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Do changes in payroll taxes incur asymmetric effects on salaries and employment for youth in Sweden

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Abstract

This thesis evaluates what effects, and if they are asymmetric, consecutive changes to the payroll tax policy in Sweden has on the intended population, individuals under the age of 26. This analysis is done by using yearly aggregated data from Statistics Sweden which includes a large proportion of the workforce in Sweden from 2004 until 2020. Two separate events are analyzed using a Difference-in-Difference framework and using differences in different age groups as control and treatment. The results indicate that wages might be more slow-moving than employment especially downwards. Through robustness checks with a more homogeneous sample evidence of asymmetric effect from consecutive changes in the payroll tax is found. By researching a subject yet to be researched in Sweden, both the raising of the payroll tax in 2015 and the presence of potential asymmetric effects from changes, this thesis contributes to a growing amount of research into tax incidence as well as provides a deeper understanding of how labor market responses work and provide better understanding for policymakers.

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Introduction

Since the 1980's there has been a shift and a growing trend around the world of governments shifting the responsibility of employee benefits mandated by law from the government to the employers (Bellante & Porter, 1990). This could be viewed as a step closer to a welfare state, and Sweden opted to use this shift as early as the 1960s (Ekonomifakta, n.d b). This shifting of the taxation to the employers changed the cost for the companies but also became an important tax revenue for the government (Holmlund, 1983). Interesting questions arise from taxation, how much should the governments mandate employers to pay in benefits for their employees, and to what degree is it possible to use changes in these mandated benefits as an economic means of control. To what degree could the government boost employment for specific parts of the population in their country and what effects would these types of changes have in the long run.

The Swedish government has previously attempted to use these mandated benefits paid by employers as an economic means of control and tried again during one of the larger changes in the payroll tax policy in Swedens' history (Ekonomifakta, n.d b, Riksdagen, 2008). In October 2006 the right-leaning government proposed a directed reduction in the employer-paid payroll tax from 32.42% to 21.32% for all individuals turning between 19 to 24 years old during 2007 and onwards. The reason behind the government's decision was to combat the relatively high youth unemployment which at the time was around 21% (Riksdagen, 2006. Statista, 2022). Due to a lack of expected effects, in 2009 the government proposed a further expansion of the reduction in the payroll tax from 21.32% to 15.49% and expanding who was eligible (Riksdagen, 2008). This new version should apply to all individuals below 26 from 2009 and onwards. Meanwhile, they also lowered the general payroll tax from 32.42% to 31.42%. The reduction was expected to be a costly economic means of control, estimated to cost the government 5.6 billion SEK in lost tax revenue for 2009 (Riksdagen, 2008).

A shift in political power during the election of 2014 meant the end of the payroll tax reduction, during 2015 the payroll tax deduction was revoked and yet again everyone was subject to the same payroll tax of 31.42% (Riksdagen 2014).

Several studies regarding what effects the lowering of the payroll tax should or have had have been conducted over the years (see Saez. et al. 2019, Skedinger 2014, Egebark & Kaunitz, 2018). However, to my knowledge, there has been no research conducted into what effects the revocation of the payroll tax policy, and the raising of the tax has had on the employment and salary development of youths in Sweden.

The fact that Sweden during a relatively small period has both lowered and raised the payroll tax presents a unique opportunity to study what implications this has had on the intended population. Several studies have shown evidence that changes in taxes

have asymmetric effects (e.g. Benzarti. et al. 2020, Ljungqvist & Smoljansky, 2014). In these studies, it is evident that lowering a tax generally results in positive effects and that raising the tax results in negative effects. The asymmetric part consists of these effects being different in magnitude. Generally, the negative effect of raising a tax is higher than the positive effect of lowering the tax. This leads to the insight that there is an obvious gap in the research around payroll taxes and their effect on employees.

This thesis will therefore attempt to contribute to the research within payroll taxation and fill the obvious hole by answering the research question.

“Do consecutive changes in the Swedish payroll tax policy have asymmetric effects on employment and salaries of the youth in Sweden”.

This will examine if the expected positive effects on employment and salaries from lowering payroll taxes are equally large as the expected negative effects on employment and salaries from raising the tax, for the youths that are the intended targets of this policy. If these effects are different in magnitude, then logic dictates that changes in the payroll tax should have asymmetric effects. This has been accomplished by using data collected yearly by Statistics Sweden in a larger survey conducted between September and November each year, and a Difference-in-Difference framework will be utilized to stack different age groups against each other as treatment and control to see how they have reacted to changes in the tax policy. The dataset that has been constructed spans from 2004 until 2020 and each of these 17 years consists of 15 observations each year for a total of 255 observations. The scope of the study was decided to be limited to Sweden, simply because the policy changes were conducted in Sweden and the effects of the changes will be visible in Sweden. It might not be possible to replicate in other countries or markets without the same prerequisites.

According to Riksdagen (2016) in their budget proposal, the basis for the decision to raise the tax was decided on the fact that raising the tax would have symmetric effects as the lowering of the tax. The fact that the government reasons this way is what makes this research question both interesting and necessary to pursue. If their assumption is false, it could have long-term negative effects on the labor market and especially on the youths that already are at a disadvantage in the labor market because of increased susceptibility to economic swings and increased job-searching friction (Dhillon & Cassidy, 2018, Daunfeldt & Hortlund, 2014). These facts point to yet another contribution that this thesis will provide, to further the understanding of how the labor market reacts to changes in payroll taxation will give future decision-makers a more solid understanding of the ramifications of their actions in the longer term.

The results in this paper provide different outcomes, some results from the main analysis corroborate earlier studies that point to a negative effect of lowering the tax, and some of the results point to a positive effect which corroborates other studies.

Some of the results in the main analysis with the entire sample used produce inconclusive results with insignificant estimates. This thesis does, however, find evidence that lowering and raising the payroll tax produces asymmetric effects for the youth. When performing robustness checks with more homogenous treatment and control groups, significant results are found regarding the effect that lowering and raising the tax has on the share of employees that belongs to the age group 18-24-year-olds. Lowering the tax increases this share by roughly 1.7% and raising the tax decreases this share by roughly 2.4% which is an effect that is 40% larger.

The structure of this thesis is as follows. The next section, section two will describe the background of the payroll tax policy in Sweden as well as what changes were made during the period of interest. Section three will discuss the relevant literature that has been used as the basis for this thesis as well as pose the hypotheses that will be answered in this thesis. Section four provides a deeper explanation of how the data for this thesis have been gathered as well as how the model for the empirical analysis has been constructed and decided on. Section five will provide all the results from the empirical analyses as well as a discussion regarding these results. The sixth and final section will include the concluding remarks of the thesis, some limitations as well as remarks on future research.

Background

Employer-paid payroll tax

The government should ideally fulfill its obligations towards its citizens and to do so it needs funds. Taxes are a way to collect income for the government. How governments choose to tax their citizens and companies differs across countries. In Sweden, companies and citizens must pay social security contributions in the form of employer-paid employee tax for the companies, and a general pension fee for citizens. According to the Swedish government's budget for 2023, employer-paid employee tax is a substantial source of income. Budgeted to bring in roughly 700 billion SEK, which makes up almost 27% of the public sector income for the government (Riksdagen, 2022).

The employer-paid employee tax is constituted into 7 smaller parts. Health insurance fee of 3.55%, Parental insurance fee of 2.6%, Retirement pension fee of 10.21%, Survivor's pension contribution of 0.6%, Labor market fee of 2.64%, Worker's compensation fee of 0.2% and General payroll tax of 11.62% (Skatteverket n. d. b). All of these fees and contributions scale relative to the employee's gross salary and total up to 31.42%.

The payroll tax policy in Sweden during 2007-2015

Implementation of the new tax policy

According to Statistics Sweden (2022), in the early part of the 21st century, the Swedish economy was flourishing, GDP was increasing and the outlook going forward was positive. In the middle of these good times, the ruling government of Sweden changed. From a more progressive leftwing government to a more conservative center/rightwing government.

The Swedish political parties that occupy the center/rightwing are more conservative and have generally over the years focused on policies that should make it easy to enter the labor market as well as profitable to work (Winborg, 2022). Even though the Swedish economy was on the rise, so was the unemployment rate for youth during the same period. The definition for youths in youth unemployment is the individuals between 15 to 24 years old, who are actively trying to find a job but are

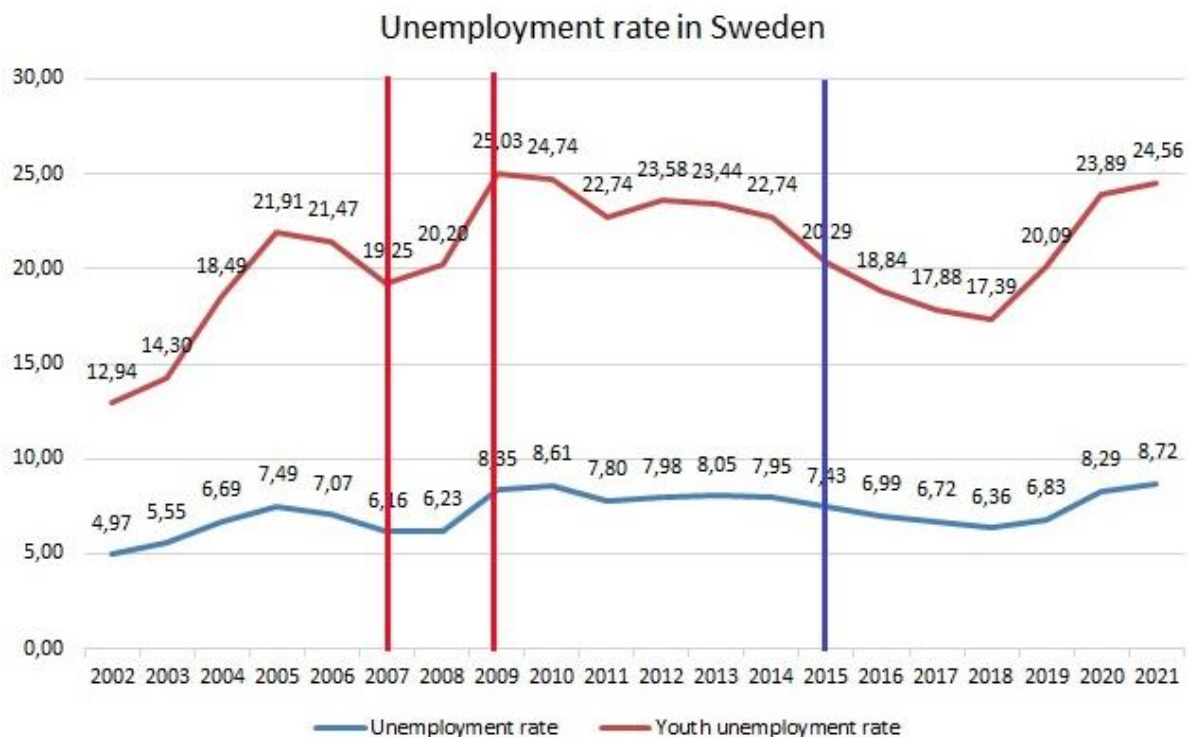


Figure 1 shows the unemployment rate from 2002-2021, two red line marks the years when the policy was implemented, and one blue line marks the year when the policy was revoked.

currently unemployed and currently not studying full time. Between the years 2002 and 2006, the unemployment rate for this group almost doubled from roughly 12% to almost 22% (Statista, 2022). Above is a figure showing the youth unemployment rate as well as the overall unemployment rate in Sweden.

The newly elected right/center-oriented government proposed measures to attempt to decrease the rising youth unemployment (Riksdagen, 2006). In this proposition, a solution was to increase the demand for labor. Therefore, they formulated the first

major change in a series of changes to the Swedish system of payroll taxes since the middle of the 1990s (Ekonomifakta, n.d. b). The government suggested that the youth should be specifically targeted by this newly proposed change in the payroll tax. According to the proposition by Riksdagen (2006), a change to the payroll tax for the general population would likely result in higher nominal wages and an insignificant impact on the employment rate. This iteration of the proposal would be implemented on the 1st of July 2007. Individuals born between January 1st, 1982, and January 1st, 1989, were decided to be the target of this tax change. This meant that individuals who had already turned 18 but had not turned 25 at the beginning of 2007 could receive the lowered payroll tax regardless of whether they already had employment or not. Therefore, all employers had the same opportunity to reap the benefits of the new policy.

