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Master Thesis

Evaluation of the effectiveness of a working-hours reduction law to improve work-life balance of South Korean employees

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Abstract

This paper analyzed the implementation of a working-hours reduction law that was introduced in South Korea and evaluated how this implementation affects the actual worked hours and the health of employees. The policy under review started being implemented in July 2018 and reduced the maximum average number of working hours from 68 to 52 hours per week with the aim to improve the work culture nationwide. Data from the Korean Labor & Income Panel Study were used to examine whether the law reduced working hours in practice and improved employee's health by comparing these outcomes before and after the introduction of the law using a difference-in-difference approach. The results showed that the number of actual hours worked generally did not decrease and the health of workers was negatively impacted or remained unaffected after the law was implemented. Although the results of this evaluation raise some concerns about reliability because of the limited explanatory power of the models and a relatively small sample size, they criticize the effectiveness of the disapproved law and suggest that stricter control and compliance measures and a number of additional policies are needed to create a cultural shift to a healthier work culture. Additionally, the results showed that females and individuals with a low or middle socio-economic status are sometimes affected differently. This proves that it is crucial to consider heterogeneous effects and tailor policies to also protect the more vulnerable workers. For future research it would be relevant to also examine its impact on other economic outcomes than actual worked hours and health, such as wages and employment.

Table of content

1. Introduction

South Korea is the country with the longest average working hours of developed countries (Kim, McLean & Park, 2018). South Korean employees work on average 1901 hours per year, while the average working hours for employees of other OECD countries is 1752 hours per year (OECD, 2022). Partly as a result of this hard-working culture, the suicide rates are high and the well-being of employees is poor, compared to other OECD countries (The Guardian, 2023).

In the mid 1950s the Korean economy was devasted as a consequence of the Korean war. After a period of war, the economy began to grow from the 1960s onward (Lee, 2016; Yuhn & Kwon, 2000). Frequently, the period of economic growth that South Korea has accomplished in the past decades is called a miracle. However, one of the driving forces to accomplish this economic transformation was that South Korea created one of the hardest-working cultures in the world, sometimes at the cost of human lives. *"Gwarosa"* is the term being used to refer to deaths due to overworking. In 2017, government data showed that hundreds of *Gwarosa* took place (New York Times, 2020). The MZ generation (millennials and generation Z) opposes to this workaholism and culture of working long hours and they started a movement to create a healthier work-life balance (CNN, 2023). Demonstrations of young workers, criticism on social media, and the resistance of unions and politicians put pressure on the government to improve working conditions.

As a result of the societal discussion about work-life balance, the high suicide rates and the pressure from the public, the working long hours culture is on the agenda of the government since 2017. The government realized that the necessary measures needed to be taken to move away from a society of overwork. Consequently, the South Korean Labor Standard Act was amended by the Moon Jae-in government, which reduced the maximum working week from 68 to 52 hours (including overtime). The implementation of the law consisted of several phases: first large-sized firms had to comply, then medium-sized firms and lastly small-sized firms. The law attempts to improve work arrangements and contribute to a healthier work culture nationwide (Ministry of Employment and Labor, n.d.). More specific, the law should contribute to employee's well-being and employee's productivity.

Although the government is trying to contribute to a cultural change to improve working conditions by introducing such policies, it is unclear if the designed policies actually contribute. Previous research found by utilizing a difference-in-difference approach that a law of 2004 that

was also implemented to reduce the long working hours in South Korea, had an effect of a 2-hour reduction in weekly average worked hours, instead of the required 4-hour reduction (Kim & Lee, 2023). Additionally, Carcillo, Hijzen & Thewissen (2024) found that the specific hour-reduction law of 2018 that is also central to this thesis, reduced the likelihood of working more than 52 hours, however it did not yet cease.

This raises the question whether this policy is adhered in practice and because the policy aims to improve the well-being of employees it also raises the question what effect the passing of the law had on the health condition of employees. Therefore, this thesis will explore the following research question:

"*What is the relationship between the working-hour reduction law, amended in 2018 by the South Korean government, on the actual worked hours and the health of employees?"*

The possible discrepancy between the legal work hours and the actual work hours will be investigated by using data on actual weekly working hours that employees reported themselves. Furthermore, the health of employees is defined as their self-reported health and their satisfaction with their job. The relationship between the implemented policy and the actual working hours and employees' health condition is explored by using a difference-in-difference approach. This gives the opportunity to compare the effects of employees in the treatment group to employees in the control group after the law was implemented on the outcome variables.

The paper contributes to the existing literature in two important features. First, this is the first paper that evaluates the relationship between the proposed reduction and the actual reduction by examining the first and second stage of implementation of the policy reform. It also considers heterogeneous gender and socio-economic status (henceforth referred to as SES) effects and thus examines whether different types of workers are affected differently. Secondly, it is the first paper that explores how the policy reform affects South Korean workers health. Since the aim of the law is to improve employee health, it is relevant to examine the relationship between the implementation of the law and health. The effect on employees' health is currently lacking in the existing literature.

Additionally, from a policy point of view this thesis is relevant because it assesses the effectiveness of the law. This evaluation can be used to adjust the existing policies or can be considered when designing additional policies that help shift from a culture of workaholism to

a more balanced culture between work and life. Moreover, the evaluation can help other countries that want to improve work-life balance and end the overtime culture by seeing what policies work and do not work.

This thesis proceeds as follows. Section 2 presents the theoretical framework where key concepts and the related literature are discussed. Then Section 3 discusses the used data, the sample selection, and presents the descriptives statistics of the sample. Section 4 discusses the methodology which includes checking the difference-in-difference assumptions and presenting the equations to estimate the effect of the implementation of the reduction hour law. Section 5 interprets and discusses the results. Section 6 will link the found results back to the hypotheses and provide a discussion and some recommendations for further research. Finally, section 7 summarizes the paper.

2. Theoretical framework

2.1 Background information

2.1.1 The policy

In 2018, a working-hours reduction law was passed by the South Korean government which stipulated that the average working hours per week should not exceed 52 hours (Ministry of Employment and Labor, n.d.). With the passage of the law, the average working week could now consist of a maximum of 8 hours per day, 40 hours per week and a maximum of 12 overtime hours per week. This brings the total maximum average working week to 52 hours per week. This law was passed in 2018 and was also implemented in 2018. However, the law was implemented incrementally depending on the size of the companies. First, the law went into effect for larger firms, with more than 300 employees on 1 July 2018. Thereafter, the law was extended in stages. On 1 January 2020 the law also went into effect for medium-sized firms, with a number of employees between 50 and 299. As a final step, the law was extended on 1 July 2021 for smaller firms, including firms having 5-49 employees. An overview of the implementation phases of the law can be found in Figure 1. This article focuses on the first and second phases of the law's implementation. In doing so, it evaluates how effective the implementation of the law from 1 July 2018 is for employees that work in a firm with 300 or more employees and from 1 January 2020 for employees that work in a firm with 50-299 employees. This makes it the first article to also analyze the second phase of the implementation and thus examines how employees of medium-sized companies are affected alongside employees of large-sized firms.

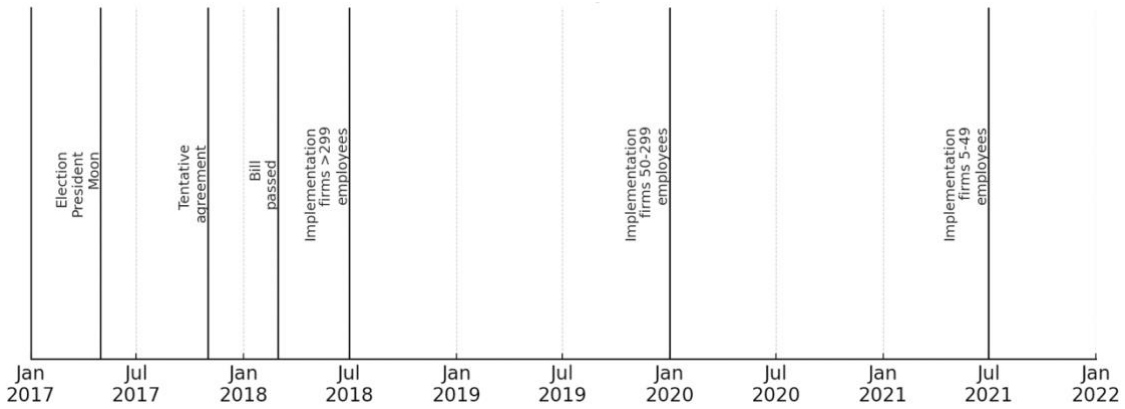

Figure 1: Timeline of working-hours reduction law (including the stepwise implementation).
Source: Designed by the author.

2.1.2 The South Korean work culture

The hours-reduction law central to this thesis was adopted as a result of resistance to the culture of overworking. The work culture of East Asian countries demands a lot from workers. Working hours are longer compared to other OECD countries, it is common to have a six-day work week and work over hours. Kim, McLean and Park (2018) argued that this long working-hour culture partly exists because there is no clear balance between work and life. Employees are expected to devote their time mostly to their jobs instead of leisure (Kim, McLean & Park, 2018). The South Korean culture emphasizes the importance of work and preforming well at work. Additionally, the working conditions are worse in South Korea compared to other OECD countries. The average working hours are high, over time hours are often not paid, and South Korea experienced periods of high job insecurity and sharp falls in wages (Sohn, Choi & Jung, 2016). The next section discusses how this culture of workaholism, and unsatisfactory working conditions affects the health status of South Korean employees.

2.2 Health

Working hours is closely related to employees' health. Working long hours often creates unhealthy habits, such as excessive use of alcohol and exercising too little. Too long working-hours are associated with an increased risk of heart disease, depression, stress, stroke and workplace accidents (Kim & Min, 2023; Park, Kim & Han, 2017). Park et al. (2020) shows by using a multivariate logistic regression model that working long hours is positively related with stress and depression for young Korean workers.

Even more worrisome are the high suicide rates, which are partly attributable to the workaholism culture. In 2021, 317.680 South Korean died from suicide (Jang et al. 2023). This was a 4.2 percent increase compared to 2020. The suicide rate of Korean workers is the highest rate worldwide (Sohn, Choi & Jung, 2016). Regarding work culture in South Korea, Lee et al. (2020) showed by matching survey data with death registry data that the hazard ratio to commit suicide was 3.89 times higher for workers with an average work week of 45-52 hours compared to workers with an average work week of 35-44 hours.

In summary, the culture of working long hours is associated with several health issues on different aspects. This paper will focus on the general health condition as this connects well to all aspects of health that are impacted by the long working-hour culture, such as depressive and

stressful feelings and suicidal thoughts. Moreover, it also focuses specifically on job satisfaction because job satisfaction is an important determinant of one's health (Park & Hwang, 2017), and is closely related to work culture. It is therefore relevant whether changing a long hour working culture contributes to health in terms of job satisfaction.

The increased health risks are not only harmful for the individuals, but also for the society as a whole. The World Health Organization (2020) showed that between 2000-2018 the global spendings on health continued to increase and reached 10% of the global GDP in 2018 (World Health Organization, 2020). South Korea is close to this average with healthcare spending reaching 10% of GDP in 2022, which was the highest amount of healthcare spending in the past decade (Statista, 2023). While the culture of long hours in South Korea generates economic growth, it also carries the risk of continued rising health costs that threaten to become unbearable.

2.3 The importance of employee protection

To protect workers from the health risks that can result from working long hours and to ensure that health costs remain bearable, it is essential to actively protect workers and improve their working conditions. The International Labour Organization (1990) argues that hour reduction laws can benefit workers' health in several ways. Working long hours often exposes employees to stress. As employees spend more time at their workplace, they are also exposed to more sources of workplace stress. Employees who work long hours have less time to recover from those negative feelings, creating a downward spiral. The introduction of a working-hours reduction law could break this downward spiral and have a positive impact on overall health outcomes (Sánchez, 2017).

2.4 Determinants of labor supply

As has been described above, it is important to have a limit on the number of hours worked per week to protect South Korean workers, otherwise the pressure is too high, and this poses health hazards. However, from an economic perspective, it is also important to initially understand the factors that go into determining how many hours employee's work. Labor supply can be analyzed from the extensive (employment participation) and the intensive margin (worked hours). Since this paper evaluates how a policy reform affects the average worked hours, this section will discuss the determinants of the intensive margin. The final part of this section will argue that the strength of the determinants' influence on average working hours differs for specific groups, leading to the discussion of the included control variables of this paper.

2.4.1 Wage

First of all, the wage level is a determinant of how many hours people are willing to work. Neo-classical economic theory argues that rational individuals maximize their utility and determine their labor supply by trading off between consumption and leisure (Cahuc et al., 2014, p. 59). For a positive supply of labor, the current wage must be higher than the reservation wage. The reservation wage presents the lowest wage for which individuals are willing to work and depends in part on personal preferences and the available income from other sources (Cahuc et al., 2014, p. 59).

More specific, income elasticities are useful to understand how labor supply changes as income changes. An income elasticity shows the percentage change in labor supply in response to a percentage change in wages. Specifically, the Frisch elasticity presents the variation in worked hours as a result of changes in the wage, when the marginal utility of wealth is hold constant (Céspedes Reynaga & Rendon, 2012). The Frisch elasticity equals around 0.5 at the intensive margin (Cahuc et al., 2014, p. 60).

