

The impact of minimum wage on employment in Poland

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ABSTRACT: The purpose of this paper is to verify the hypothesis that minimum wage might have negative impact on employment in Poland, at least for some workers groups and regions. After having reviewed theoretical literature on minimum wage and having discussed stylized facts on labour market in Poland, the authors define econometric model to check the impact of minimum wage on employment in Poland and then discuss the results. The main conclusions of the study may be summarized as follows: i) minimum wage has had an adverse impact on employment in 1999-2010; ii) the adverse effect of minimum wage on employment has been pronounced for the young workers during the period of substantial increase of the minimum wage (2005-2010), and iii) there is some evidence that a uniform national minimum wage may be particularly harmful to employment in poorest regions.

JEL Classification: E24, J38, R23.

Keywords: Minimum wage, employment.

El impacto del salario mínimo sobre la ocupación en Polonia

RESUMEN: El objetivo de este trabajo es verificar la hipótesis de que el salario mínimo puede tener un impacto negativo sobre el empleo en Polonia, por lo menos para algunos grupos de trabajadores y las regiones. Después de haber revisado la literatura teórica sobre el salario mínimo y de haber discutido los hechos estilizados del mercado de trabajo en Polonia, se especifica y estima un modelo econométrico para cuantificar el impacto del salario mínimo sobre el empleo en Polonia y, a continuación, discutir los resultados. Las principales conclusiones del estudio se pueden resumir de la siguiente manera: i) el salario mínimo ha tenido un impacto negativo sobre el empleo en 1999-2010; ii) el efecto negativo del salario mínimo

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sobre el empleo ha sido pronunciado para los trabajadores más jóvenes durante el período de aumento sustancial del salario mínimo (2005-2010), y iii) existe cierta evidencia de que un salario mínimo nacional uniforme puede ser particularmente perjudicial para el empleo en las regiones más pobres.

Clasificación JEL: E24, J38, R23.

Palabras clave: Salario mínimo, empleo.

1. Introduction

Minimum wage in Poland, set uniformly across the regions, has increased substantially over last years and especially after Poland's accession to EU in 2004. At present Poland is one of the countries with the highest minimum wage among New Member States¹ (NMS), despite its relatively low level of economic development. Moreover, following recommendations of the International Labour Organisation² (ILO) there are plans, supported particularly by Polish trade unions, to further increase the minimum wage in Poland to 50% of an average wage rate.

While labour organizations and social partners tend to highlight social security and protection impact of minimum wage legislation, economists are quite often sceptical whether this is adequate and effective tool of alleviating poverty and income inequalities. They rather emphasise potential danger of setting minimum wage at the level above the productivity of some groups of workers what has an adverse effect on the demand for these employees. Moreover, while this objection gives an argument for the certain restraint in augmenting minimum wage, even its modest rise may be harmful to employment if there is considerable regional variation in average wage and therefore minimum wage may be binding in some low wage regions. Adjustment of minimum wage to local labour market conditions through its regional differentiation is therefore a way to neutralize to some extent negative effects of minimum wage legislation.

Poland is a country with considerable regional wage inequalities and also with substantial diversification of unemployment rates across regions and employees groups (especially, with respect to age, skills, etc.). These characteristics of labour market provide some rationale for considering setting of minimum wage at regional basis. This opinion was put forward in OECD Economic Survey of Poland 2010 as the following policy recommendation: «The minimum wage should not be increased relative to the average wage but be differentiated across regions, based on local labour market conditions». This recommendation looks plausible against the background of the stylized facts on the labour market in Poland mentioned above. However, OECD documents do not refer to any up-to-date analysis of the impact of minimum wage on labour market performance in Poland, especially in regional dimension. Indeed,

¹ Countries that joined EU in 2004 or later (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia).

² Kłos (2005).

literature on this issue for Poland is not very extensive, leaving the question of assessment of minimum wage policy in fact unfounded on empirical verification.

In this paper we attempt to check if observed minimum wage could have been a factor restraining the employment in Poland, at least for some workers groups and regions.

A structure of this paper is as follows. In section 2 theoretical considerations on potential minimum wage impact on labour market performance and some empirical evidence are presented. Section 3 presents statistical information on minimum wage in Poland. In section 4 the regional employment rates and their potential determinants are analysed. Section 5 presents the econometric analyses and results. Section 6 contains final conclusions.

2. Impact of minimum wage on labour market: theory and empirical results

There is no clear-cut answer to the question of potential impact of an increase in minimum wage on labour market performance except for the stylized, textbook-type neoclassical model with homogenous labour and symmetrical information (*e. g.*, Boeri and van Ours, 2008). In this case, rise in the minimum wage above the competitive equilibrium level produces decline in demand for labour and increase in supply, thus leading to the rising (involuntary) unemployment. However, in more «realistic» neoclassical model with heterogeneous labour and products, the result (sign of employment adjustment) depends on the elasticities of substitution across different types of workers and cross-elasticities of demand across different types of goods (*e. g.*, Neumark and Wascher, 2007).

When the models are further complicated and more labour market imperfections are being introduced, the results of minimum wage legislation are *ex ante* ambiguous, both theoretically and empirically. For instance, in the model with monopsony in factor markets, rise in the minimum wage has generally non-monotonic impact on employment. It may lead to increase in employment if the new minimum wage is lower than the competitive level (adjustment along the supply curve) but it may reduce employment if government sets minimum wage higher than competitive equilibrium level (adjustment along the demand curve) as discussed *e. g.* in Rocheteau and Tasci (2007).

Also in a labour market model with search frictions, an impact of minimum wage increase is generally indeterminate. It may lead to higher employment if market is dominated by employers (the market wage is low). But higher market wages reduce firms' incentives to create jobs, thus leading to decrease in number of vacancies, which discourages workers from searching for a job and finally results in reduced employment rates (Rocheteau and Tasci, 2007). Also efficiency wage theory gives an argument that rising minimum wage above competitive equilibrium level does not necessarily create barrier to employment. According to this approach, higher wages

generate incentives for workers to increase their productivity (since wages determine productivity) which finally results in increased employment as potential reaction to minimum wage rise (Manning, 1995).

A general specification of model often used in the literature is formulated as follows (e.g.: Neumark Wascher, 2007; Neumark, 1999 or Brown *et al.*, 1982):

$$ER = f(wmin, X) + e \quad (1)$$

where:

<i>ER</i>	employment variable,
<i>wmin</i>	minimum wage variable,
<i>X</i>	vector of control variables
<i>e</i>	unobserved error term.

Usually both employment and minimum wage are expressed in relative terms, e.g. as employment-population ratio and minimum-to-average wage ratio, respectively. As for the control variables, a measure of business cycle position (e. g., GDP, output gap, unemployment rate, etc.) is used to take into account demand factors behind employment fluctuations. Supply factors like demographic or structural variables (e. g. working age population, school enrolment) and institutional variables are also taken into consideration as potential explanatory variables. The latter represent the features of labour market that may potentially affect sensitivity of employees and employers to minimum wage legislation, like the unemployment benefit replacement rate or union density.

As for the other potential effects of minimum wage (e. g., Boeri and van Ours, 2008; Gunderson, 2005; Neumark and Wascher, 2007), impact on labour force participation is ambiguous. The net effect will result from the interplay of two countervailing forces: employees withdrawing from the labour market in a reaction to employment falling because of minimum wage rise («discouraged worker» effect) and workers entering labour market in hope of finding better paid job («added worker» effect).

As for the impact on unemployment, it will again be interplay of «discouraged» versus «added» worker effect, with empirical literature pointing to expected smaller rise in unemployment vis-à-vis drop in employment (Gunderson, 2005). Minimum wage legislation may have also an impact on employment of other workers, especially those earning just above the minimum wage (so called «spillover effect»). This effect will mean increase in demand for workers just above the minimum if they are substitutes for the employees earning minimum wage and decrease if they are complements of workers at minimum wage. Similar mechanism may be expected for the workers earning just below the minimum wage.

