



UNIVERSITY OF GOTHENBURG  
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Graduate School

**Master's Thesis in Economics:**

**“Effects of Anti-discrimination Law on the Differential  
between Non-regular and Regular Workers in South Korea”**

**Author: Wansoo Kim**  
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**(2017.06.09)**

## **Abstract**

South Korea implemented a new anti-discrimination law in 2007. The goal is to reduce the labor condition differentials between non-regular and regular workers. This study analyzes the effect of the law on the wage differential. The data comes from “Survey on Labor Conditions by Employment Type”. For the analysis, the Difference-in-Difference method was used. The result is that, by increasing the working-hours gap with the real monthly wage gap holding, the law alleviates the real hourly wage differential between targeted non-regular and regular workers. However, the law’s effects on social insurance and fringe benefit are not significant in general. This could be interpreted as firms have more discretion in other labor conditions, rather than in wage or working-hours. Another finding is that the law has no or less influence in reducing the real hourly wage differential for workers without union membership, or young workers. This implies that policy makers should pay more attention to these workers, who might be socioeconomically vulnerable.

## **Acknowledgments**

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## 1. Introduction

Why are workers paid differently? After Adam Smith, economists have attempted to answer the question and they strongly agree that “the wage differentials are consequences of productive capability of each worker, i.e. various human capitals lead to different wages” (Mortensen, 2003). In the context of this orthodox view, the wage differentials should not be caused by factors, such as race, religion, nationality, etc. which are likely to be uncorrelated with an individual’s human capital. However, the wage differentials on the ground of these factors exist across countries and throughout history. Dasgupta et al. (2015) argue that the wage differentials between non-regular and regular workers prevail among developing countries, such as Brazil, South Africa, China, Thailand, etc.; non-regular workers include workers with a fixed-term contract, temporary agency workers, on-call workers and so on<sup>1</sup>.

After the Asian Financial Crisis hit South Korea in 1997, the number of non-regular workers has increased considerably, since most firms show a tendency to prefer non-regular workers to regular workers, who are difficult for firms to dismiss. To make matters worse, the average monthly wage differential between non-regular and regular workers expanded considerably. Baek (2013) argues that this wage differential is likely to aggravate socioeconomic inequality or polarization, which could deter South Korea from making progress economically as well as socially. As non-regular workers became of great concern to South Korean, the South Korean government legislated for a better situation for non-regular workers in 2006. This new labor law states that no employer shall practise discrimination against non-regular workers on the grounds of their employment status, compared with regular workers engaged in the same or similar kinds of work. This law is considered as the first step in addressing the non-regular workers issue in South Korea.

This historically important event leads this study to investigate the effects on the labor condition differentials, especially wage differential, between non-regular and regular workers. This empirical analysis is meaningful not only from an academic perspective but also from a political perspective.

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<sup>1</sup> In South Korea, non-regular workers include agency worker, subcontract worker, on-call worker, part-time worker, fixed-term worker, and contingent worker, and in Eurostat guidelines, non-regular workers include workers with a fixed-term contract, temporary agency workers, and on-call workers (KDI, 2008).

To the best of my knowledge, there are only three previous studies on the effect of the law on the labor condition differentials between non-regular and regular workers: Choi (2011), Lee (2015), and Choi (2016). Choi (2011), who used the Difference-in Difference method with a firm-level panel data, provides the first empirical evidence that the law reduces the wage differential between non-regular and regular workers. He explains that the reason is that the law leads employers to try to treat non-regular workers more fairly. Lee (2015), who used the Triple-Difference Estimation method with an individual-level panel data, oppositely argues that the new labor law increases the wage differential between regular and non-regular workers. He interprets this as a phenomenon as firms trying to differentiate job descriptions for non-regular workers from that for regular workers after the new law. Choi (2016), who used the Difference-in-Difference method with a pooled cross-sectional data of individuals, finds that the law reduces the wage differential in labor conditions between regular and non-regular workers.

This paper attempts to deal with the limitations or weaknesses which the three previous studies potentially have due to the limitation of data. Firstly, their models could not include relevant variables (period of employment, period of working experience, etc.), which can cause the omitted variable bias. On the other hand, their models are likely to include irrelevant variables (rural residence, commuting time etc.), which can cause the estimated effect to be inefficient. For this reason, this study tries to include as many relevant variables as possible, while attempting to exclude irrelevant variables in the previous studies. Secondly, while none of them formally tested the parallel trends assumption<sup>2</sup>, this empirical analysis attempts to formally test the parallel trends assumption. Furthermore, estimating the yearly effect of the law is firstly attempted. Additionally, this study tries to address the lack of previous empirical evidence concerning whether or not the law reduced the wage differential between non-regular and regular workers.

The data for the analysis comes from the 2006–2011 “Survey on Labor Condition by Type of Employment” collected by the Ministry of Employment and Labor of South Korea, and includes relevant information about individuals and firms (e.g. gender, age, education, firm size, industry, etc.). The empirical analysis strategy is the Difference-in-Difference method with pooled cross-

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<sup>2</sup> In the absence of treatment, the average change in the response variable would have the same value for both the treatment and control groups (Roberts, 2012).

sectional data, whereas this study compares the labor condition differentials between non-regular and regular workers based on the date of the law implementation.

This study finds that, across all firm sizes, the new labor law evidently alleviates the real hourly wage differential between targeted non-regular and regular workers from 7.3 to 10.6 percent points, while the gap of working-hours increases from 6.4 to 7.9 percent points with the real monthly wage gap holding; non-regular workers<sup>3</sup> refers to fixed-term, part-time, and temporary-agency workers (Table 1). On the other hand, the law's effects on other labor conditions, such as social insurance and fringe benefits, are not significant overall. The reason why the law influences only the real hourly wage and the working-hours is that firms could exercise more discretion in other labor conditions rather than in wage or working-hours.

The second finding is that the new labor law heterogeneously affects the real hourly wage differential with respect to gender, union, age, education, and year. Remarkably, the law has no or less influence on workers without union membership, and young workers. These workers generally belong to a weak socioeconomic group, since their job situations are unstable and vulnerable to the situation of the labor market. This implies that policy makers should pay more attention to these vulnerable workers to alleviate social polarization.

These findings remain valid while undergoing the robustness checks; parallel trends assumption test, sensitivity test to model specifications, and weighted least squared regression. Other concerns, such as the potential effect of the law on the employment, anticipation effect, etc. are additionally discussed briefly, although formal investigations on these concerns are left to future studies.

This paper is organized as follows. Section 2 presents a short background on the status of non-regular workers and the newly legislated law of prohibiting discrimination against non-regular workers. Section 3 reviews the previous studies associated with this study. Section 4 describes the theoretical model. Section 5 discusses the data and the methodology for the analysis. Section 6 provides the empirical analysis results, robustness checks, and a brief discussion about some concerns. Finally, section 7 draws a conclusion from this empirical analysis.

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<sup>3</sup> The coverage of the law does not extend to all types of non-regular workers. Only three types such as fixed-term, part-time, and temporary-agency workers can be covered.

## 2. Background

This section will discuss the Status of workers in South Korea, the effects of discrimination of non-regular workers and provide greater context for the purpose of this study.

### 2.1 Status of non-regular workers in South Korea

Figure 1, which originates in ‘The Supplementary Survey of the Economically Active Population Survey’, shows the number and percentage of non-regular workers in the entire workforce by firm size. In micro-size or small/middle-size firms, the percentage is 47 or 34 percent respectively, while it is 17 percent in the large-size firms. In Figure 2, the number of non-regular workers increased from 4.6 to 5.5 million people from 2003 to 2006. The percentage of non-regular workers in the entire workforce was 35.5 percent in 2006. For these reasons, it can be mentioned that non-regular workers have played a major role in the Korean labor market.

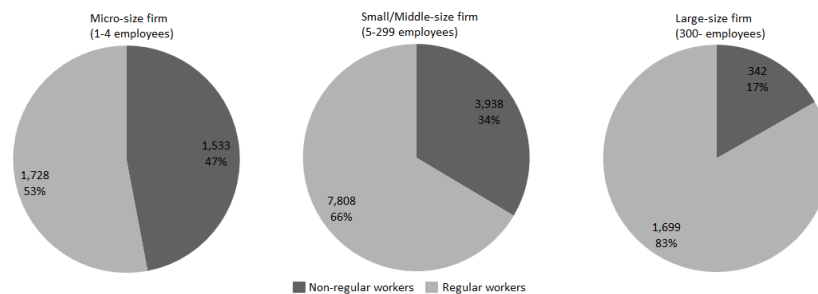


Figure 1: Number and percentage of non-regular workers in the entire workforce by firm sizes (unit: 1,000 persons, annual average from 2004 to 2016)

Source: The Supplementary Survey of the Economically Active Population Survey (KOSIS)

However, the average real monthly wage of non-regular workers was only around 62-65 percent of that of regular workers (Figure 3). The wage ratio had a tendency to decline. For this reason, the status of non-regular workers gradually deteriorated compared that of regular workers, although non-regular workers accounted for more than one third of the entire.

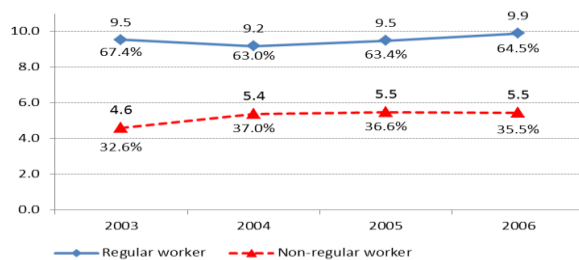


Figure 2: Number of workers (unit: million persons)

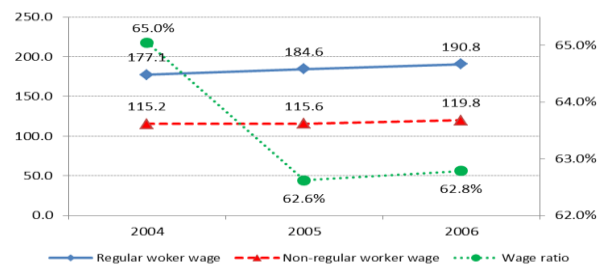


Figure 3: Average monthly wage (unit: 10,000 KRW)

Source: The Supplementary Survey of the Economically Active Population Survey (KOSIS)

## 2.2 Law of prohibiting discrimination and abuse of non-regular workers

From a socioeconomic perspective, the discrimination and abuse of non-regular workers are causes of the social polarization in South Korea. According to the Ministry of Employment and Labor of South Korea (2006), to address this non-regular workers issue, the Korean government attempted to make a new labor law in 2001, which could help to alleviate the discrimination and abuse of non-regular workers. After announcing a draft bill in 2004, the draft encountered strong opposition from both employees and employers. The employees argued that the principle of ‘equal pay for equal work of equal value’ should be stated clearly in the new law. On the other hand, employers insisted that regulations in the draft could reinforce the rigidity of the Korean labor market, which would seriously impede new employment. After 5 years of debate among employers, employees, and government, the new labor law, which is called the “Act on the protection, etc. of fixed-term and par-time workers” officially, was enrolled. Two rules, which are the prohibition of discrimination and abuse of non-regular workers, are cores in this law.

