ARE WAGES IN THE CZECH REPUBLIC AND POLAND EQUAL?

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Abstract

One of the most watched characteristics used in economics and statistics is the wage. Every employee is interested in its value. It is interesting to compare one's own wages with those of others, or with the effects of other economic changes. Is my real wage rising or falling? Can I buy more this year than last year? Comparison with other countries is also interesting. For these reasons, we will try in this article to compare wages and their development during the most recent few years in the Czech Republic and Poland. Because each country has a different currency and inflation rate, we will have to convert the wages to the same currency (EUR) for the same periods, and adjust our data to eliminate the inflation. We will also be interested in the time evolution. We have reviewed this evolution with respect to the basic characteristics (growth rate and the average absolute increment) and we have also compared the trends. The classical decomposition of time series has been used to model these trends. Our output is formulated in the form of tables and charts created in MS Excel. The data sources are taken from the publications by the statistical offices of both countries and Eurostat.

1. Introduction

One of the most carefully watched economic characteristics is the amount of the wage. The arithmetic mean is usually used to measure this amount. Everybody is interested in his/her own average wage, both as such and in comparison with others. In this paper we compare the average wages in the Czech Republic and in Poland. Further, we will compare these two countries with the remaining two members in the Visegrad Group. i.e., Slovakia and Hungary. Finally, we will also add a comparison of the V4 post-communist countries with Austria. We take our data from Eurostat and OECD. We are restricted by available data in our comparisons. The data on the Eurostat websites are expressed in national currencies, EUR, and USD. The inflation rate is different in each country; that is why we have to clean the data of inflation. Nevertheless, we often compare relative numbers (growth rate values, increments, etc.) with a goal to consider the time evolution. The entire analysis was carried out in MS Excel, with its output in the form of tables and charts.

2. Comparisons of Countries

2.1 Czech Republic vs. Poland

Let us first compare the evolution of data with a four-year step in the Czech Republic and Poland, beginning in 2002. The amounts in EUR express the average and median wages according to Eurostat data (http://ec.europa.eu/eurostat/data/database?node_Code=earn ses_hourly) from 2002, 2006, 2010, and 2014 (four-year steps) – harmonized within EU in EUR or PPS. The purchasing power standard, abbreviated as PPS, is an artificial currency unit. Theoretically, one PPS can buy the same amount of goods and services in each country. However, price differences across borders mean that different amounts of national currency units are needed for the same goods and services depending on the country. The PPS is derived by dividing any economic aggregate of a country in national currency by its respective purchasing power parities (PPPs). PPS is a technical term used by Eurostat for the common currency in which national accounts' aggregates are expressed when being adjusted to the price level differences using PPPs. Thus, PPPs can be interpreted as the exchange rate of PPS against EUR.

Another source of data for our study is OECD cf. (https://stats.oecd.org/Index.aspx?DataSetCode=AV_AN_WAGE#). This data only records the average wages in national currencies, beginning in 1995. We converted this data with the aid of average annual exchange rates (EUR/ECU exchange rates – annual data from the Eurostat source), and then we cleaned it of inflation using HICP (Harmonized Indices of Consumer Prices – cf. http://ec.europa.eu/eurostat/web/hicp/data/database).

Detailed studies analyzing wages were published, (e.g. Bartosová, Longford, 2014) or (Malá, 2015). Some comparisons, in particular with respect to the wage evolution in the Czech Republic, can also be found elsewhere; the authors of this paper published them in (Marek, 2010) and (Marek, Doucek, 2016), which have been used as a theoretical basis for the analyses set forth in the present paper.

Table 1: Mean earnings in EUR

GEO/TIME	2002	2006	2010	2014
Czech Rep.	7,174	9,781	12,696	12,542
Poland	6,878	8,574	10,507	11,665

Source: Eurostat.

Table 2: Median earnings in EUR

GEO/TIME	2002	2006	2010	2014
Czech Rep.	6,112	8,213	10,634	10,537
Poland	5,600	6,810	8,527	9,242

Source: Eurostat.

Both the average and the median of wages are higher in the Czech Republic. Let us have a look at the corresponding chart. Both the Table and the Figure clearly show that the evolution is different in each of these two countries. In the Czech Republic, the 2014 value is lower than that of 2010, whereas the values grew in Poland. We can deduce that the evolution in Poland was less turbulent in the time of the economic crisis. The levels in the Czech Republic were, in the absolute numbers, higher in all years of our study.