The «spillover» (or «ripple») effect may be also defined and observed with respect to wages. Minimum wage legislation will modify not only wage of workers directly affected but the final effect may materialize throughout the wage distribution as firms try to restore at least some of their former wage structure. Impact of the

minimum wage has been also studied in the context of training and human capital formation, on school enrolment, on wage inequality as well as on the labour supply decisions. However in this paper we concentrate only on the impact of minimum wages on the demand side of labour market.

General conclusions from the large body of empirical studies on employment effect of minimum wage (mostly on US and Canada) may be formulated as follows (Neumark and Wascher, 2007; Gunderson, 2005):

- the majority of authors find adverse impact of the minimum wage legislation. *E. g.*, according to the Neumark and Wascher (2007), two thirds of 102 studies surveyed resulted in negative employment effects and only 8 positive,
- if significant impact of minimum wage on employment was found, then respective elasticities were dispersed along wide range of estimates³,
- adverse labour market effects of minimum wage legislation concentrate in particular segments, mostly low-skilled and young workers.

Similarly to the diversity of results for the main world economies, most of the scarce literature on the countries of Central and Eastern Europe reveals negative impact of minimum wage legislation on employment but the results are not unanimous. For instance, for the Czech Republic, Fialova and Mysikova, (2009) found significant adverse consequences of the minimum wage for labour market (unemployment rate) while Gottvald *et al.* (2002) and Eriksson and Pytlikova (2004) claimed that impact of minimum wage on employment is unclear and that the effect on wages turned out to be positive. For Hungary Halpern *et al.* (2004) reported sizeable adverse impact of minimum wage increase on employment and Kertesi and Köllő (2004) confirmed these results in case of employment opportunities in the small enterprise sector.

Research on labour market consequences of minimum wage legislation in Poland has not produced, similarly to other countries, commonly accepted conclusions. Melnyk (1996) found strong negative impact of minimum wage rise on employment and unemployment rates. He also identified a large degree of regional disparity with respect to employment elasticity of minimum wages. Conclusions of the study by Suchecki (1999) were as follows: there is strong adverse employment and unemployment effect of minimum wage increase especially for young workers (fifteen to twenty-four years old) and much weaker for other age groups. Boni (2004) claimed that it is not only level of minimum wage that matters, but also alternative sources of income in case of employees and non-wage labour cost for employers (especially for low educated and young workers). Ruzik (2007) found that minimum wage might constraint employment of unskilled workers. The most extensive study on minimum wage impact on labour market by Jacukowicz (2007), based on survey of companies, concluded that there was no impact of minimum wage on unemployment and no need for regional differentiation of minimum wage. Also Golnau (2007) drew the general

³ Neumark and Wascher (2007) suggest to take -0.1 to -0.3 range as consensus view on employment elasticity of minimum wage, following Brown *et al.* (1982) survey study.

conclusion that minimum wage has rather insignificant impact on employment and unemployment. According to this author, if the adverse effects of raising minimum wage were to emerge, they would be restricted to low-wage workers (*e. g.* youths) and these effects would be rather small. Since that time no further econometric research in this area has been undertaken for Poland (according to authors' knowledge) while simultaneously the significant increase in the minimum wage level (and its ratio to average wage) was observed in Poland over last years.

3. Minimum wages in Poland

Poland is among 20 of the EU countries with national legislation setting a minimum wage by statute at national level⁴. Minimum monthly wage in Poland is negotiated on an annual basis within the Tripartite Commission for Social and Economic Affairs, composed of representatives of government, employees and employers. Then taking the negotiations' outcome into consideration, government sets legally binding minimum wage level for all the wage contracts in the subsequent year. If there is no consensus within the Tripartite Commission, the minimum wage is set unilaterally by the government.

Looking at the minimum wage level in Poland and other EU countries it can be noted that Poland belongs to the group with the low minimum wages expressed both in euro and in purchasing power standards (figure 1). However in 2011 it had the one of the highest minimum wage among the NMS, following only Malta and Slovenia.

During the last years we have observed a significant growth of minimum wage in Poland. The level of minimum wage more than doubled since 1999 (from 650 PLN in 1999 to 1386 PLN in 2011) and the changes were not uniform over time. The most significant rises were concentrated at the beginning of analysed period (about 8% per year in 2000-2001) and then in 2008 and 2009 (respectively 20.3% and 13.3%; figure 2).

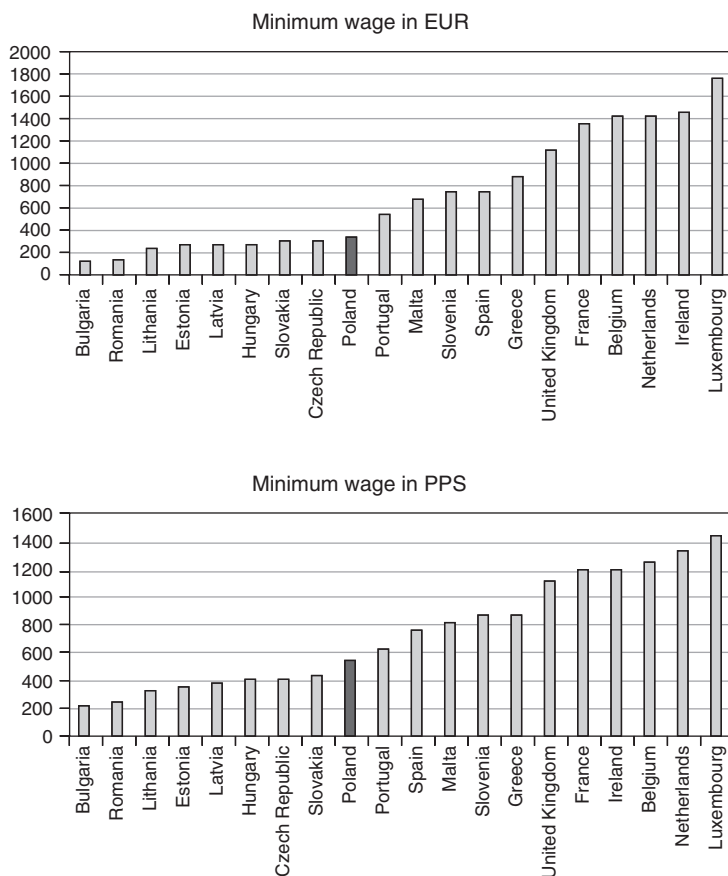
The inflation could only partially explain the growth of minimum wage, especially at the beginning of analysed period⁵ (figure 2). The significant growth of minimum wage in 2008-2009 was much higher than the inflation rate. One may rather presume that the main driving force behind fast growth of minimum wage during 2000s was continuous pressure of trade unions exerted on government to raise minimum wage to the level of 50% of average wage⁶. The growth rate of minimum wages was also higher in 1999-2010 than the growth of average wages in Poland (figure 2). These tendencies resulted in changes of its ratio with respect to the average wage in Poland

⁴ Czarzasty (2005).

⁵ Unfortunately, the data concerning regional inflation rates have been published by Central Statistical Office since 2003 only.

⁶ For instance, in July 2011 trade unions delivered a petition with 300,000 signatures to the parliament calling for an increase in the statutory minimum wage and demanding increase of the minimum wage to 50% of the average wage.

