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Does minimum wage reduce youth employment on regional labour markets in Poland?

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1/2015

# **Does minimum wage reduce youth employment on regional labour markets in Poland?<sup>1a</sup>**

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<sup>a</sup> All opinions presented within this paper reflect solely the authors' personal beliefs and shall not be identified with official standpoint of the institutions' they are employed by.

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## **Abstract**

The main aim of the paper was to verify whether the changes in minimum to average wage ratio in Poland negatively affected youth (15-24 years old) employment rate. Moreover we tried to answer the question if this impact differs among regions. We analysed a model where changes in youth employment rate were the function of changes in minimum to average wage ratio as well as other (demand and supply) variables. The analyses were conducted on 16 Polish NUTS2 regions in 1999-2012.

The analyses conducted in the paper showed that when we estimated the average impact of changes in minimum to average wage ratio on changes in youth employment rate the parameter was not significant. Changes in youth employment were driven mostly by changes in business cycle and in school enrolment ratio. After having checked for the regional variation of the determination of the youths' employment rate we found that the impact of minimum on employment differed significantly among regions, both in terms of size and sign. The regions where youth employment rates were negatively affected in the whole period by changes in minimum to average wage ratio were the rural, less developed districts of Poland (Lubelskie and Podkarpackie). The results of our analyses indicate in regions with low productivity and low average wages the level of unique minimum wage may be too high. Low youth employment rates in those regions in Poland may not only result from insufficient aggregate demand but also from relatively high costs of employing young workers.

JEL Codes: R23, J31.

Key words: minimum wages, youth employment rates, regional labour markets in Poland.

## Introduction

The aim of the paper was to answer a question of whether changes in minimum to average wage ratio in Poland had a negative impact on changes in youth employment rate. This question gains in importance as during last years the minimum wage in Poland has increased substantially. As a result, Polish minimum wage is one of the highest among the new EU member states<sup>2</sup>. Moreover, the minimum wage in Poland has been increasing much faster than the average wage, which resulted in a rapid growth of minimum to average wage ratio, from 34% in 2007 to 42% in 2012.

Additionally, the role played by the minimum wage in institutional setup of the labour market and its regulations has been lately intensely discussed in Poland by trade unions, employers' organizations, government, academics and international bodies involved in assessment of the Polish economy performance (eg. OECD). On one hand, trade unions and social partners are to a large extent responsible for the rising trend of the minimum wage as they exert the pressure on government to increase the minimum wage to the level of 50% of the average wage. They use the arguments of the protection of the living standard of low wage workers and reducing poverty.

On the other hand, employers tend to highlight potential damage to the cost competitiveness of their businesses and expect cuts in the employment as employers' adjustment to the minimum to average wage ratio increases. It's worth emphasizing that moderate wage dynamics vis-à-vis labour productivity and the resulting improvement of the international competitiveness of the Polish firms have been the strong features of the Polish economy during transformation (Peters, 2010). With its specialization in rather labour intensive low and medium tech goods, price competitiveness has been a dominant mechanism for the exports' expansion of the Polish firms and restrained unit labour cost dynamics have been essential to achieve it. In this respect, strong increases in minimum wage with its potential impact of shifting up wages throughout wage distribution may thus have negative impact on the Polish exports cost competitiveness of labour intensive industries.

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<sup>2</sup> Countries that joined EU in 2004 or later (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia)

Economists, including international experts (see OECD, 2014), are quite often sceptical about the existence of a positive impact of high minimum wage on living standards of low wage workers' families and on its ability to reduce poverty. They rather suggest that in case of Poland, with its relatively wide variation of regional wage level and unemployment statistics, one of the ways to work out good compromise between expected *good* effects of higher minimum wage (decent pay) and *bad* hazards involved (jobs lost) is the adjustment of the minimum wage level to local labour market conditions through differentiating its level by region. During last years OECD has been not only advocating the restraint in raising the minimum to average wage ratio in Poland but also regional diversification of minimum wage. Its experts recommended to the Polish government in 2014 as follows: *'Refrain from increasing the minimum-to-average wage ratio. Consider differentiating the minimum wage across regions depending on local labour market conditions'* (OECD, 2014)<sup>3</sup>.

Indeed, the regional dimension of minimum wage impact on youth employment in Poland is of particular importance. Poland is a country with considerable regional wage inequalities. With the minimum wage set uniformly at national level, the ratio of minimum to average wage is very diversified among regions. It differs from 0.32 in capital region to 0.46 in low wage, eastern regions of Poland. In the last ones the minimum wage may be too high comparing to local productivity and therefore harmful to employment. Moreover, potential adverse effects of minimum wage usually materialize among the low-pay segments of the labour market, like youth and low-skilled workers. In Poland, the situation of these groups of employees is weak both in terms of relatively high unemployment and low employment rates. Again, the distribution of these groups of workers is uneven across regions what adds an additional argument in favour of including regional dimension into the discussion on minimum wage policy.

The intensity of discussion on minimum wage in Poland is strikingly not matched by the up-to-date empirical analyses that show its potential impact on employment. This paper belongs to the strand of literature that may be attributed to the Brown et al. (1982) analysis on time-series data, then modified by Neumark and Wascher (1992) to panel data with regional or country dimension (see also Williams, 1993). This approach, after being

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<sup>3</sup> Similar suggestions were proposed in 2012 and 2010 OECD Economic Surveys.

widely in use for years, gained the reputation of ‘the standard panel data approach’ (Neumark et al., 2013). Models belonging to this class explain employment rate by minimum wage to average (or median) wage and the set of control variables, covering some characteristics of labour supply, business cycle dynamics and institutional variables, relevant to the labour market. The latest works applying this approach include several contributions of Neumark and Wascher (eg. Neumark et al., 2013, Neumark and Wascher, 2008, 2007, 2004 and others like Cuesta et al., 2011).

As far as Poland is concerned, there is a lack of up-to-date analyses of minimum wage impact on youth employment. Our previous works (Majchrowska and Żółkiewski, 2012 and Broniatowska, Majchrowska, Żółkiewski, 2013) are among the few that attempt to econometrically model the impact of minimum wage on employment and carefully analyse regional labour markets in Poland. Previous analyses of this type were published a decade ago or earlier and therefore cannot be valid as empirical support of the current discussion on minimum wage in Poland.

In this paper we estimated the panel model that explains changes in youth employment rate by changes in minimum to average wage ratio and other control variables in 16 regional (NUTS2) labour markets in Poland in 1999-2012.

Apart from estimating the average impact of minimum to average wage ratio on youth employment in Poland we allow the coefficient to vary across regions. This approach allowed us to answer the question of whether minimum wage was binding employment especially in low wage regions.

The analyses conducted in the paper showed that when we estimated the average impact of changes in minimum to average wage ratio on changes in youth employment rate the parameter was not significant. Changes in youth employment were driven mostly by changes in business cycle and in school enrolment ratio. After having checked for the regional variation of the determination of the youths’ employment rate we found that the impact of minimum on employment differed significantly among regions, both in terms of size and sign. The regions where youth employment rates were negatively affected in the whole period by changes in minimum to average wage ratio were the rural, less developed districts of Poland (Lubelskie and Podkarpackie). Moreover our results seem to reveal that negative impact of minimum wage on youths’ employment in Poland manifested itself

both during economic downturn of 1999-2003 and economic growth period (2004-2008). The results confirm also a significant and negative impact of changes in minimum to average wage ratio in case of 30-39 years old workers, especially in the period of high economic growth (2004-2008).

Our paper is organized as follows. After the introduction, the first section describes the evolution of minimum wage in Poland. In section two, the theoretical model that underpins our econometric analyses is formulated. A review of literature is presented in section three. Fourth section contains the evolution of youth employment rates in regional labour markets in Poland. Section five describes the model. Section six presents the econometric analyses and the results. Section seven concludes.

## **1. Minimum wage in Poland – some stylised facts**

The nationwide minimum wage in Poland is regulated by law. Its annual increase is guaranteed by the amount of (at least) the rise in the price level projected for the next year. In addition, in 2005 the Polish government introduced an automatic annual increase in the minimum wage, which is  $\frac{2}{3}$  of the forecasted GDP growth rate. This rule is set until the minimum wage does not exceed half of the average monthly wage in the national economy.