Figure 1: Mean earnings in EUR

Source: the authors' work.

The skewness of the data distribution will be evaluated as well. A simple and widely-used characteristic of the skewness is the Pearson's coefficient α, based on the relationship between the values of the arithmetic mean and the median ($x_{0,5}$):

$$\alpha = \frac{3\left(\overline{x} - x_{0,5}\right)}{s_x}.$$ (1)

This coefficient equals zero for symmetric distributions. Its value and sign show the degree and character of the skewness. Professor Cyhelský suggested another approach – his rate of absolute skewness equals

$$C_a = \left(\overline{x} - x_{0,5}\right).$$ (2)

Again, it is zero for symmetric distributions; and its positive or negative values indicate different degrees of the so-called positive or negative skewness.

Cyhelský's rates of relative skewness, which we use for characterizing the wage distributions in the paper, are based on comparing the average and the median. Instead of the standard deviation (which we did not have at our disposal), the "relative" means with respect to either the average or the median.

$$C_{am} = \frac{\left(\overline{x} - x_{0,5}\right)}{x_{0,5}} \quad \text{or} \quad C_{ap} = \frac{\left(\overline{x} - x_{0,5}\right)}{\overline{x}}$$ (3)

We have decided to use the C_{ap} characteristic for the skewness. The two countries differ from each other with respect to this characteristic as well – see Figure 2.

The index in question was, except for 2002, nearly constant in the Czech Republic, but it fluctuated in Poland; however, its main characteristic was its growth – the number of above-average wages has been growing faster there than in the Czech Republic. Years 2002 and 2010, as well as 2006 and 2014 were nearly identical with each other. This fact indicates a less uniform relationship between the average and the median, and a higher degree of positive

skewness (the number of high wages has been growing). Let us evaluate the velocity of wage growth in these two countries. This time we will take the wages expressed in the respective national currencies because of working with relative numbers, thus being relieved of the necessity to convert to the same currency. We take the relative growth for a suitable characteristic and analyze the data from the period 1995-2015. The first relative growth value is thus available for 1996. The time evolution of this growth is shown in Figure 3.

Figure 2: Comparison of mean and median
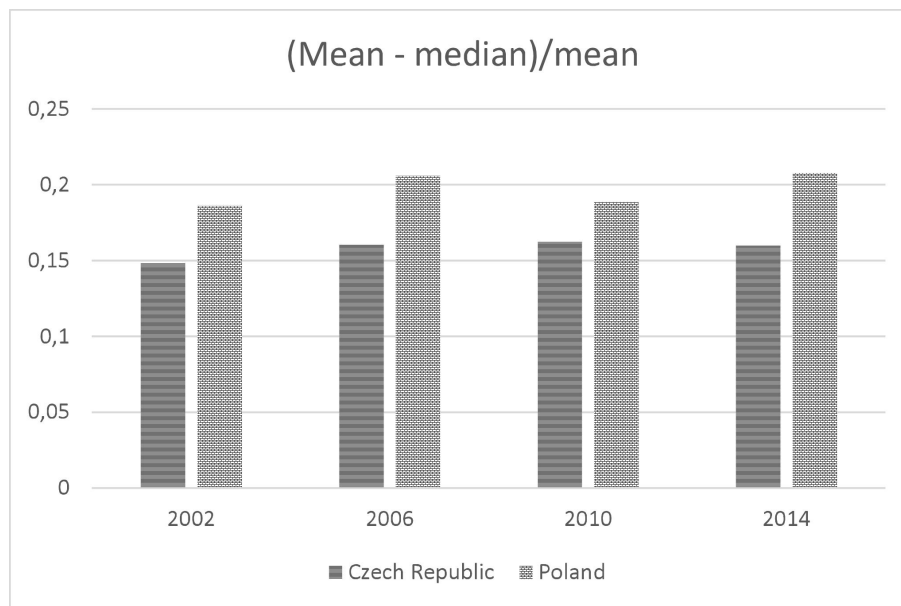
Source: the authors' work.

