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# **Minimum Wage: Labour Market Consequences in the Czech Republic**

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## **Abstract:**

**This paper aims to quantify the impact of the minimum wage on labour market performance in the Czech Republic. Using regional data for 1995-2004, it estimates the effect of the minimum wage adjusted for regional wage differential on the regional unemployment. Consequently, using detail individual data from 2004/2005, we analyze the annual hikes in the minimum wage that allow us to estimate employment probabilities for workers with wage level at, or close to, the new minimum wage. The aim is to reveal whether the most endangered groups of workers exhibited significantly different employment probabilities. Our results reveal that the minimum wage has had a significant impact on increasing regional unemployment and reducing the employment probabilities of low-paid workers.**

**Keywords:** minimum wage, employment probability, unemployment

**JEL:** E24, J38, J64

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## 1 Introduction

Almost all the developed countries use some form of wage legislation that prevents wages to fall below certain threshold. Indeed, several conventions of International Labour Office recommend minimum wage concept as an instrument of workers' protection.<sup>1</sup> However, institution of minimum wage and its economic consequences have been traditionally in the centre of both academic and political discussions and subject to many controversies.<sup>2</sup>

On one hand, proponents of minimum wage mostly seek arguments in social area. The main goal of the minimum wage is usually put as reduction (or prevention) of poverty, decreasing income inequality, improvement of living conditions of low-paid workers and making "work pay". Indeed, certain positive employment consequences of minimum wage were reported for instance by Dickens et al. (1999), Card and Krueger (1995) or Dolado et al. (1999). Also, Lee (1999) showed a positive effect of minimum wage on decreasing income differentiation; Card (1992) and Bazen and Martin (1991) indicated a positive effect on increasing wages of young workers.

However, the potential of the minimum wage in a fight against general poverty is rather limited. Burkhauser et al. (1996) state that mainly higher-income households profit from the minimum wage. Borjas (2005) confirms this result and estimates that only 19% of increase in incomes resulting from growing minimum wage between 1989 and 1992 was registered in poor households. As was indicated by OECD (1998) in its study on nine developed countries in 1993, the major part (60-90%) of low-paid workers paid below two thirds of wage median

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<sup>1</sup> Czech Republic ratified two out of three conventions recommending the introduction of minimum wage.

<sup>2</sup> Minimum wage might be either statutory, established by the government, or set as an extension of collective bargaining agreements. Many „old“ European countries don't have legally binding minimum wage, but usually there exist an effective minimum wage determined by collective bargaining (Austria, Italy, Germany, Denmark, Sweden).

lived in medium- or high-income households. On the other hand, the proportion of low-paid workers living in the poorest households was around 10% only. Thus, minimum wage doesn't seem to be an efficient instrument in preventing general poverty.

On the other hand, there are significant critics of minimum wage, who stress the potential adverse impacts on raising labour costs of firms and increasing unemployment among the least productive workers (Deere et al., 1995; Neumark and Wascher, 2003; Abowd et al., 1999; Bazen and Martin, 1991). From the similar perspective, OECD in its Jobs Strategy (1994) emphasises the allocation function of wages in providing essential information regarding the employment opportunities. In this sense, wage flexibility is of particular importance. However, flexibility might be reduced if the minimum wage level is set too high, resulting in negative effects on employment.

Economic theorists have not reached a broad consensus regarding the consequences of minimum wage so far. Nevertheless, it is usually generally accepted that although it might have certain positive impact on motivation to productivity increase among low-paid workers (Stigler, 1946, Acemoglu a Pischke, 1998, Cahuc a Michell, 1996), as a motivation device in efficient wages framework (see Rebitzer and Taylor, 1995, or Manning, 1995), or in case of a monopsony (Card and Krueger, 1995), there exists a threshold, over which the negative effects of minimum wage tend to prevail. Minimum wage then increases the unemployment and causes economic losses in terms of economic efficiency. The effect is stronger for particular groups of workers with the lowest productivity, especially the youngest and the least experienced. This situation is to certain extent confirmed by existing empirical research. For a summary of empirical research results on this issue see e.g. Brown, Gilroy and Kohen (1982) or OECD (1998).

Czech Republic has introduced the minimum wage in 1991 as a part of its sweeping labour market reforms. Minimum wage in the Czech Republic exhibited a dynamic growth since late 1990s with a certain slackening after 2003. Yet, empirical evidence on economic consequences of the minimum wage in the Czech Republic is rather limited. The first analysis was conducted by Buchtíková (1995) on the early 1990s data. The author constructed an econometric simulation to manifest effects of a wage growth driven by the minimum wage hikes on employment in firms. The results indicate that increasing minimum wage doesn't necessarily have to result in a higher unemployment. The negative effect would be more apparent in particular industries (textile, machinery, wood-processing, foods) and groups of

workers (young, women and part-time workers). However, the data covered state-owned enterprises only and, hence, the interpretation power of the results is rather limited.

Gottvald et al. (2002) examined the effects of minimum wage on employment and wage distribution in the Czech Republic in period 1998-2002. The authors prove a significant positive effect of minimum wage on wages in given period, whereas the magnitude of the effect diminishes as one moves up on the wage scale. The effect on unemployment proved to be rather low and was not statistically significant, as in the previous study. Similar results were reported by Ericsson and Pytlikova (2004) in their study on data for the same period. They evaluate the effect of minimum wage on wages as positive in general, while the impact on employment as ambiguous. The employment effect was even positive in case of large companies employing a large share of low-paid workers (the authors attribute this result to increased motivation stemming from growing minimum wage and its distance from the subsistence minimum); on the other hand, minimum wage hikes had negative consequences in small businesses.

