ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Thesis Economics and Business: Policy Economics

The effect of an increase in the minimum wage on employment, consumer prices, profits and labor costs

Empirical evidence from Lithuania

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Abstract

In this thesis I evaluate the effects of the Lithuanian minimum wage increase in 2013 on employment, profits, monthly labor costs and relative consumer prices. To do so, I will discuss several theoretical and empirical papers about minimum wage legislation. In addition, I perform a difference-in-difference analysis using sector level data. I will use an OLS regression to see how trends on firm-level change after the implementation of the minimum wage. I will extend my analysis by testing whether regional differences occur in these trends. In addition, I will observe heterogeneous trends for firms with different level of market power. In Lithuania, firms in sectors with a large share of minimum wage workers are not affected when it comes to employment and labor costs. In contrast with existing literature about the minimum wage, profits increase and relative consumer prices seem to decrease more or increase less as an effect of the minimum wage increase.

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1 Introduction

In 2013, the Lithuanian monthly minimum wage was increased from 231.70 euros to 289.62 euros (Eurostat, 2022). Back then, Lithuania used their own currency, which was the Lita, until 2015, but for simplicity I will use the value in euros. This 25 per cent increase was the first nominal change in the monthly minimum wage since 2008.

Often, when the purchasing parity of low wage workers decreases, politicians and unions will demand higher minimum wages. Lately, this debate has risen in the Netherlands as well as a result of high inflation. Therefore, it is important to know what happens after the minimum wage has been increased. Will firms' profits fall? Will employment fall? or will consumer prices rise? To answer these questions, it is important to evaluate the effects of minimum wage increases, such as the one in Lithuania in 2013.

The aim of a higher minimum wage is to improve the purchasing parity of the minimum wage workers and that of the workers who are now earning below the new minimum wage. There are four groups of the population who might be affected by this policy change. First, it can be minimum wage workers, who might lose employment as a higher marginal cost of their labor might decrease demand for their labor. Second, it might be other workers in the same firm who are affecte, their wages might be lowered or less increased as this part of the budget for labor costs is now going to the minimum wage workers. Hirsch et al. (2015) found that the internal wage structure of firms became more compressed after new minimum wage legislation had been implemented. Third, the firms might be affected. Firms might choose to pay higher wages and lower their margins. Then, their profits would be lower as a result of the policy chagnes. Lastly, if firms choose to keep their margins equal despite their higher labor costs, they will increase their prices. In this caes, consumers are affected the most by the minimum wage increase.

The minimum wage increase in Lithuania has already been studied before. Šuminas (2015) studied changes in employment after the increase of the minimum wage. He found no significant positive or negative effect of the increase on employment. He admits that there might be other channels for firms to pay for the minimum wage, but does not investigate how these were used in the Lithuanian case. Another paper about this minimum wage increase is the one from Karpuškienė (2015). Rather than trying to find out in what way firms adapt to the new policy, she focuses on the macro-economic consequences, such as the competitiveness of the Lithuanian energy sector and labor market. Garcia-Luozao and Tarasonis (2021) described the statistics of the minimum wage over the years, but did not try to find a causal effect. In their paper, they identify the level of the minimum

wage compared to the average wage in the minimum wage and who the people are that are earning this minimum wage.

Bodnár et al. (2018) conducted research in which they used firm-level data from eight countries in Central and Eastern Europe including Lithuania. All these countries had increased their minimum wage in the previous years. The authors set out a survey in which they asked the firms what their response was to the recent increase of the minimum wage in their country. The results show that firms try to cut other non-labor costs, raise their prices or try to improve their productivity.

Existing papers, as described above, focus on the other effects of the minimum wage increase in Lithuania or use survey data or focus on different countries in a different context. Therefore, this thesis will add new insights to the literature by empirically measuring the effects of the increase of the minimum wage in Lithuania in 2013, by focusing on employment, labor costs, profits and consumer prices at the same time. Furthermore, it will observe heterogeneity among firms in sectors with large shares of minimum wage workers. This might be the basis for further literature about the different effects of minimum wage legislation.

This thesis will empirically assess the effect of the minimum wage increase on labor costs, consumer prices, profits and employment. This empirical analysis will be done using a difference-in-difference approach in which I compare sectors with a large share of minimum workers to sectors with a small share of minimum wage workers. Then, I will use an OLS regression to analyze the trends of the different variables on firm-level. Doing so allows me to compare the trends of firms in high wage regions to firms in low wage regions as well as firms with relatively much market power to firms with less market power.

The minimum wage increase in Lithuania seems to have no effect on labor costs, employment. This thesis finds some remarkable positive effects of the policy change on profits and negative effects on consumer prices. Furthermore, I find that the wage level in the region in which a firm is located is related to the number of employees a firm has. Moreover, a relationship between market power and employment and profits among firms in sectors with a large share of minimum wage workers will be visible as well.

This paper starts with an outline of the existing literature of the minimum wage. First, theoretical models about the effects of a minimum wage on different variables will be discussed, which will then be complemented by empirical papers which provide evidence for these models. After that, I will discuss the data I use as well as my empirical strategy. Then, I will discuss the results of my analysis and finish this paper off with a conclusion and a discussion.

2 Literature Review

2.1 The dynamics after a minimum wage increase

The minimum wage is a highly debated topic amongst economists. Most of the research has been focusing on the effect of the implementation of a minimum wage or an increase of the minimum wage on employment. Nevertheless, according to Stigler (1946), minimum wage legislation can effects on many more variables.

2.1.1 Effects in the competitive model

Stigler (1946) starts off with the basic textbook model with competitive wage determination. A minimum wage will increase the costs of employment, in this model, this will result in a situation where the value of the services of some workers will be lower than the minimum wage and these workers will be discharged. These workers might move to the informal sector, where they are expected to be less efficient. So, discharging workers will lead to a fall in aggregate output. Nevertheless, employees and employers might react differently to the legislation and improve productivity. According to this mechanism, employees will work harder as a result of the increased threat of employment. Next, employers might use different production techniques in order to increase the added value of the labor of their employees. If this is the case, minimum wage legislation might increase output in the competitive model.

2.1.2 Effects in the model with monopsonistic competition

Although the competitive model helps to understand mechanisms in the real world, there are economists who think that a monopsonistic model might be better to understand what happens after minimum wage legislation is implemented. According to Stigler (1946) and Dickens et al. (1994), in this model, the employer has control over the wage rate and sets this below the marginal productivity of his employees. In this case, increasing the minimum wage will increase labor supply and thus output will increase. Yet, it should be taken into account that the minimum wage should not be set too high as this would still lead to a decrease in employment and output. In their book, Card and Krueger (1995) agree that this model is more suitable. They argue that every firm has some sort of market power as consumers, firms and employees differ in physical locations. According to them, an increased minimum wage leads to higher labor costs and a higher market price of output. This happens either through a decrease in output, which mechanism is described above, or through producers who pass-through their increased labor costs in their prices. Card and Krueger (1995) state that increasing prices will lead to consumers switching to substitutes. This is being followed by firms going out of business until prices rise enough to restore profits to their “normal” level. In addition, they expect that every firm will raise its prices after an increase or the introduction of the minimum wage, this results in a smaller net reduction in demand for a particular firm. Yet, Card and Krueger

(1995) expect that firms will not be able to change their behavior immediately, so in the short-term of around 6 months, the increase in costs will be borne by firm-owners. In the long-run, the effect of an increase will diminish because of inflation.

2.2 Empirical evidence

2.2.1 Studies on the different effects of a minimum wage increase

Redmond and McGuinness (2021) evaluated the effects of the Irish minimum wage increase in 2016 by looking at employment and average labor costs, using a difference-in-difference approach. They find that the increase of almost 6 per cent resulted in increased labor costs and more hiring of full-time employees for firms with a relatively high-share of minimum wage workers. They also see that the results differ with the share of minimum wage workers of a firm. Harasztosi and Lindner (2019) assessed the minimum wage increase in Hungary in 2000. They find that workers lost their job, but that other workers saw their wage increase. The firms paid for these increased labor costs by higher output prices. They also find that labor was substituted by capital and that profits decreased. They conclude that consumers were the main group paying for the minimum wage. The latter was also found by Barry et al. (2015), they studied minimum wage increases in Georgia and Alabama by looking at restaurants. They found that employment effects vary strongly between firms and that, indeed, prices were raised. Contrary to Harasztosi and Linder (2019), did they not find evidence for lower profits as profit margins could be retained. Another paper that found price increases as a response to a minimum wage increase, is the one by Aaronson et al. (2008) who assessed restaurant prices after a minimum wage increase in the United States in 1996. They find that a ten percent increase in the minimum wage leads to consumer prices increases between 0.32 and 1.55 percent. Where the likelihood of a price increase is larger for low service restaurants, as these are more likely to pay minimum wages. Moreover, they see that prices only rise in affected sectors as prices in sectors like housing and medical care do not change. Contrary, Lemos (2008) finds no evidence of price changes after comparing a hypothetical situation with a one hundred percent pass-through with the real situation. As she does not find any effect, she states that the price effect of a minimum wage depends on inflation.

