

Typology of EU Countries from the Viewpoint of the Minimum Wage and Selected Characteristics

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Abstract

The minimum wage in EU countries is applied either by law or through agreement between social partners. The aim of this paper is to create a typology of EU countries with respect to the amount of the statutory minimum wage and selected characteristics (economic level, educational level of the population and rate of unemployment). The analysis draws on official statistical data which have been processed using statistical methods. After the evaluation of the values of the calculated coefficients of correlation, only two characteristics were included in the cluster analysis (economic level and educational level). The reason for this, is that it was shown that the amount of the minimum wage and the rate of unemployment were independent variables.

On the basis of the results of the cluster analysis, seven clusters were identified. From the description and analysis of the individual clusters it was not possible to draw any definitive conclusion on whether a particular level of minimum wage is bound to a certain educational level. Even the statement that higher statutory minimum wages are found in countries with higher economic level can only be made with considerable caution. It was also evident that “old” EU countries showed much greater homogeneity in these characteristics than was found in the “new” ones.

Keywords: EU, GDP, minimum wage, cluster analysis

Introduction

Today, in many countries (not just in the EU) a minimum wage is now a commonplace part of the legislative framework. Nevertheless, discussions still continue as to its significance, impact and its actual economic and social functions. Advocates of a minimum wage regularly point out that it can motivate employees to accept and carry out work (even when low-paid) and provides employers with uniform conditions in terms of wage competition. Detractors, meanwhile, point to the possibility that minimum wages restrict employment opportunities for these self-same low-paid and

generally poorly qualified workers: for employers the minimum wage represents the very lowest threshold for wage costs which cannot be undercut.

Broadly speaking, it can be said that in countries where a statutory minimum wage has been introduced, various institutional and methodological mechanisms have been used to implement it. As a rule, one of the following approaches has been adopted:

1) the minimum wage is set by law, i.e. under a generally binding regulation with the legal force of an Act, i.e. by the State (it is for this reason that is generally referred to as the “statutory minimum wage”); or

2) it is set under binding collective agreements which stipulate the minimum wage or its various levels (divided by industry, sector, qualifications or professional groups), i.e. through agreement between various social partners (see e.g. Baštýř 2007, pp. 6-7).

Member states of the European Union apply both types of mechanism, although the commonest approach is for the minimum wage to be set by the State under law. EU member states see the advantages of doing so in the following facts:

It is a system founded on unified, statutorily regulated rules which define the scope and conditions for applying the minimum wage (the principle being that the scope for applying a minimum wage is as broad as possible); its basic rate and the conditions under which it is applied; the unified conditions under which a reduced minimum wage can be applied; and the ability to define the method and conditions under which the minimum wage can be increased (valorised).

The system establishes relatively favourable conditions for realizing the protective function of a minimum wage, both for employers and employees. The use of such a system is possible and suitable in countries where collective negotiations on wages rarely occur above the individual company level.

The system makes it possible to simply (and clearly) maintain a proportionate relationship to movements in the level of consumer prices and to changes in nominal and real wages.

Within the European Union, this system (with certain differences) is applied in the following states: Belgium, France, Croatia, Ireland, Luxembourg, the Netherlands, Portugal, Greece, Spain, United Kingdom, Czech Republic, Estonia, Hungary, Malta, Lithuania, Latvia, Poland, Slovakia, Slovenia, Bulgaria, Romania and also for the first time (from 2015) Germany. Pavelka (2014, pp. 88-90) provides an excellent overview of the developments in the application of the minimum wage in these countries and a description of the specifics of the individual systems, including the areas of application of the minimum wage, valorisation methods, etc.

The basic precondition for setting a minimum wage through collective bargaining is the attainment of highly developed collective bargaining between the social partners (in particular across an industry, i.e. above individual company level). This requires the existence of functioning ties between employers and employees that bring together a sufficient proportion of businesses and employees in order that they can negotiate, as

respective representatives, cross-company collective agreements. The provisions of such agreements, entered into across an industry or sector, then help lay the foundations for minimum wages in that country. In countries where the setting of a minimum wage under such collective agreements has been adopted, the number of employees covered varies. In general, the proportion of employees covered is lower than when the minimum wage is set by the State. Nonetheless, for those employees to whom no collective agreement applies (who have very little or no trade union representation), state regulation is provided through more selective legal regulations (relating only to particular groups of workers) or through the extension of valid collective agreements to cover such men and women. The minimum wage is set by collective agreements in the following EU countries: Denmark, Finland, Sweden, Italy, Austria and Cyprus.