2.4.2 Tax policies

Furthermore, it is well known from the macro-economic literature that governments policies in countries affects the intensive margin. An important part of this, is the level of taxes set by the government. Prescott (2004) shows for example by using a calibrated model the importance of average tax rates (both on income and consumption) in explaining differences in behavior across countries with respect to average hours worked. The relative lower tax rate in the United States can explain why Americans on average work more hours than Germans, because having a higher income left over is an incentive to work more. Other papers also confirm the negative effect of tax rates on the working hours (Davis & Henrekson, 2004; Dew-Becker & Gordon, 2006; Faggio & Nickell, 2007). However, the relationship between tax rates and average hours worked is complex. For instance, it also relevant to take into account how taxes are spent by the government. Rogerson (2006) showed with descriptive empirical models for example that when governments use the higher tax rates to subsidize childcare services for working employees, the negative relationship between tax rates and working hours becomes smaller. Additionally, other policies of the government are also important for understanding the intensive margin. For example, unionisation rates, labor market regulations, and binding

employment protection (such as working hour regulations) also affect the intensive margin, and affect specific groups differently.

2.4.3 Societal preferences

Lastly, societal preferences are also a determinant of the intensive margin. Citizens of different countries are likely to maximize their utility differently because of different consumption and leisure preferences. Blanchard (2002) discussed in his paper with help of the Solow model that the disparity between working hours in the United States and Europe can be explained for a large part because of societal preferences. Furthermore, cultural norms can also determine the intensive margin. South Korea is known for their hard-working culture, and for example has less free holidays than other OECD countries (Kim & Min, 2023). Normalizing working on the weekends, working overtime, focusing on performing at work affects the average worked hours.

2.5 Control variables

The sections above describe that the wage, tax rates, and societal preferences are determinants of the number of hours worked. However, labor supply behavior is not the same for everyone. For some groups, the determinants will not affect the average working hours, or to a different extent. These heterogenous effects brings me to the control variables of this paper.

First, it was argued that wages play an important role for the labor supply. However, Blundell et al. (2016) show that the income elasticities differ by gender. A Frisch elasticity of 0.63 for the intensive margin for women in the UK was found, while the average Frisch elasticity equals 0.5. Other papers also confirm that the labor supply elasticity of women exceeds the labor supply elasticity of men (Cahuc et al, 2014; Causa, 2010; Evers et al, 2006). Jongen and Stoel (2019) who found an elasticity of taxable income of 0.1 in the short-run and 0.24 in the medium long-run in the Netherlands by estimating regression models, also proved the higher elasticity of taxable income for women and found that this applied both to single and coupled women. Additionally, it is also the case that wage elasticities decrease when the household income increases (Causa, 2010). This shows the importance to consider gender, marital status, income, and SES effects when estimating the effect of the policy reform on the actual worked hours.

Secondly, the tax rate of a country appeared to be a determinant of the intensive margin. However, Causa (2010) showed by considering cross-country time series models that a higher

marginal tax rate results in lower average worked hours for females, while this significant effect is much smaller for males. It might be the case that females are disincentivized more than males because their income elasticity is higher. Females may react more aggressively to tax rates, due to the still high responsibility in family life, because women are still often second earners in a household, and because women are more likely to work part-time. These factors could potentially lead to the more flexible adjustment of hours worked once the marginal tax rate increases. Additionally, more related to the scope of this paper, Causa (2010) also showed that the effects of working hours regulations are bigger for men and differ across educational levels. The effect is likely to be smaller for women, and in particular low-skilled women, because the lower-skilled work less and are less devoted to the labor market compared to the higher-skilled workers and are therefore less affected by the policy regulation. These findings show that it is important to control for gender and educational effects when evaluating the effect of policies on the intensive margin as different groups show different behavior. Moreover, research showed that policy reforms on working time schedules have different effects depending on occupation, firm size and industry (Skuterud, 2007; Afsa & Biscourp, 2004). Therefore, this study also includes sectors as a control variable.

Lastly, societal preferences determine how many hours employees in a country work on average. In South Korea it was normal to work for one company until your retirement to ensure job security and income. In return, it was required to work long hours. However, a cultural shift is being made now, imposed by the younger generations, making it more common to switch job and not work during the weekends and holidays. This shows that it is for example important to control for age. Also, gender norms are a key component for labor supply. South Korea is characterized by persistent conservative gender norms (Lee, 2022). Therefore, females are often seen as the second breadwinner and have more responsibilities in the family and household life. This makes it important to control for gender effects when estimating the intensive margin of employees.

To conclude, it is important to include gender, marital status, educational categories, income, SES, and sectors as control variables in the empirical model when evaluating a policy, because the above discussed literature showed that labor supply determinants are different for specific groups and the groups respond differently to policy reforms and regulations. The intensive margin determinants are heterogenous. If I would not control for these variables, it is likely to

get a biased effect of the implementation on the policy on the actual worked hours and health outcomes.

2.6 Related literature

2.6.1 Working-hours reduction laws and actual worked hours in South Korea

Kim and Lee (2023) explored how a policy reform of 2004 that reduced the average working week from 44 to 40 hours in South Korea affected the actual worked hours. They also used data of the Korea Labor Institute and explored the relationship by using a difference-in-difference method. They find that the average working hours were reduced with 2 hours, instead of the introduced reduction of 4 hours. However, they did not investigate any additional effects on the employees. This paper builds further on the paper of Kim and Lee (2023). It will use the same data and empirical approach, but focuses on the newer policy reform amended in 2018, and therefore uses newer waves of the Korea Labor Institute Panel Study.

Another paper related to the relationship between the work-hour reduction law and actual average worked hours in South Korea is the research of Carcillo, Hijzen & Thewissen (2024). They investigate how the same policy central to the one of this thesis, affects the actual worked hours, also by using difference-in-difference regressions. The likelihood to work more than 52 hours diminished but does not disappear for workers that work in a firm of 300 or more employees. Only the first stage of the implementation is examined in their paper. Additionally, they use other data which did not allow them to explore what the effect of the implementation is on the health of workers. This thesis will also evaluate the implementation of the law for employees that work in a firm with 300 or more employees. Additionally, this thesis adds by also evaluating the implementation of the law for employees that work in a firm with 50-299 employees.

2.6.2 Working-hours reduction laws and actual worked hours outside of South Korea

Furthermore, academics evaluating hour reduction laws on actual hours worked outside South Korea show that the implementation of laws has mixed effects on the actual worked hours (Crépon & Kramarz, 2002; Kawaguchi et al., 2008; Sánchez, 2017). For example, Kawaguchi et al. (2008) showed by using a regression model that reducing the legal work hours with one hour is associated with a 0.14 reduction in actual working hours in Japan. Therefore, the effect on the actual worked hours was not as large as stated in the required law. In addition, Crépon

& Kramarz (2002) prove through a difference-in-difference approach, that French workers continue to work 40 hours, while an hour reduction law from 40 to 39 hours was passed. Finally, Sánchez (2017) evaluated working-hours reduction laws introduced in France in 1998 and in Portugal in 1996 that reduced the legal weekly working hours from 39 to 35 and 44 to 40 respectively. In contrast, he found evidence using different regression models that the actual average working hours of the treatment group decreased significantly, while this effect was not found for the control group. This proves that the laws implemented had the intended effect in practice.

2.6.3 Working-hours reduction laws and health outcomes

Interestingly, Sánchez (2017) also explored the effect of implementing the laws on people's health. He found that the implementation of the law in France had a negative effect on males and a positive effect on females. No such effects were found in Portugal. The relationship between the working-hours reduction law central in this thesis and health has not yet been researched in South Korea, but it is also understudied in the existing literature outside South Korea. There is some related literature focusing on the relationship between working hours and health (Artazcoz et al., 2007; Yang et al., 2006), but it is likely that the results are biased because working hours may be endogenous. A reduction in average worked hours might be impacted by unobserved factors that also influence health outcomes. An example for such an unobserved factor would be stress or socio-economic status. A higher level of stress (or a lower socio-economic status) can lead to a high number of average working hours, but at the same time have a negative effect on someone's health. The introduction of the working-hours reduction law central to this study gives the opportunity to explore the relationship between reducing working hours and health by comparing the health outcomes before and after the introduction of the law. With this empirical strategy, it controls for time-varying unobserved factors and thus overcomes biased estimates and avoid a spurious relationship.

Overall, it is highly relevant to examine the health effects of the implementation of the law, since there is limited evidence of this relationship in the existing literature. Additionally, this relationship is relevant to explore, since the policy central to this thesis was designed and intended to improve the health of employees. Therefore, this thesis will explore the effect of the implementation of the South Korean law on health outcomes, and will also consider

heterogenous effects in terms of gender and SES, as Sánchez (2017) shows that males and females health are affected differently.

2.7 Hypotheses

Based on the literature review and evaluations of previous working-hours reduction laws, the following main hypothesis is central to this thesis:

Hypothesis 1: The implementation of the working-hour reduction law passed in 2018 is negatively related to the actual average working hours of South Korean employees.

To examine the effect of the introduction of the law in more detail, I will estimate the effect on the average number of hours worked as a continuous variable. The effect of the introduction of the work-hour reduction is broken down into the implementation of 2018, targeting employees of large-sized firms, and the implementation of 2020, targeting employees of medium-sized firms. This leads to the following sub hypotheses:

Hypothesis 1a: The implementation of the working-hour reduction law implemented in July 2018 is negatively related to the actual average working hours of South Korean employees working in large-sized firms.

Hypothesis 1b: The implementation of the working-hour reduction law implemented in January 2020 is negatively related to the actual average working hours of South Korean employees working in medium-sized firms.

To also explore its impact on health outcomes, the other main hypothesis is as follows:

Hypothesis 2: The implementation of the working-hour reduction law passed in 2018 is positively related to the health of South Korean employees.

For this hypothesis, the effect of the introduction of the work-hour reduction is also split in the implementation of 2018, targeting employees of larger-sized firms, and the implementation of 2020, targeting employees of medium-sized firms. This leads to the following sub hypotheses:

Hypothesis 2a: The implementation of the working-hour reduction law implemented in July 2018 is positively related to the health of South Korean employees working in large-sized firms.

Hypothesis 2b: The implementation of the working-hour reduction law implemented in January 2020 is positively related to the health of South Korean employees working in medium-sized firms.

Finally, to also examine heterogenous effects, the following hypotheses are formulated:

Hypothesis 3a: The effects of the implementation of the working-hour reduction law passed in 2018 differ for females and males.

Hypothesis 3b: The effects of the implementation of the working-hour reduction law passed in 2018 differ for individuals with different levels of socio-economic status.

3. Data

3.1 Data source

For the purpose of this study, data of the Korean Labor & Income Panel Study (KLIPS) were analyzed. This dataset is for example comparable with the Panel Study of Income Dynamics of the United States and the Socio-Economic Panel of Germany. The survey is specifically designed to help with policy development and to implement appropriate and progressive employment policies (Korean Labor Institute, n.d.). It is widely used by academics and policy makers. This made the survey an excellent source for evaluating the working-hour reduction law on which this paper focuses.

KLIPS is a yearly longitudinal survey, conducted by the Korean Labor Institute. The first sample was collected in 1998 and currently 25 waves have already been held. The survey period runs from April to September each year. Professional trained interviewers ask the questions to interviewees through a face-to-face interview (Korean Labor Institute, n.d.). The survey is completed each year by household members of 5,000 households if they are 15 years or older. It forms one of the most representative data sources for labor-related panel data in South Korea as it successfully represents the South Korean population, and the attrition rate of participants is relatively low. The survey targets household from urban areas nationwide. To ensure a representative sample, the stratified cluster method was used in two stages. First, 1,000 districts were randomly selected and then five households were randomly selected from those areas. The sample retention rate from 1998 to 2019 is 65.3%. To ensure the sample remains representative, the Korea Labor Institute monitors it closely. In 2009, for example, 1,425 households were added. Of the sample from 2009 to 2019, the retention rate is 82.1% (Korean Labor Income Panel Study, n.d.).

The panel data included two main data sources each year: firstly, data are collected on household characteristics and secondly data are collected on individual characteristics. This paper mainly focuses on the individual characteristics surveyed such as the economic and income activities, employment characteristics, work hours and job satisfaction.

3.2 Sample

This section briefly discusses how the final sampling of this sample was designed. In the reference year 2016, 5000 households and 14202 individuals from urban areas participated in the survey. Only a small number of participants from the original sample could be included in this study. First, individuals were selected who work and reported their weekly working hours. Also, it was ensured that respondents had at least one observation before the law was passed and one observation after the law was passed in order to compare outcome variables over time. Furthermore, I limited the observations to people aged 60 and below, because the overall retirement age is 60 in South Korea (Kim & Lee, 2023). Furthermore, as in Kim and Lee's (2023) research design, observations were limited to those who worked a minimum of 15 hours and a maximum of 96 hours. Before doing this, it was first examined whether many respondents switched from working less than 15 hours to working more 15 hours, or vice versa, and working more than 15 hours to working less than 15 hours, or vice versa, during the period under study. This did not occur for the 96 hours requirement. For the 15-hour requirement, this hardly occurred in the sample. An overview of this is given in Table A1 (see Appendix). To avoid potential bias, these few individuals were deleted from the sample. The only threat is that it is not explored whether people switch from 15 to no work, since people did have to report their average working hours to be included in the sample.