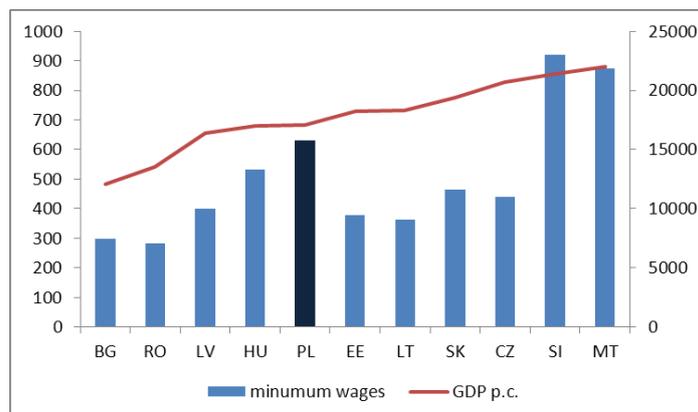
The minimum wage in Poland is determined each year by negotiations of the Tripartite Commission for Social and Economic Affairs (which consists of representatives of government, employers' organizations and workers). These negotiations set the basis for determining the level of minimum wage for the following calendar year. In a situation where the Trilateral Commission does not manage to agree on the minimum wage up to July, 15<sup>th</sup> the decision is made solely by the Council of Ministers. Minimum wage in Poland covers all the workers, however the worker during his first year of employment can be paid less than the minimum wage. His compensation must amount to at least 80% of the statutory minimum wage.

Looking at the level of minimum wages in Poland and other emerging markets in the region in 2012, we can see that Poland, with 345 EUR of monthly minimum wage, was one of the countries with the highest minimum wages among the new member states<sup>4</sup>. Higher minimum wages in 2012 were only observed in Slovenia and Malta. Moreover, the minimum wage rate in Poland seems to be high when taking into account the level of GDP per capita (in PPS, see Figure 1). For instance, in Estonia and Lithuania, where GDP per capita is higher than in Poland, the minimum wage is considerably smaller. Also in Hungary, although the GDP per capita is comparable to Poland, minimum wage is set on a considerably lower level. This situation, associated also with the relatively high labour costs in Poland may have a negative impact on its competitiveness on the international arena.

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<sup>4</sup> Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Romania, Slovak Republic and Slovenia (there is no minimum wage on Cyprus).

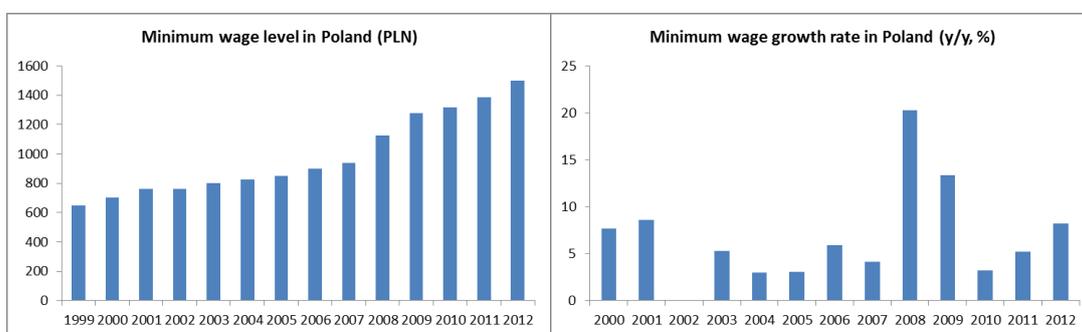
Figure 1. Minimum wage and GDP per capita in New Member States in 2012 (PPS)



Source: Eurostat.

High level of the minimum wage in Poland results mainly from its strong growth in recent years (see Figure 2). In 1999-2012 the minimum wage in Poland increased from 670 to 1500 PLN, which is more than double. The most significant rises were noted in 2008 and 2009 (20.3% and 13.3% y/y respectively).

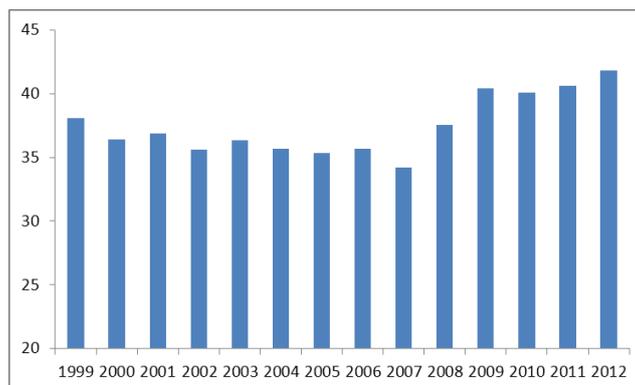
Figure 2. Level of minimum wage in Poland (left panel, PLN) and its growth rate (right panel, y/y, %) in 1999-2012



Source: Ministry of Labour and Social Policy data, own estimates.

Quick growth of minimum wage resulted in changes of its ratio with respect to the average wage in Poland (see Figure 3). In 1999 the minimum to average wage ratio in Poland was about 38%. In subsequent years this ratio has decreased to 34% in 2007. The strong increase in minimum wage in Poland that was visible in 2008 and 2009 has led to increase in minimum to average wage ratio to 40% in 2009. In subsequent years it further amounted to 42%.

Figure 3. Minimum to average wage ratio in Poland in 1999-2012 (%)



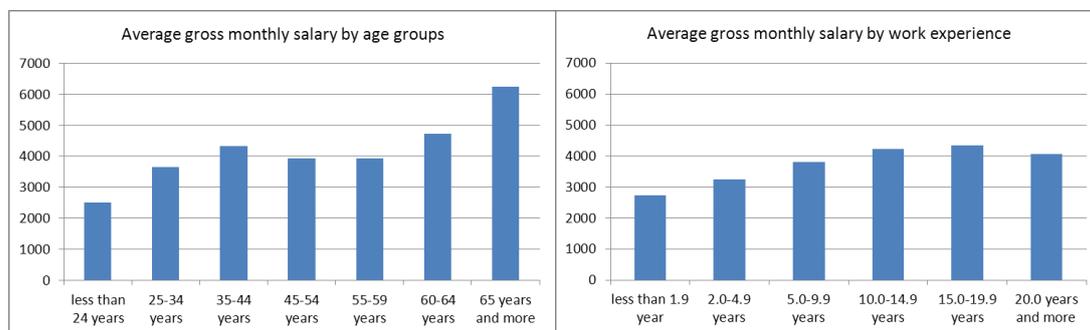
Source: Ministry of Labour and Social Policy and Polish Central Statistical Office data, own calculations.

In our further analyses, according to the approach described by Williams (1993), we assume that young workers are the group most often paid by minimum wage. This assumption is partly confirmed by statistical data. Unfortunately there are no recent data about the minimum wage coverage among young in Poland. The only one available data are from the enterprises survey carried out in 2004 (see Jacukowicz, 2007). It showed that the workers below 24 years old were the biggest group among minimum wage receivers (12% of total minimum wage earners).

The fact that the youths are the least paid group of workers is confirmed by the statistical data. Looking at the wage distribution by age and work experience<sup>5</sup> in October 2012 we can see that for those who have not finished 24 years the average wage amounted to 64.4% of the average national wage. To compare - for the workers between 25 and 34 years it was 93.5%. For all other age groups, the average wage exceeds 100% of the average for the country. Similar data can be acquired by looking at the wages according to the work experience. Workers employed for less than two years earned in October 2012 on average 2735 PLN, ie. 70.2% of the average wage in the country (see Figure 4).

<sup>5</sup> In enterprises with at least 10 employees (data for the whole economy are not available).

Figure 4. Average gross monthly salary by age groups and work experience in Poland in October 2012 (PLN)



\* In enterprises with at least 10 employees

Source: Structure of wages and salaries by occupations in October 2012, Central Statistical Office, Warsaw, 2014.

## **2. The impact of minimum wage on employment - theoretical approach**

The demand for labour depends strictly on the demand for goods and services produced and sold on the market. Its size is determined among others by such factors as the price of factors of production, the number of firms and productivity of the employees. In particular, productivity plays an important role because as it increases, the need for recruiting new employees diminishes (*ceteris paribus*). Eventually, the company seeking to ensure optimal scale and allocation of resources, adjusts the demand for production factors of to the demand for the goods or services it offers.

At the same time, the price of labour plays an important role, as employees are hired up to the point at which the cost of their employment does not exceed their productivity. If the statutory minimum wage exceeds the productivity of individual employees, their employment becomes unprofitable. Determination of the minimum wage above the market clearing level may thus cause a decline in demand for the labour of these people and involuntary unemployment may emerge. This problem affects mainly two groups of employees: workers with low productivity, who are usually low-skilled and those who do not have professional experience, i.e. young workers.

In the literature, much attention has been devoted to the issue of the minimum wage and its impact on the labour market. However, in the theory, this impact is clear only in the case of perfectly competitive labour market (see Boeri and van Ours, 2008). Minimum wage set at a level higher than the market clearing wage leads to a decrease in employment and increase in supply, what results in (involuntary) unemployment. In a neoclassical model with heterogeneous labour and products, the result of introducing a minimum wage is not that obvious since it depends of the elasticities of substitution across different types of workers and cross-elasticities of demand across different types of goods (see Neumark and Wascher, 2007).