Figure 1. Average level of minimum wage in Poland and other EU countries in 2011

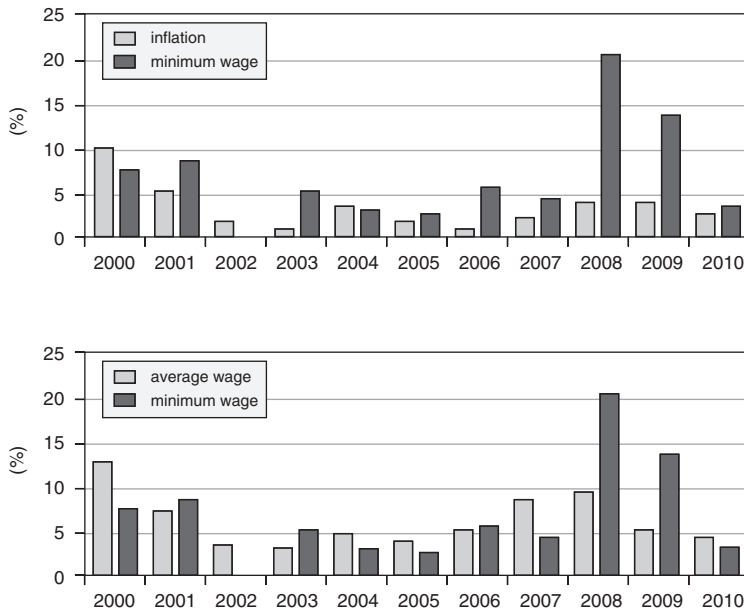


Source: Eurostat.

(figure 3). In 1999 the minimum to average wage ratio in Poland was about 38%. In subsequent years this ratio fluctuated and has decreased to 33% 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 ratio to 40%.

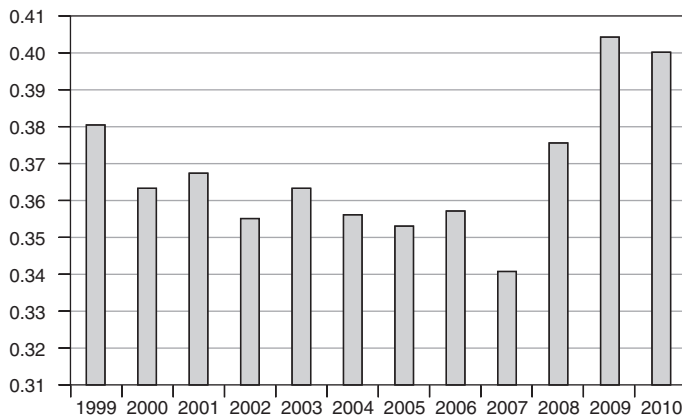
Looking at the development of minimum wages in Poland vis-à-vis NMS we may notice that, due to the relatively high growth rate during the last years, only in Slovenia and Malta minimum wages were in 2010 higher than in Poland. Even bigger differences can be observed while comparing the minimum wages in purchasing power standards, especially taking into account the differences in economic development. Although GDP per capita in Poland is relatively low among the NMS, the minimum wage level is higher than in Czech Republic, Hungary and Slovakia, the countries with higher level of economic development (figure 4).

Figure 2. Minimum wage, inflation and average wage growth in Poland in 1999-2010 (y/y, %)



Source: Ministry of Labour and Social Policy (www.mpips.gov.pl) and Eurostat.

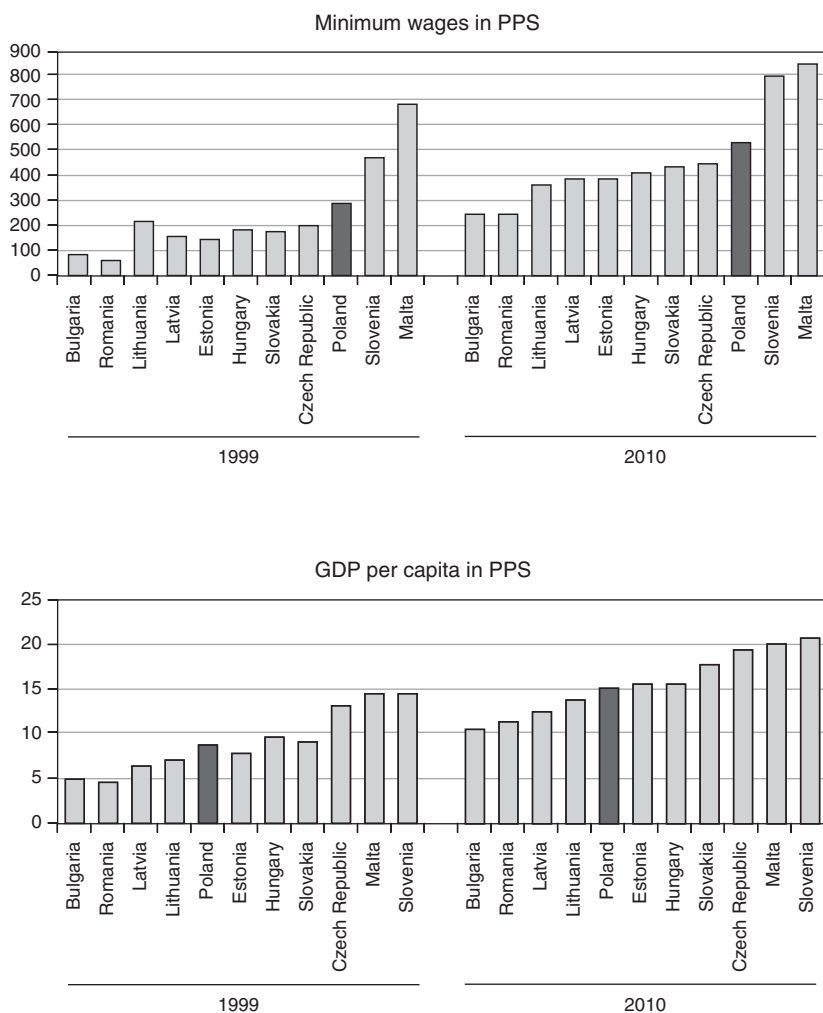
Figure 3. Minimum to average wage ratio in Poland in 1999-2010 (%)



Source: www.stat.gov.pl, own calculations.

Additionally, while analysing the impact of minimum wages on employment one should take into account quite substantial regional diversity of average wages in Poland. Therefore the uniformly set minimum wage can influence the labour demand on

Figure 4. Minimum wage and GDP per capita in PPS in Poland among other New Member States in 1999 and 2010



Source: Eurostat.

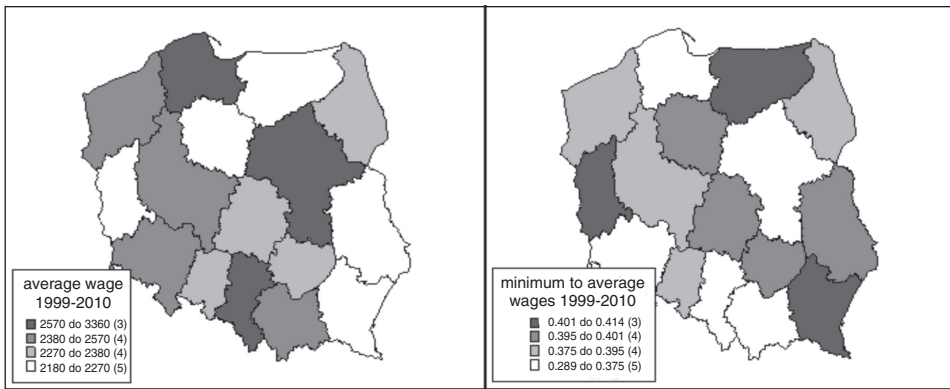
the regional labour markets to a various extent, potentially creating barrier to employment in low productivity (and low wage) regions.

Looking at regional differences in average wage level we may notice that the highest wages in Poland are observed in Mazowieckie (capital)⁷ region (map 1). Wages above the average are observed also in Slaskie and Dolnoslaskie, the regions with considerable share of mining industry and Pomorskie (shipyard industry). The lowest wages in

⁷ The administrative map of Poland is included in Annex 1.

Poland are observed in rural regions of the eastern part of Poland and also in some of the northern and western regions of Poland with high structural unemployment. The uniform economy-wide minimum wage in Poland on the one hand and regional diversity of average wage by regions on the other result in significant variation of regional minimum to average wage ratio (map 1). In 2010 the ratio of minimum to average wage varied from 0.30 in Mazowieckie (capital) to 0.44 in Podkarpackie region.