Statement of a problem

There is a great quantity of publications and individual papers, of varying quality, which deal with the minimum wage and its manifold connections within an economy. In fact, the minimum wage has attracted the attention of economists (but also politicians, trade unionists and others) since the 1910s and 20s, when the first studies on the impact of a minimum wage were published in the USA (see e.g. Ashenfelter, Card 1999).

Authors have overwhelmingly preoccupied themselves with the impact of the introduction of, and the subsequent raising of, a minimum wage and its connection to unemployment. It is remarkable, but perhaps symptomatic of economic theory, that two contrasting schools of opinion have formed with regards to the appraisal of the effects of the minimum wage on employment. The first group (Card, Krueger 1995, and many others), believe that a minimum wage may have a positive, or at worst non-negative, impact on employment. The second group (Neumark, Wascher 2000; Neumark, Wascher 2007; Aaronson, French 2007) are fundamentally more sceptical, and their conclusions incline more towards mainstream economic theory, i.e. that the introduction of (or increase in) a minimum wage has a very direct effect, namely a reduction in employment. Neither of these two schools have been able to provide the overwhelming evidence or conclusive arguments that are needed to overturn the beliefs of the opposing side. As a result, the two currents of thought have now coexisted for several decades¹.

One of the most recent publications worth citing which deals with the relationship between the level of the minimum wage and employment is that by Pícl et al. (2014). The authors investigated the effect of the minimum wage on employment in the Czech Republic. They concluded that no such effect could be confirmed. A similar conclusion was also reached by Schmitt (2015) for the situation in the USA. In the context of EU states, Pavelka (2014) investigated the dependence between general and youth

¹ The discussions in the 1990s were particularly heated with regards to the conclusions of the empirical studies carried out by Card and Krueger with Neumark and Washer in *The American Economic Review* or between Card, Katz and Krueger with Neumark and Washer in the *Industrial and Labor Relations Review*.

unemployment levels and the proportion of the minimum wage to median wages. His analysis drove him to conclude that the dependence was positive, but that the effect was only very slight. In fact, for those persons with the very lowest level of education, no dependence was demonstrated between unemployment levels and the proportion of the minimum wage to median wages. Conversely, after examining data from Cyprus, Mitsis (2015) drew attention to the negative relationship between minimum wage levels and employment, recognizing simultaneously a significant displacement of employment towards those sectors that had not been covered by the minimum wage.

Other areas that have attracted the attention of authors have included the effect of a minimum wage on income (in)equality and also wage distribution (Bosch 2015). An interesting opinion was reached by Garnero et al. (2015), who used data from 18 European states (2007 – 2009) to investigate how the diversity of systems for generating a minimum wage influences unequal earnings. The results of the research confirmed, what had hitherto been assumed by many economists, that a combination of a sectoral minimum wage with a high coverage of collective bargaining is entirely equivalent to a legislated statutory minimum wage. Campolieti (2015), examines the impact of a minimum wage on the wage distribution of the adult labour force (aged 15 – 64 years) in Canada in the years 1997 – 2010. He concludes that the impacts are not as significant as those in the United States.

Now and again papers also appear that evaluate minimum wages in relation to enterprises (generally those enterprises in which minimum wages are paid – fast food restaurants, hotels, minor services). However, these tend not to be scientific papers, but rather compilations of more or less scholarly articles in newspapers, for example.

It is probable that the relationship between the minimum wage, economic level and education (see the subject of analysis in this text) has not so far been separately described by any of the aforementioned authors. The only relationships that has been examined is between education and wage distribution (or wages), whereby the minimum wage is just one of the factors that affects the latter (under Czech conditions see Bílková 2013; Devereux, Fan 2011; Brunello 2010).

Materials and Methods

The subject of this analysis is the relationship between the level of the statutory minimum wage in EU member states (provided such measure has been introduced) and certain selected characteristics. The aim of the analysis is to establish a typology of EU countries with regards to the amount of minimum wage and the selected characteristics.

Three characteristics were chosen: the economic level of the country as expressed by the indicator GDP per capita in PPS (whereby the EU28 is 100%), the proportion of people with a tertiary education in the population aged 25 – 74 years and the harmonized level of unemployment. The first two characteristics were selected on the basis of the findings of various authors (Ashenfelter, Card 1999; Bílková 2013; Dinis da

Costa et al. 2014), according to whom these factors contribute to the shaping of the wage level, of which the statutory minimum wage is a part.