In regards to the rule of prohibiting “discrimination” against non-regular workers (Act on the protection, etc. of fixed-term and par-time workers 2007), the rule prohibits employers from discriminating against non-regular workers on the ground of their employment status, compared with regular workers engaged in the same or similar kinds of work. Discrimination means treating non-regular workers unfairly without reasonable grounds<sup>4</sup> in terms of wage, working-hours, paid holidays-or-vacations, on-the-job-training, compensation for workplace-accidents, dismissal, and other things associated with employment relationships. When an employer displays discriminatory treatment to a non-regular worker without reasonable grounds, the non-regular worker can appeal to the Korean Labor Relations Commission to address the discrimination. If the Commission officially approves of the treatment to be unreasonably discriminating, it instructs the employer to eliminate the discriminatory treatment.

Table 1: The coverage of the rule of prohibiting discrimination on non-regular workers

Non-regular Worker							
Temporary Agency Worker	Part-time Worker	Fixed-term Worker	Non-standard Contracted Employee	Home-based Worker	Contract Worker	Daily Worker	Temporary Worker, Not Fixed-term Worker
Covered			Not Covered				

Note: See Appendix 1 for the definition of each employment type.

<sup>4</sup> For example, the reasonable grounds are productivity, responsibility, work-difficulty, etc.



If the employer does not conform to the Commission's instruction, the employer should pay a penalty of a maximum 100 million KRW (approximately 745,000 SEK). This rule covers only fixed-term, part-time, and temporary-agency workers (Table 1). The rule has gradually been applied to firms over several stages based on the firm size from 2007 to 2009<sup>5</sup>.

Regarding for the rule of forbidding "abuse" of non-regular workers, which covers only fixed-term workers, this rule means that an employer can employ a fixed-term worker for a maximum of two years<sup>6</sup>. In the case where a fixed-term labor contract is repeatedly renewed, the total consecutive employment period shall not exceed two years. Prior to this rule, there was no restriction on renewal terms, so the total period of employing a non-regular worker was not limited. On the other hand, after this rule, if an employer engages a fixed-term worker for more than two years, the fixed-term worker shall be considered as a worker who made a non-fixed term labor contract, that is, an employer who wants to use a worker for more than two years should make a non-fixed term contract with the worker. The rule has been applied, in one stage, to all firms with more than 5 employees from July 2007.

This new labor law, which includes these two core rules, was considered as the first step in dealing with the problem of non-regular workers. Policy makers expected that the law would contribute to alleviating the polarization between the labor classes, by making the use of non-regular workers more reasonable and reducing discrimination. Additionally, the law would help to enhance firms' competitiveness in the long run through increasing workers' productivity.

Considering that one of two core rules of the law is a prohibition of "discrimination" against non-regular workers, empirical analysis investigating the effect of this new law on the labor condition differentials between non-regular and regular workers is of importance, from the political and academic perspective. Moreover, for a more accurate implication, it is necessary to isolate the net law's effect on the differential with controlling for relevant factors, instead of simply examining the changes<sup>7</sup> of the average differential.

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<sup>5</sup> Large-size firms with more than 300 employees have been applicable from July of 2007. Middle-size firms with 100-299 employees have done so from July of 2008. Small-size firms with 99-5 employees have done so from July of 2009. Micro-size firms with less than 5 employees are excluded from the application of this rule.

<sup>6</sup> This might have an effect not on the discrimination but on the employment of non-regular workers.

<sup>7</sup> Since the characteristics of non-regular or regular workers are not controlled, the effect of the new labor law on the labor condition differentials cannot be estimated precisely.

### 3. Literature Review

The key concept of prohibiting discrimination in the new law is, in principle, identical to the concept of “Affirmative Action (AA)”; AA was firstly used in the United States to ensure that employees are treated during employment, without regards to their race, creed, nationality, etc. According to previous literature which studies the impact of this AA on various areas, Holzer and Neumark (2000), Holzer and Neumark (2006), and Unzueta, et al. (2008) find positive effect on employment, firms’ performance, and individuals’ recognition. On the other hand, Coate and Loury (1993), Griffin (1992), and Murray (1994) find that it has negative effects such as investment decrease, cost increase, and a stigmatizing effect.

In the context of the study on “AA”, a number of studies have attempted to evaluate the effect of the new labor law on the labor market in South Korea after the law was implemented. Most of these studies focus on the effect of the law (especially the rule of the prohibition of abuse on non-regular workers) on employment environment, since the topic of employment is more attractive to researchers due to the serious employment situation in South Korea.

To the best of my knowledge, three studies investigate the effect of the law (especially the rule of the prohibition of discrimination on non-regular workers) on the wage differential: Choi (2011), Lee (2015), and Choi (2016).

Choi (2011) finds that the law plays a role in significantly alleviating the wage differential between non-regular and regular workers. That is, the wage differential is reduced after the implementation of the law, so the law leads employers to try to treat non-regular workers more fairly. Choi (2011) used firm-level panel data and the Difference-in-Difference method.

Lee (2015) argues that the new labor law does not reduce the wage differential between non-regular and regular workers. Furthermore, the new labor law aggravates the wage differential. This is interpreted as a phenomenon that firms try to differentiate job descriptions of non-regular workers from those of regular workers after the law implementation. Lee (2015) used individual-level panel data and the Triple-Difference Estimation Method (Difference-in-Difference-in-Difference).

Table 2: Previous studies on the new law effect on the wage discrimination against non-regular workers

	Choi (2011)	Lee (2015)	Choi (2016)
Data	<ul style="list-style-type: none"> <li>·Workplace Panel Survey<sup>[1]</sup></li> <li>·Firm panel data</li> <li>·2005, 2007</li> </ul>	<ul style="list-style-type: none"> <li>·Korea Working Conditions Survey<sup>[4]</sup></li> <li>·Individual panel data</li> <li>·2006, 2010</li> </ul>	<ul style="list-style-type: none"> <li>·Supplementary Survey of Economically Active Population Survey<sup>[5]</sup></li> <li>·Individual cross-sectional data</li> <li>·2007, 2008, 2009, 2010</li> </ul>
Method	<ul style="list-style-type: none"> <li>·Difference-in-Difference</li> <li>·Treatment group: large-size firms</li> <li>·Control group: middle-size, small-size firms</li> </ul>	<ul style="list-style-type: none"> <li>·Triple-Difference Estimation Method</li> <li>·Treatment group: targeted non-regular workers, not micro-size firms</li> <li>·Control group: regular workers, non-targeted non-regular workers, micro-size firms</li> </ul>	<ul style="list-style-type: none"> <li>·Difference-in-Difference</li> <li>·Treatment group: targeted non-regular workers</li> <li>·Control group: non-targeted non-regular workers, regular workers</li> </ul>
Variables	<ul style="list-style-type: none"> <li>·Main dependent: the wage ratio of non-regular workers to regular workers</li> <li>·Controls: firm type<sup>[2]</sup>, firm-governance type<sup>[3]</sup>, percentage of foreigner's stock, percentage of union membership, percentage of non-regular workers, region, industry, public sector, labor cost</li> </ul>	<ul style="list-style-type: none"> <li>·Main dependent: the probability of wage including each wage component</li> <li>·Controls: gender, age, education, income level, occupation, industry, working- system, public sector, region, commuting time</li> </ul>	<ul style="list-style-type: none"> <li>·Dependent variable: hourly wage</li> <li>·Controls: gender, age, education, marital status, head of household, rural residence, farming household, occupation, union membership, industry</li> </ul>
Result	<ul style="list-style-type: none"> <li>·The new labor law reduces the wage differential between non-regular and regular workers.</li> </ul>	<ul style="list-style-type: none"> <li>·The wage differential between non-regular and regular workers becomes worse.</li> </ul>	<ul style="list-style-type: none"> <li>·The wage gap between non-regular and regular workers is narrowed.</li> </ul>

[1] The population group of Workplace Panel Survey, which is implemented by the Korea Labor Institute, includes 1,700 sample workplaces across the country with 30 or more employees

[2] Firm type: State-owned enterprise or not.

[3] Firm-governance type: owner managing system or not

[4] This survey by the Korea Occupational Safety and Health Agency is implemented every four years. The survey method is one-on-one interview with a professional interviewer visiting the household.

[5] This survey by the Korea National Statistics Office (KOSTAT) includes labor related information of about 32,000 individuals.

Choi (2016) provides empirical evidence that the new labor law narrows the wage differential between non-regular and regular workers. Choi (2016) used an individual cross-sectional data and the Difference-in-Difference method, whereas the two previous studies used panel data. Table 2 summarizes previous studies on the law effect on the wage differential between non-regular and regular workers.

Although it is meaningful that these studies attempt to estimate the effect of the new labor law on the wage differential between non-regular and regular workers, they have potential limitations or weaknesses due to the insufficiency of data or variables.

Firstly, Choi (2011) as the first study on this topic used only firm's characteristics. Since the individual wage depends not only on individual characteristics but also on firm characteristics, a model including both of these two characteristics is able to estimate the effect of the new labor law more precisely. For these reasons, following studies, Lee (2015) and Choi (2016), used both individual and firm characteristics. However, due to the limitation of data, their models are likely to exclude relevant variables, which cause the omitted variable bias, whilst their models are likely to include irrelevant variables which lead estimated effect to be inefficient. For instance, they did not use a period of working experience which appears to have strong relationship with the status and wage of a non-regular worker, while they used commuting time or rural residence which is likely to have no relationship with the status and wage of a non-regular worker.

Secondly, Choi (2011) and Lee (2015) used panel data sets where their time-periods are only two years. Choi (2016) attempted to use an extended time-period from 2 to 4 years. Nevertheless, Choi (2016) as well as Choi (2011) and Lee (2015) could not conduct a formal test of the parallel trends assumption which is considered to be the most crucial assumption in the Difference-in-Difference method.

This paper attempts to deal with these limitations or weaknesses and then go further, in order to find more convincing and precise effects of the new labor law on the wage differential between non-regular and regular workers. This empirical analysis includes both individual and firm characteristics (period of employment, period of working experience, etc.) which are relevant to the status of non-regular workers and workers' wages, while excluding marital status, head of household, rural residence, commuting time and farming household which are included in the previous studies. This is the first contribution. The second contribution is that this study attempts to formally test the parallel trends assumption, whereas the previous studies cannot do so due to the data limitation. Thirdly, this study provides new empirical evidence concerning whether or not the law reduced the wage differential between non-regular and regular workers. Lastly, this analysis makes the first attempt at estimating the yearly effect of the law.

#### 4. Theoretical framework

In this section, a theoretical framework which can predict the effect of the law on the labor condition differentials between non-regular and regular workers is set up. This framework is based on Expected Utility hypothesis according to Von Neumann–Morgenstern’s utility theorem. The framework considers an employer and a policy maker with complete information. The employer tries to maximize their expected profit ( $\pi$ ), while the policy maker tries to maximize the expected effect of their policy. The employer has two strategies; complying with the law or not. If the employer complies with the law, then its profit decreases by a cost ( $c_e$ ), which is a type of law-complying cost. The policy maker monitors whether the employer complies with the law or not, with a probability ( $\rho$ ), and the cost of monitoring of the policy maker is assumed to be zero. If the policy maker verifies that the employer does not comply with the law, the employer will face a heavy penalty ( $f$ ).