Derenoncourt et al. (2021) found no employment effect of the minimum wage increase in Brazil, where the minimum-median wage ratio rose from 30 to 50 percent between 1999 and 2009. This suggests that from the options from firms to react, as described by Stigler (1946), firms are more likely to improve productivity rather than to decrease employment. This seems plausible as Derenoncourt et al. (2021) fail to find a significant reallocation of labor from the formal to the informal sector. Card and Krueger (2000) neither managed to find a negative employment effect when studying fast food restaurants in two states in the United States after a minimum wage

increase. What's more, they even found a positive employment effect in New Jersey, where the minimum wage was increased. This increase in employment went hand in hand with an increase in consumer prices, which is in line with the previously discussed papers.

Consistent with the literature that firms let their consumers pay for the minimum wage by raising their prices is the study of Pacheco and Naiker (2006). They carried out an event study to test whether news events which impacted investors' expectations about a probable minimum wage. They found no effect of the news events on the share price of firms which would be relatively much affected by the new legislation. So, they state that a minimum wage does not impact expected profits. Nevertheless, Hirsch et al. (2015) used survey data to assess firms' responses to minimum wage increases in Georgia and Alabama. They find that non-minimum wage workers would get smaller wage raises, which is called internal compression. In contrast with the Pacheco and Naiker (2016) study, they see that firms' profits decrease after a minimum wage increase, yet managers tell them that in better economic circumstances, they would be able to offset the increased labor costs by other costs.

2.3 Minimum wage legislation as a tool for redistribution

Reason for governments to introduce a minimum wage are more mostly equity reasons. They want to support low wage income families and do so by forcing firms to increase the wages. In addition, in times of decreasing purchasing power, unions and opposition parties demand higher minimum wages. Yet, in the economic literature, there is no consensus that a higher minimum wage is the best way to support the poor. MaCurdy (2015) investigated to what extend the minimum wage effective is in supporting the poor by using data from the United States. He sees that the minimum wage increases labor costs and thus consumer prices, but that there is not much evidence that a minimum age reduces profits. This would mean costs of an increased minimum wage are borne by consumers and not by firm owners. This increases the efficiency costs of minimum wage legislation. Stigler (1946) adds to this by stating that it is impossible to set a minimum wage at the optimum level, as this optimum is influenced strongly by several factors, such as time, firm and workers. Moreover, he does not think that the minimum wage is an effective way of solving the problem of poverty. A minimum wage supports every person in the same way, no matter the level of family income. Therefore, a minimum wage is not efficient according to the principle of equity says Stigler (1946). This is supported by the data from MaCurdy (2015). In his paper, it shows that the share of minimum wage workers is as good as equal across all family income quintiles and that less than 20 percent of the workers affected by a minimum wage increase had a family income below the poverty threshold. Moreover, he states that prices might also rise in non-affected sectors as a result of more expensive intermediate goods. So, a minimum wage might only help high income families,

whereas low-income families might only pay for it due to higher prices. For these reasons, both MaCurdy (2015) and Stigler (1946) do not recommend the minimum wage as an instrument for redistribution as it is not well targeted.

3 Institutional Background

3.1 The minimum wage in Lithuania

In the beginning of 2008, just before the global crisis, the Lithuanian monthly minimum wage was increased to the equivalent of 232 euros in 2013. Then, in October of 2012, the Social Democratic Party won the elections and promised an increase in the minimum wage. That same month, the monthly minimum wage was increased with 6.25 percent and after that it was increased to 289.60 euros. So, in three months' time, the monthly minimum wage rose with 25 percent after being constant for almost five years. This increase meant that the minimum-median wage ratio rose from 38 to 44 percent (OECD, 2022). In the meantime, the monthly minimum wage in Lithuania has increased further to 730 euros.

In 2012, 8.9 per cent of the employees in Lithuania earned the minimum wage or less. There was large variation across sectors in the share of employees earning the minimum wage. As can be seen in table 11.1 in the appendix, in NACE Rev. 2 sector I (accommodation and food service activities), near a quarter of the workers earned the minimum wage back in 2012, whereas in sector D (Electricity, gas, steam and air conditioning supply, just over one out of hundred employees earns the minimum wage or less. So, this shows that the minimum wage increase will have a different impact on different sectors, as it will be much more binding for sectors with a large share of minimum wage workers. Therefore, this data will be used to determine which sectors and thus which firms are in the treatment and control group.

Not only is there variation in wages across sectors, but it is also present between the ten different counties Lithuania has. As can be seen in table 11.2 in the appendix, the wages in Vilnius County, where capital city Vilnius is located, are significantly higher than in the rest of the country. The average wage level per county is noted as percentage of the average wage in the country. Vilnius is with 114 percent, the only county that has an average wage which is higher than the average wage.

3.2 Economic circumstances in Lithuania

In 2012, Lithuania was still recovering from the consequences of the financial crisis. According to Račickas and Vasiliauskaitė (2010), real estate and stock market bubbles emerged prior to the financial crisis in 2008 due to rapid expansion of the lending volume. This in combination with external factors caused that Lithuania was largely hit in the first hit of the financial crisis. In 2009,

their real GDP decreased with 14.8 percent, which is more than three times as large as the decrease in the European Union as a whole, where total GDP decreased with 'only' 4.8 percent (OECD, 2022). In 2012, Lithuania's real GDP was back on the level it had before the crisis (Statistics Lithuania, 2022). A similar pattern is visible when looking at the unemployment rate, which had decreased from over 12 percent to just over 4 percent in the five years before the crisis. Yet, in 2010 the unemployment rate in Lithuania peaked at 17.8 percent (OECD, 2022). In 2013, unemployment was still at 13 percent. Again, the peak in the whole European Union was lower, namely at 11.5 percent, so as concluded by Račickas and Vasiliauskaitė (2010), Lithuania was severely hit by the credit crisis of 2008. Yet, their economy was recovering when the minimum wage was increased.

4 Data

4.1 Data sources

To estimate the effects, I make use of data from two databases. I will use the national statistical database from Lithuania, which is called Statistics Lithuania. From this database I can retrieve data about the level of the minimum wage from 2008 until 2016. This source also provides sector specific information, which are: share of workers earning the minimum wage, indexed wages, consumer price indices, earnings per region on municipality and county level and labor costs per month worked.

The financial database of Orbis gives access to financial data from 96,422 Lithuanian firms between 2013 and 2016. Their dataset allows me to select firms based on their sector. Moreover, I can retrieve data about firms' number of employees, gross profit, profit margin, sales and the region in which its activities take place. If data is labelled with, for example, 2013, this means that in case of a variable from the balance sheet, it has been measured at the 31st of December in 2013. For data from the profit and loss account, this means data has been measured over the year 2013. Both Statistics Lithuania and Orbis use the NACE Rev. 2 standard to classify their sectors.

4.2 Treated and control groups

The treatment and control groups are defined by the share of minimum wage workers that was present in a sector in 2012. The share of minimum wage worker per NACE Rev. 2 sector is retrieved from Statistics Lithuania and presented in table 11.1 in the appendix. The treatment group consists of the four sectors which have the largest share of minimum wage workers. These are: Accomodation and food service activities; Other service activities; Wholesale and retail trade, repair of motor vehicles and motorcycles and Real estate activities. Likewise, the control group will be constructed using data from the four sectors with the lowest share of minimum wage workers with enough data available. As Statistics Lithuania does not have enough data from the two sectors

Financial and insurance activities and Public administration and defence; compulsory social security, these sectors are left out of the control group. This means that the control group consists of the following sectors: Mining and quarrying; Human health and social work activities; Water supply, sewerage, waste management and remediation activities and Electricity, gas, steam and air conditioning supply. The consumer price index is the only variable where Statistics Lithuania does not use the NACE Rev. 2 classification as the CPI is classified by the COICOP standard. Therefore, I used the correspondence tables from UNStats (2022) to see compare the two standards. I calculated which sectors which COICOP sectors corresponded with the most subsectors of the NACE Rev. 2 classification in order to calculate which COICOP sectors should be in the treatment group. This resulted in a treatment group consisting of the following sectors: Hotels and restaurants; Furnishings, household equipment and routine maintenance of the house; Transport and Education. The control group consists of three sectors: Food and non-alcoholic beverages; Housing, water, electricity, gas and other fuels and Food.