A condition for highly paid, complex and innovative work is highly qualified, educated labour - the interconnection between education, wage distribution and the wage level is relatively tight. At the same time, education is often seen as a source of prosperity and a high economic level (Bílková 2013) or productivity (Chevalier et al. 2004). Countries producing output with high added value must have a highly educated population who consequently demand higher wages for their work. In other words, higher wage levels (including the minimum wage) can be expected in countries with a highly educated population.

The possible link between the rate of unemployment and the minimum wage has been pointed out by numerous authors (as discussed above), even though they do not completely agree on the extent of this effect.

There is no doubt that the wage level and the minimum wage level in a given country will also be related to other characteristics (e.g. social benefits system, establishment of a subsistence minimum and a living wage – and many others). Nevertheless, for the purposes of a cluster analysis, it is necessary to select only a limited number of indicators in the knowledge that the results will be affected by this selection.

The underlying assumptions for the cluster analysis are as follows:

- 1) The minimum wage level in countries is tied to a specific economic level (the higher a country's economic level the higher its minimum wage), to the level of unemployment (the higher the minimum wage level the higher the level of unemployment), and to education levels (the greater the proportion of people with a tertiary education, the higher the minimum wage).
- 2) In countries where the statutory minimum wage is higher, the expectation is that the economic level is higher and that there is a more educated workforce, but also greater levels of unemployment.
- 3) In general, the statutory minimum wage reflects (more or less) the overall wage level, which in turn influences the economic level and education (we assume that in countries with a more educated population there are also generally higher wages). In line with mainstream economics², the assumption is that unemployment is higher in countries with a higher minimum wage.

Prior to the cluster analysis, it is necessary to calculate the correlation coefficients in order to determine whether, or not, all three characteristics can be included in the cluster analysis. If any of the characteristics do not demonstrate at least a medium-strength dependency on the amount of the minimum wage it cannot be included in the cluster analysis. In order to confirm that the correlation coefficient calculations were not affected by external variations (especially in the case of unemployment and GDP per

² The author is not a supporter of this point of view.

capita), the correlation coefficients were calculated for the years 2011 – 2014 (with exception to the coefficient for the correlation between the minimum wage and the proportion of people with a tertiary education: data on the educational structure in 2013 are from a select survey; however, the assumption has been made that the educational structure is not subject to much interannual variation). The actual cluster analysis was carried out for 2013 because it was the last year for which all such data were fully available.

With respect to the character of the analysis, only secondary data from official statistics were used as source data. Conducting an independent questionnaire survey would have been impossible. The source data were taken from the Czech Statistical Office (international comparison). Data on those countries without a statutory minimum wage (i.e. Denmark, Finland, Sweden, Italy, Austria and Cyprus) and Germany, which although it does have a minimum wage today (2015), did not have one in 2013, previously applying a system of collective bargaining instead, were deliberately discarded from the analysis.

This secondary data was processed using methods of descriptive statistics, statistical correlation and cluster analysis.

Table 1: Underlying statistics in selected EU member states in 2013

Country	Minimum wage (EUR per month) ¹	GDP per capita in PPS (%, EU28=100)	Rate of unemployment ² (%)	Prop. of population with a tertiary education ³ (%)
BE: Belgium	1,501	118.7	8.4	33.1
BG: Bulgaria	158	46.5	13.0	24.2
CZ: Czech Rep.	318	79.9	7.0	19.1
EE: Estonia	320	73.0	8.6	37.2
EL: Greece	876	76.4	27.5	24.8
ES: Spain	748	95.2	26.1	31.0
FR: France	1,398	108.2	10.3	29.8
HR: Croatia	373	60.8	17.3	19.1
HU: Hungary	335	66.8	10.2	21.5
IE: Ireland	1,461	126.3	13.1	38.7
LV: Latvia	286	67.3	11.9	29.3
LT: Lithuania	289	74.2	11.8	32.8
LU: Luxembourg	1,874	264.1	5.9	38.4
MT: Malta	697	88.2	6.4	17.2
NL: Netherlands	1,469	126.8	6.7	31.7
PL: Poland	392	68.0	10.3	24.2

PT: Portugal	565	75.5	16.4	17.5
RO: Romania	157	54.1	7.1	14.5
SI: Slovenia	783	82.7	10.1	26.4
SK: Slovakia	337	76.3	14.2	18.8
UK: United Kingdom	1,249	105.7	7.6	38.2

¹ Non-euro area countries: exchange rates and conversion into EUR: see Eurostat Metadata;

² From selected labour force surveys;

³ Proportion in the population aged 25 – 74 years, selected survey.
Source: Czech Statistical Office, Eurostat (Eurostat Metadata)

Results

Correlation between the level of the minimum wage and the selected characteristics

The strength of the dependency between the amount of the minimum wage and the selected characteristics was measured using the correlation coefficient r_{xy} . The results are presented in Table 2.