Therefore, based on the results of previous economic research in the Czech environment, we can expect some positive effects of minimum wage on increasing wage level of workers (i.e. those, who sustain their job even after a minimum wage hike) and, consequently, perhaps also on increasing the motivation of unemployed or inactive people to find a job. However, their chance to be hired might be reduced as a result of increased costs of firms in employing low-productive workers. In existing research, there is no clear consensus regarding what the effects of minimum wage on employment and unemployment in the Czech environment would be. In this context, this paper is concerned with the impact of minimum wage on employment and unemployment in the Czech Republic.

Using regional data for 1995-2004 and 2004/2005 individual data from the Statistics on Income and Living Conditions database we aim to find out whether the minimum wage did indeed influence the labour market performance. More precisely, on the regional level, we estimate the effect of the minimum wage adjusted for regional wage differential on the regional unemployment. Consequently, using detail individual data we analyze the annual hikes in the minimum wage and categorize workers into several groups based on their wage level relative to the minimum wage. We focus on the workers, whose wage in period  $t$  was lower or marginally higher than the new minimum wage in period  $t+1$ , and estimate the subsequent employment probabilities in period  $t+1$ . We aim to reveal whether the most endangered groups of workers exhibited significantly different employment probabilities.

Based on our results we aim to reveal whether the minimum wage has had any adverse effect on the Czech labour market performance.

The paper is organized as follows: The next section provides an overview of the development of minimum wage in the Czech Republic and puts it into a broader economic and social context. Section 3 is devoted to the macro analysis of minimum wage effects on unemployment on regional level. Section 4 presents the analysis of minimum wage consequences on individual level, depicts the methodology for the employment equation estimations and the model. The main results and discussion are summarized in Section 5.

## 2 Minimum wage development and its socioeconomic consequences in the Czech Republic

Minimum wage in the Czech Republic was introduced in 1991 together with a system of minimum wage tariffs, fixing the minimum wage rates for particular occupations.<sup>3</sup> Sub-minimum wage tariffs for young and disabled supplemented the system to eliminate potential negative employment effects. Basic minimum wage rate was firstly set relatively high, at CZK 2,000.<sup>4</sup> However, its nominal level was not considerably adjusted until late 1990s. Consequently, real value of the minimum wage was continually falling to its historical minimum in 1998, when it reached 63% of the real 1991-value. The development, together with a comparison with the average wage level and other economic variables, is summarized in Table 1 and Figure 1.

**Table 1. Minimum wage (MW) and average wage (AW) in the CR, 1991-2007, CZK**

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>MW</b>	2000	2200	2200	2200	2200	2500	2500	2650	3425*	4250*	5000	5700	6200	6700	7185	7763*	8000	8000
<b>AW</b>	3792	4644	6095	7226	8572	10141	11132	12163	13181	14029	15248	16363	17443	18589	19591	20855	22384	23659**
<b>MW/AW (%)</b>	52.7	47.4	36.1	30.4	25.7	24.7	22.5	21.8	26.0	30.3	32.8	34.8	35.5	36.0	36.7	37.2	35.7	33.8**

Note: \*figure refers to annual average (minimum wage was increased in January and July); \*\* data on average wage in Q1-Q3 2008.

Source: Ministry of Labour and Social Affairs of the CR, Czech Statistical Office

<sup>3</sup> After the collapse of central administration of wages at the beginning of 1990s, the system of minimum wage tariffs was firstly intended as temporary and was designed to protect workers, until the system of collective bargaining over wages would develop to take over this function. The tariffs are binding for firms without a collective agreement. The number of tariff classes was diminished in 1996, fully re-introduced in 2000 and reduced to eight in 2006 again (renamed to “guaranteed wage” by the new Labour Code). However, even the highest, eighth tariff amounted to less than 80% of average wage only, which makes these tariffs a completely ineffective limitation for more human capital intensive occupations.

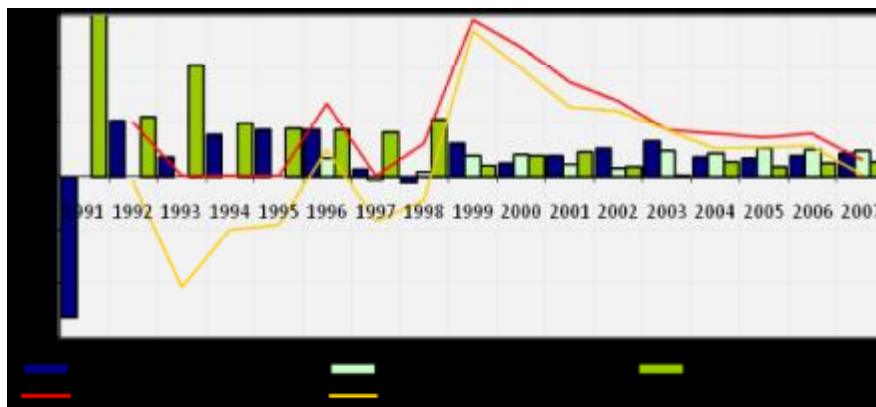
<sup>4</sup> This represented more than 50% of average wage in the economy as such a threshold was considered a common level in the western European countries.



There were several reasons for such stagnation: weak position of trade unions in early 1990s; restrictive government's income policy introduced in 1991 by a system of wage regulation; and last but not least, legal interconnection between the minimum wage and social system. Many social benefits were explicitly linked to the minimum wage. In this interrelated political framework, increasing minimum wage pushed up the state's social expenditure and caused budgetary pressures, which made the hikes in minimum wage politically unacceptable.