Lastly, this thesis focused on regular workers. This means that employers, self-employed individuals, temporarily workers and daily workers were excluded from the sample. Focusing on regular workers eliminates the risk of seasonality effects, inconsistent work schedules, and non-formal contracts effects which are likely to be correlated with the average worked hours. Eventually, 1468 individuals were included for the analysis of the first phase of the implementation of the law and 1279 individuals were included for the analysis of the second phase of the implementation of the law.

In addition, to ensure that the results are representative of the South Korean population, weights were created and assigned to each respondent based on the population size of the different districts to accommodate unequal probabilities to be selected. The population size and sample proportion of the nineteen different districts were used to calculate the share of the district compared to the overall population, and more weight was assigned to bigger districts. This ensures that the found results are not biased toward respondents from smaller districts.

It is noteworthy that the number of individuals of my sample is small compared to the total number of participants of the KLIPS survey. Only around 10 percent of the baseline participants of the survey are included in my sample. This is the case, because only around 25 percent of the respondent's both work and report their working hours. When it is further restricted to meeting the additional sampling requirements, around 10 percent of the original sample remains. Table A2 (see Appendix) gives a complete overview of how this shrunken sample was created. Although the sample has shrunk significantly, there is still a sufficient number of observations to perform a difference-in-difference approach.

3.3 Measurers

To estimate the effects, KLIPS data of 2016-2022 are used. The different waves of the KLIPS data allowed me to compare the actual worked hours and the health condition of South Korean employees' before and after the law was implemented. This section outlines which variables are used and how variables are constructed to estimate the effects.

3.3.1 Worked hours

To estimate the effect of the implementation of work-hour reduction law on the worked hours, the reported average weekly work hours over the past half year were used. This is a continuous variable. A mean of the average working hours per year was also constructed for both the treatment and control group and was used for the visual inspection of the parallel trends.

3.3.2 Firm size

The KLIPS data contained information on the number of employees of the companies where the participants work. The original variable for number of employees ranges from 1 to more than 1,000 employees, measured on a scale of 1 to 10. This variable is transformed into three dummy variables. For the first step of the implementation of the law that forced large firms to comply, a first and second dummy variable were constructed. The first dummy variable was constructed indicated if someone worked in a firm with 300 or more employees. This dummy was used to indicate if someone belonged to the treatment group of the first step of the implementation. A second dummy variable was constructed that indicated if someone worked in a firm with 50-299 employees. This dummy was used to indicate if someone belonged to the control group of the first step of the implementation. This second dummy was also used for the second step of the implementation of the law that forced medium-sized firms to comply. The

dummy that indicated if someone worked for a firm with 50-299 employees now served as variable that indicated if someone belonged to the treatment group of the second step of the implementation. The third dummy indicated if someone worked in a firm with 5-49 employees. This dummy was used to indicate if someone belonged to the control of the second step of the implementation.

In summary, the following variables were constructed to conduct the treatment and control groups:

- First step of implementation (as of 1 July 2018)
    - Treatment group: employees in firms with 300 or more employees
    - Control group: employees in firms with 50-299 employees
- Second step of implementation (as of 1 January 2020)
    - Treatment group: employees in firms with 50-299 employees
    - Control group: employees in firms with 5-49 employees

3.3.3 Health

Workers' health status was measured on two aspects. First, self-assessed health was used as health information of individuals. This was measured with one question asking about the general health in life on a five-point scale, ranging from ‘excellent’ to ‘very poor’. Using self-reported raises some concerns because such a subjective measure is sensitive to measurement errors, such as bias, subjectivity and interpretation concerns. Despite the caveats, self-assessed health is widely used for socio-economic research and the correlation between self-assessed health and objective health measures is high (Doiron et al., 2015). The scale was reversed for easier interpretation. Because of the ordinal nature of the scale, it is used in ordered logistic regression models to estimate difference-in-difference equations. Subsequently, for every answer option, a dummy variable was constructed that was used for the descriptive statistics

Additionally, to the self-reported health condition, this paper also focused on job satisfaction as measurement for employees’ health. KLIPS data contained items measuring job satisfaction. The following items were used to measure job satisfaction:

- "I'm satisfied with the job I'm currently doing"
- "I'm glad to have joined this company"
- "I enjoy this job"
- "I feel this job to a be personally rewarding"
- "I want to continue this job if other things remain the same"

The items were also measured on a five-point scale, ranging from 'strongly disagree' to 'strongly agree'. Although Park and Hwang (2017) showed that these items have excellent internal consistency and therefore mean scaling the items into a job satisfaction scale is therefore an appropriate measurement, I checked this again. The main reason for this is that Park and Hwang (2017) used the 17th wave to assess the validity, while this paper used the 19th – 23rd wave. The Cronbach's alpha for job satisfaction for this paper was 0.9460. In line with the paper of Park and Hwang (2017), this also proves excellent internal validity. Therefore, I was confident creating a mean scale of the five items for job satisfaction which will be used throughout this paper. Because this scale follows a normal distribution, this variable is considered as a continuous variable and will be used in a linear regression model.

3.3.4 Control variables

Several control variables were included in the regression analyses to control for the effects of independent variables on the dependent economic outcomes. This helps reducing the chances for omitted variable bias. Relevant control variables that were added were gender by two categories, age as continuous variable, educational level by seven categories, marital status by five categories, economic status by six categories, and the work industry by eight categories. Controlling for those variables is in line with Carcillo, Hijzen & Thewissen (2024), who also used these variables as controls. All those variables are likely to be associated with the actual worked hours and health. Sánchez (2017) argues for example that the number of worked hours differ across industries, and a working-hours reduction law might have more negative effects on males.

3.4 Descriptive statistics

Table 1 presents the descriptive statistics of the variables under analysis and the covariates separately for the treatment group and control group of first phase of the implementation of the law and. Table 2 presents the descriptive statistics of the variables under analysis and the

covariates separately for the treatment group and control group of the second phase of the implementation of the law. The descriptive statistics are measured in the baseline year, 2016. It is noteworthy that overall respondents that participate in the KLIPS survey are on average middle-aged, likely to be married, around 60 percent is male, and are likely to have a lower-middle economic status.

Table 1 shows that specifically for the first phase of the implementation, individuals from the weighted treatment group on average have a higher income, have a higher socio-economic status, are younger, are more likely to be a male, and are more likely to be highly educated compared to the weighted control group. In addition, Table 2 shows that specifically for the second phase of the implementations, individuals from the weighted treatment on average have a higher income, have a higher socio-economic status, group are more likely to work for a public firm, and are more likely to be married, compared to the weighted control group. The regressions that will be employed to compare the treatment and control group will control for these significant changes between the treatment and control group by adding those variables as control variables. Other covariates are quite balanced between the treatment and control groups.

The Tables 1 and 2 also give the number of individuals for both the treatment and the control group. For the first phase of the implementation, there are 827 individuals that work in a firm with more than 300 employees (treatment group) and 641 individuals that work in a firm with 50-299 employees (control group). For the second phase of the implementation, there are 596 individuals that work in a firm with 50-299 employees (treatment group) and 683 individuals that work in a firm with 5-49 employees (control group). A more extensive overview of the number of individuals per year can be found in Table A3 (see Appendix).

Table 1: Descriptive statistics for the weighted treatment and control group for the first phase.

	(1) Treatment group Large firms (SD)	**(2)** Control group Medium firms (SD)	**(3)** Difference (1- 2) (SE)
Age	40.453	41.267	-0.814*
	(9.036)	(9.488)	(0.491)
Gender[a]	0.298	0.377	-0.080***
	(0.457)	(0.485)	(0.025)
Educational level			
Elementary schooling	0.002	0.020	-0.018***
	(0.047)	(0.140)	(0.006)
Lower secondary	0.024	0.027	-0.003
	(0.152)	(0.162)	(0.008)
Upper secondary	0.229	0.304	-0.075***
	(0.421)	(0.460)	(0.023)
2 years of college	0.219	0.238	-0.019
	(0.414)	(0.426)	(0.022)
4 years of university	0.425	0.344	0.082***
	(0.495)	(0.475)	(0.026)
University (master)	0.074	0.050	0.024*
	(0.261)	(0.217)	(0.013)
University (doctoral)	0.027	0.018	0.009
	(0.162)	(0.133)	(0.008)
Marital status			
Single	0.201	0.219	-0.018
	(0.401)	(0.414)	(0.022)
Married	0.764	0.723	0.042*
	(0.425)	(0.448)	(0.023)
Separated	0.004	0.005	-0.001
	(0.061)	(0.069)	(0.004)
Divorced	0.027	0.039	-0.012
	(0.164)	(0.195)	(0.010)
Spouse passed away	0.003	0.014	-0.011**
	(0.057)	(0.119)	(0.005)
Average working hours	40.842	42.463	-1.621***
	(5.178)	(7.331)	(0.349)
Health			
Very poor	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Poor	0.021	0.019	0.002
	(0.144)	(0.136)	(0.007)
Fair	0.223	0.278	-0.055**
	(0.417)	(0.448)	(0.023)
Good	0.714	0.678	0.036
	(0.452)	(0.468)	(0.024)
Excellent	0.042	0.025	0.017*
	(0.200)	(0.156)	(0.010)

Job satisfaction[b]	3.731	3.600	0.131***
	(0.506)	(0.534)	(0.028)
Economic status			
Lower-bottom	0.010	0.019	-0.009
	(0.099)	(0.137)	(0.006)
Upper-bottom	0.123	0.244	-0.121***
	(0.329)	(0.430)	(0.020)
Lower-middle	0.567	0.540	0.026
	(0.496)	(0.499)	(0.026)
Upper-middle	0.272	0.184	0.089***
	(0.446)	(0.388)	(0.022)
Lower-highest	0.020	0.013	0.008
	(0.141)	(0.111)	(0.007)
Upper-highest	0.007	0.000	0.007**
	(0.082)	(0.000)	(0.003)
Work			
Public firm	0.211	0.184	0.027
	(0.408)	(0.388)	(0.021)
Private firm	0.760	0.789	-0.029
	(0.427)	(0.409)	(0.022)
Income[c]	4531.033	3224.873	1306.16***
	(2589.397)	(1596.646)	(112.931)
Number of individuals	827	641	

Note: The table shows the descriptive for the baseline year 2016 of the population aged 18-60. Column 1 and 2 presents the descriptives for the weighted treatment and control group of the first stage of the implementation. Column 3 presents the (significant) differences between these two groups.

[a] Gender is a dummy variable where 1 indicates being a female and 0 indicates being a male.

[b]Job satisfaction is given on a five-points scale, ranging from 1 not being satisfied with the job to 5 being satisfied with the job. This scale was conducted after proving excellent internal validity ($\alpha = 0.946$).

[c]Income is the yearly income and is given in the official currency of South Korea. Unit: KRW 10,000. For reference, 3500 is the median yearly income (Statisa, 2024) and equals around 23.000 Euro.

Source: Authors' calculations.

Table 2: Descriptive statistics for the weighted treatment and control group for the second phase.

	(1) Treatment group Medium firms (SD)	**(2)** Control group Small firms (SD)	**(3)** Difference (1 - 2) (SE)
Age	40.944	41.731	-0.787
	(9.320)	(10.279)	(0.551)
Gender[a]	0.368	0.393	-0.025
	(0.483)	(0.489)	(0.027)
Educational level			
Elementary schooling	0.019	0.027	-0.008
	(0.136)	(0.162)	(0.008)
Lower secondary	0.025	0.070	-0.045***
	(0.157)	(0.255)	(0.012)
Upper secondary	0.302	0.352	-0.050*
	(0.459)	(0.478)	(0.026)
2 years of college	0.237	0.237	0.000
	(0.426)	(0.426)	(0.024)
4 years of university	0.352	0.280	0.072***
	(0.478)	(0.449)	(0.026)
University (master)	0.048	0.034	0.013
	(0.213)	(0.183)	(0.011)
University (doctoral)	0.018	0.000	0.018***
	(0.131)	(0.000)	(0.006)
Marital status			
Single	0.214	0.259	-0.045*
	(0.411)	(0.439)	(0.024)
Married	0.727	0.663	0.064**
	(0.446)	(0.473)	(0.026)
Separated	0.005	0.011	-0.006
	(0.072)	(0.103)	(0.005)
Divorced	0.038	0.055	-0.017
	(0.192)	(0.228)	(0.012)
Spouse passed away	0.015	0.012	0.003
	(0.123)	(0.109)	(0.007)
Average working hours	42.317	42.657	-0.341
	(7.116)	(8.050)	(0.452)
Health			
Very poor	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Poor	0.020	0.020	0.000
	(0.142)	(0.142)	(0.008)
Fair	0.280	0.416	-0.136***
	(0.449)	(0.493)	(0.026)
Good	0.676	0.536	0.141***
	(0.468)	(0.499)	(0.028)
Excellent	0.023	0.028	-0.004
	(0.151)	(0.164)	(0.009)

Job satisfaction[b]	3.608	3.437	0.171***
	(0.525)	(0.579)	(0.031)
Economic status			
Lower-bottom	0.019	0.034	-0.014*
	(0.137)	(0.180)	(0.009)
Upper-bottom	0.241	0.260	-0.020
	(0.428)	(0.439)	(0.024)
Lower-middle	0.541	0.581	-0.039
	(0.499)	(0.494)	(0.028)
Upper-middle	0.188	0.115	0.073***
	(0.391)	(0.320)	(0.021)
Lower-highest	0.011	0.008	0.003
	(0.104)	(0.087)	(0.006)
Upper-highest	0.000	0.002	-0.002
	(0.000)	(0.040)	(0.002)
Work			
Public firm	0.182	0.070	0.113***
	(0.387)	(0.255)	(0.019)
Private firm	0.792	0.921	-0.129***
	(0.406)	(0.271)	(0.020)
Income	3245.423	2635.265	610.1589***
	(1606.335)	(1330.953)	(85.648)
Number of individuals	596	683	

Note: The table shows the descriptive for the baseline year 2016 of the population aged 18-60. Column 1 and 2 presents the descriptives for the weighted treatment and control group of the second stage of the implementation. Column 3 presents the (significant) differences between these two groups.

