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The Employment Effect of an Increase in the Swedish Minimum Wage

An empirical study of the 2005 wage agreement between SKL and Kommunal

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Abstract

This thesis investigates the relationship between a minimum wage increase and change in employment for municipality workers in Sweden between 2003 and 2007. The effect is estimated by performing a natural experiment comparing a treatment group of workers affected by the increase to a control group of unaffected workers. The results identify a positive effect for the aggregate employment levels after the minimum wage was raised in April 2006. The effects are stronger in the larger municipalities while almost zero for the smallest quartile of municipalities. Overall our results contribute to the recent studies challenging the neoclassical models and their view of the labour market, emphasizing the complexity in foreseeing the effect of minimum wages.

Keywords: Minimum wage, employment effect, public sector, municipality

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1 Introduction

The conventional neoclassical belief about the high unemployment rates in many OECD countries is that they are caused by the rigidity of the market. It is said that different employment benefits such as strict unemployment protections, powerful unions and high minimum wages, create an unfavourable ground for employment by increasing labour costs and reducing the incentives for low-income earners to work.

This debate about minimum wages is ongoing and without clear winners. Minimum wages are often justified on the ground that they are said to strengthen the position of low-wage workers and decrease income inequality. However, arguments against this point of view claim that minimum wages reduce employment and actually worsen the situation for low-income workers. The question about the employment effect of minimum wage increases is controversial, with several studies arguing for both positive and negative employment effects (Cahuc and Zylberberg, 2004).

The basic competitive model of labour markets explicitly predicts that employment should fall if the minimum wages are raised, as a consequence of higher labour costs for the employer. This model rests on the assumption that the employer has all market power and adjusts the employment level to fit the profit maximization equation. Until the end of the 20th century this was the leading, and barely questioned, opinion. However, new empirical research from the USA (Card and Krueger, 1995) put this subject in the spotlight with empirical findings contradicting the simplified arguments suggested by the neoclassical theories. In fact, few papers examining the employment effect after a minimum wage increase have managed to confirm the assumed negative effect, some even showed increased employment. The contradicting findings force economists to search for new models and theories that better explain the reality of the labour market (Zavodny, 1998).

The vast majority of previous studies have focused on countries with statutory minimum wages whereas little has been said about countries like Sweden and its Scandinavian neighbours, where the minimum wage is set by collective agreements (Skedinger, 2005). There is also a lack of studies concerning the public sector even though it has been argued that there might be a difference in the employment effect between the public and the private sector in South America (Lemos, 2007; Gindling and Terrell, 2009). Knowing the effect of minimum wages is central for deciding about the welfare effects of imposing a minimum wage and how it should be designed (Skedinger, 2005).

1.1 Purpose

The aim of this essay is to further the empirical evidence on the employment effects of increases in the minimum wage. It also fills the void in research on the public sector and countries without a statutory minimum wage. The basis of this study is the specific minimum wage hike for all 290 Swedish municipalities. We estimate the effect of the increase in minimum wages settled in a collective agreement between the trade union *Kommunal* and their employer counterpart *SKL*¹ on April 1st, 2005, resulting in a monthly wage increase from 14 000 SEK to 15 000 SEK which went into effect on April 1st, 2006. The method used to estimate the level of change in employment is a so called natural experiment. We use a treatment group of workers earning the minimum wage and a control group of workers earning just above the minimum wage, thus not affected by the increase. To perform a natural experiment this study only focuses on employees with a formal upper secondary education and at least a year of work experience, since the two groups must be as identical as possible, with the treatment being the only differentiating factor. Including uneducated workers² would violate this premise and they are thus not suitable to include in this study. This specific occasion was chosen due to the relatively large amount of information available on that wage negotiation, yet current enough to give new evidence. The sample consists of observations of full-time employees in both treatment group and control group two years before and two years after the minimum wage increase. It would have been valuable to look at other factors; such as tenure, experience, gender, age and specific education level, but due to limited availability³ these additional variables will not be accounted for in this study. Unbiasedness of the estimates can still be claimed due to the fact that these omitted variables are not likely to be correlated with the minimum wage increase.

The thesis is organized as follows. Starting with an overview of previous research on this matter then proceeding with presenting the theories previously used to explain both negative and positive employment effects following changes in minimum wage. Section 3 explains the main concepts of this thesis, regarding terms as minimum wage, unions, collective bargaining. Section 4 illustrates the empirical approach, stating our specifications and estimation models. The empirical results and

¹ *Kommunal* is the trade union for municipal workers, while *SKL* represents all Swedish municipalities and regions. For more information about this specific round of negotiations we refer to the yearly report made by *The National Mediation Office*, containing all facts about the two parties. See section 3.2 for more information about *Kommunal* and *SKL*.

² In the same wage agreement, the minimum wage for workers without a formal education was raised to 13 800 SEK. See more information in Appendix 2.

³ Databases from SCB (Statistics Sweden) on individual data including the above variables are only available for studies conducted at PhD-level or above.

analysis are then presented in section 5. Section 6 concludes with a discussion of our results and its relation to the hypothesis as well as previous research.

1.2 Hypothesis

According to traditional competitive labour market theory, employment is expected to fall when minimum wage increases. However, empirical evidences have not always been able to prove this relationship, implying that the effects of imposing a minimum wage are not as straightforward as suggested by neoclassical models. It has also been suggested that the public sector would react differently to increases in the minimum wage (Gindling and Terrell, 2009). Hence we are aiming to answer the question whether an increase in the minimum wage, *ceteris paribus*, will affect employment negatively for the above mentioned subjects. Our null hypothesis state:

H₀: An increase in the minimum wage has no effect on employment in the affected group (two-sided).

By using a two-sided alternative we are testing the null hypothesis against either a negative or a positive employment effect on the affected group.

1.3 Previous research

There is an immense amount of literature about minimum wages and several papers examining the relationship between increased minimum wages and employment. The early studies of the 1970s and 1980s generally produced an outcome in which a small reduction in employment was found. This resulted in a common view of the empirical relationship of the employment effect as being negative, with an expected effect of roughly 1 percent decrease in employment of a 10 percent increase in the minimum wage (Cahuc and Zylberberg, 2004). Later research however, as will be discussed below, contradicted this view (Zavodny, 1998).

The 1990s gave rise to controversy on the subject of minimum wages. Several famous studies in the United States, starting with the Card (1991) paper, examined the effect of a minimum wage increase on teenage employment and came up with results contradictory to the empirical relationship observed during the 1970s and 1980s. Card found a small, but positive change in employment for this group. Card and Krueger (1994) followed up with a study on fast food restaurants in New Jersey, a state which raised its minimum wage in April 1992. They used a difference-in-differences estimation using fast food restaurants in the neighbouring state Pennsylvania – where no raise had been implemented – as a control group. Comparing the two states Card and Krueger found no negative employment effect among fast food employees after the wage increase. These studies

questioned the neoclassical view on the minimum wage and offered the idea that moderate increases in the minimum wage would not affect employment.

An extensive overview of studies of the last two decades was made by Neumark and Wascher (2006). In their summary they present 86 studies examining the employment effect of increased minimum wages. Two thirds of these studies found a negative employment effect (although not always statistically significant). The majority of all studies were conducted in the United States and the United Kingdom. The latter is an attractive study object because minimum wage legislation was enacted as late as 1999. This clear policy shift is optimal for performing natural experiments. Studies conducted during 1999 and 2006 show that minimum wages increased over 50 percent. However, no significant employment effect could be traced back to this policy change (Stewart, 2004; Dickens and Draca).

The above studies have all focused on countries with statutory minimum wages. In contrast, research on countries without them is regrettably scarce. To be sure, it is much more difficult to quantify and examine a myriad of different collective agreements in countries without statutory minimum wages. Concerning the Swedish market, there are as far as we are aware of only two previous studies. The Edin and Holmlund (1994) paper studied youth employment effects following several minimum wage increases in the industrial sector during the 1970s. They found a negative effect on relative demand on young employees. The other study, Skedinger (2002), examined the member companies of the trade organization Swedish Hotel and Restaurant Association during 1979-1999, a period which likewise experienced numerous minimum wage increases. This segment has a large share of low-earning workers, and Skedinger used data on individual wages with a sample size of 207 000 observations and used the difference-in-difference estimation to approximate the effect of the minimum wage increase. His statistical results show negative – however insignificant – effects on employment. Due to the many insignificant results it is difficult to deduce any actual effect on employment in Skedinger's paper.