During 2007, the general payroll tax level was 32.42% for all individuals. The implementation of this first iteration of the tax policy would decrease the tax for people between 18 and 25 down to 21.32% and leave it unchanged for the rest of the population. According to the proposition in March of 2007, the decreased income for the government would amount to 1.99 billion SEK under the first 6 months of the implementation, and amount to 3.98 billion SEK under the first 12 months (Proposition 2006/07:84). However, this is the final forecasted effect net of the extra tax income that would arise from the increased profits that were forecast for companies due to the lowered tax burden. The gross effect of lost income for the government would according to the proposition amount to 7.7 billion SEK (Proposition 2006/07:84). During 2007, the youth unemployment rate decreased by 2.1%, this can be seen in Figure 1. After the implementation in 2007, youth unemployment continued to increase over the following years. One of the causes of this continuing increase could be the large economic crisis that originated in the USA and then spread across the world. During 2008 and 2009 it hit Sweden the hardest and these were the years when the payroll tax policy was strengthened.

Something that will affect the outcome of these analyses is that young employees are a lot more affected by cyclical changes in the economy. Even in a country such as Sweden, where a lot of people have stable employment, young people are possibly, to a more considerable extent employed on temporary contracts. There are factors such as being considered less experienced and that certain jobs that young people get more regularly only hire on temporary contracts. They might also work at several different workplaces simultaneously to a higher degree. These might be factors that show us the much larger swings in unemployment that plague the younger population. In Figure one it is clearly shown that the swings in unemployment among young people, those under the age of 25, are larger than the general population (Dhillon & Cassidy, 2018). They might also suffer from an increased degree of job-searching friction, which might cause them to stay unemployed for a longer time. (Daunfeldt & Hortlund, 2014).

The continually rising youth unemployment, even after the payroll tax change in 2007 made the government propose further changes to the payroll tax in their 2008 budget proposal. According to the proposition, further measures to stimulate the demand for labor would be necessary to facilitate lowered youth unemployment (Regeringen, 2008). In this proposition, two major changes to the tax policy were presented. The first was that the general payroll tax level, which formerly was 32.42% should be lowered to 31.42%. For those that were eligible for the tax cut implemented in 2007, a new, further decrease to the tax was proposed. This would decrease the payroll tax level from 21.32% to 15.49% (Regeringen, 2008). These new changes to the payroll tax were proposed to be implemented 1st of January 2009. Furthermore, the definition of who should be eligible for the tax reduction was expanded to include everyone who, by the beginning of the year, had not yet turned 26. In 2009, everyone who was born after the 31st of December 1982 would be eligible for the lowered payroll taxes.

According to Regeringen (2008), the total gross cost for this newly changed payroll tax for youth would cost the government a further 8.97 billion SEK per year. For the year 2009, the total decrease in the revenue for the government would amount to roughly 16.7 billion SEK.

Revocation of the tax policy

During the election in 2014, a major change occurred. The ruling center-right government dropped heavily compared to their 2010 election result and lost the election. In their place, a more progressive, and left-oriented government took their place (Valmyndigheten, 2023).

In the budget proposition for 2015, this new left-wing government made it very clear that they have been opposed to the payroll tax cut because they deem it inefficient and a waste of resources on people that are not really in need of help (Riksdagen, 2014). In the same budget proposal, this new government quotes a report, stating that the revenue loss for the government per created job amounted to between 1-1.6 million SEK per job. In the 2015 budget proposition, the payroll tax was proposed to be equalized yet again so all individuals would be subjected to the same tax percentage. Because of a fear of adverse effects of raising the tax too quickly. The revocation of the policy would be conducted in two steps. In 2015 the difference between the youth tax and the normal tax would be decreased by 50% by raising the youth tax. 1st of June 2016 the difference would be eradicated, and all individuals would be subject to a payroll tax of 31.42% (Riksdagen, 2014).

To summarize, between the years 2007 and 2015. A new payroll tax policy was both implemented and revoked. Since the interest of this research paper is if changes in the payroll tax will result in asymmetric effects on the youth in Sweden. The entire period between 2007 and 2015 will be analyzed. However, they will be analyzed separately. The first period of interest will look at the implementation of the tax cut and

therefore look at the years 2004 until 2014. The second period of interest is the revocation of the tax cut and therefore look at the years 2012 until 2020.

Literature Review

This section will discuss some literature that has researched how lowering payroll taxes in Sweden has affected employment and salary for youths in Sweden, and other papers discussing economic concepts that will be used to answer the research question of this paper. As well as an explanation of how this paper contributes to the already existing research.

Research conducted on changes in the Swedish payroll tax

Most of the research conducted in the field of Swedish payroll tax changes has generally looked at the event when the tax was lowered between 2007 and 2009. This section will provide valuable points from this earlier research. However, since there is virtually no research into the raising of the tax in 2015, no such points will be provided in this section.

According to IFAU (n. d.), the Institute for labor market and educational political evaluation, research conducted to evaluate the reduction of the tax has mainly been conducted with two different approaches. Either looking into a possible substitution effect of young (people under 26) being made comparatively cheaper to hire, or a scaling effect, where the number of young people already hired would constitute a mechanism of freeing up capital otherwise paid in taxes which could now be used for other means. The following sections will provide key points from some of these studies. Many of the studies have researched the same subject, with similar data but during different times. This has made the results vary slightly over time.

Substitution effect

In a study by Egebark & Kaunitz (2014), they used micro-level data and a difference-in-difference framework to investigate the presence of substitution effects between eligible and ineligible youths in Sweden. Using the first iteration of the implementation as the treatment for the youths, their results show that during 2007, the unemployment for youths decreased by 2.7%, and during 2008 the unemployment for youths decreased by 1.4%. According to Egebark & Kaunitz (2014), this effect should be attributed to the substitution effect. The results of this effect would generally manifest as a branch of the General Equilibrium Theory discussed in the theoretical framework section. As one part of the workforce becomes comparatively cheaper, by cutting their payroll taxes. Profit-maximizing firms should attempt to hire more of this sub-group compared to the expensive one. This creates a shock to the equilibrium of the market which will be further explained in the theoretical framework part.

Scaling effect

One of the most in-depth papers researching the effect of the tax cut was conducted by Saez et al. (2019). Using both iterations of the implementation of the payroll tax as their timeframe. They investigated both the presence of a scaling effect and a substitution effect. They combined micro-level individual data and accounting data as well as employment data from a large proportion of the companies in Sweden. The substitution effect was estimated using the micro-level individual data and used differences in different cohorts' eligibility to produce estimates. Their estimates were slightly larger than Egebark & Kaunitz, a roughly 3% decrease in unemployment for youths. The scaling effect was investigated using the accounting and employment data. They used a difference-in-difference framework where companies with either a low or a high share of young employees were used as treatment and control groups. Estimates showed that companies with a high share of young employees increase the salary for all of their employees compared to companies with a low share of young employees.

Reduced payroll taxes in Swedens' retail sector

During the years 2013 and 2014. Two reports investigating what effects the lowering of the payroll tax has had on the retail sector in Sweden. The retail sector could be considered a sector with a higher turnover of people in many countries (Carlén & Boman, 2013).

Carlén & Boman (2013) estimated what effect the payroll tax cut had on employment in the retail and wholesale sectors, and found contradictory evidence compared to earlier research referenced here. Collecting data from the union that covers both the retail and wholesale sectors, and utilizing a logical and graphical analysis they estimated what effect the payroll tax cut had on these sectors. Their findings show negative correlations between the tax cut and the employment of young people. Both the share of young employees and the number of hours worked by young employees had declined since the implementation of the policy.

The second of these reports was written by Skedinger (2014). Much like the other reports that have been mentioned in this paper, Skedinger (2014) only investigates the implementation of the policy in 2007 and 2009. Skedinger (2014), discusses in depth the possibility that a substitution effect and a scaling effect exist in these sectors. According to Skedinger (2014), the substitution effect could overestimate the effect of the policy implementation, which is true according to economic theory. However, the scaling effect might instead underestimate the effect of the policy implementation, this is also factually correct according to economic theory. A Difference-in-Difference approach was used to investigate how employment and hours worked have been affected by the payroll tax cut. Micro-level data was used to investigate the substitution effect, by estimating how many enter and exit their employment compared to their

control group. However, he only finds evidence of modest substitution effects after the implementation.

Wage shifting

According to Skedinger (2014), how a payroll tax is levied has a significant outcome. Standard payroll theory dictates that what party the tax is levied on is the important part. As in Sweden, if the tax is levied on the employer, the tax should be shifted to the employees. This phenomenon is called wage shifting. This has a solid base in standard economic theory. If profit-maximizing firms are assumed. Then when a certain subclass of inputs, in this case, labor, gets subsidized with lower costs, for example through a lowered payroll tax. The profit-maximizing firms should hire more of the relatively cheaper workers. All else equal and without firing costs, they should substitute as many employees as possible from the relatively more costly to the relatively less costly. How large a proportion of the labor force this is possible for, depends on how similar the employees are in all other categories except their eligibility for the lower payroll tax. This would cause a shock to the equilibrium in the labor market and increase the demand for this subclass of labor.

The phenomenon of wage shifting has been researched specifically by Kim et. al. (2022). They looked at the Singaporean labor market and evaluated a cut in the payroll tax for people of a specific age. Contrary to the research conducted in Sweden, Kim et. al. (2022) could find a direct link between this tax cut and an increase in salary without an increase in the labor input. According to Kim et. al. (2022) the main reason that there are such discrepancies between different markets, could be dependent on how competitive the labor market is.

Ljungqvist & Smolyansky (2016) investigated how changes in corporate taxes affect salary and employment. Even though corporate income tax is not strictly a payroll tax. A reasonable assumption that can be made is that corporations can act similarly under changes to these two taxes. The research was conducted in the USA and used variations in different states' corporate tax together with a difference in difference and spatial discontinuity design to find causal links between corporate tax changes and salary as well as employment development. Ljungqvist & Smolyansky (2016) concludes that tax cuts are generally inefficient in boosting employment or raising salaries. Ljungqvist & Smolyansky (2016) also find evidence that changes in the corporate income tax will yield asymmetric effects on the salary and employment numbers. Increases to the corporate tax will always have negative effects, while decreases to the tax will sometimes have positive effects, but this is mainly reliant on when the cuts are made.

Contributions by this paper

As evidenced by the previous section, comparatively little research has been conducted into what effect raising the payroll tax in Sweden will have. Even less has been, or none that could be found at the time of writing this paper, conducted into if consecutively raising and lowering the payroll taxes have asymmetric effects or not. This is the hole that will be attempted to be filled by this paper. Therefore, it was decided that both the implementation and the revocation of the policy should be analyzed independently to see exactly what effects these have had on the chosen sample. By using similar methods but different data as many of the referenced studies, a good solid foundation of analysis will be conducted separately into the lowering and the raising of the payroll tax. The results and the theories that have been researched in the referenced papers are what will be used to discuss the results of the individual analyses as well as give the foundation of discussion on the main research question of this paper.

Theoretical Framework & Hypotheses

Theoretical Framework

General Equilibrium Theory

According to Hahn (1980), General Equilibrium Theory is what we use to explain how our economy with so many profit-maximizing actors in it does not descend into chaos. As the world keeps expanding, we get more and more actors. Actors, in this case, are defined as firms or households (Hahn, 1980). Most people have heard of the terms supply and demand. The General Equilibrium Theory brings these two terms together and creates markets where everything is in equilibrium, under the assumption of perfect competition, as the theory states. This means that every individual decision made by either households or firms collectively ends up in a state where the quantity demanded of any good is equal to the supply created by firms. On a macro scale, this also works as a price-setting mechanism for firms. As evident by the name, the core assumption of the general equilibrium theory is that all markets always are trying to reach their equilibrium. Shocks to the market might shift either demand or supply in some way. But mechanisms built into the market will attempt to find either the old equilibrium or a new one if the conditions for that specific market have changed. This can be considered one of the fundamental functions of our modern economy. As described by this theory, every good or product has its market. The labor market is one of these markets, subject to the same forces as every other market. Therefore, the general idea of the General Equilibrium Theory should apply to the labor market as well.

Imperfect Competition & Labor Market Rent

If the labor market exhibits signs of being a market under perfect competition, employers should never have to spend money or time to find a perfect substitute for an employee who has separated from the company for some reason. This effect should be equal on the employee side of this equation as well. When separated from their employment, they should not have to spend any time to find new employment of equal type. Research into these subjects has long been producing some evidence that the labor market does not function under perfect competition (Manning, 2011). According to Manning (2011), a large contributor to the fact that the labor market functions under imperfect rather than perfect competition, is a concept called rents. Rents can be viewed from the employers' or employees' side, where one gains or gets something extra from their current arrangement.

