How the 2003 Social Insurance Premium Reform Affects Firm Behavior*

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Abstract

The total reward system introduced in Japan in 2003 led to an increase in the social insurance premium burden for some companies and a decrease for others. Utilizing the variation in the bonus-to-salary ratio, we employ the difference-in-differences approach. With a large nationwide dataset, we find that firms reduced employment and increased the average working hours per person, keeping total hours, which is a proxy of labor demand, unchanged. This trend was stronger especially for large-sized manufacturing firms. We also show that when firms have bleak business prospects, increasing burden can decrease employment even when current labor demands are stable.

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1 Introduction

For most firms, the burden of social insurance premiums for their employees are substantial costs, along with tax burdens. Although some countries relieve the tax burden, or keep it low, to augment international competitiveness, firms in many countries shoulder a greater burden of social welfare and pension expenses as the population ages.[1] Significantly, in Japan, social insurance premium has been increasing gradually over the last 20 years. The increasing burden could worsen business conditions, especially in firms with a high labor cost share, such as small and medium-sized firms. In spite of the increasing importance of the impact of social welfare burden on firm behavior, there are few studies on the effects of social insurance premium from the labor demand side because of identification problem originated one country one social policy and law in principle.

In 2003, a total reward system was introduced for social insurance premiums in Japan. Due to this reform, the insurance premiums for bonuses increased from almost zero to 21.87%. The premiums had been calculated based on monthly salary prior to 2003; however, after 2003, they were calculated based on total annual remuneration, that is, total monthly salary and bonuses. In response to this reform, theoretically, some firms whose bonus-to-salary ratio was originally very high experienced an increase in costs while others experienced a decrease. Thus, even though the changes in the social insurance premiums and the reward system policy are uniformly applied throughout the nation, the impact those changes have on firms varies depending on the previous bonus-to-salary ratio that companies used. Therefore, we utilized this natural experiment to explore how this reform affected various labor market outcomes, using a rich Japanese national dataset complied by the Japanese government. Our findings of the effects in the 2003 reform could apply to many developed countries suffering from an increase in the social insurance premium burden.

Our paper is most closely related to three strands of existing literature. The first one is the literature on the effects of tax reform on the labor market. For example, Eissa and Liebman (1996)

[1] For example, the percentages of social insurance premium and of the tax burden to national income, respectively, are 7.4% and 23.3% in the US; 10.7% and 37.0% in the UK; 29.5% and 21.7% in Germany; 36.7% and 25.2% in France; and 24.1% and 17.5% in Japan. http://www.nta.go.jp/osaka/shiraberu/gakushu/kyozai/pdf/04/08.pdf

examined the impact of the US Tax Reform Act of 1986, which included an expansion of the earned income tax credit, by using a difference-in-difference (DID) estimation to compare the change in the labor supply of single women with children and of those without children. They found that the Tax Reform Act increased labor participation among single women with children. Furthermore, Blundell et al. (1998) examined how the UK tax reforms in the 1980s affected that country's labor supply by comparing the labor supply responses over time for different groups defined by cohort and education level. Aaron (1981), Feldstein (1995), Feldstein and Feenberg (1996), Blundell et al. (1998), Meghir and Phillips (2008), Gelber (2014) have explored the impacts of tax reforms on economic behavior. Many of these studies focused on the effects that changes in tax rates have on labor income through work hours/labor participation, as well as employee effort at work, job choices, and manner of earning income (e.g., salary, dividends, or capital gains) from the labor supply side.

The second strand of the related literature includes studies focusing on who ultimately bears the costs of insurance contribution—employers or employees. These studies yield a wide variety of conclusions on whom and how the incidence of insurance premium is burdened, because the countries, objects, and data source are different for researchers in different countries (Hamermesh 1979, Holmlund 1983, Komamura and Yamada 2004, Tachibanaki and Yokoyama 2008, Iwamoto and Hamaaki 2006, Sakai 2006, Sakai and Kazekami 2007, Iwamoto and Hamaaki 2009). To overcome the causality issue, some studies, for example, Gruber (1997), Anderson and Meyer (2000), Kugler and Kugler (2009), Iwamoto and Hamaaki (2006), and Hamaaki (2012) use the difference of social insurance premium between states, jobs, and/or years as natural experiments, and apply the DID approach. They find that employees pay a substantial amount of the social insurance premium. Iwamoto and Hamaaki (2006) discuss the mechanism of the incidence of social insurance contributions theoretically.

The final strand of the related literature looks at the effects on employment of the policies that result in higher labor costs, such as minimum wage, and overtime regulation (Hamermesh 2014, Kim 2008, Sakai 2009, Miyazato and Ogura 2010, Kawaguchi and Mori 2013, Kawaguchi et al.

2008). Hamermesh (2014) describes that polices that increase labor costs, such as overtime pay, hiring subsidies, the minimum wage, and payroll taxes, can affect both employment and work hours. Many (though not all) of the empirical studies ignore the fact that employers make wage and employment decisions at the same time. To address this chicken and egg problem, some studies use specific examples of the impact of shocks that alter the number of workers available to employers (Angrist 2000, Kugler and Kugler 2009, Autor et al. 2004). A reasonable consensus from these studies is that higher hourly wage costs do lead employers to use fewer workers.