Choosing the four sectors at both ends of the distribution of shares of minimum wage workers ensures that the control group is not or only little affected by the minimum wage increase. Using all sectors, and comparing sectors above the median with sectors under the median would not ensure this as in the middle of the distribution, the size of the shares are very close to each other, so it would be a much stronger assumption to state that only sectors in the treatment group are affected by the new minimum wage legislation.

4.3 Outcome variables

In my empirical analysis, I will use four different outcome variables. The first one is full-time equivalents (FTE's). This variable denotes the total number of hours worked divided by the standard number of hours in a fulltime schedule in a sector in a certain year and sector. The second outcome variable is net profits. This variable denotes the average net profit or loss of firms in a certain sector had in a specific year. Net losses are presented with negative values. The third outcome variable denotes the average monthly labor costs of one FTE in a certain sector. This variable is measured in euros and consists of both wage costs as other costs related to labor. The last outcome variable is the consumer price index (CPI) of a sector. As described above, this variable is classified in a different, yet comparable standard. The CPI shows how prices evolve relative to their base year. In my dataset, the base year is 2015, which means that the CPI equals 100 for all sectors in the year 2015. A value of 105 means that prices in that sector are 5 per cent higher than in 2015.

4.4 Other variables

In my heterogeneity analysis, I will use the variable *profit margin* to determine whether a firm has a low, normal or high level of market power. A firm's profit margin has been measured in 2013 and has been retrieved from Orbis. The profit margin is measured as a percentage and denotes the share of sales that adds to the firm's profit. It can be calculated by dividing gross profit by operating revenue.

4.5 Descriptive statistics

Table 4.1 Descriptive statistics of the control and treatment group

	Control group		Treatment group	
	N	Mean	N	Mean
Sales	11,474	3,620,108.3	95,592	2,783,116.1
Number of Employees	25,818	36.641	193,874	10.707
Operating Revenue	17,481	2,483,704.9	164,065	1,725,991.3
Gross Profit	10,406	1,251,289.5	85,455	520,802.03
Cost of Goods Sold	8,233	3,384,218.5	77,108	2,756,576.2

Sales, operating revenue, gross profit and cost of goods sold are measured in euros

Table 4.1 shows the descriptive statistics of different financial indicators in the control and treatment group. It shows, that there are significantly more observations in the treatment than in the control group. This can be explained by the fact that the control group consists of sectors in which companies are relatively large, such as the electricity, gas and water suppliers, insurance companies and firms in the financial sector. Contrary, the treatment group consists of relatively small firms, such as restaurants and retailers. The descriptive statistics in table 4.1 confirm that the companies in the control group are larger than in the treatment group. On average, treated companies have less employees, sales and operating revenue. Moreover, gross profits are lower in the treatment group as well as the cost of goods sold, although differences in the cost of goods sold could also be explained by differences in the nature of the activities of firms in the control and treatment group.

5 Empirical Framework

5.1 Difference-in-difference framework

To identify the effects of the minimum wage increase, I will carry out multiple difference-in-difference analyses. By using this methodology, I will compare the changes in the dependent variables of firms in different sectors in Lithuania after the increase of the minimum wage. To perform a difference-in-difference analysis, it is important that without treatment, the difference between the treated and the untreated group would not have changed. If this is the case, the trend of the control group after the treatment is a valid counterfactual. Therefore, I assume that, without treatment, both the control and treatment group have the same trends. I will use the four years before the implementation of the higher minimum wage to test this assumption and calculate the effects for four years after the implementation. This means that the observed period is from 2008 until 2016. I observe only four years after the policy change because the minimum wage has been increased more during this period, so it would be difficult to distinguish whether changes in later periods are due to the policy change of 2013 or if they are the result of later policy changes. The equation of the difference-in-difference analysis will look like this:

$$Y_{i,t} = \beta_0 + \beta_1 * Post + \beta_2 Post_t * Treatment_{i,t} + \beta_3 * Treatment + a_i + a_t + e_{i,t} \quad (1)$$

In this equation, $Y_{i,t}$ is the value of the dependent variable of sector *i* in period *t*. I will use four different dependent variables, which are: the number of employees; the average monthly labor costs per employee; the logarithmic value of gross profits and consumer price indices). The coefficient of interest is β_2, which shows the difference in outcome for firms in affected sectors compared to less or not affected sectors after the increase of the minimum wage. $Treatment_{i,t}$ is a dummy which equals 1 if sector *i* is in the treatment group and 0 if the sector is in the control group. $Post_t$ is a dummy variable which equals one for years after 2013 and zero for all other years. To control for sector-specific invariant factors, I add a_i which denotes sector fixed effects. Lastly, a_t denotes year fixed effects to control for the time trend.

5.2 Ordinary least squares framework

After performing the difference-in-difference analysis, I will also analyze the effects using the firm-level data from Orbis. In this analysis I will analyze how the profits and employment from Lithuania firms behave after the implementation of the minimum wage. To do so, I will use an ordinary least squares (OLS) regression in which I compare the average levels of gross profits and the number of employees per year in the treatment group to those of the control group. This is done using the following equation.

$$Y_{i,t} = \beta_0 + \beta_1 * Treatment_i * Year_t + \beta_2 * Treatment_i + a_i + a_t + e_{i,t} \quad (2)$$

In this regression, $Y_{i,t}$ is the dependent variable, which shows the number of employees or the gross profit of firm *i*, in year *t*. $Treatment_i$ is a dummy variable which equals one for firms in treated sectors. $Year_t$ denotes a set of dummy variables for the years 2013 until 2016. In this regression, β_1 , which denotes all coefficients for the treatment variable, is the variable of interest as it shows how the size of the average difference in the dependent variable between the control and treatment group behaves from 2013 until 2016. As the coefficient for 2013 will be left out because of collinearity, the coefficient will show how the gap between firms in the treatment and control group changes in 2014, 2015 and 2016 compared to the existing gap in 2013. To control for time-invariant variables such as legal form and share of full-time workers and time trends, firm and year fixed effects are covered by a_i and a_t respectively.

5.2.1 Heterogeneity analysis

Considering that wage levels differ strongly between regions, as discussed in the data section. It seems plausible that the minimum wage increase might be more binding in rural areas with lower wages than in the county of the capital city, Vilnius County. Therefore, I will perform a heterogeneity analysis in which I will compare the effects of the minimum wage on employment and gross profits for different counties. To do so, I will add an interaction variable to the OLS regression. This will be an interaction variable with *Region* which equals one if the firm is located in a county with high wages. The regression will look like this:

$$Y_{i,t} = \beta_0 + \beta_1 Post_t * Year_t * Treatment_i * Region_i + \beta_2 * Treatment_i + \beta_3 * Region_i + a_i + a_t + a_{i,t} + e_{i,t} \quad (3)$$

I will run this regression twice for each dependent variable. In the first regression, *Region* will only equal one for firms in Vilnius county. In the second regression *Region* will equal one for firms in the three counties with the highest wages, which are Vilnius county, Klaipėda county and Kaunas county. The results of these regressions will show how the gap between treated firms in high wage regions changes from 2014 until 2016 compared to the existing gap in 2013. The *a*-variables denote fixed effects on firm and year level as well as fixed effects for the interaction of *year* with the variables *region* and treatment.