An example from each side that Manning (2011) gives is, from the employers' side this would mean the marginal product that this specific employee provides the company is higher than the wage that the company pays this employee. The difference between these two is the rent that the company receives, and the marginal cost of employing an identical employee to the one who they got separated from is a measure of the inefficiency in the labor market, a measure of how imperfect the competition is. From the employee side, the opportunity cost of finding an identical job is not zero. This can be considered a measure of the rent that the employee receives from the current situation they are in. One, or both effects can be present at a specific company at a specific time. Together they can be used to estimate how perfect or imperfect the labor market is. These market rents could influence the timing of decisions of letting employees go from their employment, or on employees' decision to leave their employment willingly. Which could potentially delay the negative effect of the policy revocation.

Tax Incidence & Wage Shifting

Both the General Equilibrium Theory and Labor Market Rent have been used in research to explain phenomena such as Tax Incidence and by extension Wage Shifting. Since the labor market always tries to stay at its equilibrium point. Any exogenous shock such as a change in the taxation of a corporation, whether it is income tax or payroll tax, will influence the equilibrium point of the labor market. Depending on if it is a decrease or increase in taxation, will decide what way the corporate demand curve will shift. Of course, this is a large oversimplification of the complex mechanism that is the labor market. However, to attempt to explain some of the driving forces of tax incidence and wage shifting, at least a foundational knowledge of the basics of demand and supply could be beneficial. A decrease in taxation will generally lead to lower labor costs for the eligible company. With lower labor costs the demand curve will shift outwards and an exogenous shock to the general equilibrium will occur. According to the general equilibrium theory, the standard response of the labor market to this shock will be to attempt to, either return to its old equilibrium points,

or force will find a new equilibrium point. The eligible companies will attempt to hire more people to expand their output, this will raise wages for the newly hired employees (Skedinger, 2014). This effect will continue until a new equilibrium point is found where wages are higher, and employment is higher than the original point. In this simplest form, an increase or decrease in corporate taxation, no matter if its income or payroll will affect the incidence on wages in the company (Carbonnier, et. al. 2022). In the event of a decrease in taxation, labor costs for the company will generally decrease. The response of the labor market to this shock will depend on, in part to what degree wage shifting will occur. According to Holmlund (1983), how much of this shifting will occur depends on the elasticities of labor demand and labor supply in this specific market, and according to Carbonnier, et. al (2022), labor supply is generally more inelastic than the demand side of the same market. This should lead to the effect that a decrease in taxation should be shifted onto the wages of employees. A simple graphical explanation of this sequence of events is shown in Figure 2.

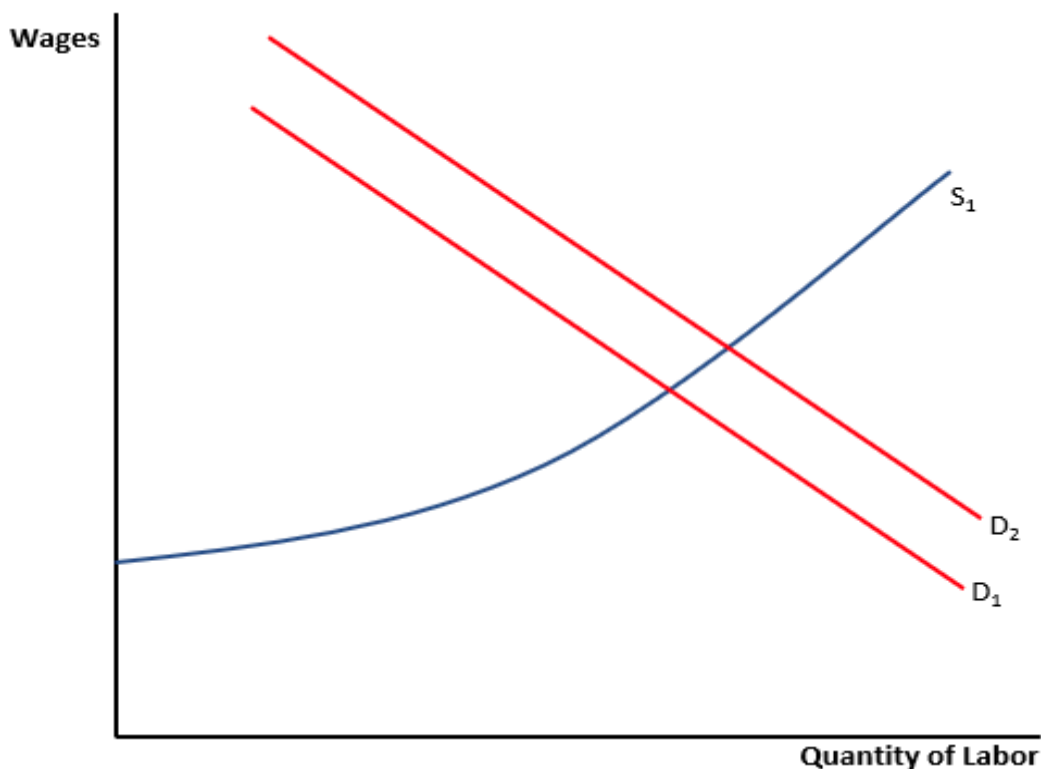


Figure 2, S1 shows the labor supply curve. D1 shows the equilibrium before the policy intervention. D2 shows the new equilibrium on the labor market after the decrease in taxes which would influence the cost of corporations and potentially lead to increased wages and quantity of labor.

However, these effects do not seem to be universal, there is also evidence that how much shifting takes place will depend on which circumstances you study it under, such as differences in economic factors such as recession and expansion (Kugler & Kugler, 2002). There has also been some early work from Summers (1989), regarding payroll taxes, that shows some evidence of how much shifting that occurs will depend on the valuations of the benefits received by the employees, for example, pension fees are closely linked to the benefit that the employee gets. Therefore, that is a clear-cut case when a lot of wage shifting will occur. Tax incidence and wage shifting are subjects

that have been researched for a long time yet can still produce some different results depending on exactly how you look at it. However, this only proves the point that the labor market is a complex organism, with many potential things that can influence it.

Hypotheses

Based on the literature and theories presented in the former section the hypotheses that will be explored to evaluate the asymmetry of payroll tax responses are as follows.

1. *Lowered payroll taxation increases salaries and employment for the affected population.*
2. *Increased payroll taxation lowers salaries and employment for the affected population.*

Data

The main point of interest in this paper is if the implementation and revocation of a payroll tax policy have had asymmetric effects on the salaries and the share of employed people between 18-24 in Sweden. To examine these points data from Statistics Sweden have been collected.

The collected data originates from the Labor Market Survey performed yearly from September to November (Statistiska Central Byrån, n.d.). Some of the interest of the survey is the full-time equivalent monthly salary averaged between all the respondents and the total number of employees. The individuals of interest are those who have worked at least 1 hour the week that they are being surveyed. Two events have taken place and are of interest to the research topic of this paper. The implementation and the revocation of the payroll tax policy and what effects these have had, on a yearly basis, on the average monthly salary and share of employed people between 18-24. The periods that are of interest are the years between 2004 and 2020, and the decision why this period was chosen will be thoroughly described in the identification part of this paper. This means that the dataset that has been constructed consists of 17 years. In each of these 17 years, there are 15 individual observations. This data is aggregated by year, by age group, and by occupational group. The aggregation is what gives the 15 individual observations per year, so each of the 15 observations is a combination of a age group and occupational group. These 15 observations do not change over the 17 years, rather they are a fixed point and therefore is comparable over the years.

Descriptive statistics

This section will in deeper detail describe how the data from Statistics Sweden is aggregated, how the characteristics of the aggregate groups look as well as display a summary table of the dependent and independent variables with a brief discussion of the contents of the table. A graphical description of some of the characteristics of the dependent variables will also be provided.

Statistics Sweden categorizes respondents into different age groups, the three age groups used are 18 to 24-year-olds, 25 to 34-year-olds, and 35 to 44-year-olds. Each of these groups has changed over the period of interest, 18 to 24-year-olds amounted to 307,100 respondents in 2004 and increase by roughly 32% to 405,000 respondents in 2020. The 25 to 34-year-olds amounted to 763,200 respondents in 2004 and increased by roughly 31% to 998,000 respondents in 2020. The 35 to 44-year-olds is the age group that has been most consistent over the years, starting in 2004 with 922,600 respondents in 2004 and increasing by roughly 4% to 961,900 respondents in 2020.

Statistics Sweden organizes the respondents' answers into different occupational groups depending on where the respondent work. Due to changes in the way that further disaggregated occupational data was categorized in 2013. The occupational groups were chosen as the aggregate level to be used since there is a necessity for consistency over the entire period. Five occupational groups are the ones that have stayed the same over the entire period and were deemed appropriate to use for this purpose. These five occupational groups are as follows with a few examples of the jobs that could belong to that specific group.

- Governmental employees (e.g. Police, University Teachers, Tax agency employees)
- Municipal employees (e.g. Elementary School Teachers, Carers, Assistant nurses)
- Regional governmental employees (e.g. Doctors, Nurses, Biomedical analysts)
- Privately employed blue-collar employees (e.g. Warehouse staff, Restaurant, and hotel staff, Store staff)
- Privately employed white-collar employees (e.g. Engineers, IT-Architects, Bankers)

Some of these occupational groups are larger than others, and more importantly, their composition of age groups are different. The two privately employed groups are consistently the largest groups. Roughly 70% of all respondents belong to these two groups in 2020. Out of all respondents in each occupational group, the groups with the highest percentage of respondents belonging to the age group 18 to 24-year-olds are privately employed blue-collar employees with 17% 18 to 24-year-olds. The second group with the largest percentage is municipal employees with 8% 18 to 24-year-olds. The data supports assumptions made previously that young people to a higher degree work in fields that require less experience and generally have a higher degree of part-time contract e.g. Restaurant, Hotel, Carers.

Each one of the 15 yearly unique combinations will give an observation of the full-time equivalent average monthly salary, as well as the number of employees in that combination. Each respondent also contributes what gender they belong to when they

are surveyed, this information will be used to calculate what proportion of each of the aggregate groups are male. Together with this dataset, yearly data has been collected from other sources to supplement the dataset with additional information, such as Swedens' GDP numbers have been collected from Statistics Sweden between the years of 2004 and 2020 to see what years if any Sweden has suffered from a recession.

In Summary Table 1, summary statistics are presented for all variables that are used in the analysis.

Descriptive Statistics

	N	Mean	SD	Min	Max
Monthly Salary Running Prices	255	26587.059	5931.043	17000	46000
Monthly Salary Stable Prices	255	23980.783	4728.767	16911.84	38221.041
Employees	255	144249.8	123353.043	2800	424500
Share of Employees	255	.174	0.083	.014	.308
Recession	255	.235	0.425	0	1
Males	255	.434	0.178	.191	.819

Summary Table 1, summary statistics

Out of the 255 observations in total, the average amount of employees is roughly 144,000 employees, with the smallest one having 2800 employees and the largest having 424,000 employees. The average share of employees in the 255 observations amount to roughly 17% of the total amount of employees with the smallest group contributing with roughly 1.4% and the largest with roughly 31%. The mean of the variable Recession should show how many years are counted as suffering from a recession. The mean of the variable Males should tell us on average, how large the proportion of males is in the data set, it is also clear to see that there is a large difference between different combinations of the age groups and occupational groups regarding how large the proportion of males is. The smallest is around 19% and the largest is around 82%.

As discussed previously, young people are more susceptible to swings in the economy. Figures 3 and 4 will investigate if the outcome variables in this analysis show early evidence of the same fact or not. Figure 3 shows that the average salary has a steady upwards trend, except for the years when the big economic crisis hit Sweden. Between the years of 2009 and 2011, the average salary stagnates or even decreases slightly. If the effect on the individuals between 18 to 24-year-olds is isolated the results look very similar to the other two age groups which could indicate that the economic crisis has affected all the individuals in the sample equally.