Our first results employ the DID approach using the variation of the change of the social insurance burden before the introduction of the total reward system as a natural experiment. The results show that firms with a heavier burden of social insurance premium after the 2003 reform reduced the number of employees and increased the average number of work hours, even though they maintained the total number of working hours, which is a kind of proxy of labor demand. An increase in the average monthly salary led by longer working hours was compensated for by a decrease in the amount of the average bonuses. To address the challenges posed by the unexpected increase in labor costs, companies decreased the amount of the bonuses they paid their employees.

In our second exercise, we split the samples into 4 groups: (1) large-sized manufacturing, (2) small and medium-sized manufacturing, (3) large-sized non-manufacturing, and (4) small and medium-sized non-manufacturing firms and show that the policy change has serious impacts on large manufacturing firms, which have the highest diffusion index on surplus employment and the lowest business confidence. This suggests that the increase of the social insurance burden could negatively affect employment, especially in sectors wherein business sentiments are gloomy.

Finally, applying the resolution and analysis methods of DiNardo et al. (1996), we confirm the distribution of employment as having shifted down and the work-hour distribution shifted to a higher level after the change. These results are consistent with the results of the DID method.

In sum, in response to the 2003 social insurance premium reform, firms reduced the number of employees, increased the average number of working hours, under circumstances that the total number of working hours was left unchanged. This was especially true in large firms in manufac-

turing sectors, which had the highest diffusion index on surplus employment at that time. Levine and Tyson (1990) suggest that Japanese workers in large manufacturing firms are ensured relatively higher job security through intra-firm transfers, temporary transfers to subsidiaries, and wage compressions. It is plausible that large manufacturing firms with stronger norm consciousness of higher employment security make more prudent choices to increase the amount of labor employed.[2]

This paper is organized as follows. Section 2 describes the social insurance premium reforms in 2003 in detail. Section 3 provides an empirical model and Section 4 offers a brief description of the data. Section 5 discusses the results from the empirical analysis. Section 6 presents the discussions. The last section conclude the paper.

2 The 2003 Social Insurance Premium Reforms

In Japan, social insurance premiums, specifically the insurance premiums for employee welfare pensions, medical insurance, and the contributions to the child allowance in the private sector, are paid according to a fixed wage ratio. In 2003, the fixed percentage of the total wage paid was 13.58% for the insurance premiums for the welfare pensions, 8.20% for medical insurance, and 0.09% for the child allowance contribution, shown in Table 1.[3] The premium of welfare pensions and medical insurance payments are shared equally between the employee and employer, but the employer pays the entire contribution for the child allowance. Until 2002, the monthly salary was used as a basis for the social insurance premiums, but since April 2003, the total annual compensation, which is the total of bonuses and monthly salary, has been used instead. The 2003 reforms of the social insurance premiums were called the "introduction of the total reward system."

The total reward system was introduced to resolve an unfair element of the old system. Previously, the amount of social insurance premiums paid could be different depending on the bonus-to-salary ratios among workers with the same total annual compensation. Though the fixed percentage of monthly salary for the employee welfare pensions was 17.35% in 2002, the proportion for the

[2]Kato and Morishima (2003) point out the possibility that the economic slowdown in the1990s and the rapidly aging workforce erode the labor-management cooperation.

[3]There are ceiling insurance expenses for employee welfare pensions and for medical insurance.

annual wage was 13.58% in 2003. Similarly, the premium rate for medical insurance on monthly salaries was 8.50% in 2002, but on annual wages it was 8.20% in 2003. As a result, this reform increased the insurance premiums for bonus from 2% to 21.87%, and decreased the premiums for monthly salary from 25.96% to 21.87%. Due to this change, assuming that there was no change in amount of bonuses and monthly salary, workers with a high bonus-to-salary ratio in 2002 paid more for social insurance, and just the opposite occurred in workers with a low bonus-to-salary ratio.

Assume that the amount of bonuses is x yen, the amount of monthly salary is y yen, the social insurance premium rate for bonus is α until 2002, that for monthly salaries is β till 2002, and that for both bonuses and monthly salaries is γ since 2003. The total premium amount is exactly the same if the following equality is true:

$$\frac{x}{y \times 12} = \frac{\alpha - \gamma}{\beta - \gamma} \tag{1}$$

where α is 0.02, β is 0.2596, and γ is 0.2187. The threshold of the bonus-to-salary ratio can be calculated as approximately 2.47, upon the introduction of the total reward system. The workers with a higher bonus-to-salary ratio than 2.47 in 2002 paid higher premiums, whereas those with lower ratios than 2.47 paid lower premiums.