The real slump in the minimum wage value during 1990s was subject to critiques of many international organizations. The former connection to social system was thus released in 1998 and a way towards the minimum wage growth was opened. Minimum wage started to grow substantially and was increased by 29% in 1999 and by 24% in 2000. Consequently, it reached its real 1991-value in 2001. However, the pace of nominal growth gradually decelerated (hovered around 8% in 2003-2006 period) and finally stopped in 2008 and 2009, when minimum wage was not increased at all.

**Figure 1. Minimum wage (MW) and average wage (AW), CPI and labour productivity growth in the CR, 1991-2007, y/y %**



*Source: Ministry of Labour and Social Affairs of the CR, Czech Statistical Office, own calculations*

According to the wage law, minimum wage development should reflect the movements in prices and wages to sustain its purchasing power. The real growth of minimum wage was negative until 1998 (with an exception of 1996), as its increments did not exceed the high annual inflation (see Figure 1). Situation changed in 1999 when nominal gains in minimum wage values markedly overstepped inflation, which tempered (these two figures roughly equalised in 2007). It is clear that minimum wage has not followed the development of consumer prices and wages in the CR, despite its intended interconnection stated by the law.

Data also do not reflect any relation to developments in average wage or productivity of labour, as minimum wage rose relatively faster in periods with lower productivity gains. Thus, it seems that in the examined period, minimum wage development pursued rather political goals in social area, not reflecting the developments in real economy.

However, the absolute level of the minimum wage doesn't reflect its real importance and economic consequences. As for the economic impact, its position in overall wage distribution is of a key importance. This relationship is indicated by the Kaitz index, stating the share of the statutory minimum wage on the average gross wage in the economy (see Figure 2).<sup>5</sup> This ratio was rather high when the minimum wage was firstly introduced: it reached 53% of the economy-wide average in 1991. However, during the 1990s it drastically dropped to its minimum in 1998, amounting to 22% only. The development since 1999 meant a recurrent growth in this proportion that roughly stabilised around 36-37% since 2003. Moreover, according to the Czech Statistical Office (2008), minimum wage reached more than two thirds of the first wage decile value in 2007. This might represent a considerable burden for employment of the least-productive and least-paid workers.

On the other hand, effects on motivation of low-paid workers or not working persons to accept a paid job is indicated by the relation between the net minimum wage and subsistence minimum level, as depicted in Figure 2. Net minimum wage didn't exceed the subsistence level of a one-member household during the whole 1990s.<sup>6</sup> We can hardly expect that minimum wage would meet its goals in motivation of low-paid worker groups in the environment where social income in non-activity exceeds the potential minimum labour income. Minimum wage overgrew the subsistence minimum of a one-member household only in 2000 and kept increasing moderately since then. There was a large upward jump of the ratio of minimum wage to subsistence minimum in 2007 related to the social reform measures and cuts in social expenditure. Thus, the motivation role of the minimum wage might have been increased by reforms in 2007. However, its real potential to meet its goals might be limited due to the adverse effects on motivation of employers to hire the low-productive workers for a pay over their productivity.

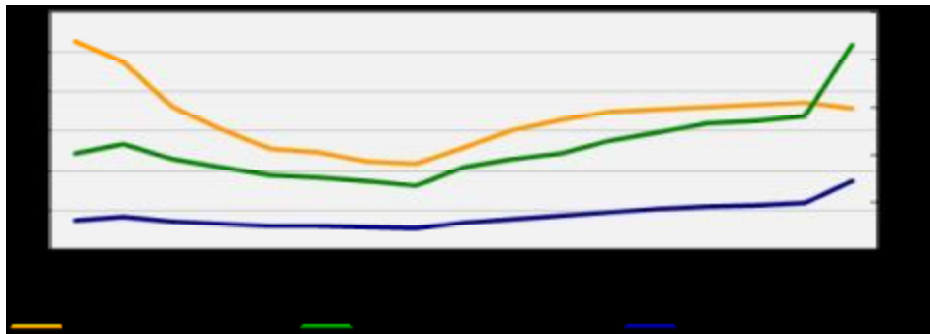
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<sup>5</sup> This index might understate the overall impact of minimum wages due to progressivity of tax systems. Also, average wage might be highly distorted by the shifts in the highest level of wage distribution, without any change in the lowest deciles mostly influenced by the minimum wage. Thus, median and net wage might be a better choice for evaluating the development of economic impact of the minimum wage in time or comparison across countries (OECD, 1998). However, comparable data sources are limited.

<sup>6</sup> The institution of subsistence minimum was introduced later than the minimum wage, as late as by the end of 1991. Developments of these two policy instruments were completely independent until late 1990s.

Sometimes, minimum wage function is perceived not on an individual level only, but takes into account welfare of whole families. In concepts of the ILO<sup>7</sup> or the European Social Charter of the Council of Europe, minimum wage should represent a level of remuneration that will provide workers and their families with a decent standard of living.<sup>8</sup> Such an approach, however, is not applied in the Czech Republic. Minimum wage amounted to roughly 20-30% of subsistence level of a four-member household between 1991 and 2000 and slightly increased to 50% in 2004-2006—see Figure 2. The surge towards 70% in 2007 is again attributable to already mentioned social reform measures. Thus, minimum wage is rather based on an individual approach in the Czech Republic, not reflecting the family concept.

**Figure 2. Minimum wage (MW) as a share of average wage (AW) and subsistence minimum (SM) of one- and four-member household in the CR, 1991-2007, %**



Source: Ministry of Labour and Social Affairs of the CR, Czech Statistical Office, own calculations

Note: SM1 – subsistence minimum for an individual household; SM4 – subsistence minimum of a four-member household, two adults, two kids.