[a] Gender is a dummy variable where 1 indicates being a female and 0 indicates being a male.
[b]Job satisfaction is given on a five-points scale, ranging from 1 not being satisfied with the job to 5 being satisfied with the job. This scale was conducted after proving excellent internal validity ($\alpha = 0.946$).
[c]Income is the yearly income and is given in the official currency of South Korea. Unit: KRW 10,000. For reference, 3500 is the median yearly income (Statisa, 2024) and equals around 23.000 Euro.
Source: Authors' calculations.

4. Methodology

4.1 Difference-in-difference approach

A difference-in-difference approach is used to evaluate the introduction of the working-hours reduction law, implemented in 2018. To identify the causal effect of the implementation of the law on the working hours and the employees' health, the changes in average working hours and health conditions are examined. To do this, employees that are in the treatment group (work in a firm with 300 or more employees in the first stage and work in a firm with 50-299 employees in the second stage) are compared with employees that are in the control group (work in a firm with 50-299 employees in the first stage and work in a firm with 5-49 employees in the second stage).

This research design is a powerful approach to evaluate the changes over time. The underlying assumption of this estimation strategy is that the unobserved factors that affect the average working hours are constant over time, conditional on the covariates. Formally, this can be written as $E[T_i * \varepsilon_{it} \mid X_{it}, W_t = 0]$. This assumption might be violated if it is the case that there are still unobserved factors affecting the average working hours non-linear over time and if this is not captured by X_{it} or W_t. For example, the analysis may be affected by the Covid-19 pandemic, as the data used run from 2016-2022 and the Covid-19 pandemic hit Korea in early 2020. Also, different policies may have been implemented during this period that may have an effect on the outcome variables. To check for these concerns, the following section analyzes the pre-trends of the treatment and control groups.

4.2 Visual evidence

The key assumption of a difference and difference approach is the parallel trend assumption: in absence of the treatment, the treatment and control group would have similar trends over time. This means that the average worked hours and health outcomes of employees who worked at a firm that had to comply with the working-hours reduction law and employees that did not work at a firm that had to comply would have been the same if the law was not amended. To check this, the pre-treatment trends for both the treatment and control groups are plotted and compared with each other. If the trends are parallel and similar, it proves that the possible difference between the treatment and control group in the post-treatment period can be attributed to the implementation of the working-hours reduction law. Figure 2, 3 and 4 presents the trends for

the average worked hours, self-reported health condition, and job satisfaction for the treatment and control group of the first phase of the implementation of the policy reform. Figure 5, 6 and 7 presents the trends for the average worked hours, self-reported health condition, and job satisfaction for the treatment and control group of the second phase of the implementation.

The parallel trend assumption seems to be met for the outcome variables for the first phase of the implementation of the implementation of the law, as Figures 2, 3, and 4 show similar pre-trends for both the treatment and control group. The same applies for the trends for employees of the second phase of the implementation. Figure 5, 6, and 7 also present parallel trends for the actual working hours and health outcome variables.

In summary, Figures 2 to 7 prove that the parallel trend assumption appears to be met and unobserved time-varying characteristics (such as the Covid-19 pandemic and other implemented policies in the same time period) seem not to affect the relationship, which allows me to estimate the difference-in-difference equations.

4.2.1 Parallel trends for the first phase of the implementation

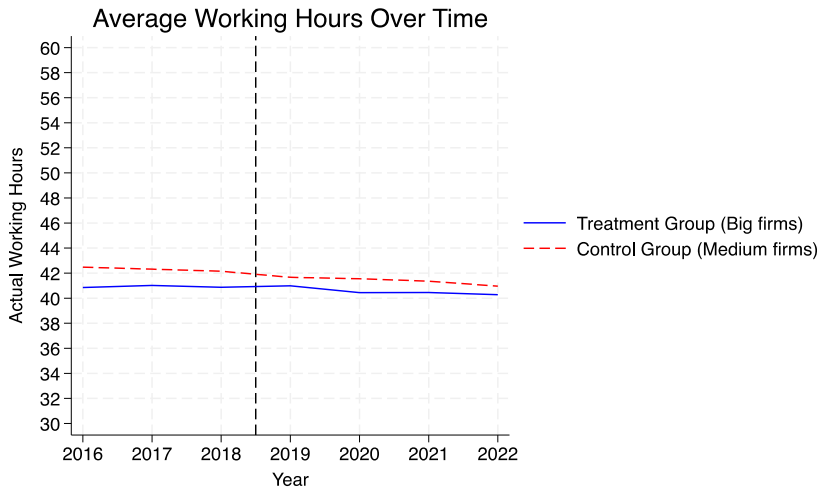

Figure 2: Visual inspection of parallel trends for working hours.

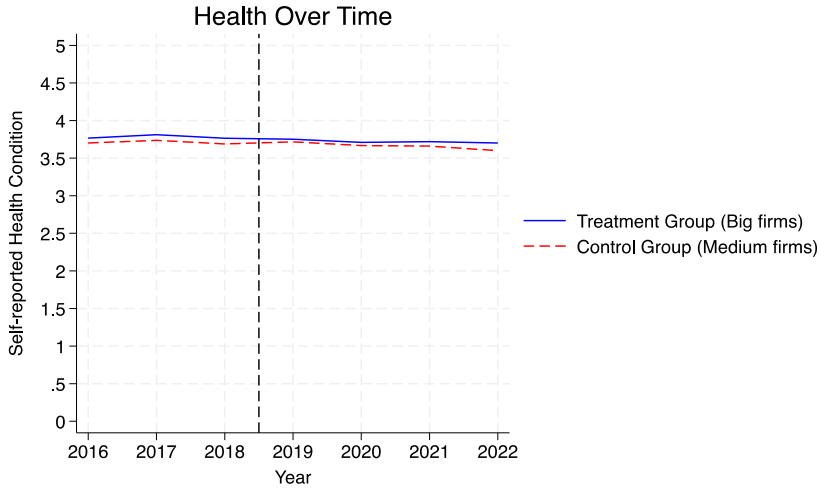

Figure 3: Visual inspection of parallel trends for self-reported health.

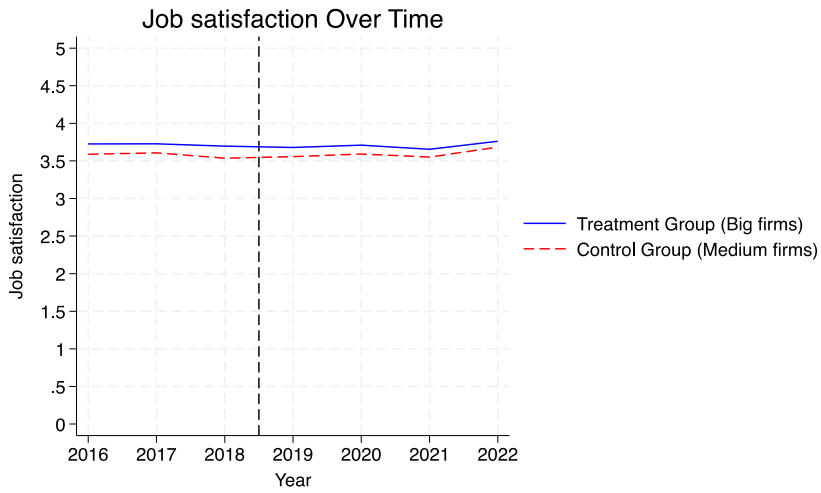

Figure 4: Visual inspection of parallel trends for job satisfaction.

4.2.2 Parallel trends for the second phase of the implementation

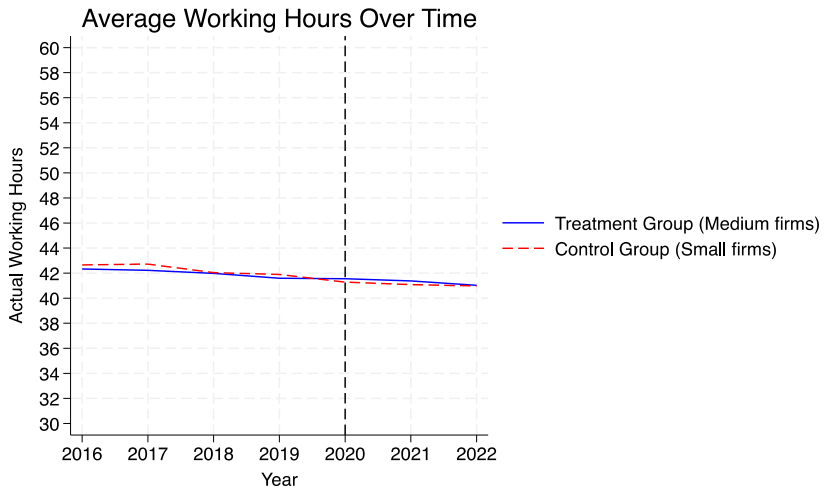

Figure 5: Visual inspection of parallel trends for working hours.

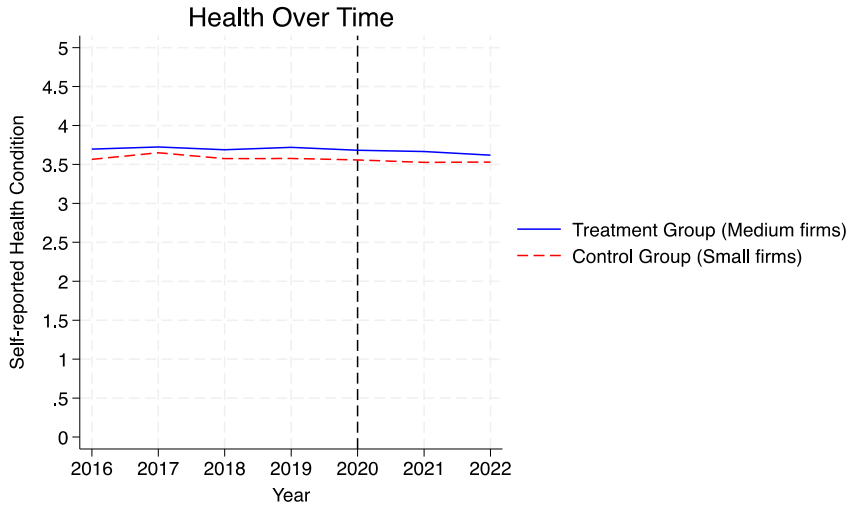

Figure 6: Visual inspection of parallel trends for self-reported health.

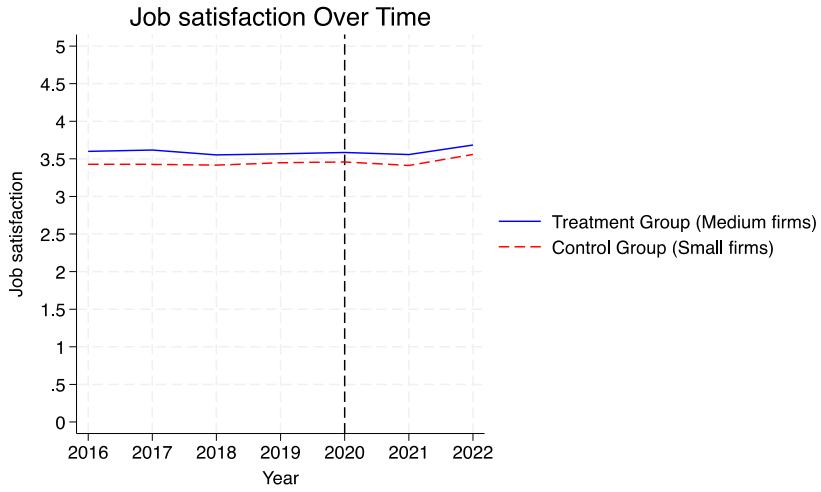

Figure 7: Visual inspection of parallel trends for job satisfaction.

4.3 Estimation

This section provides the difference-in-difference equations that are used to estimate the impact of the implementation of the working-hours reduction law on the actual worked hours and health. The difference-in-difference estimates the average treatment effect by capturing the difference in the average outcome in the treatment group before and after the implementation $(T_2 - T_1)$ minus the difference in average outcome in the control group before and after treatment $(C_2 - C_1)$.