Map 1. Average wages in 16 Polish NUTS2 regions (left map, PLN) and minimum to average wage ratio (right map, %) on average in 1999-2010



Source: www.stat.gov.pl and www.mpips.gov.pl, own calculations.

According to other studies, regional variation in wages may be to a large extent explained by differences in labour productivity across the regions due to differences in regional structure of production (*e. g.*, Rogut and Tokarski, 2007; Wyszynski, 2008). Regions with low average wage levels are at the same time characterised by low productivity. And especially in those regions minimum wage, relatively high with respect to the regional average, might be the factor potentially limiting demand for labour since cost of employing low productive worker would in some cases outweigh the product of his work. It means that actual uniform across regions minimum wage may be too high from the point of view of economic conditions of the poorer regions of Poland and may be the reason for lower employment and higher unemployment, especially among young and less educated.

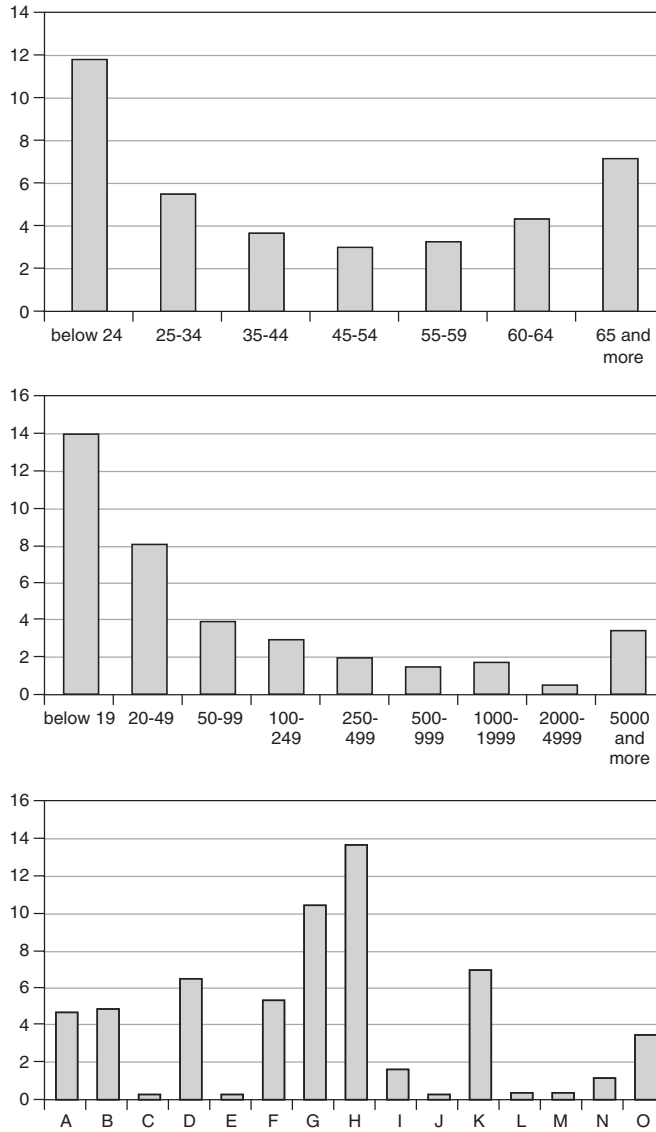
As for the number of workers covered by the minimum wages, the most recent estimate by the Ministry of Labour and Social Affairs is 3.8% of total employment in 2010⁸. Another source of the data about the distribution of wages in Poland is the firm surveys conducted by the Central Statistical Office every second year. According to the last survey (as of 2010) 17.9% of all workers earned the wage below 1772 PLN (the minimum wage in 2010 was 1317 PLN)⁹.

⁸ MPiPS (2010).

⁹ In euro terms these are respectively 444 and 330 EUR.

Looking at the distribution of minimum wage recipients in Poland in ¹⁰ 2004 we may notice that it concerned mostly young people (below twenty-five years old, figure 5). Moreover, they were employed mostly in small enterprises (below 9 or

Figure 5. Minimum wage employees by age, firm size and economic sector in 2004 (%)



Source: Jacukowicz (2007).

¹⁰ Unfortunately, no recent data were found.

between 10 and 19 employees) and the firms paying minimum wages were mostly located in services sector, especially in trade (sector G) as well as hotels and restaurants (sector H)¹¹. In the next section of the paper we focus on the employment rate, both aggregate and for the groups of young workers and we analyse some factors that may explain employment rate performance.

4. Employment rates in Poland and their determinants

As the main aim of the paper is to verify the hypothesis that minimum wages in Poland could be potentially affecting the employment, we present some statistics about the employment rates in Poland. Looking at the average employment rate (fifteen to sixty-four) in Poland we may notice that among UE27 countries it is below the average (figure 6). Especially low is the employment rate among young (fifteen to twenty-four), and in 2011 it was more than twice lower than in the Netherlands (figure 6).

Looking at the regional diversity of employment rates in Poland we can notice considerable differences (map 2). In 2010 the highest employment rate (64%) in Mazowieckie, capital region, was 10 p.p. higher than the lowest value (54% in Zachodniopomorskie, western part). Even bigger differences were observed in employment rates among young (fifteen to twenty-four). The highest employment rate (32%) was about 12 p.p. higher than the lowest one (19.6%).

While analysing the impact of the minimum wages on employment at the regional labour markets in Poland we should however have in mind that labour costs are only one of the factors affecting labour demand. According to the Keynesian theory the main determinant of the demand for labour is the aggregate demand level, usually approximated by the GDP volume. In our case, as the data concerning the regional GDP in Poland are published with considerable delay¹² we decided to approximate it by the widest available measure and use data on total retail sales per capita (map 3). Not surprisingly the highest values were registered in the capital (Mazowieckie region) and other regions where big cities are located (Pomorskie, Wielkopolskie, Dolnoslaskie, Malopolskie).

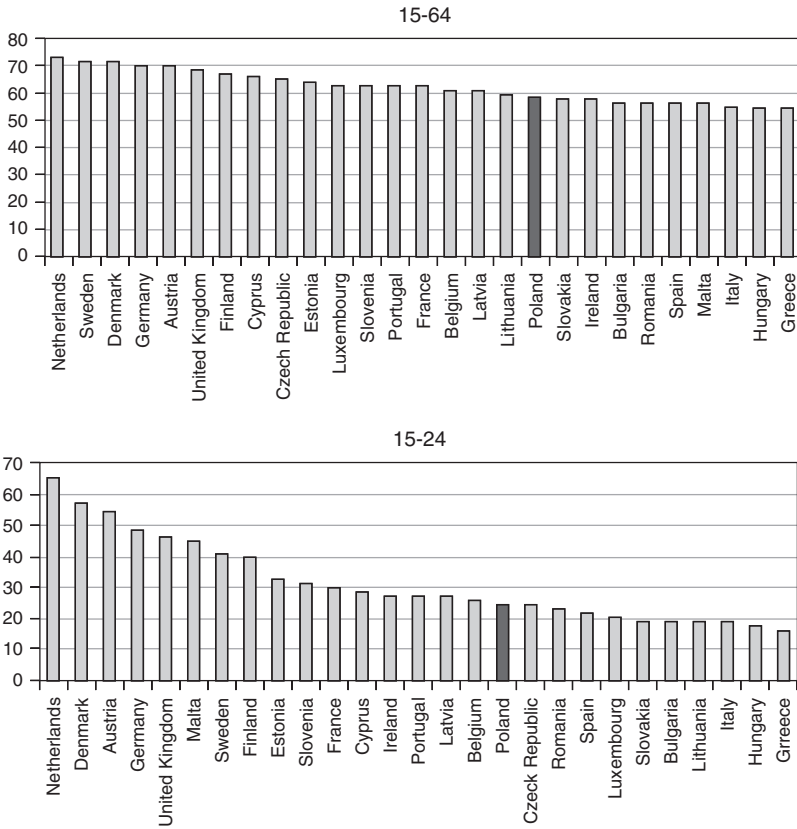
On the other hand the employment rate, especially among the younger workers should be negatively influenced by the student enrolment ratio (measured in the paper as the ratio of full time students to the population of twenty to twenty-four years old). Not surprisingly the highest enrolment ratios are registered in regions with big cities and big academic centres. The lowest ones are observed in the rural regions.