Figure 3: Relative changes in mean earnings.
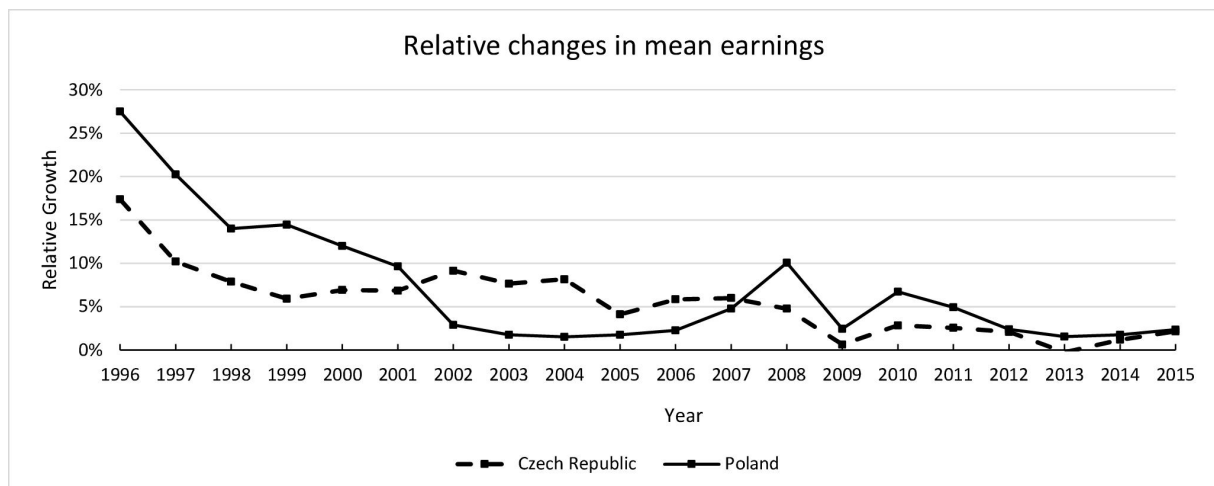
Source: the authors' work.

It is clear that the early values were quite different from each other. The evolution in the Czech Republic seems to have been more stable, but the differences have been disappearing lately, with the most recent values being very similar in both countries.

2.2 V4 vs. Austria

We will now consider a similar comparison for all member countries in the Visegrad Group, adding Austria as a neighbor of three of the Visegrad countries and, mainly, regarding

the shared historical background – the Austro-Hungarian Empire. We will compare the data from the years 2006, 2010, and 2014.
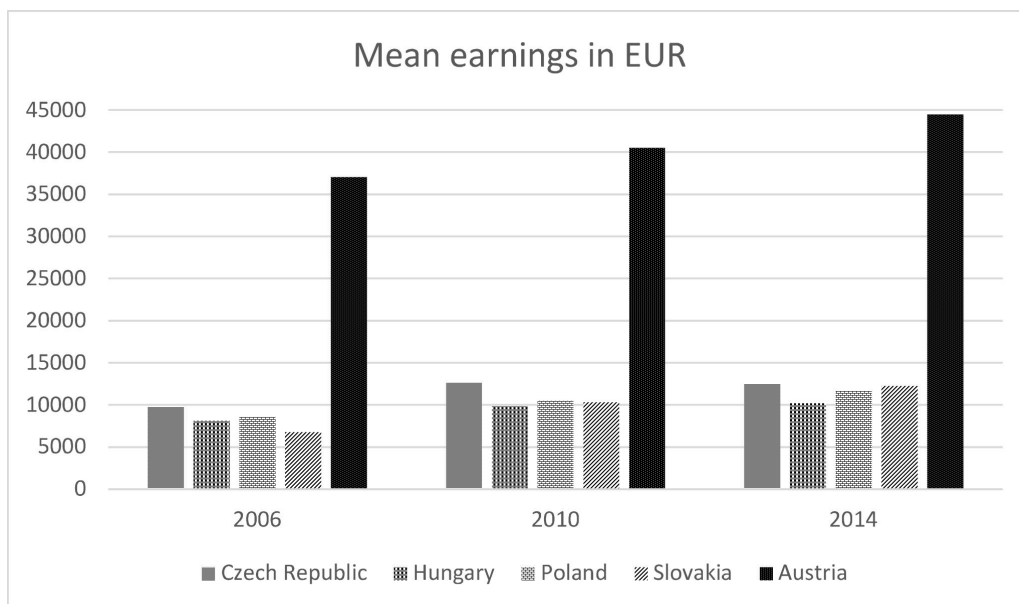
Table 3: Mean earnings in EUR

GEO/TIME	2006	2010	2014
Czech Rep.	9,781	12,696	12,542
Hungary	8,115	9,879	10,209
Poland	8,574	10,507	11,665
Slovakia	6,771	10,321	12,265
Austria	37,049	40,514	44,454

Source: Eurostat.