Whether there are any significant differences between private and public sector has been the subject of investigation for only a handful of studies. The results can at most be characterized as ambiguous. Lemos (2007) compared the private and the public sector in Brazil and found that neither sectors' employment was negatively affected by an increased minimum wages. Gindling and Terrell (2009), looked at Honduras and presented some difference between the sectors; employment was reduced by approximately -0.46 percent in the private sector, while no effect at all could be seen in the public sector.

2 Theoretical background

In this theoretical section we present the most common models for explaining the effects of imposing or raising the minimum wage. We start with the neoclassical model which predicts negative employment outcomes. It is supplemented by more dynamic models which strive to elucidate the various positive effects shown in previous research.

2.1 The Basic Competitive Model

This is the simplest and most used model. It assumes many identical firms and homogenous workers. Further, the model assumes the efficiency wage hypothesis, meaning that workers must be paid more if they are to supply more effort, and that the marginal product of labour decreases for every additional worker. Each individual firm is considered to be too small to affect the equilibrium wage.

According to the competitive model the firm only uses labour as input in production which generates a profit maximization function (1). L is the number of workers, w is the wage and p is the constant price for which the firm sells its output.

$$\max \pi(L) = pf(L) - wL \quad (1)$$

Equation (1) shows that firms choose the quantity of labour that maximizes their profits since the price is assumed to be constant. Equation (2) shows the individual firm's optimal quantity of labour in terms of the wage and the price.

$$p \times \partial f(L)/\partial L = w \quad (2)$$

Firms maximize by setting the marginal product of labour (MPL) equal to the marginal cost of labour (MCL). The value of the marginal product is the same as the price of one unit of output times the MPL. MCL is the same as the wage, w . Consequently the setting of a minimum wage above w will reduce the level of employment. This can be shown theoretically by using equation (2) to see what would happen if a minimum wage, w_m , was imposed, which is above the competitive wage, w^* . To satisfy the equation either the price, p , must increase or the amount of labour, L , must decrease. Since p is fixed, the firm's remaining option is to reduce its labour force.⁴

This model is highly simplified and based on many assumptions which do not correspond to the real life dynamics of the labour market. It is untrue that all workers have the same skill level, the price is always constant and that the firm does not set wages.

⁴ See Cahuc, P. and Zylbergberg, A. "Labour Economics", 2004, p. 515 for a more detailed discussion.

2.2 The Matching Function

Assuming that the decision to participate in the labour market is a trade-off between being a job-seeker and not participating at all, all individuals who expect their utility from participating to be greater than the utility from being outside the labour market will choose to participate. Conversely, the individuals who expect their utility to be greater when standing outside the labour market will not choose to participate. Hence the participation rate increases with the expected utility of being a job-seeker, explicitly, as the benefits of working increases more people will choose to search for a job rather than not participating at all in the total work force. The employment rate is then equal to $H(V_u)(1 - u)$, where u is unemployment and $H(V_u)$ is the participation rate with the increasing function H for all possible utilities available outside the labour market (unemployment benefits, allowances, begging, etc), giving that the participation increases with the utility of being unemployed (however job-seeking) relative to being outside the labour market. If the minimum wage w_m is less than the equilibrium wage w^* , an increase in w_m will certainly increase labour market participation until $w_m \geq w^*$, upon which participation instead decreases. However, an increase in labour market participation (characterized as more people actively searching for a job) is not the same as an increase in employment but adds to the discussion of the minimum wage.

By adding job search to the model, i.e. implying that the number of hires depends not only on the level of unemployed individuals but also on the effort the participants put into finding a job, further can be understood about the minimum wage. As in the prior description of the matching model, the effort will be decided by a trade off between expected utility from looking for work, adding the gains while subtracting the costs of searching (e.g. leisure time, playing golf). Since the gain depends on the expected wage paid when being employed, the utility will increase with a higher minimum wage and thus increase the effort put into finding a job. However, an increase in minimum wages will only result in a positive employment effect if the relationship between effort and wages is highly elastic; otherwise people will not be likely to change their amount of effort with an increase in wages (Cahuc and Zylberberg, 2004).

2.3 Substitution

The substitution model adds to the competitive model by allowing labour to be either skilled or unskilled. Its profit function (3) can be compared to the profit function of the competitive firm in equation (1).

$$\max \pi (L_1, L_2) = pf(L_1, L_2) - w_1 L_1 - w_2 L_2 \quad (3)$$

The hired amount of each type of labour is decided by the ratio of wages, given by equation (4).

$$\frac{\partial f(L_1, L_2) / \partial L_1}{\partial f(L_1, L_2) / \partial L_2} = \frac{w_1}{w_2} \quad (4)$$

When a minimum wage is imposed, it assumedly increases the wage of the unskilled workers and hence increases the ratio of wages as well. Firms will then have an incentive to replace unskilled workers for skilled workers, making the effect on total employment equal to zero, even though the employment of unskilled workers declines (Zavodny, 1998). An excess of skilled workers in the labour market is a necessary assumption for this to hold. Substitution is also argued to occur between full-time and part-time workers, where the former are substituted for the latter when wages are increased (Card and Krueger, 1995). The increase in wages is then said to both raise the incentive to work full-time as well as decreasing the cost-wedge between full-time workers and part-time workers, where the former are assumed to be better skilled than the latter. This could be a suitable explanation for the lack of negative empirical findings on total employment.

2.4 Monopsony

The monopsony model is commonly used in discussions about minimum wages since it demonstrates that up to a certain point employment will actually increase with the minimum wage. A monopsonist firm is defined as a single buyer of labour in a specific segment of the market. They face an upward-sloping labour supply curve, indicating that the number of employees can only be raised by increasing the wage.⁵ If the employer knows the available labour supply, the equilibrium wage will be set to minimize the cost of wages where the volume of hires is at its lowest possible amount, and so keeping the costs down.

The only input for production is (as in the basic competitive model) still only labour, with the level of labour supply denoted by $L(w)$, and the wage by the inverse $w(L)$. The total cost is then given by $w(L)L$ and the revenue is $Y(L)$. The model further assumes that the firm pays a single wage to all of its employees.⁶ The profit is then maximized by choosing L , as shown below.

$$\pi = Y(L) - w(L)L \quad (5)$$

Giving the first-order condition.

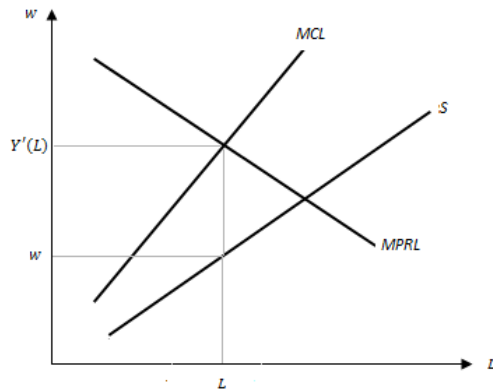
$$Y'(L) = w(L) + w'(L)L \quad (6)$$

⁵ In contrast to the perfect competition model where firms are facing a horizontal supply curve and can hire as many workers as they like, without altering the wage level.

⁶ There is no wage discrimination in the simple model of monopsony.

$Y'(L)$ is the marginal revenue product of labour and $w(L) + w'(L)L$ is the marginal cost of labour, which differs from the marginal cost in the competitive model in which it was equal to the wage. In the monopsony model the marginal cost of labour is instead equal to the wage paid to the additional worker plus the wage increase imposed on all other workers (Manning, 2003). The relationship is shown in Figure 1 below.