Despite the substantial increases of minimum wage since 1999, its level in the Czech Republic still remains rather low in an international comparison. Statutory national minimum wage has been introduced in twenty European Union member states and ranged from EUR 92 (Bulgaria) to EUR 1570 (Luxembourg) in 2007. Czech Republic with EUR 288 founds itself in the low part of the spectrum, together with most of the other new member countries.<sup>9</sup> The rating doesn't change much after adjusting for the differences in price levels when the

<sup>7</sup> Convention No. 131: Minimum Wage Fixing Convention.

<sup>8</sup> Such concept was already introduced into practice for instance by the city of Baltimore, US in 1994. The “living wage” ordinance was approved that required businesses with city contracts to pay their workers wage exceeding the national poverty level for a family of 4, which lies significantly above the federal minimum wage. In many European countries, minimum wage is roughly equal to the subsistence minimum of a four-member household (for instance France: 100%, Portugal and Ireland: more than 80% - source: Eurostat and European Commission).

<sup>9</sup> All three remaining Visegrad countries were below the Czech level with even lower minimum wages (for details see Fialová and Schneider, 2009).

differentiation of countries narrows. Minimum wage expressed in PPS in the EU varied from 204 (Bulgaria) to 1503 (Luxembourg) in 2006, Czech minimum wage went relatively up to 465, but kept the same relative position among the countries as when expressed in EUR.<sup>10</sup>

If we compare the real economic burden represented by the minimum wage when reflecting the different labour productivity and average wage level in the countries, minimum wage reached about 40% of average wage in industry and services in 2006 in the Czech Republic (Eurostat, 2007). Most of the new member states attained lower shares (the lowest, slightly over 30%, were recorded in the Baltic States), while most of the former members reached higher values (the highest, Ireland and Luxembourg, hovered around 50%). Consequently, proportion of full-time workers with earnings on the minimum wage was rather low in the Czech Republic: 2.3% in 2006, while in many countries the proportion exceeded 8% (e.g. France, Luxembourg, Latvia, and Bulgaria). However, proportion of women paid on minimum wage in the Czech Republic was more than double compared to the men's share (3.5% and 1.4% respectively).<sup>11</sup> Therefore, women are endangered by hikes in the minimum wage relatively more than men.

### **3 The impact of minimum wage on regional level**

In this paper, we focus on potential adverse consequences of minimum wage on labour market performance. In this section, we estimate the potential negative impact of minimum wage on unemployment on the regional level. We utilize the differences in average wage levels among the seventy seven Czech districts.<sup>12</sup> We might expect that the districts with relatively lower average wages would suffer from the nation-wide setting of minimum wage relatively more, as it would represent a larger economic burden for firms and regional economies. Thus, our assumption is that, as a result of minimum wage affecting the regional labour markets, low-wage districts will *ceteris paribus* exhibit higher rate of unemployment than the high-wage

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<sup>10</sup> However, as mention e.g. Dolado et al. (1996), a relatively higher minimum wage level does not necessarily have to represent larger economic burden. The existence of special sub-minimum wage tariffs for more threatened groups can mitigate the adverse effects of higher minimum wage.

<sup>11</sup> Larger share of women working for the minimum wage than respective share of men was common in almost all the European countries with the exception of Malta and Hungary. Comparably large differences in these two figures were recorded for instance in Luxembourg, Portugal or the Netherlands.

<sup>12</sup> The coefficient of variation of average wages among the 77 Czech districts (NUTS-4 level) grew substantially during 1990s and has stabilised since 1998 around 10% (with certain volatility). However, the wage disparities among regions are much lower than the differences in unemployment: coefficient of variation of regional unemployment rates has been fluctuating between 40% and 50% since 2000 (source: Czech Statistical Office and Ministry of Labour and Social Affairs of the Czech Republic, own calculations).

districts.<sup>13</sup> To estimate the burden of minimum wage we use the ratio of minimum wage to the gross average wage in the district in particular year.

The first brief analysis of the regional-level data, indeed, reveals a positive relationship between the ratio of minimum wage to the average regional wage and regional unemployment rate. The districts with prevailing low wage level registered relatively higher rates of unemployment in 2004-2005:<sup>14</sup> the unemployment rate in ten lowest-wage districts (high share of minimum/average wage) reached 11.1%, while it amounted to 7.9% in ten highest-wage districts. Correlation coefficient between unemployment and minimum wage as a proportion of average wage in the districts was positive and reached 0.3 in 2004-2005. However, to analyze causal relationship between the minimum wage and unemployment, we have to use more sophisticated models, as follows in the next section.

### **3.1 Methodology, data and variables description**

To estimate effect of minimum wage on regional unemployment more consistently, we used the generalised least squares regression analysis on panel data. We employ the data from 77 districts of the Czech Republic (NUTS-4 level) in years 1995-2004.<sup>15</sup> The source of data is the Czech Statistical Office<sup>16</sup> and unemployment statistics of the Ministry of Labour and Social Affairs.

To reveal the effect of minimum wage on unemployment and to simultaneously control for other factors of influence, we use the following characteristics of the districts. The average yearly unemployment rate ( $U$ ) represents the endogenous variable. Among the explanatory variables, the ratio of nation-wide minimum wage to the average regional wage ( $MWAW$ ) comes on the first place. According to our assumption stated above, we expect a positive effect of this variable on the explanatory variable.

In our analysis we are limited by low availability of relevant data on other control variables that might also affect the overall unemployment level in the region. Some of the data was

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<sup>13</sup> Similar relationship was already indicated by DiNardo et al. (1996), who describe more pronounced effects of the minimum wage in the states experiencing lower average wages.

<sup>14</sup> We chose the period 2004-2005 due to limitation of data: data series on wages in the districts (NUTS4) end in 2005 and, moreover, there was a break in the methodology of reporting the unemployment by Ministry of Labour and Social Affairs from 2004 on.