As a factor, which could on one hand additionally support measuring the business cycle, and on the other hand, covering the structural problems on some of the Polish

¹¹ These are the sectors in which there is the highest percentage of production in the shadow economy (GUS 2011). This is apparently factor that may complicate accurate measurement of minimum wage employment coverage and also may put bias on estimated effect of minimum wage legislation.

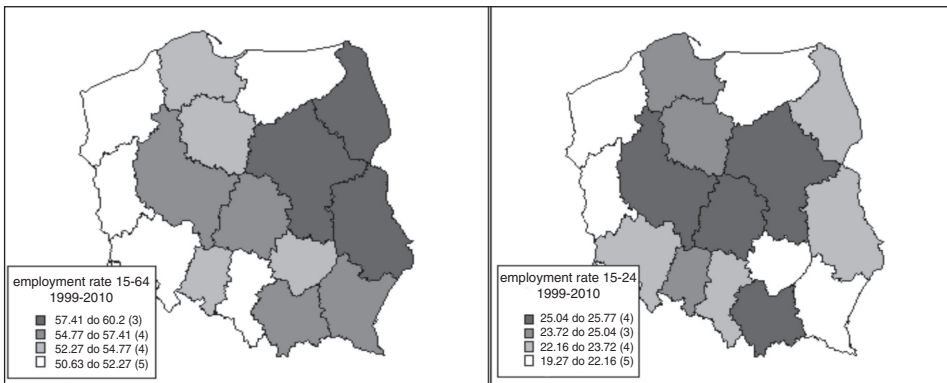
¹² Latest available data refer to 2009 (Local Data Bank, www.stat.gov.pl).

Figure 6. Employment rate in Poland and other EU countries in 2011 (%)



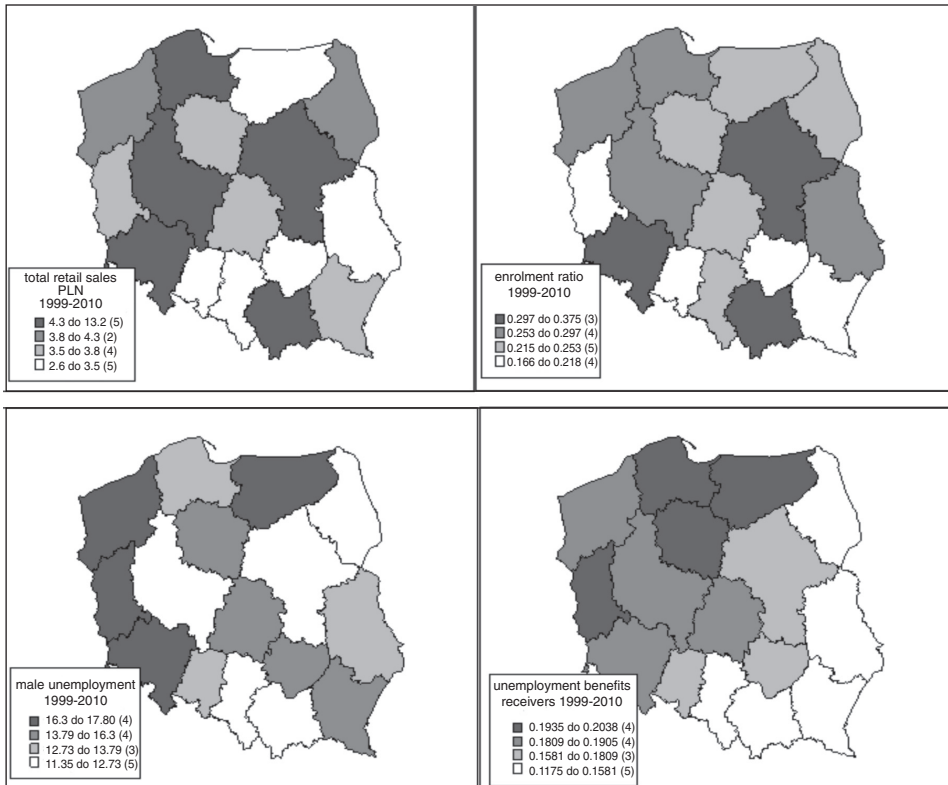
Source: Eurostat.

Map 2. Employment rate (15-64, left map and 15-24, right map) at the NUTS2 level in Poland on average in 1999-2010 (%)



Source: Eurostat.

Map 3. Regional diversity of total retail sales per capita, enrolment ratio, male unemployment and unemployment benefits receivers in Poland in 1999-2010



Source: CSO, www.stat.gov.pl, own estimates.

regional labour markets we use the male unemployment rate. High unemployment rate in some northern and western regions since the beginning of the transformation period is the result of liquidation of large State-managed Agricultural Farms (PGR) at the beginning of the 1990s in which approximately 40% of all employed in region worked.

Institutional factors other than minimum wage may also affect demand for and supply of employees. One of these factors is unemployment benefit and in particular its ratio to average or minimum wage (replacement ratio). While in general, overly generous unemployment benefits adversely affect motivation to work and thus increase unemployment rate, as Bukowski (ed), 2009 argue, this seems to be not the case for Poland where replacement ratio of unemployment benefit with respect to average wage decreased considerably over the last years (*e. g.*, from 42% in 1995 to 19% in 2009) and is lower than European average (for European OECD members). However, taken into account considerable regional variation of average wage, we treat unemployment benefits as potential explanatory factor in our analysis. Given

lack of data on replacement rate of unemployment benefits by region, we decided to take share of unemployed who receive unemployment benefits by region as a proxy. Looking at the regional data we can notice that in the western and northern part of Poland the share of unemployment benefits receivers is much higher than in the south-eastern part. This pattern reflects substantial regional variation of eligibility period for unemployment benefits, being the effect of differing conditions at local labour markets¹³.

In the next section the analysed above factors will be used to empirically verify the impact of minimum wages on regional employment.

5. Econometric analyses

In the earlier research on minimum wage impact on employment, equation (1) was being estimated econometrically as time-series model. Since 1990s combined time series and cross section data analyses became more and more popular together with the progress in panel data econometrics techniques. Panel data models proved to be particularly useful in the analyses of impact of minimum wage legislation across regions, especially for short time data. The key problem with this type of models is whether the results based on panel data models are robust to relaxation of assumptions underlying the use of the panel-data methodology, especially on the stability of the regression coefficients both over time and across regions.

Mostly due to a limited number of individual observations for Polish regions, we decided to verify the impact of minimum wages on employment using the panel data techniques. We use data for the 16 NUTS2 regions of Poland, the analysed period is 1999-2010, therefore the total number of observations is 176. Our dependent variables are the total employment rate (age group fifteen to sixty-four), the employment rate among young (age group fifteen to twenty-four) and additionally the employment rate for age group twenty-five to thirteen-four.

Taking into account the properties of the labour market processes in Poland we decided to estimate the dynamic version of the model. This method includes the lagged values of employment as additional explanatory variables to measure the adjustment of employment to changes in labour demand and supply. We use the Arellano-Bond (AB) and Blundell-Bond system estimator (BB). The first one formed moment conditions using lagged-levels of the dependent variable and the predetermined variables with first differences of the disturbances. However Arellano-Bover (1995) and Blundell-Bond (1998) found that lagged levels can be weak instruments if the autoregressive process is too persistent. In these cases the estimated values of the parameters are downward biased especially when the number of periods is small. The Blundell-Bond system estimator uses additional moment conditions in which lagged

¹³ In Poland, eligibility period for unemployment benefits is longer with higher local unemployment rate and some personal characteristics of the claimant (*e. g.* being over 50 with long work record, having dependent children or spouse without sources of income).

differences of the dependent variable are orthogonal to levels of the disturbances (Drukker, 2008).