Figure 1. The Simple Model of Monopsony



The graph illustrates the employer's added profit on each extra worker. To be able to attract additional workers the employer needs to increase wages, not only for the additional worker but also for the entire work force. This separates the monopsony model from the competitive model, where the firm does not influence wages and just pays the market wage irrespective of the amount of workers hired. For the monopsonist on the other hand, the significant increase in labour costs with each additional worker gives no incentive to increase employment. If a minimum wage is imposed however, it will raise the average cost of labour as seen in equation (6), but will also reduce the increase in wages by hiring a new worker, $w'(L)$. This in turn, makes the effect on the marginal cost of labour, MCL, undetermined (Manning, 2003).

Figure 2. A Monopsonist's reaction to an increase in minimum wages

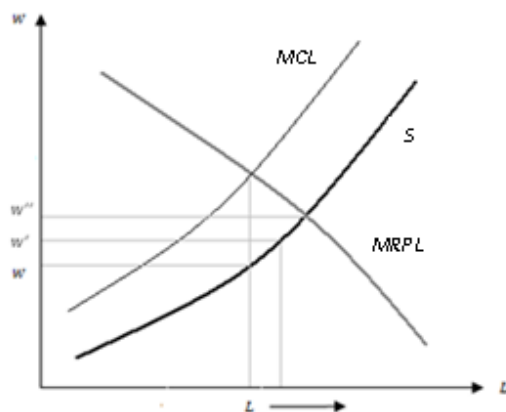


Figure 2 shows how a monopsonist firm would react to an increase in minimum wages. As already stated, the monopsonist determines the wage by deciding the amount of labour which clears marginal cost and marginal product. Since there is a gap between the marginal cost of labour and the wage, there is room for a wage increase resulting in an increase in employment until the point where labour supply S equals the marginal product, $MRPL$. This shows that up to a certain point, an increase in minimum wages can actually increase employment. Beyond that point however, the marginal product of each worker will be less than its marginal cost and it would no longer be profitable to hire additional workers.

The simple monopsony model assumes a single hiring firm, although the model is probably better seen not in the sense of there being only one big firm buying labour, but instead that the labour supply might not be finitely elastic (Manning, 2003).

2.5 Dynamic monopsony

A considerably more complex monopsony model has been introduced by Burdett and Mortensen (1989) to explain why the minimum wage may not cause a decrease in employment. As recently discussed, the monopsonist is not necessarily the single buyer of labour, but can instead be regarded as a price setter (in contrast to the competitive firm). Here the firm's ability to hire and retain workers depends on their paid wages and the wages offered by competitor firms. This makes the firm with the higher wage more attractive to workers. High-wage firms will also be able to attract and retain workers with the highest skills. Burdett and Mortensen showed that, assuming identical firms with equal capacity and profits, the level of wages is positively correlated to firm size, implying that larger firms pay higher wages. With the assumption made in neoclassical models that all workers have the same reservation wage, a minimum wage above the reservation level will not have any impact on the employment since all workers already accepted the offered equilibrium wage. On

the other hand, if reservation wages are thought of as varying across the workforce (Zavodny, 1998) an increase in minimum wages could increase the level of employment since more workers will be offered a wage higher than their reservation wage. The dynamic monopsony model can also be seen as an imperfect search model. In the neoclassical models the worker is assumed to have perfect information about the labour market, including all available job opportunities and their corresponding wage offers, leading to a market where workers immediately change jobs as better offers become available. In the model with imperfect search on the other hand, workers only have information about the job they are directly offered which consequently results in frictional unemployment; slow turnovers and vacant positions remaining unfilled (Zavodny, 1998). Proving that the dynamic model is more suitable for explaining the low-wage labour market now becomes straightforward. The sheer existence of vacant positions is a good example. In a perfectly competitive market there will not be any unfilled positions since the market adjusts and wage levels follow the supply and demand of labour.⁷

The monopsony models are in many cases well-applicable on the public sector, which in many regions is the largest employer. However, you must consider the fact that due to strong labor unions, workers have a lot more power than presumed in the model, which must be incorporated in an analysis of the model.

2.6 Alternative models

Researchers have tried to use more indirect explanations for the lack of negative empirical effects following minimum wage hikes. One of them is the so called *price effect* (Katz and Krueger, 1992). This contradicts the basic model on the notion that prices are assumed to be fixed. It points to the argument that an increase in minimum wages has an effect on prices. Returning to equation (1) where we found that imposing a binding minimum wage reduces profit and since the firm is not allowed to alter the price of its output it will instead choose to lower the amount of employed labour. With this assumption in place the opposite should also hold true: if the firm is able to raise the price of its goods (which in real life it can), then it would not have to fire as many workers and the negative employment effect would be less than the basic model predicts.

The empirical evidences are however not consistent. While some studies show that prices seem to rise when the wages are increased (Card and Krueger, 1995; Aaronson, 1997), others have shown the opposite (Katz and Krueger, 1992). Kennan (1995) uses other, hypothetical, theories explaining why studies do not find negative employment effects. One of them is the so called *hungry teenager*

⁷ An American survey performed by the National Restaurant Association in 1990 showed that more than 40% of the participating restaurants had positions that had been vacant for a longer period of time; this is assumably the case in many industries.

theory, which argues that the wage increase is likely to boost the consumption of workers who are prone to spend this additional income on “low wage goods” such as fast food⁸. This increased demand will compel fast food restaurants to increase employment – hence, leading to a zero net effect on the employment levels. Obviously this argument should be taken with a grain of salt, especially with regard to contradicting research showing that there is no direct evidence that low-income workers would spend their additional income in low-wage industries (Neumark and Wascher, 1997).

Worth considering is also the fact that minimum wages in most countries are set by policy makers, who most probably have considered the likely effects of their decisions. Thus one can expect that minimum wages will only be increased if the timing is right, i.e. when the negative effects are expected to be minimal. Any wage hikes would therefore be endogenous and explain the failure to show a negative employment effect (Zavodny, 1998). This argument stresses the importance of finding measures to control for the endogeneity bias. One possible solution to avoid this is to investigate employment effects in countries without a statutory minimum wage. Minimum wage changes set in countries using collective bargaining would arguably be more exogenously instigated since elected policy makers (presumably susceptible to populism) are not involved in the process. A suitable example is Sweden where wage negotiations occur even in times of economic downturn and wage increases are not necessarily subjected to timing. Studying countries such as Sweden could be a way of getting around the endogeneity problem with politics, but on the other hand (as will be discussed in section 6) there is reason to believe that wage agreements will suffer from other biases, still making the wage changes endogenous.

⁸ Zavodny (1998) quotes an American restaurant owner: “Our employees are our customers.” (Wall Street Journal, November 20, 1996.)

3 Main concepts

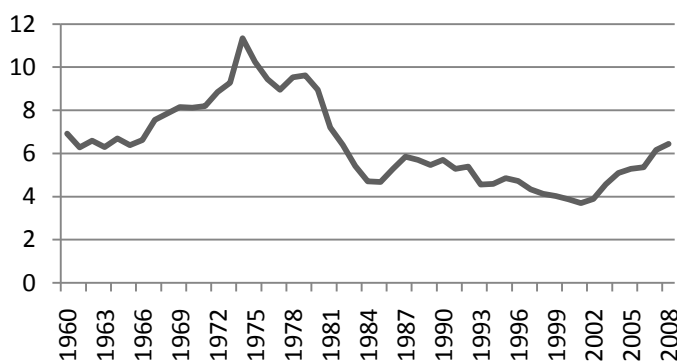
In this section we explain and discuss the main concepts used in our thesis, starting with the minimum wage and proceeding with a description of the unions and institutions subjected to this thesis.

3.1 Minimum wages

The minimum wage is the lowest salary which can legally be paid to an employee by his employer. At present, a majority of all countries have a minimum wage regulation, but there are differences in how the regulations are designed. Most countries have statutory minimum wages. These legal wage floors are applied nationwide; however they can differ between industries or groups dependent on factors such as age, experience, education, and even sometimes between geographical regions.⁹

Apart from statutory minimum wages, there are countries where minimum wages are decided by collective bargaining. Diagram 1 shows how the average real minimum wage has fluctuated in OECD-countries between 1960-2008.

Diagram 1. Hourly Average Real Minimum Wage in OECD-countries in US dollars, 1960-2008



Source: OECD-minimum wage statistics.