In the perspective of the policy maker, since the cost of monitoring is zero, monitoring is a dominant strategy. In the perspective of the employer, law-complying is a dominant strategy under the policy-effectiveness condition (1) that the expected profit when complying with the law is larger than the expected profit when not complying with the law:

$$\begin{aligned} E[ \pi \mid \text{complying with the law} ] &\geq E[ \pi \mid \text{not complying with the law} ] \\ (\pi - c_e) &\geq (1 - \rho) \cdot \pi + \rho \cdot (\pi - f) \\ \rho f &\geq c_e \end{aligned} \tag{1}$$

Therefore, when the law-complying cost ( $c_e$ ) of the employer is less than the expected penalty ( $\rho \cdot f$ ), the law can motivate the employer to comply with the law.

In the context of this theoretical framework, the null hypothesis of this paper is that the new law reduced the labor condition differentials between targeted non-regular and regular workers. In other words, this study tries to investigate whether the policy-effectiveness condition (1) is satisfied or not, in the case of the law which aims to reduce the differentials. If the estimated effect of the law is not significant, it means that the policy-effectiveness condition is not satisfied. This suggests that policy makers should reform the law. They should increase the investigation probability ( $\rho$ ) or the penalty ( $f$ ) for not-complying. Alternatively, the policy makers should take other effective measures to reduce the law-complying cost ( $c_e$ ) of the employer.

## 5. Data and Methodology

This chapter describes how the data was collected and classified, and how the variables were chosen and defined. The Difference in Difference strategy among quasi-experimental strategies, with pooled cross-sectional data, is then examined in relation to evaluating the effect of the law on the differential between targeted non-regular and regular workers in terms of several labor conditions.

### 5.1 Data

The data for the analysis originates from the “Survey on Labor Conditions by Type of Employment” which is collected by the Ministry of Employment and Labor of South Korea<sup>8</sup>. This survey aims to classify workers<sup>9</sup> in firms with one or more employees by type of employment. The survey collects information on labor conditions and socioeconomic characteristics: wage, working-hours, social insurance, fringe benefits, gender, age, education level, working experience, type of employment, firm size, etc. Its coverage is a sample of around 32,000 firms. The number of surveyed workers for each firm is a percentage of the whole number of employees based on the firm size. The reference period is every June. The survey defines well and distinguishes clearly the employment type, compared with other surveys. Furthermore, it sufficiently contains information associated with labor conditions. For these reasons, this data is appropriate for this empirical analysis.

To analyze the effect of the law, this study uses pooled cross-sectional data from 2006 to 2011. Moreover, since the new law gradually applies to the targeted non-regular workers in firms with five or more employees (Table 3), micro-size firms with 4 or less employees and non-targeted non-regular workers are excluded. The data of targeted non-regular and regular workers in only firms with 5 or more employees is used. Observations with missing values for variables are excluded. For the analysis, the sample size is 4,099,732 workers; 1,541,379 in small-size firms, 1,079,464 in middle-size firms, 1,478,889 in large-size firms.

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<sup>8</sup> Website: <http://www.moel.go.kr/english/pas/pasMOEL.jsp#>

<sup>9</sup> “Workers” refers only to paid workers, excluding self-employed, employers, unpaid family workers, etc.

Table 3: The year of the law’s application to the data by firm size

Firm size \ Data year	2006	2007	2008	2009	2010	2011
Large-size firm (300 employees or more)	NO	NO	YES	YES	YES	YES
Middle-size firm (100 employees or more)	NO	NO	NO	YES	YES	YES
Small-size firm (5 employees or more)	NO	NO	NO	NO	YES	YES
Micro-size firm (less than 5 employees)	NO	NO	NO	NO	NO	NO

Note: “YES” if the data is subject to the new labor law. NO, otherwise.

There are five dependent variables for this study, which are likely to be affected by the new labor law: hourly wage (HW), working-hours (WH), monthly wage (MW), social insurance (SOCI), and fringe benefits (FBNF). The working-hours consists of regular working-hours and overtime working-hours. The monthly wage constitutes regular payment, overtime payment, and estimated monthly special payment<sup>10</sup>. Therefore, the hourly wage can be calculated by dividing the monthly wage by the working-hours;

$$\text{Hourly wage} = \frac{\left( \frac{\text{Regular and overtime payment in June}}{\text{working hours in June}} \right) + \left( \frac{\text{Annual Special Payment of the previous year}}{12} \right)}{\text{working hours in June}}$$

Furthermore, since the hourly wage and the monthly wage are nominal, it is necessary to transform these nominal wages (HW, MW) into real wages (RHW, RMW) by dividing the Consumer Price Index<sup>11</sup>.

Besides the three previous variables, another two dependent variables are used: social insurance (SOCI) and fringe benefits (FBNF). The social insurance is a dummy variable; when an employee is provided with at least one type of four insurances (Unemployment Insurance, Pension, Health Insurance, or Occupational Safety and Health Insurance), it equals one. The individuals who do not qualify for social insurance are excluded in this empirical analysis. The fringe benefits (FBNF) is also defined as a dummy variable; when an employee receives at least one type of two benefits (special payment or retirement payment), it equals one. The individuals who have no response to the fringe benefits are also excluded.

<sup>10</sup> Since this survey is based on the June of every year, it is not possible to know the annual special payment for the survey year. Therefore, in order to estimate the annual special payment associated with June of the survey year, the annual special payment for the previous year is investigated and divided by 12 months.

<sup>11</sup> Consumer price index: 2015=100

Table 4: Definition of variables

	Variables	Definition
Dependent variables	Real hourly wage (RHW)	RHW is calculated by dividing the real month wage in June by the working-hours in June.
	Real monthly wage (RMW)	Real pre-tax monthly wage which an employee received in June.
	Working-hours (WH)	Hours for which an employee works in June, calculated by summing regular working-hours and overtime working-hours.
	Social insurance (SOCI)	Social insurance includes Unemployment Insurance, Pension, Health Insurance, and Occupational Safety & Health Insurance. SOCI is equal to 1, when an employee is provided with at least one type of these four insurances
	Fringe benefit (FBNF)	Fringe benefit includes special payment and retirement payment. FBNF is equal to 1, when an employee is provided with at least one type of these two fringe benefits.
Independent variables	New labor law (LAW)	0, before the law was implemented. 1, after the law the law was implemented.
	Targeted non-regular worker (TNRW)	0, when an employee is a regular worker. 1, when an employee is a targeted non-regular worker.
	Gender (GEN)	0, when an employee is female. 1, when an employee is male.
	Age (AGE)	
	Education (EDU)	1, when an employee has a middle school degree or less than. 2, when an employee has a high school degree. 3, when an employee has a junior college degree. 4, when an employee has a university degree. 5, when an employee has a graduate degree.
	Period of employment (POE)	Number of years for which an employee has worked at their firm.
	Period of working experience (POW)	1, when the period is less than 1 year. 2, when the period is 1 to 2 years. 3, when the period is 2 to 3 years. 4, when the period is 3 to 4 years. 5, when the period is 4 to 5 years. 6, when the period is 5 to 10 years. 7, when the period is more than 10 years.
	Type of occupation (TOO)	Korean Standard Classification of Occupations.
	Type of working system (TOW)	1, when the system is no shift. 2, when the system is 2 shifts per day 3, when the system is 3 shifts per day. 4, when the system is 1 shift every second day 5, when the system is part-time
	Union member (UNION)	0, when an employee is not a labor union member. 1, when an employee is a labor union member.
	Type of industry (IND)	Korean Standard Industrial Classification.

The new labor law, which is a treatment in this empirical analysis, is a dummy variable (LAW); after the law was implemented, LAW is equal to 1. The treatment group is a targeted non-regular worker (TNRW=1) who is a temporary agency worker, a part-time worker, or a fixed-term worker (see Table 1); when an employee is a targeted non-regular worker, TNRW is 1. The control group is a regular worker (TNRW=0). Non-targeted non-regular workers<sup>12</sup> are excluded in this empirical study. Control variables include the socioeconomic characteristics of individual

<sup>12</sup> Non-standard contracted employee, home-based worker, contract worker, daily worker, temporary worker (not fixed term worker).



and firm. They are gender (GEN), age (AGE), education (EDU), period of employment (POE), period of working experience (POW), type of occupation (TOO), whether they are a member of the labor union or not (UNION), type of working system (TOW), industry (IND)<sup>13</sup>. The definition of variables is summarized in Table 4.

Table 5 shows the mean of the main variables in this empirical analysis. In terms of dependent variables, the average real hourly wage of targeted non-regular workers is less than that of regular workers regardless of firm size; e.g. the wage of targeted non-regular workers is between 60.4 (9,409/15,584) to 68.5 (12,860/18,787) percent of that of regular workers across firm sizes. The average working-hours among targeted non-regular workers are also less than that of regular workers across all firm sizes by 16 to 32 hours. The average monthly wage of targeted non-

Table 5: Mean of main variables

		Small-size firms			Middle-size firms			Large-size firms			
		Targeted non-regular (A)	Regular (B)	Difference (A-B)	Targeted non-regular (A)	Regular (B)	Difference (A-B)	Targeted non-regular (A)	Regular (B)	Difference (A-B)	
Dependent variables	Real hourly wage (KRW)	9,409	15,584	-6,175	12,860	18,787	-5,927	17,181	25,681	-8,500	
	Working-hours (hours)	178	194	-16	171	195	-24	156	188	-32	
	Real monthly wage (KRW)	1,515,659	2,511,414	-995,755	1,801,924	2,818,392	-1,016,468	2,030,918	3,443,069	-1,412,151	
	Social insurance	0.988	0.998	-0.010	0.993	0.999	-0.006	0.995	0.999	-0.004	
	Fringe benefit	0.773	0.964	-0.191	0.829	0.991	-0.162	0.810	0.989	-0.179	
Independent variables	Gender(female=0, male=1)	0.479	0.673	-0.194	0.457	0.745	-0.288	0.443	0.734	-0.291	
	Age (years)	38.3	39.4	-1.1	36.3	39.5	-3.2	33.8	37.6	-3.8	
	Education	-Middle school	0.123	0.064	0.059	0.078	0.076	0.002	0.032	0.047	-0.015
		High school	0.506	0.399	0.107	0.374	0.389	-0.015	0.243	0.308	-0.065
		Junior college	0.132	0.193	-0.061	0.191	0.176	0.015	0.199	0.162	0.037
		University-	0.239	0.344	-0.105	0.357	0.359	-0.002	0.526	0.483	0.043
	Period of employment (years)	1.8	5.8	-4.0	2.0	7.9	-5.9	2.1	10.0	-7.9	
	Period of working experience	0-2 years	0.563	0.227	0.336	0.572	0.157	0.415	0.622	0.131	0.491
		2-5 years	0.243	0.246	-0.003	0.234	0.218	0.016	0.207	0.185	0.022
		5-10 years	0.106	0.205	-0.099	0.113	0.225	-0.112	0.100	0.207	-0.107
		10- years	0.088	0.322	-0.234	0.081	0.400	-0.319	0.071	0.477	-0.406
	Union member	0.038	0.162	-0.124	0.069	0.390	-0.321	0.067	0.423	-0.356	
Observations <sup>[1]</sup>		171,078	1,370,301		137,317	942,147		282,332	1,196,557		

[1] The number of observations in the case of Social insurance or Fringe benefit each column is different from this due to workers with no qualifications or no response.

<sup>13</sup> Industries throughout all private industrial sectors with one or more employees except the following: 1. The National and local administrative agencies, 2. Military, police and national/public educational institutes, 3. International organizations and foreign agencies, 4. Household service providers, 5. Agriculture, forestry and fishing businesses owned by individuals.

regular workers is also less than that of regular workers across all firm sizes. The average percentage of targeted non-regular workers with social insurance is slightly less than that of regular workers. The average percentage of targeted non-regular workers who receive fringe benefits is less than that of regular workers, too.