Moreover, in more complicated models the results of minimum wage legislation are *ex ante* ambiguous, both theoretically and empirically (see e.g. Rocheteau and Tasci, 2007). For instance, in the model with monopsony in factor markets, rise in the minimum wage has generally non-monotonic impact on employment. Given that the new minimum wage is lower than the competitive level, it may lead to an increase in employment (through adjustment along the supply curve). However, if the government sets minimum wage

higher than competitive equilibrium level, a fall in employment (through adjustment along the demand curve) may occur.

In labour market models with search frictions the impact of minimum wage increase is also indeterminate. It may lead to higher employment in a market dominated by employers where the wages are generally low. However, in case of the existence of higher market wages firms' incentives to create jobs fall, number of vacancies decreases, thus discouraging workers from searching for a job. As a result, employment rates are reduced (Rocheteau and Tasci, 2007).

Another approach that provides an argument that rising minimum wage above competitive equilibrium level does not necessarily create barrier to employment is efficiency wage theory. According to this model, increased minimum wage will be perceived by workers as an incentive to intensify their efforts and to increase their productivity (since wages determine productivity according to this theory). Eventually, minimum wage rise may result in increased employment if this type of adjustment will be prevailing (Manning, 1995).

It can therefore be noted that in the economic theory an opinion prevails about the negative impact of minimum wages on employment, especially for the low-skilled and with inadequate professional experience. In this case, setting the minimum wage on a level exceeding their productivity may translate into a decline in demand for their work and consequently into a reduction in employment.

One of the practical problems discussed in the literature is proper measurement of the minimum wage variable (see e.g. Neumark, Wascher 2007) when its impact on employment (or unemployment) is studied. Theoretically, the proper method is to use the Kaitz index which is defined as the ratio of minimum wage to the average wage, weighted by the coverage of the minimum wage among the workforce. However, in many cases the data about the minimum wage coverage are not available and for that reason a simplified version of Kaitz index, ie. unweighted minimum to average wage ratio has been usually used. The other approach is to use the real minimum wage if the data about price indices on a regional level are available.

The use of ratio of minimum to average wage has been widely used by Neumark, Wascher in their minimum wage research (see Neumark, Wascher, 1992 and later). This approach

was however criticized by Card (1992) who claims that due to general changes in wage levels associated with inflation, productivity growth, or changes in economic activity, the average wages are positively correlated with teen wages. Instead he prefers to use real (if the data on prices are not available) or otherwise nominal minimum wage in his regressions (see Card, 1992). The third approach in the literature is to use the percentage of teenagers with earnings between the old and new minimum wage just prior to the implementation of the new minimum (“the fraction affected variable”), the percentage of teenagers earning exactly minimum wage (“fraction at”) or percentage of teenagers earning below minimum wage (“fraction below”). This approach is possible if individual data on regional level are available (see Lemos, 2004<sup>6</sup>).

The model we present below and use in our empirical analyses, is the one described in Williams (1993<sup>7</sup>), with a reduced-form specification of production function with two inputs (young employees and experienced workers). The theoretical basis for the model is founded upon the existence of two types of input demand functions:

- a conditional input demand derived from a cost minimization framework (1),
- an unconditional input demand derived from profit maximization (2).

(1) is a function of nominal input prices and the level of output. It is also homogenous of degree zero in input prices. It can be written as:

—

where:

$x_1$  – demand for first input (young employees),

$w_1$  – nominal price of first input (minimum wages),

$w_2$  – nominal price of second input (average wages),

$y$  – level of output.

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<sup>6</sup> Lemos (2004) tried to compare the effects of the minimum wage on employment using five minimum wage variables common in the literature: real minimum wage, “Kaitz index”, “fraction affected”, “fraction at” and “fraction below” minimum wage. She used is a Brazilian monthly household survey from 1982 to 2000. However she found it difficult to compare the results of different approaches.

<sup>7</sup> Apart from Williams (1993) this is an approach undertaken e.g. by Zavodny (2000) for US regions.

Therefore, according to Williams (1993), labour demand for young employees depends upon the relative wage of the two groups of workers and it is to be estimated conditional upon the level of output  $y$ .

An alternative input demand function is presented as a function of nominal input prices and the price of output ( $p$ ) and is homogeneous of degree zero in these prices. It can be therefore written as (2):

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This equation includes therefore a real value of the minimum wages and real average wages.

In our paper, due to restricted availability of statistical data, we use only the first approach. Since we do not have data on price level on regional labour markets in Poland, we cannot analyse the second approach – the impact of real minimum wages on employment.

### 3. Impact of minimum wages on employment - review of literature

After almost one hundred years of empirical research on the impact of the minimum wage legislation on the labour market performance<sup>8</sup> (mainly on employment, unemployment and wages) economists are still divided on how does a minimum wage affect main labour market variable. On the one hand, different positions have their roots in various schools of economic thought and theories<sup>9</sup>, like neoclassical *versus* institutional, perfect competition *versus* monopsony at labour market, market-clearing wage *versus* efficiency wage formation etc. On the other hand, empirical evidence on the effect of the minimum wage on employment (the main variable analysed in the literature) by the end of the 1970s prompted the Minimum Wage Study Commission, created by the US Congress, to conclude upon the existing research that minimum wage increases tend to reduce teen employment with the elasticity in the range<sup>10</sup> from -0.3 to -0.1.

After more than thirty years of ongoing research on minimum wage (dis)employment effect, this estimate still provides the benchmark for later studies and seems to be treated as the consensus view of economists on how the minimum wage affects employment (Neumark and Wascher, 2007). One has to bear in mind that the analyses behind the 'consensus view' were time series studies with neoclassical assumptions, based on US data during the time when federal mandatory minimum wage (and not state minimum wages) was treated as critical for the performance of the low-wage segment of the labour market.

Later research on minimum wage (dis)employment effect enriched the analytical framework by adding the regional dimension to the analysis, applying improved panel-data econometric techniques and extending coverage to other countries. This so called 'new minimum wage research' (Neumark and Wascher, 2007) rather unsurprisingly produced not only wider range of the disemployment minimum wage elasticities but more importantly, it started to question even the established 'consensus' direction of the impact of the minimum wage on employment. With the ongoing discussion of the representatives of various strands of the minimum wage research and critical opinions to the 'consensus

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<sup>8</sup> Neumark et al. (2013) date one of the first empirical studies on the minimum wage impact at 1915 (Bureau of Labour Statistics, US)

<sup>9</sup> Eg., Rocheteau and Tasci (2007) provide the concise overview of the impact of the minimum wage on the labour market predicted by various economic theories.

<sup>10</sup> Brown et al. (1982)

view' put forward, the conventional disemployment effects of minimum wage can still be defended on the grounds of dominating panel data approach, as demonstrated lately by David Neumark and William Wascher (Neumark et al., 2013).

As mentioned earlier, our special focus will be on the studies belonging to the strand of the literature that we consider as our inspiration, ie. works focused on youth (dis)employment minimum wage effects, taking into account regional dimension of the problem and thus applying panel data approach subject to neoclassical perfect competition assumptions. An early important and representative example of this type of research is Neumark and Wascher (1992) on United States. The authors approach is an early application of 'the standard panel data approach' delivering the results consistent with the consensus view, ie. a 10% increase of the minimum wage is expected to reduce the employment of young workers (16-24 years old) by 1.5-2.0%. This paper is worth quoting for the early treatment of the non-standard questions on: (i) How minimum wage changes affect wages of workers close to the minimum wage level?, (ii) In case of teenagers, how does minimum wage affects a trade-off between schooling and working? Authors conclude that those two mechanisms are both important. Increasing minimum wage is likely to draw the teenagers out of school enrolment to labour market but then they may be substituted by more-skilled workers 'queuing' for the higher minimum wage<sup>11</sup>. These results show that small disemployment of minimum wage on aggregated data reported in the literature may hide more substantial impact on specific groups of young workers. In the subsequent research on the minimum wage impact on employment of youths, the school enrolment has been frequently used as control variable, providing the results both confirming conclusions of Neumark and Wascher (1992) for the United States (eg., Neumark and Wascher, 1995, 1996, 2003) and not supporting the hypothesis of an impact of the minimum wage on school enrolment (eg., Campolieti et al., 2005) for Canada.

In case of the literature on the impact of the minimum wage on employment in Western Europe, the results seem to be more diverse than in US or Canada. For instance, in case of Spain, Galán and Puente (2012) estimated probability of losing job following a substantial increase of the minimum wage in the late 2000s (logit model) across different age groups.