Another variable that might impact the results, is the market power that firms have. This can be derived from the fact that employment would theoretically decrease in a market where firms have no market power but would increase in a monopsonistic market. An indicator for market power is a firm's profit margin. If a firm has much market power, it can allow itself to add a larger mark-up to their variable costs without losing revenue. Therefore, I will perform a heterogeneity analysis to my results in which I analyze whether the dependent variables of firms with a larger profit margin, and thus relatively much market power, have different trends than firms with less market power.

$$Y_{i,t} = \beta_0 + \beta_1 * Year_t * Treatment_{i,t} * Region_i + \beta_2 * MinWage + \beta_3 * ProfitMargin_i + a_i + a_t + e_{i,t} \quad (4)$$

The dependent variables will, as in all firm-level OLS regressions, be the (logarithmic value of) the number of employees and gross profit of firm *i* in year *t*. In this regression, I will create the categorical variable $ProfitMargin_i$ which denotes whether a firm's profit margin was negative, normal or relatively high in 2013. Based on the distribution of profit margins which can be seen in graphs 11.1 and 11.2 in the appendix, firms will be placed in the category with high profit margins if their profit margin in 2013 was higher than 6 percent.

5.3 Parallel trend assumption

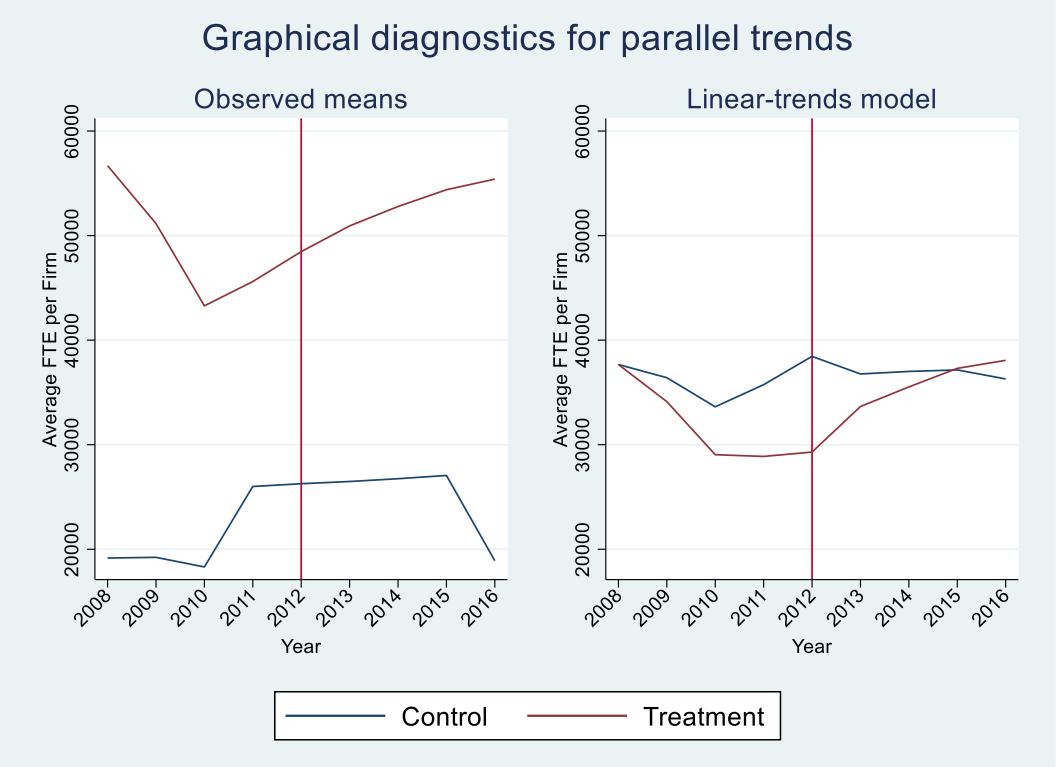
While performing a difference-in-difference analysis, it is assumed that the control and treatment group have similar trends. I test whether the parallel trends assumption holds by comparing the trends of the dependent variables prior to the implementation of the new minimum wage. I use the aggregated data from Statistics Lithuania to test the trends of the consumer price indices, monthly labor costs, full time equivalents and net profits.

I have made several graphs to test the parallel trend assumption, these graphs represent the means of the collapsed values of the used sectors derived from the Statistics Lithuania data. For every dependent variable, I constructed two graphs. The first on, on the left of each figure, shows how the average values over time for the two groups. The second graph, on the right-hand side of the figure, shows the linear-trends model. In this graph, interactions of time with an indicator of treatment are added to the model. So, this plot shows the predicted values of this model for both the treatment and control group. The vertical line in all graphs shows the timing of the treatment. In the graph, the blue line represents the control group and the red line represents the treated group. In addition to the graphical analysis of the trends prior to the treatment, I also statistically tested whether the treatment and control group had similar trends. This parallel trends test examines null hypothesis that the treatment and control group have similar trends. The results of the parallel trends tests of all regrssions are presented in table 11.3 in the appendix.

5.3.1 Employment

I have graphically tested the parallel trend assumption for employment by comparing the number of full time equivalents (FTEs) in the treatment and control group. This resulted in the following graph:

Figure 5.1: FTE trends of treatment and control group from 2008 until 2016 in Lithuania

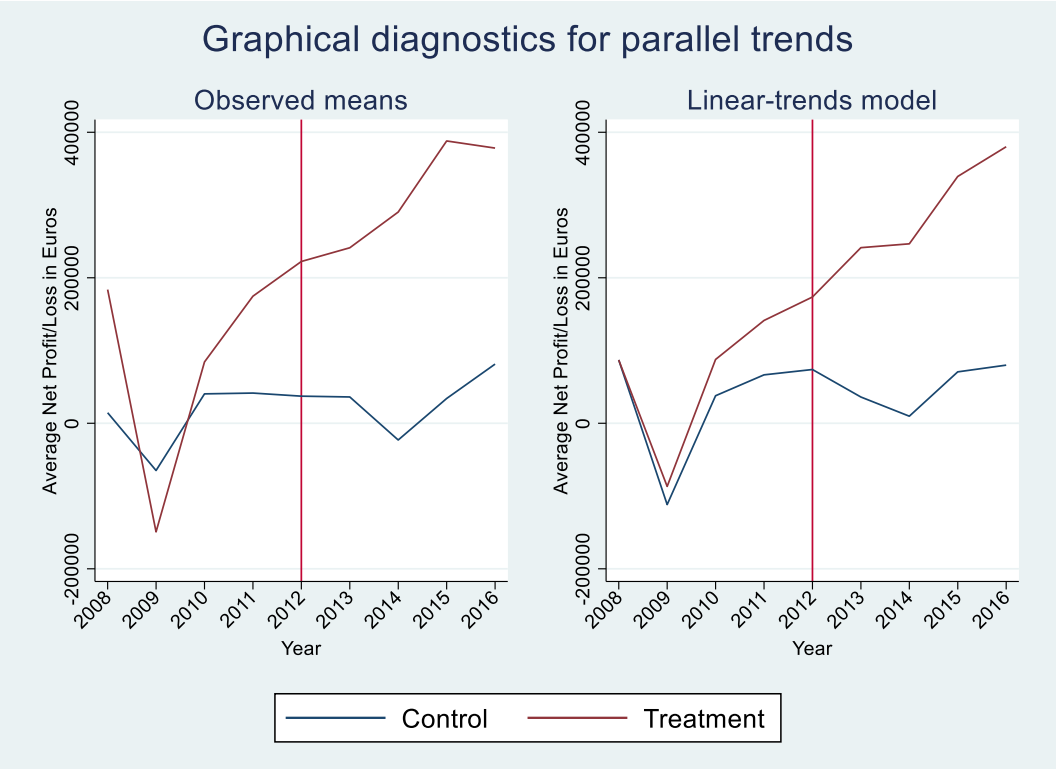


In the graph on the left, a large difference between the absolute values of the treatment and control group is visible in the graph on the left. Yet, the plots seem to follow somewhat similar patterns as they decrease before 2010 and rise in the years after 2010. When time trends are added in the Linear-trends model, both trends seem to be even more similar. This is also supported by the parallel trends test which gives a p-value of 0.228, so the null-hypothesis that trends are parallel cannot be rejected.

5.3.2 Net profit

Next, I graphically analyzed the trends of the average net profits or losses from both the control and treatment group. These plots are being shown in figure 5.2.

