

THE IMPACT OF THE IRREGULAR MINIMUM WAGE INCREASE ON WAGES, EMPLOYMENT AND AVERAGE HOURS PAID (CASE STUDY FOR SLOVENIA)¹

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Povzetek

Proučevanje učinkov minimalne plače je bilo že od nekdaj zanimiva tema mnogim znanstvenikom. Sprva so bile raziskave usmerjene predvsem v določanje značilnosti trga delavcev z nizkimi plačami; ključno vprašanje je bilo, ali ima le-ta več lastnosti konkurenčnega ali nekonkurenčnega trga dela. Kasneje so raziskovalci proučevali zlasti učinke minimalne plače. Večina študij je sicer zaključila, da ima minimalna plača negativne učinke na zaposlenost, polemika na to temo pa še vedno poteka.

Minimalna plača je bila v Sloveniji uvedena leta 1995, februarja 2010 pa so bile sprejete večje spremembe zakona, ki ureja minimalno plačo. Predvsem se je zvišal znesek minimalne plače, delodajalci pa se lahko nanj prilagodijo postopoma. Pričakovalo se je, da bo imel novi zakon velik vpliv na slovenski trg dela, zaradi pomanjkanja raziskav na slovenskem primeru ter neskladij v ekonomski teoriji pa ni bilo možno podati jasnih posledic zakona.

Za napoved posledic dviga minimalne plače je ta študija vzela v obzir izreden dvig minimalne plače iz marca 2008. Za proučevanje vpliva je bila uporabljena metoda »difference-in-differences«, ki je primerjala vpliv dviga minimalne plače v bolj prizadetih dejavnostih z manj prizadetimi na povprečne plače, zaposlenost ter povprečno število plačanih ur. Opazovalno obdobje je zajemalo čas od junija 1999 do decembra 2009. Rezultati so v povprečju pokazali, da je imel izreden dvig minimalne plače statistično značilen negativen vpliv na zaposlenost ter statistično neznačilen pozitiven vpliv na povprečne plače in povprečno število plačanih ur. Zaradi nedoslednih rezultatov ostaja vpliv izrednega dviga minimalne plače nepojasnen.

Ključne besede: minimalna plača, učinki minimalne plače, izredni dvig minimalne plače, zaposlenost, povprečna plača, povprečno število plačanih ur

Abstract

The Slovenian minimum wage law, passed in 1995, faced its most recent changes in February 2010, especially regarding the level of the minimum wage. In this paper, the irregular minimum wage increase that took place in March 2008 was taken into account to examine how the Slovenian labour market has reacted to it.

On average, the results showed that the extraordinary minimum wage increase had a statistically significant negative effect on employment, and a positive and statistically insignificant effect on the average wages and the average number of hours paid. However, due to the inconsistent results, the effect of the extraordinary minimum wage increase on the Slovenian labour market remains a conundrum.

Key words: minimum wage, minimum wage effects, irregular minimum wage increase, employment, average wage, average number of hours paid

1. Introduction

As early as the end of the 1770s, Adam Smith emphasised the importance of an appropriate wage *that would assure workers a decent living*, 'It is but equity...that they who feed, clothe and lodge the whole body of the people, should have such a share of the produce of their own labour as to be themselves tolerably well fed, clothed and lodged.'

Nowadays, the opinions concerning the minimum wage are split; some economists and politicians are in favour of the law; former U.S. President Bill Clinton, for example, stated 'I've studied the arguments and the evidence for and against a minimum wage increase. I believe that the weight of the evidence is that a modest increase does not cost jobs, and may even lure people into the job market. But the most important thing is, you can't make a living

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on \$4.25 an hour! However, there are also many sceptics; among them some Nobel Prize recipients, Milton Friedman: 'The high rate of unemployment among teenagers, and especially black teenagers, is both a scandal and a serious source of social unrest. Yet it is largely a result of minimum wage laws. We regard the minimum wage law as one of the most, if not the most, anti-black laws on the statute books.' (*Congressional Record*, 2007: 767) and James M. Buchanan: '...no self-respecting economist would claim that increases in the minimum wage increase employment' (*Deaton*, 1997: 13).

The minimum wage has been a subject of interest for policy makers, economists and researchers for decades. In the beginning, the marginalists and institutionalists debated whether the low-wage labour market could be characterised as a competitive or a non-competitive labour market. Later, the focus of discussion moved to distinguishing the effects of the minimum wage increase. The majority of the researchers found that the minimum wage on average has a negative impact on employment, while some researchers concluded that a minimum wage increase has no or even a positive influence on employment. The influence of the minimum wage on the working hours and on wages was, on average, proved to be positive.

The Slovenian minimum wage law, introduced in 1995, was recently modified in February 2010. One of the major changes was the increase in the minimum wage level. Besides the irregular increase of the minimum wage at the beginning of 2010, there was also one in March 2008. In order to receive plausible indications about what kind of effects the new law will have, the irregular minimum wage increase from March 2008 was taken into account. The applied model used the difference-in-differences method and took into consideration the effect of the minimum wage on the average wages, employment and the average hours paid. On average, the results indicated that the irregular minimum wage increase affected employment in a negative way and the average wages and average number of hours paid in a positive way. Nevertheless, as the results were not consistent, the effect of the irregular minimum wage increase on the Slovenian labour market remains a puzzle.

This paper will first present a literature review of research studies that studied minimum wage effects. In Section 3, an overview of Slovenian minimum wage policy, the empirical evidence and comparison with other EU countries is given. The paper will then proceed with an overview of data and methodology. Section 5 will introduce the model, present the research question and the results of the basic regressions and the sensitivity analyse. Section 6 will discuss the results and provide some recommendations, while Section 7 will summarise and conclude. References and an appendix are included in the last two sections.

2. Literature review

Economic theory predicts that employment will decrease due to the minimum wage in competitive markets, while the outcome is less clear-cut when markets have characteristics of a monopsony. Therefore, one could not univocally determine the outcome of the minimum wage increase by using the theoretical predictions (Borjas, 2008: 137–203).