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<sup>11</sup> This phenomenon may be treated as the special case of more wider mechanism of the minimum wage spillover over the wage distribution, known as the "ripple effect" of minimum wages" (see Phelan, 2014 for the latest review and discussion of this issue).

They found disemployment effect for young workers (16-24 years old) but much weaker than in case of the older employees. Instead, Blázquez et al. (2009) analyse the similar period and apply close to standard panel data specification to conclude that no significant impact of minimum wage on youth employment during this time materialized. Empirical literature on the UK advocates the view it is rather compression of the lower part of wage distribution than disemployment that could be observed after the introduction of the national minimum wage in UK in 1999 (Metcalf, 2007). If any negative employment effect was found, it was negligible, rather on hours than number of workers and limited to specific industries with the concentration of low-wage jobs (Machin et al., 2003).

In case of France, which is the country with high minimum wage relative to its EU peers<sup>12</sup> and a wide-ranging incidence of the employees earning wages close to the minimum wage (Abowd et al., 2006), there is no consensual view on the employment impact of minimum wage. Some papers prove substantial disemployment effects, both for the younger employees (Abowd et al., 1997) and in general (Abowd et al., 2006) while other contributions don't support this result (eg. Bruno and Cazes, 1998).

In case of the new European member states (NMS) and especially countries from the Central and Eastern Europe the empirical literature is much more scarce, but with about the same general conclusion: while most papers find disemployment effect of minimum wage, the literature is not fully unanimous. For instance, Fialova and Mysikova (2009) applied panel econometrics methodology to the Czech regional data and demonstrated relatively strong (elasticity ranging from -0.3 to -0.7) negative impact of minimum wage on employment while according to Gottvald et al. (2002) minimum wage was rather important for improving low wages than having any disemployment effects. Negative effect of minimum wage was also supported for Estonia (Hinnosaar and Rõõm, 2003) and Slovakia (Eriksson and Pytliková, 2004), the latter paper also covering Czech data. Additionally, the work of Muravyev and Oshchepkov (2013) provides an interesting contribution to the discussion of minimum wage impact on labour market outcomes in Russia, a country that introduced regional decentralization of the minimum wage setting in 2007. After having applied the standard panel approach, the authors conclude that there is strong evidence of adverse effects of the minimum wage on the labour market, especially

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<sup>12</sup> In 2013, minimum wage in France was fifth highest in EU-15 (Eurostat data base - <http://epp.eurostat.ec.europa.eu>)

in case of young workers. One may then presume that in case of Russia the regional decentralization of minimum wage setting has not been an effective tool to mitigate negative impact of minimum wage on labour market.

As far as Poland is concerned, the research on the impact of minimum wage legislation has been rather scarce. The results are generally in line with the international experience, ie. most studies document disemployment effects of minimum wage. However, majority of the hitherto published papers for Poland analysed the impact of minimum wage on employment using country level, not regional, data.

Suchecki (1999) used data on a country level in 1990-1998, defining minimum wage variables as both minimum wage level and the relation of minimum to average wage ratio. He found that the elasticity of youth (15-24) employment with respect to minimum wage level was -0.47 when both minimum wage variables were used in the model. Ruzik (2007) used the individual LFS data from last quarter 2002 and first quarter 2003 and analysed the probability of outflow from employment after the minimum wage increase. Her results show that increase in the minimum wage significantly increases the probability of losing the job for the low-wage (below new minimum) workers. The probability was also higher for less educated workers. Jacukowicz (2007), in a paper based on extensive survey of companies, found however no evidence for the negative impact of minimum wage on unemployment. Golnau (2007) analysed changes in minimum wage in Poland and introduction of subminimum wage. He concluded that the introduction of subminimum wage had no impact on youth employment. However he did not perform any econometric analyses or statistical tests.

Bukowski (ed., 2010) analysed institutional determinants of the flows at the labour markets of 23 European countries, including Poland, in 2000-2009. As the minimum wage variable, they used the relation of minimum to average wage. The results indicate that minimum wage strongly reduces rates of both inflows and outflows from the labour market, therefore decreasing the probability of finding the low paid job.

Idczak (2011) aimed to estimate the optimum minimum to average wage ratio in Poland from the employment point of view. She used the quarterly data on a country level in 1995-2007. Her analyses indicate that the optimum minimum to average wage ratio is

0.41. The increase in minimum to average wage ratio above this value is expected to cause a decrease in employment.

We have found only three papers which analyse the impact of minimum wage on regional labour markets in Poland. One of them is Melnyk (1996), which analysed the impact of minimum wage on employment and unemployment rates in Poland. He used quarterly regional (49 NUTS3 regions<sup>13</sup>) data in 1991-1995. His main explanatory variable was the ratio of minimum to average wage on regional labour markets. After pooling the data he obtained the elasticity of employment about -0.5 and the elasticity of unemployment about 2.0. Moreover he analysed separate regressions for each region and found that the elasticities of employment with respect to the relative minimum wage varied from -0.26 to -1.23, with the 39 (out of 49) estimates being significant. The second paper on impact of minimum wages on regional level is Ciżkowicz, Rzońca, Wojciechowski (2012). They based on 16 NUTS2 regions in 1998-2008 and found no impact of minimum to average wage ratio on employment growth. In the third one (Majchrowska, Żółkiewski, 2012) a panel approach was applied to 1999-2010 data in regional breakdown (16 NUTS2 regions). An adverse effect of minimum wage on employment was found, especially in case of the young workers during the period of substantial increase of the minimum wage (2005-2010). We provided also some evidence that mandatory minimum wage might be particularly harmful to employment in poorest regions.

In our last paper (Broniatowska et al., 2013) no econometric analyses was done. Instead we carefully analysed situation on both regional (NUTS2) and local (NUTS4) labour markets in Poland and concluded that current rising trend of minimum wage relative to average pay, if continued, may create barriers to low paid jobs, especially in poorer regions. In this paper we try to verify this hypothesis empirically.

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<sup>13</sup> There was an administrative reform in 1999 in Poland and 49 old regions were converted into 16 new ones.

#### 4. The model

In this paper we try to answer the question of whether the statutory economy-wide minimum wage in Poland could have a negative impact on youth employment, particularly in low wage regions. Therefore we use regional data from Central Statistical Office at NUTS2 level (16 regions). The research period is 1999-2012<sup>14</sup>. According to the theoretical part presented in section two we aim to estimate the parameters of general form equation:

$$\text{—————} \quad (3),$$

where:

$ER_{i,t}$  – is the youth employment rate on regional labour market  $i$  in Poland at time  $t$ ,

$WMIN_t$  – is the minimum wage level in Poland at time  $t$ ,

$WAV_{i,t}$  – is the average wage level on regional labour market  $i$  in Poland at time  $t$ ,

$X_{n,i,t}$  – is the vector of  $n$  control variables on regional labour market  $i$  in Poland at time  $t$ .

Following the literature our main dependent variable is youth employment rate. We use data on employment rate for 15-24 years old age group<sup>15</sup>. Following the theoretical part of our analyses, as the minimum wage variable we use minimum to average wage ratio on regional labour markets.

As other explanatory variables are concerned, we control for aggregate demand, school enrolment and share of youths in total population. We approximate the aggregate demand level by gross domestic product (GDP, in 1999 constant prices). The expected sign is positive since higher production should translate into higher employment. Another variable commonly used in the literature<sup>16</sup> as a proxy for a business cycle is male unemployment rate. Therefore, we also use this variable in the empirical model.

As we examine the impact of minimum wage on youth employment we control for school enrolment in a given region. It is measured by the ratio of full time students to the

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<sup>14</sup> Earlier data, due to change in administrative division of Poland, are not available.

<sup>15</sup> The group is wide, but Central Statistical Office in Poland does not provide separate data on employment in 15-19 and 20-24 age groups.

<sup>16</sup> For example, see. OECD (1998) and Neumark, Wascher (2004).

population of 20-24 years old. The expected sign is negative. Higher school enrolment means that lower share of young people can fully participate on the labour market.

Moreover, we include in the model the share of youths in total population. Higher share of youths in population (*ceteris paribus*) should translate into higher employment rates. Full description of the variables and their sources is provided in Appendix.

While modelling the impact of minimum wage on youth employment we have to take into account both the length of sample period and the stationarity of the variables. The sample period (1999-2012) is too short to identify the long-term dependencies between variables. However, looking into evolution of the analysed variables we can notice that most of them exhibit nonstationary behaviour<sup>17</sup>. Therefore, following previous research (e.g. Ciżkowicz, Rzońca, Wojciechowski, 2012, for Polish economy<sup>18</sup>) we decided to estimate the parameters of short-term version of conditional input demand function presented in theoretical part of the paper, where all the analysed variables are in their first differences. All the variables enter the equation in logarithms.