Regarding control variables, there are differentials between targeted non-regular and regular workers. The proportion of males as targeted non-regular workers (e.g. 0.479 in small-size firms) is less than those of females (e.g. 0.521 in small-size firms), while that of males as regular workers (e.g. 0.673 in small-size firms) is larger than that of females (e.g. 0.327 in small-size firms). This suggests that female workers are more likely to be employed as a targeted non-regular worker. The average age of regular workers is larger than that of targeted non-regular workers; e.g. in small-size firms, the average age of regular workers is 39.4, and the average age of non-regular workers is 38.4. The average age gap increases with firm sizes from 1.1 to 3.8 years. The education level of regular workers is higher than that of targeted non-regular workers in the case of small firms, whereas the education level of regular workers is the opposite in the case of middle firms or large firms: the percentage of regular workers with junior college degrees or higher is 53.7% in small firms, 53.5% in middle firms, 64.5% in large firms, and the amount targeted non-regular workers with the same level of education is 37.1% in small firms, 54.8% in middle firms, 72.5% in large firms.

The average employment-period of targeted non-regular workers is 1.8 to 2.1 years across firm sizes, whereas that of regular workers is 5.8 to 10.0 years across firm sizes. This suggests the difference in the employment stability between targeted non-regular and regular workers in the labor market. The working-experience period of regular workers is longer than that of targeted non-regular workers; more than 50% of regular workers have more than 5 years of working-experience, whereas more than 50% of targeted non-regular workers have less than 2 years of working-experience. Given that the employment-period or the working experience period is one of the wage determinants in the labor market, the difference in these kinds of period would lead to a wage differential between targeted non-regular and regular workers. Lastly, there is remarkable difference in terms of labor union membership. The percentage of regular workers who join a labor union is noticeably larger than that of targeted non-regular workers; the percentage of regular workers is 16.2 to 42.3 percent, but that of targeted non-regular workers is 3.8 to 6.9

percent. Given the positive wage effect of a labor union, the gap in the union participation rate between targeted non-regular and regular workers would be a cause of the wage differential. This study additionally examines the mean difference of each variable between before-and-after the law implementation (see Appendix 2).

## 5.2 Empirical Strategy

In order to evaluate the effect of the law on the differential between targeted non-regular and regular workers in terms of several labor conditions, this study uses the Difference-in-Difference among quasi-experimental strategies, with pooled cross-sectional data.

The treatment is the new labor law, which applies to only targeted non-regular workers. As discussed before, the treatment group constitutes temporary agency workers, part-time workers, and fixed-term workers, whereas the control group constitutes regular workers. Based on the assumption that the new labor law can influence the five labor conditions: real hourly wage, working-hours, monthly wage, social insurance, and fringe benefits, the model specification basically used in this empirical analysis is shown by Equation (1):

$$Outcome_{it} = \beta_0 + \beta_1 \cdot TNRW_{it} + \beta_2 \cdot LAW_{it} + \beta_3 \cdot TNRW_{it} \cdot LAW_{it} + \beta_4 \cdot X_{it} + \varepsilon_{it} \quad (1)$$

In Equation (1),  $Outcome_{it}$  denotes the natural logarithm<sup>14</sup> of real hourly wage, the natural logarithm of working-hours, the natural logarithm of monthly wage, social insurance, and fringe benefits of each individual  $i$  at time  $t$  respectively.  $TNRW_{it}$  indicates the treatment group or the control group.  $LAW_{it}$  represents whether the new labor law as a treatment in this empirical analysis is implemented or not.  $X_{it}$  denotes relevant control variables.  $\varepsilon_{it}$  is the error term, which is assumed as that the error term has no relationship with the independent variable;  $E[\varepsilon_{it}/TNRW_{it}, LAW_{it}, X_{it}] = 0$ . However, the error term could be independent across clusters but correlated within clusters. For this reason, the statistical inference for this analysis uses the cluster-robust standard errors instead of conventional standard errors<sup>15</sup>.

<sup>14</sup> It makes the estimated effect interpretable as the percentage changes, rather than change the measurement unit.

<sup>15</sup> Cameron and Miller (2014) say “Conventional standard errors can greatly overstate estimator precision. Instead, if the number of cluster is large, statistical inference after OLS should be based on cluster-robust standard errors”

The coefficient of interaction term between  $TNRW_{it}$  and  $LAW_{it}$ ,  $\beta_3$ , is the parameter of interest. It indicates the effect of the new law on the differential of each outcome between targeted non-regular and regular workers, if the parallel trends assumption is satisfied. The reason follows as;

$$E[ Outcome_{it} | TNRW_{it}=1, LAW_{it}=1 ] = \beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 \quad (2)$$

$$E[ Outcome_{it} | TNRW_{it}=1, LAW_{it}=0 ] = \beta_0 + \beta_1 + \beta_4 \quad (3)$$

$$E[ Outcome_{it} | TNRW_{it}=0, LAW_{it}=1 ] = \beta_0 + \beta_2 + \beta_4 \quad (4)$$

$$E[ Outcome_{it} | TNRW_{it}=0, LAW_{it}=0 ] = \beta_0 + \beta_4 \quad (5)$$

The gap between Equation (2) and (3) is the difference in average outcome for the treatment group due to the law;  $\beta_2 + \beta_3$ . The difference between Equation (4) and (5) is the gap in average outcome for the control group due to the law;  $\beta_2$ :

$$E[ Outcome_{it} | TNRW_{it}=1, LAW_{it}=1 ] - E[ Outcome_{it} | TNRW_{it}=1, LAW_{it}=0 ] = \beta_2 + \beta_3 \quad (6)$$

$$E[ Outcome_{it} | TNRW_{it}=0, LAW_{it}=1 ] - E[ Outcome_{it} | TNRW_{it}=0, LAW_{it}=0 ] = \beta_2 \quad (7)$$

The difference between Equation (6) and (7),  $\beta_3$ , is the effect of the new labor on the differential of each outcome between targeted non-regular and regular workers. In Figure 4, the reason why  $\beta_3$  indicates the effect of the law on an outcome differential is shown graphically.

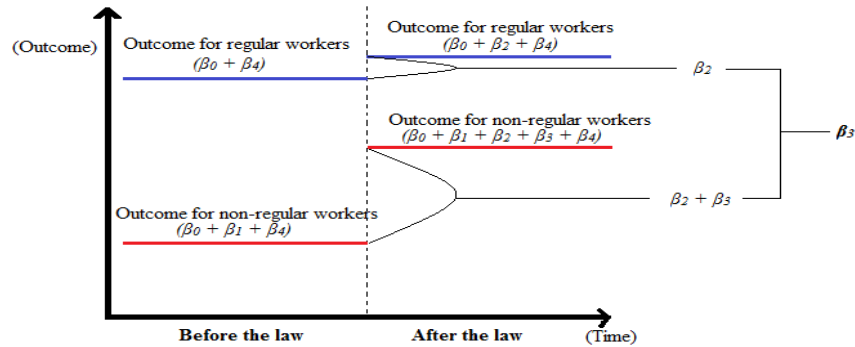


Figure 4: Graphical explanation for  $\beta_3$

This Difference-in-Difference strategy is based on the parallel trends assumption. Unfortunately, this assumption cannot be verified since the error term is unobservable. However, the assumption could be tested indirectly by inspecting the trend during the pre-treatment period, when the data-period is more than 2. In section 6.2.1, this issue will be discussed in detail.

## 6. Results and Analysis

This section provides the empirical analysis results, robustness checks, and a brief discussion about some concerns.

### 6.1 Effects of the law

The effects of the law on the five dependent variables is examined, firstly the hourly wage, the working hours and the monthly wage.

#### 6.1.1 Effects on the hourly wage, the working-hours, and the monthly wage

Table 6 shows the estimated average effects of the new labor law on the differentials between targeted non-regular and regular workers in small-size firms in terms of the real hourly wage, the working-hours, and the real monthly wage. Model 1 does not include the control variables or a time trend. This model is more likely to be subject to the omitted variable bias. On the other hand, in order to deal with the bias, Model 2 includes as many relevant control variables as possible, which potentially correlate with targeted non-regular workers and outcomes: gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership. Furthermore, a linear time trend is taken into account in Model 2. When it comes to the model specification, it will be discussed more specifically in section 6.2.2.

Table 6: The estimated average effects of the new labor law on the hourly wage, the working-hours, and the monthly wage in the case of small-size firms

VARIABLES	Real hourly wage <sup>[4]</sup>		Working-hours <sup>[4]</sup>		Real monthly wage <sup>[4]</sup>	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
TNRW_LAW <sup>[1]</sup>	0.079*** (0.024)	0.101*** (0.022)	-0.105*** (0.020)	-0.072*** (0.016)	-0.036 (0.030)	0.011 (0.017)
TNRW	-0.488*** (0.066)	-0.123*** (0.028)	-0.100** (0.038)	-0.006 (0.011)	-0.505*** (0.073)	-0.103*** (0.026)
LAW	0.000 (0.019)	-0.025*** (0.008)	-0.009 (0.007)	0.014*** (0.004)	0.011 (0.012)	-0.017 (0.011)
Observations	1,541,379	1,541,379	1,541,379	1,541,379	1,541,379	1,541,379
Adjusted R <sup>2</sup>	0.051	0.573	0.043	0.306	0.082	0.506
Controls <sup>[2]</sup>	NO	YES	NO	YES	NO	YES
Time trend <sup>[3]</sup>	NO	YES	NO	YES	NO	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (Targeted Non-Regular Worker dummy) and LAW (Law dummy).

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] Linear time trend.

[4] Independent variables are log (real hourly wage), log (working-hours), and log (real monthly wage).

Firstly, the estimated coefficients of interaction terms between the targeted non-regular worker dummy and the law dummy are significantly positive at 1 percent significance level, regardless of the models (column 1 and 2). Since these coefficients imply the estimated effects of the law on the real hourly wage differential, the law significantly alleviates the real hourly wage differential between targeted non-regular and regular workers. Furthermore, the estimated effects of the law are considerable. The estimated coefficients are 0.079 and 0.101 in Model 1 and 2, respectively. Considering the logarithm of the real hourly wage, the wage differentials decreased, due to the law, by 7.9 and 10.1 percent points in Model 1 and 2, respectively. In detail, in Model 2, before the law, other variables remaining unchanged, the real hourly wage of a targeted non-regular worker is less than that of a regular worker by 12.3 percent points (the estimated  $\beta_2$  is -0.123). After the law, the real hourly wage of a targeted non-regular worker is less than that of a regular worker by 2.2 percent points (the sum of the estimated  $\beta_2$  and  $\beta_3$  is -0.022). Therefore, the real hourly wage gap is reduced by 10.1 percentage points.

In regards to the working-hours (column 3 and 4), the estimated coefficients of the interaction terms are significantly negative. The law increases the gaps of the working-hours by 10.5 and 7.2 percentage points in Model 1 and 2, respectively. In detail, in Model 2, before the law, the working-hours of a targeted non-regular worker are similar to those of a regular worker because the coefficient of TNRW is not significant at conventional levels (10, 5, and 1 percent significance levels). After the law, the monthly working-hours of the targeted non-regular worker are less than those of a regular worker by 7.2 percentage points. Therefore, the differential of the monthly working-hours are increased by 7.2 percent points. Therefore, the law has a negative influence on alleviating the differential of the working-hours. Possibly, employers are likely to reduce the working-hours of targeted non-regular workers more than that of regular workers due to the law.

