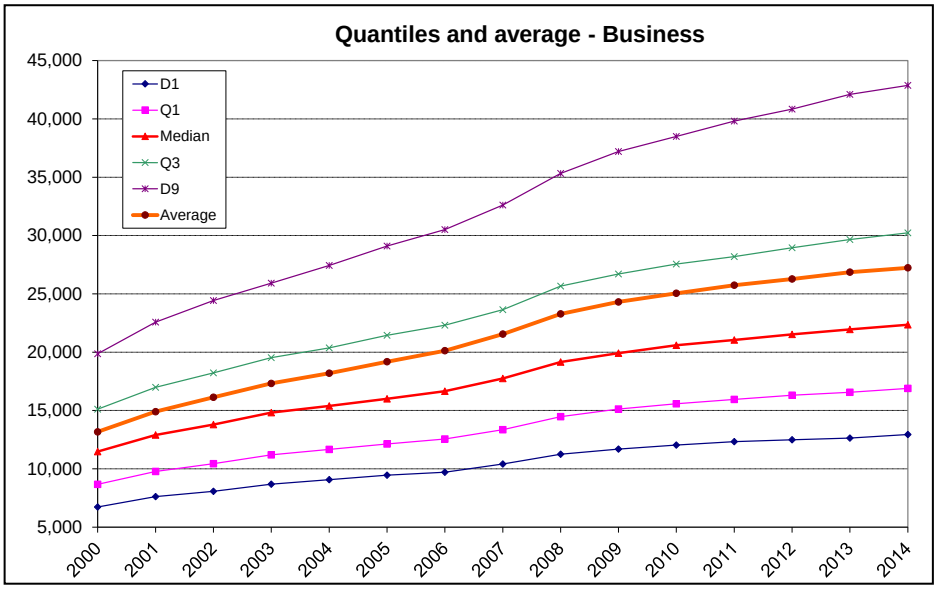
Year	Business	Non-Business	CR
2000	13,171	10,454	12,579
2001	14,901	13,301	14,649
2002	16,136	15,122	15,964
2003	17,327	16,690	17,203
2004	18,194	16,745	17,647
2005	19,179	18,058	18,758
2006	20,124	18,530	19,526
2007	21,548	19,840	20,955
2008	23,281	20,431	22,338
2009	24,316	21,668	23,418
2010	25,054	22,194	24,077
2011	25,746	22,031	24,484
2012	26,279	22,413	24,988
2013	26,865	22,627	25,448
2014	27,232	22,819	25,728

Source: Trexima

2.3 Quantiles

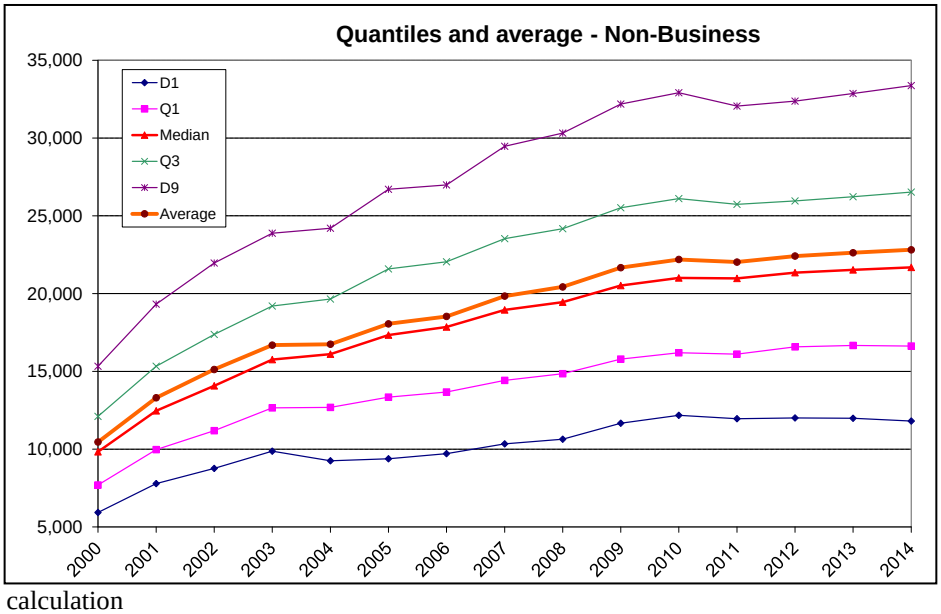
We work with two groups of data – business and non-business. So, we have 5 quantiles in each sector. At Figure 5 and Figure 6 we can compare base quantiles in both sectors. The symbols have the following meaning: D1 – 10% quantile, Q1 – 25% quantile, Median – 50% quantile, Q3 – 75% quantile, D9 – 90% quantile. Quantiles are sorted from top to bottom as listed in the legend.

Fig. 5: Quantiles - sector business



Source: own calculation

Fig. 6: Quantiles - sector non-business



Source: own calculation

When we compare both graphs it is clear that there is significant difference between quantiles. In business sector are the same quantiles greater. 75% quantile in business sector for year 2014 is 30.227 CZK, in non-business only 26.525 CZK. 90% quantile in business sector is 42.876 CZK, in non-business only 33.381 CZK. Average is more near to median in non-business sector. The difference between quantiles is greater over time for both sectors. It means that the variability is growing.