We estimated the parameters of the following equation:

$$\Delta er_{it} = \alpha_0 + \beta_1 \Delta wreI_{it} + \beta_2 \Delta gdp_{it} + \beta_3 \Delta um_{it} + \beta_4 \Delta se_{it} + \beta_5 \Delta pop_{it} + \xi_{it} \quad (4)$$

where:

$er_{it}$  – youth (15-24 years old) employment rate on regional labour market  $i$  ( $i=1, 2, \dots, 16$ ) in Poland at time  $t$  ( $t=1999, 2000, \dots, 2012$ ; %),

$wreI_{it}$  – minimum to average wage ratio on regional labour market  $i$  in Poland at time  $t$  (%),

$gdp_{it}$  – gross domestic product on regional labour market  $i$  in Poland at time  $t$  (PLN, constant 2002 prices),

$um_{it}$  – male unemployment rate on regional labour market  $i$  in Poland at time  $t$  (%),

$se_{it}$  – school enrolment rate on regional labour market  $i$  in Poland at time  $t$  (%),

$pop_{it}$  – share of youths (15-24 years old) in total population on regional labour market  $i$  in Poland at time  $t$  (%),

$\xi_{it}$  – error term.

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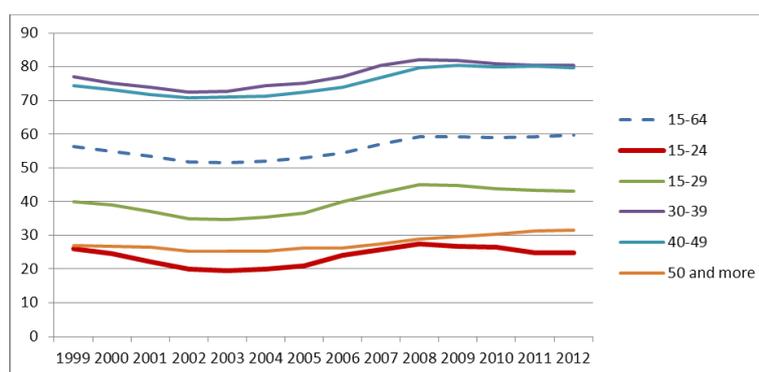
<sup>17</sup> Formal tests of stationarity of all variables used in the model is provided in Table A2 in Appendix.

<sup>18</sup> For other countries see e.g. Lemos (2004).

## 5. Regional development of employment rates in Poland

Youth employment rates in Poland are relatively low in comparison with other groups of workers. In 2012 employment rate among 15-24 years old workers was 24.7%. It was lower than the overall (15-64) employment rate (59.7%) and employment rates for 30-39 and 40-49 years old (ca. 80% in both groups in 2012, see Figure 5).

Figure 5. Employment rates in Poland in 1999-2012 (%)

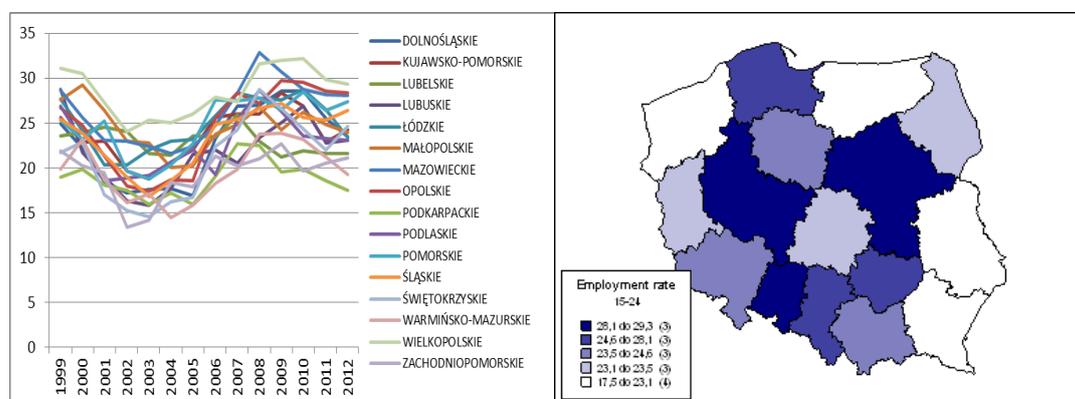


Source: Central Statistical Office, [www.stat.gov.pl](http://www.stat.gov.pl).

Youth employment rate is very diversified among regions (see Figure 6 and Map 1). In 2012 the highest employment rate (noted in Wielkopolskie<sup>19</sup> - 29.3%) was almost 12 p.p. higher than the lowest value (17.5% - noted in Podkarpackie region). In particular, low youth employment rates are observed in eastern (relatively less developed) regions of Poland. The highest employment rates among young are noted in regions with big cities.

<sup>19</sup> The administrative division of Poland is provided in Appendix.

Figure 6 and Map 1. Youth (15-24) employment rates at the NUTS2 level in Poland in 1999-2012 (left, %) and in 2012 (right, %)

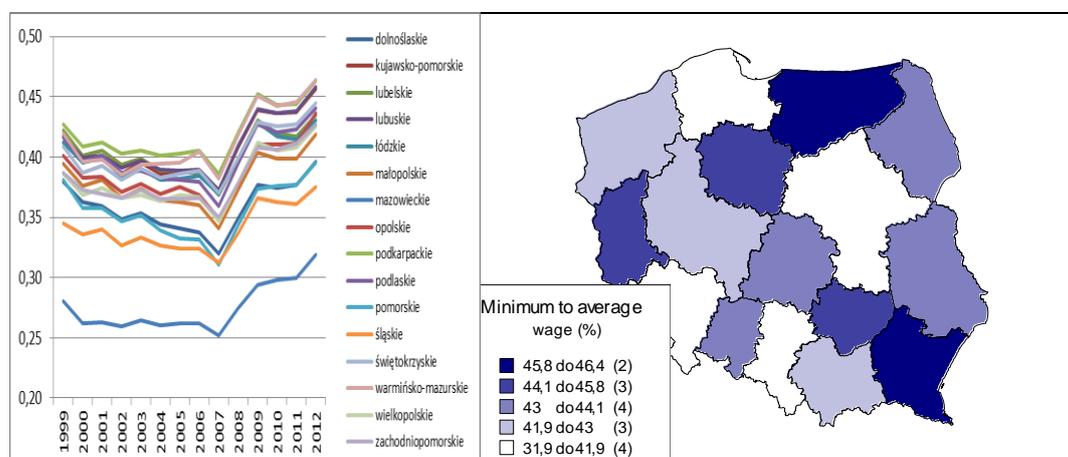


Source: Local Data Bank, CSO.

Looking at the evolution of youth employment rates over time (see Figure 6) we can see that in most regions the employment rate was decreasing in 1999-2003, growing in 2004-2008 and then decreasing again in 2009-2012. The highest growth of youth employment in 1999-2012 was noted in Swietokrzyskie (eastern) region and in western and north-western regions of Poland (Opolskie, Zachodniopomorskie, Lubuskie, Pomorskie, Slaskie and Dolnoslaskie). On the other hand relatively low youth employment growth rates in the analysed period were noted in the eastern and south-eastern part of Poland.

Regional differences are also important when looking at the minimum wage variable. Due to substantial regional diversity of average wages in Poland the relation of a unique minimum wage to average wages is diversified among regions (see Figure 7 and Map 2). In 2012 the ratio of minimum to average wage varied from 0.32 in Mazowieckie (capital region) to 0.46 in Podkarpackie and Warminsko-mazurskie regions.

Figure 7 and Map 2. Minimum to average wage ratio in 16 Polish NUTS2 regions in 1999-2012 (left, %) and in 2012 (right, %)



Source: Local Data Bank, CSO and Ministry of Labour and Social Policy data, own calculations.

It is worth noting that the latter are regions with low average wage levels and low productivity (see Broniatowska, Majchrowska, Żółkiewski 2013). It is especially in those regions that relatively high minimum to average wage ratio might be the factor potentially limiting demand for labour, since the cost of employing low productive worker would in some cases outweigh the product of his work.

The evolution of minimum to average wage ratio varied also in time. The relative minimum wage was decreasing in 1999-2007 and increasing in 2008-2012. Due to relatively low rate of growth of average wages, the highest growth of minimum to average wage ratio was noted in Mazowieckie. The lowest relative minimum wage growth was noted in Lubelskie and Pomorskie.