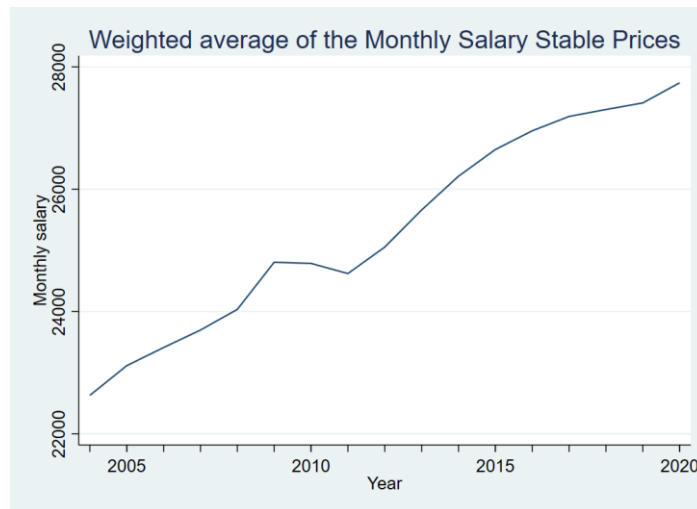


Figure 3 shows the weighted average salary of the entire sample each year

Evidence that the economic crisis could have had some effects are visible in Figure 4. The graph shows that the share of employees starts swinging downwards around 2008, roughly when the economic crisis hit. The trend does not swing upward until roughly 2017, which could indicate that the crisis was the start of a longer downturn for the share of employment. Since the trend is not flattened out until 2014 there could be evidence that something else than the economic crisis has also influenced the employment share over these years.

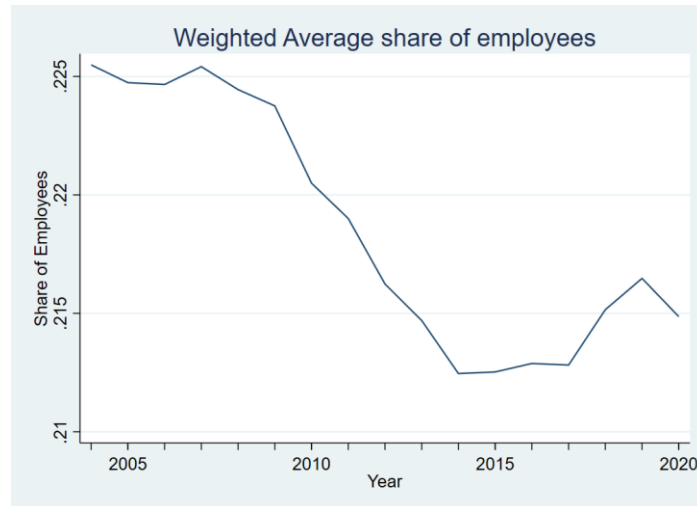


Figure 4 shows the weighted average percentage of the employees belonging to the sample

Dependent variables

The two outcome variables that were deemed interesting for research purposes from the survey were monthly salary and share of employees.

Statistics Sweden takes the hourly wage of the employees who are working less than full-time and scales it up to full-time employment. These observations are then added to the employees who are working full-time. Out of all the respondents' monthly

salaries, an average is taken. This measure is the full-time equivalent average monthly salary for that specific year as well as the specific age group and occupational group it is aggregated to. The reason Statistics Sweden measures in this way is to erase differences in attendance and actual length of working hours. Therefore, everything is normalized to a full-time equivalent monthly salary. This measure is shown in Table 1 as “Monthly Salary Running Prices”. This value is then corrected for inflation with 2004 as the base year. This correction was made so that data is comparable over the years. The inflation-corrected measure is shown as “Monthly Salary Stable Prices” in table one.

The second variable of interest is the “Share of Employees” in table one. By taking the yearly number of employees in each aggregated age and occupational group and dividing it by the total number of employees in that specific occupational group, produces a measure that shows us what fraction belongs to that specific group. This value will be used as a dependent variable in the analysis to analyze how changes in the composition of the labor force have developed.

Independent variables

Two independent variables were deemed appropriate for the analysis. The first is the variable named Recession in Table 1. Constructed by the simplest definition of what constitutes a recession. Years with two or more consecutive quarters with negative GDP growths constitute years where the country is in recession. Several large economic events happened during the period of interest and therefore to minimize bias and omitted variable bias a control variable for recessions was deemed necessary to see how it has affected the two different policy treatments. A dummy was constructed to indicate the years when Sweden suffered from a recession, which were 2008, 2009, 2012, and 2020.

As previously mentioned, and can be seen in Summary Table 1, the proportion of males varies a lot between different observations. This could likely have influenced the different treatments that will be analyzed. Therefore, it was decided that “Males” should be used as a control variable to see what effect an increase or decrease in the proportion of males would have on the treatment. The share of males could potentially affect the outcome variable, especially wages which could potentially be higher for males in general. To isolate this effect and see the treatment effect. Controlling for the share of males was deemed necessary.

Fixed Effects

Some effects are either time invariant or occupational group invariant. These effects need to be controlled for as well. To do this, fixed effects are included in the regressions. Firstly, yearly fixed effects are included in the regressions to capture effects that changes between individual years, but equal across all observations.

These fixed effects are added to capture such events as the large layoffs that happened because of the start of the corona-pandemic in 2020. The other kind of fixed effect that is added is occupational group fixed effects. These fixed effects are added to capture effects that are different between occupational groups but are constant over time. For example, if some occupational groups constantly experience a higher rate of growth, this should be captured by these fixed effects. These two fixed effects are added to make sure that unobserved effects such as these are accounted for in the regressions that are performed and to try to increase the validity of the results.

Methodology

Identification Strategy

In this paper, much like many others that have analyzed problems of a similar nature, a Difference-in-Difference method (hereafter DiD) will be used to perform the econometric analyses. The DiD method will be used to estimate what effect changes in the payroll tax policy in Sweden have had on the salary and the share of total people who are employed belonging to the age category 18 to 24-year-olds. The DiD method will be used to analyze both the implementation of the policy as well as the removal of the policy. To be able to analyze and investigate if these changes to the tax policy have had asymmetric effects on the variables of interest.

The choice to implement the DiD framework was a natural response to potential problems with omitted variable bias, due to a lack of data. The DiD framework is especially good at circumventing omitted variable bias and producing unbiased counterfactuals and therefore also unbiased induction. The induction estimated from the DiD framework relies on changes over time in the differences within a control and treatment group. The control group functions as a counterfactual to the treatment group. Since it is impossible to know what would happen to the treatment group if they did not receive the intervention they did, the next best thing is used. That is a group as closely similar as possible except in the treatment status. Changes within different age groups will be used for induction and the policy implementation or revocation mentioned in the background will act as treatment. The youngest age group in the available data was decided to be the treatment group since they fall within the eligible ages for the policy treatment, this age group consists of 18 to 24-year-olds. To get an as accurate as possible counterfactual, but also increase the variability due to lack of data and some spillover between the groups. Both other age groups were decided to be used as the control group, which makes the control consists of 25 to 44-year-olds.

Something that should be noted was woven into the decision-making regarding the control groups, even from the first implementation and iteration of the payroll tax cut, is that this type of categorization would have some spillover from the treatment group into the age group above. Increasing the control group with another age group, would

likely increase the variability and make the control and treatment group slightly less homogenous. However, increasing the control group might also decrease the contamination of the spillover effect from the treatment group. Therefore, the decision to increase the control group with another age group, from one group to two groups, was deemed to be a wise decision that would likely give opportunities for a wider analysis and more sensitivity testing.

The general form of the DiD framework used would therefore be.

$$y_{ijt} = \beta_0 + \beta_1\lambda_t + \beta_2\delta_j + \beta_3\lambda\delta_{ijt} + \beta x_{ijt} + \eta_t + \sigma_i + \varepsilon_{ijt} \quad (1)$$

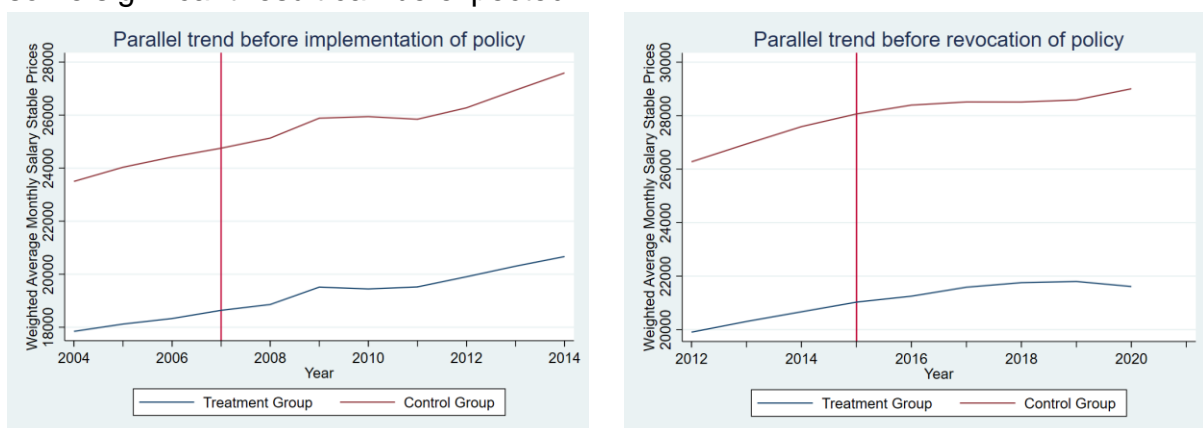
The subscripts in this regression are as follows, *i* refers to which of the five occupational groups the observation belongs. The *j* refers to which of the three age groups the observation belongs to. *t* is a time indicator showing which year the observation belongs to.

In this specification, *y* is the dependent variable and will either be the full-time equivalent averaged between respondents' monthly salary adjusted for inflation or the fraction of employed people. **Lambda** is the post-treatment variable in this equation, this will take two different forms depending on if the implementation or revocation of the policy is estimated. When the implementation of the policy is estimated the years between 2008 and 2015 will be given the value one, since these are the years when the policy is active, all the other years will be given the value zero in this instance. When the revocation is estimated all the years from 2015 and onwards will be given the value of one and all the years before 2015 will be given the value of zero. **Delta** is a treatment variable, that will indicate whether the observation that is used for the estimation is within the treatment group or not. As previously described the lowest age group, 18 to 24-year-olds, are the treatment group. Therefore, they will be given the value one in the treatment variable. The control group consists of two age groups combined, the 25 to 34-year-olds and the 35 to 44-year-olds. These will be given the value zero in the treatment variable. The third term **Delta-Lambda** is the interaction term of the post-treatment and the treatment variables. This is the variable that is of interest in the regression and what will give us the average treatment effect of the treated. *x* will always consist of the same independent control variables as described previously. **Epsilon** is the error term of the regression.

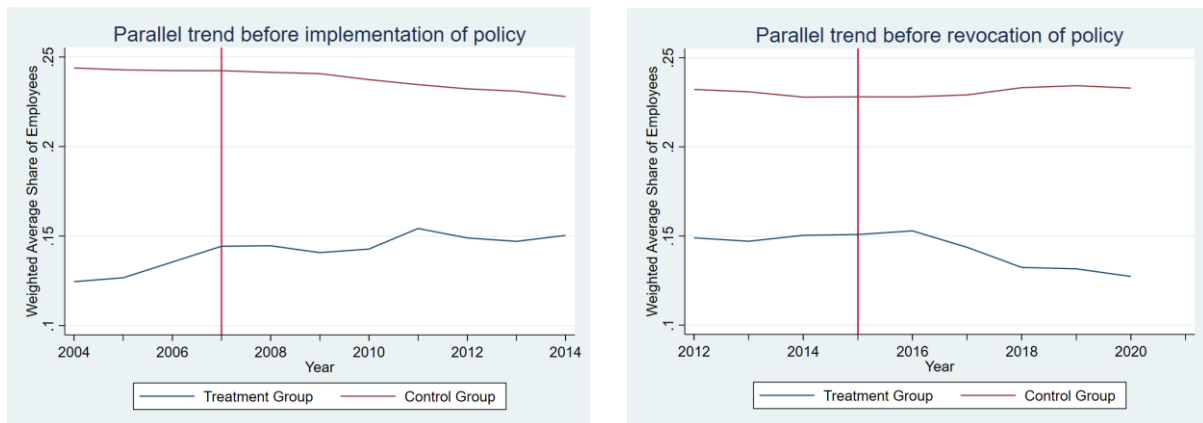
The problems with omitted variables or spillover effects might cause problems with the most important assumption of the DiD framework, the parallel trend assumption. This is what identifies if the control and the treatment group have evolved similarly before the treatment even though they are different groups. This is a necessary assumption because, without it, it would be impossible to say that the change shown would be derived from the treatment. It could be a wide variety of variables that would be responsible for the change after the treatment if the two groups do not have similar pre-trends.