Lastly, with regards to the real monthly wage, the estimated coefficients of the interaction terms are statistically insignificant at conventional levels. This result can be interpreted as the law neither increases nor decreases the differential of the real monthly wage between targeted non-regular and regular workers.

The estimated effects of the law in the case of middle-size and large-size firms are presented in Appendix 3. Their results are similar to those in small-size firms, although the magnitude of each coefficient differs. Therefore, the interpretations of the results in the case of small-size firms can be applied to the results of middle-size or large-size firms.

In summation, according to the results, the law decreases the differential of the real hourly wage between targeted non-regular and regular workers, whilst increasing the differential of the working-hours. Furthermore, the law does not influence the differential of the real monthly wage. The law leads to not only alleviation in the differential of the real hourly wage, but also aggravation in the differential of the working-hours. This relationship between the two opposite results can be compatible, since the law has no influence on the differential of the real monthly wage. Intuitively, provided that the real monthly wage is not changed, the real hourly wage increases when the monthly working-hours decreases. These results can be interpreted as employers being likely to respond to the law by not changing the labor cost. In the perspective of policy makers, due to the conflicting influences, it is difficult to assess whether or not the law plays a positive role in reducing the labor condition differentials.

### **6.1.2 Heterogeneous effects on the real hourly wage differential by gender, union, age, education, and year**

The new labor law is likely to not homogeneously but heterogeneously affect the real hourly wage across some characteristics, such as gender, age, union membership, education, and year. Table 7 shows the estimated average effect of the new law on the real hourly wage with respect to gender, union membership, age, and education. The model specification for this table complies with Model 2 in the previous section 6.1.1.

Firstly, regarding gender in the case of small-size firms (column 1 and 2 Panel A), all the estimated coefficients (0.098 and 0.094) of the interaction term between the targeted non-regular worker dummy and the law dummy are statistically significant at conventional levels. The estimated effect of the law on the real hourly wage differential for female workers is slightly larger than for male workers between targeted non-regular and regular workers.

Table 7: The estimated average heterogeneous effects of the new labor law on the real hourly wage by gender, union membership, age, and education

Panel A. Small-size firm

VARIABLES	Gender		Union membership		Age				Education		
	Female	Male	Not union	Union	-29	30-44	45-59	60-	-Middle school	High school	Junior college-
TNRW_LAW <sup>[1]</sup>	0.098*** (0.026)	0.094*** (0.022)	0.092*** (0.022)	0.286*** (0.077)	0.062** (0.028)	0.079*** (0.021)	0.128*** (0.019)	0.125*** (0.017)	0.130*** (0.020)	0.109*** (0.023)	0.061** (0.023)
TNRW	-0.130*** (0.026)	-0.120*** (0.036)	-0.132*** (0.025)	-0.090 (0.089)	-0.106*** (0.034)	-0.152*** (0.031)	-0.100*** (0.034)	-0.020 (0.027)	-0.098*** (0.032)	-0.125*** (0.034)	-0.127*** (0.035)
LAW	-0.007 (0.007)	-0.035*** (0.011)	-0.021*** (0.007)	-0.062** (0.026)	-0.004 (0.005)	-0.017* (0.009)	-0.042*** (0.012)	-0.099*** (0.030)	-0.045 (0.026)	-0.020 (0.013)	-0.025** (0.009)
Observations	537,152	1,004,227	1,313,245	228,134	358,316	685,581	420,795	76,687	109,038	632,600	799,741
Adjusted R <sup>2</sup>	0.501	0.566	0.542	0.672	0.402	0.520	0.650	0.599	0.487	0.516	0.515
Cont. <sup>[2]</sup> and Tr. <sup>[3]</sup>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B. Middle-size firm

VARIABLES	Gender		Union membership		Age				Education		
	Female	Male	Not union	Union	-29	30-44	45-59	60-	-Middle school	High school	Junior college-
TNRW_LAW <sup>[1]</sup>	0.090*** (0.024)	0.046 (0.034)	0.080*** (0.027)	0.122 (0.076)	0.038 (0.029)	0.076*** (0.024)	0.076* (0.036)	0.061 (0.048)	0.101*** (0.026)	0.079*** (0.021)	0.062 (0.037)
TNRW	-0.210*** (0.043)	-0.135** (0.053)	-0.192*** (0.035)	-0.047 (0.085)	-0.158*** (0.026)	-0.203*** (0.051)	-0.095 (0.082)	0.034 (0.101)	-0.075 (0.076)	-0.138*** (0.046)	-0.205*** (0.049)
LAW	-0.161*** (0.023)	-0.132*** (0.018)	-0.166*** (0.019)	-0.104*** (0.028)	-0.145*** (0.019)	-0.158*** (0.015)	-0.114*** (0.024)	-0.063 (0.036)	-0.075** (0.030)	-0.114*** (0.018)	-0.172*** (0.015)
Observations	314,554	764,910	702,802	376,662	233,946	506,128	306,654	32,736	82,440	418,307	578,717
Adjusted R <sup>2</sup>	0.561	0.597	0.619	0.614	0.431	0.554	0.667	0.685	0.453	0.527	0.566
Cont. <sup>[2]</sup> and Tr. <sup>[3]</sup>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel C. Large-size firm

VARIABLES	Gender		Union membership		Age				Education		
	Female	Male	Not union	Union	-29	30-44	45-59	60-	-Middle school	High school	Junior college-
TNRW_LAW <sup>[1]</sup>	0.088*** (0.015)	0.107*** (0.023)	0.095*** (0.021)	0.136*** (0.046)	0.031* (0.017)	0.147*** (0.030)	0.189*** (0.039)	0.190*** (0.026)	0.203*** (0.026)	0.087** (0.032)	0.085*** (0.019)
TNRW	-0.303*** (0.041)	-0.329*** (0.065)	-0.306*** (0.055)	-0.328*** (0.061)	-0.233*** (0.030)	-0.346*** (0.052)	-0.340*** (0.095)	-0.220** (0.096)	-0.296*** (0.029)	-0.213*** (0.031)	-0.349*** (0.055)
LAW	-0.064** (0.024)	-0.020 (0.023)	-0.044* (0.025)	-0.014 (0.019)	-0.041 (0.030)	-0.016 (0.023)	-0.046** (0.020)	-0.055 (0.047)	-0.038* (0.018)	-0.043 (0.026)	-0.028 (0.026)
Observations	475,922	1,002,967	953,495	525,394	407,422	727,417	323,728	20,322	64,873	436,862	977,154
Adjusted R <sup>2</sup>	0.564	0.554	0.638	0.526	0.463	0.479	0.611	0.718	0.610	0.592	0.597
Cont. <sup>[2]</sup> and Tr. <sup>[3]</sup>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (Targeted Non-Regular Worker dummy) and LAW (Law dummy).

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] Linear time trend.

[4] Independent variables are log (real hourly wage), log (working-hours), and log (real monthly wage).



In regards to union membership (column 3 and 4 in Panel A), the estimated law effect on the real hourly wage differential for workers who join a labor union is larger than on workers who do not. The magnitudes of the effect are markedly different; 0.092 and 0.286 respectively. According to this result, the law reduces the wage differential for workers with a union membership much more than for workers without. This implies that the union is likely to implicitly play an important role in forcing firms to comply with the new labor law.

In terms of age (column 5 to 8 in Panel A), the estimated effects of the law on the differential increase until the age group between 45-59 (0.062, 0.079, and 0.128), and then the effect decreases in the age group of more than 60 (0.125). That is, the effect is an inverted V-shape. This implies that the law decreases the differential for young groups (under 44 years old) less than for old groups (upper 45 years old). In the case of education in the small-size firms (column 9 to 11 in Panel A), the effects of the law decrease with the education level increase; 0.130, 0.109, and 0.061. This implies that the law has more influence in reducing the differential for a low education group than for a high education group.

Secondly, in the case of middle-size firms (Panel B), some estimated coefficients of the interaction term are significantly positive at conventional levels, whereas others are insignificant. Statistically, the law reduces the wage differential only for several groups, such as female workers, non-union members, workers aged 30 to 59 years old, and workers with an education level below high school. In the perspective of economics, the patterns of the law's effects with respect to each variable are similar to that of the effect in the case of small-size firms. The effects of the law for a female, union, older, and low-educated workers are larger than in each opponent group.

Lastly, in the case of large-size firms (Panel C), all the estimated coefficients of the interaction terms are significantly positive at conventional levels. The patterns of the law's effects on large firms noticeably differ from those in the case of small-size or middle-size firms. Firstly, regarding gender, the estimated effect for male workers is larger than for female workers; 0.107 and 0.088 respectively (column 1 and 2 in Panel A). This pattern is opposite to that in small-size or middle-size firms. The pattern of the estimated effect in terms of age is different, too. The

effect in large-size firms gradually increases with workers' age, while the law effect in small-size or middle-size firms is an inverted V-shape.

Table 8 shows the estimated yearly-effects of the law on the wage differential. The model specification for this table also complies with Model 2 in the previous section 6.1.1. The estimated coefficient of each interaction term between the targeted non-regular worker dummy and year dummy represents the 'actual' and 'anticipation' yearly-effect of the law. In the case of small-size firms (column 1), the estimated actual yearly-effects of the law after the law implementation are statistically significant at 5 percent significance level, whereas the estimated anticipation yearly-effects before the law implementation are not significant at 5 percent significance level. The estimated law effect increases from 7.9 to 13.5 percentage points during the two years after the law implementation. In other words, the law reduces the wage differential by 7.9 percentage points at the first year mark after the law implementation. At the second year mark after the law implementation, the law reduces the differential by 13.5 percent points.

Table 8: The estimated average yearly-effects of the new labor law on the real hourly wage

VARIABLES	Small-size firm	Middle-size firm	Large-size firm
(TNRW)_(2 years before the law) <sup>[1]</sup>	-0.012 (0.022)		
(TNRW)_(1 year before the law) <sup>[1]</sup>	0.050* (0.024)	-0.016 (0.025)	
(TNRW)_(0 year before the law) <sup>[1]</sup>	-0.003 (0.023)	0.018 (0.026)	0.053** (0.022)
(TNRW)_(1 year after the law) <sup>[1]</sup>	0.079** (0.027)	0.040* (0.021)	0.139*** (0.038)
(TNRW)_(2 years after the law) <sup>[1]</sup>	0.135*** (0.021)	0.100** (0.040)	0.036 (0.030)
(TNRW)_(3 years after the law) <sup>[1]</sup>		0.088** (0.038)	0.143*** (0.026)
(TNRW)_(4 years after the law) <sup>[1]</sup>			0.197*** (0.026)
TNRW	-0.131*** (0.027)	-0.167*** (0.039)	-0.346*** (0.049)
LAW	-0.022** (0.008)	-0.135*** (0.018)	-0.015 (0.020)
Observations	1,541,379	1,079,464	1,478,889
Adjusted R-squared	0.573	0.603	0.605
Controls <sup>[2]</sup> and Linear time-trend	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (targeted non-regular worker dummy) and year dummy.

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

In the case of middle-size firms (column 2), the estimated actual yearly-effects after the law implementation are significant at conventional levels, whereas the estimated anticipation yearly-effects before the law implementation are statistically insignificant. At the first post-year, the law decreases the wage differential by 4.0 percent points. At the second post-year, the law reduces the differential by 10.0 percent points. At the third post-year, the law reduces the differential by 8.8 percent points.