<sup>15</sup> Our dataset is limited by year 2004 as this is the last year when detailed regional statistics on the NUTS-4 level were reported by the Czech Statistical Office. Later on, more detailed statistics switched to more aggregated NUTS-3 level corresponding to the standard general European approach.

<sup>16</sup> Publication “Districts of the Czech Republic in Year...”

available for period 1995-2001 only. Thus, in the initial basic analysis we only cover five independent control variables in period 1995-2004 (model (1)).

In the basic dataset of model (1) we control for the overall situation and tightness of the regional labour market by including the vacancy rate in the region (*VACR*). The share of self-employed entrepreneurs on 1,000 inhabitants of the region (*ENT*) reflects the activity of regional population; higher level of self-employment might push the regional unemployment down. We also control for the educational level of population in the districts by adding the variable stating the share of population older than 15 years that attained tertiary educational degree (*TERTIARY*). Regional unemployment also differs according to the urbanization of regions as rural regions typically exhibit lesser employment opportunities than urban districts. Thus, we also account for the urbanization of the region as a share of inhabitants living in the cities (*URB*). As there exist significant regional disparities in the Czech Republic and the capital Prague represents the economic centre of the country and source of economic growth, we also add the variable stating the distance of the regional capital from the country capital, Prague (*DIST*).

In further analysis (model (2)), we narrow the time period to 1995-2001 and add two more explanatory variables to check the robustness of the previous results. This adjusted dataset also reflects the sector structure of employment by covering the share of working labour force employed in the primary sector (*EMPA*) and the development of capital construction expenditure in the region (*CAPCON*), reflecting the trends in economic development of the region itself.<sup>17</sup>

The regression equation then takes the following form:

$$\ln U_{it} = \alpha + \beta_1 \ln MWA_{it} + \beta_2 \ln VACR_{it} + \beta_3 ENT_{it} + \beta_4 TERTIARY_{it} + \beta_5 URB_{it} + \beta_6 DIST_{it} + (\beta_7 EMPA_{it} + \beta_8 \ln CAPCON_{it}) + \varepsilon_{it}, \quad (1)$$

where  $\varepsilon$  represents normally distributed residuals with zero mean and constant variance. In line with the common practice in this type of research, the dependent variable, the ratio of minimum wage to the average regional wage and vacancy rate are represented in logs.<sup>18</sup> We use the random effects regression model employing the generalised least squares procedure, because time variability of variables *DIST* and *TERTIARY* is zero and in such a case, fixed effects model is not applicable. As the data reflect the information regarding units of different

<sup>17</sup> The descriptive statistics of the variables are available from the authors upon request.

<sup>18</sup> Capital construction expenditure is represented in log, as well, to eliminate the potential source of heteroskedasticity (as the data covers units of different size). The expression of variables as logs allows us to interpret the regression coefficients as elasticities.

size, presence of heteroskedasticity is highly probable. Therefore, we use the robust estimates of variance of the regression coefficients. Moreover, the residual analyses indicate the autocorrelation (AR1), therefore we utilise econometric procedures eliminating this effect. Consequently, our analysis will offer consistent and efficient estimates.<sup>19</sup>

### 3.2 Results

The results of our regression models are stated in Table 2. In the basic model covering longer time period (model (1.a)), all the six explanatory variables proved to be significant. The expected effect of the variables was confirmed with the exception of variables *URB* and *ENT* that indicated a low positive effect on unemployment. Our results suggest that the impact of self-employment might be unambiguous within the transitional processes that took place in given period. The effect of urbanisation might be also more complex: high urbanisation has been connected with both higher share of expanding tertiary sector in some districts but also with contracting secondary sector in other districts. Thus, besides the low-unemployment districts (Prague, Brno, Plzeň etc.), there were also highly urbanised industrial districts of northern Bohemia and northern Moravia, suffering from the restructuring processes and high levels of unemployment.

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<sup>19</sup> The conducted Chow tests rejected the hypotheses of stability of regression coefficients among the districts, which puts some doubts on our approach to analysis of the data as a panel. However, applying a Chow test puts rather restrictive assumptions on the character of input data and residuals (e.g. homoskedasticity of residuals; for more details see Greene, 2003), which were not fulfilled by the data used. Therefore, we accept the assumption of general homogeneity of the Czech Republic as regards the reactions of unemployment to the development of various factors of influence due to similar institutional and socio-cultural background. Consequently, we proceed to analysis of the data as a panel.

**Table 2. Regression estimation results – regional data analysis**

	Model (1.a)	Model (1.b)	Model (2.a)	Model (2.b)	Model (2.c)
<b>Constant</b>	-1.022 *** (0.315)	-0.510 (0.334)	-1.031 * (0.511)	-0.328 (0.544)	-0.176 (0.404)
<b>lnMVAW</b>	0.314 *** (0.072)	0.724 *** (0.082)	0.391 *** (0.093)	0.652 *** (0.107)	0.639 *** (0.105)
<b>lnVACR</b>	-0.113 *** (0.016)	-0.209 *** (0.018)	-0.158 *** (0.022)	-0.256 *** (0.025)	-0.256 *** (0.025)
<b>ENT</b>	0.011 *** (0.001)		0.012 *** (0.001)		
<b>TERTIARY</b>	-0.164 *** (0.019)	-0.074 *** (0.016)	-0.159 *** (0.021)	-0.084 *** (0.019)	-0.087 *** (0.018)
<b>URB</b>	0.015 *** (0.003)		0.019 *** (0.004)		
<b>DIST</b>	0.003 *** (0.000)	0.002 *** (0.000)	0.003 *** (0.001)	0.002 *** (0.000)	0.002 *** (0.000)
<b>EMPA</b>			0.014 * (0.008)	0.005 (0.008)	
<b>lnCAPCON</b>			-0.088 ** (0.037)	0.006 (0.041)	
<b>N (districts, time):</b>	770 (77, 10)	770 (77, 10)	539 (77, 7)	539 (77, 7)	539 (77, 7)
<b>R<sup>2</sup> overall:</b>	0.475	0.451	0.430	0.389	0.402
<b>R<sup>2</sup> within:</b>	0.758	0.525	0.764	0.445	0.441
<b>R<sup>2</sup> between:</b>	0.274	0.427	0.248	0.406	0.429

Note: \*\*\* significant 1%, \*\* significant 5%, \* significant 10%

Random effects generalized least squares estimation method, robust standard errors in parentheses.