2.4 Growth rate

Growth rate values are in Table 2. We compare sector business, non-business and whole country.

Tab. 2: Growth rate

Year	Business	Non-Business	CR
2001	1.131	1.272	1.165
2002	1.083	1.137	1.090
2003	1.074	1.104	1.078
2004	1.050	1.003	1.026
2005	1.054	1.078	1.063
2006	1.049	1.026	1.041
2007	1.071	1.071	1.073
2008	1.080	1.030	1.066
2009	1.044	1.061	1.048
2010	1.030	1.024	1.028
2011	1.028	0.993	1.017
2012	1.021	1.017	1.021
2013	1.022	1.010	1.018
2014	1.014	1.009	1.011

Source: own calculation

Very interesting are the first years, especially the sector non-business. The wages were rising much faster than in sector business and in whole country. In recent years, the situation has completely reversed and growth rate is greater in sector business. Consequently, the average growth rate is almost the same in both sectors over all observed period 2000-2014. There is value 1.053 for business and 1.057 for non-business. But, when we calculate the

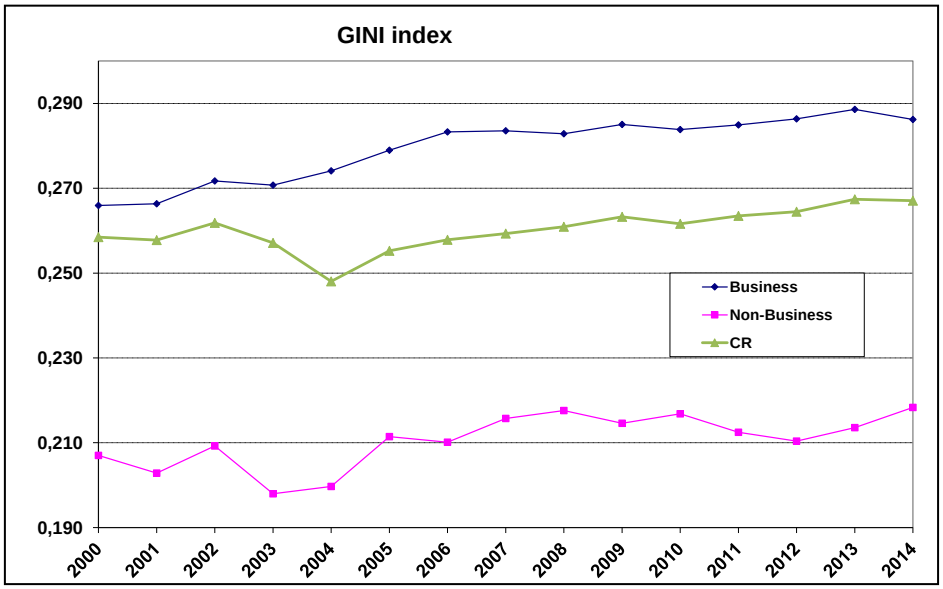
growth rate over years 201-2014 only, we have results 1.023 for business and only 1.010 for non-business.

2.5 Gini index

The Gini index is a measure of statistical dispersion intended to represent the income distribution of a nation's residents, and is the most commonly used measure of inequality. A Gini index of zero expresses perfect equality, where all wages are the same. A Gini coefficient of one (or 100%) expresses maximal inequality among wages. In our country, the rate of redistribution classically is low. In most western economies, this index is higher, but it is not valid for the Scandinavian countries.

At the Figure 7 are shown time series values of Gini index for both sector and for whole country. There is significant difference between this series. Both sectors behave differently. Gini index in sector business is much greater. The values in non-business are much smaller and are even much smaller than in the CR. It means that there are larger differences between individual wages in sector business. Relatively high values of the index in sector business indicates that in this sector is greater redistribution rate.

Fig. 7: Quantiles - sector non-business



Source: own calculation

Conclusion

We compared wage distributions for two economic sectors – business and non-business. We showed that there are the significant differences between these two groups. The average wage

in individual sectors is different. The higher wages are in sector business. The trend of wage is polynomial of second degree. We showed that it is possible to build appropriate model for trend of wages. The quality of models is very good as is evidenced by the R-square value close to 1.

When we studied frequency polygon we proved that wage distribution is changed over time – the level (average wage) and variability are growing, as well as the skewness. Kurtosis of distribution decreases. The differences between individual wages are increasing. There is significant difference between sector business and non-business in all basic statistical characteristics.

For to quantile measures are valid similar conclusions as to the average. Once again, there are great differences between the same quantiles in both sectors. It is true that in sector business are values greater.

Growth rate developed in both groups differently. The average growth rate is almost the same when we calculate this average over all observed period 2000-2014. But when we calculate average growth over five last years, the sector business is growing much faster.

Gini index in sector business is much greater. The values in this sector mean greater redistribution rate in business sector. There is greater variability and greater differences between individual wages.

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Trexima, http://www.trexima.cz

Contact

Luboš Marek

University of Economics, Prague

Nám. W. Churchilla 4, 130 67 Prague, Czech Republic

marek@vse.cz