While aiming at verifying impact of minimum wage on employment, we follow the strand of literature that suggests including in the list of regressors variables representing other than minimum wage supply factors, demand factors representing business cycle dynamics and some institutional variables, usually related to labour market characteristics (*e. g.*, Brown *et al.*, 1982; Neumark and Wascher, 2007). As for other than minimum wage supply factors we will use school enrolment rate as one of our hypotheses is that young workers may be potentially the group mostly affected by minimum wage legislation¹⁴. The use of this variable in minimum wage impact models was extensively discussed in Neumark and Wascher (2007) and Brown *et al.* (1982) applied this approach in their seminal work. Business cycle dynamics is represented in our model by total retail sales (a proxy to unavailable for this time horizon regional data on GDP) as for instance in Dickens *et al.* (1999). We also use male unemployment rate as explanatory variables to control changes in the level of economic activity, as envisaged by the literature quoted above. Additionally, we use share of unemployed who receive unemployment benefits as one of the institutional factors other than minimum wage affecting employment.

We estimated the following version of model (1):

$$er_{it} = \alpha_0 + \alpha_1 er_{it-1} + \beta_1 w \min_{it} + \beta_2 y_{it} + \beta_3 se_{it} + \beta_4 u_{it} + \beta_5 ub_{it} + \xi_{it} \quad (2)$$

where:

- er_{it} log of employment rate on regional labour market i ($i = 1, 2, \dots, 16$) in Poland at time t ($t = 1999, 2000, \dots, 2010$)¹⁵,
- $w \min_{it}$ log of minimum to average wage ratio¹⁶ on regional labour market i in Poland at time t ,
- y_{it} log of total retail sales per capita on regional labour market i in Poland at time t ,
- se_{it} log of school enrolment on regional labour market i in Poland at time t ,
- u_{it} log of male unemployment rate on regional labour market i in Poland at time t ,
- ub_{it} log of share of unemployment benefits receivers on regional labour market i in Poland at time t ,
- ξ_{it} error term.

The logarithmic specification of the model allows us to interpret the parameters estimates as the respective elasticities.

¹⁴ Variable representing the number of workers covered by minimum wage legislation might be also useful for controlling of the actual scale of minimum wage influence but these data are not available neither by regions nor even at aggregate level as time series.

¹⁵ The definitions and sources of all the dependent and explanatory variables are provided in annex 2.

¹⁶ As explained in section 3, unfortunately due to limited availability of the regional inflation data, we could not define our wage variables in real terms.

The results of this estimation for age group fifteen to sixty-four are presented in columns 1-2 of table 1. The results confirm negative and significant impact of the relative minimum wages on total employment rate. The estimated coefficient is -0.10 when estimated with AB and increases to -0.08 when using the BB system estimator. The results indicate also that in 1999-2010 total employment rate on regional labour markets in Poland was affected by business cycle variables (the total retail sales and unemployment rate). In general, higher enrolment ratio and also the unemployment benefits recipients ratio were conducive to decrease of the employment rate.

Table 1. Estimated parameters of equation 2 for the period 1999-2010 (*t*-ratios in the parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	AB	BB
Employment rate (-1)	0.58 (12.54)	0.61 (11.94)	0.43 (4.82)	0.58 (6.14)	0.37 (3.81)	0.49 (5.37)
Employment rate (-2)	—	—	—	-0.13 (-3.78)	—	—
Minimum to average wage ratio	-0.10 (-3.13)	-0.08 (-3.03)	-0.07 (-0.34)	-0.27 (-1.94)	-0.16 (-3.32)	-0.06 (-1.40)
Total retail sales	0.07 (4.65)	0.07 (3.78)	0.28 (4.01)	0.09 (2.29)	0.046 (3.39)	—
School enrolment	-0.06 (-2.26)	-0.08 (-3.03)	-0.57 (-3.62)	—	—	—
Male unemployment rate	-0.05 (-6.73)	-0.06 (-6.53)	-0.07 (-2.02)	-0.10 (-3.29)	-0.07 (-5.49)	-0.09 (-11.72)
Unemployment benefits receivers	-0.03 (-1.79)	-0.05 (-3.48)	-0.04 (-0.54)	—	—	-0.06 (-3.65)
Cons.	1.80 (11.96)	1.84 (10.37)	1.77 (3.14)	2.23 (5.34)	3.07 (8.50)	2.79 (8.21)
Obs.*	160	176	160	176	160	176
Sargan	60.86 0.24	71.37 0.24	63.84 0.17	68.60 0.26	63.63 0.17	64.12 0.47
ABond(1)	-2.95 0.003	-2.76 0.006	-2.99 0.003	-3.25 0.001	-2.92 0.003	-3.46 0.0005
ABond(2)	-1.01 0.31	-0.92 0.36	-1.98 0.05	-1.41 0.16	-0.008 0.99	0.55 0.58

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

* In case of Arellano-Bond estimator, parameters are estimated on first differences of explanatory variables observations and as for Blundell-Bond estimator, observations expressed in levels are used. Hence in case of AB estimation number of observation is lower than for BB estimation by the number of regions (16).

Source: own estimates.

The results for the age group fifteen to twenty-four are shown in columns 3-4 of table 1. The minimum wage coefficient estimated by AB method is negative (-0.07) but not significant and the Arellano-Bond test for the serial correlation indicates the problems with second order autocorrelation. Therefore we decided to include the second lag of the dependent variable in the model. The BB estimations with two lags show the negative and statistically significant elasticity of -0.27 and the tests show no problem with model specification. We can notice that the employment rate of young workers on regional labour markets was also more (than in case of total employment) affected by the business cycle.

To check the robustness of the results, we took age group twenty-five to thirteen-five as a control group (column 5-6 of table 1). This group consists of people who have already been on the labour market since some time and for that group we may notice that employment rate is slightly less responsive than the one observed for total employment rate but not significant (BB method). Dependent variable has been also significantly explained by changes in unemployment rate and unemployment benefit coverage (both negatively) while not surprisingly, the enrolment ratio was not significant for this age group.

In the next step, trying to check the robustness of our results across time, we divided our sample into two subsamples: 1999-2004 and 2005-2010. During most of the first period the slowdown in economy was observed and the employment rates were decreasing, and the ratio of minimum wage to average exhibit tendency to decrease. In the second period, before the global crisis¹⁷, the economic recovery took place and an increase in employment rate was observed (even in 2009-2010 the employment rate slightly increased), while minimum-to-average wage ratio considerably increased.

Table 2 presents the results for the period 1999-2004. They indicate that in this period minimum wage was not the factor limiting overall employment in Poland. The estimated parameter at minimum wage variable is negative but not significant both for the total and young employment rate. For the control group twenty-five to thirteen-four the coefficient on minimum wages is positive¹⁸. Employment in that period was mostly driven by the demand factors.

The opposite situation was observed in the second period (2005-2010, table 3). The minimum wage coefficient is negative and significant for both total and young employment rates. Also negative but insignificant minimum wage coefficient estimate was received for the control group twenty-five to thirteen-four. The demand factor (total retail sales) was not significant. The results indicate therefore that to a greater extent the cost and not demand factors determined the employment in that period. However, as this sub-period covers the slow-down of the Polish economy as

¹⁷ Which in case of Polish economy was less visible. In 2009 Poland was the only EU country with positive growth rate.

¹⁸ However one has to look carefully at the results for twenty-five to thirteen-four years old group as the estimated autoregression parameters are above the one estimated by OLS which indicates that the results in these cases are upward biased.