Table 1 shows the minimum wage as a percentage of average wages in some EU countries, Turkey and the United States.¹⁰ Only countries with statutory minimum wages are included in this table due to the difficulty to estimate an average in countries where the minima are not legislated. The Scandinavian countries, Germany and Italy regulate their minimum wages in collective agreements, explaining why they are left out from the table.¹¹

⁹ Eurostat wage report (2008).

¹⁰ For a deeper discussion on minimum wages in Europe download the 2008 Eurostat report on minimum wages where information about the relative wage levels and their respective legal regulation can be found.

¹¹ Austria was also part of this group, but decided to have legislated minimum wage in 2007.

Table 1. The minimum wage as a percentage of average wage.

Country	2003	2004	2005	2006	2007
Bulgaria	46.2	45.5	45.7	45.5	45.3
Czech Republic	40.4	41.4	46.6	44.7	42.1
Ireland	32.4	34.6	33.2	30.5	30.4
Greece	43.4	----	----	39.7	38.6
Spain	48.6	47.5	48.6	47.7	46.3
France	32.9	33.6	35.1	35.8	36.5
Lithuania	39.9	41.9	36.2	33.3	34.2
Luxembourg	42.1	45.4	44.9	42.1	38.7
Hungary	46.6	46.0	46.8	46.2	46.8
Malta	42.2	41.2	41.3	41.7	39.8
Belgium	48.2	47.4	50.5	50.4	49.0
Netherlands	47.7	46.1	45.5	44.1	44.2
Poland	33.9	35.1	33.7	36.1	32.4
Portugal	40.7	40.0	40.5	40.7	41.6
Romania	37.3	34.4	32.6	30.2	29.1
Slovenia	45.8	45.9	46.2	45.2	43.4
Slovakia	34.0	34.1	34.4	34.8	----
UK	34.5	36.5	37.9	37.9	38.9
Turkey	----	48.4	----	48.5	----
USA*	26.0	25.0	24.0	24.0	24.0

*Source: Eurostat, *OECD for US data.*

The minimum wage level is below 50 percent of average wages in almost all EU countries, but still relatively high compared to the minimum wage in the United States. Looking more closely, it also shows that relative minimum wages have decreased in many countries during this period.

3.1.1 Minimum wages in Sweden

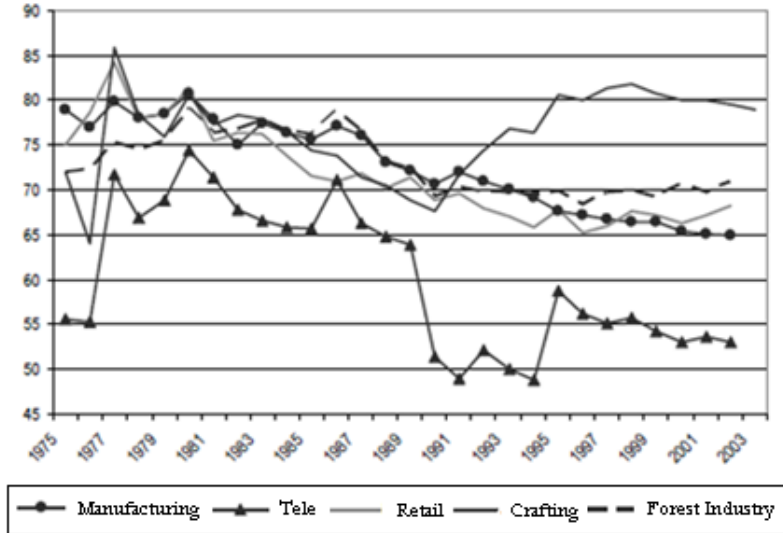
The Swedish minimum wage is, unlike most other countries, not regulated by law. Sweden and the rest of Scandinavia set the minimum wage by collective bargaining between unions and employers. The set agreements then apply to all firms in the concerned industry, regardless of whether their workers are union members or not.

There are different minimum wage agreements for different types of workers in Sweden. One distinction is between educated and uneducated workers, where the latter are defined as lacking formal education above the primary school level, while the former are workers with a formal upper secondary education and at least a year of work experience.¹² Diagram 2 shows that Swedish real minimum wages have somewhat declined since 1975. Comparing these levels to the levels in table 1

¹² This separation stems from the collective agreement, *HÖK 05*, see appendix 2. For further discussion see Skedinger (2002).

shows that the Swedish wage is very high, with minimum wages as high as 80 percent of average wages in the retail sectors a decade ago. However, not all sectors are alike; telecom workers have consistently had a 5-20 percentage point lower relative minimum wage.

Diagram 2. Minimum wages in Sweden, percent of average wage.



Source: Andersson and Kainelainen, 2004, page 8.

Due to the variation of wage agreements and the absence of minimum wage legislation it is difficult to get an overview of the minimum wage levels. Compared to other EU countries the Swedish minimum wage is relatively high. Skedinger (2006) exemplifies with minimum wages in the manufacturing industry being 60-70 percent of the median wage.

3.1.2 Measuring the minimum wage

To be able to measure minimum wages between countries a commonly used measure is the Kaitz index (Kaitz, 1970). This index is a coverage-weighted minimum wage, relative to the average wage.

$$\sum_i f_i(w_m / \bar{w}_i)s_i \quad (7)$$

Equation (7) shows the definition of the Kaitz-index, where f_i is the share of teenagers employed in a specific industry i , w_m is the hourly minimum wage, \bar{w}_i the hourly average wage in industry i and s_i is the share of workers earning the minimum wage in industry i . The Kaitz index has been used in several studies to compare minimum wages between countries.¹³

¹³ See Doledo (1996) for a useful comparison between countries.

3.2 Unions

Unions are defined as a group of workers who join forces to strive for higher wages and better working conditions at their work place. In Sweden it started in Sundsvall, when lumberjacks in revolted against a wage decrease in 1879. They demanded reduced hours, increased democracy at the work place and the right to vote in general elections. *LO*, the Swedish Trade Union Confederation, formed in 1898 as an umbrella organization for the many newly formed unions. The Swedish union density is one of the highest in the world with 71 percent of the workforce belonging to a union in 2008.¹⁴

Today the Swedish labour market relies heavily on collective bargaining. The three major actors on the union side are *LO* (blue-collar workers), *TCO* (white-collar workers) and *SACO* (academic union cartel). Their employer counterparts are the confederation of enterprises, *Svenskt Näringsliv*, and the Swedish Association of Local Authorities and Regions, *SKL*. Table 2 presents the three central trade union federations and their respective membership figures.

Table 2. Central organizations in Sweden 2010¹⁵

	Affiliates	Members
SACO	23	600 000
TCO	16	1 200 000
LO	14	1 700 000

LO is the largest of the central organizations, governing trade unions of blue collar workers. Their members mainly work in the production industry but also include a majority of the municipality workers, gathered in the trade union *Kommunal*. Below is a presentation of both *Kommunal* and the abovementioned *SKL*; the two actors that agreed upon the minimum wage level which is the basis of our study.

3.2.1 SKL

SKL represents the governmental and employer related interests of Sweden's 290 municipalities, county councils and regions. The association aims at promoting and strengthening local self-government and democracy by working to influence opinions in Sweden and European institutions. As an employer organization *SKL* signs collective agreements with the trade unions concerning more than 1.1 million employees making *SKL* the largest employer organization in Sweden. *SKL*

¹⁴ However, between 2007 and 2008 Sweden experienced a drastic fall in union membership, decreasing from 77 to 71 percent, according to Anders Kjellberg (2009)

¹⁵ More information about the different central organizations can be found on their homepages, find references at the end of this paper.

works with all questions regarding employer and employee relations, from regulations and laws to working conditions and wage levels.¹⁶

3.2.2 Kommunal

Kommunal is Sweden's largest trade union with 570 000 workers with the majority of them working in municipalities and local authorities. *Kommunal* is one of the 14 affiliates encompassed in *LO*, and was established in 1910. Their members work mainly with elderly care, child care, health care, bus services, roads, parks, refuse collections and agriculture. Eight of ten members are women, of which 50 percent work in the care sector. The organization rate is exceptionally high with a 90 percent coverage rate of the total workforce in their concerned occupational areas.¹⁷

3.2.3 Collective bargaining

Collective bargaining can be explained as an activity in which the price of labour is agreed upon. The negotiations are not limited to wage setting, but also concern working conditions and working hours.¹⁸

The collective agreements are valid only for a few years before new negotiations take place. The agreements are formulated by the trade unions and its local representatives. The suggestions made by individual members and representatives are later discussed on a regional level after which the board of *Kommunal* sets the negotiation agenda. Before negotiations the board elects a delegation of negotiators, which will further *Kommunal*'s agenda in the negotiations with the employers. If the demands are not met, the board of *Kommunal* decides whether to release a conflict or to continue with the negotiations. *SKL* can similarly accept or reject the offer.