Source: Ministry of Labour and Social Affairs of the CR, Czech Statistical Office, own calculations

Therefore, we exclude the variables *ENT* and *URB* due to an unambiguous relationship with the regional unemployment. This step also significantly improves the explanatory power of the model in case of between-groups variation and decreases the overall explanatory power only negligibly. The reduced form of the basic model (1.b) includes four exogenous variables only: *MVAW*, *VACR*, *TERTIARY* and *DIST*. All these variables proved to be significant. The model explains almost 50% of the variation of unemployment in the districts in time.

Our results for model (1) indicate that the share of minimum wage on the average wage in the region has a significant positive effect on regional unemployment. However, the results are sensitive to inclusion of the variable *ENT*. The elasticity of unemployment with respect to *MVAW* amounts to 0.3-0.7 (depending of inclusion of variables *ENT* and *URB*); i.e. is positive and lower than one. Furthermore, higher education level of districts' population and higher supply of vacancies decrease the unemployment in regions. On the other hand, larger distance from Prague brings along higher rates of regional unemployment.

If we add two more variables and narrow the time period (model (2.a)) we get similar results. Again, the results are sensitive to including variable *ENT*, which influences the explanatory power of the model and regression coefficients and their significance. After excluding variable *ENT* and *URB* (model (2.b)), variables *EMPA* (that was in the original model only



significant at 10% level) and *CAPCON* become insignificant and consequently were excluded, too.

The final, reduced model (2.c) leaves us with four explanatory variables, again as in model (1.b), that are significant and show similar effect on the endogenous variable as in the basic model. The model explains 40% of the variation of unemployment in the districts in time. The variable *MWAW* shows a significant positive effect in all the models (2.a-c), but its magnitude slightly alters according to the control variables covered. The elasticity of regional unemployment with respect to the share of minimum wage on the average wage in the region reaches 0.4-0.6.

Overall, our results indicate that since 1995, increasing minimum wage expressed as a share on the average regional wage did have a significant effect on increasing the unemployment rate in regions. The estimates of the elasticity are, however, not robust, are sensitive to inclusion of particular variables and amount to 0.3-0.7. That means that increasing the share of minimum wage on the average wage in the region by 1% leads to a rise in unemployment by 0.3-0.7%.

An increase in the ratio *MWAW* occurs if the minimum wage grows relatively faster than the average wage. In 2001, for instance, minimum wage rate went up by 18%. Therefore, if the average wage growth in a region did not exceed this level, we can expect that minimum wage increase led to higher unemployment in the respective regions. Looking at the data from 2001, we find that the average wage growth was indeed below the minimum wage growth: wages grew by more than 10% in five districts only (Ostrava, Kutná Hora, Kladno, Jihlava, and Beroun) and by more than the 18% threshold in a single district only (Kutná Hora). Thus, in all the regions but one, we may expect a negative effect on unemployment. We can also expect the districts where the ratio *MWAW* increased most rapidly between 1995 and 2004 to be negatively affected the most. Indeed, eight out of ten districts, which exhibited more than 55% growth in *MWAW* in given period, recorded considerably over-average levels of unemployment in 2004.<sup>20</sup>

Our results indicate significant adverse effect of minimum wage on the regional unemployment. However, macroeconomic district-level data reflects a large spectrum of factors and we cannot attribute a substantial part of the differences in unemployment to the

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<sup>20</sup> High unemployment levels were registered in Karviná (21.1%), Frýdek-Místek (15.2%), Sokolov (13.5%), Hodonín (15.2%), Třebíč (13.6%), Louny (16.1%), Chomutov (18.1%), Karlovy Vary (11%). On the other hand, low, below-average unemployment was sustained in Písek (8.2%) and Tábor (6.5%). The country average reached 10.2% in 2004.

effect of minimum wage only. To estimate the labour market impact of minimum wage more precisely, we supplement our approach by the analysis of individual level data.

## **4 The impact of minimum wage on individual level**

In this section, we estimate the potential negative impact of minimum wage on employment on the individual level. Our analysis comes out from an assumption based on the theory of competitive markets: in case that productivity of workers remains the same, hikes in the nominal wage render the workers originally paid between the old and new minima currently unemployable.

We use the hike in the minimum wage value from 2004 ( $t$ ) to 2005 ( $t+1$ ) to identify the groups of individuals mostly endangered by this provision: at the first place, these are the workers paid at a level right between the old and new statutory minimum. Secondly, due to significant spill-over effects (OECD 1998), workers originally paid marginally over the new minimum might also be hit. We suppose that these two groups of individuals have significantly lower probabilities of staying employed after the hike in minimum wage takes place. Therefore, we compare conditional probabilities of being full-time employed in period  $t+1$  given a full-time employment status in period  $t$ ,  $p(e_{t+1}=1|e_t=1)$ , for these groups of individuals with individuals who were paid considerable over the new statutory minimum in reference period  $t$ . In our approach we use logistic regression to estimate conditional probabilities. In our analysis we employ a similar approach to that of Abowd et al. (1997).