Table 2: Correlation coefficient values between the amount of the minimum wage (MW) and the selected characteristics

	2011	2012	2013	2014
MW/GDP per capita in PPS	0.84721943	0.83733720	0.82882930	0.84743664
MW/rate of unemployment	-0.32259086	-0.21516527	-0.15955132	-0.15997547
MW/prop. of population with a tertiary educ.	¹	¹	0.63421037	¹

¹ Data not available

Source: own calculation based on data from Czech Statistical Office

On the basis of the results presented above it is possible to state that for all four years a strong direct linear dependence exists between the amount of the minimum wage and the economic level (expressed as GDP per capita in PPS), and that a moderate direct linear dependence exists between the amount of the minimum wage and the proportion of the population with a tertiary education (although the dependence is lower than expected). In contrast, the results show that the amount of the minimum wage and the unemployment rate are only slightly dependent; for 2013 – 2014 it could even be said that they were independent (the value of the correlation coefficients for all four years is low – close to zero). This last result confirms the views of those who do not consider the

minimum wage to be a cause of unemployment or do not see a relationship between the minimum wage and (un)employment (Pícl et al. 2014; Schmitt 2015).

Cluster analysis

Only those variable which demonstrate a medium-strength dependence can be included in the cluster analysis. As a result, only the following variables can be utilized: minimum wage level, GDP per capita and the proportion of people with a tertiary education. For these variables the descriptive statistical results are presented in Table 3.

Table 3: Results of descriptive statistics

Descriptive statistics	Min. wage	GDP per capita	Tertiary educ.
Mean	742.1905	92.1286	27.0238
Minimum	157	45.5	14.5
Maximum	1,874	264.1	38.7
Median	565	76.4	26.4
Standard deviation	533.1992	45.3692	7.7592
Variance	284,301.4	2,058.4	60.2

Source: own calculation based on data presented in Table 1

Since the data are measured in a variety of units (EUR, %) and show markedly different levels and variability, they must be normalized in order to carry out the cluster analysis. Failure to normalize the data would result in the cluster analysis practically being determined by the first variable which would differ markedly from any result where all three variables would have an equal impact on the cluster result. The normalized values are presented in Table 4.

Table 4: Normalized data for cluster analysis

Country	Min. wage	GDP per capita	Tertiary educ.
BE: Belgium	1.423126	0.585671	0.78309
BG: Bulgaria	-1.09563	-1.00572	-0.36393
CZ: Czech Republic	-0.79556	-0.26953	-1.02121
EE: Estonia	-0.79181	-0.42162	1.311492
EL: Greece	0.250956	-0.34668	-0.2866
ES: Spain	0.010896	0.067698	0.512445
FR: France	1.229952	0.354236	0.357791
HR: Croatia	-0.69241	-0.69052	-1.02121
HU: Hungary	-0.76367	-0.55828	-0.7119
IE: Ireland	1.348107	0.753185	1.50481
LV: Latvia	-0.85557	-0.54726	0.293352
LT: Lithuania	-0.84995	-0.39517	0.744427
LU: Luxembourg	2.122677	3.790485	1.466146
MT: Malta	-0.08475	-0.08659	-1.26608
NL: Netherlands	1.363111	0.764206	0.60266
PL: Poland	-0.65677	-0.53183	-0.36393

PT: Portugal	-0.33232	-0.36652	-1.22741
RO: Romania	-1.09751	-0.8382	-1.61405
SI: Slovenia	0.076537	-0.20782	-0.0804
SK: Slovakia	-0.75992	-0.34888	-1.05987
UK: United Kingdom	0.950507	0.299133	1.440371