Figure 5.2: Net profit trends of treatment and control group from 2008 until 2016 in Lithuania

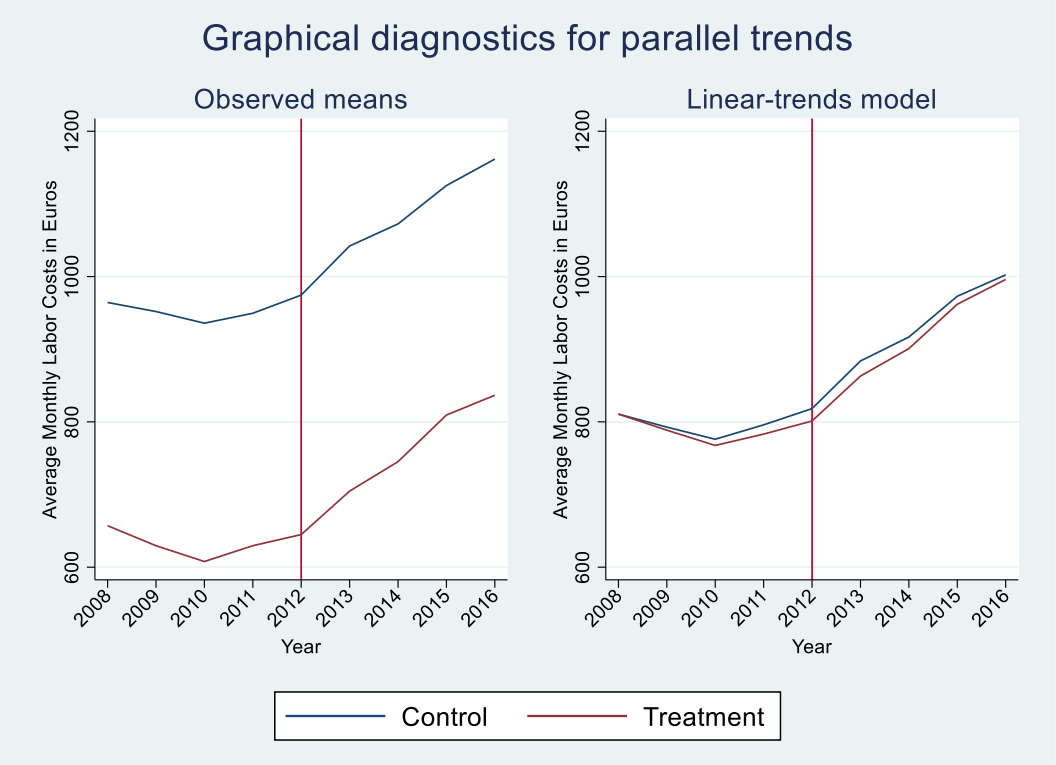


These graphs shows that before 2010, the trends of the treatment and control group behaved in similar ways, but that the absolute changes in the treatment group were larger than those of the control group. Nevertheless, when time trends are added in the Linear-trends model, the treatment and control group seem to follow similar trends. This is supported by the parallel trends test which has a p-value of 0.259, so the hypothesis that the trends are similar cannot be rejected.

5.3.3 Labor costs

Figure 5.3 shows the graphical analysis of both groups' trends regarding the average monthly labor costs.

Figure 5.3: Monthly labor costs trends of treatment and control group from 2008 until 2016 in Lithuania

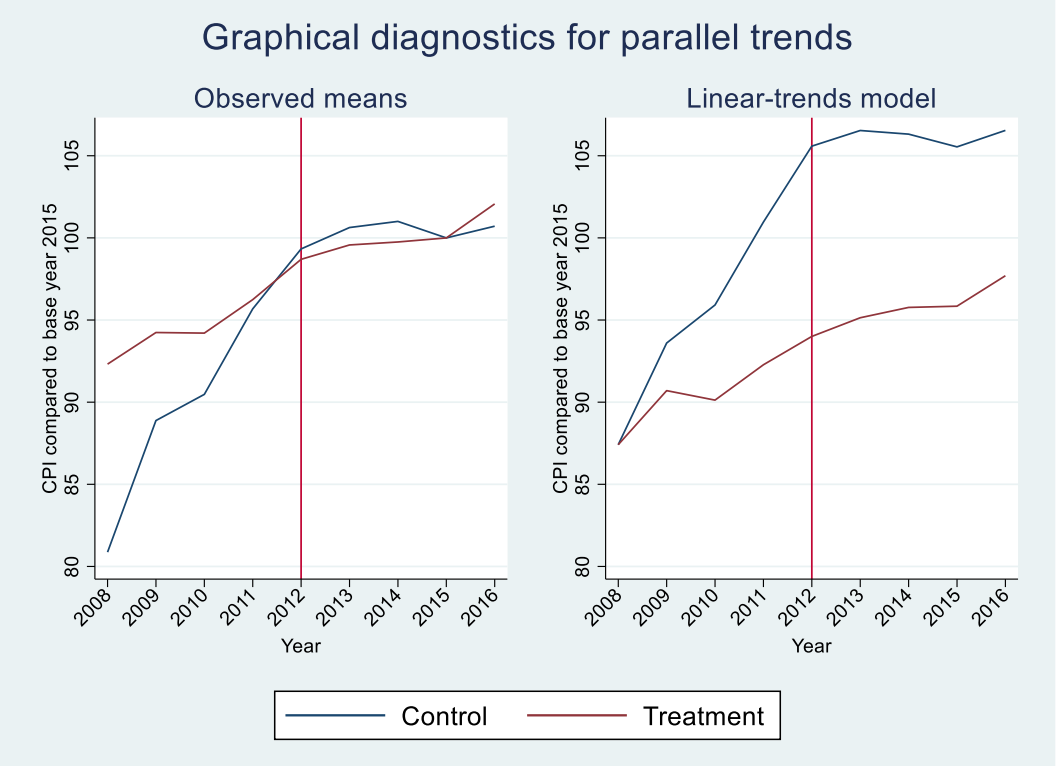


This graphs shows a decreasing trend before 2010 and an increasing trend after 2010 for both the treatment and control group. These parallel trends are even better visible in the Linear-trends model. The outcome of the graphical analysis can be backed by the statistical analysis as the p-value of the parallel trends test equals 0.674.

5.3.4 Consumer prices

The effect of the minimum wage on consumer prices in this thesis are calculated using the consumer price index (cpi). As mentioned in the data section, my control and treatment groups are slightly different compared to those in the previous analyses as the sectors for the cpi are defined by a different classification than the NACE Rev. 2 classification. Figure 5.4 shows the cpi trend for both the control and treatment group. The cpi is relative to the base year 2015.

Figure 5.4: CPI trends of treatment and control group from 2008 until 2016 in Lithuania



The two plots do not seem to follow similar trends as the cpi of the control group increases sharper than the treatment group's cpi. This cannot be solved by adding time trends in the Linear-trends model. Nevertheless, the p-value of the parallel trends test equals 0.104, so we cannot reject the null-hypothesis at the 90% significance level.

6 Results

6.1 Results from the difference-in-difference analysis

In this section, I will discuss the results of my statistical analysis. I start off with the results from the difference-in-difference regression on sector level. Thereafter, I will use an OLS regression on firm-level to observe different trends. This firm-level data will also be used to perform a heterogeneity analysis in which I analyze the role of market power and regional differences between firms.

Table 6.1 Results from the four difference-in-difference regressions of the policy change

	(1) FTE	(2) Net profit	(3) Monthly Labor Costs	(4) CPI
Post*treatment	3,915.493	148,432.73*	-4.976	-4.332*
	(2,799.162)	(90,101.841)	(20.73)	(2.316)
Treatment	30,359.761	63,104.9	-321.43***	4.092
	(37,754.204)	(103,030.63)	(112.38)	(3.119)
Observations	80	72	72	756
Year fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*
Net Profit and Monthly labor costs are measured in euros and are averages within the treatment and control group. Monthly labor costs is the average cost per monthly FTE.
CPI has been measured relative to the base year 2015.

Table 6.1 shows the results of the difference-in-difference regressions I performed. The number of observations differs per regressions as Statistics Lithuania split up sectors in subgroups for the FTE data. The number of observations is higher for the CPI regression because this data was given in months unlike the other data which was given in years.

Column (1) shows the result of the difference-in-difference regression on FTE. The results show that the treated sector's employment rose after the increase of the minimum wage, nevertheless there was no statistically significant effect on the 10 percent significance level. So, from this data, we cannot conclude that employment is affected by a minimum wage increase.