In this analysis, four different main regressions will be performed, therefore, four different pre-trends have been analyzed and displayed in the following four figures. Figures 5 and 6 show the weighted average of the inflation-corrected full-time equivalent monthly salary for the treatment and control groups. As evident, in Figure 5, the trends before the implementation of the payroll tax policy are very similar. What could be worrying about the accuracy of the results is the lack of any concrete visual discrepancies after the implementation. Both the control and the treatment group continue very similar trends. A successful treatment effect should result in some type of change for the treatment group. A very similar conclusion can be drawn from the graph in Figure 6, the pre-trends are very similar and so are the trends after the revocation of the policy. A conclusion from the graphical analysis is that large or significant estimates of the average treatment effect of the treated should not be expected. Although, it is important to also note that it is impossible to fully test for pre-trend accuracy through graphical analysis. Instead, the reasoning is more important for the accuracy of the assessment of parallel trends.

Figures 7 and 8 show the weighted average of the share of employees in the control and treatment groups that are employed before the implementation and before the revocation of the tax policy. Before the implementation of the policy, there are some discrepancies between the control and treatment groups. However, as evident by Figure 1, youths experience larger swings from economic shocks than their older counterparts. As also discussed previously in the paper, during the years before the policy implementation Sweden was experiencing favourable economic conditions and therefore a difference between the control and treatment group is expected. Therefore, it is still assumed that the pre trends hold for this analysis. There is also evidence that the implementation has influenced the treatment group compared to the control group. Similar results can be seen in Figure seven, the pre-trends are relatively stagnant for both groups but there is graphical evidence that the revocation has influenced the treatment group. A concluding remark on the share of employees pre trends are that some significant result can be expected.



Figures 5 and 6 show the parallel trends of salaries before implementation and before the revocation of the policy



Figures 7 and 8 show parallel trends for the share of employed people before the implementation and before the revocation of the policy

As has been shown in the background section of this paper. The payroll tax policy was implemented and then also strengthened. When it was removed it was removed in two steps over one year. With this information in hand, the two implementation stages would be considered as one event, and the revocation stages would also be considered as one event. This decision was made mainly due to the suitability of the data. Therefore, the periods used in the DiD framework will look as follows.

For the implementation of the policy, three years before the first implementation will be used as the starting point to give a sufficiently long pre-treatment period. All the years up until and including 2014 were deemed as an appropriate time frame to analyze the effect of the policy since this was the year that it was revoked again.

For the revocation of the policy, three years before the revocation and four years after the revocation was deemed suitable. The decision of these timeframes was influenced by the fact that all the data in this data set is only yearly which makes it unsuitable to attempt to analyze anything besides full-year periods. This gives us the period from 2012 until 2020 that will be analyzed, the reasoning is similar to the implementation period. Three years before the revocation gives a reasonable pre-treatment period and several years after the revocation gives a reasonable amount of time for the effect to take place.

Results

In this section, the results of the analyses that have been performed will be presented. Section one will focus on the regressions from the implementation of the payroll tax policy during the time frame 2004 to 2014. Section two will focus on the regressions from the revocation of the payroll tax policy during the time frame from 2012 to 2020.

Here follows explanations of some of the general results that will appear in several of the result tables. The variable *Constant* will display the average outcome for the control group before the implementation or revocation of the policy depending on what

regression is run. The variable *Post-Treatment* will instead show how the control group on average has developed from before to after the treatment, this can be seen as a general trend that will affect everyone independent of treatment status. *Treatment* is the variable that will show the difference between the treatment and control group before the time of treatment. The most important of the reoccurring variables is *DiD* which will display the average treatment effect of the treated (ATET). Full and individual versions of all the regression tables are available in the appendix.

Implementation of the Policy

Monthly Salary

Table 1 shows the estimates from the DiD regression with “Monthly Salary Stable Prices” as the dependent variable. The DiD variable does not produce a significant result in this version of the regression. The Time variable shows a significant estimate of roughly 2000 SEK which indicates that the average salary between 2004 and 2014 has increased by roughly 2000 SEK, which is expected based on the graphical evidence from the outcome variable. There is also a significant difference between the groups where the treatment group earns on average 5000 SEK less than the control group before the treatment. Neither the Recession nor the Males variables produce significant results. The fixed effects estimates produce results that align with the reasoning throughout the paper. The years that were affected by the economic crisis produce lower estimates compared to the base year 2004. The occupational groups also react differently, Governmental employees earn on average more than municipal employees and privately employed blue-collar employees but earn less than privately employed white-collar employees. The fact that the DiD variable does not produce a significant result might have several reasons. It also makes it difficult to deduce which of the referenced studies the results would be similar to since there are some that indicate increased salaries, and some indicate decreased salaries. The fact that a large economic policy was implemented at the same time as a large economic crisis hit would result in two forces working in opposite directions, these opposite effects might also make the results unclear. The absence of salary increases might be in line with the reasoning of the political parties implementing the policy, that wage shifting might take a long time before occurring. An important fact that might be a contributing reason to lowering the significance of some results is the data that was available for this paper. Especially the fact that the smallest extra age group that could be added to the control group was an entire 10-year span group of individuals. This might have made the control and treatment groups too heterogeneous. However, this fact will be investigated during the robustness checks that will be performed.

Implementation of the tax policy								
	Monthly Salary Stable Prices				Share of Employees			
	Age group 18-24 Treatment		Age group 25-44 Control		Age group 18-24 Treatment		Age group 25-44 Control	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-Treatment	2,097.406*** (0.003)	2,117.612*** (0.003)	2,462.790*** (0.001)	2,120.757*** (0.007)	-0.005 (0.529)	-0.005 (0.548)	-0.004 (0.597)	-0.009 (0.510)
Treatment	-5,257.506*** (0.000)	-5,181.978*** (0.000)	-5,182.431*** (0.000)	-5,373.324*** (0.000)	-0.156*** (0.000)	-0.154*** (0.000)	-0.154*** (0.000)	-0.168*** (0.000)
DiD	-1,008.772 (0.178)	-1,040.564 (0.152)	-1,040.373 (0.151)	-960.021 (0.182)	0.014 (0.450)	0.013 (0.463)	0.013 (0.465)	0.019 (0.148)
Males		2,723.602** (0.034)	2,707.269** (0.034)	-4,176.437 (0.260)		0.090*** (0.000)	0.090*** (0.000)	-0.433*** (0.000)
Recession			-805.699 (0.196)	348.624 (0.675)			-0.000 (0.991)	-0.000 (0.989)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	23,511.455*** (0.000)	22,302.943*** (0.000)	22,310.191*** (0.000)	26,056.203*** (0.000)	0.226*** (0.000)	0.186*** (0.000)	0.186*** (0.000)	0.452*** (0.000)
Observations	165	165	165	165	165	165	165	165
R-squared	0.481	0.495	0.501	0.763	0.670	0.709	0.709	0.817

Table 1. Four versions, per dependent variable, of the same model. With yearly and occupational group fixed effects are included in version (4) of each version. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1. A full table including all the fixed effects estimates is available in the appendix.

Share of Employees

Table 1 also shows the results from the regression performed with the Share of Employees as the dependent variable. The R-squared value tells us that the model explains a large proportion of the variation in the model. However, the DiD variable does not produce a significant result. The Treatment variable indicates that there is a significant difference between the control and treatment groups before the treatment, which is expected and has been discussed in the data section. The Time and Recession variable does not produce any significant results. The Males variable does produce a significant estimate of -0.43%. This should indicate that for every percentage increase of Males that the policy implementation results in, should decrease the share of Employees by 0.43%. The governmental employees on average over this period contribute to the total share of employees with a larger proportion than the municipal and regional governmental employees but less than the privately employed employees. These effects are expected from the analysis in the data section, where the privately employed occupational groups are the largest. The insignificance of the DiD variable makes it impossible to say if this analysis would be in line with Saez et. al. (2019) and Egebark & Kaunitz (2014,2018), who showed positive employment trends from the policy implementation or Carlén & Boman (2013), who showed negative employment trends because of the implementation of the policy.

Although the parallel trend showed some promising results, none of them show up in the results of this regressions. Yet again it is worth mentioning the fact that the inclusion of another age group in the control group might have had negative effects on this specific regression.

Revocation of the policy

Monthly Salary

Table 2 shows the results from the estimation of the revocation of the policy on the “Monthly Salary Stable Prices” as the dependent variable. Firstly, the DiD variable does not produce any significant result and neither does the Recession or Males variable. There is a positive significant trend indicated by the Time variable and a significant difference between the groups before the revocation of the policy indicated by the Treatment variable. The occupational group also produces significant results. The governmental employees earn on average more than the municipal employees and the privately employed blue-collar employees, but less than the privately employed white-collar employees. These results are significant on a 1% level. These results are also in line with the reasoning regarding the difference in the composition of the occupational groups. Yet again, the parallel pre-trend for the monthly salary did show some signs that the criteria for the parallel trend assumption could be broken. The inclusion of the extra age group in the control group might also have had a negative effect on the results. There is no earlier research on this policy change and therefore there are no earlier results to compare against.

Share of Employees

Table 2 also shows the estimate of the revocation of the policy with the “share of employees” as the dependent variable. The DiD variable does not produce any significant results, neither does the Recession variable or the Males variable. The R-squared is high which could mean a large proportion of the variation in the model is explained by this regression. There is a significant difference between the control and the treatment group indicated by the Treatment variable. The yearly fixed effects with 2012 as the comparison year do not produce any significant results. The occupational group privately employed Blue-Collar Employees fixed effects with governmental employees as the comparison does produce significant results. Governmental employees on average contribute by a lower proportion than the Blue-Collar Employees. This result is significant on a 1% level. Since the focus yet again is the revocation of the policy, there is no earlier research conducted on this policy revocation in Sweden. There are no earlier results that could indicate what results to expect. Yet again, the dilution of the control group might have negatively affected the significance of the results.

Revocation of the payroll tax policy								
	Monthly Salary Stable Prices				Share of Employees			
	Age group 18-24 Treatment		Age group 25-44 Control		Age group 18-24 Treatment		Age group 25-44 Control	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-Treatment 2	1,745.457*	1,757.254*	1,734.435*	3,091.947***	0.006	0.007	0.007	0.007
	(0.057)	(0.056)	(0.060)	(0.003)	(0.406)	(0.321)	(0.323)	(0.636)
Treatment	-6,754.700***	-6,746.555***	-6,746.512***	-6,754.000***	-0.136***	-0.136***	-0.136***	-0.137***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DiD 2	-498.284	-547.148	-547.402	-502.479	-0.012	-0.015	-0.015	-0.009
	(0.602)	(0.567)	(0.567)	(0.586)	(0.531)	(0.431)	(0.433)	(0.533)
Males		1,693.237	1,702.021	145.369		0.087***	0.087***	-0.095
		(0.337)	(0.334)	(0.970)		(0.000)	(0.000)	(0.312)
Recession			-457.605	-656.614			-0.000	-0.001
			(0.531)	(0.457)			(0.973)	(0.946)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	26,771.539***	26,032.907***	26,143.476***	26,625.957***	0.219***	0.181***	0.181***	0.264***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	135	135	135	135	135	135	135	135
R-squared	0.486	0.490	0.491	0.731	0.715	0.750	0.750	0.786

Table 2. Four versions, per dependent variable, of the same model. With yearly and occupational group fixed effects are included in version (4) of each version. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1. A full table including all the fixed effects estimates is available in the appendix.

Robustness checks

Specific analyses with the individual age groups as control groups instead of the entire control group were made as a form of robustness check. They were made to see if the division of the control groups would result in significant results and therefore prove that the problem of spillover would not cause problems with the analysis. Having a smaller control group might improve the results since the control group is more uniform than if two age groups are included. Tables five to eight display the results from these analyses.

Implementation of the tax policy

Table 3 shows the estimates of the robustness checks with individual age groups as the control group and “Monthly Salary Stable Prices” as the dependent variable. When the effect is divided up, the DiD variable only produces a significant result when the older control group was used, which indicates that the treatment group on average earned 1400 SEK less than the control group after the implementation of the policy. Neither the Recession nor Males variables produce significant results in any of these robustness checks, but the Time and Treatment variables produce significant results in both regressions. The reduced variation shows up in the increased r-squared values and decreased observations.