In the case of large-size firms (column 2), the estimated yearly-effects of the law after the law implementation (except the second post-year) are significant at 1 percent significance level, while the estimated anticipation yearly-effect before the law implementation is insignificant at 1 percent significance level. However, at 5 percent significance level, the estimated anticipation effect at the first year before the law implementation is significant, and the magnitude of the estimated effect, 0.053, could not be negligible. This is likely to cause a concern of internal validity such as anticipation effect, which will be discussed in section 6.3.2. Considering only the period after the law implementation, the effect of the law overall increases from 13.9 to 19.7 percentage points over time. This effect trend is similar to the case of small-size firms, but different from the case of middle-size firms.

To sum up, the effects of the law on the wage differential are heterogeneous by gender, union, age, education, and year. The law reduces the differential for female workers more than for male workers, since the differential for female workers is likely to be larger than for male workers. The law has less influence in reducing the differential for non-union workers than for union workers, since a union can play an important role in reducing the wage differential. The law decreases the differential for older workers more than for younger workers. The law affects the differential for workers with a low education level more than for workers with a high education level. Lastly, the effects of the law, after the law implementation, vary over time. The heterogeneous effects of the law are probably caused by other policies or economic events which occurred in the data-period. The finding that the law has no or less influence in reducing the wage differential for workers without union membership, or the young workers is meaningful for policy makers, since these workers are likely to belong to weaker socioeconomic groups in the context of the labor market in South Korea. This suggests that the policy makers should pay more attention to these vulnerable workers in order to alleviate social polarization.

### 6.1.3 Effects on social insurance or fringe benefit

The main purpose of the new labor law is to prohibit discrimination against non-regular workers. The coverage of the prohibition of discrimination is not only wage or working-hours, but also other labor conditions, such as paid leave, safety or health benefit, workplace accident compensation, etc. For this reason, it is necessary to investigate the effects of the law on other interesting labor conditions. Instead of the real hourly wage, two variables, social insurance and fringe benefits, are used as independent variables. The model specification in this section also complies with Model 2 in the previous section 6.1.1. To be precise, since the dependent variables in this section are dummies, this model is the Linear Probability Model<sup>16</sup>. In this model, the estimated coefficient of each independent variable can be interpreted as an effect on the probability of being provided with social insurance or fringe benefits.

Table 9: The average estimated effects on the social insurance and the fringe benefit

VARIABLES	Social insurance			Fringe benefit		
	Small-size firm	Mid.-size firm	Large-size firm	Small-size firm	Mid.-size firm	Large-size firm
TNRW_LAW <sup>[1]</sup>	0.007** (0.003)	0.003 (0.004)	0.002 (0.002)	0.009 (0.014)	-0.007 (0.011)	-0.008 (0.018)
TNRW	-0.008*** (0.003)	-0.008* (0.004)	-0.006** (0.002)	-0.105*** (0.010)	-0.061*** (0.015)	-0.045* (0.023)
LAW	-0.000 (0.001)	-0.002** (0.001)	0.000 (0.001)	-0.014*** (0.004)	-0.004 (0.003)	0.018 (0.012)
Observations	1,445,121	1,002,403	1,314,767	1,541,379	1,079,464	1,478,889
Adjusted R <sup>2</sup>	0.011	0.010	0.006	0.118	0.300	0.419
Controls <sup>[2]</sup>	YES	YES	YES	YES	YES	YES
Time trend <sup>[3]</sup>	YES	YES	YES	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (Targeted Non-Regular Worker dummy) and LAW (Law dummy).

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] Linear time trend.

<sup>16</sup> The reason why the Linear Probability Model, although the model has some drawback, is used is that LMP is easier than other models, such as Logit or Probit, in the perspective of interpreting a result.

Table 9 is the result of the estimated law's effect on the differentials of social insurance and fringe benefits. Firstly, with regards to the social insurance (column 1 to 3), the estimated coefficient of the interaction term in the case of small-size firms is significantly positive at 5 percent significance level, whereas the estimated coefficients in the case of middle-size and large-size firms are insignificant. In detail, the differential of probability of being provided with the social insurance between targeted non-regular and regular workers significantly decreases, after the law, by 0.7 percentage points in the case of small-size firms. However, the differentials of probability in the case of middle-size and large-size firms do not change significantly. Only in the case of small-size firms, the law reduces the differential. The result of regression on each insurance (Unemployment Insurance, Pension, Health Insurance, and Occupational Safety and Health Insurance) is presented in Appendix 4.

Regarding the fringe benefits (column 4 and 5), the estimated coefficients of the interaction terms are statistically insignificant at conventional levels. The law has no influence in reducing the differential of probability of receiving fringe benefits between targeted non-regular and regular workers. In other words, the law neither alleviates nor aggravates the differential of the fringe benefit. The result of regression on each fringe benefit (special payment and retirement payment) is shown in Appendix 4.

In summation, overall, the law does not reduce the differentials of social insurance and fringe benefits. The reason can be that firms generally have a great deal of discretion in providing workers with social insurance or fringe benefits, compared with wage or working-hours. This suggests that it is complicate to address the differential in these kinds of labor conditions.

## **6.2 Robustness checks**

This section describes the robustness tests performed on the data and results, which are the Parallel Trends Assumption test, Sensitivity to Model Specifications and Linear Least Squares regression and Weighted Least Squares regression.

### 6.2.1 Parallel trends assumption test

One of critical challenges to the validity of the empirical strategy is whether or not the parallel trends assumption holds. According to Talosaga and Mark (2014), there are two formal tests used in the literature to check the parallel trends assumption. The first method investigates any differentials in trends over the pre-treatment period. The model specification for this test is shown by Equation 8:

$$\ln(W_{it}) = \beta_0 + \beta_1 \cdot TNRW_{it} + \beta_2 \cdot TREND_{it} + \beta_3 \cdot TNRW_{it} \cdot TREND_{it} + \beta_4 \cdot X_{it} + \varepsilon_{it} \quad (8)$$

$\ln(W_{it})$  denotes the natural logarithm of the real hourly wage.  $TREND_{it}$  denotes a time trend variable.  $TNRW_{it} \cdot TREND_{it}$  denotes an interaction term between the targeted non-regular worker dummy and the time trend variable.  $X_{it}$  denotes control variables. If the parallel trends assumption is satisfied, the estimated coefficient of the interaction term,  $\beta_3$ , should be close to zero and statistically insignificant.

The result of this test is presented in Table 10. None of the estimated coefficients of the interaction term are statistically significant at conventional levels. This implies that there is no time trend differential of the wage between targeted non-regular and regular workers. This implies that the parallel trends assumption can be satisfied and the empirical strategy is valid.

Table 10: The average estimated effects of the law on the real hourly wage during the pre-law period

VARIABLES	Small-size firm	Middle-size firm	Large-size firm
TNRW_TREND <sup>[1]</sup>	0.008 (0.007)	0.003 (0.014)	0.001 (0.016)
TNRW	-0.093*** (0.027)	-0.140*** (0.044)	-0.276*** (0.056)
TREND	0.004 (0.004)	0.036*** (0.006)	0.050*** (0.008)
Observations	977,859	557,694	575,930
Adjusted R-squared	0.597	0.635	0.625
Controls	YES	YES	YES
Linear time-trend	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between the targeted non-regular worker dummy and the time trend variable.

The second method uses a placebo treatment over the pre-treatment period. This test attempts to re-estimate the empirical strategy model, assuming that the treatment was implemented at an earlier date. The model specification for this test is shown by Equation 9:

$$\ln(W_{it}) = \beta_0 + \beta_1 \cdot TNRW_{it} + \beta_2 \cdot PLACEBO_{it} + \beta_3 \cdot TNRW_{it} \cdot PLACEBO_{it} + \beta_4 \cdot X_{it} + \varepsilon_{it} \quad (9)$$

$PLACEBO_{it}$  and  $TNRW_{it} \cdot PLACEBO_{it}$  denote a placebo treatment variable and an interaction term between the targeted non-regular worker dummy and the placebo treatment variable, respectively. Three separate placebos are assumed. Firstly, the law is assumed to be implemented one year before the actual implementation year. Secondly, the law is assumed to be implemented two years before the actual implementation year. Lastly, the law is assumed to be implemented in 2007, applying to all firms with more than 5 employees in one stage. If the parallel trends assumption is valid, the estimated coefficient of the interaction term,  $\beta_3$ , should be statistically insignificant and close to zero.

Table 11 presents the result of this test. The estimated coefficients of the interaction term are not significant. This suggests that there is no placebo effect on the wage differential. Consequently, since the parallel trends assumption can be satisfied, the empirical strategy is valid.

Table 11: The average effect of the placebo labor law on the real hourly wage during the pre-law period

VARIABLES	Placebo (1 year before)			Placebo (2 years before)		Placebo (in 2007)		
	Small-size firm	Middle-size firm	Large-size firm	Small-size firm	Middle-size firm	Small-size firm	Middle-size firm	Large-size firm
TNRW_PLACEBO <sup>[1]</sup>	0.029 (0.019)	0.029 (0.019)	0.001 (0.016)	0.031 (0.019)	-0.018 (0.027)	-0.014 (0.016)	-0.018 (0.027)	0.001 (0.016)
TNRW	-0.111*** (0.026)	-0.153*** (0.038)	-0.277*** (0.050)	-0.122*** (0.029)	-0.130*** (0.039)	-0.092*** (0.025)	-0.130*** (0.039)	-0.277*** (0.050)
PLACEBO	-0.097*** (0.018)	-0.043 (0.037)	0.050*** (0.008)	0.033 (0.027)	0.042 (0.038)	0.015 (0.012)	0.074*** (0.011)	0.050*** (0.008)
Observations	977,859	557,694	575,930	977,859	557,694	977,859	557,694	575,930
Adjusted R-squared	0.599	0.635	0.625	0.597	0.635	0.599	0.635	0.625
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Linear time-trend	YES	YES	YES	YES	YES	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between the targeted non-regular worker dummy and the placebo treatment variable.

## 6.2.2 Sensitivity to model specifications

Another critical challenge is whether or not a model specification is appropriate. Instead of formal tests suggested by Hausman (1978), the appropriateness of a model specification is analyzed indirectly by testing coefficients' sensitivity to model specifications. The result of this test is presented in Table 12.