4.3.1 Actual worked hours equations

The following difference-in-difference equations will be used to estimate the effect of the implementation of the work-hour reduction law on the actual worked hours:

$$Y_{it} = \alpha + \beta_1 T_i + \beta_2 Post_t + \beta_3 (T_i * Post_t) + \varepsilon_{it} \quad 1)$$

$$Y_{it} = \alpha + \beta_1 T_i + \beta_2 Post_t + \beta_3 (T_i * Post_t) + \beta_4 X_{it} + \varepsilon_{it} \quad 2)$$

$$Y_{it} = \alpha + \beta_1 T_i + \beta_2 Post_t + \beta_3 (T_i * Post_t) + \beta_4 X_{it} + W_t + \varepsilon_{it} \quad 3)$$

where Y_{it} is a variable indicating how many hours an individual i works in a week at a specific time t. T_i is the variable that indicates if an individual i is treated. Treated is defined as work at a firm with 300 or more employees (first phase of implementation) or work in a firm with 50-299 employees (second phase of implementation). Furthermore, the variable $Post_t$ is a dummy variable which is equal to 1 if it is the period after the introduction of the implementation of the law and 0 if it is the period before the introduction of the child benefit. The dummy equals 1 if the employee was surveyed after 1 July 2018 (first phase of implementation) or after 1 January 2020 (second phase of implementation) and equaled 0 if the employee was surveyed before the implementation date. The variable of interest is $(T_i * Post_t)$. This difference-in-difference variable captures the causal effect of the working-hours reduction law on the average worked hours. The interaction term indicates if an individual i is treated and if the individual is in the post treatment period t. This combined interaction terms allows me to compare the changes for employees of the treatment and control group after the law was implemented.

Equation two also includes control variables. X_{it} is a vector that includes various individual control characteristics (gender by two categories, age as continuous variable, educational level by seven categories, marital status by five categories, economic status by six categories, the

work industry by eight categories, and the yearly income). Next, equation three also includes fixed effects. W_t is a year level fixed effect. Further, ε_{it} is the error term.

In addition, to the most comprehensive equation, equation 3, this model is also estimated when using weights to obtain more representative estimates. Weighted least squares models assign a weight (w_i) to each individual for each observation based on a respondents' district of residence.

The effect of the law on the actual worked hours will be estimated by running linear regression models, because the dependent variable is a continuous variable. Furthermore, similarly to the research of Sánchez (2017), this paper uses clustered standard errors for all equations. Clustered standard errors are useful when using panel data and to be able to control for correlations within clusters. Clustered standard errors control for heteroskedasticity and within cluster correlation.

4.3.2 Health equations

Next, the same approach as discussed in section 4.3.1 will be followed to examine the effect on the health outcomes. Equation 1-4 will also be used to estimate the effect of the implementation of the law on health outcomes, with the only difference being the outcome variable. Weighted least squares models will also be estimated for the health outcomes.
Y_{it} now either indicates the self-reported health condition of an individual i at a specific time t or the job satisfaction of an individual i at a specific time t.

The effect of the law on the health outcome self-reported health will be estimated by running ordered logistic regression models, because this dependent variable is an ordinal variable. Ordered logistic regression models can incorporate the ordinal structure of the variables and give therefore more accurate estimates. The effect of the law on the health outcome job satisfaction will be estimated by running linear regression models, because this dependent variable can be considered as a continuous variable. As with the previous comparisons, clustered standard errors at the individual levels are also used for the health outcomes.

4.3.3 Heterogonous effects equations

Subsequently, to consider heterogenous effects when estimating the effect on actual worked hours and health, the following difference-in-difference equation, which builds on the most comprehensive equation (equation 3, including weighted least squares models) will be estimated for gender effects:

$$Y_{it} = \alpha + \beta_1 T_i + \beta_2 Post_t + \beta_3 F_i + \beta_4 (T_i * Post_t) + \beta_5 (F_i * T_i) + \beta_6 (F_i * Post_t) + \beta_7 (F_i * T_i * Post_t) + \beta_8 X_{it} + Z_i + W_t + \varepsilon_{it} \quad 4)$$

In equation 4, F_i is a dummy variable, where 0 indicates if someone is a male and 1 indicates if someone is a female. The coefficient of interest is β_7 which represents how the economic outcome variables of South Korean employees differ after the implementation of the laws based on being a female, compared to being male. Equation 4 will be estimated for all different outcome variables: average actual worked hours, self-reported health, and job satisfaction.

In addition, to also consider social-economic status effects, the following difference-in-difference equation, which also builds on the most comprehensive equation (equation 3, including weighted least squares models) will be estimated:

$$Y_{it} = \alpha + \beta_1 T_i + \beta_2 Post_t + \beta_3 Low_i + \beta_4 Med_i + \beta_5 (T_i * Post_t) + \beta_6 (Low_i * T_i) + \beta_7 (Low_i * Post_t) + \beta_8 (Low_i * T_i * Post_t) + \beta_9 (Med_i * T_i) + \beta_{10} (Med_i * Post_t) + \beta_{11} (Med_i * T_i * Post_t) + \beta_{10} X_{it} + Z_i + W_t + \varepsilon_{it} \quad 5)$$

In equation 5, Low_i is a dummy variable, where 0 indicates if someone does not belong to the low social-economic class and 1 indicates if someone belong to the low social-economic class. Med_i is a dummy variable, where 0 indicates if someone does not belong to the medium social-economic class and 1 indicates if someone belong to the medium social-economic class. The coefficients of interest are β_8 and β_{11} which indicate how the economic outcomes variables of South Korean employees differ after the implementation of the laws based on belonging to the low or middle socio-economic class, compared to the high socio-economic class (high socio-economic class is the reference category). Equation 5 will be estimated for all different outcome variables: average actual worked hours, general health status, and job satisfaction.

5. Results

This chapter discusses the estimated results and links these results back to the hypotheses discussed earlier in Chapter 2. For all results discussed, the difference-in-difference is the variable of interest, and this will be the variable I refer to when drawing conclusions. This variable reflects the difference in the outcome variable (either actual working hours or health) from before the implementation of the law to after the implementation of the law between the treatment group and the control group.

5.1 Hypothesis 1: The implementation of the work-hour reduction law and the average worked hours

The first hypothesis formulated a negative association between the amended law and the average working hours of South Korean employees. Table 3 (for the first phase of the implementation) and Table 4 (for the second phase of the implementation) show the results of the linear regression models for this hypothesis.

5.1.1 Hypothesis 1a

Considering Hypothesis 1a, that focuses on the first phase of the implementation of the law, Column 1 of Table 3 presents a significant positive coefficient for the interaction effect on the actual average weekly worked hours. This difference-in-difference interaction estimate, the coefficient of interest, equals 0.495 hours and is significant at the five percent level. This result suggests that the treatment group had an increase in their average weekly working hours by approximately half an hour, compared to the control group after the law was implemented. Strengthening the analysis further, by adding controls and fixed effects and using the weighted sample, the estimate of the difference-in-difference interaction became only significant at the ten percent level and becomes slightly smaller, equaling 0.486 hours. This most comprehensive model (Table 3, column 4) has a R squared of 0.0506. This means that the implementation of the law only explains 5.06% of the variation in the average weekly worked hours.

In conclusion, the introduction of the law had a very small effect on workers' actual weekly hours worked. Although the effect is very small, the effect is only significant at the 10 percent level, and the relationship between the implementation of the law and the actual worked hours is weak, it is an interesting finding that actual hours worked increased slightly on average for

workers in large-sized firms compared to workers in medium-sized firms, after the law was introduced, because the very purpose of the law was to reduce average hours worked.

5.1.2 Hypothesis 1b

Considering Hypothesis 1b, that focuses on the second phase of the implementation of the law, Column 1 of Table 4 also shows a significant positive coefficient for the interaction effect on the actual worked hours. The difference-in-difference interaction estimate equals 0.484 hours and is significant on the ten percent level. This indicates that the average actual working hours increased with approximately half an hour a week for employees working in a medium-sized firm, compared to employees working in a small-sized firm after the law was implemented. However, when the analysis was further strengthened, and control variables, fixed effects, and the weighted sample were added, the result stayed similar in magnitude, but became insignificant. The difference-in-difference estimate of column 4 in Table 4 equals 0.440 hours but is not significant. This insignificant result suggests that the implementation had no significant impact on the actual weekly worked hours for employees that work in medium-sized firms on average compared to employees working in a small-sized firm, after the implementation of the law. This is also an interesting finding, suggesting that the implementation of the law had no effect on employees of medium-sized firms and therefore employees of medium-sized firms are affected differently than employees from large-sized firms. The explanatory power of this model is also very limited. The R squared of this model (column 5 Table 4) equals 0.007.

5.1.3 Conclusion

In summary, the effect of the implementation of the law on actual worked hours of South Korean employees seems mixed. For employees from larger-sized firms compared to employees from middle-sized firms, the implementation of the law tends to slightly increase the average working hours. This would suggest that the law has the opposite effect than how it was designed. For employees from medium-sized firms, no significant effect was found. Strengthening the empirical model by adding controls, fixed effects, and a weighted sample for both stages of the implementation of the law leads to smaller, and less, or even insignificant results.

The overall conclusion of this hypothesis is therefore that it cannot be concluded that the implementation of the work hour reduction law is negatively related to the actual worked hours of employees and that employees from large-sized firms are affected differently than employees from medium-sized firms. However, the explanatory power of the models is very limited, and the results should not be interpreted as causal effects, but the surprising results are still interesting for policy implications.

5.2 Hypothesis 2: **The implementation of the work-hour reduction law and employees' health**

The second hypothesis formulated a positive association between the amended law and the health of South Korean employees. The two included health outcomes are the self-reported overall health condition and the job satisfaction. Table 3 (for the first phase of the implementation) and Table 4 (for the second phase of the implementation) show the results of this hypothesis. Ordered logistic regression models and their odds ratios were used to interpret the results for self-reported health. Linear regression models were used to measure the results for job satisfaction.

5.2.1 Hypothesis 2a

Considering Hypothesis 2a, that states the effect for the first stage of the implementation of the law, which targets employees from large-sized firms, column 5 of Table 3 shows that the implementation of the law has no significant effect on self-reported average health condition of employees from large-sized firms. The difference-in-difference estimate equals -0.051. When strengthening the model further by adding controls, fixed effects, and a weighted sample, the coefficient of interest becomes significant on the one percent level and larger, equaling -0.312 (column 8 of Table 3). This means that the implementation of the law is associated with a decrease in the log-odds of reporting a better health. In other words, the odds ratio of 0.732 suggests that the odds for individuals working in large-sized firms for reporting a higher health category decrease with approximately 27% compared to individuals working in a medium-sized firm, after the law was implemented.

Therefore, it can be concluded that the self-reported health worsened significantly for employees working in a large-sized firm, compared to employees working in a medium-sized firm after the law was implemented. However, the explanatory power of this model is very limited, as the R squared of this model equals 0.0215 (column 8 of Table 3).

Furthermore, for the other aspect of health, the job satisfaction, column 9 of Table 3 presents that the implementation of the law also has no significant effect on the job satisfaction of employees from large-sized firms. The difference-in-difference estimate in the most basic model for job satisfaction equals 0.004. When strengthening the model further by adding controls, fixed effects, and a weighted sample, column 12 of Table 3 shows that the coefficient turns into a negative estimate, equaling -0.017. This result is still not significant.
Therefore, it cannot be concluded that the job satisfaction significantly changed for employees working in a large-sized firm, compared to employees working in a medium-sized firm after the law was implemented.

The results indicate that South Korean employees working in a company with more than 300 employees did not, on average, become healthier after the introduction of the law, compared with employees working in a company with 50-299 employees.

5.2.2 Hypothesis 2b

Considering Hypothesis 2b, that states the effect for the second stage of the implementation of the law, which targets employees from medium-sized firms, column 5 of Table 4 shows that the implementation of the law has no significant effect on self-reported health of employees. The difference-in-difference estimate of column 5 of Table 4 equals -0.060, almost equaling zero, and is insignificant. When also including controls, fixed effects, and the weighted sample, the difference-in-difference estimate turns into a significant estimate on the five percent level. This difference-in-difference estimate equals -0.222 and can be found in column 8 of Table 4. This means that the implementation of the law is associated with a decrease in the log-odds of reporting a better health. The odds ratio of 0.801 suggests that the odds for individuals working in medium-sized firms for reporting a higher health category decrease with approximately 20% compared to individuals working in a small-sized firm, after the law was implemented.
It can therefore be concluded that the self-reported health worsened significantly for employees working in a medium-sized firm after the law was implemented, compared to employees working in a small-sized firm. In this model, the explanatory power is very little, because the R squared only equals 0.0316 (column 8 of Table 4).

Next, column 9 of Table 4 shows that the implementation of the law has no significant effect on the job satisfaction of employees working in a medium-sized firm. The difference-in-difference estimate of column 9 of Table 4 equals -0.023. Column 12 of Table 4 also includes control variables, fixed effects, and the weighted sample, but the difference-in-difference remains insignificant. By strengthening the model, the coefficient changes from -0.023 to -0.036. This means that the implementation of the law did not have a significant effect on the job satisfaction of employees working in a middle-sized firm.