Table 2. Estimated parameters of equation 2 for the period 1999-2004 (*t*-ratios in the parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
Period	1999-2004	1999-2004	1999-2004	1999-2004	1999-2004	1999-2004
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	BB	BB pre	AB	BB
Employment rate (-1)	0.34 (2.42)	0.56 (5.26)	0.74 (2.35)	0.28 (1.91)	0.54 (2.24)	0.61 (8.77)
Minimum to average wage ratio	-0.06 (-0.43)	-0.05 (-0.44)	-0.31 (-0.47)	-0.47 (-0.69)	0.18 (0.60)	0.33 (2.97)
Total retail sales	0.07 (3.17)	0.07 (3.06)	0.48 (1.95)	0.20 (1.74)	0.05 (1.19)	0.05 (2.22)
School enrolment	—	0.03 (0.65)	-0.47 (-1.56)	—	0.10 (1.34)	0.14 (1.95)
Male unemployment rate	-0.13 (-5.80)	-0.12 (-4.27)	-0.17 (-1.32)	-0.35 (-3.34)	-0.13 (-3.54)	-0.13 (-3.60)
Unemployment benefits receivers	0.04 (1.07)	—	—	0.18 (1.78)	—	—
Cons.	2.46 (3.01)	1.60 (2.48)	—	2.78 (1.14)	—	—
Obs.*	64	80	80	80	64	80
Sargan	0.50	0.63	0.66	0.21	0.24	0.58
ABond(1)	0.07	0.05	0.06	0.04	0.04	0.03
ABond(2)	0.35	0.98	0.59	0.16	0.68	0.77

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. BB pre – Blundell-Bond system estimator with predetermined minimum to average wage variable. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

the reaction to the global crisis, cyclical factors (as represented by the male unemployment rate) proved significant as explanatory variable.

In the next step we check the robustness of the results across space by estimating equation (2) separately for high (table 4) and low (table 5) wage regions. The results show that, firstly, for overall and twenty-five to thirteen-four employment rates the estimated coefficients on minimum wage were negative and smaller (in absolute terms) for the high wage regions than for the low wage ones. However, in the high wage regions only the employment elasticities with respect to minimum wages for twenty-five to thirteen-four years old workers were statistically significant.

For the low wage regions we can confirm the significant and negative impact of minimum to average wage ratio on overall and twenty-five to thirteen-four employment rate. The estimated parameters for the fifteen to twenty-four workers are not significant. Therefore our results support the hypothesis that in low wage regions (being

Table 3. Estimated parameters of equation 2 for subperiod 2005-2010 (*t*-ratios in the parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
Period	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	BB	BB	BB	BB	AB	BB
Employment rate (-1)	0.82 (10.95)	0.66 (11.32)	0.91 (5.68)	0.56 (5.60)	0.27 (2.25)	0.35 (3.18)
Minimum to average wage ratio	-0.16 (-3.33)	-0.07 (-2.64)	-0.50 (-2.55)	-0.27 (-2.56)	-0.06 (-1.01)	-0.09 (-1.30)
Total retail sales	—	—	—	—	—	—
School enrolment	—	—	—	—	—	—
Male unemployment rate	-0.06 (-4.25)	-0.06 (-6.85)	—	-0.10 (-2.11)	—	—
Unemployment benefits receivers	-0.05 (-2.23)	-0.04 (-3.08)	—	—	-0.07 (-4.42)	-0.06 (-4.53)
Cons.	1.59 (7.35)	1.90 (10.28)	2.15 (4.03)	2.64 (5.18)	3.52 (9.01)	3.27 (10.57)
Obs.*	80	80	80	80	64	80
Sargan	0.35	0.23	0.98	0.98	0.69	0.67
ABond(1)	0.02	0.02	0.003	0.01	0.01	0.01
ABond(2)	0.35	0.26	0.21	0.11	0.81	0.56

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. BB pre – Blundell-Bond system estimator with predetermined minimum to average wage variable. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

the effect of low productivity) the minimum wages may be binding the employment, especially for relatively young workers (twenty-five to thirteen-four years old).

6. Conclusions

In this paper we have tried to verify the hypothesis that minimum wage may be the factor reducing demand for labour in Poland, in particular in case of some labour market segments and particular groups of regions. For this reason we have used NUTS 2 regional data in our analysis and also defined employment rate variable for the various age groups. Our analytical tool has been dynamic panel regression model, specified according to specification common in the literature.

The following main conclusions may be drawn from our study. First, minimum wage has had an adverse impact on employment in Poland during 1999-2010. Employment rate (our dependent variable) has been also co-determined by cyclical de-

Table 4. Estimated parameters of equation 2 for high wage regions
(*t*-ratios in the parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
	High wage regions					
Period	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	AB	BB
Employment rate (-1)	0.56 (14.46)	0.58 (9.19)	0.39 (3.61)	0.55 (7.08)	0.40 (7.80)	0.45 (6.48)
Employment rate (-2)	—	—	—	-0.20 (-5.27)	—	—
Minimum to average wage ratio	-0.12 (-3.00)	-0.04 (-0.94)	-0.06 (-0.40)	-0.07 (-0.49)	-0.11 (-2.25)	-0.09 (-2.07)
Total retail sales	0.05 (3.51)	0.02 (1.29)	0.18 (2.07)	0.04 (1.10)	0.04 (2.47)	0.04 (2.82)
School enrolment	—	—	-0.34 (-2.43)	—	—	—
Male unemployment rate	-0.05 (-5.21)	-0.08 (-7.31)	-0.10 (-2.41)	-0.12 (-4.46)	-0.06 (-5.27)	-0.06 (-5.33)
Unemployment benefits receivers	—	-0.06 (-2.18)	—	—	—	—
Cons.	1.87 (11.91)	2.01 (13.38)	2.00 (3.61)	2.29 (4.61)	2.74 (12.22)	2.53 (7.57)
Obs.	80	88	80	88	80	88
Sargan	0.65	0.77	0.17	0.52	0.15	0.19
Abond(1)	0.05	0.03	0.05	0.03	0.03	0.05
Abond(2)	0.16	0.11	0.07	0.08	0.54	0.69

AB – Arellano–Bond estimator. BB – Blundell–Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano–Bond test for serial correlation of first and second order.

Source: own estimates.

mand factors (sales per capita), labour market position (unemployment rate), demographic characteristics (school enrolment) and institutional factors (unemployment benefits coverage) with the expected signs of the parameter estimates. Second, our results show that during the period of substantial increase of the minimum wage (2005-2010) it is the group of young workers (of age fifteen to twenty-four) that has been the most adversely affected by the minimum wage legislation. For this group estimated elasticity of employment rate with respect to relative minimum wage is more much larger as for the total labour force (age fifteen to sixty-four). Third, our additional estimations have shown some evidence that a uniform national minimum wage may be particularly harmful to employment in poorest regions (with lower wages).

Table 5. Estimated parameters of equation 2 for low wage regions (*t*-ratios in the parentheses)

	(1)	(2)	(3)	(4)	(5)	(6)
	Low wage regions					
Period	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	BB	BB pre
Employment rate (-1)	0.54 (9.62)	0.63 (10.52)	0.33 (3.31)	0.48 (3.82)	0.44 (3.54)	0.37 (4.89)
Minimum to average wage ratio	-0.15 (-2.22)	-0.11 (-2.53)	0.16 (0.54)	-0.05 (-0.16)	-0.14 (-2.39)	-0.11 (-1.80)
Total retail sales	0.10 (3.74)	0.07 (3.03)	0.28 (3.56)	0.11 (1.52)	—	—
School enrolment	-0.08 (-2.77)	-0.06 -2.52	-0.69 (-3.27)	-0.36 (-2.49)	—	—
Male unemployment rate	-0.05 (-3.09)	-0.05 (-4.87)	-0.09 (-2.00)	-0.14 (-2.92)	-0.10 (-9.33)	-0.11 (-11.50)
Unemployment benefits receivers	—	-0.03 (-2.22)	-0.10 (-2.16)	-0.10 (-2.07)	-0.05 (-2.49)	-0.04 (-2.10)
Cons.	1.88 (7.89)	1.69 (10.17)	1.82 (1.76)	2.70 (2.54)	3.30 (6.65)	3.51 (9.30)
Obs.	80	88	80	88	88	88
Sargan	0.15	0.04	0.42	0.34	0.83	0.53
Abond(1)	0.06	0.08	0.03	0.02	0.01	0.01
Abond(2)	0.72	0.92	0.28	0.22	0.50	0.61