3 Empirical Model

3.1 Difference-in-Differences

To evaluate the effects of the social insurance premium reform on firms' labor-related behavior, we estimated the following standard DID model:

$$y_{it} = \alpha + \beta\, After \times Treatment_i + X_{it} + (establishment\ fixed\ effects) + (year\ effects) + u_{it} \tag{2}$$

where y_{it} is labor demands related indices of establishment i in year t, such as the total working hours in an establishment, employment calculated on a headcount basis, average hours worked, average amount of monthly salary and bonuses at 2010 prices.[4] $After \times Treatment_i$ is the interaction term with the $After$ dummy variable (= 1 if the year t is after 2003, 0 otherwise) and the bonus-to-salary ratio in 2002.[5] The estimated coefficient on $After \times Treatment_i$ is of prime interest, and the negative and significant coefficient indicates that the 2003 reform negatively impacts firms with a heavier burden of social insurance premium. As we use the fixed bonus-to-salary ratio in 2002 as the treatment variable, we exclude the treatment dummy from the independent variable because the treatment variable is time-invariant and we are now using the fixed effect model.

It is plausible that the bonus-to-salary ratio is correlated with unobserved establishment characteristics that tend to be time-invariant, such as workplace culture, tradition, and underlying managerial practice (e.g., committed relationships, profit sharing plans, or lifetime employment practices). Furthermore, such unobserved establishment characteristics are likely to be correlated with labor-related indices. Without accounting for such unobserved firm heterogeneity, the estimated coefficients will be biased. Fortunately, our data are longitudinal, and thereby allow us to estimate establishment fixed effect models and account for such unobserved establishment heterogeneity.

To control for common year effects including common trends and macro shocks, we also consider year fixed effects. Finally, we control for time-variant establishment characteristics such as female employee ratio, average tenure, average experience in years, proportion of graduates from each level of school (junior high school, senior high school, 2-year-college, and 4-year-university) firm's employment (in log), and industry.

For further investigation, we split the sample firms into 4 groups, i.e.,{manufacturing, non-manufacturing}$\times${large-sized firms, small and medium-sized firms}. We apply the DID approach in equation (2) to the 4 groups.

[4]CPI is used as a deflator.

[5]For robustness check, we create the alternative index of bonus-salary ratio using bonus payments of the same establishments in the next survey in order to synchronize the year of the bonus payments with monthly salary.

3.2 Before and after distribution -DFL Decomposition-

Lastly, we visually confirm how the behavioral changes affect the overall distribution of each dependent variable employing the DFL decomposition (DiNardo et al. 1996). The advantage of this method is that it visually decomposes the change in the distribution into two parts: structure effects and composition effects (DiNardo et al. 1996, DiNardo and Lemieux 1997).[6]

First, the distribution in 2002 is expressed as

$$F_{2004} = \int f_{2002}(Y/X)h(X/t = 2002)dX \tag{3}$$

where $f_{2002}(Y/X)$ is the income determination mechanism in 2002 that maps firms' attributes to the income distribution. The density $h(X/t = 2002)$ is the of attributes in year 2002. Similarly, the distribution during year 2004 is expressed as

$$F_{2004} = \int f_{2004}(Y/X)h(X/t = 2004)dX \tag{4}$$

What the distribution would be after the tax reform if the income determination mechanism were identical to its mechanism in 2002 is expressed as

$$F_{2004}^{2002} = \int f_{2002}(Y/X)h(X/t = 2004)dX \tag{5}$$

This can be thought of as a counterfactual distribution in the period 2004 without the reform because it consists of the same firms' attributes as the real 2004 distribution of X but of β prior to the tax reform. This counterfactual distribution is calculated by DiNardo et al. (1996) method:

$$F_{2004}^{2002} = \int f_{2002}(Y/X)h(X/t = 2004)dX = \int \omega f_{2002}(Y/X)h(X/t = 2002)dX \tag{6}$$

[6]Because the disadvantage of this method is that it contains the effects of the policy change as well as those of other changes such as business cycle, we use this method only as a check for robustness.

The reweighting term ω can be calculated by the DiNardo et al. (1996) method:

$$\omega = \frac{h(X/t=2004)}{h(X/t=2002)} = \frac{P(t=2004/X)P(X)/P(t=2004)}{P(t=2002/X)P(X)/P(t=2002)} = \frac{P(t=2004/X)P(t=2002)}{P(t=2002/X)P(t=2004)} \quad (7)$$

where the density $h(X/t=T)$ is the p.d.f. of attributes in year T. The second equation is derived from Bayes' rule. In the actual regression of ω, $P(t=T/X)$ can be calculated using propensity scores obtained from the probit model in which $P(t=T)$ is regressed on X, and $P(t=T)$ is calculated as the proportion of the observations from year T in the pooled data.

4 Data

The Basic Survey on Wage Structures (BSWS) is the most comprehensive wage survey in Japan, conducted every year by the Ministry of Health, Labour and Welfare. The BSWS excludes agriculture, forestry, fisheries, and public services. It covers private and public sector firms with ten or more employees, and private sector establishments with five to nine employees. The establishments in the sample were randomly chosen in proportion to the size of prefectures, industries, and the number of employees, using data from the Establishment and Enterprise Census (EEC), which includes all establishments in Japan. The sampling of the survey was done in two steps: first, a random sample of establishments was selected; then, the establishments selected in the first step were asked to take a random sample of workers and provide their payroll records.