The significant results for self-reported health and the insignificant results of job satisfaction led to the conclusion that the implementation of the law is associated with a decrease in the odds to report a better health category, while job satisfaction was not significantly affected for employees that work in a firm with 50-299 employees compared to employees that work in a firm with 5-49 employees.

5.2.3 Conclusion

The interaction effects of the self-reported health outcome are significant in the most comprehensive models, both for first phase of the implementation of the law and for the second phase of the implementation. This suggests that the introduction of the law impacted the self-reported health of treated individuals after the law was implemented negatively, compared to individuals from the control group. For the other health outcome, job satisfaction, no significant results were found. In conclusion, hypothesis 2 that stated that health would improve as a result of the implementation of the law, cannot be confirmed, and it cannot be concluded that the implementation of the law is positively associated with the health of treated employees. Although, the explanatory power of the models is very limited, it is interesting, because these results prove the opposite (health worsens or remains unaffected) than the aim of the policy.

Table 3: Main regressions for the effect of working-hours reduction law on the economic outcomes for the first phase of the implementation.

	(1) Average hours (SE)	**(2)** Average hours (SE)	**(3)** Average hours (SE)	**(4)** Average hours (SE)	**(5)** Health (SE)	**(6)** Health (SE)	**(7)** Health (SE)	**(8)** Health (SE)	**(9)** Job Satis (SE)	**(10)** Job Satis (SE)	**(11)** Job Satis (SE)	**(12)** Job Satis (SE)
Policy[a] * Treatment[b]	0.495** (0.238)	0.595** (0.245)	0.604** (0.245)	0.486* (0.248)	-0.051 (0.091)	0.026 (0.099)	0.025 (0.099)	-0.312*** (0.073)	0.004 (0.022)	-0.002 (0.022)	-0.003 (0.022)	-0.017 (0.022)
Treatment	-1.476*** (0.308)	-1.432*** (0.300)	-1.421*** (0.299)	-1.026*** (0.326)	0.288*** (0.097)	0.065 (0.101)	0.066 (0.101)	0.355*** (0.089)	0.125*** (0.023)	0.086*** (0.022)	0.086*** (0.022)	0.124*** (0.026)
Policy	-0.800*** (0.201)	-0.909*** (0.214)	-0.171 (0.367)	0.432 (0.378)	-0.218*** (0.065)	-0.141* (0.073)	-0.228 (0.073)	1.393*** (0.155)	-0.027 (0.081)	-0.028* (0.017)	-0.069** (0.030)	0.022*** (0.032)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Weighted sample	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
Number of Individuals	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468
Number of observations	8772	7811	7811	7811	9746	8195	8195	8195	9323	8195	8195	8195
R-Squared	0.0115	0.0688	0.0746	0.0506	0.0039	0.0531	0.0547	0.0215	0.0132	0.1306	0.1354	0.1545

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1-4 and 9-12 present the results of the linear regression models, and columns 5-8 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

[a]Policy is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 July 2018 for the first implementation phase) and 0 indicates if someone was surveyed before the implementation date.

[b] Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 300 or more employees for the first implementation phase).

Table 4: Main regressions for the effect of working-hours reduction law on the economic outcomes for the second phase of the implementation.

	(1) Average hours (SE)	**(2)** Average hours (SE)	**(3)** Average hours (SE)	**(4)** Average hours (SE)	**(5)** Health (SE)	**(6)** Health (SE)	**(7)** Health (SE)	**(8)** Health (SE)	**(9)** Job Satis (SE)	**(10)** Job Satis (SE)	**(11)** Job Satis (SE)	**(12)** Job Satis (SE)
Policy[a] * Treatment[b]	0.484*	0.480	0.460	0.440	-0.060	-0.146	-0.155	-0.222**	-0.023	-0.024	-0.025	-0.036
	(0.276)	(0.316)	(0.316)	(0.319)	(0.082)	(0.098)	(0.098)	(0.027)	(0.024)	(0.025)	(0.025)	(0.027)
Treatment	-0.383	0.001	0.009	0.227	0.438***	0.390***	0.394***	0.409***	0.154***	0.120***	0.120***	0.140***
	(0.337)	(0.321)	(0.321)	(0.350)	(0.085)	(0.089)	(0.089)	(0.088)	(0.023)	(0.021)	(0.021)	(0.085)
Policy	-1.231***	-1.397***	-2.029***	5.417***	-0.152***	0.005	0.089	1.482***	0.044***	0.052***	0.117***	1.216***
	(0.215)	(0.259)	(0.345)	(2.069)	(0.055)	(0.069)	(0.092)	(0.214)	(0.016)	(0.019)	(0.024)	(0.228)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Weighted sample	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
Number of Individuals	1279	1279	1279	1279	1279	1279	1279	1279	1279	1279	1279	1279
Number of observations	7586	6634	6634	7215	8690	7215	7215	7215	8312	7215	7215	7215
R-Squared	0.0053	0.0634	0.0663	0.0569	0.0070	0.0504	0.0520	0.0316	0.0192	0.1363	0.1413	0.1854

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1-4 and 9-12 present the results of the linear regression models, and columns 5-8 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

[a]Policy is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 January 2020 for the second implementation phase) and 0 indicates if someone was surveyed before the implementation date.

[b] Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 50-299 employees for the second implementation phase).

5.3 Hypothesis 3: The implementation of the work-hour reduction law and heterogenous effects

The third hypothesis formulated, stated that the effects of the implementation of the work-hour reduction law differ for females and males, and individuals from different SES. Table 5 and Table 6 present the results to explore those heterogenous effects. For this analysis, only the most complete models are presented. This means the effects are presented when control variables, fixed effects, and a weighted sample were considered.

5.3.1 Hypothesis 3a

The results of Table 5 suggest that the impact of the implemented law on the actual worked hours differs significantly for females and males, but only for the first phase of the implementation. The difference-in-difference estimate for the first phase of the implementation is presented in Table 5, column 1, and equals -0.962 hours. This estimate is significant on the ten percent level. It suggests that the implementation of the law is associated with approximately an hour decrease in working hours for treated females compared to males. However, it is noteworthy that the model has a R squared of only 0.0525 (column 1, Table 5).

Next, the results of Table 5 show that for the other outcome variables in the first phase of the implementation, no significant differences were found between females and males. The interaction term for health (presented in Table 5, column 2) equals -0.217 and the interaction term for job satisfaction (presented in Table 5, column 3) equals -0.041, but they are both not significant.

Furthermore, the results of Table 5 for the second phase of the implementation are also insignificant. The interaction terms presented in columns 4, 5, and 6 are not significant. The interaction term for actual working hours (presented in Table 5, column 4) equals -0.114, the interaction term for health (presented in Table 5, column 5) equals -0.114 and the interaction term for job satisfaction (presented in Table 5, column 6) equals -0.014, but they are all not significant. Therefore, it cannot be concluded that females working in middle-sized firm are affected differently than males.

5.3.2 Hypothesis 3b

Table 6 considers a heterogenous analysis in terms of SES. For the first step of the analysis, no significant effects were found on the different outcome variables, both for people with a low SES and middle SES. It can therefore not be concluded that individuals with a low or medium SES working are affected differently than individuals with a high SES.

However, for the second phase of implementation, some significant effects were found for the effect of the implementation of the law on actual working hours, both for individuals with low SES and middle SES. The implementation of the law is associated with an increase of approximately three hours for individuals with low SES and approximately two and a half hours for individuals with middle SES compared to individuals with high SES.

5.3.3 Conclusion

In conclusion, females actual working hours is associated with a decrease after the law was implemented compared to males in the analysis of the first step of the implementation of the law. Additionally, working hours of people with a low or middle SES is associated with an increase after the law was implemented compared to individuals with high SES in the analysis of the second step of the implementation of the law.

Therefore, hypothesis 3, that stated that females and people of different SES are affected differently can be accepted for the effect of the law on actual worked hours for females working in large-sized firms and people with low and middle SES working in medium-sized firms. For the other outcome variables, no heterogenous effects were found.

Table 5: Main regressions for the effect of the implementation of the law on the different economic outcomes for the first and second phase of the implementation, including gender effects.

	First phase of implementation			Second phase of implementation		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Average hours	Health	Job satisfaction	Average hours	Health	Job satisfaction
	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Policy[a] * Treatment[b] * Gender[c]	-0.962*	-0.217	-0.041	-0.114	0.064	-0.014
	(0.524)	(0.149)	(0.047)	(0.662)	(0.150)	(0.053)
Policy * Treatment	0.879***	0.107	0.011	0.538	-0.133	-0.019
	(0.305)	(0.081)	(0.027)	(0.376)	(0.092)	(0.031)
Policy * Gender	0.125	0.131	-0.021	0.555	-0.006	-0.004
	(0.415)	(0.108)	(0.035)	(0.531)	(0.108)	(0.038)
Treatment * Gender	1.262*	0.096	-0.017	0.446	0.003	-0.027
	(0.653)	(0.178)	(0.053)	(0.721)	(0.172)	(0.053)
Policy	-0.215	-0.153	-0.062*	-2.363***	0.012	0.105***
	(0.413)	(0.125)	(0.033)	(0.370)	(0.081)	(0.028)
Treatment	-1.830***	-0.039	0.091***	-0.246	0.265***	0.123***
	(0.429)	(0.102)	(0.032)	(0.448)	(0.102)	(0.032)
Female	-1.995***	0.011	0.071*	-2.110***	0.094	0.090**
	(0.531)	(0.130)	(0.040)	(0.549)	(0.119)	(0.036)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weighted sample	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1468	1468	1468	1279	1279	1279
Number of observations	7811	8195	8195	6634	7215	7215
R-Squared	0.0525	0.0190	0.1495	0.0462	0.0187	0.1501

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1, 3, 4, and 6 present the results of the linear regression models, and columns 2 and 6 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.
[a]Policy is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 July 2018 for the first implementation phase and 1 January 2020 for the second implementation phase) and 0 indicates if someone was surveyed before the implementation date.
[b] Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 300 or more employees for the first implementation phase and working in a firm with 50-299 employees for the second implementation phase).
[c]Gender is a dummy variable where 1 indicates being a female and 0 indicates being a male.

Table 6: Main regressions for the effect of the implementation of the law on the different economic outcomes for the first and second phase of the implementation, including SES effects.

	First phase of implementation			Second phase of implementation		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Average hours	Health	Job satisfaction	Average hours	Health	Job satisfaction
	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Policy[a] * Treatment[b] * low SES[c]	-1.436	1.830	-0.401	3.322**	-1.327	-0.418
	(2.050)	(1.518)	(0.484)	(1.540)	(1.130)	(0.516)
Policy reform * Treatment* middle SES[d]	-1.980	0.582	-0.402	2.625*	-1.327	-0.428
	(1.932)	(0.690)	(0.484)	(1.421)	(1.114)	(0.514)
Policy * Treatment	2.270	-1.193*	0.385	-2.422*	1.106	0.387
	(1.915)	(0.688)	(0.483)	(1.371)	(1.114)	(0.513)
Policy * low SES	0.739	-1.747***	0.199	-4.147***	0.423	-0.137
	(1.959)	(0.569)	(0.438)	(0.909)	(0.842)	(0.297)
Policy * middle SES	1.743	-0.731	0.190	-2.804***	0.259	-0.147
	(1.883)	(0.552)	(0.439)	(0.826)	(0.832)	(0.295)
Treatment * low SES	2.258	-1.546***	-0.213	-2.776**	0.769	0.357
	(1.998)	(0.407)	(0.394)	(1.362)	(0.869)	(0.454)
Treatment * middle SES	2.208	-0.287	-0.186	-1.982	0.911	0.315
	(1.901)	(0.384)	(0.394)	(1.249)	(0.849)	(0.453)
Policy reform	-1.057	2.374***	-0.160	7.689***	1.513***	1.427***
	(1.905)	(0.571)	(0.447)	(2.170)	(0.355)	(0.358)
Treatment	-3.148	0.956**	0.318	2.416*	-0.453	-0.184
	(1.920)	(0.388)	(0.394)	(1.286)	(0.854)	(0.454)
Low SES	-1.577	1.059	0.213	2.010**	-0.931	0.231
	(1.950)	(0.758)	(0.350)	(0.806)	(0.595)	(0.275)
Middle SES	-2.216	1.865**	0.339	1.158	-0.035	0.405
	(1.903)	(0.751)	(0.351)	(0.711)	(0.580)	(0.273)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weighted sample	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1468	1468	1468	1279	1279	1279
Number of observations	7811	8195	8195	6634	7215	7215
R-Squared	0.0489	0.0209	0.1028	0.0528	0.0305	0.1446

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1, 3, 4, and 6 present the results of the linear regression models, and columns 2 and 6 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

[a]Policy reform is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 July 2018 for the first implementation phase and 1 January 2020 for the second implementation phase) and 0 indicates if someone was surveyed before the implementation date.

[b]Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 300 or more employees for the first implementation phase and working in a firm with 50-299 employees for the second implementation phase).