For employees it would be much worse to negotiate individually. Even for the employer it is advantageous to have only one contract for all its employees; since the employer knows that all employees will work when the contract is signed and no conflicts threaten production under the duration of that agreement. However, for the employer the collective agreements can also be a source of risk, making it more difficult to make budgets and plans for the future. Therefore employer organizations push for increasing the scope of the agreements, making them valid for a longer period of time. The employees (and the unions) on the other hand, want to negotiate as often as possible to secure greater flexibility for workers, giving them more power on the labour market.

¹⁶ This information was gathered from *SKL*'s homepage, on May 10th, 2010, see reference list.

¹⁷ "People Who Care", a presentation of *Kommunal*.

¹⁸ The aim of collective bargaining and union activity has been widely discussed. For an in-depth theoretical discussion see Cahuc and Zylberberg (2006), p. 371.

The scope of collective agreement coverage differs a lot between countries. In Sweden a collective agreement is valid for all workers, regardless whether you are a member of the union or not. Spain and France have the same system, although Australia, New Zealand, the United Kingdom and the United States have legalized the right to discriminate non-unionized workers (Cahuc and Zylberberg, 2004). The low coverage level for these countries has understandably resulted in high union density.¹⁹ However, this density has fallen substantially for a majority of European countries, including Sweden. The reason behind this is debated and the unions are trying to recover membership levels since their power in negotiations is dependent on the size of its membership base (Kjellberg, 2009).

3.2.4 The wage negotiations of 2005

The wage trend in Sweden was relatively slow in 2000-2004, leading to a moderate increase in the consumer prices in relation to the rest of Europe. Consumer prices in Sweden rose 0.8 percent in 2005, compared to 2 percent in many of the other European countries. At the turn of the century, the Swedish economy went into a recession. Growth dampened, leading to an unemployment rate of 6 percent. However, in 2004 the trade outlook recovered and a real upturn was predicted in 2006, with a domestic demand supported by low interest rates and a low Swedish currency favouring the important export sector. In other words, Sweden was in a strong position when the wage negotiations started in 2005.

In 2005 the number of agreements was not as comprehensive as the year before which included more than 2 million employees. This year 80 agreements (compared to 420 in 2004, were made encompassing nearly 1.3 million employees from the transport sector, parts of the construction industry, the bank and insurance sector and municipality workers (representing 1 million of the concerned employees).

The agreements regarding the municipalities were settled without conflict. The negotiations resulted in an agreement comprising the next 27 months, which is a relatively short compared to the private sector where many of the decided agreements were valid for 36 months or more. The reason why the public sector managed to decide on a shorter time period is due to the large amount of workers employed by municipalities and county councils (*Avtalsrörelsen och lönebildningen*, 2005).

¹⁹ Union density should be distinguished from collective bargaining coverage, meaning the scope of workers being included in the settled agreements while the former is equal to the proportion of unionized workers. Moreover, it is interesting to note that even though the Swedish employer is forbidden by law to discriminate non-unionized workers its union density is still higher than that in the UK.

4 Empirical approach

This section explains the methodology used in our study, starting with a motivation of our definition of the treatment and the control group, followed by a statement of the difference-in-differences estimation, and its necessary assumptions. We proceed by motivating the chosen robustness and sensitivity tests and conclude with specifying the OLS-estimation and a description of the used data sample.

4.1 Estimating the effect on low-wage workers

To estimate the impact of minimum wages on employment difference-in-differences (DiD) estimation will be used, performing a natural experiment with a treatment group and a control group. This use of this method is motivated based its frequent use in previous studies on the same subject.²⁰ It is also found to be most suitable to answer our research question and to correctly estimate the effect on a minimum wage increase on the aggregate level. With individual data covering a longer period of time it would have been interesting to look at the effects of the minimum wage on the individual level and instead doing time-series regression including further variables. However, with the data available for this thesis, the difference-in-difference estimation is assumed to be most appropriate.

This study examines a specific change in the minimum wages for municipality workers: an agreement between the union Kommunal and employer association SKL settling at the minimum level 15 000 SEK for municipal workers with a least upper secondary education. According to the National Mediation Office (*Avtalsrörelsen och lönebildningen*, 2004) this resulted in a total raise of 1000 SEK per month for educated workers hired at the lowest wage level.

The impact of the reform is estimated by comparing a treatment group (TG) and a control group (CG) between the years 2004 - 2006 and then 2003 - 2007. The first time period compares employment for the years immediately before, during and after the agreement. Since the wage was decided to be realized on April 1st 2006, the second period is added to account for potential lags. The treatment group consists of workers earning a monthly pay in the range 14 000 to 15 000 SEK. It is an appropriate interval as it will only include employees with at least a formal upper secondary education. This however constitutes the assumption that all employees with a monthly wage higher than 14 000 SEK have some kind of formal education and thus are comparable with employees in the slightly higher wage interval, the control group. The control group is of similar characteristics but earn a monthly wage between 15 001 and 16 000 SEK, ensuring that they are not affected by the treatment (i.e. the wage increase). Previous research used different ranges; Skedinger (2002) suggested using a control group of individuals earning 5 percent above the minimum, this range

²⁰ See Card and Krueger (1994) and Skedinger (2006).

would in our case however result in too few observations.²¹ Both groups are in the educated segment of the workforce, earning below the average wage²² and should therefore be comparable. The control group is used to exclude biases and trends caused by exogenous changes (e.g. demand and supply shocks) that might distort the results. The assumptions for validating this estimation are stated below.

Comparing the difference in employment changes for the two groups and calculating the “double difference” for the treatment and the control group generates a “difference-in-difference” estimation, showed in equation (8).²³

$$\hat{\delta}_1 = (\hat{Y}_{CG}^{06} - \hat{Y}_{TG}^{06}) - (\hat{Y}_{CG}^{04} - \hat{Y}_{TG}^{04}) \quad (8)$$

The table below shows the *DiD* construction for our sample.

Table 4. Construction of *DiD*-estimation 2004 to 2006

Year	Range		Difference
	14 000-15 000 SEK (TG)	15001-16 000SEK(CG)	
2004	\hat{Y}_{BG}^{04}	\hat{Y}_{CG}^{04}	$(\hat{Y}_{CG}^{04} - \hat{Y}_{BG}^{04})$
2006	\hat{Y}_{BG}^{06}	\hat{Y}_{CG}^{06}	$(\hat{Y}_{CG}^{06} - \hat{Y}_{BG}^{06})$
<i>Difference</i>	$(\hat{Y}_{BG}^{06} - \hat{Y}_{BG}^{04})$	$(\hat{Y}_{CG}^{06} - \hat{Y}_{CG}^{04})$	$\hat{\delta}_1$

If the estimation of $\hat{\delta}_1$ is different from zero it will show that the raise in minimum wages had an effect on employment, thus testing the hypothesis that $\hat{\delta}_1 = 0$ against the alternative $\hat{\delta}_1 \neq 0$, at a 5 % significance level.

Supplementary robustness tests will be performed by evaluating potential differences in employment effect between municipalities according their total employment size, divided into four quartiles. The total employment level for each municipality will also be used to perform a weighted least squares method (WLS). In addition to these tests further specifications accounting for trends and eventual leads and lags will be estimated. The trends in the treatment and control groups are expected to be the same, according to the *common trend assumption*²⁴ about natural experiments. The leads will indicate whether the wage increase was exogenous or not. Exogeneity must be assumed in order to be able to claim causality between wage increases and employment effects. The lags are

²¹ To be specific; our control group consists of individuals earning up to 6.67% more than the minimum wage.