The data contain information on individual workers' monthly salaries in June, total bonus payments in the previous year, hours worked, gender, age, length of employment, education, job title, and job type. The data include approximately 1.2 million workers for each year, from 70,000 establishments. We created the establishment-level panel data using the information from the EEC. We aggregated the total work hours in an establishment, the bonus-to-salary ratio, average monthly work hours, average monthly salary, and average amount of bonuses by establishments, using worker-level information. The dataset we used in this analysis contains 67,671 establishment observations from 2002 and 2004. Table 2 summarizes the descriptive statistics of this study. The

sample in Column (1) is the statistics of the unbalanced panel, which includes 2002 and 2004. To compare the descriptive statistics change between 2002 and 2004 at the same establishments, Columns (3) and (4) report statistics before and after the reform.

When we look at the balanced panel data of 2002 and 2004, monthly salary slightly increased in accordance with an increase in monthly hours worked per person while bonus payments decreased.

5 Empirical Results

5.1 DID Results

Table 3 first presents the fixed effect estimates of Eq. (2), using the data from 2002 (before the reform) and 2004 (after the reform). The estimated coefficient on 2004 year dummy is negative and significant at the 1% level in Columns (1) and (3), and that on $After \times Treatment_i$ is insignificant in Column (1), indicating that the total labor demands in firms in 2004 are, on average, lower than those in 2002. In addition, there are little differences between the labor demands in firms burdened more heavily by the 2003 reform and those in non-burdened firms. Secondly, the estimated coefficients on $After \times Treatment_i$ in Column (2) is negative and statistically significant, even at the1% level, when we use the number of employees (in log) as the dependent variable. The size of the estimated coefficient suggests that the establishments with one month more bonus-to-salary ratio in 2002 will lead to a 0.9% decrease in employment after the reforms. The estimated coefficient on the average hours worked per person is positive and significant at the 1% level, suggesting that establishments with a heavier social insurance premium burden increased their average work hours.

Table 4 reports the results for wages. In Table 3, we can see that monthly work hours per person increased; thus, in accordance with the change, monthly salary also increased with statistical significance. The magnitude of $After \times Treatment_i$ on the amount of monthly salary is quite the same as the average working hours. We cannot identify the causality, but the increase in working hours and monthly salary occur simultaneously. In contrast, the estimated coefficient on the amount of

bonus is negative and significant.

Compared to the magnitude of the coefficient of the interaction term, it turns out that bonus responded more than monthly salary. These results are consistent with the fact that bonuses are flexible in Japan.[7]

Therefore, in sum, firms that suffered a greater burden as a result of the 2003 reform might have to decrease the level of employment or bonus because their resources for the total payroll allocated to the employees could have decreased.

5.2 Robustness Check

There might be a possibility that the bonus-to-salary ratio in 2002 is something special, i.e., the firms might have experienced some special business cycle shocks in that year, and thus categorizing firms based on the 2002 bonus-to-salary ratio might introduce some biases. To mitigate the possibility of an abrupt shock in 2002 biasing our results, we also use the average bonus-to-salary ratio of each establishment during 1999-2002 as an independent variable, instead of the 2002 bonus-to-salary ratio. In Table 5, we find our key results to be robust to this alternative treatment variable, as shown in the main result in Table 3.

Furthermore, to mitigate a possible time-lag for the impact to appear, we extended the sample period in Table 6, but achieved similar results to Table 3.

In Table 7, we also test our results using the placebo period of data from 1999 and 2001, which could not have been affected by the 2003 reforms. The estimated coefficients on the total labor demands, the employment numbers, and the average hours worked in Table 7 are insignificant.[8]

[7]The Japanese wage is known to respond flexibly to exogenous shocks, because bonus payments comprise around 25 to 33 percent of total annual compensation (Steinberg and Nakane 2011). Firm-specific human capital resulting from labor-market friction is often identified as an important feature of the Japanese labor market (Hashimoto and Raisian 1985). Consequently, both employers and employees have strong incentives to protect their relationship and, hence, future returns on their investments in specific human capital, by adjusting wage compensation, including bonus payments (Hashimoto 1979). Although Japanese labor law prohibits employers from cutting compensation without workers' consent unless the employers experience hardship (and courts apply strict criteria to define that hardship), many unions/workers' representatives and employers agree to contracts in which the bonus payment depends on the firm's performance.

[8]Because the BSWS contains information on individual workers' monthly salaries in June and total bonus payments in the previous year, the bonus-to-salary ratio in our main results is calculated by the amount of bonus payments in the year $t-1$, and the monthly salary in year t. In contrast, because the BSWS contains establishment-level and not

5.3 Before and After Distribution –DFL Results–

Figure 1 presents the results of a DFL decomposition of the logs of bonus amount and monthly salary. The red line is the kernel density of the bonus amount in 2002, and the blue line of that in 2004. After the introduction of the total reward system in 2003, the bonus distribution shifted to the left, which reconfirms the decrease in bonus after the 2003 reform. Furthermore, we also draw the distribution that would have been realized if the 2003 reform had not occurred. This counter-factual distribution indicates that the bonus amount would have distributed at a higher level without the reform. Note that the difference between the two actual lines can mainly be explained by the difference between the counter-factual line and the actual 2004 line, which is caused by something other than the change in attributes of firms, since both the blue and the black line have the same attributes in 2004. This result strongly implies the effect of the introduction of the 2003 total reward system on the gap of the two distributions. As we have confirmed, the change in monthly salary is much more modest, which is consistent with the so-called wage rigidity in basic pay.