Minimum wage and its effects have been the source of heated discussions for many years. Since researchers started studying effects of the minimum wage increase few decades ago, the results of the first studies differ from the new ones as the research methods have changed significantly. In the new wave of research, economists improved the already existing research studies with more recent data series, included new methods, started to use the variation in the minimum wage levels among the individual states of the U.S.A., and took into account the economic conditions in order to obtain more robust results (Neumark and Wascher, 2007: 2–3). Therefore, the literature review in this study focuses more on the research studies, done after 1990, dividing them in appropriate thematic subheadings.

2.1. Negative minimum wage effects

Neumark and Wascher (2007) made an exhaustive review of the minimum wage studies and found consistent but not always significant disemployment effects of the minimum wage in two thirds of them. The negative employment effect appears to be particularly strong for the least-skilled workers. Furthermore, Neumark and Wascher (2007) agree that the labour market for low-wage workers can be compared to the competitive model. The authors conclude that in order to estimate the effectiveness of the minimum wage policy, one need to take into account not only the employment effect of the policy but also its effects on the distribution of wages, working hours, incomes, human capital accumulation and other possible variables.

There were many studies that observed employment effects of the minimum wage. Abowd et al. (2009) used panel data and a difference-in-differences estimate when examining the employment effects in the United States and France. Researchers found no employment effects in the United States, whereas France was facing a strong and negative employment effects. Concerning research studies made on the basis of the US data, Deere, Murphy and Welch (1995) and Kim and Taylor (1995) concluded that when the costs of low-wage workers increase, the employment of these workers decreases. Singell and Terborg (2007) found negative employment effects for the industries in which the minimum wage is relatively binding, but not for those that have less strict legislation.

David Neumark conducted many research studies concerning the minimum wage. In the one with Schweitzer and Wascher (2004), they concluded that the low-wage workers are more strongly affected by minimum wage increases. Workers whose income lies between the previous and the new minimum wage level face the wage increase, but they are also confronted with diminishing employment and a declining number of working hours. Altogether, the net effects of the minimum wage increase for the low-wage workers are negative. Neumark and Nizalova (2006) took into account the long-term effects of the minimum wage recipients and found that workers in their late twenties earned less the longer they had received the minimum wage when they were younger. When doing research on the minimum wage in Brazil, Neumark, Cunningham and Siga (2006) could not confirm that the minimum wage increased earnings of the low-income families. Conversely, several facts indicated negative consequences of the minimum wage for these households. A similar study was made by Neumark, Schweitzer and Wascher (2005) for the US data, where the results also indicated the negative net effect of the increase in the minimum wage for the low-income families.

2.2. Positive or undetermined minimum wage effects and their critics

Surveys that did not find negative employment effects but more condensed distributions of earnings due to the minimum wage were made by Dickens, Machin and Manning (1999) on British data and Lemos (2007) for Brazil, while the research by Stewart (2004) only confirmed the first part; i.e. no adverse employment effects in the UK case. Metcalf (2004) wrote an overview of the literature for the UK and concluded no adverse effect on employment but increased intensity of training due to the minimum wage.

Levin-Waldman (2000) took the alternative approach and examined the consequences of the minimum wage increase on employers. His study concluded that the minimum wage increase examined did not have harmful impacts on employers. However, the survey showed that there would have been one if the minimum wage increase had been bigger.

Research studies conducted by Card, Katz and Krueger received a great deal of attention and led to an intense debate among researchers concerning the effects of the minimum wage. The research by Katz and Krueger (1992) studied the impact of the minimum wage change on fast-food restaurants in Texas. Their results indicated that employers increased the wages of fast food workers by more than was required by a new law. Moreover, the new law condensed the distribution of the starting wages in the industry. Employment increased in those companies that were supposedly more affected by the

law while the changes in prices were proven not to be the consequence of the law. Katz and Krueger (1992) supplemented their results with the comment that larger increases in the minimum wage might have caused a decrease in employment and an increase in prices.

Card and Krueger (1994) also did research on the fast food industry. When comparing the less affected New Jersey fast food restaurants with more affected ones, or when comparing New Jersey fast food restaurants with Pennsylvania ones, the results indicated that the minimum wage increase had a positive effect on employment. Moreover, Card and Krueger (1994) found that prices of meals in fast food restaurants increased due to the new law, but that the increase was not higher in more affected restaurants.

Similar conclusions to those in the previous two studies were made by Card (1992) in the case of the minimum wage increase in California. The results indicated that the raise of the minimum wage increased the earnings of low-wage workers and did not reduce the employment of teenage workers.

Many researchers attempted to replicate the presented three studies. Neumark (1993), Neumark and Wascher (2000), and Clark, Kaas and Madden (2006) all concluded that there in fact were negative employment effects due to the increased minimum wage in the three presented studies of Card, Katz and Krueger.

A broader review of the studies, written after the 1990 is available upon request.

3. Slovenian labour market and the minimum wage

The following section describes the labour market and the minimum wage in Slovenia in the previous few years and compares it with selected EU countries.

3.1. Distinct facts about Slovenian labour market

Before the current economic crisis, the Slovenian labour market was faced with increasing employment and decreasing unemployment. However, the situation changed after the crisis. Nowadays, there are worries about the low labour force participation rate of the elderly and younger populations, and high hiring and firing costs. The OECD suggested that Slovenia increase its retirement age, restrict early retirement programs and decrease the length of tertiary studies in order to improve the labour market (OECD).

In November 2010, 937,237 persons participated in the labour force (833,406 in paid employment and 103,831

registered as unemployed). Registered unemployment rate in November 2010 was 11.1%, compared to September 2008, when it was 6.3%. The GDP has decreased from €37,135 million in 2008 to €34,894 million in 2009 (SURS). The recovery of the Slovenian economy is on average slower than in other countries of the euro zone. Forecasts show that the recovery of the Slovenian economy will be slow, with the growth estimated at 2.5% in 2011 (UMAR).