Let us view this data in a chart, which illustrates the comparison in a more pronounced way.

Figure 4: Mean earnings in EUR – V4 and Austria

Source: the authors' work.

We can see at first sight that Austria is completely different from the V4 countries – its values are about four times higher than those of the Czech Republic, which ranks second. The mutual differences within V4 are not so apparent in this chart, being distorted by Austria's high values. After removing Austria, the differences are easier to observe – cf. Figure 5. The Czech Republic achieved the highest values in all years of our study. Slovakia is interesting: from the lowest value among all Visegrad members in 2006 it had worked its way up to the second position just behind the Czech Republic in 2014. Hungary was undoubtedly in last position in both 2010 and 2014.

The chart of relative growth indicates the highest stability in Austria; in the remaining countries, the chaotic behavior typical for the early years has gradually changed to a more stable evolution in recent years. The differences between countries were originally quite high, but lately all countries have been approaching the Austrian values and the relative growth values have been stabilized.
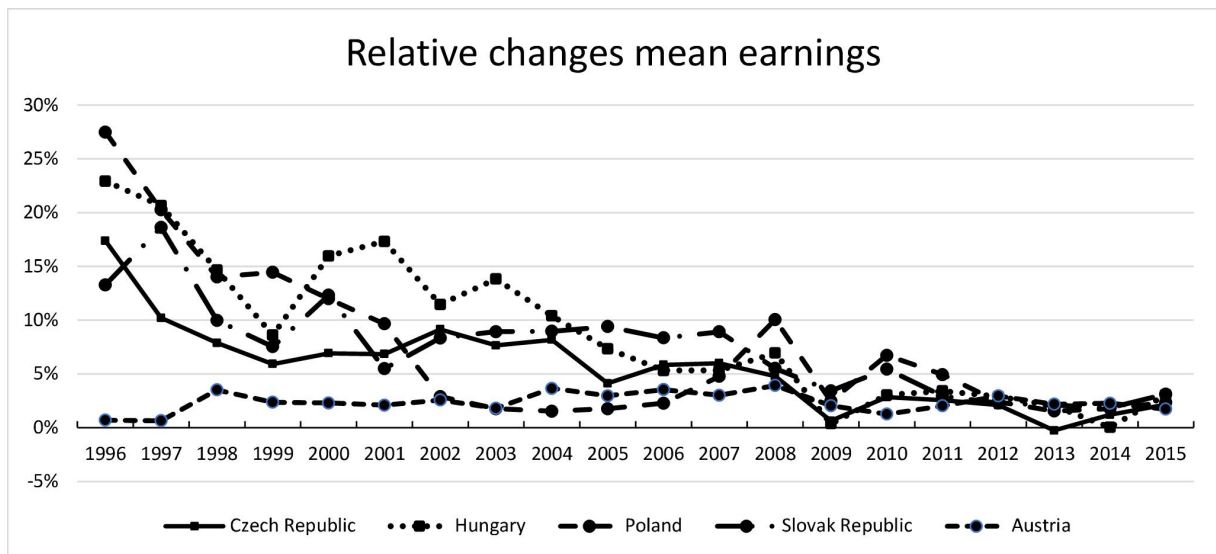
Let us now compare the value of index (1) for all five countries in the years 2006 and 2010; the data for Austria are not at our disposal for the other years.