²² The average wage for low-skilled municipality workers in 2003 – 2005 was 16 300 SEK, while the average wage for all Swedish workers was 23 300 SEK, according to the LO report: *Löner i kommuner och landsting* (2005).

²³ See more in Woolridge, J.M. (2006), “Introductory Econometrics – A Modern Approach”, 3rd edition, p. 456.

²⁴ Read more in Mostly Harmless Econometrics on p. 230 where the common trend assumption regarding Card and Krueger (1994) is discussed.

then added to estimate if the potential employment effect differs between 2006 and 2007. At last we will test our model by adding 2005 to the sample, again testing the leads, lags and trends.

Assumptions for natural experiments

(i) *The treatment (i.e. the increase in the minimum wage) is exogenous.*

It is reasonable to argue in the case for exogeneity since wages are determined on a national level and do not vary between municipalities and regions.

(ii) *The treatment and the control group are as similar as possible. The treatment should in fact be the only real difference between the two groups.*

The groups chosen in this study are in the same industry, both are in the low-wage segment (below the average wage) and with at least a formal education. Heterogeneity between the groups would distort the results. This also includes the *common trend assumption*.

(iii) *The control group is not affected by the treatment.*

Minimum wages are said to have an effect on total wage levels, which consequently influence the control group as well. This indirect effect can however be argued to be very limited since wages are rigid and change slowly over time (Skedinger, 2006)

4.2 Specification of OLS-estimation

Standard OLS and WLS-regressions are used to estimate the DiD estimate:

$$y_{it} = \beta_0 + \beta_1 treatment_{it} + \beta_2 after_{it} + \beta_3 treatment_{it} * after_{it} + u_{it} + \varepsilon_{it} \quad (9)$$

The estimated β_3 is the difference-in-differences estimate. Equation (10) is the model specified for our study. The variables of interest are *interval_1* and *after*. The dummy variable *after* equals 1 if the observation is after the wage increase and 0 otherwise. The dummy variable *interval_1* equals 1 if the observation belongs to the treatment group of individuals earning 14 000-15 000 SEK. The interaction dummy *interval_1*after* indicates if the observations are both in the treatment group and after the wage increase.

$$y_{it} = \beta_0 + \beta_1 interval_1 + \beta_2 after + \beta_3 interval_1 * after + \varepsilon_{it} \quad (10)$$

4.3 Data

The foundation of this empirical study is custom ordered data from *SKL*. This consists of panel-data from all Swedish municipalities, meaning 290 observations for each consecutive between year 2003 and 2007. We only choose to include full-time workers. To perform a natural experiment the observations are divided into two wage ranges, 14 000-15 000 SEK, and 15 001-16 000 SEK, which

means that the actual number of observations sum up to 2900. These observations include low-wage workers such as assistant nurses, child care-takers, recreation leaders and school cooks.

There should not be any missing observations and the employment figures are, according to *SKL*, highly accurate. Mistakes that might still occur would then be due to misreported classifications. Some municipalities might also not have finished their local wage negotiations and will therefore report last year's wage. The reports are made in November each year, stating the number of employees working that month. After the municipalities have reported their number of employees, the collection of data goes through a thorough inspection process at *SKL*, controlling the reasonability of the reported numbers and wage developments.²⁵

²⁵ Interview with Madeleine Eckervig, investigator at *SKL*, 01.04.2010 at 13:00-13:30.

5 Results and analysis

The results are presented in the following three tables; Table 5 presents year 2004 and 2006 while Table 6 presents the same specifications as in Table 5 but tests the years 2003-2004 against 2006-2007. Table 7 shows the trends, lags and leads tested for these paired years. Finally, presented in Table 8, we exhaust all possible interpretations by performing an additional sensitivity check including year 2005 in the sample.

The estimation of primary interest, β_3 , is presented in the third row as *DiD*. For specifications (I) – (VI) we use data from year 2004 and 2006, i.e. the years immediately before and after the wage increase. The stars presented after each estimate indicate their level of significance.

Table 5. Results of DiD-estimation, 2004 and 2006

Employed	(I)	(II)	(III)	(IV)	(V)	(VI)
<i>after</i>	-16.965* (8.101)	-3.902 (2.141)	-0.508 (1.109)	-2.789 (1.960)	-10.669*** (3.416)	-32.256* (12.779)
<i>interval_1</i>	-36.785*** (8.101)	-13.888*** (2.247)	-5.930*** (1.089)	-11.163*** (1.945)	-24.870*** (3.409)	-67.187*** (13.087)
<i>DiD</i>	23.986* (11.456)	7.223* (3.209)	2.818 (1.568)	6.541* (2.771)	16.461*** (4.831)	37.083* (18.073)
<i>Constant</i>	60.561*** (3.721)	21.732*** (1.589)	9.637*** (0.770)	16.764*** (1.375)	38.036*** (2.410)	10.197*** (0.645)

Note: *** $P < 0.005$, ** $P < 0.01$; * $P < 0.05$; where (I) are OLS p -values, (II)-(VI) are WLS p -values.

In general we get results with high significance ($p < 0.05$), and difference-in-differences estimates which are positive for all specifications. This implies a positive employment effect for the workers in the lowest wage segment after the minimum wage increase. So far the results seem to directly contradict the neoclassical prediction that a wage increase decreases employment.

Specification (I) is the basic, unweighted, model in equation (10). For specification (II)-(VI) we use WLS to account for potential heteroskedasticity. Specification (II) is weighted for the relative size of the municipalities, adding less weight to the observations with a larger error variance. The DiD estimate in (II) is smaller than in (I) but still with the same sign and significance. For the following specifications, (III)-(VI), the municipalities were divided into four different quartiles defined by total number of employees (in all wage levels) to see if the employment effect of the treatment group is dependent on municipality size²⁶. Specification (III) contains the quartile with the smallest municipalities and specification (VI) the quartile with the largest. The results show an almost linear relationship, with the employment effect as an increasing function of the municipality size. For the municipalities in the first quartile, presented in (III), the estimate is very small and insignificant,

²⁶ Here we define municipality size by total number of employees.

implicating that there was zero effect on the low-wage workers in the smallest municipalities. Since the aggregated estimates (I) and (II) are significant we reject the null hypothesis for the positive alternative at a 5 % significant level, for all groups except for small municipalities where the effect is undetermined.

The dummy variable *after* shows a decrease in employment in both the treatment and the control group between 2004 and 2006 (however not always significant). The variable for the treatment group, *interval_1*, shows that the treatment group generally has a lower employment level than the control group (even though employment in the treatment group increased after the minimum wage hike, as shown by the positive *DiD* estimate). For information about the employment levels in municipalities go to Appendix 1, which shows total number of employees 1981-2007.

In addition to the above regressions, robustness tests for years 2003-2004 against 2006-2007 were performed. For the following specifications the dummy variable *after* equals 1 for observations in year 2006 and 2007 and zero in year 2003 and 2004 creating an *after* and a *before* group.²⁷

Table 6. Results of DiD-estimation, 2003-2004 and 2006-2007

Employed	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
<i>after</i>	-53.903*** (6.348)	-23.086 *** (1.984)	-11.251*** (1.057)	-18.230*** (1.694)	-40.944*** (3.450)	-102.367*** (0.996)
<i>interval_1</i>	-53.872*** (6.348)	-23.595*** (1.982)	-11.551*** (1.067)	-19.690*** (1.663)	-39.716*** (3.427)	-103.618*** (10.853)
<i>DiD</i>	37.623*** (8.977)	17.315*** (2.806)	8.682*** (1.495)	14.873*** (2.396)	30.139*** (4.879)	70.075*** (15.149)
<i>Constant</i>	88.736*** (4.489)	35.864*** (1.402)	17.187*** (0.754)	28.420*** (1.176)	61.598*** (2.423)	165.078*** (7.674)

Note: *** $P < 0.005$, ** $P < 0.01$; * $P < 0.05$; where (I) are OLS *p*-values, (II)-(VI) are WLS *p*-values.