3.2. Definition of Slovenian minimum wage

Slovenian law declares the minimum wage as the lowest amount of payment received by full-time employees (Brezigar Masten et al., 2010: 2). The Slovenian minimum wage is adjusted annually by the government, based on the arrangement with social partners; i.e. the 'tripartite agreement'. In addition, the minimum wage affects all employees with no exemptions, and the coverage is approximately 2.7% of all employees (Funk and Lesch, 2005). In the case of non-compliance with the legislation, the highest punishment for a firm that breaks the law is €20,000 (Uradni list RS, 2010). The Slovenian minimum wage was enacted in 1995 and changed a few times since then. The introduction of a new law was accepted in February 2010. The main difference is that the minimum wage will now be adjusted once a year, after consulting social partners and taking into account consumer price indices, wage movement, growth rate and the movement of employment. The new law also significantly enhanced the level of the minimum wage (to €734.15, gross) on the 1st March 2010 (DURS) but allowed employers to adapt to it gradually until January 2012 (Brezigar Masten et al., 2010: 3–5). If the employer is allowed to increase the minimum wage gradually, the current minimum wage value is €654.69, gross (Uradni list RS, 2010).

The levels of monthly minimum wages in the past few years are shown in Table 1.

Table 1: Levels of monthly minimum wages in Slovenia in the period from January 2004 till December 2009

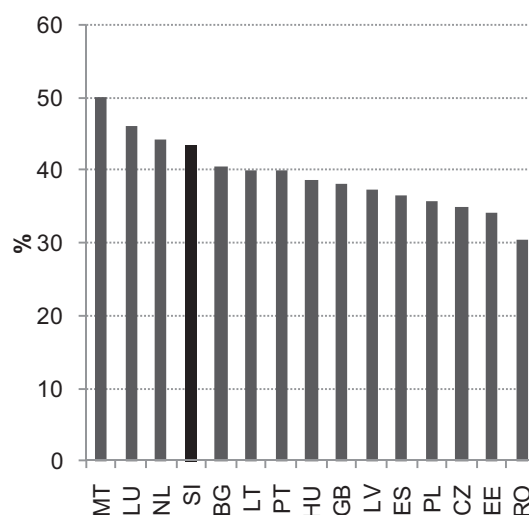
Time period	Minimum wage level (gross value, in €)
From January 2004 until July 2004	465.21
From August 2004 until July 2005	490.32
From August 2005 until July 2006	511.60
From August 2006 until July 2007	521.83
From August 2007 until February 2008	538.53
From March 2008 until July 2008	566.53
From August 2008 until July 2009	589.19
From August 2009 until December 2009	597.43

Source: DURS.

3.3. Comparison with other countries

The majority of EU countries have some form of the statutory minimum wage, varying in types, coverage and the groups of exempted employees. Slovenia has one of the highest levels of minimum wage among the Member States that joined the EU in 2004 and 2007. However, when taking into account all Member States, its minimum wage is somewhat average. The majority of the EU Member States (Slovenia being one of them) reported that the minimum wage had a positive influence on female incomes and the decline in the gender wage gap (Funk and Lesch, 2006).

Figure 1: Minimum wage as a proportion of average monthly earnings across the EU Member States²



Source: EUROSTAT.

When comparing the minimum wages as a proportion of average monthly earnings as reported by EUROSTAT for 2008, the ratio among Member States fluctuated between 50.2% in Malta and 30.5% in Romania. Compared to the other EU countries, Slovenia is in the upper half by this indicator (Figure 1).

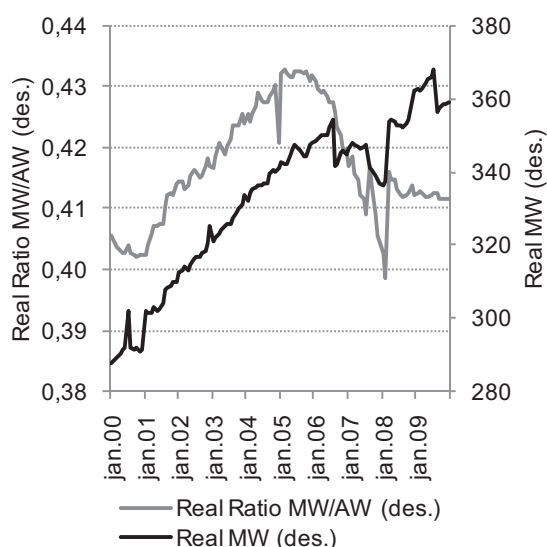
3.4. Empirical evidence

The relation between the minimum wage and the average gross wage in Slovenia fluctuated through the observation period (Figure 2) but (taking into account the original data) it did not deviate on average by more than a magnitude of 0.04 from the initial value in December 1999 (0.42). This indicates that it stayed more or less the same through the observed period. In order to eliminate seasonal effects, caused by the annual bonus (or "13th

² MT=Malta, LU=Luxembourg, NL=Netherlands, SI=Slovenia, BG=Bulgaria, LT=Lithuania, PT=Portugal, HU=Hungary, GB=United Kingdom, LV=Latvia, ES=Spain, PL=Poland, CZ=Czech Republic, EE=Estonia, RO=Romania

pay"), Christmas bonuses and yearly minimum wage increases, Figure 2 includes only seasonally adjusted data. The vertical line in the figure presents the irregular increase of the minimum wage that took place in March 2008.

Figure 2: Movement of the minimum wage in Slovenia



Source: SURS, DURS, own calculations.

Concerning the wage distribution in September 2007 and in September 2008, the highest real average wage

was in Industry D (Electricity, gas and water supply) and the lowest in Industry G (Hotels and restaurants) (SURS). More detailed data on lowest and highest real gross earnings in a particular industry are available upon request.