Figure 5: Mean earnings in EUR – V4
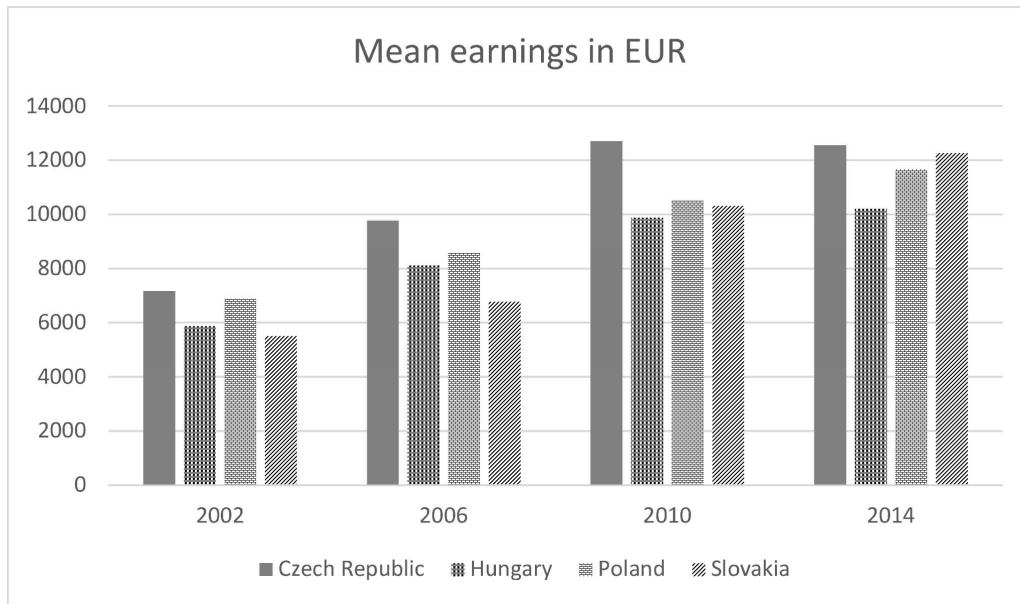
Source: the authors' work.

Figure 6: Relative changes in mean earnings.
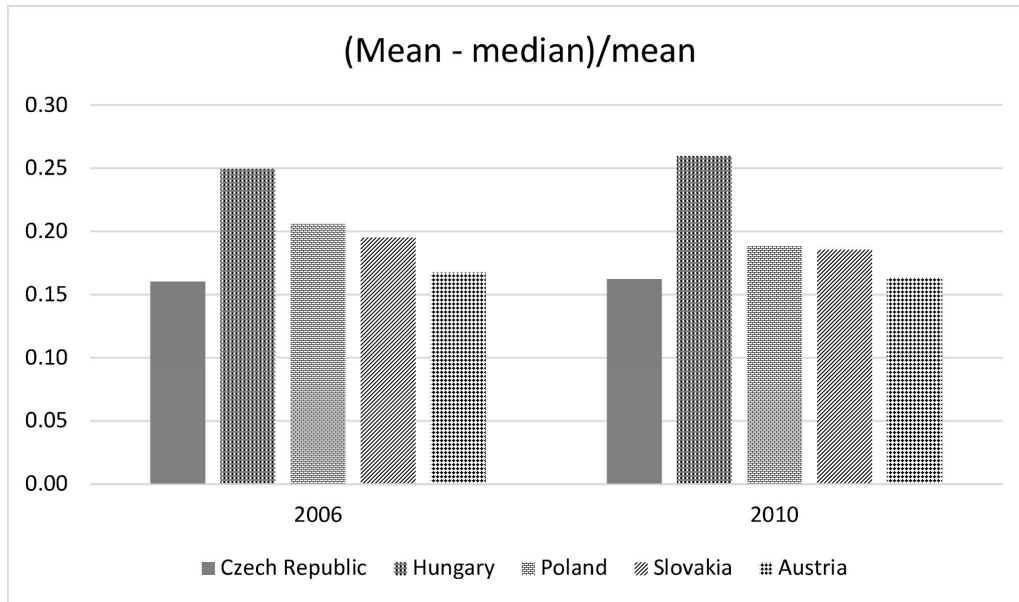

Source: the authors' work.

In both mentioned years, the highest value was achieved by Hungary, followed by Poland and Slovakia; the lowest (and quite similar to each other) are the values of the Czech Republic and Austria. In other words, the highest positive skewness (meaning a high proportion of above-average wages) surprisingly occurs in Hungary. On the contrary, the Czech and Austrian tendencies towards egalitarianism seem to be of the same kind.