Figure 2 reveals that firms do not change the total work hours much, but if we look at employment in Figure 3, the distribution for 2004 shifted down, which echoes the central message of the DID approach that employment decreased after the 2003 reform. Again, since the gap between the two actual lines can mainly be explained by the gap between the counter-factual line and the actual 2004 line, this result implies that the gap of the two distributions are explained not by the changes of observable variables but by changes in coefficients or an error term; in this case, the effect of the introduction of the 2003 total reward system.

As we have confirmed in the DID estimation in Figure 4, the distribution of monthly work hours per person shifted to the right (i.e., increased). The gap between the two actual lines are again explained by changes in coefficients or an error term, i.e., there is a great possibility that the

worker-level panel data, the alternative definition of bonus-to-salary ratio is calculated by bonus payments in year t from the survey in year $t+1$ and monthly salaries in year t from the survey in year t. We cannot identify data at the worker level, and many workers are not necessarily resampled even if the same establishments are resampled in consecutive years. What is worse is that some establishments cannot be resampled in consecutive years and are dropped from the analysis altogether. Thus, we basically have two options for calculating bonus-to-salary ratio: (a) defining it as $Bonus_t/Salary_t$ using two consecutive surveys, or (b) defining it as $Bonus_{t-1}/Salary_t$ using one survey, in which case we are free from the problem of resampling and loss of sample size when matching firms that appear in two consecutive years. The results in Table A.1 in the Appendix do not change much even if we use Option (a).

2003 reform affected the distributional change. While the results are consistent with the picture painted by our DID approach, they should be interpreted with caution, as DFL composition does not allow us to extract the strict policy effects.

6 Discussion

To investigate the reason why firms with heavier burden of social insurance premium cut more employment, we split the samples into 4 groups, i.e., {manufacturing, non-manufacturing}×{large-sized firms, small and medium-sized firms}.[9] As shown in Panel A in Table 8, total work hours within an establishment stay the same in large-sized manufacturing, small and medium-sized manufacturing, and large-sized non-manufacturing firms. In these groups, total labor demand does not seem to change between 2002 and 2003. Panel B in Table 8 shows that only large-sized manufacturing firms decrease their employment. As shown in Panel C in Table 8, the average work hours increase in large-sized manufacturing and all non-manufacturing firms. They clearly describe that large-sized manufacturing firms decreased their employment even though their total labor demand did not change, and compensated by increasing the average work hours per capita, whereas small and medium-sized manufacturing firms kept their total work hours, employment, and average work hours unchanged.

The diffusion index on employment, specifically, the index of excessive employment minus insufficient employment, by the Bank of Japan's quarterly survey of business sentiment (Tankan) is presented in Figure 5. In the figure, the diffusion index on employment of large-sized manufacturing is the worst around 2002-2003. The business conditions of manufacturing were especially bad because this period was after the Asian financial crisis and before the economic recovery driven by export. As Levine and Tyson (1990) suggests, Japanese workers, especially in large manufacturing firms, are ensured relatively higher job security through intra-firm transfers, temporary transfers to subsidiaries, and compression of wages. Japanese workers enjoy higher security of employment

[9] We define large firms as those with 300 or more employees, and small and medium-sized firms as those with less than 300 employees in our analysis.

than those in the US or most EU countries, especially in large firms that have a strong norm consciousness. The high job security could lead to a low diffusion index of large-sized manufacturing firms under a recession period (Hall 2005).

When labor costs increase, firms' short-term options are to either do nothing and absorb the extra cost or decrease the amount of labor employed. It takes time to alter capital investments. To adjust the amount of total labor employed, increasing workers' work hours can be done more quickly and easily than increasing the number of workers, in the Japanese context. Our findings suggest that the higher labor costs unaccompanied by technology change, such as the reform of the social insurance premium, could decrease employment when the firms have bleak business prospects even when current labor demands are stable. Policy makers may need to pay particular attention to not only the current labor demands but also business sentiment in order to avert the negative impacts on employment when they want to increase the social insurance burden.

7 Conclusion

In 2003, a total reward system was introduced for employees' pension insurance and health insurance in Japan. This reform increased the insurance premiums for bonuses from 2% to 21.87%, and decreased the premiums for monthly salary from 25.96% to 21.87%. The social insurance premium burden of some companies increased, while that of others decreased as a result of the reform. The different effects depending on the difference in bonus-to-salary ratio before the introduction of the total reward system allow us to measure the influence of the increased social insurance premium burden using a natural experiment.

This paper has provided new evidence on the possible effect of the 2003 social insurance premium reform on the firms' behavior related to labor demand using unique employer-employee matching data. As a result, many firms reduced the number of employees and increased average working hours, keeping total working hours unchanged. The same trend can be seen with samples of large-sized manufacturing firms and, in fact, we find that the trend is rather stronger for large-

sized manufacturing firms. An increase in average monthly salary associated with longer working hours is compensated with a decrease in the amount of the average bonuses. To address the challenges posed by the unexpected increase in labor costs, companies increased the average working hours of regular workers and the amount of monthly salary, and decreased the amount of bonuses.