Implementation of the payroll tax policy								
	Monthly Salary Stable Prices Age group 18-24 treatment Age group 35-44 Control				Monthly Salary Stable Prices Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-Treatment	2,560.467** (0.025)	2,588.465** (0.022)	2,946.268** (0.013)	2,599.044*** (0.010)	1,634.346** (0.012)	1,650.807** (0.010)	1,910.646*** (0.005)	1,607.735*** (0.005)
Treatment	-6,516.208*** (0.000)	-6,443.508*** (0.000)	-6,443.946*** (0.000)	-6,598.115*** (0.000)	-3,998.805*** (0.000)	-3,910.207*** (0.000)	-3,910.984*** (0.000)	-4,009.637*** (0.000)
DiD	-1,471.833 (0.204)	-1,513.430 (0.182)	-1,513.180 (0.183)	-1,424.967* (0.085)	-545.711 (0.427)	-573.691 (0.384)	-573.445 (0.383)	-542.290 (0.240)
Males		3,196.830* (0.064)	3,177.577* (0.065)	-3,601.713 (0.374)		2,707.681*** (0.007)	2,683.924*** (0.007)	-331.035 (0.892)
Recession			-835.267 (0.263)	-866.016 (0.358)			-606.630 (0.147)	-584.972 (0.243)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	24,770.156*** (0.000)	23,367.617*** (0.000)	23,376.064*** (0.000)	27,358.916*** (0.000)	22,252.753*** (0.000)	21,037.795*** (0.000)	21,048.455*** (0.000)	22,358.742*** (0.000)
Observations	110	110	110	110	110	110	110	110
R-squared	0.629	0.644	0.648	0.841	0.635	0.663	0.670	0.866

Table 3. Results from the implementation of the policy. "Monthly Salary Stable Prices" as the dependent variable. Occupational group and yearly fixed effects in iteration 4 of each regression. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1.

The yearly fixed effects produce similar results for both the robustness checks, the year 2014 is significant and the sample earns more this year compared to the comparison of 2004 when the older control group is used. With the younger control group, the yearly fixed effects for 2009, 2012, 2013, and 2014 all produce significant results compared to the baseline year 2004. They all produce positive estimates indicating that salaries are higher than the comparison year. The occupational groups fixed effects also produce similar results as the main result, and similar for both robustness checks. Governmental employees earn more money on average than regional governmental employees and privately employed blue-collar employees but earn less than privately employed white-collar employees. The division of the control group seems to have had positive effects on the results of the estimation. Although, these ambiguous results are still expected since there are some problems with the parallel trend as well as some inaccuracy in the data due to only yearly observations. This could also indicate that the policy is inefficient, or that the wage shifting takes even longer to take place.

Table 4 displays the results of the robustness checks of the implementation of the policy with "Share of Employees" as the dependent variable. The estimations produce similar results as in the main analysis but with better p values for the younger control group, which indicates a point estimate closer to the real effect. The point estimate for

the DiD variable with the younger control group is 0.017 or roughly 1.68%. Although it is significant on a weaker level, the 10% level, it is exactly the effect that is predicted by the theories of general equilibrium theory and corroborated by earlier studies such as Saez et. al. (2019) and Egebark & Kaunitz (2014, 2018) which all point to effects that increase the employment of young people of roughly 2-3%. This can also be an indication that the ambiguous results from the salary estimations are true.

Implementation of the payroll tax policy								
	Share of employees Age group 18-24 treatment Age group 35-44 Control				Share of employees Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post Treatment	-0.006	-0.006	-0.006	-0.008	-0.004	-0.003	-0.002	-0.007
	(0.391)	(0.432)	(0.503)	(0.634)	(0.642)	(0.280)	(0.702)	(0.591)
Treatment	-0.186***	-0.184***	-0.184***	-0.195***	-0.127***	-0.122***	-0.122***	-0.138***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DiD	0.015	0.014	0.014	0.020	0.013	0.012	0.012	0.017*
	(0.414)	(0.426)	(0.429)	(0.159)	(0.492)	(0.479)	(0.480)	(0.094)
Males		0.058**	0.058**	-0.393***		0.135***	0.135***	-0.330***
		(0.012)	(0.012)	(0.000)		(0.000)	(0.000)	(0.000)
Recession			0.001	-0.004			-0.003	-0.010
			(0.941)	(0.808)			(0.772)	(0.422)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	0.255***	0.230***	0.230***	0.455***	0.196***	0.136***	0.136***	0.366***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	110	110	110	110	110	110	110	110
R-squared	0.777	0.789	0.789	0.884	0.598	0.693	0.693	0.913

Table 4. Results from the implementation of the policy. "Share of Employees" as the dependent variable. Occupational group and yearly fixed effects in iteration 4 of each regression. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1.

Since the cost of the employees has been lowered but there is no evidence that the salary has been raised, the logical thing that profit-maximizing firms should do is hire more employees. The Males variable also produces a significant effect of the magnitude of -0.33 which would indicate that for every extra percent of male employees created by the implementation of the policy, the effect for the treatment group would decrease by 0.33%.

Revocation of the tax policy

In Table 5, the results from the robustness check regarding the revocation of the policy are presented with the "Monthly Salary Stable Prices" as the dependent variable. Most notably, the DiD variable does not produce any significant results. Neither does the Recession nor the Males variables in either of the versions. For both versions of the regression, none of the yearly fixed effects produce any significant results. The occupational groups produce similar results as the main analysis. With the younger

control group, the governmental employees earn more than the municipal employees, but less than both privately employed occupational groups. For the older control group, the governmental employees earn more than the blue-collar privately employed employees but less than the white-collar privately employed employees. These estimations are also in the realm where there is no previous research to compare the results against. Yet again, the scarcity of anything but yearly data might influence the effectiveness of the estimation.

Revocation of the payroll tax policy								
	Monthly Salary Stable Prices Age group 18-24 treatment Age group 35-44 Control				Monthly Salary Stable Prices Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post Treatment 2	2,014.524	2,041.136	2,014.107	2,204.148*	1,476.390**	1,480.265**	1,461.599**	1,438.325***
	(0.158)	(0.153)	(0.161)	(0.052)	(0.042)	(0.040)	(0.044)	(0.007)
Treatment	-8,745.397***	-8,752.211***	-8,752.232***	-8,759.305***	-4,764.003***	-4,740.995***	-4,741.083***	-4,738.238***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DiD 2	-767.351	-843.315	-843.539	-922.384	-229.216	-272.928	-272.762	-278.166
	(0.597)	(0.562)	(0.562)	(0.381)	(0.767)	(0.722)	(0.722)	(0.563)
Males		2,254.382	2,261.030	4,600.903		1,819.703	1,812.794	2,037.759
		(0.328)	(0.327)	(0.322)		(0.104)	(0.104)	(0.380)
Recession			-542.156	-690.750			-373.018	-615.215
			(0.532)	(0.518)			(0.420)	(0.229)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	28,762.236***	27,796.478***	27,929.168***	26,392.127***	24,780.842***	23,972.788***	24,069.111***	23,156.207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	90	90	90	90	90	90	90	90
R-squared	0.661	0.666	0.667	0.851	0.675	0.684	0.687	0.892

Table 5. Results from the revocation of the policy. "Monthly Salary Stable Prices" as the dependent variable. Occupational group and yearly fixed effects in iteration 3 of each regression. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1.

Table 6 shows the estimates from the robustness regression with the "Share of employees" as the dependent variable and the revocation of the policy as the period. When the older control group is used, only the Treatment variable produces a significant result, indicating a significant difference between the control and treatment group before the revocation of the policy. The only fixed effect that produces any significant result in the occupational group privately employed blue-collar employees which contribute to the total share of employees with a larger share than the comparison group governmental employees. When the younger control group is used, the most interesting result is produced. Yet again, the Treatment variable produces significant results that are like the main analysis. The DiD variable produces a significant result of -0.024 significant on a 5% level, which could indicate that the treatment group suffered an employment share loss of 2.43% compared to the control group when the policy was revoked. This is also a result that is expected but has not yet been proven in any other research paper. According to the same forces that would

increase employment when the policy was implemented, when the policy is revoked would cause employment to decrease. This is also the same result that was predicted by Daunfeldt & Hortlund (2014) when the revocation was announced.

Revocation of the payroll tax policy								
	Share of Employees				Share of Employees			
	Age group 18-24 treatment		Age group 35-44 Control		Age group 18-24 treatment		Age group 25-34 Control	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post Treatment 2	-0.008 (0.381)	-0.007 (0.436)	-0.007 (0.436)	-0.006 (0.805)	0.020** (0.019)	0.020*** (0.000)	0.020*** (0.000)	0.019 (0.197)
Treatment	-0.159*** (0.000)	-0.159*** (0.000)	-0.159*** (0.000)	-0.158*** (0.000)	-0.114*** (0.000)	-0.112*** (0.000)	-0.112*** (0.000)	-0.115*** (0.000)
DiD 2	0.002 (0.919)	-0.000 (0.999)	-0.000 (0.999)	0.005 (0.796)	-0.026 (0.189)	-0.029 (0.104)	-0.029 (0.106)	-0.024** (0.031)
Males		0.061** (0.046)	0.061** (0.047)	-0.077 (0.493)		0.127*** (0.000)	0.127*** (0.000)	-0.073 (0.301)
Recession			-0.001 (0.931)	0.000 (0.993)			-0.000 (0.968)	-0.003 (0.813)
Occupational Group Fixed Effects				Yes				Yes
Yearly Fixed Effects				Yes				Yes
Constant	0.242*** (0.000)	0.215*** (0.000)	0.216*** (0.000)	0.274*** (0.000)	0.197*** (0.000)	0.140*** (0.000)	0.140*** (0.000)	0.215*** (0.000)
Observations	90	90	90	90	90	90	90	90
R-squared	0.749	0.763	0.763	0.798	0.674	0.748	0.748	0.904

Table 6. Results from the revocation of the policy. "Share of Employees" as the dependent variable. Occupational group and yearly fixed effects in iteration 4 of each regression. Robust P-values are in parentheses and the significance values are as follows *** p<0.01, ** p<0.05, * p<0.1.

Discussion

The previous section has shown the results from all the regressions as well as a brief overview of some of the links to the literature that has been referenced. This section will collect all the results into their major points, link them to the referenced reports and see how these results will influence the hypotheses stated in this paper. This section will be divided into two parts, one for the implementation and one for the revocation of the payroll tax policy.

Implementation of the tax policy

This first section will handle the implementation of the policy in the time frame from 2004 until 2014. The complete analysis of the implementation of the policy has been performed in Tables 1, 3 and 4. Some general facts are worth pointing out, almost all the estimations with the "Monthly Salary Stable Prices" as the dependent variable, produce little significant results. Overall, the estimations give inconclusive results but with a smaller sample, the estimates show that individuals under the age of 25 have been affected negatively by the implementation of the policy compared to the control group consisting of the slightly older sample. This result is in line with what Carlén &

Boman (2013), who showed evidence that young people, especially in a sector where they are heavily overrepresented, have suffered from increased unemployment as well as fewer working hours. These results might indicate that this fact is true even for the wider labor market. However, since the only time significant results are produced is when the older smaller control group is used, might indicate that there are some things that the model cannot pick up. Otherwise, the assumption would be that the most significant result should be present when the younger control group is used.

The results from the implementation with the salary dependent variable are somewhat unexpected, precautions were taken to eliminate as many of the inherent problems with the data available as possible. Broadening the control group, controlling for some of the larger influencing effects as well as fixed effects. The choice of estimation model was chosen specifically as this is one of the most widely used for this type of analysis and usually gives some of the most accurate results. This gives safety in the choices that were made in advance, and therefore the results are somewhat unexpected. Especially when the theories of general equilibrium, rent sharing, substitution and scaling effects are taken into the equation. These theories would predict that salaries should increase during circumstances like this. Under these circumstances when steps were taken to reduce problems with the estimation but still received unexpected results, the type of available data must be questioned. The available data only exist with yearly observations which is not optimal for this type of analysis and will be further discussed in the limitation section.

The second variable of interest, the “Share of Employees”, can only be assumed to suffer from the same problems in the data as the “Monthly Salary Stable Prices”. Overall, the share of employees variable produces more significant results than the salary one. It is clear from the evidence that the proportion of males influences the result of the implementation of the policy. However, it is only when the control group is split up yet again that results that are more in line with theoretical predictions and earlier studies present themselves. Using the slightly younger control group a significant result of 0.017 in the DiD variable is produced. This result is what is expected according to the theories that are outlined in the theoretical framework, as well as is in line with several of the studies that have been referenced in this paper. As is also shown in the theoretical framework and literature review sections, how large this effect is will depend on how the split between scaling and substitution effects are. However, determining this is something that is outside of the scope of this study.

These paragraphs have investigated the estimations that would answer the first hypothesis stated in this paper. With the estimated results, it is clear to say that the implementation of the payroll tax policy has had positive effects on the employment of youths in Sweden. However, there are inconclusive results regarding what effect the tax policy has had on the salary development of the youth. This indicates that the first hypothesis stated can be answered to some degree.