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

Our main results proved to be rather robust to the tests applied in the paper but some grain of salt has to be maintained. One of the reasons for our caution is limitation on the side of data that seriously restrained us from fully appropriate specification of the model. Some relevant variables could not be defined for the reason of the lack of data at regional level (*e. g.* unemployment and social benefits, minimum wage coverage) and the other variables had to be defined only as proxies of the correct specifications, like for instance nominal instead of real wages and sales because of the lack of the long enough data on regional CPI indices. Also statistics on regional variation of the cost of living, if available, would be very important for the proper assessment of minimum wage significance, given relatively large inequalities of level of regional development in Poland. Therefore the question of the impact of minimum wage legislation on market performance in Poland requires, on the one hand, further improvement of analytical tools, but on the other hand it also calls

for extending statistical information on the social and economic development at regional level.

As for the potential policy recommendations, we would like to highlight three of them. First, as our study seems to prove that minimum wage may be a binding factor for employment in Poland. Therefore, further increase of minimum wage over the average wage, should be very carefully analysed from the point of view of labour market impact, and rather avoided, as OECD experts recommend. Second, since our results show that impact of minimum wage on employment is more harmful in the poorer regions, there is some room for consideration the regional differentiation of minimum wage level to adjust it to local labour market conditions, which was also suggested by OECD. Third, our study clearly points young workers as the group especially vulnerable to minimum wage legislation. Unemployment rate in this group is already much higher than average and —as our results show— situation may be aggravated by the future minimum wage rises. Moreover, relatively low participation of students in the labour market in Poland was pointed out in some previous OECD studies. Therefore, further reforms of both higher education system and labour market to increase economic activity of students will alleviate negative impact of minimum wage on employment of younger workers.

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Annex 1. Territorial map of Poland (in the territorial breakdown in force since 1 January 1999)



Annex 2. Description of variables used in the model

<i>Variable</i>	<i>Definition</i>	<i>Unit</i>	<i>Source</i>
Employment rate	Ratio of the number of the persons aged 15-64 in employment to the total population of the same age group (based on the EU Labour Force Survey).	%	Eurostat
Employment rate 15-24	Relation of the number of the persons aged 15-24 in employment to the total population of the same age group (based on the EU Labour Force Survey).	%	Eurostat
Employment rate 25-34	Relation of the number of the persons aged 25-34 in employment to the total population of the same age group (based on the EU Labour Force Survey)	%	Eurostat
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 (approximated upon quarterly data).	PLN	Zatrudnienie i wynagrodzenia w gospodarce narodowej (Employment, wages and salaries in national economy). Central Statistical Office (CSO), www.stat.gov.pl
Minimum to average wage ratio	Minimum wage divided by the average wage.	%	Own calculations based on CSO data
School enrolment	Share of full time students to the total population of 20-24 years old.	%	Own calculations based on Local Data Bank, CSO, www.stat.gov.pl
Total retail sales	Retail sales of goods (including VAT, current prices) refer to entities employing more than 9 persons divided by the total population.	Thousands of PLN	Own calculations based on Local Data Bank, CSO, www.stat.gov.pl
Male unemployment	Unemployment rate of men aged 15-64.	%	Local Data Bank, CSO, www.stat.gov.pl
Unemployment benefits receivers	Share of unemployed receiving the unemployment benefits in total unemployment.	%	Local Data Bank, CSO, www.stat.gov.pl

Comment on «The impact of minimum wage on employment in Poland», by Aleksandra Majchrowska and Zbigniew Żółkiewski

J. D. Tena *

Introduction

Estimating the effect of the national minimum wage (NMW) on employment is an issue of great relevance for both academic researchers and policy makers. Following the current economic crisis, it has become an even more interesting topic because the importance of NMW should be more evident in periods of downturn and for countries and regions that more affected by financial turmoil. This paper tries to address this issue for the Polish economy by estimating the effect of NMW on employment for different regions and groups of workers. The authors conclude that NMW does not have a significant aggregate impact but could negatively affect employment for some specific groups, such as young workers.

The analysis has at least two original aspects. First, although estimating the effect of NMW is not a new topic, the existing research typically does not analyse regional differences but mainly focuses on the study of discrete increases in NMW [Dickens *et al.* (2010) and Stewart (2004)], age-related increases [Dickens *et al.* (2007) and Fidrmuc and Tena (2012)], or surveys/meta studies [Dolado *et al.* (1996) and Doucouliagos and Stanley (2009)]¹⁹. The reasons for this lack of analysis will be explained in the following section and are mainly based on the difficulty of finding a control group of regions. The second contribution is that the analysis is conducted for an Eastern European country.

The remainder of this comment discusses the econometric approach used in the estimation, followed by some concluding remarks.

Methodological aspects

It is always difficult for the social sciences to estimate the real impact of a given policy action. In this particular context, a perfect experiment to analyse the effect of NMW would be to observe the employment output of a given region, then clone the region and impose a NMW under similar circumstances. The average difference between the results observed in the two regions would provide an estimation of the impact of the NMW. Of course, this ideal experiment cannot be performed, but it is still possible to run a relatively similar analysis. In order to do that, it is necessary to

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¹⁹ Card and Krueger (1994) is a remarkable exception to this pattern.

define a treatment group (those directly affected by the NMW), and a control group (people very similar to the first group except for the fact that they are not affected by NMW).

The paper proposes the following specification (equation 2 in the paper) to estimate the impact of the NMW-to-average wage ratio on the employment rate of region i at time t :

$$\frac{\#employed_{it}}{working\ age\ population} = \alpha_0 + \alpha_1 \frac{NMW_t}{Average\ wage_{it}} + \alpha_2 X_{it} + \xi_{it} \quad (1)$$

where X_{it} is a set of control variables and ξ_{it} a stochastic error component.

My first comment to this approach is that I am very sceptical of the fact that estimation of parameter α_1 provides relevant information about the impact of NMW on employment, mainly because all Polish regions face the same NMW. In other words, we do not have the treatment and control groups of regions that are required for a sound estimation. Because of this, the regional variation of the NMW-to-average wage ratio is caused by the evolution of the average wage.

As mentioned in the introduction, perhaps because NMW is typically set at the national level, there are few attempts in the previous literature to estimate the impact of NMW across regions. One exception is Card and Krueger (1994) who, in their seminal paper, developed a comparative analysis of employment in fast food restaurants in New Jersey and Pennsylvania after the April 1992 increase in New Jersey's minimum wage.

In addition, there are at least two additional weaknesses of the approach taken by the paper. The first is the potential endogeneity of the key explanatory variable, given that both NMW and average wage are affected by the economic cycle. This type of endogeneity cannot be corrected by including individual effects that are fixed through time in the equation. Indeed, the significantly negative impact of NMW found in some estimations could simply be due to the positive correlation between the numerator of the dependent variable and the denominator of the NMW-to-average wage ratio. Second, it is also problematic that both the dependent and the key explanatory variables are defined as ratios because we cannot identify the individual impact of each variable. It would be more helpful to separately estimate the impact of NMW and average wage on employment and activity.

Conclusions

The paper presents an empirical analysis on the relationship between the employment rate and the NMW-to-average wage ratio across regions. Although there are important flaws that make me very cautious about the conclusions of the paper, I think it is important to value its originality. Furthermore, I think this paper should not be considered conclusive but an initial step encouraging the continuation of work on

this type of analysis in the future. Some suggestions are (1) to extend the time dimension of the data and compare the aggregate impact of NMW through time and (2) to compare the effect of different NMWs in different groups of countries.

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