Table 2 presents people in paid employment by amount of gross wages in September 2007 and September 2008. Since the lowest wage class from 2007 no longer existed after the irregular minimum wage increase in March 2008, one could predict what might happen in 2008 by summing the lowest two wage classes from the September 2007. After summing the percentages in classes up to 550, and from 551 to 615 (columns 1 and 2, while the sum is in column 3), we could expect that, due to the irregular increase in 2008, the number of minimum wage recipients would increase the most in Industries E (Construction), G (Hotels and restaurants) and J (Real estate, renting and business activities). The results in the third column would also be in accordance with the presented literature, since the research studies usually found the condensation of wage distribution around the minimum wage after the increase of the minimum wage. However, when comparing the third column with 2008 (column 6), the percentages of employees that received the actual wages from €551 to €615 did not increase as much as one would expect from the 2007 data. Table 2 indicates that the wage distribution adapted to the irregular wage increase very quickly; possible reasons could be the anticipation effect (which will be examined in Section 5) or that the new minimum wage increase

Table 2: Persons in paid employment by amount of gross wages, by industries, Slovenia, September 2007 and September 2008

Industry ('SKD united')	2007					2008		
	(1) to 550	(2) 551 to 615	(3) to 615	(4) 615 and more	(5) Total	(6) 551 to 615	(7) 615 and more	(8) Total
	%					%		
Total	5.1	5.3	10.4	89.6	100	5.3	94.7	100
A Agriculture, hunting, forestry and fishing	5.1	6.5	11.6	88.4	100	4.6	95.4	100
B Mining and quarrying	0.6	0.7	1.3	98.7	100	0.5	99.5	100
C Manufacturing	6	7	13	87	100	5.7	94.3	100
D Electricity, gas and water supply	0.5	0.8	1.3	98.7	100	0.6	99.4	100
E Construction	13.3	8.1	21.4	78.6	100	15	85	100
F Wholesale, retail, certain repair services	4.6	6.4	11	89	100	4.5	95.5	100
G Hotels and restaurants	8.3	10.4	18.7	81.3	100	10.4	89.6	100
H Transport, storage and communication	3.2	2.8	6	94	100	4.4	95.6	100
I Financial intermediation	2	1	3	97	100	1.4	98.6	100
J Real estate, renting and business activities	9.4	7.3	16.7	83.3	100	10.3	89.7	100
K Public administration and defence; compulsory social security	0.6	1.1	1.7	98.3	100	0.5	99.5	100
L Education	0.9	1.3	2.2	97.8	100	0.6	99.4	100
M Health and social work	3.2	3.9	7.1	92.9	100	1.3	98.7	100
N Other social and personal services	3.7	3.5	7.2	92.8	100	3.6	96.4	100

Source: SURS, own calculations.

Table 3: Number of persons in paid employment with minimum wage by industries, September 2007 and 2008 (MW = minimum wage, WP = working population)

Industry ('SKD united')	September 2007			September 2008		
	With MW	Persons in paid employment Employees and industry*	Share of MW recipients (MW/WP) %	With MW	Persons in paid employment Employees and industry*	Share of MW recipients (MW/WP) %
Total	22,869	771,066	0.027	20,782	795,591	0.023
A Agriculture, hunting, forestry and fishing	158	6,351	0.004	67	6,552	0.002
B Mining and quarrying	8	3,673	0.002	7	3,496	0.002
C Manufacturing	8,286	222,113	0.036	6,655	220,860	0.029
D Electricity, gas and water supply	38	11,363	0.003	42	11,461	0.004
E Construction	3,355	70,562	0.041	3,470	79,512	0.038
F Wholesale, retail; certain repair	2,400	104,188	0.021	2,080	107,740	0.018
G Hotels and restaurants	1,005	28,812	0.031	1,009	29,539	0.03
H Transport, storage and communication	818	50,732	0.015	988	53,404	0.017
I Financial intermediation	160	21,969	0.007	133	22,831	0.006
J Real estate, renting and business activities	5,071	68,871	0.066	5,185	74,449	0.063
K Public administration and defence; compulsory social security	223	50,205	0.004	301	51,021	0.006
L Education	136	58,467	0.002	144	59,625	0.002
M Health and social work	714	49,713	0.014	282	50,612	0.005
N Other social and personal services	497	24,047	0.016	419	24,489	0.013

Source: SURS, own calculations.
Note: Persons in paid employment and self-employed persons.

was not sufficient (this statement, however, would need deeper investigation, beyond the scope of this paper).

The highest relative share of the minimum wage recipients in September 2007 and in September 2008 was in Industry J (Real estate, renting and business activities), whereas the lowest was in Industries B (Mining and quarrying) and L (Education) in September 2007, and A (Agriculture, hunting, forestry and fishing), B (Mining and quarrying) and L (Education) in September 2008 (Table 3).

4. Data and methodology

This section briefly discusses the data and methodology used. The main data used in this study were from the Statistical Office of the Republic of Slovenia (SURs) and from the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES); the variable Harmonised Index of Consumer Prices (HICP) was acquired from the EUROSTAT database. The method used was difference-in-differences.

4.1. Data

The data is of the panel type, controlling for the monthly time variable and cross-sectional type of the industry. The observation period is from June 1999 until December 2009. The descriptive statistics of the main variables are available upon request.

In January 2008, NACE Rev. 2, the new classification of activities of business entities replaced NACE Rev 1.1 in all EU Member States. The national version of the standard classification (SKD 2008) also came into force on the same date in Slovenia. SKD 2008 includes the entire European classification of activities, but also adds some national subclasses. Therefore, it was necessary to combine both classifications in order to have consistent results. The combination of both classifications ('SKD united') was done as a rough comparison, suggested by SURs (SKD). A more accurate arrangement was not possible due to the lack of subcategories among some of the variables. The table for converting into 'SKD united' is included in Appendix 1 (Table A.1).

4.2. Methodology

When an exogenous event, which is usually a consequence of the government's modification of a policy, changes the environment of individuals, families, firms or cities, the ensuing conditions have the characteristics of a so-called natural experiment. Such an experiment has two groups; a control group which is not affected by the policy change and a treatment group that is. The difference-in-differences method compares the difference in results of the affected group with the unaffected one, before and after the interference

(Wooldridge, 2009: 451–454). When the (irregular) increase in minimum wage occurs, the shock offers a natural experiment for observing the consequences of the minimum wage increase (Pereira, 2003: 230). The advantages of the difference-in-differences method are its simplicity (Bertrand, Duflo and Mullainathan, 2002: 2), removing the biases after the intervention, which could be due to the undeviating diversities in the treatment and comparison group, and removing the over-time differences in the treatment group that could be attributable to trends (Wooldridge, 2007: 2-4).