For the analysis, four models<sup>17</sup> are used. Model 1 is the main specification used in the previous analysis, which is Model 2 in section 6.1.1. This model includes the control variables, such as

Table 12: The average effect of the new labor law on the real hourly wage by several specifications

VARIABLES		Model 1	Model 2	Model 3	Model 4
Small-size firm	TNRW_LAW <sup>[1]</sup>	0.101*** (0.022)	0.102*** (0.022)	0.110*** (0.013)	0.107*** (0.014)
	TNRW	-0.123*** (0.028)	-0.123*** (0.028)	-0.160*** (0.019)	-0.158*** (0.019)
	LAW	-0.025*** (0.008)	0.023*** (0.005)	-0.029*** (0.008)	-0.038*** (0.007)
	Observations	1,541,379	1,541,379	1,541,379	1,541,379
	Adjusted R-squared	0.573	0.573	0.687	0.688
Middle-size firm	TNRW_LAW <sup>[1]</sup>	0.073*** (0.024)	0.074*** (0.024)	0.086*** (0.026)	0.086*** (0.026)
	TNRW	-0.165*** (0.043)	-0.165*** (0.043)	-0.290*** (0.028)	-0.290*** (0.028)
	LAW	-0.142*** (0.019)	-0.049*** (0.014)	-0.190*** (0.017)	-0.190*** (0.017)
	Observations	1,079,464	1,079,464	1,079,464	1,079,464
	Adjusted R-squared	0.603	0.602	0.789	0.789
Large-size firm	TNRW_LAW <sup>[1]</sup>	0.106*** (0.018)	0.108*** (0.018)	0.103*** (0.022)	0.104*** (0.022)
	TNRW	-0.321*** (0.053)	-0.322*** (0.053)	-0.396*** (0.041)	-0.396*** (0.042)
	LAW	-0.036 (0.022)	0.027 (0.017)	-0.019 (0.049)	-0.034 (0.051)
	Observations	1,478,889	1,478,889	1,478,889	1,478,889
	Adjusted R-squared	0.603	0.604	0.768	0.768
Controls <sup>[2]</sup>	YES	YES	YES	YES	
Linear time-trend	YES	NO	YES	YES	
2008 Financial crisis <sup>[3]</sup>	NO	YES	NO	YES	
Firm's indicators <sup>[4]</sup>	NO	NO	YES	YES	

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (a targeted non-regular worker dummy) and LAW (a new labor law dummy).

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] The collapse of the investment bank Lehman Brothers on September 15, 2008.

[4] Refers to ID of each firm.

<sup>17</sup> Besides these four model, this paper uses three more model including (age)<sup>2</sup>, (employment period)<sup>2</sup> and (working experience)<sup>2</sup> respectively. Their estimated coefficients are similar to Table 12.



gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership. These control variables are used in other models, too. Besides these control variables, a linear time trend is considered in Model 1, since the data-period is short and the labor market is stable in the short run<sup>18</sup>.

In Model 2, a crucial economic event during the data-period as a kind of year effect is taken into account, instead of the linear time trend. That is, Model 2 replaces the linear time trend variable in Model 1 with the financial crisis dummy. The reason is that, due to the short data-period, the linear time trend is likely to be absent and the crucial event could have a considerable effect on the wage differential. The event is the financial crisis in 2008. The crisis seriously affected South Korea economy from the end of 2008, and then it took almost two and half years to recover from the crisis. In Model 3, firm's indicators are added into Model 1, since firm's observable or unobservable characteristics probably affect the wage differential. In Model 4, the financial crisis effect is included into Model 3.

According to Table 12 which is the result of this test, the result shows that the estimated coefficients are consistent across the models. This fact can reaffirm the robustness of the main findings of this empirical analysis.

### **6.2.3 Linear Least Squares regression and Weighted Least Squares regression**

In this section, this empirical analysis briefly attempts to compare the result by Linear Least Squares regression (LLS) which is used in the previous sections and the result by Weighted Least Squares regression (WLS)<sup>19</sup>. According to Table 13, the estimated coefficients of both methods are similar to each other in the case of small-size or large size firms, although those in the case of middle-size firms are noticeably different. This implies that the main findings of this study are likely to be robust. Additionally, the reason for the difference of the results in the case of middle-size firms is that the estimated weights or sampling potentially have some problems. However, the investigation into the reason is beyond the scope of this paper.

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<sup>18</sup> If the data-period is long and the labor market has a stable equilibrium in the long run, the time trend could be non-linear, such as a quadratic or cubic form of a time trend variable.

<sup>19</sup> NIST/SEMATECH e-Handbook of Statistical Methods (2012) says that the weighted least squares method reflects the behavior of the random errors in the model.

Table 13: The average effect of the new labor law on the real hourly wage by LLS or WLS

VARIABLES	Small-size firm		Middle-size firm		Large-size firm	
	LLS <sup>[2]</sup>	WLS <sup>[3]</sup>	LLS	WLS	LLS	WLS
TNRW_LAW <sup>[1]</sup>	0.101*** (0.022)	0.090*** (0.026)	0.073*** (0.024)	0.016 (0.041)	0.106*** (0.018)	0.096*** (0.033)
TNRW	-0.123*** (0.028)	-0.124*** (0.037)	-0.165*** (0.043)	-0.140** (0.049)	-0.321*** (0.053)	-0.315*** (0.053)
LAW	-0.025*** (0.008)	-0.030*** (0.007)	-0.142*** (0.019)	-0.130*** (0.015)	-0.036 (0.022)	-0.059*** (0.017)
Observations	1,541,379	1,541,379	1,079,464	1,079,464	1,478,889	1,478,889
Adjusted R-squared	0.573	0.544	0.603	0.591	0.603	0.592
Controls/Time-trend	YES/Linear	YES/ Linear	YES/ Linear	YES/ Linear	YES/ Linear	YES/ Linear

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (a targeted non-regular worker dummy) and LAW (a new labor law dummy).

[2] Linear Least Squares regression.

[3] Weighted Least Squares regression.

## 6.3 Other concerns

There are other concerns in validating the results of this empirical analysis, although the result is likely valid through undergoing the previous robustness checks. These concerns are informally discussed in this section.

### 6.3.1 Changes of the employment for each type of workers

The new labor law could have an influence on the employment of targeted non-regular workers as well as other types of workers. Since a new restriction or responsibility of employers in using targeted non-regular workers is introduced after the law implementation, employers could replace targeted non-regular workers with regular workers or non-targeted non-regular workers.

The change of demand for each type of workers leads to affecting the labor conditions such as wage, working-hours, social insurance, etc. The law has potentially influenced the labor condition differentials, especially the real hourly wage differential. If this is true, there might be a spillover effect, which means that not only the treatment group but also the control group is influenced by the law. Consequently, the estimated result in this empirical analysis could not be robust.

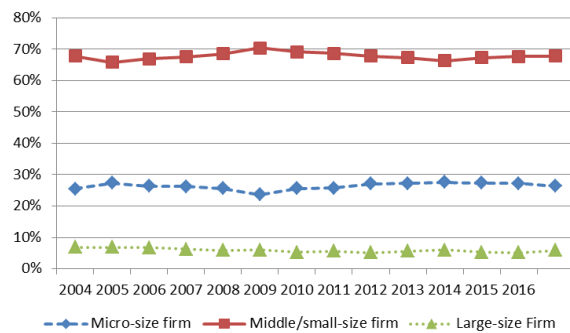
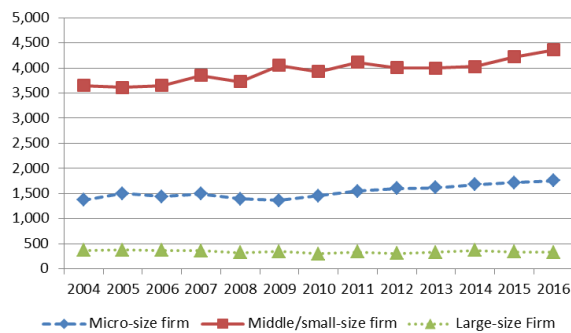


Figure 5: Number of non-regular workers (unit: 1,000) Figure 6. Percentage of non-regular workers  
 Source: The Supplementary Survey of the Economically Active Population Survey (KOSIS)

However, Figure 5 and Figure 6, which base on The Supplementary Survey of the Economically Active Population Survey, illustrate the number and percentage of non-regular workers, which includes all kinds of non-regular workers in Table 1, over time by firm size. Overall, the number of non-regular workers by firm size follows a stable trend, and the percentage of them by firm size also follows a parallel trend. Moreover, Nam and Park (2010) and Yoo and Kang (2013), who analyzed the effect of the law on employment for each type of workers argue that the law has a slightly negative effect on employment not only for regular workers but also for non-regular workers.

To sum up, the graphic analysis and the previous studies suggest that the law has little influence on the employment for each type of workers. This can support the robustness of the results in this analysis.

### 6.3.2 Other potential concerns

The law was discussed for almost five years before it was enacted, and it was implemented six months later after the law was announced. For this reason, firms could respond to the law preemptively even before the law implementation. However, firms are less likely to do so. The reason is that the preemptive response leads only to additional cost, without return of effort in reducing the labor condition differentials. That is, the optimal behaviors of firms are ‘no response’ before the law and ‘response’ after the law. Additionally, attention was paid to the law by firms and media at the beginning of discussion, but, over a few years, the attention diminished gradually. The long discussion might paralyze firms.

On the other hand, firms could not respond to the law immediately. It is likely to take some time to respond to the law, since firms should prepare for the law. Furthermore, if the Korean government's will to monitor the law implementation is weak, the firms' response to the law would be delayed. This concern seems to be reasonable, considering the financial crisis of 2008. The crisis occurred just one year after the law implementation and the crisis led the Korean government to concentrate on the issue of unemployment. In order to address this concern, the financial crisis of 2008 is used simply in the section 6.2.2, as a kind of year effect, instead of using a lagged dependent variable.

The endogeneity of the new labor law as a treatment is another concern. According to Meyer (1995), this means that the law might be made due to the Korean government's response to factors which have a relationship with pre- or post- outcomes. If this is true, the estimated effect does not imply the causal effect of the law on the labor condition differentials, but the correlation between the law and the differentials.

To sum up, concerns for internal validity in this empirical analysis exist and they are discussed intuitively. Although each concern should be investigated in order to make the result more robust, this paper leaves investigations of these concerns to future studies.

## **7. Conclusion**

In 2007, South Korea implemented a new anti-discrimination law in order to alleviate the labor condition differentials between non-regular and regular workers. This empirical study analyzes the law effect of on the differentials. The Difference-in-Difference method is used for the analysis, and the data comes from "Survey on Labor Conditions by Employment Type". This study tries to differentiate from previous studies by including more relevant variables, testing formally the parallel trend assumption, and estimating the yearly law effect. Furthermore, the previous studies are not sufficient for convincing the Korean people. By providing this new empirical evidence, it is anticipated that the Korean people would be convinced that the law plays a positive role in alleviating the labor condition differentials between targeted non-regular and regular workers.

This study finds that, across all firm sizes, the new labor law alleviates the real hourly wage differential between targeted non-regular and regular workers, while increasing the gap of working-hours with the real monthly wage gap holding. This implies that employers respond to the law by not changing the labor cost. However, the effects of the law on other labor conditions, such as social insurance and fringe benefits, are not significant overall. The reason why the law influences only the real hourly wage and the working-hours is likely to be that firms can exercise more discretion in other labor conditions rather than in wage or working-hours.

The secondly finding is that the law heterogeneously affects the real hourly wage differential between targeted non-regular and regular workers with respect to gender, union membership, age, education, and year. In particular, the law has no or less influence in reducing the real hourly wage for workers without union membership, or young workers. These workers are likely to belong to a socioeconomically disadvantaged group, since their job conditions are unstable and vulnerable to the situation of the labor market. This suggests that policy makers should pay more attention to these vulnerable workers in order to alleviate social polarization: if the Korean government tries to drive workers to join labor unions more, the wage gap is likely to be narrower, and the government should take measures to prevent a wage differential among young workers.

Lastly, while this result still remains valid through the robustness checks, there are other concerns for internal validity: the law has potential influence on the employment or the law might have a lagged-effect on the labor condition differentials, etc. These concerns are recommended for future studies.