[c]Low SES is a dummy variable where 1 indicates that someone has a low social-economic status (high SES is the reference category).

[d]Middle SES is a dummy variable where 1 indicates that someone has a low social-economic status (high SES is the reference category).

5.4 Robustness checks

5.4.1 Treatment definition and consistency

Being treated was defined based on if someone worked in a firm with more than 300 employees in 2016 (baseline) for the first step of the implementation and as someone who worked in a firm with 5-49 employees in 2016 (baseline) in the second step of the implementation. However, it is assumable that employees switch over time to another company and the treatment proportion does not stay consistent over time. Therefore, the annual proportion of employees working in a large-sized firm (treatment group for the first phase) and the annual proportion of employees working in a medium-sized firm (treatment group for the second phase) was examined. It is crucial that this treatment assignment characteristic does not change significantly between 2016 and 2018 and 2016 and 2020, because this can introduce bias.

Figure 8 presents the proportion of the treatment groups over time. The proportion stays very stable over time. For the treatment group of the first phase, the proportion over time varies with 4 percent points (but only with one percentage point between 2016-2018), and for the treatment group of the second phase, the proportion over time varies only with 2 percentage points. A detailed overview of the proportion percentages for every year for the different treatment groups can be found in Table A4 (See Appendix).

This consistency over time indicates that treatment allocation does not change significantly between 2016 and the implementation period (either 2016-2018 for the first phase or 2016-2020 for the second phase), and therefore the validity of the representative groups is confirmed.

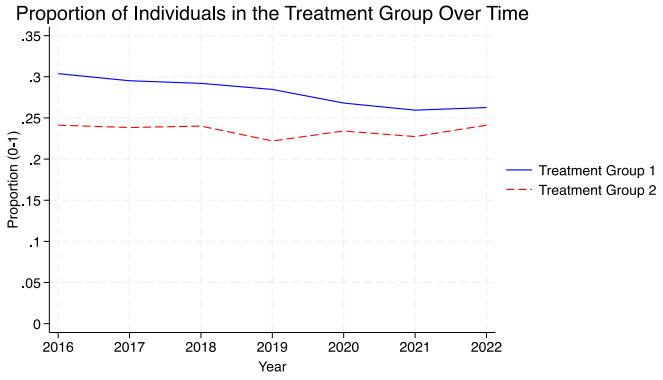

Figure 8: Treatment proportion over time for employees working in a large-sized and medium-sized firm.

Note: Treatment Group 1 consists of employees working in a firm with more than 300 employees and Treatment group 2 consists of employees working in a firm with 50-299 employees.

5.4.2 Number of participations

The number of observations per individual is not the same for every individual. A potential threat is that attrition is likely to be endogenous. Sánchez (2017) argued for example that unhealthier people are more likely to stop participating. If there is non-random attrition it is likely that therefore respondents who participated in all survey rounds differ substantially from respondents who did not participate in all survey rounds. If this is the case, the estimated results would be biased.

Therefore, the participation count of respondents was examined. Most respondents participated in all survey rounds. For the analysis of the first phase of the law's implementation, 82% of the sample participated in all survey rounds. For the analysis of the second phase of the law's implementation, the percentage was 87%. Table A5 (see Appendix) gives a complete overview of the number of times participants participated in the survey. To examine whether those who participated each year are different from those who did not, and to strengthen the credibility of the results, sensitivity analyses were performed that divided the sample in people who participated in all survey waves and those who did not to check if those different groups responded differently to the implementation of the law. The same regression models were run to compare the estimations for the difference-in-difference effect across the three different models (full participation, partial participation, and the main analysis). Table 3 and 4 present the main results of this paper. When the main results are compared with Table A6 (see Appendix) that considers only people who participate in every wave, and Table A7 (see Appendix) that considers people who did not participate in every wave, similar results are found.

For the effect on the actual working hours for the first phase of implementation, the results are the same in direction across the different models, but the estimates becomes insignificant in the full participation and partial participation model compared to the main analysis (full participation 0.366 (Table A6, column 1), partial participation 1.031 (Table A7, column 1), and the main analysis 0.486* (Table 3, column 4)). This proves that the effects on actual working hours for the first phase are not completely robust. Further, the results imply that for the actual worked hours of the second phase of the implementation, the main findings remained the same across the main, full participation, and partial participation models (in size and significance) and are therefore robust (full participation 0.394 (Table A6, column 4), partial participation 0.816 (Table A7, column 4), and the main analysis 0.460 (Table 3, column 4)).

For the effect on job satisfaction for the first phase of implementation, the effect stayed the same for the three different models (full participation 0.001 (Table A6, column 3), partial participation -0.106 (Table A7, column 3), and the main analysis -0.017 (Table 3, column 12)). The interaction terms across the different models are all not significant and the results are therefore robust. For the effect on job satisfaction for the analysis of the second phase of implementation, the effect remains the same in terms significance for the partial participation and main analysis model: 0.042 (Table A7, column 6) and -0.036 (Table 4, column 12) respectively. For the full participation model, the difference-in-difference effect changes from significance level: -0.047* (Table A6, column 6). This proves that the effects on job satisfaction are not completely robust.

Next, for the effect on self-reported health for the analysis of the first phase of implementation the effects are similar in terms of direction and significance for full participation and main analysis model: -0.299*** (Table A6, column 2) and -0.312*** (Table 3, column 8). For the partial participation model the difference-in-difference estimate equals -0.237 (Table A7, column 2), but is not significant. Therefore, the results for the full participation model and the main analysis model remain the same, but the partial model deviates by no longer being significant, however still having the same direction. Lastly, for the effect on self-reported health for the analysis of the second phase of implementation the effects are also similar in terms of direction and significance for full participation and main analysis model: -0.292*** (Table A6, column 5) and -0.222** (Table 4, column 8). For the partial participation model the difference-in-difference estimate equals 0.308 (Table A7, column 5), but is not significant. Therefore, the results for the full participation model and the main analysis model remain the same, but the partial model deviates by no longer being significant and having another direction.

In conclusion, a potential threat is that respondents who participated in all survey rounds differ substantially from those who did not participate in all survey rounds. This would limit the validity of this research. The robustness checks suggest that the findings for actual worked hours of the second phase and the findings for job satisfaction of the first phase are robust. For the other outcomes, there are some differences across the models, which may suggest that the number respondents participate may affect the results. Therefore, the reliability of the estimated effect of the implementation of the law on the different outcome variables is somewhat limited.

5.4.3 Placebo test

A placebo test was conducted to examine if there were significant differences between the treatment and control group before the working hour reduction law was implemented. This serves as extra robustness check.

2017 was chosen as the fake treatment period (the actual law was implemented in July 2018 for large-sized firms, and in January 2020 for medium-sized firms). The same regressions were run, but now the placebo year was used instead of the actual treatment years. Table A8 (see Appendix) presents these placebo effects for 2017. The interaction term of the placebo test equals -0.294 hours for the treatment year of the first phase of implementation and equals -0.508 hours for the treatment year of the second phase of implementation for the effects on actual working hours. Both interaction terms are insignificant. For self-reported health, the interaction terms equal 0.005 and -0.055 respectively for the first and second phase of the implementation. These interaction terms are also not significant. Finally, for job satisfaction, the interaction terms equal -0.017 scale points and 0.028 scale points respectively for the first and second phase of the implementation. These interaction terms are also not significant.

All insignificant interaction terms suggest that there were no significant differences between the treatment and control group before the law was implemented and that the groups are therefore comparable. This strengthens the validity of this research and makes it more likely that the estimated effects on the actual worked hours and health outcomes can be attributed to the implementation of the law and the effect is not biased due to pre-existing differences.

6. Discussion

6.1 Implications

6.1.1. Limited effectiveness

Since the difference-in-difference estimates of the most comprehensive models showed a positive effect for the treatment group of the first phase and no effect for the treatment group of the second phase on actual hours worked and some small negative effects or no effects on health for both treatment groups were found, this suggests limited effectiveness of the implemented policy that aimed to reduce working hours and improve health.

A positive effect of the law on the actual worked hours of roughly half an hour a week was found for the treatment group of the first phase of the implementation (see Table 3, column 4). No effect on the actual worked hours were found for the treatment group of the second phase of the implementation (see Table 4, column 4). Furthermore, for the first phase of the implementation, the odds of reporting a higher self-reported health decrease with approximately 27% for individuals working in a large-sized firm compared to individuals working in a medium-sized firm, after the law was implemented (see Table 3, columns 8 for the negative difference-in-difference estimate). For the second phase of the implementation, the odds of reporting a higher self-reported health decrease with approximately 20% for individuals working in a medium-sized firm compared to individuals working in a small-sized firm, after the law was implemented (see Table 4, columns 8 for the negative difference-in-difference estimate). These percentages can be economically relevant, given South Korea's dissatisfaction with workload, signaling that health has not yet improved. Finally, no effects on job satisfaction were found for the treatment groups of the first and second phase of the implementation.

Although the found results were somewhat surprising (the law aimed to reduce working hours and improve work-life balance), they were also consistent with ambigious results in the existing literature (Crépon & Kramarzm, 2002; Kim & Lee, 2023; Sánchez, 2017).

The limited effectiveness of the policy raises the question of whether more surveillance is needed for such laws to generate the intended effectiveness. Additional policies can also be considered to reduce the average worked hours in South Korea and improve employees' health. It seems that more is needed to contribute to a cultural shift towards a less long-working hours

culture, which is needed to improve work-life balance and lower the high suicide rates and *gwarosa* cases, which are partly caused by the culture of workaholism in South Korea. Concrete policy implications could be from implementing other work-life balance impoving policies at the same time, so that a cultural change transformation can be accelerated. However, this makes it difficult to isolate and evaluate the effects from each other. Furthermore, stricter monitoring and compliance measurers could be employed. Consideration could also be given to including sector-specific effects. Sectors may react differently and have different challenges and therefore tailor adjustment or revisions appropriately. Finally, the limited effectiveness also raises the question of whether the outcome variables are appropriate measures. While a more immediate effect on actual work hours would be expected, it is worth noting that health outcomes are very likely to respond with a delay. Therefore, potential positive effects of the law may not be felt until much later, as creating long-term positive health or lifestyle changes may take time.

This evaluation is also insightful for other countries. Globally, health expenditures continue to increase as the World Health Organization (2020) showed that in 2018 the health spendings reached 10% of the global GDP. These expenditures seem to be becoming unbearable for societies. It is therefore necessary for governments to implement enough and appropriate policies to have healthy citizens and reduce healthcare costs.

6.1.2 Promotion hypothesis

Further, this thesis shows the importance of careful implementation of policies as workers are affected in different ways. The heterogenous analyses shows that the working hours of females in the treatment group of the first phase of the implementation decreased compared to the ones in the control group, after the law was implemented. These results can be related to the promotion theory, also discussed in the context of working-hours reduction laws in the research of Sánchez (2017). The promotion theory states that companies promote employees based on their outstanding performance compared to peers, but because the quality of work or how hard someone works is difficult to observe, indicators such as long working hours are used to choose promotion allocation (Rosen, 1986). Requiring reducing the average worked hours can negatively affect the chances to get promotion and therefore negatively impact future earnings, which in turn can have a negative effect on health.

In South Korea, a hierarchical work culture is common. For example, it is hard for ordinary employees to get promoted (HRM Asia, 2018), and males earn acceptance and respect at the workplace more easily than females (Friedrich Naumann Foundation, 2023). This might imply that females have to try harder to get promoted than males. Therefore, if the implementation of the law reduces the working hours and therefore chances of promotion, then females might be worse off, as promotion does not come naturally to them, and they have to prove themselves by working long hours. If females are affected differently, this might negatively impact their health in the long term (although this paper did not find negative effects in the short term). Therefore, it is crucial to understand the mechanisms behind the effects, and tailored policies are likely needed to apply policies to heterogeneous workers to ensure that more vulnerable groups are not worse off as a result of implemented policies.

This thesis provides an evaluation of the effectiveness of the implemented law and some suggestions for improvement are made above based on the results. However, these results cannot be taken as causal. The explanatory power of the models is limited, the sample size is small and there are some limitations. The limitations of this thesis will be discussed in the next section.

6.2 Limitations and future research

Although this paper presents some insightful results, there are some concerns regarding reliability and there are some limitations. Recommendations are also made, as the limited scope of this research leaves some interesting questions unanswered.

6.2.1 Limitations

This paper used the Korean Labor Income Panel Study as data source. Although this is a reliable data source, non-random attrition and an unrepresentative sample could have biased the results of this paper. To ensure that a representative sample was used, some sensitivity analyses were performed, and weights were assigned to individuals considering their living place, but it is still assumable that the sample is not a perfect representation of the Korean population. Non-random attrition, for example, can result in the healthiest people remaining (Sánchez, 2017). Additionally, people from different districts (in size or location) may significantly differ from each other. If those who participate are substantially different and respond in a different way to the implementation of the law than those who did not participate, the results do not accurately reflect the true effects.

Also, the nature of the data source only provides data from people from urban areas. Therefore, this paper lacks to include people from rural areas. This is a flaw, as they may experience a very different work culture and work pressure than people from the city.