2.3 V4 vs. Austria – another data source

This comparison makes use of the OECD data on average wages in national currencies, starting from 1995. The data was converted with the aid of EUR/ECU exchange rates (eg. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ert_bil_eur_a&lang=en), with the values for individual countries and the years 1995 through 2015. The data is shown in Table 4,

cleaned of inflation and stated in 2015 prices. Since the inflation rate evolved differently in each country, each time series had to be cleaned individually. Data on inflation was again obtained from (http://ec.europa.eu/eurostat/web/hicp/data/database).

Figure 7: Comparison of mean and median

Source: the authors' work.

Table 4: Converted wages in EUR – cleaned of inflation

Year	Czech Republic	Hungary	Poland	Slovak Republic	Austria
1996	2,143	1,156	2,040	1,505	18,370
1997	2,450	1,512	2,597	1,893	18,705
1998	2,886	1,743	3,143	2,221	19,522
1999	3,044	1,981	3,568	2,638	20,087
2000	3,505	2,455	4,645	3,324	20,953
2001	4,088	3,184	5,853	3,758	21,882
2002	5,006	3,945	5,842	4,214	22,826
2003	5,212	4,503	5,247	4,978	23,541
2004	5,774	5,349	5,370	5,830	24,882
2005	6,542	6,028	6,282	6,556	26,160
2006	7,428	6,200	6,717	7,406	27,545
2007	8,269	7,410	7,434	8,219	28,999
2008	10,253	8,397	9,185	9,014	31,111
2009	9,791	7,867	7,946	9,409	31,875
2010	10,655	8,640	9,432	9,991	32,825
2011	11,479	9,157	9,967	10,705	34,688
2012	11,872	9,614	10,416	11,360	36,632
2013	11,615	9,721	10,629	11,769	38,225
2014	11,146	9,353	10,863	11,974	39,667
2015	11,518	9,606	11,043	12,305	40,678

Source: the authors' work.

Austria is again an outlier. The wage evolution is different in each of the other studied countries. The 2015 values of the Czech Republic, Hungary and Poland do not substantially differ from the previous years. On the other hand, the wages have been steadily growing in Slovakia. Let us view a chart illustrating the evolution. The Austria values are governed by the axis on the right hand side because the values are so much higher.

Figure 8: Evolution of wages – in EUR, cleaned of inflation
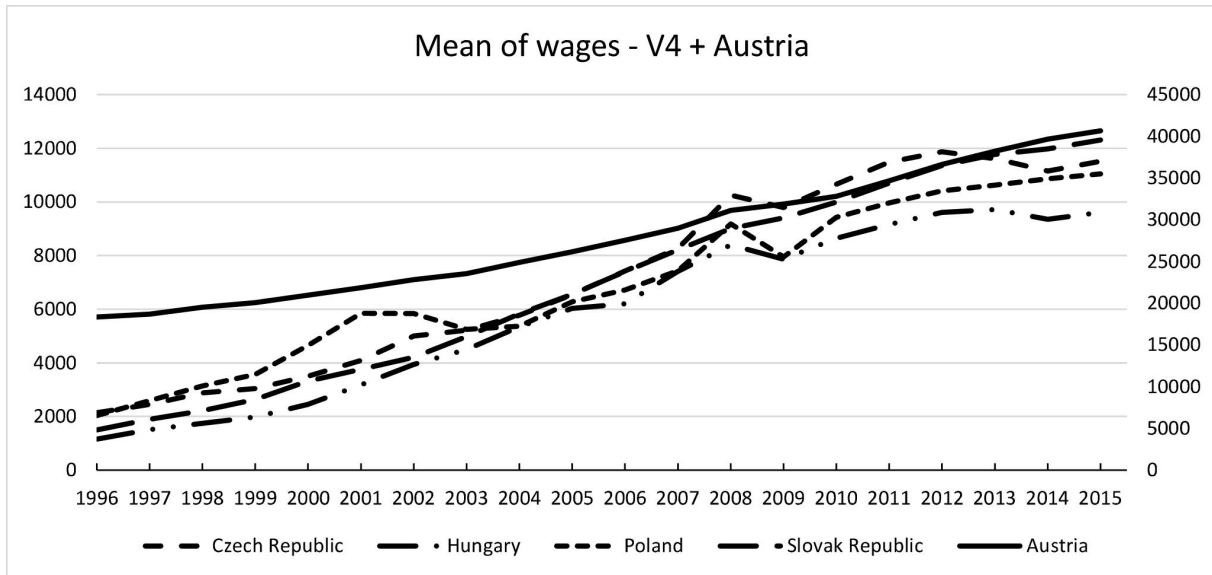
Source: the authors' work.