### **4.1 Methodology, data and variables**

The household survey European Union—Statistics on Income and Living Conditions (EU-SILC) data was employed.<sup>21</sup> Reference period for income variables,  $t$ , is the year 2004; the majority of other variables is related to the current situation at the time of the survey,  $t+1$ , which means Q2 2005. The data provides us with yearly net wages; therefore, the net monthly earned income was constructed according to the number of worked months.

The original data set includes 10,333 individuals (8,628 aged 16 and over) in 4,351 households. In our study, only individuals 16 to 64 years old are considered. We cover only those individuals, who reported full-time employment in last four months of reference period  $t$

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<sup>21</sup> EU-SILC is a new panel survey which replaced the ECHP survey in 2004. It is a harmonized survey compulsory for all EU member states. The information is collected on both household level (mainly information on living conditions) and individual level (e.g. individual and job characteristics, wages, income, social allowances).

and part-time employment, full-time employment, unemployment, retirement, or out of labour force status in period  $t+1$ .<sup>22</sup> Further, self-employed are eliminated since their income contains irregularities which would make the analysis biased. We also exclude individuals reporting their wage below the minimum wage. Further, we eliminate individuals, who received any sickness benefits in 2004 as this biases their wage considerably.

In other words, only individuals who moved between full-time employment in  $t$  and full-time employment, part-time employment, unemployment, retirement and inactivity during period  $t+1$  are included. This leaves us with 3,070 individuals. Individual weights were included, which reflect the number of people in the whole population who are represented by the particular individual.

The logistic regression is used for computations since the endogenous variable in the applied model is dichotomous. This variable is being employed full-time in the current reference period  $t+1$  (Q2 2005, i.e. 4 to 6 months lagged to the income reference period  $t$ ) and takes the value of 1 if the individual was full-time employed and 0 if she/he is part-time employee, unemployed, retired, or out of labour force. The logistic model takes the following form:

$$\ln [p/(1-p)] = \beta_0 + \beta_i X_i, \quad (2)$$

where  $p$  is the probability of staying employed in  $t+1$  conditional on employment in  $t$  ( $p(e_{t+1}=1|e_t=1)$ ), vector  $X_i$  includes all explanatory variables. The explanatory variables included in equation (2) were individuals' minimum wage status, age, education, sex, occupational category, and region as a proxy for general trends in the unemployment rate.<sup>23</sup>

The minimum wage status ( $MWST_j$ ) is the individual's position in the wage distribution given the relation to the net minimum wage in  $t$  and  $t+1$ .  $MWST_1$  represents those employees receiving a wage higher than minimum wage in  $t$ , but at the same time not exceeding the minimum wage in  $t+1$  ("between" employees).  $MWST_2$  represents those employees who were paid marginally over the minimum wage in  $t+1$  ("marginally over" employees). Therefore, thresholds are represented by the net minimum wage in 2004 (CZK 5,459), 2005 (CZK 5,819) and 1.5 multiple of 2005's level for the interval "marginally

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<sup>22</sup> We limit our reference period to four months only because covering the whole year 2004 would be too restrictive. Four-month period also exclude those people employed in probation period only (generally lasts three months in the Czech Republic). Part-time employees in the income reference period are excluded since their monthly income is incomparable with full-time workers' wage.

<sup>23</sup> Descriptive statistics of the variables are available from the authors upon request.

over”.<sup>24</sup> We adjust the intervals for errors in measurement ( $\pm 10\%$ ). The intervals are defined as follows:

- *MWST\_1* — “between”:  
 $CZK\ 4,900\ (MW_t * 0.9) < \text{monthly net wage in } t < CZK\ 6,400\ (MW_{t+1} * 1.1);$
- *MWST\_2* — “marginally over”:  
 $CZK\ 6,400\ (MW_{t+1} * 1.1) \leq \text{monthly net wage in } t < CZK\ 8,700\ (MW_{t+1} * 1.5);$
- *MWST\_3* — “considerably over” (reference variable):  
 $CZK\ 8,700\ (MW_{t+1} * 1.5) \leq \text{monthly net wage in } t.$

*AGE<sub>k</sub>* are the dummies for age reflecting also the work experience. Reference group is age 35-44. The education variable (*TER\_EDUC*) corresponds to tertiary education.<sup>25</sup> *MALE* is a dummy variable which equals 1 when the individual is male. *ISCO<sub>l</sub>* are variables classifying the occupation according to the International Standard Classification of Occupations. Reference group is *ISCO9* (elementary occupations). *REG<sub>m</sub>* are dummies for region as a proxy for unemployment rates. The regions on NUTS-2 level were clustered into four groups given the level of unemployment to reflect the labour market situation in region where individuals live. Reference group is the Prague region.<sup>26</sup>

## 4.2 Results

The results of a maximum likelihood logit estimation procedure are reported in Table 3. The results show that workers, whose 2004’s wage falls between the level of 2004 and 2005 minima or marginally over 2005 minimum, have substantially lower subsequent employment probabilities in 2005 than have the workers, whose wage in 2004 exceeds the new 2005 minimum considerably. The differences proved to be statistically significant. Moreover, the hike in minimum wage hits the “between” workers much harder than hits the workers paid “marginally over”: the coefficient of “between” workers group is much lower than the one of “marginally over” group. Furthermore, age and occupational variables proved to be relevant in explaining conditional employment probabilities: probability of subsequent employment significantly falls in groups aged 55-59 and 60-64 (the effect of retirement) and in ISCO group 0—armed forces (this relates to huge withdrawals from army and police in connection with the lustration law and the new civil service law).

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<sup>24</sup> Thresholds were adjusted for individuals aged 16-21 according to their respective sub-minimum wage tariffs.