Many researchers have evaluated the impacts of minimum wage increases with the difference-in-differences method, including Card and Krueger (1994), Neumark and Wascher (2000), Pereira (2003), Neumark, Schweitzer and Wascher (2005) and Abowd (2009). The three different models used in this study measured the influence of the irregular minimum wage increase on the average gross wages, the second on employment and the third on the average number of hours paid.

4.2.1. Formulation of control and treatment groups

Economic theory suggests that an industry will be more affected by the minimum wage increase if the rise in the average costs is higher. Therefore, due to the irregular minimum wage increase, the average costs would increase relatively more in those industries that have a higher share of minimum wage recipients. Furthermore, since Haltiwanger and Vodopivec (2003) concluded that firms with less compressed wage-ranges have lower employment instability, one could expect that the more affected industries (due to the irregular minimum wage increase) would also be those that had a more compressed wage-range in the period before the irregular increase. Given that the results on wage distribution are done once a year, the treatment groups were chosen only by the share of the minimum wage recipients. Every model was observed via three different treatment groups. Treatment group 1 included the industries that had more than 3% of the minimum wage recipients in March 2008 (i.e., in the month of the irregular minimum wage increase), Treatment group 2 presented the industries that had more than 3% of the minimum wage recipients in February 2008, and Treatment group 3 presented the industries with more than 6% of the minimum wage recipients in February 2008. The industries in Treatment Group 1 were: C (Manufacturing), E (Construction), G (Hotels and restaurants) and J (Real estate, renting and business activities), Treatment Group 2 consisted of Industries E, G, J, whereas in Treatment Group 3, there was only Industry J. As Industry J has the highest share of minimum wage recipients, one could expect the results to be the most significant for Treatment Group 3. The presumption is that the financial crisis affected the

treatment and comparison group in the same way; the available data did not allow controlling for the financial crisis and there might be deviations between the control and treatment group. However, both groups are counterbalanced in such a way that they both include some industries that were affected by the financial crisis more.

4.2.2. Concerns regarding the difference-in-differences method

The drawbacks of the difference-in-differences method and the possible solutions for resolving them were introduced only recently (Wooldridge, 2007). Donald and Lang (2007) and Bertrand, Duflo and Mullainathan (2002), for example, presented some methods that improve the difference-in-differences method. Bertrand, Duflo and Mullainathan (2002) made a review of the recent papers that used difference-in-differences in their research and concluded the vast majority of them did not deal with the problem of serial correlation adequately. To test how serious the problem of the serial correlation is, Bertrand, Duflo and Mullainathan (2002) created placebo laws (i.e. imaginary laws developed by the authors that did not exist in reality) and tested them with the difference-in-differences method. The method found a significant effect in the 45% of the placebo laws. Although the presented solutions to this problem are beyond the scope of this study, one should bear the drawbacks of the method in mind.

5. Empirical results

This section will present the research question, model, parameter estimates and sensitivity analyses.

5.1. Research question

The main focus of this study is aimed at answering the question regarding the outcome of the irregular minimum wage increase in March 2008 on employment, wages and the average number of hours paid in Slovenia. As some researchers proposed, employers can also adjust the number of working hours instead of lowering employment (Neumark and Wascher, 2007: 34–36); therefore, the variable of average number of hours paid was also included in the model. According to previous studies, one would expect to see the response of employers to the raise of the minimum wage shortly after the increase. However, there are some concerns that the response of employers would not be so observable due to short observation period after the increase. Moreover, employers could also respond to the minimum wage increase before the increase actually happened; for this reason, the sensitivity analyses also controls for anticipation effect.

5.2. Model

Model 1: the impact of an irregular minimum wage increase on the number of employees

$$\ln emp_{it} = \beta_0 + \beta_1 after + \beta_2 treatX + \beta_3 aftertreatX + \beta_4 treatXt + \beta_5 compXt + other\ variables \quad (1)$$

The subscription i represents the industries (from A to N) and t represents the months (from June 1999 until December 2009). The dependent variable $\ln emp_{it}$ is the logarithm of the number of employees by industries, $after$ is the dummy variable that is 1 in the period after the irregular minimum wage increase (thus starting in March 2008) and therefore presents a treatment period, and $treatX$ presents three different treatment groups, where X corresponds to 1 when dealing with Treatment groups 1 and 2 and 3, when dealing with Treatment groups 2 and 3 correspondingly. The variable $aftertreatX$ presents the multiplication of the dummy variable $after$ and $treatX$ and is so-called 'average treatment effect' with β_3 being the coefficient of interest. The variable $aftertreatX$ measures the effect of the minimum wage increase on the average gross wages.

Since the graphic analyses (available upon request) showed there were different time trends between treatment and comparison groups, two different time trends to control for group-specific time trends were included into the model. The variable $treatXt$ is the multiplication of the dummy variable $treatX$ and time trend, specific for the equivalent treatment group, while the variable $compXt$ presents the time trend, specific for the comparison group of the matching treatment group. Other factors include the logarithm of GDP per employee in different industries ($\ln gdpemp_{it}$), the logarithm of harmonised index of consumer prices ($\ln hicp_t$) and the dummy variables for industries (da, db, dc , etc.).

Model 2: the impact of an irregular minimum wage increase on the average gross wages

$$\ln awgross_{it} = \beta_0 + \beta_1 after + \beta_2 treatX + \beta_3 aftertreatX + \beta_4 + treatXt + \beta_5 compXt + other\ variables \quad (2)$$

The dependent variable $\ln awgross_{it}$ presents the logarithm of the average gross wage, whereas the other variables are the same as in Model 1.