Revocation of the tax policy

The revocation of the tax policy was analyzed during the time frame from 2012 until 2020. The results have been presented in Tables 2, 5 and 6. This part can be considered the most interesting in the entire paper since, to my knowledge, there are no other papers that have studied the revocation of the payroll tax policy in Sweden during 2015/2016. This means that there are no studies that have previously shown evidence that leads in either direction and therefore, the only things to rely on are the theories discussed in the theoretical framework.

The first dependent variable, “Monthly Salary Stable Prices”, should according to the theories of general equilibrium and wage shifting give a negative effect from the tax change. The same reasoning was made in Daunfeldt & Hortlund’s (2014) paper discussing what potential effects the revocation of the policy could have. Simply explained, raising the cost of the employee by increasing the tax should decrease the demand for that type of employee. Depending on the degree of wage shifting that has occurred earlier, wages might have increased more than what could be considered normal in the general equilibrium model. For the labor market to find a new equilibrium, one of two effects must happen. Either salaries have to decrease for the same number of employees to stay employed, or salaries stay the same and instead, the number of employees decreases.

These are the two extremes, usually, some form of mix is what occurs. This means that a decrease in both the salary and the employment of the youths is to be expected when the payroll tax policy was revoked. The estimates with the salary as the dependent variable do not show any significant results from the DiD variable in any of the three estimations. The results in themselves are somewhat unexpected, however, there are several things that might have interfered with the estimation. Firstly, the data still suffers from the same problem in this part of the estimation as it did in the implementation of the policy. Wages also do not always act rationally. A common problem that sometimes presents itself when wages are supposed to shift downwards is hysteresis. In a country such as Sweden with a high degree of people belonging to a union and having centrally negotiated wages. Wages might be set in longer contracts, so when things such as a tax change happen, there is extra friction for wages to move downwards. This might be one of the effects that have made the estimations insignificant.

The “Share of Employees” produces estimates that are a lot more in line with what is estimated by the theories. None when the entire sample is used, but when the control group is divided up, exactly as in the implementation of the policy. That is when a significant result is produced. The DiD variable for the estimation using the younger control group produces a point estimate of -0.024. Worth mentioning is the fact that this estimation should react in the same way to spillover as the one in the implementation of the policy. If the groups were defined better, there is a possibility

that the effect would be even larger than seen in this estimation, which is discussed further in the limitations section. The fact that the theories suggest that the revocation of the policy should inflict negative effects on the employment of the subjects, give legitimacy to the results of this estimation. Receiving results that are more in line with the predictions from the theories is expected when employment is discussed. Employment is not susceptible to the same frictions in different directions as salary. Salaries have more of these hindrances from movements, such as hysteresis, the fact that employment is less sticky in the short run also gives legitimacy to the estimated results.

Employment share might be more fluid in the short run compared to salaries, this might have been a cause for these two dependent variables to act differently. Besides this, there might also be other unobserved factors that are only affecting salaries and not employment shares. However, there is no evidence in these estimations that the data should decrease the validity of the estimations with the share of employees as the dependent variable.

The second hypothesis stated in the theoretical framework part of this paper uses these paragraphs as the foundation for how it should be answered. The answer is similar to the answer to the first hypothesis. The results regarding salary and how it has been affected by the revocation of the tax policy are inconclusive. The effects on the share of employees caused by the revocation of the policy are negative when the most homogenous control group is used. Which should mean in total that the hypothesis is partly answered.

Limitations

There are some limitations that have been briefly touched upon throughout this thesis. They will be brought up here and sufficiently discussed. Firstly, the fact that the only available data that has been consistently collected and where the definitions stayed consistent over the entire period of interest for this thesis are yearly observations comes with some problems. This is the reason for the decision that the two versions of the implementation were counted as one event. The same logic made up the decision that the revocation was counted as one event. Yearly observations would not be sufficient to clearly define differences between the two different implementations, and yearly observations could not find any difference between the different stages of revocation either. Potential problems with spillover effects have also briefly been brought up. The fact that the youngest age group used is limited to the oldest age of 24. Makes each implementation of the policy have some eligible individuals in the control group. This effect should contaminate the results in some way. The logical conclusion to this should be that the effects that are found, even when there are some spillover effects, should be lower than the true results. Therefore, this gives confidence in the results that are estimated, since if the age groups would be defined in a way

that was better for this specific analysis. It is reasonable to believe that the results would be even greater in magnitude. Due to changes in the collection of data by Statistics Sweden, only the aggregate data could be analyzed and compared over such a long timeframe. This has resulted in a lower number of observations which could have had implications for the statistical power. This can be seen in the rather high r-squared values in the results of the regressions. However, since this is the only available data at the moment of writing this thesis for this author, and the fact that the important results are corroborated by other studies. It is assumed that the statistical power should not be a large problem.

Conclusion

This study has attempted to answer 2 hypotheses and a research question. What effects the implementation, and revocation of a large payroll tax policy has had on the salary and employment of young people in Sweden. As well as if these effects are asymmetric. These questions were attempted to be answered by using data from Statistics Sweden, 15 observations per year over 17 years.

Overall, this study has produced mixed results but has still been able to answer the hypotheses to some degree. Significant evidence points to the fact that the implementation of the policy has had negative effects on the salary of people below the age of 25 compared to the older control group. Reasons that this has occurred might include some of the reasons mentioned in the Carlén & Boman (2013) paper combined with the fact stated in Dhillon & Cassidy (2018). Young individuals being extra susceptible to economic swings in the labor market combined with facts that some of the largest sectors employing young people show that young people worked fewer hours after the implementation, which might result in lower wages. The revocation of the policy has not shown any significant and interesting results in the main analysis of this paper. According to Saez. et al. (2019) sticky wages or centrally negotiated wages might hinder factors that let market forces act as predicted. The fact that wages are sticky in the short run will probably be an excluding factor from this paper being able to analyze if the wages of people under the age of 25 have been affected asymmetrically or not.

The share of employees in the age group of those below 25 has provided a much better framework for this specific analysis. The sub-analysis with a slightly smaller sample and more homogenous control and treatment groups gave promising results. Results both significant in the implementation and revocation of the payroll tax policy using the same control and treatment groups gives a good opportunity to look at if these effects are symmetric or asymmetric. It was expected that the implementation and revocation of the policy should incur effects of opposite signs. The results produced follow this logic. The implementation of the policy showed that the treatment group, those under the age of 25 gained employment shares over the control group, those between 25 to 34, in the magnitude of 1.68%. This result was significant and of

the expected sign. The revocation of the policy was expected to have results of the opposite sign. The results produced followed the expected logic. The produced results showed that the same treatment group lost employment share against the same control group in the magnitude of 2.43%. This result was also significant and of the expected sign. This means that both results follow the expected logic and produce results that are significant.

This gives the optimal setting to judge whether these effects are symmetric or not. Both the control and treatment groups should be equal over the years since there is usually not that large of a difference between different cohorts, the fact that the groups also include several cohorts should dilute eventual changes in the size and composition of specific cohorts. With these facts in mind, it is possible to say that they have stayed the same over the entire period and a straight comparison of the effects against each other is feasible. An employment share reduction of 2.43% is clearly a more negative effect than a 1.68% increase in employment share is positive. This means that at least for the subsection of the sample in this study there is evidence that changes in the payroll tax policy do affect youth in Sweden asymmetrically. This result is not unexpected, this type of asymmetric effect on salaries and employment exists when changing other type of corporate taxes which was proven by Ljungqvist & Smolyansky (2016). This means that the research question of this paper can be answered. The research question receives a similar answer as hypotheses 1 and 2, the results for the salary development of the youth in Sweden are inconclusive. For the employment development of youths in Sweden, clear significant evidence, when the most homogenous setup is used, points to the fact that these effects are indeed asymmetric.

As frequently mentioned in this paper, youths are in a special position in the labor market. They usually lack experience compared to other age groups, this can lead to being funneled into job categories that tend to hire on shorter contracts and with less potential for career development. The sole reason this intervention in the tax policy was proposed was to make young people more attractive in the labor market. It is self-explanatory that policymakers need a deep understanding of the ramifications of their actions, not only in the short term but also in the long term. Logically, decreasing youth unemployment would decrease expenses for the government through decreased social security payments and increase the tax revenue for the government. Since no such research yet exists, all the decisions that have been made regarding the future of youths in Sweden have been taken with suboptimal knowledge and potential long-term harm. Further research into this field with data that might reveal even greater effects than this study and should be considered very important. Therefore, it should be recommended for policymakers that further research be conducted into what effects raising the payroll tax has on the affected population, to eventually be able to deduce if these effects are symmetrical or asymmetrical.

Some potential dangers might show themselves over time if the evidence from this study proves correct. In the longer run, these effects might accumulate and negatively affect the youth of Sweden. It is not unreasonable to think that the more times the payroll tax is changed, the greater the collective asymmetric effect will be, and this could incur negative effects for the population that the tax changes are intended for.

Therefore, in the future, further research into this question with better quality data, for example with individual cohorts instead of age groups, and more years of data after the revocation of the policy, is recommended and might give even better insights into if these effects are asymmetric or not and how they present themselves. Further research that will attempt to identify the scaling and substitution effects and how they affect youths when the tax policy is revoked is also of great importance since it is research that has not been performed before. This might also broaden the insight into the long run effects of tax incidence. During the covid-pandemic Sweden yet again lowered and raised the payroll tax for youths. This could give future researcher even greater amount of data and consecutive times the tax has been changed.

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Appendix

The following tables are the full and individual versions of the tables displayed in the results section. Robust P-values in parentheses

Table 1

	Implementation of the tax policy			
	Monthly Salary Stable Prices			
	Age group 18-24 Treatment		Age group 25-44 Control	
Post	2,097.406*** (0.003)	2,117.612*** (0.003)	2,462.790*** (0.001)	2,120.757*** (0.007)
Treatment	-5,257.506*** (0.000)	-5,181.978*** (0.000)	-5,182.431*** (0.000)	-5,373.324*** (0.000)
DiD	-1,008.772 (0.178)	-1,040.564 (0.152)	-1,040.373 (0.151)	-960.021 (0.182)
Males		2,723.602** (0.034)	2,707.269** (0.034)	-4,176.437 (0.260)
Recession			-805.699 (0.196)	348.624 (0.675)
year_2005_fe				373.550 (0.590)
year_2006_fe				589.437 (0.398)
year_2007_fe				721.680 (0.319)
year_2008_fe				-1,146.998 (0.152)
year_2009_fe				-231.333 (0.777)
year_2010_fe				81.980 (0.919)
o.year_2011_fe				-
o.year_2012_fe				-
year_2013_fe				1,013.964 (0.230)
year_2014_fe				1,804.348** (0.046)
sector_2_fe				-4,841.642*** (0.001)
sector_3_fe				-1,417.276 (0.287)
sector_4_fe				-1,909.436*** (0.002)
sector_5_fe				2,604.582*** (0.000)
Constant	23,511.455*** (0.000)	22,302.943*** (0.000)	22,310.191*** (0.000)	26,056.203*** (0.000)
Observations	165	165	165	165
R-squared	0.481	0.495	0.501	0.763

Table 2

Implementation of the payroll tax policy				
Share of Employees				
Age group 18-24 Treatment				
Age group 25-44 Control				
	(1)	(2)	(3)	(4)
Post	-0.005 (0.529)	-0.005 (0.548)	-0.004 (0.597)	-0.009 (0.510)
Treatment	-0.156*** (0.000)	-0.154*** (0.000)	-0.154*** (0.000)	-0.168*** (0.000)
DiD	0.014 (0.450)	0.013 (0.463)	0.013 (0.465)	0.019 (0.148)
Males		0.090*** (0.000)	0.090*** (0.000)	-0.433*** (0.000)
Recession			-0.000 (0.991)	-0.000 (0.989)
year_2005_fe				-0.002 (0.877)
year_2006_fe				-0.003 (0.842)
year_2007_fe				-0.003 (0.824)
year_2008_fe				-0.004 (0.802)
year_2009_fe				-0.003 (0.823)
year_2010_fe				-0.003 (0.840)
o.year_2011_fe				-
o.year_2012_fe				-
year_2013_fe				0.002 (0.913)
year_2014_fe				0.001 (0.927)
sector_2_fe				-0.140*** (0.000)
sector_3_fe				-0.153*** (0.000)
sector_4_fe				0.108*** (0.000)
sector_5_fe				0.025** (0.029)
Constant	0.226*** (0.000)	0.186*** (0.000)	0.186*** (0.000)	0.452*** (0.000)
Observations	165	165	165	165
R-squared	0.670	0.709	0.709	0.817