In general, it is believed that firms can adjust the average work hours per capita or number of employees when the labor demand is reduced. However, our findings suggest that when the firms have bleak business prospects, a negative shock on costs could decrease employment even though the current labor demands are stable, especially in the period, sector, or country of strong norm consciousness with high employment security. Thus, policy makers may need to pay particular attention to not only the current labor demands but also business sentiment in order to avert negative impacts on employment when they want to increase the social insurance burden. Our finding of the effects of the 2003 reform on the behavior of firms raises an important implication to many developed countries plagued by the conflict between increasing burden of social insurance premiums and employment stability.

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Table 1: The premium rates in 2002 and 2003

	Before		Aftert	
	Bonus	Salary	Bonus	Salary
Welfare Insurance Premiums	1.00%	17.35%	13.58%	13.58%
Health Insurance Premiums	1.00%	8.50%	8.20%	8.20%
Child Benefits	0.00%	0.11%	0.09%	0.09%
Total	2.00%	25.96%	21.87%	21.87%

Note: Table 1 shows the social insurance premium before and after 2003.

Table 2: Descriptive Statistics

	(1) Unbalanced Panel	(2)	(3) Balanced Panel	(4)
Sample	All	All	Before	After
Year	2002 and 2004	2002 and 2004	2002	2004
Total Work Hours	24,023.40	59,418.61	60,375.38	58,461.85
	(65,372.95)	(115,399.24)	(114,193.28)	(116,591. 84)
Establishment Size	144.34	355.55	363.49	347.62
	(390.82)	(686.80)	(689.91)	(683.62)
Monthly Hours Worked	167.68	168.46	167.86	169.06
	(25.90)	(22.75)	(22.53)	(22.96)
Monthly Salary (100 yen)	2,853.67	3,222.26	3,202.17	3,242.34
	(1,042.29)	(1,114.24)	(1,095.19)	(1,132.68)
Bonus Amount (100 yen)	7,977.33	10,690.28	11,079.67	10,300.89
	(6,712.645)	(7,328.67)	(7,359.26)	(7,277.59)
Bonus-to-salary Ratio in Year *t*	2.47	3.02	3.15	2.88
	(1.54)	(1.46)	(1.45)	(1.46)
Bonus-to-salary Ratio in 2002 (Fixed)	2.52	3.15	3.15	3.15
	(1.56)	(1.45)	(1.45)	(1.45)
Bonus-to-salary Ratio during 1999-2002	2.60	3.23	3.23	3.23
	(1.54)	(1.40)	(1.40)	(1.40)
After	0.25	0.50	0.00	1. 00
	(0.43)	(0.50)	0.00	0.00
Fraction of Female Workers	0.35	0.31	0.31	0.30
	(0.27)	(0.24)	(0.24)	(0.24)
Potential Experience	21.70	21.12	20.88	21.35
	(7.35)	(6.15)	(6.25)	(6.04)
Tenure	11.60	13.39	13.16	13.63
	(6.07)	(5.90)	(5.87)	(5.91)
Part Ratio	0.13	0.09	0.09	0.10
	(0.23)	(0.19)	(0.19)	(0.20)
Junior-High School Graduates	0.09	0.07	0.08	0.06
	(0.16)	(0.12)	(0.13)	(0.12)
High School Graduates	0.54	0.51	0.52	0.51
	(0.29)	(0.28)	(0.28)	(0.29)
Two-year College Graduates	0.14	0.13	0.13	0.13
	(0.19)	(0.16)	(0.16)	(0.16)
University Graduates	0.23	0.29	0.28	0.30
	(0.25)	(0.26)	(0.26)	(0.27)
Firm Size	1,088.21	1,632.59	1,639.88	1,625.30
	(1,715.66)	(1,910.73)	(1,918.41)	(1,903.11)
Observations	67,671	16,392	8,196	8,196

Note: The observation units are establishments. The sample in Column (1) is used for Table 5, which is an unbalanced panel of 2002 and 2004. To compare the descriptive statistics change between 2002 and 2004 at the same establishments, Columns (3) and (4) report statistics before and after the reform.

Table 3: FE DID Estimation Results (2002 (Before) VS 2004 (After))

	(1) ln(Total Work Hours Within an Establishment)	(2) ln(Employment)	(3) ln(Work Hours Per Person)
After×Treatment$_{i(02)}$	-0.002	-0.009***	0.007***
	(0.003)	(0.003)	(0.001)
Year2004	-0.031***	-0.014	-0.015***
	(0.010)	(0.010)	(0.003)
Female	0.332**	0.585***	-0.195***
	(0.152)	(0.164)	(0.027)
Experience	0.008	0.017**	-0.006***
	(0.006)	(0.007)	(0.002)
Experience$^2/100$	-0.021	-0.038***	0.008*
	(0.013)	(0.014)	(0.005)
Tenure	-0.046***	-0.059***	0.010***
	(0.007)	(0.008)	(0.002)
Tenure$^2/100$	0.116***	0.150***	-0.025***
	(0.021)	(0.022)	(0.005)
High School Graduates	-0.029	-0.058	0.016
	(0.061)	(0.061)	(0.018)
Two-year College Graduates	-0.065	-0.117	0.006
	(0.073)	(0.075)	(0.023)
University Graduates	-0.236**	-0.234**	-0.019
	(0.094)	(0.096)	(0.023)
ln(Firm Size)	0.132***	-	-0.008***
	(0.015)		(0.002)
Industry Dummies	Yes	Yes	Yes
R-squared	0.088	0.065	0.043
N	59,027	59,027	59,027

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses. Bonus are taken from the same survey year, which means survey of year t uses bonus during the previous year.