As mentioned, apart from cost factors (minimum and average wages) there are other factors which can influence the behaviour of youth employment on regional labour markets in Poland. The first group contains demand factors – GDP growth and male unemployment as the measures of economic activity. The other group contains supply side factors which can influence youth employment rate – school enrolment ratio (ratio of full time students to the population of 20-24 years old) and share of youths in total population. The information about the variables used in the model and their development in time are presented in Table A1 and Figure A1 in the Appendix.

## 6. Econometric results

Equation (4) presented in the fourth section of the paper is the base for our empirical analyses described below.

In the first step we estimate the parameters of equation (4) for the whole sample (1999-2012; see Table 1). First, the parameters were estimated with ordinary least squares (OLS) and fixed effects (FE) approach. As expected, in the model with first-differenced data, individual effects turned out to be insignificant. Further, the parameters of both models were estimated by panel corrected standard errors model (PCSE) and finally with feasible generalized least squares (GLS), controlling for both heteroskedasticity error structure and panel-specific AR(1) autocorrelation structure. The results (see Table 2) show that in the whole sample the parameter by changes in minimum to average wage ratio was positive (0.16<sup>20</sup>) and insignificant.

Table 1. Estimated parameters of model (4) for 15-24 employment rate in the whole sample (1999-2012)

	OLS	FE	PCSE	GLS
$\Delta wrel$	0.171	0.174	0.151	0.165
$\Delta gdp$	0.951***	0.974***	1.015***	0.910***
$\Delta um$	-0.105***	-0.102***	-0.110***	-0.113***
$\Delta se$	-0.679***	-0.719***	-0.693***	-0.715***
$\Delta pop$	-	-	-	-
R2	0.278	0.284	0.338	
F test (Prob.)		0.18 (0.9998)		
Wald test			45.3	127.4
Obs.	208	208	208	208

OLS – ordinary least squares estimator, FE – fixed effects estimator, PCSE - panel corrected standard errors model with panel-specific AR(1) autocorrelation structure, GLS - feasible generalized least squares with heteroskedastic error structure and panel-specific AR(1) autocorrelation structure

Source: own estimates.

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<sup>20</sup> GLS estimates.

Changes in youth employment rate in the analysed period were mostly driven both by demand (GDP growth rate and changes in unemployment rate) and supply (changes in school enrolment ratio) factors. Growth in GDP by 1% led to almost 1% growth of youth employment rate. Moreover, 1% change in unemployment rate led to 0.11% change in youth employment rates. 1% increase in school enrolment ratio led to 0.71% decrease in youth employment rate. Changes in share of youths in total population turned out to be insignificant.

To check the robustness of the results we also performed the analyses for other age groups for which the data are available. The results (see Table 2) indicate that only for employment rates among 15-29 years old employees the parameter by minimum to average wage ratio was significant (at 10% significance level) and positive (0.13). The negative value of parameter was observed for employment rates among 30-39 years old employees however was not significant.

The comparison of the parameters with business cycle variables (GDP growth and changes in unemployment rate) shows that youth employment is much more volatile in time than for other groups of workers. 1% growth in GDP led to on average 0.9% growth in employment rate of 15-24 years old, 0.6% among 15-29 years old and only around 0.2% among 30-39 and 40-49 years old workers. Changes in employment rate of elder workers (over 50 years old) were not significantly correlated with changes in GDP growth.

As expected, changes in school enrolment ratio were most significant in case of young employees. Moreover, we can notice that the parameter by share of youths in population is significant in case of older (50 plus) workers, which can indicate some signs of “replacement” of the older employees by young ones at the regional labour markets.

Table 2. Estimated\* parameters of model (4) for different age groups of workers in the whole sample (1999-2012)

	15-24	15-29	30-39	40-49	50+
$\Delta wrel$	0.165	0.127*	-0.043	0.007	0.043
$\Delta gdp$	0.910***	0.576***	0.232***	0.164***	-
$\Delta um$	-0.113***	-0.107***	-0.055***	-0.057***	-0.059***
$\Delta se$	-0.715***	-0.359***	-0.075**	-0.069**	0.049
$\Delta pop$	-	-	-0.114	-0.162**	-0.760***
Wald test	127.4	236.6	237.0	230.7	47.7
Obs.	208	208	208	208	208

\* GLS estimates controlling for both heteroskedasticity error structure and panel-specific AR(1) autocorrelation structure

Source: own estimates.

The hitherto results seem to imply that changes in minimum to average wage ratio had no impact on youth employment changes in Poland. However, the small and insignificant effects of changes in minimum to average wage ratio on youth employment might result from averaging the data over all regions (see Thompson, 2009). In that case the parameter we get is the average of the effects in individual regions – both in those where the minimum wage is binding and also in the ones where it is not. Such averaging can yield small estimated overall employment effects that hide stronger and significant effects at the regional level.

To check out if this happens we estimated the impact of changes in minimum to average wage ratio for each of the 16 regions separately. The short time period (14 years) does not allow us to perform separate equations<sup>21</sup>. Instead we follow the approach of Williams (1993) for US states by introducing dummies for each region and interacting them with our variables of interest to allow the coefficient to differ across particular regions.

The results, presented in Table 3, indicate that the impact of minimum to average wage ratio on youth employment changes is very diversified among Polish regions. In five of the regions (out of 16) the parameter was negative, in eleven – positive. This can result in low and insignificant value of parameter in the whole sample.

<sup>21</sup> As it was done in Melnyk (1996) for 49 former Polish regions.

However only in three regions the parameter was significant. In two of them (Podkarpackie and Lubelskie) the parameter was negative and significant at 1% significance level indicating that changes in minimum to average wage ratio negatively affected changes in youth employment rates in the analysed period. Both regions are rural eastern districts of Poland with high share of employment in agriculture, low productivity and low average wages. In Wielkopolskie region the parameter was positive and significant at 5% significance level).

The other factors (GDP growth, changes in unemployment rate and changes in school enrolment ratio) were significant at 1% significance level. Changes in share of youths in population were not significant.

To check the robustness of the results we decided to check the impact of minimum to average wages on other groups of workers. The results (see Table 5) for 15-29 years old workers confirm in general the results for 15-24 age group. Only in three regions the parameter by relative wages was significant. In Lubelskie and Podkarpackie regions the impact of changes in minimum to average wage ratio was negative but with lower values of parameters.

In case of 30-39 years old workers, the parameter by minimum wage variable was significant in three regions. In two of them (Malopolskie and Warminsko-mazurskie) it was negatively affecting employment rates. Both of the regions are also rural regions in southern and eastern part of Poland.

The changes in minimum to average wage ratio were not binding employment of 40-49 years old workers. However, in case of workers over 50 years old in two regions the parameter was significant and negative. Both of them (Lubelskie and Swietokrzyskie) are the rural districts of eastern Poland. The parameters of other, control variables, confirm the previous findings.

Table 3. Estimated parameters of model (3) with separate effects of changes in minimum to average wage ratio in the regions – sample period 1999-2012

	15-24	15-29	30-39	40-49	50 plus
$\Delta wrel * DOLN$	-0.009	0.037	0.029	0.133	0,001
$\Delta wrel * KUJA$	0.786	0.579*	0.180**	0.090	0,456
$\Delta wrel * LUBE$	-0.956***	-0.593**	0.021	0.045	-0,408*
$\Delta wrel * LUBU$	1.345	0.406	-0.205	-0.215	0,196
$\Delta wrel * LODZ$	-0.515	0.295	-0.008	-0.103	-0,556
$\Delta wrel * MALO$	0.048	-0.042	-0.174**	0.183*	0,428
$\Delta wrel * MAZO$	0.453	0.165	-0.060	0.059	-0,077
$\Delta wrel * OPOL$	0.377	0.501	0.049	0.197	0,242
$\Delta wrel * PODK$	-1.398***	-0.533**	0.099	0.007	0,178
$\Delta wrel * PODL$	0.023	0.373	-0.062	-0.067	0,269
$\Delta wrel * POMO$	0.080	0.201	-0.058	-0.221*	-0,309
$\Delta wrel * SLAS$	0.465	0.222	0.143	0.341***	0,407
$\Delta wrel * SWIE$	0.257	0.323	-0.046	-0.055	-0,639**
$\Delta wrel * WARM$	-0.279	-0.175	-0.386***	0.097	0,389
$\Delta wrel * WIEL$	0.588**	0.331	-0.094	-0.161*	-0,162
$\Delta wrel * ZACH$	0.844	0.529	0.174	-0.042	0,389
$\Delta gdp$	0.882***	0.618***	0.247***	0.163***	-0.011
$\Delta um$	-0.110***	-0.100***	-0.053***	-0.059***	-0.072***
$\Delta se$	-0.686***	-0.386****	-0.105***	-0.061*	0.125
$\Delta pop$	-	-	-0.076	-0.126*	-0.744***
Wald $\chi^2$	178.4	270.6	300.1	279.1	75.6
Obs.	208	208	208	208	208

Source: own estimates.