In column (2), I present the results from the difference-in-difference regression on net profits. The results show a statistically significant effect of the minimum wage increase on net profits on the 10 percent significance level. The results imply that on average firms in the treated sectors saw their net profit increase with 148,432 euros more than firms in the control group as an effect of the minimum wage increase.

The results of the difference-in-difference regression of the minimum wage on average monthly labor costs are presented in column (3) of table 6.1. I did not find a statistically significant effect of the increased minimum wage the average monthly labor costs.

Column (4) of table 6.1 shows the results of the diff-in-diff regression of a the minimum wage increase on the consumer price index. The results show that the minimum wage increase had a negative effect on consumer prices. The coefficient implies that relative consumer prices in the treatment group were 4.332 percentage point lower as a result of the minimum wage increase. This coefficient is statistically significant on the 10 percent significance level.

6.2 Results of the OLS regression

As described in the empirical framework, I performed an OLS analysis using panel data on number of employees and gross profits. The results of these regressions are being shown in table 6.2. As the policy came into effect in 2013, the coefficient of *2013* show the size of the difference between the treatment and control group in 2013. The coefficients of the interaction variable between the year dummy variables and the treatment variable show how this difference changed in the years after the minimum wage increase.

Table 6.2 Results from the OLS regression analyzing trends after the minimum wage increase

	(1) Number of Employees	(2) Ln Number of Employees	(3) Gross Profit
Treatment	-23.775***	-.432***	-1,153,857.2**
	(3.446)	(.028)	(555,013.06)
Treatment * Year			
2014	-.088	-.031***	-1,086,731.8*
	(.239)	(.007)	(614273.4)
2015	-.393	-.048***	-14,522.79
	(.374)	(.009)	(454,140.07)
2016	-.812*	-.073***	199,265.26
	(.438)	(.011)	(278,036.09)
Observations	127,894	127,894	21,531
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Number of employees in absolute number, Gross profit is in euros, measured in the calendar year

Column (1) of table 6.2 shows the results of the OLS regression on the number of employees. The coefficient of *Treatment* means that firms in the control group had on average almost 24 less employees than firms in the control group. The results show that in the first two years after the increase of the minimum wage, there was no statistically significant change in this gap between the treatment and control group. Nevertheless, this gap seems to have increased by 0.812 employees in 2016, although this coefficient is only significant at the 10 percent significance level.

Then, in column (2) I analyzed the number of employees for the treatment and control group again, but now I used logarithmic values. The results show that the relative trends of the number of employees differs across the two groups. The number of employees in the treatment group decreased more or increased less in 2014, 2015 and 2016. So, the gap in the number of employees increased gradually to 0.07 percentage point during these three years compared to 2013.

Column (3) of table 6.2 shows the same regression as column (1), but in this regression Gross Profit is being used as the dependent variable. The coefficients show that in 2013, firms in the treatment group on average had a gross profit which was 1.1 million euros lower than that of firms in

the control group. This gap was even larger in 2014, where it grew with just over 1 million euros, this finding is statistically significant at the 10% significance level. Yet, this gap seemed to have only lasted for one year, as I failed to find a statistically significant difference compared to 2013 for the years 2015 and 2016.

6.3 Regional heterogeneity analysis using an OLS regression

Table 6.3 shows the results of the OLS regression that evaluates whether the employment and profits of firms in regions with relatively high wage levels have different trends compared to the rest of the country. I performed this heterogeneity analysis only for the dependent variables *Number of Employees* and *Gross Profit,* as the aggregated data from Statistics Lithuania did not allow to separate results for different counties. In column (1), (3) and (5) the dummy variable *HIghWageRegion* equals 1 for firms in Vilnius County. In column (2), (4) and (6) the same dummy equals 1 for firms in Vilnius County, Klaipėda County and Kaunas County.

Table 6.3 Results from the OLS regression analyzing heterogeneous trends for treated firms in high wage regions

	(1)	(2)	(3)	(4)	(5)	(6)
	Number of Employees	Number of Employees	Ln Number of Employees	Ln Number of Employees	Gross Profit	Gross Profit
Treatment	-23.858***	-23.726***	-.418***	-.422***	-1,178,414**	-1,138,441**
	(3.4)	(3.434)	(.028)	(.028)	(549,143.04)	(532,568.9)
Region * Year (Treatment = 1)						
2014	.729	.475	.019	.053***	-374,351.3	-801,633.26
	(.544)	(.569)	(.016)	(.015)	(1,538,530.5)	(1,100,423.5)
2015	.518	.099	.047**	.083***	958,962.54	48,489.087
	(.786)	(.922)	(.02)	(.019)	(695,627.01)	(811,455.29)
2016	.775	-.002	.071***	.096***	-126,665.35	410,345.58
	(1.057)	(.882)	(.022)	(.021)	(474,912.17)	(555,856.53)
Region	.97	-.627	-.178***	-.177***	114,651.04	-56,527.842
	(1.733)	(1.327)	(.014)	(.016)	(108,517.28)	(191,026.08)
Observations	127,894	127,894	127,894	127,894	21,531	21,531
Fixed Effects						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Year * Treatment	Yes	Yes	Yes	Yes	Yes	Yes
Year * Region	Yes	Yes	Yes	Yes	Yes	Yes
Region	Vilnius	Vilnius, Klaipėda and Kaunas	Vilnius	Vilnius, Klaipėda and Kaunas	Vilnius	Vilnius, Klaipėda and Kaunas

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Number of employees in absolute number, Gross profit is in euros, measured in the calendar year

In column (1) of table 6.3, I present the results of the regional heterogeneity analysis regarding the number of employees of a firm. The coefficient of *Region* shows that firms in Vilnius

did not have a statistically significant different number of employees compared to firms in other counties in 2013. The insignificant coefficients of the interaction variable show that there neither is a different trend after 2013 for firms in Vilnius county In the treatment group compared to treated firms in other counties.

The regression shown in column (2) of table 6.3 is very similar to the one in column (1), but in this regression the variable equals 1 for two more counties, Klaipèda county and Kaunas county instead of only Vilnius county. This change does not affect the results as still none of the coefficients is significant. So, after the minimum wage increase, the trend of treated firms' number of employees in absolute numbers is not different for firms in counties with high wages compared to firms in the rest of Lithuania.

In column (3), I performed the same regression as in column (1), with *Region* being one for firms in Vilnius County, but now I used the logarithmic value of the number of employees as the dependent variable. This regressions does give statistically significant results on the 1 percent significance level for the interaction variables of 2015 and 2016. This means that for treated firms the relative change of the number of employees compared to 2013 is more positive for firms in Vilnius county than those in other counties.

For the regression in column (4) of table 6.3, I once again, used the three counties with the highest wages as *Region*, as I did before in the regression in column (2). Now, I also find a statistically significant coefficient for the interaction variable of 2014. This the gap that exists in 2013 between treated firms in counties with a relatively high wage level relatively changes after 2013. In these years, the number of employees increases relatively more for treated firms in high wage regions than at treated firms in other regions.

In columns (5) and (6) of table 6.3 I tested whether gross profits of treated firms in high wage regions behaved differently after the minimum wage increased than those of treated firms in other regions. As with the analysis of the number of employees I used two definitions for the high wage regions. In column (5), the dummy variable *Region* equals 1 for firms in Vilnius county and in the regression in column (6) *Region* equals 1 for firms in Klaipèda county and Kaunas county as well. In both regressions I did not manage to find a statistically significant change of the gap between the profits of treated firms in high wage regions compared to treated firms in other regions. I was not able to test whether there were relative changes as the dependent variable has negative values for some observations.

6.4 Heterogeneity analysis considering market power using an OLS regression

Table 6.4 shows the results of the heterogeneity analysis based on market power. In this regression I use firms' profit margin in percentages as a proxy for their market power. Profit margin is defined as the gross profit divided by the operating revenue. The categorical variable *ProfitMargin* equals "Loss" for firms with a negative profit margin, "High" for a profit margin larger than 6 percent and "normal" for other values. I used firms with a negative profit margin as the base value in all regressions. The dependent variables are *Number of Employees* and its logarithmic value and on *Gross Profit* as only the firm-level Orbis data allows to make distinctions on firm-level.