Table 4: FE-DID Wage Regression Results (2002 (Before) VS 2004(After))

	(1) ln(Annual Bonus)	(2) ln(Monthly Salary)
After×Treatment$_{i(02)}$	-0.009*	0.007***
	(0.005)	(0.001)
Year2004	-0.096***	-0.027***
	(0.020)	(0.004)
Female	-0.841***	-0.628***
	(0.165)	(0.039)
Experience	0.003	0.015***
	(0.009)	(0.003)
Experience$^2/100$	-0.015	-0.029***
	(0.019)	(0.005)
Tenure	0.089***	0.025***
	(0.008)	(0.002)
Tenure$^2/100$	-0.154***	-0.029***
	(0.021)	(0.006)
High School Graduates	0.056	0.055***
	(0.082)	(0.021)
Two-year College Graduates	0.085	0.084***
	(0.100)	(0.026)
University Graduates	0.196**	0.153***
	(0.096)	(0.029)
ln(Firm Size)	0.053***	-0.001
	(0.013)	(0.003)
Industry Dummies	Yes	Yes
R-squared	0.167	0.321
N	54,911	59,027

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 5: FE DID Estimation Results (Treatment defined over 1999-2002)

	(1) ln(Total Work Hours Within an Establishment)	(2) ln(Employment)	(3) ln(Work Hours per Person)
After×Treatment$_{i(99-02)}$	-0.001	-0.009***	0.007***
	(0.003)	(0.003)	(0.001)
Year2004	-0.031***	-0.014	-0.016***
	(0.010)	(0.010)	(0.004)
Female	0.332**	0.585***	-0.195***
	(0.152)	(0.164)	(0.027)
Experience	0.008	0.017**	-0.006***
	(0.006)	(0.007)	(0.002)
Experience$^2/100$	-0.021	-0.038***	0.008*
	(0.013)	(0.014)	(0.005)
Tenure	-0.046***	-0.059***	0.010***
	(0.007)	(0.008)	(0.002)
Tenure$^2/100$	0.116***	0.150***	-0.025***
	(0.021)	(0.022)	(0.005)
High School Graduates	-0.029	-0.057	0.016
	(0.061)	(0.061)	(0.018)
Two-year College Graduates	-0.065	-0.116	0.005
	(0.073)	(0.075)	(0.023)
University Graduates	-0.236**	-0.234**	-0.019
	(0.094)	(0.096)	(0.023)
ln(Firm Size)	0.132***	-	-0.008***
	(0.015)		(0.002)
Industry Dummies	Yes	Yes	Yes
R-squared	0.088	0.065	0.042
N	67,671	67,671	67,671

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 6: FE DID Estimation Results (Period 1999-2002 (Before) VS 2004-2007 (After))

	(1) ln(Total Work Hours Within an Establishment)	(2) ln(Employment)	(3) ln(Work Hours Per Person)
After×Treatment$_{i(02)}$	-0.002	-0.010***	0.009***
	(0.002)	(0.002)	(0.001)
Year2000	0.003	-0.011***	0.014***
	(0.003)	(0.003)	(0.001)
Year2001	0.002	-0.006*	0.008***
	(0.003)	(0.003)	(0.001)
Year2002	-0.068***	-0.065***	-0.004***
	(0.004)	(0.004)	(0.001)
Year2004	-0.076***	-0.055***	-0.027***
	(0.008)	(0.009)	(0.002)
Year2005	-0.070***	-0.055***	-0.028***
	(0.008)	(0.009)	(0.002)
Year2006	-0.063***	-0.056***	-0.024***
	(0.008)	(0.009)	(0.002)
Year2007	-0.065***	-0.056***	-0.027***
	(0.009)	(0.009)	(0.003)
Female	0.231***	0.458***	-0.241***
	(0.056)	(0.059)	(0.010)
Experience	-0.001	0.007***	-0.006***
	(0.002)	(0.002)	(0.001)
Experience$^2/100$	0.003	-0.008*	0.007***
	(0.005)	(0.005)	(0.002)
Tenure	-0.039***	-0.052***	0.008***
	(0.003)	(0.003)	(0.001)
Tenure$^2/100$	0.080***	0.109***	-0.017***
	(0.008)	(0.008)	(0.002)
High School Graduates	-0.046**	-0.070***	0.006
	(0.020)	(0.021)	(0.007)
Two-year College Graduates	-0.109***	-0.132***	0.005
	(0.026)	(0.027)	(0.008)
University Graduates	-0.236***	-0.220***	-0.023***
	(0.036)	(0.037)	(0.009)
ln(Firm Size)	0.139***	-	-0.007***
	(0.006)		(0.001)
Industry Dummies	Yes	Yes	Yes
R-squared	0.097	0.064	0.053
N	119,750	119,750	119,750