The wage evolution is similar in all the Visegrad member countries. Leaving Austria out of this comparison, the evolution was similar in the Czech Republic, Slovakia, and Poland. However, Slovakia's jump upwards was much higher than in the other two countries in 2015. Hungary was the last among the Visegrad members.

Table 5 shows the values of average absolute growth and the average growth coefficient.

Table 5: Average absolute growth and the average growth coefficient

Country	Average absolute growth	Average growth coefficient
Czech Republic	493	1.093
Hungary	445	1.118
Poland	474	1.093
Slovakia	568	1.117
Austria	1,174	1.043

Source: the authors' work.

The Czech Republic and Poland have the same average coefficient of the growth, by 9.3%. Hungary (11.8%) and Slovakia (11.7%) are practically identical to each other. Austria (4.3%) has been growing slowest. Let us recall that the relative growth is only one aspect, though: the "mere" 4.3% in Austria represents an annual growth by 1,174 EUR; the apparently identical growth in Slovakia and Hungary actually means 123 EUR more in Slovakia. The lowest relative growth among the Visegrad members means an annual increase by 474 EUR in Poland and by 493 EUR in the Czech Republic (i.e., higher than in Hungary but lower than in Slovakia).

Our primary task was to compare the wages in Poland and the Czech Republic; let us have a more detailed look at these two countries now.
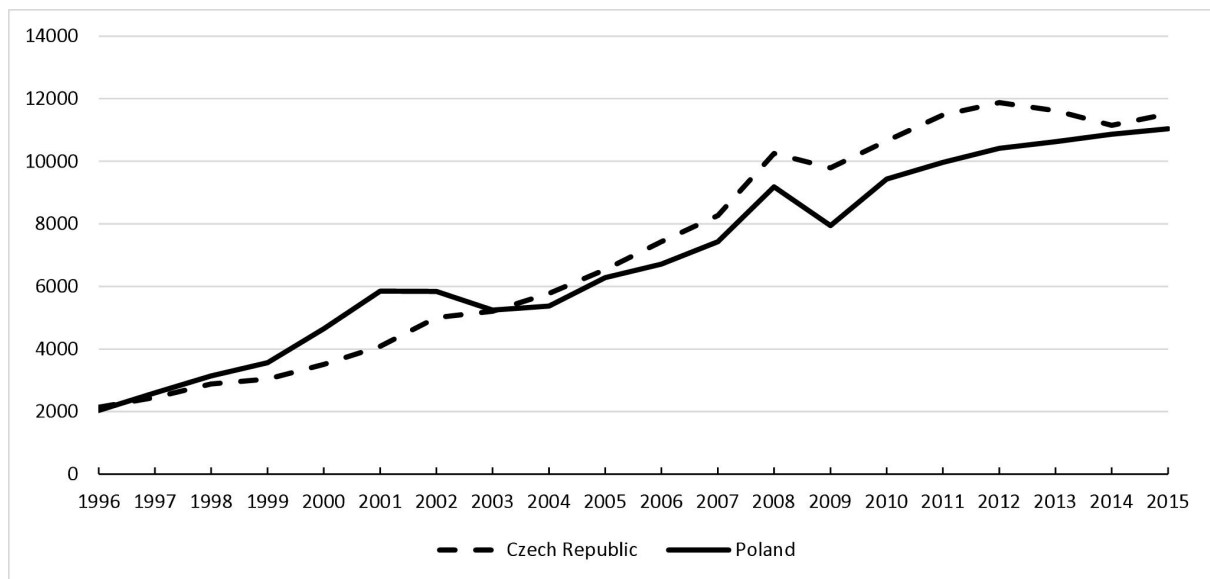
Table 6: Growth coefficient and absolute growth