Model 3: the impact of an irregular minimum wage increase on average number of hours paid

$$\ln hourspaid_{it} = \beta_0 + \beta_1 after + \beta_2 treatX + \beta_3 aftertreatX + \beta_4 + treatXt + \beta_5 compXt + other\ variables \quad (3)$$

The variable $\ln hourspaid_{it}$ presents the logarithm of the average number of hours paid by industries. The other variables are the same as in Model 1.

Table 4: The results of the models with Treatment Group 3

	Model 1 (y = <i>lnemp</i>)	Model 2 (y = <i>lnawgross</i>)	Model 3 (y = <i>lnhrspaid</i>)
after	-0.019 (-2.0)**	0.016 (2.6)***	0.007 (2.4)**
treat3	1.056 (44.4)***	-0.153 (-9.2)***	-0.014 (-1.4)
aftertreat3	-0.054 (-2.9)***	0.001 (0.1)	0.002 (0.2)
lngdpemp	-0.536 (-19.2)***	0.078 (4.9)***	0.030 (3.9)***
lnhicp	0.166 (2.0)**	0.870 (18.0)***	0.059 (2.0)**
treat3t	0.007 (21.7)***	0.001 (5.3)***	-0.001 (-4.8)***
comp3t	0.003 (11.0)***	0.002 (7.7)***	-0.001 (-6.3)***
_cons	13.77 (33.4)***	1.876 (8.2)***	4.596 (33.5)***
Number of observations	1,778	1,778	1,680
R-squared	0.9923	0.9548	0.3108

Notes:

a) * statistically significant at 10%, ** statistically significant at 5%, *** statistically significant at 1%

b) t-test values are shown in parentheses

c) The dependent variables are: the logarithm of the number of employees (*lnemp*; Model 1), the logarithm of the average gross wages (*lnawgross*; Model 2) and the logarithm of the average number of hours paid (*lnhrspaid*; Model 3).

d) The independent variables are: dummy variable for the treatment period, being 1 in the period after March 2008 (*after*), dummy variable for Treatment Group 3 (industry J, Real estate, renting and business activities) (*treat3*), the average treatment effect (*aftertreat3*), the logarithm of the GDP per employee by industries (*lngdpemp*), the logarithm of the harmonised index of consumer prices (*lnhicp*) and group specific time trends for the treatment and comparison groups (*treat3t* and *comp3t* correspondingly). Other regressors are dummy variables for the specific industry.

5.3. Parameter estimates in basic regressions

The results vary among the three treatment groups. The results of the models with Treatment Group 3 are in accordance with the expected and since the key parameters of the other treatment groups are statistically insignificant, the presented results only refer to the models with Treatment Group 3. Outcomes confirm that Treatment Group 3 (Industry J: Real estate, renting and business activities) was the most affected by the irregular minimum wage increase, which was also expected, since it had the highest share of the minimum wage workers.

The average treatment effect (*aftertreat3*) is statistically significant only in Model 1, and shows there was an approximately 5.4% reduction in the number of employees due to the irregular minimum wage increase. Model 2 and Model 3 indicate that the average gross wages and the average number of hours paid increased. However, given that the results are not statistically significant, one could not conclude how strongly the

irregular increase of the minimum wage influenced the average gross wages and the average number of hours paid. The treatment and comparison group had on average similar effects on the dependent variable.

5.4. Sensitivity analyses

The sensitivity analyses included different dependent variables and diverse combinations of explanatory variables with Treatment Group 3 (Industry J: Real estate, renting and business activities) as it had the most statistically significant results in the basic regressions in comparison to the other two treatment groups.

The analyses were composed of the basic regressions and regressions with the different treatment period that was testing for the anticipation effect (the variable *after3*). The treatment period of the variable *after3* starts from November 2007, since no references were found in the media or in official documents to the irregular minimum wage increase before that date. The regressions did not confirm any anticipation effects.

Furthermore, regressions with shorter observation period (from January 2005 until December 2009) were included in order to have more time-balanced treatment and pre-treatment period. However, as the number of observations decreased considerably (to 840 observations on average), the results were unreliable for drawing conclusions. Moreover, a dummy variable for March 2008 was incorporated so as to control for possible different trends in this month, but the results did not vary from the basic ones. Finally, due to the results of Haltiwanger and Vodopivec (2003), a new treatment group (*treat4*) was formulated that included Industry G (Hotels and restaurants), which had the most compressed wages in September 2007 (SURs). However, the results of the latter treatment group should be used with caution since the research is done only once a year every September. All regressions have heteroskedastic robust standard errors. Statistics and results from more detailed research, which follows in the next few subheadings, are available upon request.

5.4.1. Impact of the irregular minimum wage increase on employment

When observing the influence of the irregular minimum wage increase on employment, several dependent variables were included in the sensitivity analyses. First, when using the logarithm of the number of employees (*lnemp*) as the dependent variable, the average treatment effect was mostly negative and statistically significant. Concerning the results, the irregular minimum wage increase decreased employment on average by 5.4%.

The second dependent variable was the logarithm of the ratio between the number of minimum wage recipients and the number of employees (*lnmwcover*), where the average treatment effect was generally negative and statistically insignificant. Hence, one could not conclude what was the effect of the irregular minimum wage increase on the share of the minimum wage recipients. However, the dependent variable *lnmwcover* might not be the most appropriate since one cannot distinguish which of the two variables had the prevailing effect on the ratio; it might be the decrease in the number of minimum wage recipients or the increase in the number of employees.

The third variable was the logarithm of the whole working population (*lnworkpop*), which, besides employees, also includes the self-employed. The average treatment effect was negative and statistically significant through most variations. The results show that, on average, the irregular increase in the minimum wage decreased the working population by 3.9%.

The final dependent variable in this group was the logarithm of the ratio between the number of minimum wage recipients and the working population (*lnshareworkpop*). The average treatment effect in

these regressions was on average negative and statistically significant. The results show that the ratio between minimum wage recipients and the working population decreased by 3.9% on average due to the irregular minimum wage increase. Nonetheless, the same concerns relate to the dependent variable *lnshareworkpop* as to the dependent variable *lnmwcover* (the ratio between the number of minimum wage recipients and the number of employees).