<sup>25</sup> Dummy on primary education was excluded due to lack of relevant observations.

<sup>26</sup> REG2 consists of South-West, Central Bohemia and North-East, REG3 consists of South-East and Central Moravia, REG4 consists of North-West and Moravian-Silesian region.

**Table 3. Regression estimation results – individual data analysis**

	Coeff.	S.E.	Odds ratio
MWST_1	-1.8642 ***	(0.3565)	0.1550
MWST_2	-0.7724 **	(0.3090)	0.4619
MALE	0.4318	(0.2801)	1.5400
AGE16_21	-0.3995	(0.6021)	0.6707
AGE22_25	0.2824	(0.5775)	1.3264
AGE26_34	-0.2547	(0.3652)	0.7752
AGE45_54	0.3619	(0.4081)	1.4361
AGE55_59	-1.2781 ***	(0.3896)	0.2786
AGE60_64	-2.1715 ***	(0.5138)	0.1140
TER_EDUC	-0.5694	(0.4587)	0.5658
ISCO0	-2.8734 ***	(0.8819)	0.0565
ISCO1	1.0208	(1.3588)	2.7753
ISCO23	0.4164	(0.5217)	1.5165
ISCO45	-0.1057	(0.4590)	0.8997
ISCO67	-0.1811	(0.4722)	0.8343
ISCO8	-0.6131	(0.4904)	0.5417
REG2	0.1019	(0.4421)	1.1072
REG3	0.3337	(0.4752)	1.3961
REG4	-0.2523	(0.4568)	0.7770
CONSTANT	4.2184	(0.6373)	67.9245

Note: \*\*\* significant at 1% level, \*\* significant at 5% level. Equation estimated by maximum likelihood logit. Standard errors in parentheses. Sample size: 3,070. Correctness of observation classification 97.5%.

Source: EU-SILC data, own calculations

The probabilities of employment resulting from the model have to be considered in relation to the relevant reference variable, which here consists of workers paid considerably more than the new minimum (more than 1.5 multiple of the 2005’s minimum wage net value). The odds ratio of the reference variable equals 1. When an individual exhibits the minimum wage status “between” (*MWST\_1*), his employment probability decreases substantially: the odds ratio amounts to very low 0.16 (see Table 1). Furthermore, for workers with minimum wage status “marginally over” the new minimum wage (*MWST\_2*), the odds ratio increases slightly to 0.46 but still is well below one.

That means that if we compare two otherwise completely similar individuals, the first one who is paid *between* the old and new minima, and the second whose net wage exceeds the new minimum considerably, the first one will be 0.16 times as likely to remain employed after the minimum wage hike compared to the second one. The respective drop in employment probability of a worker paid *marginally over* the new minimum reaches 0.46. The results, therefore, affirm our initial assumption and prove the negative effect of the minimum wage on employment probability of low-paid workers. The strength of this effect diminishes as one moves up the wage distribution.

Despite the substantial negative effect estimated, the first of the at-risk groups is relatively small: workers in “between” group comprise 5.2% of the sample only. On the other hand, workers in group “marginally over” comprise relatively more, 18.5% of the sample, and the adverse effects might have a larger scope. However, as is usually assumed in the empirical literature, the differences in age-averages of the groups are not statistically significant and, therefore, the adverse effects are not limited to young workers only.

## **5 Conclusions**

This paper aimed to quantify the impact of the minimum wage on labour market performance in the Czech Republic. There were substantial hikes in the minimum wage since late 1990s. The development of minimum wage tariffs was, however, not reflecting the trends in real economy and was mainly a result of political measures in social area. Despite the rapid growth, Czech Republic stays among more liberal countries in the EU as regards relative importance of minimum wage in the economic environment.

Our analyses suggest that there really do exist significant adverse consequences of minimum wage on labour market performance. Using regional data for 1995-2004, we estimate the effect of varying economic burden represented by the ratio of the minimum wage to average regional wage on the regional unemployment. Our results indicate that since 1995, increasing minimum wage expressed as a share on the average regional wage had a significant effect on increasing the unemployment rate in regions. The estimates of the elasticity are, however, not robust, sensitive to inclusion of particular variables and amount to 0.3-0.7. That means that increasing the share of minimum wage on the average wage in the region by 1% leads to a rise in unemployment by 0.3-0.7%. However, when interpreting the results, the low robustness of estimates must be taken into account.

Consequently, using detailed individual data for 2004/2005, we exploit the annual hikes in the statutory minimum wage to identify workers, whose wage falls “between” the old and the new minimum wage level and “marginally over” the new minimum wage. We estimate the subsequent employment probabilities of these workers compared to workers, whose wage exceeds the new minimum considerably. Our results show that when a worker exhibits the minimum wage status “between” in 2004, his/her subsequent employment probability in 2005 decreases substantially: he/she is 0.16 times as likely to remain employed after the minimum wage hike compared to a worker paid considerably over the minimum. Furthermore, for workers who are “marginally over” the new minimum wage, the difference in probability

increases slightly to 0.46, but still is well below one. The results, therefore, affirm our initial assumption and prove the negative effect of the minimum wage on employment probability of low-paid workers. The strength of this effect diminishes as one moves up the wage distribution.

The potential of minimum wage in fighting poverty is generally rather limited as shows empirical literature on this topic (for details on the Czech Republic see also Fialová, 2007). Given its proven adverse effects on unemployment in regions and employment probabilities of low-paid workers, it seems valid to claim that minimum wage in the Czech Republic has not been a very purposeful and effective instrument so far. Instead, alternative measures of motivation of low-paid workers (e.g. negative income tax) without adverse effects on employment should be considered together with direct provisions aimed at enhancing the human capital of least productive workers.

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