Second, self-selection could potentially bias the results. If employers anticipate to the introduction of the law, by staying just below the threshold requirement for when a firm must comply with the working hour reduction law, they could continue keeping a long hour working culture. For employees, there could also be anticipation effects. Maybe an employee would choose an employer or switch to an employer that had to comply with the law to ensure him or herself a healthier work-life balance. However, while these anticipation effects may play a role, it is questionable to what extent this would be the case, since it was announced in advance that the law would be phased in and would eventually apply to every company and every employee. For some companies, the law would not apply until later, but the question is whether it would be worthwhile to anticipate this by not expanding as an employer (in terms of number of employees) or by changing jobs as an employee if the law did apply after a year or so.

Thirdly, this paper aimed to examine how the implementation of the law affects the actual working hours and health outcomes (the self-reported health condition and job satisfaction). Although the firms must comply with the law, there can be an adjustment period for both employers and employees. Moving away from a long working hour culture and creating new routines can take time as cultural changes are often slow. Therefore, the effects on outcome variables may not be directly felt and measured.
But especially, the health effects may well be seen only in the long term. Effects on the health outcomes are likely to be delayed, because many health outcomes, such as mental health and risk of heart disease will not be felt until long-lasting lifestyle changes are made. Additionally, the level of stress, which is closely related to employees' health may not be influenced immediately.
Finally, a difference-in-difference approach requires that no other policies or events affected the treatment and control group during the examined period. Unfortunately, it cannot be stated that other policies were not implemented, as the Korean government wanted to improve the work-life balance in several areas in the last decade, for example, by also expanding child subsidies. Furthermore, the Covid-19 pandemic is an external shock that drastically affect the daily life of everyone. The pandemic is likely to confound the results, because it led to job losses, reduced income, reduced working hours as a result of lockdowns, and created other

economic disruptions (Statista, 2024). However, this would suggest that the analyses would result in an overestimation of the effects, further reducing the number of working hours. But in contradiction, no significant decline in hours worked was even found in this study during this period. It may be that workers who were forced to stop working (for example factory workers) were compensated by office workers who started working more as a result of limited opportunities for other time use or that individuals from this sample were relatively not so affected by the Covid-19 pandemic. Still, it remains a serious limitation of this paper is that it could not control for Covid-19 in the estimated models.

Due to other implemented policies and the Covid-19 pandemic it is therefore hard to isolate the effect of the working-hours reduction law on the actual working hours and health outcomes. However, placebo tests were performed to verify the robustness of the results. No significant placebo effects were found in the fake treatment period, which helps to prove reduced risk of confounding factors and strengthen the validity of this difference-in-difference approach.

6.2.2 Recommendations

Due to the limited adequacy of the data, it was not possible to examine how the implementation of the law affected other economic outcomes. Besides improving work-life balance, the law was also implemented to increase employees' productivity and to create more jobs. Therefore, it would be interesting if further research would also focus on these factors of the indented aims of the policy. Other economic outcomes may be affected more strongly or differently than the outcome variables of this paper: actual hours worked and health.

Also, due to the data constraints, it was only possible to explore the short-term effects of the introduction of the law. It would also be interesting to investigate what the long terms effects are. In addition, by considering a longer post-period, the third step of the implementation of the law could also be evaluated. The third and final step of implementation required firms with fewer than 5 employees to comply. It is relevant to also evaluate how the implementation of the law affects these employees as it is likely that they experience a different workload and work culture than employees of large-sized firms and medium-sized firms. Furthermore, this thesis focused on regular workers, but it is recommended to also analyze how such regulations affect employers, self-employed individuals, temporarily workers and daily workers.

7. Conclusion

This thesis aims to answer the following research question: “What is the relationship between the hour reduction law, amended in 2018 by the South Korean government, on the actual worked hours and the health of employees?”. It is the first paper that also evaluates the second phase of implementation and examines the impact on health. An answer to the research question is sought by estimating the difference between the actual worked hours and health status of South Korean employees from the treatment and control group before the law was implemented and after the law was implemented. To estimate the impact of the law on the actual worked hours and health, a difference-in-difference approach is used. The explanatory power of the models is limited, and the sample size is relatively small. To strengthen the validity of this research, several robustness checks are performed. This includes sensitivity analyses for the treatment definition, participation rates and a placebo test.

The difference-in-difference regressions shows that there is no significant effect of the implementation of the work-hour reduction law on actual worked hours for employees working in medium-sized firms compared to small-sized firms. In contrast, a small positive significant effect on the ten percent level of approximately half an hour a week on the actual worked hours is found for employees working in large-sized firms compared to medium-sized firms, after the law was implemented. Overall, it cannot be stated that the working-hours reduction law reduces the actual working hours of South Korean workers and therefore Hypothesis 1 cannot be accepted. This result is not expected and not in line with the goals of the implemented policy, which aims to reduce the average number of working hours. However, it is in line with the findings of Crépon & Kramarz (2002) that also found that workers kept working long hours.

Next, small negative effects are found for the implementation of the work-hour reduction law on self-reported health. The self-reported health condition in both phases of the implementation was negatively impacted, after the law was implemented. No effects are found in both phases of the implementation for the other health outcome, job satisfaction. Therefore Hypothesis 2, that stated a positive relationship between the law and health, cannot be accepted. Since the previous discussed results show that actual working hours did not decrease, it is also explicable that workers' health did not improve (as they might still work long hours). Yet these results go against the expectations and goals of the policy.

The heterogenous analyses shows that the working hours of females in the treatment group of the first phase of the implementation decreased and the working hours of individuals with low and middle SES increased in the treatment group of the second phase of implementation, compared to the ones in the control group, after the law was implemented. These results can be related to the promotion theory and show the importance of taking into account the different influences on different groups and the importance of developing tailored policies to protect more vulnerable employees. Designing tailored policies is very important to create a diverse and inclusive work culture and reduce gender differences. Hypothesis 3 can therefore be partially accepted, as the results show that females and males and individuals with different levels of SES are sometimes affected differently.

Because this thesis finds no negative effects of the effect of the implementation of the law on actual worked hours and no positive effects on health, this thesis comments on the effectiveness of the working-hours reduction law. This may serve as input for starting a debate on how best to improve the quality of life of South Korean workers. It could be that the implementation of such a law should be accompanied by strict monitoring controls to check whether employers are not still asking too much from workers. Also, it may simply not be effective to implement a law if it does not create an actual cultural shift. If employees still feel great performance pressure from employers or colleagues, South Koreans will continue to work more on average than other OECD countries. The Korean government should continue to pay attention to improving the work-life balance by designing new policies and reconsider policies that did not seem to be effective, as the mental health, suicide rates, average working hours of South Koreans and the resistance prevalent among the new generation about the workaholism culture is alarming.

Recommendations for further research include examining the effect of the working-hours reduction law on the third stage of the implementation, which let small firms comply. Additionally, it is interesting to investigate how self-employed, employers, and temporarily workers are affected by such laws. Lastly, it is also relevant to explore what the effect of such laws are on other economic outcomes, such as wages and employment, where it would be relevant to examine more long-term effects rather than short-term effects, since the effects of outcome variables are likely to be lagged.

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Appendix A

Table A1: Transition in working hours over time.

Year	Individuals transitioning to less than 15 hours	Individuals transitioning to more than 15 hours
2017	1	2
2018	4	1
2019	0	2
2020	1	2
2021	3	8
2022	7	5
Total individuals who transition	16	20
Total individuals of baseline year	1468	1468
Percentage transitioning	1%	1%

Table A2: Original number of individuals and the restriction process for sample size selection.

Phase	Number of individuals (baseline)	Working individuals	Individuals who reported working hours	Excluding people aged above 60	Working hour restrictions	Having at least one pre period observation and one post period observation	Belonging to the treatment or control group
First step	14202	8148	5004	4457	4419	3936	1468
Second step	14202	8148	5004	4457	4419	3536	1279

Table A3: number of individuals for the treatment and control groups per survey wave for the first and second stage of the implementation of the law.

	First step of implementation				Second step of implementation			
	Year	Total	Treatment	Control	Year	Total	Treatment	Control
Pre-period	2016	1468	827	641	2016	1279	596	683
	2017	1433	807	626	2017	1253	584	669
Combined	2018	1418	800	618	2018	1242	574	668
Post-period	2019	1394	786	608	2019	1244	578	666
	2020	1356	763	593	2020	1236	574	662
	2021	1347	761	586	2021	1232	569	663
	2022	1330	755	575	2022	1204	561	643

Table A4: Treatment proportion over time for the different treatment groups.

Year	**Treatment group first phase of implementation**	**Treatment group second phase of implementation**
	Employees working in a large-sized firm	Employees working in a medium-sized firm
2016	0.3038	0.2412
2017	0.2952	0.2384
2018	0.2920	0.2401
2019	0.2846	0.2220
2020	0.2681	0.2341
2021	0.2595	0.2273
2022	0.2626	0.2412

Table A5: Overview of number of times respondents participated.

Participation count	First stage of implementation	Second stage of implementation
2	8	1
3	31	4
4	45	15
5	52	44
6	127	113
7	1205	1107
Total number of individuals	1468	1279

Table A6: Main regression results for those who participated in all waves of the survey.

	First phase of implementation			Second phase of implementation		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Average hours	Health	Job satisfaction	Average hours	Health	Job satisfaction
	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Policy[A] * Treatment[b]	0.366	-0.299***	0.001	0.394	-0.292***	-0.047*
	(0.267)	(0.081)	(0.023)	(0.334)	(0.101)	(0.028)
Policy	0.557	1.557***	0.018	6.240***	1.506***	1.313***
	(0.398)	(0.038)	(0.034)	(2.087)	(0.466)	(0.234)
Treatment	-0.857**	0.325***	0.084***	0.189	0.466***	0.159***
	(0.347)	(0.098)	(0.093)	(0.378)	(0.096)	(0.028)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weighted sample	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1205	1205	1205	1104	1104	1104
Number of observations	6717	7061	7061	5880	6408	6408
R-Squared	0.0562	0.0234	0.1501	0.0543	0.0337	0.1913

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1, 3, 4, and 6 present the results of the linear regression models, and columns 2 and 6 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.
[a]Policy reform is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 July 2018 for the first implementation phase and 1 January 2020 for the second implementation phase) and 0 indicates if someone was surveyed before the implementation date.
[b] Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 500 or more employees for the first implementation phase and working in a firm with 50-299 employees for the second implementation phase).

***Table A7*:** Main regression results for those who did not participate in all waves of the survey.

	First phase of implementation			Second phase of implementation		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Average hours	Health	Job satisfaction	Average hours	Health	Job satisfaction
	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Policy[a] * Treatment[b]	1.031	-0.237	-0.106	0.816	0.308	0.042
	(0.679)	(0.179)	(0.070)	(1.090)	(0.305)	(0.078)
Policy	0.026	0.270	0.054	2.977	1.136***	-0.095
	(1.159)	(0.326)	(0.084)	(9.208)	(0.272)	(0.690)
Treatment	-1.632*	0.492**	0.335***	0.848	0.019	-0.019
	(0.883)	(0.209)	(0.068)	(1.025)	(0.239)	(0.076)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weighted sample	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	263	263	263	175	175	175
Number of observations	1094	1134	1134	754	807	807
R-Squared	0.0772	0.0202	0.2197	0.1373	0.0227	0.1983

Note: Regression results are based on observations of the period 2016-2022, using clustered standard errors at the individual level. Columns 1, 3, 4, and 6 present the results of the linear regression models, and columns 2 and 6 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.
[a]Policy reform is a dummy variable where 1 indicates if someone is surveyed after the implementation date (1 July 2018 for the first implementation phase and 1 January 2020 for the second implementation phase) and 0 indicates if someone was surveyed before the implementation date.

[b] Treatment is a dummy variable where 1 indicates that you are an employee of a company that had to comply with the law (working in a firm with 500 or more employees for the first implementation phase and working in a firm with 50-299 employees for the second implementation phase).

Table A8: Placebo effects for the first and second phase of the implementation.

	First phase of implementation			Second phase of implementation		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Average hours	Health	Job satisfaction	Average hours	Health	Job satisfaction
	(SE)	(SE)	(SE)	(SE)	(SE)	(SE)
Placebo Difference-in-Difference	-0.294	0.005	-0.017	-0.508	-0.055	0.028
	(0.245)	(0.105)	(0.026)	(0.333)	(0.113)	(0.028)
Placebo Treatment	-0.710**	0.008	0.072***	0.389	0.222***	0.102***
	(0.277)	(0.045)	(0.076)	(0.309)	(0.047)	(0.024)
Placebo policy reform	7.327***	0.181**	1.419***	12.70***	0.209***	1.495***
	(1.728)	(0.020)	(0.227)	(3.268)	(0.080)	(0.211)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Weighted sample	Yes	Yes	Yes	Yes	Yes	Yes
Number of individuals	1468	1468	1468	1279	1279	1279
Number of observations	7732	8114	8114	6568	7144	7144
R-Squared	0.0550	0.0189	0.1879	0.0598	0.0188	0.1890

Note: Regression results are based on observations of the fake treatment period, 2017, using clustered standard errors at the individual level. Columns 1, 3, 4, and 6 present the results of the linear regression models, and columns 2 and 6 present the results of the ordered logistic regression models. Standard errors are presented parenthesis. *, **, *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.