The impact of the irregular minimum wage increase on the employment of the young population was also tested but was later excluded from the results due to the incompatibility of the data from different statistical sources.

To be concise: taking into account the constraints of variables *lnmwcover* (the ratio between the number of minimum wage recipients and the number of employees) and *lnshareworkpop* (the ratio between the number of minimum wage recipients and working population), one should rely more on the results of regressions with dependent variables *lnemp* (the logarithm of the number of employees) and *lnworkpop* (the logarithm of the whole working population). The latter both indicate the irregular minimum wage increase had a negative impact on employment on average. However, the exceptions were regressions with the treatment variable *treat4*.

5.4.2. Impact of the irregular minimum wage increase on average gross wages

Several different dependent variables were treated when looking for the wage effect. The first was the same as in the basic regressions (variable *lnawgross*; the logarithm of the average gross wages). The average treatment effect changed signs depending on which independent variables one included into the regressions. Additionally, all coefficients of the average treatment effect were statistically insignificant, so it is not clear what the exact effect of the irregular minimum wage increase on the average gross wages was. It is sometimes argued that because of the increase in the minimum wage, the negative employment effects (which will be presented later) are offset by increased earnings. However, similar to Meyer and Wise (1982), no statistically significant increase was found in the earnings due to the irregular increase in the minimum wage. Regressions with the addition of the variable *after3*, with the shorter observation period or with Treatment Group 4 (Industry G: Hotels and restaurants) gave similar results.

The second compilation checked whether the results would be more statistically significant with the inclusion of a new dependent variable: the logarithm of the ratio between the minimum wage level and the average gross wage (variable *lnmwawgross*). Comparing different regressions, the average treatment effect was negative on average but again statistically insignificant.

In view of the fact that average wages had spikes every year in November and December due to the "13th pay" or Christmas bonuses, the moving averages were calculated in order to smooth the data. Since Slovenia had a very high inflation in 2007, 2008 and 2009 (above the average in the euro area) (EUROSTAT), the nominal average wages were transformed into real average wages with the reference date being June 1999 (variable *Inrealawmoving*). The average treatment effect was positive in all cases, but on average statistically insignificant.

Since the variable *Inrealawmoving* is calculated as the moving average, is in real terms and gives the most consistent results, one could conclude that the irregular increase in the minimum wage increased the average gross wages. However, the conclusion should not be taken as a matter of course as the majority of the results are not statistically significant.

5.4.3. Impact of the irregular minimum wage increase on the average number of hours paid

The influence of the irregular minimum wage increase on the logarithm of the average number of hours paid (variable *Inhrspaid*) was, on average, positive and statistically insignificant across different regressions. Since all results of the average treatment effect were statistically insignificant, it was not possible to conclude what the effect of the irregular minimum wage increase on the average number of hours paid was.

6. Discussion and recommendations

The results from the previous section indicate the irregular minimum wage increase from March 2008 had a negative impact on average on employment and a positive impact on the average gross wages and the average number of hours paid. However, the conclusions are not unambiguous since the coefficients of the average treatment effect vary substantially when observing the employment effect, whereas they are usually statistically insignificant when observing the effect on the average gross wages and the effect on the average number of hours paid.

There are several concerns regarding the results presented in the previous section. First, the results with Treatment Group 4 (variable *treat4*; Industry G: Hotels and restaurants) seem to contradict majority of the results when observing the impacts of irregular minimum wage increase on employment and on the average number of hours paid. Moreover, the average treatment effect of the employment effect is sometimes too high to be realistic (for example 0.211 when the dependent variable was *Inmwcover*). One reason for this phenomenon could be the characteristics of Industry G

(Hotels and restaurants). Specifically, Card and Krueger (1994) also found a positive impact on employment because of the minimum wage increase in fast-food restaurants. Critics claimed the positive employment effect appeared also due to the characteristics of the industry, which supposedly has monopsonistic qualities. However, Card and Krueger (1994) observed only one aspect of the industry, while this study looked at it as a whole, so this argument might not be reliable. The other explanation could be that, contrary to the other industries, the crisis influenced this industry in a positive way. The reason could be that Slovenian tourists rather spent their holidays in Slovenian tourist resorts than abroad because of the crisis. Therefore, since Industry G (Hotels and restaurants) greatly depends on the trends in tourism, higher domestic demand could have had a positive impact on this industry. When observing the statistical data, the percentage of Slovenian tourists in 2008 and 2009 increased on average compared to the same months of the previous year, while the number of foreign tourists decreased on average. When evaluating the overall number of tourists in Slovenia, the number increased by 3.17% (the number of domestic tourists increased by 7% while the number of foreign tourists increased by 1.14%) in 2008 compared to 2007. Conversely, the overall number of tourists decreased by 1.6% in 2009 compared to 2008 (although the increase in the number of domestic tourists was 5.92%, the decrease of 5.82% of foreign tourists prevailed). Therefore, the reason for increased employment in the treatment period in Industry G (Hotels and restaurants) could be due to the increased number of domestic tourists and not due to the irregular minimum wage increase. The results thus indicate the treatment variable *treat4* might not be reliable, since the crisis might influence Industry G (Hotels and restaurants) in a different way than the other industries.

Although the results for the dependent variable average number of hours paid (*Inhrspaid*) are statistically insignificant, the outcomes are congruent with some other research studies (Neumark and Wascher, 2007: 34–36). When the irregular minimum wage increase had a negative influence on employment, on average it had a positive influence on average number of hours paid (and vice versa). This indicates that when employers had to decrease employment due to the higher labour costs, they compensated the decrease with the increased number of hours paid.