Table 6.4 Results from the OLS regression analyzing heterogeneous trends for treated firms with different levels of market power

		(1) Number of Employees	(2) Ln Number of Employees	(3) Gross Profit
Treatment		-192.743***	-2.078***	-1,084,450.4**
		(35.265)	(.088)	(431,915.5)
Profit Margin				
	Normal	2.265	.254***	491,482.03*
		(16.244)	(.053)	(267,920.73)
	High	-137.279***	-.853***	1,492,122.8
		(39.275)	(.206)	(1,560,117.9)
Jaar * Profit Margin (Treatment = 1)				
	2014 Normal	5.559**	.076***	1,753,792.1
		(2.615)	(.024)	(1,800,910.4)
	2014 High	8.358	.019	2,957,182.8**
		(5.363)	(.045)	(1,497,315.7)
	2015 Normal	8.664*	.086**	-563,524.95
		(4.876)	(.035)	(1,193,130.1)
	2015 High	14.453	-.001	1,416,767.1
		(9.995)	(.077)	(868,306.17)
	2016 Normal	8.472	.072	-523,985
		(7.692)	(.048)	(690,213.32)
	2016 High	11.815	.018	676,076.75
		(9.693)	(.083)	(940,643.15)
Observations		19,824	19,824	14,871
Fixed Effects				
	Firm	Yes	Yes	Yes
	Year	Yes	Yes	Yes
	Year*Profit Margin	Yes	Yes	Yes
	Year*Treatment	Yes	Yes	Yes

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Number of employees in absolute number, Gross profit is in euros, measured in the calendar year
Firms with a negative profit margin are used as the base values. Normal profit margin means a profit margin between 0 and 6 percent. Firms with a higher proifit margin are in the group of firms with a high profit margin.

In column (1) of table 6.4, the results of the regression observing treated firms with different profit margins are presented. It shows that, compared to treated firms with a negative profit margin, treated firms with a normal profit margin see their number of employees increase more in 2014 and

2015 compared to 2013. Nevertheless, in 2016 there is no statistically difference visible anymore. The number of employees from firms with a high profit margin follows a similar trend after 2013 as there are no statistically significant deviations from the gap that existed in 2013 as can be interpreted from the coefficients of the interaction variables.

Column (2) of table 6.4 shows the same regression as column (1), but now I used the logarithmic values of the number of employees. This means that the coefficients of the interaction variables show how the gap in the number of employees with treated firms with a negative profit margin relatively changes compared to the gap in 2013. As in column (1), I find a statistically significant effect for treated firms with a normal profit margin for the years 2014 and 2015. This means that in these two years firms with a normal profit margin saw their number of employees increase more (or decrease less) compared to treated firms with a large profit margin. In 2016 the gap was not statistically significant different from the gap in 2013. For treated firms with a high profit margin, the relevant changes of the gap between the number of employees of firms with a negative profit margin did not differ statistically significant from the existing gap in 2013.

In the last column of table 6.4, I performed the same regression as in the first two columns, but now I used *Gross Profit* as the dependent variable. The results show that treated high profit margin firms on average saw their gross profit increase more in 2014 than treated firms with a negative profit margin. Nevertheless, in 2015 and 2016 the gap did not change significantly compared to 2013. For treated firms with a normal or negative profit margin, the average change of the gross profit compared to 2013 did not differ statistically significantly.

7 Robustness Checks

To test whether to test the robustness of my results, I performed placebo tests in which I test whether changing the treatment year would give similar results. In addition, I tested whether anticipation effects were visible using the granger causality test in Stata.

Table 7.1 Results of the placebo tests of the difference-in-difference analysis using 2010 as the treatment year

	(1) FTE	(2) Net Profit	(3) Monthly Labor Costs	(4) CPI
Post*Treatment	-7,073.827	-56,873.975*	-14.019	-13.812**
	(5,321.624)	(29713.287)	(24.589)	(5.843)
Treatment	34,727.042	153,240.35	-314.75***	14.46***
	(41,069.79)	(131,848.51)	(118.094)	(5.502)
Observations	54	72	48	756
Year fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Net Profit and Monthly labor costs are measured in euros and are averages within the treatment and control group. Monthly labor costs is the average cost per monthly FTE. CPI has been measured relative to the base year 2015.
The observed period is from 2005 until 2013.

Table 7.2 Results of the placebo tests of the difference-in-difference analysis using 2010 as the treatment year

	(1) FTE	(2) Net Profit	(3) Monthly Labor Costs	(4) CPI
Post*Treatment	5,720.909	119,008.17	-12.433	3.258
	(3,852.622)	(85,094.096)	(39.241)	(5.893)
Treatment	30,284.536	147,320.67	-326.367***	.223
	(37,290.214)	(13,8672.7)	(111.665)	(3.081)
Observations	80	72	72	756
Year fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Net Profit and Monthly labor costs are measured in euros and are averages within the treatment and control group. Monthly labor costs is the average cost per monthly FTE. CPI has been measured relative to the base year 2015.
The observed period is from 2010 until 2018.

In table 7.1, I show the results of the first placebo tests I performed. The placebo tests are difference-in-difference analyses, yet, the treatment year is now 2010 instead of 2013. Therefore, the observed period is 2005 until 2013. In table 7.2 I did the same, but now chose a later year as treatment year. So, for the placebo tests in table 7.2 the treatment year is 2015 and data from 2010 until 2018 are observed.

Column (1) of table 7.1 and 7.2 show the results of the placebo tests with *FTE* as the dependent variable. Neither of the coefficients is statistically significant at the 10 percent significance

level which makes it impossible to interpret the results. Yet, the coefficients are not very similar to the original coefficient from the regression in column (1) of table 6.1, so these placebo tests do not undermine my results with regard to employment. The results of the Granger causality test in table 11.4 in the apendix support this as the p-value of the regressions on FTE are 0.752, which means that we cannot reject the null hypothesis that there are no effects in anticipation of the treatment.

The placebo tests of the *net profit* regression are shown in column (2) of tables 7.2 and 7.2. Only the coefficient in table 7.1 can be interpreted as this one is statistically significant at the 10 percent significance level. This coefficient is negative, whereas the coefficient in the original regression, shown in table 6.1 is positive. Nevertheless, the Granger causality test gives a p-value of 0.098, this means that we cannot reject the null-hypothesis of no anticipation effects at the 10 percent significance level.

The third columns of the tables 7.1 and 7.2 show the results of the placebo tests for the regression on *monthly labor costs*. For the regression with 2010, the observed period is from 2008 until 2013 as I did not have data for the years 2009 and 2008. Just as in the original regression, I fail to find a significant effect of the policy change on monthly labor costs in both placebo tests. Therefore, I cannot interpret the coefficients. Therefore, these placebo tests do not undermine the validity of my results. The granger causality test does not give any evidence for anticipation effects neither, as the p-value is 0.684. This means that the null-hypothesis of no anticipation effects cannot be rejected.

The fourth column in the tables 7.1 and 7.2 show the results of the placebo tests on the CPI regression. The regression shown in table 7.1 shows a statistically significant coefficient. This negative coefficient is around three times as large as the coefficient of the consumer prices in the regression in table 6.1. This is in line with the outcome of the Granger causality test, as the p-value is 0.002, which means that I can reject the null-hypothesis that there are no anticipation effects. These results of the robustness analysis undermine the validity of the results of my difference-in-difference analysis on the CPI.

8 Limitations

The main problem of my empirical analysis is the lack of firm-level data before 2013. Therefore, I could not perform a difference-in-difference analysis using the Orbis. Therefore, the heterogeneity analysis could only be done by using an OLS regression. This means that all these results only show relationships instead of causal effects. Trying to find causal effects with the sector-level data from Statistics Lithuania works, but is not suitable for a more in-depth analysis of the results. Moreover, it would have been better to have data about the price-levels on firm level as well as labor costs. This would have allowed me to perform a heterogeneity analysis on these variables as well, which would have given me more insight in the results.

What's more, the research could be improved if the firm-level data had been more complete. Now, I lost half of my possible 95,000 observations because the number of employees was missing. Analyzing the heterogeneous effects on number of employees was even less reliable, as the profit margin was missing for large number of firms, restricting my analysis to only 1,896 observations. These missing values decrease the internal and external validity of my analysis.

So, first of all, further research could improve my analysis by using more complete data, which would definitely improve the internal validity of the analysis as it would be a more reliable way of testing the parallel trend assumption. Moreover, the assumption that parallel trends would be present until 2013 is pretty strong, although the assumption of parallel trends could not be rejected for all difference-in-difference regressions, not all plots show very similar trends.