These results further confirm the outcome shown in table 5; positive effects on employment (*DiD* estimate) for all specifications and the large estimates imply that the effect was larger in 2007 than in 2006. In contrary to the estimates presented in table 5, where some of the estimates were insignificant at a 5 % level, all of these estimates are highly significant with $p < 0.005$. The reason for this could probably be explained by lags in the effects, delaying the change in employment another year. Since our estimates for these specifications are highly significant we can credibly reject the null hypothesis in favour of the positive alternative at a 1 % significance level, saying that the increase in

²⁷ Year 2005 is not included in the sample since we want to estimate to time periods, one before and one after the change.

minimum wages had a positive effect on employment. This result is consistent with earlier findings from Card (1992).

In addition to the difference-in-differences estimations, regressions using data for the same years as for specification (VII)-(XII) were conducted to account for trends and probable lags and leads.

Table 7. Results of trends, leads and lags estimations, 2003-2004 and 2006-2007

Employed	(XIII)	(XIV)	(XV)
<i>after</i>	56.783*** (19.887)	-53.849*** (6.360)	-16.458 (76.541)
<i>interval_1</i>	-27329.14 (17809.04)	-55.612 (76.782)	-16.433 (76.541)
<i>DiD</i>	-3.241 (28.124)	38.808 (77.046)	-7.776 (77.065)
<i>year</i>	-36.874*** (6.285)	----	----
<i>year_int1</i>	13.614 (8.889)	----	----
<i>constant</i>	73966.16*** (73996.16)	88.736*** (4.492)	51.239 (76.541)
<i>lag1</i>	----	----	16.051* (6.345)
<i>lag2</i>	----	----	29.508 (76.541)
<i>lead1</i>	----	1.003 (6.355)	----
<i>lead2</i>	----	1.240 (76.519)	----

Note: *** $P < 0.005$, ** $P < 0.01$, * $P < 0.05$ all are OLS p -values.

In specification (XIII), presented in the first column, two trend variables are included. One for both groups (*year*) and one trend for the treatment group only (*year_int1*). The estimate in front of *year_int1* is not significant and we can safely assume that the time trend in both treatment and control groups are the same, hence not violating the common trend assumption. Another thing worth noticing is that our *DiD* estimate is now negative (yet not significant) which contrary to our previous results implies that the previously shown positive employment effect on the treatment group was mainly due to the overall positive trend rather than the minimum wage increase. This finding should however be interpreted cautiously since the *DiD estimate* is not significant even at a 10 % level.

The specifications with leads (XIV) and lags (XV) further investigate the robustness and sensitivity of our performed natural experiment. The leads test for endogeneity and since none of these estimates are significant the wage increase can be assumed to be exogenous. The lags presented in the third column replicate the conclusions drawn from table 6; that the employment effect was greater in 2007 (*lag2*) than in 2006 (*lag1*). Due to the low significance of the lag estimates it is however difficult to draw viable conclusions from this regression.

To conclude the empirical estimations we will do the same specifications as in table 7 but where we have included year 2005 in the sample. It was excluded earlier to make sure that we had a clear natural experiment hence only looked at periods *before* and *after* the treatment, but it is also meaningful to check the sensitivity of the results to any assumptions and modeling choices imposed.

Table 8. Results with trends, leads and lags, 2003-2007 (all years included)

Employed	(XVI)	(XVII)	(XVIII)	(XIX)
<i>after</i>	-37.455*** (5.502)	-48.457*** (10.797)	-37.376*** (5.489)	-4.527 (7.310)
<i>interval_1</i>	-44.814*** (4.020)	-32551.79** (10589.09)	-26.418*** (6.936)	-11.913 (6.894)
<i>DiD</i>	28.565*** (7.780)	-12.058 (15.269)	6.941 (9.639)	-12.306 (9.601)
<i>year</i>	----	-34.316*** (3.736)	----	----
<i>year_int1</i>	----	16.221** (5.284)	----	----
<i>constant</i>	72.289*** (3.479)	68842.12*** (7487.619)	72.205*** (3.468)	39.300*** (5.969)
<i>lag1</i>	----	----	----	16.052* (5.948)
<i>lag2</i>	----	----	----	41.304*** (7.873)
<i>lead1</i>	----	----	6.422 (5.987)	----
<i>lead2</i>	----	----	-30.738*** (7.923)	----

Note: *** $P < 0.001$, ** $P < 0.005$, * $P < 0.01$ all are OLS p -values.

The first row shows the simple unweighted specification presented in both table 5 and 6. Comparing the tables show that there is not much difference when 2005 is added to the sample. However, the comparison shows that the *lead2* in table 8 is significant, while it was not in table 7. This indicates that the treatment could have been endogenous. It also indicates a difference

between the treatment group and the control group where the estimate in front on *year_int1* shows, that even if the overall employment trend is negative, the trend is “more positive” for the treatment group than the control group 2003-2007 (the estimate for *year_int1* is however not significant). This is against the common trend assumption stated at the end of section 4.1. Since it is not “clean” whether 2005 was before or after the wage increase, the results including 2005 could be skewed and conclusions should be drawn carefully.

All in all our results point to a rejection of H_0 in favour of the positive alternative, H_1 . The significance varies however between different specifications which makes it difficult to credibly conclude the validity of the positive estimations. Furthermore, as shown in specification (XIII), there is a more positive trend (however not significant) in employment for the treatment group while the control group shows a negative trend. As suggested by Card and Krueger (1994) this could indicate that employers are substituting part-time work for full-time work, based on the principle of substitution as described in section 2.3. Since our dataset only includes full-time workers, substitution could be a part of the explanation behind the positive employment effect shown by the estimations. Table 9 shows the amount of full-time and part-time workers between the years 2003 and 2007. Table 10 below shows that the number of employees going from part-time to full-time work increased by 38 percent.²⁸

Table 9. Full-time and Part-time employees 2003-2007

Year	Employees			
	Full-time	Change, %	Part-time	Change, %
2003	372 899		284 289	
2004	366 174	-1.80	282 287	-0.70
2005	370 078	1.07	283 831	0.55
2006	378 839	2.37	280 803	-1.07
2007	380 556	0.45	281 291	0.17

Table 10. Workers going from part-time to full-time

Year	Number of Employees
2004-2005	11 500
2005-2006	15 900

²⁸ The data is from the SKL report *Kommunal personal 2007* and can also be found in the appendix. Unfortunately it was not possible to find more numbers for table 9 including 2006-2007 which otherwise would have been valuable.

6 Discussion

This section is a discussion of the results presented in section 5. We start by relating our results to our hypothesis, previous research and theory, moving on to discussing potential biases of our estimates. We conclude by presenting practical implications for our results as well as suggestions for future studies.

The results from our empirical study show that there was an increase in employment following the increase in minimum wages for municipality workers, decided on the 1st of April, 2005 and implemented on April 1st, 2006. This contradicts our null hypothesis stating that the minimum wage increase would have no effect on employment. This emphasizes the importance of looking beyond the neoclassical labour economics, accepting a more complex relationship between minimum wages and employment.

The results of our thesis are in line with those of the prior studies which concluded that there is little evidence for the basic competitive model. Most of the previous studies have focused on the private sector in industries containing mainly low-income workers, such as the fast-food and restaurant industry. Our study distinguishes itself by looking at the public sector in a country without statutory minimum wages. We can nevertheless refer to the study by Gindling and Terrell (2009), which compared the effects of a minimum wage increase in Honduras for both its private and public sector, and found that there was a small fall in employment in the private sector, yet no change at all in the public sector. The similar positive results for the Swedish public sector that we present could find an explanation in the monopsony model. Since the municipality most often is the single largest employer in its region, it then can be likened to a monopsonist. Therefore (as argued in the model in section 2.4) the municipality probably has a margin between the actual and the competitive wage, giving room for wage increases up to the competitive level. This in turn increases the attractiveness of low-wage municipality work as well as the pool of potential employees (by exceeding more people's reservation wages), resulting in higher employment. This argument is also valid for the substitution model, where the increase in wages gives an incentive for part-time workers to instead choose full-time work. Yet it should be remembered that the ongoing debate in Sweden is not about lacking incentives to work full-time, but instead the opposite situation where most part-time work is involuntary, and rather a way for the employer to cut down on redundant work force²⁹. Still the substitution model is a useful tool for explaining the various increases in employment in several minimum wage studies, and somewhat fills the explanatory void left by the traditional and rather stilted models.