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## **Legislation**

Act on the protection, etc. of fixed-term and par-time workers 2007

## Appendix 1: Definitions of type of workers

Type of workers	Definition	The new Law application
Regular Worker	A worker who works under a regular employment relationship such as a single employer, regular working-hours(usually 9:00 am to 6:00 pm), unlimited employment period, etc.	No
Non-regular Worker	Temporary Agency Worker	Yes
	Part-time Worker	
	Fixed-term Worker	
	Non-standard Contracted Employee	No
	Home-based Worker	
	Contract Worker	
	Daily Worker	
Temporary Worker, Not Fixed-term Worker	Workers whose employment contract is not settled but they work under the condition of termination of contract depending on the condition of the company.	



Appendix 2: Mean of variables before and after the law implementation

Table A2.1: Small-size firm

	Targeted non-regular worker			Regular worker			
	Before	After	Difference (After -Before)	Before	After	Difference (After -Before)	
Real hourly wage (KRW)	9,176	9,753	577	15,721	15,340	-381	
Total working-hours	185	169	-16	195	193	-2	
Real monthly wage (KRW)	1,283,013	1,400,645	117, 632	2,124,447	2,326,184	201,737	
Social insurance	0.986	0.992	0.006	0.998	0.998	0.000	
Fringe benefits	0.776	0.768	-0.008	0.963	0.965	0.002	
Gender	0.477	0.481	0.004	0.679	0.663	-0.016	
Age	37.6	39.3	1.7	39.0	40.3	1.3	
Education	-Middle school	0.125	0.121	-0.004	0.069	0.056	-0.013
	High school	0.502	0.510	0.008	0.401	0.393	-0.008
	Junior college	0.142	0.118	-0.024	0.191	0.196	0.005
	University -	0.231	0.251	0.020	0.339	0.354	0.015
Period of employment	1.8	1.7	-0.1	5.7	5.9	0.2	
Period of working experience	0-2	0.554	0.576	0.022	0.230	0.220	-0.010
	2-5	0.247	0.237	-0.010	0.248	0.244	-0.004
	5-10	0.108	0.103	-0.005	0.202	0.210	0,008
	10-	0.091	0.084	-0.007	0.319	0.326	0.007
Union member	0.047	0.026	-0.021	0.170	0.146	-0.024	
Observations	101,893	69,185		875,966	494,335		

Table A2.2: Middle-size firm

	Targeted non-regular worker			Regular worker			
	Before	After	Difference (After -Before)	Before	After	Difference (After -Before)	
Real hourly wage (KRW)	12,602	13,079	477	19,720	17,755	-1,965	
Total working-hours	177	166	-11	193	196	3	
Real monthly wage (KRW)	1,522,938	1,618,958	96,020	2,373,236	2,516,838	143,602	
Social insurance	0.992	0.995	0.003	0.999	0.999	0.000	
Fringe benefits	0.849	0.813	-0.036	0.991	0.992	0.001	
Gender	0.440	0.471	0.031	0.741	0.751	0.010	
Age	35.3	37.2	1.9	38.7	40.4	1.7	
Education	-Middle school	0.079	0.078	-0.001	0.080	0.072	-0.008
	High school	0.379	0.370	-0.009	0.381	0.398	0.017
	Junior college	0.211	0.174	-0.037	0.178	0.173	-0.005
	University -	0.332	0.378	0.046	0.361	0.356	-0.005
Period of employment	2.0	1.9	-0.1	7.8	7.9	0.1	
Period of working experience	0-2	0.555	0.586	0.031	0.166	0.148	-0.018
	2-5	0.255	0.218	-0.037	0.219	0.217	-0.002
	5-10	0.117	0.109	-0.008	0.213	0.238	0.025
	10-	0.073	0.087	0.014	0.403	0.397	-0.006
Union member	0.074	0.065	-0.009	0.382	0.398	0.016	
Observations	62,942	74,375		494,752	447,395		

Table A2.3: Large-size firm

	Targeted non-regular worker			.159821 Regular worker			
	Before	After	Difference (After -Before)	Before	After	Difference (After -Before)	
Real hourly wage (KRW)	14,865	18,100	3,235	25,190	26,028	838	
Total working-hours	164	153	-11	188	187	-1	
Real monthly wage (KRW)	1,545,466	1,877,331	331,865	2,689,488	3,184,485	494,997	
Social insurance	0.994	0.996	0.002	1.000	0.999	-0.000	
Fringe benefit	0.827	0.804	-0.023	0.983	0.993	0.010	
Gender	0.420	0.452	0.032	0.733	0.734	0.001	
Age	33.1	34.1	1.0	36.9	38.0	1.1	
Education	-Middle school	0.044	0.027	-0.017	0.055	0.041	-0.014
	High school	0.293	0.224	-0.069	0.331	0.291	-0.040
	Junior college	0.215	0.193	-0.022	0.160	0.163	0.003
	University -	0.448	0.557	0.109	0.453	0.505	0.052
Period of employment	2.3	2.0	-0.3	9.5	10.4	0.9	
Period of working experience	0-2	0.578	0.639	0.061	0.144	0.122	-0.022
	2-5	0.246	0.191	-0.055	0.195	0.180	-0.015
	5-10	0.114	0.094	-0.020	0.196	0.214	0.0188
	10-	0.062	0.075	0.013	0.466	0.484	0.018
Union member	0.069	0.066	-0.003	0.418	0.427	0.009	
Observations	80,238	202,094		495,692	700,865		

Appendix 3: The estimated average effects of the new labor law on the hourly wage, the working-hours, and the monthly wage in the case of small-size and large-size firms

Panel A. Middle-size firm

VARIABLES	Real hourly wage <sup>[4]</sup>		Working-hours <sup>[4]</sup>		Real monthly wage <sup>[4]</sup>	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
TNRW_LAW <sup>[1]</sup>	0.120*	0.073***	-0.118**	-0.064***	-0.010	-0.011
	(0.057)	(0.024)	(0.055)	(0.021)	(0.032)	(0.017)
TNRW	-0.444***	-0.165***	-0.155	-0.004	-0.450***	-0.124**
	(0.095)	(0.043)	(0.100)	(0.011)	(0.097)	(0.048)
LAW	-0.083**	-0.142***	0.017*	0.086***	-0.035	-0.055***
	(0.033)	(0.019)	(0.009)	(0.016)	(0.035)	(0.014)
Observations	1,079,464	1,079,464	1,079,464	1,079,464	1,079,464	1,079,464
Adjusted R <sup>2</sup>	0.043	0.603	0.070	0.438	0.070	0.503
Controls <sup>[2]</sup>	NO	YES	NO	YES	NO	YES
Time trend <sup>[3]</sup>	NO	YES	NO	YES	NO	YES

Panel B. Large-size firm

VARIABLES	Real hourly wage <sup>[4]</sup>		Working-hours <sup>[4]</sup>		Real monthly wage <sup>[4]</sup>	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
TNRW_LAW <sup>[1]</sup>	0.116**	0.106***	-0.121	-0.079***	-0.004	0.002
	(0.046)	(0.018)	(0.074)	(0.025)	(0.036)	(0.016)
TNRW	-0.608***	-0.321***	-0.230	0.014	-0.606***	-0.217***
	(0.068)	(0.053)	(0.141)	(0.022)	(0.093)	(0.052)
LAW	0.045***	-0.036	-0.001	0.023	0.064***	-0.002
	(0.011)	(0.022)	(0.004)	(0.021)	(0.012)	(0.025)
Observations	1,478,889	1,478,889	1,478,889	1,478,889	1,478,889	1,478,889
Adjusted R <sup>2</sup>	0.114	0.603	0.123	0.654	0.180	0.563
Controls <sup>[2]</sup>	NO	YES	NO	YES	NO	YES
Time trend <sup>[3]</sup>	NO	YES	NO	YES	NO	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW (Targeted Non-Regular Worker dummy) and LAW (Law dummy).

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] Linear time trend.

[4] Independent variables are log (real hourly wage), log (working-hours), and log (real monthly wage).

Appendix 4: The regression result in terms of each insurance and each fringe benefit

Panel A. Small-size firm

VARIABLES	Social insurance				Fringe benefit	
	Employment Ins.	Health Ins.	Pension	Occupational Health and Safety Ins.	Special payment	Retirement payment
TNRW_LAW <sup>[1]</sup>	0.016 (0.010)	0.017** (0.008)	0.018* (0.010)	0.010*** (0.003)	0.042*** (0.014)	0.010 (0.017)
TNRW	-0.114*** (0.034)	-0.075*** (0.011)	-0.105*** (0.025)	-0.013*** (0.003)	-0.184*** (0.019)	-0.107*** (0.014)
LAW	-0.007*** (0.002)	-0.003 (0.002)	-0.005** (0.002)	0.005** (0.002)	-0.050*** (0.009)	-0.012 (0.007)
Observations	1,411,701	1,434,648	1,361,588	1,445,118	1,541,379	1,541,379
Adjusted R <sup>2</sup>	0.108	0.121	0.108	0.017	0.152	0.094
Controls <sup>[2]</sup>	YES	YES	YES	YES	YES	YES
Time trend <sup>[3]</sup>	YES	YES	YES	YES	YES	YES

Panel B. Middle-size firm

VARIABLES	Social insurance				Fringe benefit	
	Employment Ins.	Health Ins.	Pension	Occupational Health and Safety Ins.	Special payment	Retirement payment
TNRW_LAW	0.005 (0.008)	0.008 (0.008)	0.007 (0.009)	0.005 (0.004)	0.003 (0.027)	-0.008 (0.013)
TNRW	-0.050** (0.023)	-0.028*** (0.007)	-0.042** (0.016)	-0.010** (0.004)	-0.212*** (0.036)	-0.059*** (0.019)
LAW	-0.003* (0.002)	-0.004** (0.001)	-0.005*** (0.002)	-0.003** (0.001)	-0.009 (0.012)	0.000 (0.006)
Observations	992,190	999,935	970,235	1,002,403	1,079,464	1,079,464
Adjusted R <sup>2</sup>	0.039	0.034	0.036	0.006	0.208	0.222
Controls	YES	YES	YES	YES	YES	YES
Time trend	YES	YES	YES	YES	YES	YES

Panel C. Large-size firm

VARIABLES	Social insurance				Fringe benefit	
	Employment Ins.	Health Ins.	Pension	Occupational Health and Safety Ins.	Special payment	Retirement payment
TNRW_LAW	0.020 (0.016)	-0.002 (0.009)	-0.000 (0.018)	0.002 (0.003)	-0.019 (0.032)	0.002 (0.025)
TNRW	0.007 (0.037)	-0.008 (0.007)	0.011 (0.034)	-0.007** (0.003)	-0.244*** (0.038)	-0.009 (0.038)
LAW	0.002 (0.004)	0.002 (0.003)	0.013 (0.014)	0.000 (0.002)	0.048** (0.021)	0.044 (0.028)
Observations	1,310,144	1,308,927	1,297,310	1,313,218	1,478,889	1,478,889
Adjusted R <sup>2</sup>	0.227	0.033	0.102	0.015	0.362	0.324
Controls	YES	YES	YES	YES	YES	YES
Time trend	YES	YES	YES	YES	YES	YES

Note: Robust standard errors (clustered by industry) in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

[1] Interaction term between TNRW and LAW. TNRW is a dummy variable for a targeted non-regular worker; TNRW=0 is a regular worker, TNRW=1 is a targeted non-regular worker. LAW is a dummy variable for the new labor law; LAW=0 is before the law, LAW=1 is after the law.

[2] Controls are gender, age, education, period of employment, period of working experience, type of occupation, type of working system, type of industry, and union membership.

[3] Linear time trend.