In the last step we check the evolution of impact of changes in minimum to average wage ratio on youth employment changes in time. We divided the analysed sample into three subperiods following changes in business cycle:

- 1999-2003 – the period of economic slowdown with low GDP growth rates and decreasing employment,

- 2004-2008 – the period of relatively fast GDP growth rates and growing employment,
- 2009-2012 – the period of economic slowdown and decreasing employment.

Taking into account the relatively small sample (14 years in total), instead of dividing the whole sample into subsamples, we introduced dummy variables for the three subperiods and we interacted them with minimum wage variable.

The results of the estimation in the subsamples (see Table 4) show that for the youngest workers (15-24 years old) the parameter by minimum wage variable was diversified in time, however in none of the subperiods was significant. The significant values of parameter by changes in minimum to average wage ratio were noted in case of 15-29 years old workers in 2009-2012 and for 30-39 years old workers in 2004-2008 and 2009-2012. In 2009-2012 in both age groups the parameter was positive implying that changes in minimum to average wage ratio had positive impact on employment in these groups of workers. In 2004-2008 the changes in minimum to average wage ratio negatively affected employment of 30-39 years old workers.

Table 4. Estimated parameters of model (4) for different age groups in the subsamples (1999-2003, 2004-2008, 2009-2012)

	15-24	15-29	30-39	40-49	50 plus
$\Delta wrel*d9903$	-0.029	0.008	0.138	-0.062	0.050
$\Delta wrel*d0408$	-0.082	0.023	-0.162***	-0.028	0.053
$\Delta wrel*d0912$	0.401	0.292**	0.123**	0.107*	0.043
$\Delta gdp$	0.939***	0.591***	0.254***	0.169***	-
$\Delta um$	-0.123***	-0.115***	-0.058***	-0.063***	-0.058***
$\Delta se$	-0.700***	-0.362***	-0.065*	-0.062*	0.043
$\Delta pop$	-0.082	0.025	-	-0.147**	-0.762***
Wald test	129.5	239.9	262.1	246.0	47.3
Obs.	208	208	208	208	208

Source: own estimates.

In the next step we checked if the impact of minimum wage changes differ in time for every region. The results (see Table 5) show that in 1999-2003 the impact of changes in minimum to average wage ratio on youth employment was significant only in five regions.

In three of them (Lubelskie, Podkarpackie, Warminsko-mazurskie) the parameter was negative indicating that changes in minimum to average wage ratio could dampen youth employment.

Table 5. Estimated impact of changes in minimum to average wage ratio on 15-24 employment rate changes separately for all the regions in three subperiods (1999-2003, 2004-2008, 2009-2012)

	1999-2003	2004-2008	2009-2012
$\Delta wrel^{*DOLN}$	0,817	-0,709	0,648
$\Delta wrel^{*KUJA}$	2,122*	-0,274	2,472***
$\Delta wrel^{*LUBE}$	-1,679**	-1,565***	0,039
$\Delta wrel^{*LUBU}$	2,782	1,121	1,167
$\Delta wrel^{*LODZ}$	-0,297	-0,933	0,033
$\Delta wrel^{*MALO}$	-0,493	0,439	-0,091
$\Delta wrel^{*MAZO}$	1,113*	0,538	-0,007
$\Delta wrel^{*OPOL}$	1,629	-1,446	1,919**
$\Delta wrel^{*PODK}$	-4,512***	-1,301**	-0,893
$\Delta wrel^{*PODL}$	0,835	0,129	-0,081
$\Delta wrel^{*POMO}$	0,968	-0,679	0,907
$\Delta wrel^{*SLAS}$	-0,362	0,386	1,105
$\Delta wrel^{*SWIE}$	-2,054	0,977	0,996
$\Delta wrel^{*WARM}$	-3,038***	0,681	-0,311
$\Delta wrel^{*WIEL}$	0,209	1,114***	0,150
$\Delta wrel^{*ZACH}$	3,130	-0,535	1,671
$\Delta gdp$	1.105***		
$\Delta um$	-0.106***		
$\Delta se$	-0.762***		
$\Delta pop$	-0.029***		
Wald $\chi^2$	272.4		
Obs.	208		

Source: own estimates.

In 2004-2008 only in three regions the impact of changes in minimum and average wage ratio was significant. In two of them (Lubelskie and Podkarpackie) the impact was negative.

In 2009-2012 we cannot confirm a negative and significant impact of minimum wage on employment in any of 16 regions. In two of them (Kujawskie and Opolskie) the parameter was positive and significant.

The parameters by other (demand and supply) factors determining changes in youth employment had expected signs and confirm previous results.

To check robustness of the results for youngest workers, we perform the regression for 15-29 and 30-39 years old employees. The results for 15-29 years old (see Table 6) show that in 1999-2003 the parameter by minimum to average wage ratio was significant only in four regions. In two of them (Podkarpackie and Warminsko-mazurskie) was negative. In 2004-2008 in five regions the parameter by minimum wage variable was significant. In two of them (Lubelskie and Podkarpackie) was negative. In 2009-2012 in six regions the parameter was significant on at least 10% significance level. In all of them the impact of changes in minimum to average wage ratio was positive.

Looking at the results for 30-39 years old workers (see Table 7) we can notice that in 1999-2003 in six regions the impact of minimum to average wage changes on employment changes was significant. In one of them (Podlaskie) the parameter was negative.

The negative effects of changes in minimum to average wage ratio in case of 30-39 years old workers were mostly concentrated in 2004-2008 period. In four regions minimum to average wage changes significantly affected employment of 30-39 years old workers. In all of them (Lubuskie, Malopolskie, Pomorskie and Warminsko-mazurskie) the parameters were significant on at least 10% significance level). In 2009-2012 in five regions the parameter by minimum wages was significant. In two of them (Lubuskie and Warminsko-mazurskie) was negative.

Table 6. Estimated impact of changes in minimum to average wage ratio on 15-29 employment rate changes separately for all the regions in three subperiods (1999-2003, 2004-2008, 2009-2012)

	1999-2003	2004-2008	2009-2012
$\Delta wrel * DOLN$	-0,357	-0,085	0,473
$\Delta wrel * KUJA$	-0,041	0,229	1,509***
$\Delta wrel * LUBE$	-0,638	-1,203***	0,134
$\Delta wrel * LUBU$	1,514***	0,155	0,760*
$\Delta wrel * LODZ$	-0,615	0,261	0,816*
$\Delta wrel * MALO$	-0,212	0,113	-0,016
$\Delta wrel * MAZO$	0,330	0,550***	-0,225
$\Delta wrel * OPOL$	-0,026	-0,269	1,546***
$\Delta wrel * PODK$	-1,607***	-0,591**	-0,009
$\Delta wrel * PODL$	1,320**	0,779**	-0,333
$\Delta wrel * POMO$	1,096	-0,209	0,442
$\Delta wrel * SLAS$	0,431	-0,044	0,502
$\Delta wrel * SWIE$	-0,326	0,409	0,993**
$\Delta wrel * WARM$	-1,274*	0,016	0,240
$\Delta wrel * WIEL$	0,212	0,552*	0,184
$\Delta wrel * ZACH$	1,555	-0,586	1,495***
$\Delta gdp$	1.105***		
$\Delta um$	-0.106***		
$\Delta se$	-0.762***		
$\Delta pop$	-0.029***		
Wald $\chi^2$	272.4		
Obs.	208		

Source: own estimates.

Table 7. Estimated impact of changes in minimum to average wage ratio on 30-39 employment rate changes separately for all the regions in three subperiods (1999-2003, 2004-2008, 2009-2012)

	1999-2003	2004-2008	2009-2012
$\Delta wrel * DOLN$	0,634*	-0,225	0,188
$\Delta wrel * KUJA$	0,357	-0,080	0,562***
$\Delta wrel * LUBE$	-0,177	-0,148	0,257
$\Delta wrel * LUBU$	0,518*	-0,292**	-0,416**
$\Delta wrel * LODZ$	-0,020	-0,013	-0,069
$\Delta wrel * MALO$	0,138	-0,297*	0,078
$\Delta wrel * MAZO$	-0,071	-0,144	0,018
$\Delta wrel * OPOL$	0,261	-0,010	0,077
$\Delta wrel * PODK$	0,408*	-0,159	0,336***
$\Delta wrel * PODL$	-0,520***	-0,070	0,136
$\Delta wrel * POMO$	-0,136	-0,284**	0,253*
$\Delta wrel * SLAS$	0,759***	0,016	0,029
$\Delta wrel * SWIE$	-0,268	-0,132	0,293
$\Delta wrel * WARM$	-0,062	-0,517**	-0,345**
$\Delta wrel * WIEL$	0,080	-0,173	-0,036
$\Delta wrel * ZACH$	0,835*	0,226	-0,100
$\Delta gdp$	0.236***		
$\Delta um$	-0.056***		
$\Delta se$	-0.069*		
$\Delta pop$	-0.055		
Wald $\chi^2$	272.4		
Obs.	376.6		

Source: own estimates.