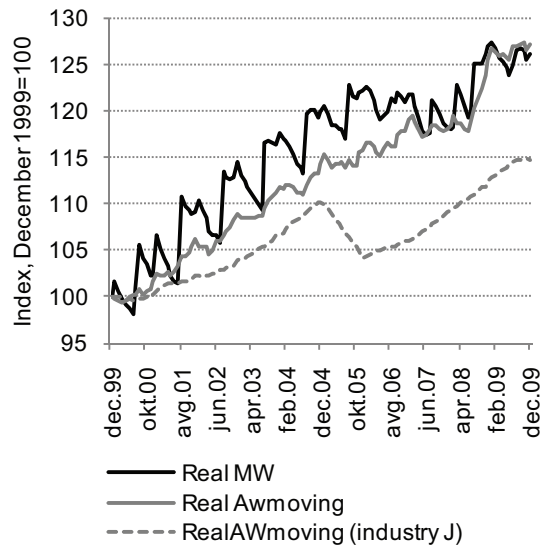
Another remark can be made about the vast varieties among elasticities for average treatment effect when observing the employment effect. The already mentioned concerns regarding Treatment Group 4 (variable *treat4*; Industry G: Hotels and restaurants) and regressions with shorter observation periods could explain the diversities in coefficients for these regressions, while the inconsistency in coefficients of basic regressions might indicate the problems with the data.

There might also be concerns regarding high R-squared values, especially when observing the employment effect, where the R-squared was often higher than 0.99. Some of the first researchers who indicated the concerns regarding high R-squared values were Granger and Newbold (1974). In their paper, they also brought forward the phrase 'spurious regression', which relates to a situation where two variables are related due to their correlation with a third variable (Wooldridge, 2009: 636). This might indicate the problem of the integration of order zero ($I(0)$) or the integration of order one ($I(1)$) (Wooldridge, 2009: 363-637). Since it is hard to determine whether a time series is integrated of order zero or of order one (Wooldridge, 2009: 394), it was checked whether the result changes with first-differencing the dependent variable $\ln emp$ (the logarithm of the number of employees); one of the methods, proposed by Wooldridge (Wooldridge, 2009: 393-395). The R-squared decreased, while the other coefficients did not change significantly.

Ultimately, disregarding the peculiar results of the regressions with the shorter period and the variable $\ln emp$, the results of the employment effect for the basic regressions do not seem to be compatible with the results of the wage effect. Specifically, since the average treatment effect is mostly consistent in being negative and statistically significant in the first case, one would expect it would also be statistically significant in the latter. However, the wage effect is positive on average but always statistically insignificant when observing the basic regressions. One reason for this could be that the minimum wage receivers were getting a hike above inflation, while other workers were getting a raise that did not compensate for inflation. The facts that are in favour of this statement are the aforementioned high inflation in Slovenia in 2007, 2008 and 2009, and the increase in the ratio between the minimum wage and the average gross wage after the irregular minimum wage increase in March 2008. Therefore, the reason could be that the workers most affected by the irregular minimum wage increase received a nominal wage increase, hence nobody's salary was reduced, but the overall effect on the real wages was zero since the wage of the minimum wage receivers increased in the real terms, whereas the rest of the workers faced a real wage decrease. The data confirm these predictions, since the real average gross wages in Industry J (Real estate, renting and business activities) decreased in real terms several times after February 2008. Especially when observing the moving average of the average gross wages, the data show that the increase was smaller every year, and that in the last months of 2009, there was a decrease in the moving average of real average gross wages in Industry J (Real estate, renting and business activities). Moreover, in favour of this explanation are also facts that Industry J (Real estate, renting and business activities) had a higher share of high wage earners than the average industry in September 2007 and in September 2008 (SURs), and

that the real wages in this industry grew slower than the real minimum wages and real average gross wages in the average industry (figure 3).

Figure 3: Comparison of the real minimum wage and moving averages of the real average gross wages and the real average gross wages in Industry J (Real estate, renting and business activities)



Source: SURs, own calculations.

Finally, the data in this study seem to be insufficient. Perhaps this is due to the change in the classifications in 2008, an overly short post-treatment observation period or the lack of the inclusion of the other relevant factors, such as human capital, for which no appropriate data were found.

7. Conclusions

In the beginning of the 1990s, Card, Katz and Krueger started a still on-going debate concerning the influences of the minimum wage. Some researchers found the minimum wage has a positive or insignificant impact on employment while the majority of the results indicate the minimum wage has an adverse effect on employment. The wage effect seems to be less controversial. Some authors have also mentioned the importance of studying the effect on working hours since, besides employment, employers can also adjust the number of hours paid by their employees.

The Slovenian minimum wage law was passed in 1995 and to 2010 there were modest changes in the law. The motivation was to check how the Slovenian labour market reacts to irregular minimum wage increases, referring specifically to that of March 2008. The focus of this study was finding the effects of the irregular minimum wage increase on wages, employment and average number of hours paid. The observation period was from June 1999 until December 2009.

The model was based on the difference-in-differences method. Several treatment groups consisted of the industries that had the highest share of minimum wage recipients and should therefore have been more affected by the irregular minimum wage increase. The results, based on the treatment group with the most consistent results, on average indicated the irregular minimum wage increase had a positive and statistically insignificant influence on wages and average number of hours paid but a statistically significant negative influence on employment.

Even though there were some possible explanations provided in the discussion to the dilemmas that appeared during the research, some unresolved issues still remain. In order to obtain more significant results, future researchers should take into account a longer post-treatment observation period, include other appropriate factors, for instance human capital, and take the drawbacks of the difference-in-differences method into consideration. Nonetheless, this study sheds some light on the possible outcomes, what might be the shortcomings and giving some recommendations for future research.

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Appendix

Table A. 1: Description of 'SKD united'

SKD 'united'	SKD 2002	SKD 2008	Description
A	A+B	A	Agriculture, forestry and fishing
B	C	B	Mining and quarrying
C	D	C	Manufacturing
D	E	D+E	Electricity, gas and water supply
E	F	F	Construction
F	G	G	Wholesale and retail trade, repair of motor vehicles and motorcycles
G	H	I	Hotels and restaurants
H	I	H+J	Transport, storage and communication
I	J	K	Financial intermediation
J	K	L+M+N	Real estate, renting and business activities
K	L	O	Public administration and defence, compulsory social security
L	M	P	Education
M	N	Q	Health and social work
N	O	R+S	Other community, social and personal service activities

Source: SKD.