Other further research could go more in depth in who are paying for the minimum wage than dividing it into consumer, minimum wage workers, other employees and firm owners. It would be interesting to see who these consumers, workers and employees are and know what their financial situation is. This would allow policymakers to know which income groups would be affected by a minimum wage increase and consider whether the legislation will be an efficient way to reach their goals. To do this, much more detailed data would be needed. This would also be very useful if firm-level data on the share of minimum wage workers would be present. This allows for an even more precise distinction between firms with a large and small share of minimum wage workers

9 Conclusion

This thesis analyzes the effect of a minimum wage effects on labor costs, consumer prices, employment and profits. This has been done by evaluating the Lithuanian minimum wage increase in 2013. To do this, I used difference-in-difference analysis in which I compare sectors with a large share of minimum wage workers with sectors which have a small share of minimum wage workers.

The results show that the minimum wage increase did not result in a decrease in employment. So, this analysis fails to find evidence for the negative employment effect of a minimum wage as described by the textbook competitive model. Yet, it does not provide evidence for the positive effect on employment a minimum wage would have according to the monopsonistic model as described by Stigler (1946) either. After testing if the trends differ for different regions based on average wages in these regions, I do not find any significant differences for the trends of employees when comparing treated firms in high wage regions with other treated firms. After that, I tested whether the employment trends varied with the market power firms have. The results of the regression with extra interaction variables for market power show some interesting results. Firms with a normal level of market power in sectors with a large share of minimum wage workers seem to see their number of employees increase more than firms with little market power in the years 2014 and 2015 compared to 2013.

After finding no effect of the minimum wage increase on employment on sector level, I did manage to find a statistically significant effect on profits, although it is only significant at the 10 percent significance level. The increase of the minimum wage leads to an average increase of 148,433 euros of net profits in sectors with a large share of minimum wage workers. This effect is not in line with standard economic thinking. Sectors in the treatment group have a large share of minimum wage workers and thus their profits are expected to be smaller as a result of higher labor costs. This trend is visible in the outcomes of the OLS regression, which shows that firms in the treatment group saw their gross profits in 2014 decrease more than firms in the control group relative to 2013. Whether a treated firm is located in a high wage region or a low wage region does not matter for the trend of its profits. Contrary, a treated firm's gross profit can differ statistically significantly when placing them in groups based on their market power. Firms with a large profit margin, and thus much market power, have seen their gross profit statistically significantly increase with on average almost 3 million euros more in 2014 than treated firms with little market power. This coefficient might be explained by the fact that firms with a lot of market power do not need to cut their profits when their labor costs increase. Their market power might allow them to pass the higher costs through to consumers.

The difference-in-difference analysis of monthly labor costs shows no statistically significant effect of the policy change on the average monthly labor costs in sectors with a large share of minimum wage workers. This is remarkable, as the monthly labor costs of treated sectors will increase directly as a result of the minimum wage increase. This result might imply that treated firms cut on the wages of workers with a wage above the minimum wage or that the policy change had spillover effects to the wages workers in other sectors who earned more than the minimum wage.

Yet, the analysis of the consumer price indices of the different sectors does show some statistically significant effect. The minimum wage increase has a negative effect on relative consumer prices. This is not in line with theoretical model and other empirical literature, which shows that consumer prices increase after a minimum wage increase, because the higher labor costs are passed through to consumer by the firms. As these consumer prices opposes other literature, it is difficult to conclude what causes this effect. Especially, since consumer prices are relatively vulnerable to spillover effects, as treated sectors might supply intermediate goods to non-treated sectors.

In conclusion, the results show no significant effect of the minimum wage increase on employment and monthly labor costs. A striking positive effect on profits and negative effect on consumer prices has been found, although the significance level of these effects is small. This Nevertheless, the OLS regression results show that zooming in from sector-level to firm-level data might give different results. The relative number of employees might be affected differently for firms in high wage regions than in other regions and market power might play a role in the size of the effects as well. Yet, on firm-level, this paper could only identify relationships between these variables and no causal effects.

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11 Appendix

Table 11.1 NACE Rev. 2 sectors and their share of minimum wage workers in Lithuania in 2012

	NACE Rev. 2	Sector	Number of firms in dataset	Share of total firms in %	% minimum wage workers
1	I	Accommodation and food service activities	3,376	3.91	24,4
2	S	Other service activities	5,919	6.85	19,9
3	G	Wholesale and retail trade; repair of motor vehicles and motorcycles	20,534	23.77	12,9
4	L	Real estate activities	4,763	5.51	12,5
5	P	Education	2,612	3.02	12
6	F	Construction	8,198	9.49	11,9
7	A	Agriculture, forestry and fishing	1,905	2.21	10,9
8	M	Professional, scientific and technical activities	9,689	11.22	8,7
9	C	Manufacturing	6,953	8.05	8,4
10	R	Arts, entertainment and recreation	3,502	4.05	8,4
11	N	Administrative and support service activities	3,397	3.93	7,4
12	H	Transportation and storage	7,314	8.47	6,5
13	J	Information and communication	3,323	3.85	5,9
14	B	Mining and quarrying	123	0.14	4,4
15	Q	Human health and social work activities	2,735	3.17	3
16	E	Water supply; sewerage, waste management and remediation activities	355	0.41	2,9
17	K	Financial and insurance activities	734	0.85	2,3
18	O	Public administration and defence; compulsory social security	75	0.09	1,8
19	D	Electricity, gas, steam and air conditioning supply	868	1.00	1,1

Table 11.2 average wage level per county

County	Firms	Share of total number of firms in %	Wage level as a percentage of the national average wage
Tauragė county	1,990	2.1	78,1
Marijampolė county	2,755	2.9	81,3
Šiauliai county	6,000	6.2	82,3
Alytus county	3,177	3.3	84,7
Panevėžys county	4,979	5.2	85,9
Utena county	2,602	2.7	86,2
Telšiai county	3,086	3.2	89,2
Kaunas county	20,048	20.8	95,8
Klaipėda county	10,821	11.2	98,2
Vilnius county	40,943	42.5	114,4

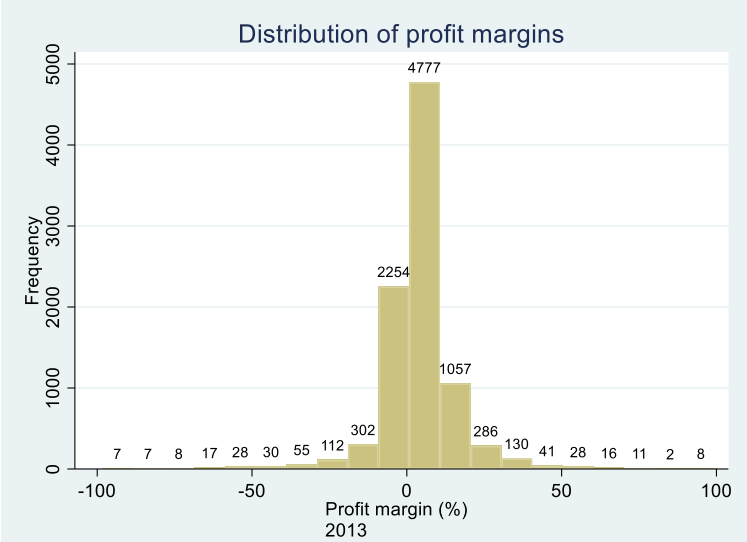
Table (11.3) Results parallel trends test

Dependent variable	F-value	P-value
FTE	F(1, 9) = 1.68	Prob > F = 0.228
Net Profit	F(1, 6) = 1.56	Prob > F = 0.259
Monthly Labor Costs	F(1, 7) = 0.19	Prob > F = 0.673
CPI	F(1, 6) = 3.66	Prob > F = 0.104

Table 11.4 Results granger causality test

Dependent variable	F-value	P-value
FTE	F(4, 9) = 0.54	Prob > F = 0.7084
Net Profit	F(4, 6) = 3.22	Prob > F = 0.0979
Monthly Labor Costs	F(4, 7) = 0.59	Prob > F = 0.6839
CPI	F(4, 6) = 17.37	Prob > F = 0.0019

Graph 11.1: Distribution of profit margins in Lithuania in 2013



Graph 11.2: Zoomed in distribution of profit margins in Lithuania in 2013