In Table 8 we indicated regions where the parameter by changes in minimum to average wage ratio was negative and significant on at least 10% significance level. First of all, we can notice that all of them are the mostly rural, less developed, regions of Poland. In these regions changes in minimum to average wage ratio negatively affected employment in the analysed period. Secondly, we have to underline that apart from young workers, the

negative effects were noted also in case of 30-39 years old workers. Moreover, the results indicate that in case of young workers the negative effects of changes in minimum to average wage ratio were mostly concentrated in the first subperiod (1999-2003). In case of 30-39 years old workers the negative effects were mostly visible in 2004-2008 period suggesting that in period of high economic growth the cost factors could limit the growth of employment.

Table 8. Regions where the parameter by changes in minimum to average wage ratio was negative and significant on at least 10% significance level

	Whole sample 1999-2012	1999-2003	2004-2008	2009-2012
15-24	Lubelskie Podkarpackie	Lubelskie Podkarpackie Warminko- mazurskie	Lubelskie Podkarpackie	
15-29	Lubelskie Podkarpackie	Podkarpackie Warminko- mazurskie	Lubelskie Podkarpackie	
30-39	Malopolskie Warminko- mazurskie	Podlaskie	Lubuskie, Malopolskie, Pomorskie Warminko- mazurskie	Lubuskie Warminko- mazurskie

Source: own elaboration.

## 7. Conclusions

The main aim of the paper was to verify whether the changes in minimum to average wage ratio in Poland negatively affected youth (15-24 years old) employment rate. Moreover we tried to answer the question if this impact differs among regions.

We analysed a model where changes in youth employment rate were the function of changes in minimum to average wage ratio as well as other (demand and supply) variables. The analyses were conducted on 16 Polish NUTS2 regions. The research period was 1999-2012.

The analyses conducted in the paper showed that when we estimated the average impact of changes in minimum to average wage ratio on changes in youth employment rate the parameter was not significant. Changes in youth employment were driven mostly by changes in business cycle and in school enrolment ratio.

After having checked for the regional variation of the determination of the youths' employment rate we found that the impact of minimum on employment differed significantly among regions, both in terms of size and sign. The regions where youth employment rates were negatively affected in the whole period by changes in minimum to average wage ratio were the rural, less developed districts of Poland (Lubelskie and Podkarpackie). These are the regions with GDP per capita much lower and minimum to average wage higher than Poland's average. Moreover our results seem to reveal that negative impact of minimum wage on youths' employment in Poland manifested itself both during economic downturn of 1999-2003 and economic growth period (2004-2008).

Moreover the results confirm significant and negative impact of changes in minimum to average wage ratio in case of 30-39 years old workers, especially in the period of high economic growth (2004-2008).

This result substantiates for Poland the hypothesis put forward in the literature (see Thompson, 2009) that significant effect of minimum wage on employment may sometimes disappear in cross-regional analyses when regional mechanisms of the employment rates differ substantially (diverse elasticities average out to small, often insignificant values).

The results of our analyses indicate in regions with low productivity and low average wages the level of unique minimum wage may be too high. Low youth employment rates in those

regions in Poland may not only result from insufficient aggregate demand but also from relatively high costs of employing young workers.

All in all, our results seem to show that while there is no significant impact of minimum wage on youth employment for the aggregate labour market in Poland, there may be regions where minimum wage at historically observed level might possibly create a barrier to employment growth. On the policy grounds, this analysis is therefore in line with the views of those economists, OECD experts in particular, who advocate rather regional adjustment of minimum wage to the local labour market conditions than further increasing minimum wage relative to average in Poland.

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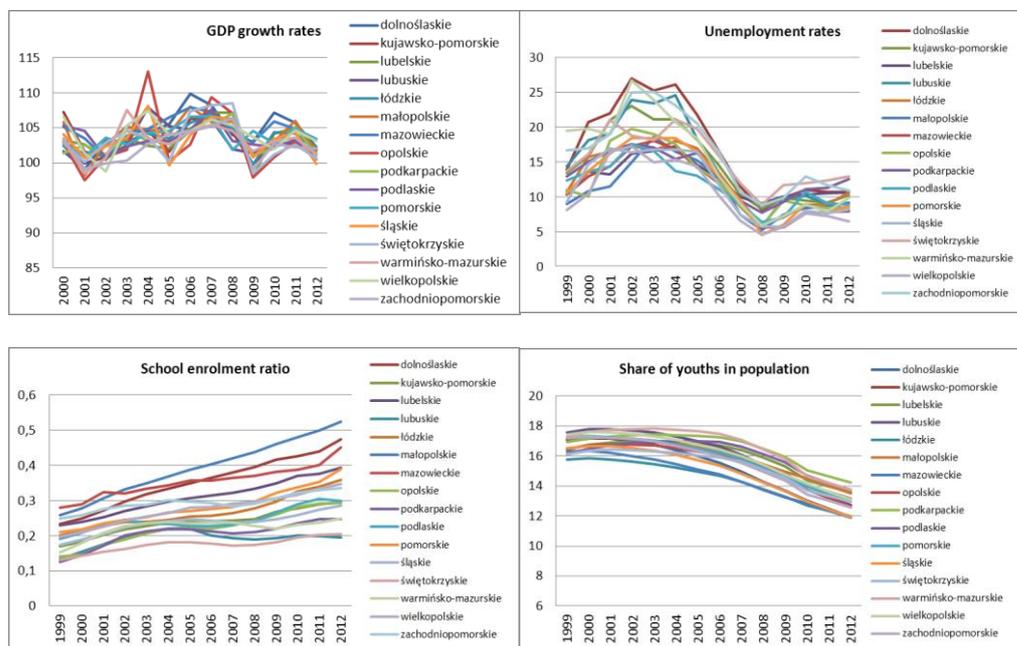
## Appendix

Map A1. Administrative division of Poland (NUTS2 regions)



Source: own elaboration.

Figure A1. Regional development of GDP growth rates, unemployment rates, school enrolment ratios and share of youths in population in Poland in 1999-2012



Source: Local Data Bank, CSO.

Table A1. Description of variables used in the model

Variable	Description	Unit	Source
Employment rate 15-24	Ratio of the number of the persons aged 15-24 in employment to the population of this age group	%	Local Data Bank, Central Statistical Office, <a href="http://www.stat.gov.pl">www.stat.gov.pl</a>
Minimum wage	Statutory minimum wage level	PLN	Eurostat (for international comparison) and Ministry of Labour and Social Affairs (for Polish data)
Average wage	Average gross monthly earnings	PLN	Zatrudnienie i wynagrodzenia w gospodarce narodowej (Employment, wages and salaries in national economy) Central Statistical Office, <a href="http://www.stat.gov.pl">www.stat.gov.pl</a>
Minimum to average wage ratio	Minimum wage divided by the average wage	%	Own calculations
Gross domestic product	Gross domestic product in constant 2002 prices	Thousands of PLN	Own calculations based on Local Data Bank, CSO, <a href="http://www.stat.gov.pl">www.stat.gov.pl</a>
Male unemployment rate	Unemployment rate of men in 15-64 age group	%	Local Data Bank, CSO, <a href="http://www.stat.gov.pl">www.stat.gov.pl</a>
School enrolment ratio	Share of full time students to the total population of	%	Own calculations based on Local Data Bank, CSO.

		20-24 years old		
Population 15-24		Share of 15-24 years old in total population	%	Own calculations based on Local Data Bank, CSO.

Table A2. Results of unit root and stationarity tests (sample period 1999-2012)

	Levin-Lin-Chu	Harris-Tzavalis	Breitung	Im-Pesaran-Shin	Hadri
<i>er</i>	0.006	0.045	0.0001	0.375	0.000
<i>wrel</i>	1.000	0.731	0.0009	0.9996	0.000
<i>gdp</i>	0.652	0.9999	1.000	1.000	0.000
<i>um</i>	0.0012	0.778	0.0004	0.982	0.000
<i>se</i>	0.0002	0.925	1.000	0.030	0.000
<i>pop</i>	1.000	1.000	1.000	1.000	0.000

Source: own estimates.