Source: own calculation based on data presented in Table 1

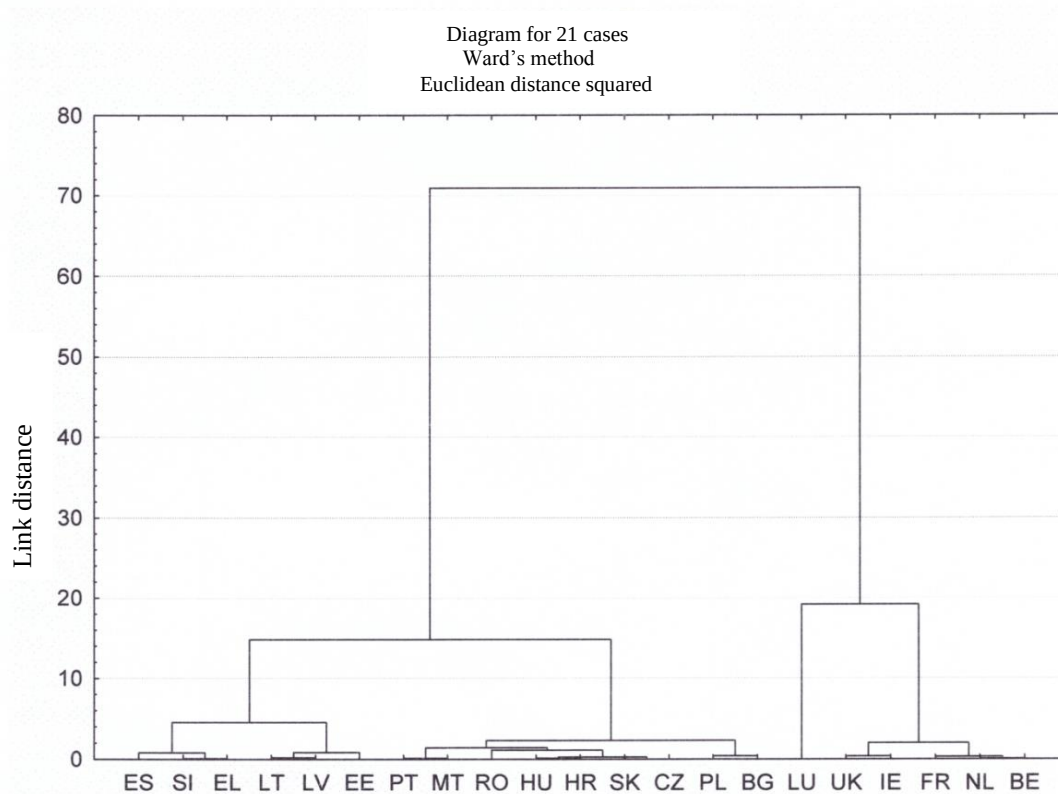
The squared Euclidian distance was chosen as the distance metric. The clusters were assembled using Ward's method. The results of the cluster analysis are illustrated in Figure 1.

On the basis of the results of the cluster analysis, seven clusters were created:

Cluster designation	No. of states	Cluster features
S1	3	Spain, Slovenia, Greece
S2	3	Lithuania, Latvia, Estonia
S3	2	Portugal, Malta
S4	5	Romania, Hungary, Croatia, Slovakia, Czech Republic
S5	2	Poland, Bulgaria
S6	1	Luxembourg
S7	5	United Kingdom, Ireland, France, the Netherlands, Belgium

To complete the picture, it is necessary to re-emphasize that a completely separate group of countries exists, formed by those states who do not have a statutory minimum wage, which were discarded from the cluster analysis (Denmark, Finland, Sweden, Italy, Austria, Cyprus and, because the year in question was 2013, also Germany).

Figure 1: Dendrogram of the clustering procedure



Source: author – processed on the basis of data presented in Table 4

Discussion

With respect to similarity, the most similar are Slovenia and Greece, followed by Lithuania and Latvia, as well as Portugal and Malta. These pairings also constitute the most homogenous clusters (that is if we ignore the cluster which constitutes only one country - Luxembourg), whereas the most heterogeneous is the very last group comprising the United Kingdom, Ireland, France, the Netherlands and Belgium.

The countries in the first cluster (Spain, Slovenia and Greece), may be cautiously characterized as “average”. Their minimum wage levels, economic level and the proportion of people with a tertiary education all show approximately average values.

The Baltic States (Lithuania, Latvia and Estonia) make up the second cluster: they are typified by minimum wage levels that are far below-average (less than half the average), slightly below-average economic level, but above-average levels of education.

Portugal and Malta (third cluster) are characterized by slightly below-average minimum wages levels and economic level, but also a considerably below-average proportion of people with a tertiary education (both countries report the lowest proportion of people with a tertiary education out of all the given states).