²⁹ A very recent example on the extremes of involuntary part-time work is the latest McDonald scandal exposed in Dokument Inifrån, 2010-05-16.

When discussing our results it is of course important to mention the possible difficulties in estimating an employment effect in Sweden. It has already been mentioned that there is a lack of studies conducted in countries with statutory minimum wages. Hereby it should further be said that these countries are more difficult to look at, since the minimum wage differs between sectors. Sweden is also exceptional with its high union density, making the workers relatively powerful against their employers. Hence a negative effect on employment might be more difficult to find. There are other labor market institutions making the Swedish labor market a more complicated subject of study. *LAS (The law about employment protection)*, is a good example of such an institution, which makes it very difficult for an employer in Sweden to fire an employee. This in turn, might also be an explanation for why we do not see a negative employment effect in Swedish municipalities.

In a further discussion of the validity of our results it should be mentioned that for the original model specifications, where the year 2005 is excluded, we can safely assume that we are not violating the assumptions mentioned in section 4.1. Table 7 shows that the trend in both groups is the same, according to assumption (i). With regard to the exogeneity assumption, our estimates in table 7 indicate that the minimum wage increase was exogenous; hence we can claim that none of the assumptions were violated.

When data for 2005 was added (in order to exhaust our data) to the sample in table 8, the estimate in front of *lead2* was significant. It is therefore worth noticing that the 2003-2007 regression showed a small indication of endogeneity of the treatment. The trend indicator for the treatment group is also significant for this sample, implying a violation of the common trend assumption. On the other hand, 2005 is not a suitable year to include since *DiD* estimations require a clear before and after period, hence we can still claim that we have not violated assumptions essential for natural experiments.

Another liability regarding the two experiment groups is the fact that they include aggregates and not individuals. We assumed the groups to be similar in the sense that they both contain at least upper secondary educated individuals in the lower income segment, i.e. they are both below the monthly average wage level (16 300 SEK) during the investigated periods. However we cannot account for specific changes made on the individual level, say, that after 2005 a certain municipality chose to pay some individuals in the treatment group more than the minimum of 15 000 SEK set by the collective agreement, hence extracting these individuals from the 14 000 – 15 000 SEK interval. This occurring at the same time as the minimum wage increase would lead to a negative bias – making it easy to assume a seemingly negative employment effect – while in reality people

were not fired but instead moved to a higher wage segment. However, since our results show a positive employment effect, such a negative bias rather enhances our conclusion – implying that our estimates are actually smaller than they should be. On the other hand, this argument could very well be claimed for the uneducated workers, paid the lowest minimum wage level of 13 800 SEK. It is just as probable that some municipalities would choose to increase their wages, and therefore adding them to our treatment group, resulting in a positive bias. These biases are however not detrimental to our conclusions, since wage structures are traditionally too rigid for such large increases outside the collective agreement.³⁰

6.1 Practical implications and ideas on future studies

The empirical evidence of this thesis contributes to the knowledge about the effects of minimum wage changes. It is essential for policy makers to know the expected effect of minimum wage hikes when discussing future wage levels for low-income workers. Moreover our results show that there is a positive relationship between municipality size and employment effect, meaning that the positive effect is greater in the larger municipalities. Hence, future wage negotiations between labour unions and employer associations will hopefully find it useful to lean against these results when discussing regional differences for the minima. Furthermore, if these conclusions are general they would be of importance also for statutory minimum wage countries, improving their ability to direct the minimum wage increase for optimal outcomes.

The fact that the available data sample was limited by its few variables, excluding important ones such as tenure, experience, gender, age and specific education level, makes it difficult to conclude how large the actual employment effect really was. It is recommendable for future studies to include such additional variables to decide the *pure* employment effect. It would likewise be interesting to use micro-data with long time dimension, to follow individuals over a period of time to ascertain how they were independently affected by minimum wage increases. This would also make it possible to evaluate further wage increases to see whether our results were incidental or if it is applicable to other increases of the same sort.

Since Gindling and Terrell (2009) see an indication of a discrepancy between the public and private sector in their study of Honduras, it is motivating to investigate if such results are replicable in other countries. If it could be generally proven that minimum wage increases have a positive effect on employment in the public sector, minimum wages could potentially play a role in decreasing unemployment and combating income inequality.

³⁰ Average real wages increased by 2.8% between 2005 and 2006, according to wage statistics from *The National Mediation Office*. Comparing this to the minimum wage increase of 7.14 % (from 14 000 to 15 000 SEK), it is unlikely that wages would be increased even further.

7 Summary

This thesis investigates the relationship between a minimum wage increase and changes in employment for municipality workers in Sweden between 2003 and 2007. The effect is estimated by performing a natural experiment comparing a treatment group of workers affected by the increase to a control group of unaffected workers. The results identify a positive effect for the aggregate employment levels after the minimum wage was raised in April 2006. The effects are stronger in the larger municipalities while almost nonexistent for the smallest quartile of municipalities.

Our findings argue against the argument against minimum wages (which claims that they actually worsen the situation for low-wage workers by increasing unemployment for this group). The shown results indicate that the increase actually had a positive employment effect and that the minimum wage is a potential tool for improving conditions for low-wage workers.

Overall our results contribute to recent studies which challenge the neoclassical models and their view of the labour market, emphasizing the complexity in foreseeing the effects of minimum wages. The results point to the need of more flexible models accounting for the numerous factors influencing employment.

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9 Appendices

Appendix 1. Total employed by the municipalities 1981-2007

År	Monthly employed			Hourly employed	Teachers et al. with public agreements	Total employed
	Full-time	Part-time	Total			
1981	203 500	159 700	363 200	134 400	141 000	638 600
1982	206 800	168 300	375 100	119 400	140 000	634 500
1983	218 100	178 000	396 100	111 200	139 000	646 300
1984	225 400	184 900	410 300	108 700	138 000	657 000
1985	220 900	206 600	427 500	97 200	137 000	661 700
1986	242 400	225 700	468 100	65 600	136 300	670 000
1987	246 700	227 300	474 000	65 200	137 400	676 600
1988	249 600	234 800	484 400	68 500	139 100	692 000
1989	256 100	231 300	487 400	68 000	144 800	700 200
1990	271 600	239 100	510 700	70 600	128 500	709 800
1991	376 100	257 500	633 600	76 700	..	710 300
1992	376 800	288 500	665 300	83 400	..	748 600
1993	362 500	282 300	644 800	81 400	..	726 200
1994	340 600	293 900	634 500	91 800	..	726 200
1995	354 800	303 100	657 900	91 900	..	749 800
1996	358 800	302 100	660 900	98 300	..	759 100
1997	347 315	285 597	632 912	101 750	..	734 662
1998	352 496	275 550	628 046	110 218	..	738 264
1999	359 443	276 005	635 448	117 474	..	752 922
2000	357 573	278 036	635 609	114 267	..	749 876
2001	363 974	278 723	642 697	117 020	..	759 717
2002	372 309	279 442	651 751	121 283	..	773 034
2003	372 899	284 289	657 188	117 488	..	774 676
2004	366 174	282 287	648 461	120 163	..	768 624
2005	370 078	283 831	653 909	121 196	..	775 105
2006	378 839	280 803	659 642	122 582	..	782 224
2007	380 556	281 291	661 847	121 463	..	783 310

Source: SKL, Kommunal Personal (2007).

Appendix 2. Minimum wage levels as defined by HÖK 05

Vocational upper secondary school [Yrkesförberedande gymnasieutbildning] with at least one year continuous employment:
15 000 SEK

Workers above 19-years without an education:
13 800 SEK

Appendix 2 above shows how the minimum level was defined in the collective agreement between SKL and Kommunal, called HÖK [Huvudöverenskommelse] or the *main agreement*.

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