Table 3

Revocation of the payroll tax policy				
Monthly Salary Stable Prices				
Age group 18-24 Treatment				
Age group 25-44 Control				
	(1)	(2)	(3)	(4)
Post 2	1,745.457*	1,757.254*	1,734.435*	3,091.947***
	(0.057)	(0.056)	(0.060)	(0.003)
Treatment	-6,754.700***	-6,746.555***	-6,746.512***	-6,754.000***
	(0.000)	(0.000)	(0.000)	(0.000)
DiD 2	-498.284	-547.148	-547.402	-502.479
	(0.602)	(0.567)	(0.567)	(0.586)
Males		1,693.237	1,702.021	145.369
		(0.337)	(0.334)	(0.970)
Recession			-457.605	-656.614
			(0.531)	(0.457)
o.year_2013_fe				-
year_2014_fe				777.095
				(0.404)
year_2015_fe				1,347.062
				(0.158)
year_2016_fe				-1,248.941
				(0.361)
year_2017_fe				-1,068.982
				(0.435)
year_2018_fe				-1,002.246
				(0.462)
year_2019_fe				-916.176
				(0.497)
o.year_2020_fe				-
sector_2_fe				-3,059.510**
				(0.027)
sector_3_fe				816.095
				(0.575)
sector_4_fe				-2,580.063***
				(0.001)
sector_5_fe				3,399.891***
				(0.000)
Constant	26,771.539***	26,032.907***	26,143.476***	26,625.957***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	135	135	135	135
R-squared	0.486	0.490	0.491	0.731

Table 4

	Revocation of the payroll tax policy			
	Share of Employees			
	Age group 18-24 Treatment		Age group 25-44 Control	
	(1)	(2)	(3)	(4)
Post 2	0.006 (0.406)	0.007 (0.321)	0.007 (0.323)	0.007 (0.636)
Treatment	-0.136*** (0.000)	-0.136*** (0.000)	-0.136*** (0.000)	-0.137*** (0.000)
DiD 2	-0.012 (0.531)	-0.015 (0.431)	-0.015 (0.433)	-0.009 (0.533)
Males		0.087*** (0.000)	0.087*** (0.000)	-0.095 (0.312)
Recession			-0.000 (0.973)	-0.001 (0.946)
o.year_2013_fe				-
year_2014_fe				-0.001 (0.933)
year_2015_fe				-0.000 (0.998)
year_2016_fe				-0.003 (0.899)
year_2017_fe				-0.002 (0.904)
year_2018_fe				-0.002 (0.922)
year_2019_fe				-0.002 (0.936)
o.year_2020_fe				-
sector_2_fe				-0.033 (0.225)
sector_3_fe				-0.046 (0.107)
sector_4_fe				0.051*** (0.003)
sector_5_fe				0.013 (0.205)
Constant	0.219*** (0.000)	0.181*** (0.000)	0.181*** (0.000)	0.264*** (0.000)
Observations	135	135	135	135
R-squared	0.715	0.750	0.750	0.786

Table 5

Implementation of the payroll tax policy								
	Monthly Salary Stable Prices Age group 18-24 treatment Age group 35-44 Control				Monthly Salary Stable Prices Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post	2,560.467** (0.025)	2,588.465** (0.022)	2,946.268** (0.013)	2,599.044*** (0.010)	1,634.346** (0.012)	1,650.807** (0.010)	1,910.646*** (0.005)	1,607.735*** (0.005)
Treatment	-6,516.208*** (0.000)	-6,443.508*** (0.000)	-6,443.946*** (0.000)	-6,598.115*** (0.000)	-3,998.805*** (0.000)	-3,910.207*** (0.000)	-3,910.984*** (0.000)	-4,009.637*** (0.000)
DiD	-1,471.833 (0.204)	-1,513.430 (0.182)	-1,513.180 (0.183)	-1,424.967* (0.085)	-545.711 (0.427)	-573.691 (0.384)	-573.445 (0.383)	-542.290 (0.240)
Males		3,196.830* (0.064)	3,177.577* (0.065)	-3,601.713 (0.374)		2,707.681*** (0.007)	2,683.924*** (0.007)	-331.035 (0.892)
Recession			-835.267 (0.263)	-866.016 (0.358)			-606.630 (0.147)	-584.972 (0.243)
year_2005_fe				398.385 (0.651)				303.827 (0.572)
year_2006_fe				610.814 (0.486)				467.149 (0.376)
year_2007_fe				727.594 (0.427)				514.218 (0.348)
o.year_2008_fe				-				-
year_2009_fe				982.339 (0.291)				869.399* (0.088)
year_2010_fe				25.573 (0.979)				140.893 (0.779)
o.year_2011_fe				-				-
year_2012_fe				1,217.398 (0.202)				843.559* (0.094)
year_2013_fe				1,050.313 (0.283)				883.309* (0.074)
year_2014_fe				1,870.975* (0.075)				1,439.033*** (0.006)
sector_2_fe				-5,062.062*** (0.001)				-2,377.402*** (0.003)
sector_3_fe				-1,810.330 (0.173)				78.082 (0.916)
sector_4_fe				-2,443.864*** (0.001)				-730.876* (0.073)
sector_5_fe				2,102.330*** (0.007)				1,636.449*** (0.000)
Constant	24,770.156*** (0.000)	23,367.617*** (0.000)	23,376.064*** (0.000)	27,358.916*** (0.000)	22,252.753*** (0.000)	21,037.795*** (0.000)	21,048.455*** (0.000)	22,358.742*** (0.000)
Observations	110	110	110	110	110	110	110	110
R-squared	0.629	0.644	0.648	0.841	0.635	0.663	0.670	0.866

Table 6

Implementation of the payroll tax policy								
	Share of employees Age group 18-24 treatment Age group 35-44 Control				Share of employees Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post	-0.006 (0.391)	-0.006 (0.432)	-0.006 (0.503)	-0.008 (0.634)	-0.004 (0.642)	-0.003 (0.280)	-0.002 (0.702)	-0.007 (0.591)
Treatment	-0.186*** (0.000)	-0.184*** (0.000)	-0.184*** (0.000)	-0.195*** (0.000)	-0.127*** (0.000)	-0.122*** (0.000)	-0.122*** (0.000)	-0.138*** (0.000)
DiD	0.015 (0.414)	0.014 (0.426)	0.014 (0.429)	0.020 (0.159)	0.013 (0.492)	0.012 (0.479)	0.012 (0.480)	0.017* (0.094)
Males		0.058** (0.012)	0.058** (0.012)	-0.393*** (0.000)		0.135*** (0.000)	0.135*** (0.000)	-0.330*** (0.000)
Recession			0.001 (0.941)	-0.004 (0.808)			-0.003 (0.772)	-0.010 (0.422)
year_2005_fe				-0.001 (0.918)				-0.003 (0.809)
year_2006_fe				-0.001 (0.970)				-0.003 (0.790)
year_2007_fe				-0.000 (0.984)				-0.004 (0.759)
o.year_2008_fe				-				-
year_2009_fe				0.001 (0.959)				0.001 (0.954)
year_2010_fe				-0.003 (0.852)				-0.007 (0.523)
o.year_2011_fe				-				-
year_2012_fe				0.003 (0.852)				0.011 (0.347)
year_2013_fe				-0.001 (0.958)				0.005 (0.633)
year_2014_fe				-0.002 (0.923)				0.005 (0.621)
sector_2_fe				-0.118*** (0.000)				-0.102*** (0.000)
sector_3_fe				-0.137*** (0.000)				-0.125*** (0.000)
sector_4_fe				0.101*** (0.000)				0.124*** (0.000)
sector_5_fe				0.018 (0.169)				0.007 (0.422)
Constant	0.255*** (0.000)	0.230*** (0.000)	0.230*** (0.000)	0.455*** (0.000)	0.196*** (0.000)	0.136*** (0.000)	0.136*** (0.000)	0.366*** (0.000)
Observations	110	110	110	110	110	110	110	110
R-squared	0.777	0.789	0.789	0.884	0.598	0.693	0.693	0.913

Table 7

	Revocation of the payroll tax policy							
	Monthly Salary Stable Prices Age group 18-24 treatment Age group 35-44 Control				Monthly Salary Stable Prices Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post 2	2,014.524 (0.158)	2,041.136 (0.153)	2,014.107 (0.161)	2,204.148* (0.052)	1,476.390** (0.042)	1,480.265** (0.040)	1,461.599** (0.044)	1,438.325*** (0.007)
Treatment	-8,745.397*** (0.000)	-8,752.211*** (0.000)	-8,752.232*** (0.000)	-8,759.305*** (0.000)	-4,764.003*** (0.000)	-4,740.995*** (0.000)	-4,741.083*** (0.000)	-4,738.238*** (0.000)
DiD 2	-767.351 (0.597)	-843.315 (0.562)	-843.539 (0.562)	-922.384 (0.381)	-229.216 (0.767)	-272.928 (0.722)	-272.762 (0.722)	-278.166 (0.563)
Males		2,254.382 (0.328)	2,261.030 (0.327)	4,600.903 (0.322)		1,819.703 (0.104)	1,812.794 (0.104)	2,037.759 (0.380)
Recession			-542.156 (0.532)	-690.750 (0.518)			-373.018 (0.420)	-615.215 (0.229)
o.year_2013_fe				-				-
year_2014_fe				789.484 (0.468)				546.779 (0.283)
year_2015_fe				1,416.150 (0.200)				1,063.095** (0.036)
o.year_2016_fe				-				-
year_2017_fe				186.623 (0.849)				160.965 (0.724)
year_2018_fe				248.981 (0.817)				303.052 (0.534)
year_2019_fe				316.609 (0.762)				413.502 (0.392)
year_2020_fe				1,155.581 (0.448)				1,193.039* (0.099)
sector_2_fe				-2,003.902 (0.165)				-1,186.737* (0.085)
sector_3_fe				2,036.746 (0.171)				1,575.318** (0.036)
sector_4_fe				-3,258.286*** (0.002)				-471.990 (0.303)
sector_5_fe				3,327.441*** (0.000)				2,438.843*** (0.000)
Constant	28,762.236*** (0.000)	27,796.478*** (0.000)	27,929.168*** (0.000)	26,392.127*** (0.000)	24,780.842*** (0.000)	23,972.788*** (0.000)	24,069.111*** (0.000)	23,156.207*** (0.000)
Observations	90	90	90	90	90	90	90	90
R-squared	0.661	0.666	0.667	0.851	0.675	0.684	0.687	0.892

Table 8

Revocation of the payroll tax policy								
	Share of Employees Age group 18-24 treatment Age group 35-44 Control				Share of Employees Age group 18-24 treatment Age group 25-34 Control			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post 2	-0.008 (0.381)	-0.007 (0.436)	-0.007 (0.436)	-0.006 (0.805)	0.020** (0.019)	0.020*** (0.000)	0.020*** (0.000)	0.019 (0.197)
Treatment	-0.159*** (0.000)	-0.159*** (0.000)	-0.159*** (0.000)	-0.158*** (0.000)	-0.114*** (0.000)	-0.112*** (0.000)	-0.112*** (0.000)	-0.115*** (0.000)
DiD 2	0.002 (0.919)	-0.000 (0.999)	-0.000 (0.999)	0.005 (0.796)	-0.026 (0.189)	-0.029 (0.104)	-0.029 (0.106)	-0.024** (0.031)
Males		0.061** (0.046)	0.061** (0.047)	-0.077 (0.493)		0.127*** (0.000)	0.127*** (0.000)	-0.073 (0.301)
Recession			-0.001 (0.931)	0.000 (0.993)			-0.000 (0.968)	-0.003 (0.813)
o.year_2013_fe				-				-
year_2014_fe				-0.002 (0.919)				-0.001 (0.957)
year_2015_fe				-0.002 (0.902)				0.002 (0.868)
o.year_2016_fe				-				-
year_2017_fe				-0.002 (0.922)				0.001 (0.960)
year_2018_fe				-0.005 (0.826)				-0.001 (0.954)
year_2019_fe				-0.007 (0.760)				0.001 (0.946)
year_2020_fe				-0.007 (0.821)				0.004 (0.810)
sector_2_fe				-0.014 (0.679)				-0.011 (0.630)
sector_3_fe				-0.038 (0.289)				-0.031 (0.194)
sector_4_fe				0.049** (0.031)				0.101*** (0.000)
sector_5_fe				0.013 (0.338)				0.012 (0.218)
Constant	0.242*** (0.000)	0.215*** (0.000)	0.216*** (0.000)	0.274*** (0.000)	0.197*** (0.000)	0.140*** (0.000)	0.140*** (0.000)	0.215*** (0.000)
Observations	90	90	90	90	90	90	90	90
R-squared	0.749	0.763	0.763	0.798	0.674	0.748	0.748	0.904