Typical for countries in the fourth cluster (Romania, Hungary, Croatia, Slovakia and the Czech Republic) is a minimum wage level that is significantly below-average, as well as below-average economic level and the proportion of people with a tertiary education.

The fifth cluster, consisting of Poland and Bulgaria, is an interesting combination of considerably below-average minimum wage levels, as well as below-average economic level, but with average levels of people with a tertiary education.

Luxembourg defies comparison and is therefore in a cluster of its own. It is a state with the highest level of minimum wage, the highest economic level and has one of the highest proportions of people with a tertiary education of any of the monitored countries.

The seventh cluster consists of the United Kingdom, Ireland, France, the Netherlands and Belgium. These are countries where the level of the minimum wage is much higher than average, with above-average economic level and well above-average educational attainment.

Conclusion

On the basis of the correlation and cluster analysis, the following conclusions can be drawn:

The calculated correlation coefficients show that the level of the minimum wage and the unemployment rate were only slightly dependent, or even independent, variables. The values of the correlation coefficients were close to zero (between -0.3 and -0.1). These results support the views of those who do not see the minimum wage as being a cause of unemployment (Pícl et al. 2014; Schmitt 2015), and that it simply adds another piece of evidence to the long (and certainly not finished) discussion on the impact of minimum wages on unemployment. Contrary to the assumption made, this indicator could not be included in the cluster analysis. As a result, it became clear before starting the cluster analysis, that our original assumption that the higher the minimum wage in a country the higher the level of unemployment, would definitely not be confirmed (or possibly overturned).

The correlation coefficient calculations for the remaining two assumptions confirmed that a direct linear dependence exists between the level of the minimum wage and the economic level, as well as between the level of the minimum wage and education. The linear dependence between the level of the minimum wage and the economic level was strong (the value of the correlation coefficient was over 0.8). Of particular interest is the fact that the dependence between the level of the minimum wage and a population's education level was 'only' moderately strong (the value of the correlation coefficient was slightly above 0.6). The expectation was that there would be a stronger dependency.

Only three variables were therefore included in the cluster analysis: the amount of the minimum wage, the economic level (expressed by the indicator GDP per capita in PPS) and the proportion of people with a tertiary education.

Seven clusters were identified on the basis of the results of the cluster analysis. One cluster featured only one element, the others contained between two and five elements (i.e. countries).

From the description and analysis of the individual clusters it was not possible to draw any definitive conclusions with regards to a specific minimum wage level being tied to a specific level of education. If the specific case of Luxembourg is ignored, there are states (e.g. the Baltic States – Lithuania, Latvia and Estonia) in which the level of the minimum wage is well below-average, despite the population being above-averagely educated. In contrast, there are other countries (e.g. Croatia, Slovakia, Czech Republic, Romania and Hungary) where a low minimum wage is accompanied by below-average levels of education. It can only be claimed for the states of 'old' Europe (bolstered by Slovenia) that an average or above-average minimum wage corresponds with an average or above-average proportion of the population having a tertiary education.

It is true, that when assessing the connection between the level of the minimum wage and the level of economic activity it can be concluded that there is a strong connection. (This was expected because the value of the correlation coefficient was greater than in the previous example). It can therefore be stated that in countries with a higher minimum wage we can expect a (more or less) higher economic level. However, for reasons previously given, this statement should be treated with caution.

It can be also noted that those countries that tend to be harmonised in other aspects (e.g. the Baltic States) (Minařík et al. 2013) usually fall together into clusters typified by the levels of the given characteristics.

In conclusion, it is not possible to definitively state that a particular amount of minimum wage is accompanied by a particular economic level and simultaneously a particular level of education within a society. Nonetheless, the 'old' countries of the EU tend to be more homogenous: the overall levels of minimum wages matches their respective economic level and, in general, they have a greater proportion of people with a tertiary education (although small dissimilarities exist between countries in Southern and Western Europe) (see also Pavelka 2014). In terms of minimum wage levels, 'new' Europe lags well behind. Nevertheless, this delay is not always accompanied by a similar shortfall in the levels of education or economic level. However, greater differences exist between these characteristics than exist in the original EU countries.

Even though the results of the analysis do not appear to be particularly conclusive (in fact they did not even confirm our original assumptions), they may present a certain alternative insight into the context of the minimum wage in the ongoing debate about the issues and perspectives of minimum wages in EU countries.

The minimum wage is still an inspiring topic. Further research could include additional factors for cluster analysis (e.g. long-term unemployment rates) or the processing of data using alternative statistical methods (e.g. ANOVA).

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