Year	Growth coefficient		Absolute growth	
	CR	Poland	CR	Poland
1997	1.143	1.273	307	557
1998	1.178	1.210	437	545
1999	1.055	1.135	158	425
2000	1.152	1.302	461	1,077
2001	1.166	1.260	583	1,208
2002	1.224	0.998	917	-11
2003	1.041	0.898	207	-595
2004	1.108	1.023	562	122
2005	1.133	1.170	768	912
2006	1.135	1.069	886	436
2007	1.113	1.107	841	717
2008	1.240	1.236	1,984	1,751
2009	0.955	0.865	-462	-1,239
2010	1.088	1.187	864	1,486
2011	1.077	1.057	824	536
2012	1.034	1.045	393	448
2013	0.978	1.020	-257	213
2014	0.960	1.022	-469	234
2015	1.033	1.017	372	179

Source: the authors' work.

This Table indicates that the evolution is far from being uniform – up and down stages irregularly alternate. When the values go up in one country, they go down in the other (2002, 2003, 2013, and 2014). All these facts are signs of the discrepancy in the development of both economies, which respond in different ways to economic changes. Such differences are also reflected in wages. Only data for the Czech Republic and Poland is shown in Figure 9.

Figure 8: Wage evolution in the Czech Republic and Poland in EUR, cleaned of inflation

Source: the authors' work.

We can see that the growth rate of the wages in the Czech Republic is about the same as in Poland – after all, this aspect is already seen from the average growth coefficient and the average absolute growth. Wages have been somewhat higher in the Czech Republic since 2003; a sudden decrease in wages occurred in both countries in 2010. Since then, wages in Poland have been slowly growing, while they have been decreasing in the Czech Republic since 2012, but still keeping above the level of Poland. In the most recent years, wage levels have been about the same in both countries. Nevertheless, the quick economic expansion in 2016 and 2017 will undoubtedly cause a much quicker wage growth, especially in the Czech Republic.

3. Conclusions

The goal of this paper is to compare the wages in the Czech Republic and in Poland, as well as within the entire Visegrad Group, and with Austria. Our comparisons have been made in several steps and with the aid of several different methods. We have come to the following conclusions:

- Regarding the total annual sum of wages, the values in the Czech Republic have been higher than those in Poland for the entire period of our study. The differences are shown in Table 1 (comparison of the annual sums) and Table 2 (comparison of the medians).
- When comparing the average and the median, their difference is the lowest in the Czech Republic in all years of our study (cf. Figure 2). It means that the wages are most egalitarian in our country, with a low proportion of people with high wages.
- Evaluating the relative growth values in individual years (Figure 3), we can see that a stage of more stable circumstances came after a turbulent period. These values have been decreasing, showing a lower variability in time. We can also see that the values of both countries have been approaching each other and no substantial differences have been seen in this respect in the most recent years.
- Comparing the four Visegrad member countries with Austria, the latter's annual sum of wages is several times higher than those of the former. In other words, Austria is a separate entity and it does not make much sense to compare it with the Visegrad members. Among those, the Czech Republic has been achieving the highest values in all years of our study.
- After a period of very high growth, a drop occurred in all the studied countries in the late 1990s. The slowest decrease of growth values was seen in Poland. The Czech Republic's growth values have been the lowest in the long run (being the closest to Austria's). On the contrary, a radical increase came in Poland at the turn of the century. The end of the study period is characterized by wage leveling.
- We have also compared the annual time series in absolute values, cleaned of inflation. Austria is again far from the Visegrad members, which have all been developing at about the same rate; Slovakia has been achieving a significantly higher rate in the recent years.
- Comparing the average absolute growth values and the average growth coefficients, the most uniform growth has been occurring in Austria. The Czech Republic and Poland have the same average growth coefficient; similarly for Hungary and Slovakia.
- A more detailed analysis of the wage evolution in Poland and the Czech Republic shows that the wages have been somewhat higher in the Czech Republic since 2003 and a drop occurred in both countries in 2010.

- The time series of the absolute growth values and the growth coefficients for the Czech Republic and Poland indicate that the development is far from being uniform. Stages of growth and decline irregularly alternate.

In conclusion we can observe that the Czech Republic achieves slightly better values than Poland for most indices. The wages are higher, but the differences are not substantial, especially in the most recent years.

Acknowledgements

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