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 7: FE DID Estimation Results (Placebo: 1999 VS 2001)

	(1) ln(Total Work Hours Within an Establishment)	(2) ln(Employment)	(3) ln(Work Hours Per Person)
After×Treatment$_{i(02)}$	0.001	0.001	-0.000
	(0.003)	(0.003)	(0.001)
Year2001	-0.033***	-0.042***	0.009**
	(0.011)	(0.011)	(0.004)
Female	0.625***	0.834***	-0.204***
	(0.155)	(0.163)	(0.022)
Experience	-0.014*	-0.007	-0.008***
	(0.007)	(0.008)	(0.002)
Experience$^2/100$	0.032**	0.022	0.009**
	(0.014)	(0.016)	(0.004)
Tenure	-0.015**	-0.030***	0.013***
	(0.007)	(0.008)	(0.002)
Tenure$^2/100$	0.016	0.052**	-0.027***
	(0.020)	(0.021)	(0.005)
High School Graduates	-0.134**	-0.156**	0.018
	(0.060)	(0.062)	(0.015)
Two-year College Graduates	-0.250***	-0.258***	0.007
	(0.073)	(0.076)	(0.018)
University Graduates	-0.425***	-0.429***	-0.015
	(0.092)	(0.095)	(0.019)
ln(Firm Size)	0.118***	-	-0.004**
	(0.010)		(0.002)
Industry Dummies	Yes	Yes	Yes
R-squared	0.083	0.073	0.046
N	64,810	64,810	64,810

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 8: FE DID Estimation Results (2002 (Before) VS 2004 (After))
(Panel A) Dependent Variable: ln(Total Work Hours within an Establishment)

Dependent Variable:	(1)	(2)	(3)	(4)
	Manufacturing		Non-manufacturing	
ln(Total Work Hours Within an Establishment)	Large Enterprises	Small and Medium-sized Enterprises	Large Enterprises	Small and Medium-sized Enterprises
After×Treatment$_{i(02)}$	-0.008	-0.001	0.010	0.009**
	(0.006)	(0.005)	(0.006)	(0.004)
Year2004	-0.034	-0.021	-0.086***	-0.032**
	(0.024)	(0.014)	(0.026)	(0.016)
Female	0.139	0.166	0.465	0.125
	(0.359)	(0.155)	(0.328)	(0.214)
Experience	0.035**	-0.010	0.003	0.008
	(0.017)	(0.009)	(0.015)	(0.009)
Experience$^2/100$	-0.108**	0.005	0.025	-0.027*
	(0.044)	(0.019)	(0.032)	(0.016)
Tenure	-0.068***	-0.023*	-0.031**	-0.032***
	(0.021)	(0.012)	(0.014)	(0.010)
Tenure$^2/100$	0.202***	0.054**	0.041	0.078**
	(0.063)	(0.026)	(0.041)	(0.033)
High School Graduates	-0.027	-0.002	-0.282	0.045
	(0.142)	(0.074)	(0.188)	(0.102)
Two-year College Graduates	0.028	-0.069	-0.303	0.049
	(0.151)	(0.098)	(0.215)	(0.116)
University Graduates	-0.082	-0.086	-0.533**	-0.105
	(0.154)	(0.135)	(0.246)	(0.137)
ln(Firm Size)	0.076***	0.299***	0.061*	0.225***
	(0.015)	(0.032)	(0.032)	(0.023)
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.083	0.240	0.071	0.122
N	5,812	13,470	16,319	23,426

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 8: (Panel B) Dependent Variable: ln(Employment)

Dependent Variable:	(1)	(2)	(3)	(4)
	Manufacturing		Non-manufacturing	
ln(Employment)	Large Enterprises	Small and Medium-sized Enterprises	Large Enterprises	Small and Medium-sized Enterprises
After×Treatment$_{i(02)}$	-0.015**	-0.004	0.003	0.000
	(0.006)	(0.006)	(0.006)	(0.004)
Year2004	-0.020	-0.015	-0.068***	-0.013
	(0.024)	(0.014)	(0.026)	(0.016)
Female	0.146	0.654***	0.681**	0.404*
	(0.369)	(0.190)	(0.333)	(0.234)
Experience	0.029	-0.007	0.013	0.012
	(0.020)	(0.009)	(0.015)	(0.011)
Experience$^2/100$	-0.086*	-0.001	0.005	-0.033*
	(0.049)	(0.022)	(0.032)	(0.019)
Tenure	-0.063***	-0.038***	-0.050***	-0.045***
	(0.023)	(0.014)	(0.014)	(0.011)
Tenure$^2/100$	0.182***	0.092***	0.088**	0.107***
	(0.068)	(0.028)	(0.040)	(0.035)
High School Graduates	-0.004	-0.044	-0.311*	0.038
	(0.143)	(0.089)	(0.177)	(0.100)
Two-year College Graduates	0.024	-0.115	-0.324	0.029
	(0.151)	(0.111)	(0.205)	(0.121)
University Graduates	-0.015	-0.031	-0.576**	-0.044
	(0.157)	(0.136)	(0.237)	(0.146)
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.089	0.086	0.091	0.054
N	5,812	13,470	16,319	23,426

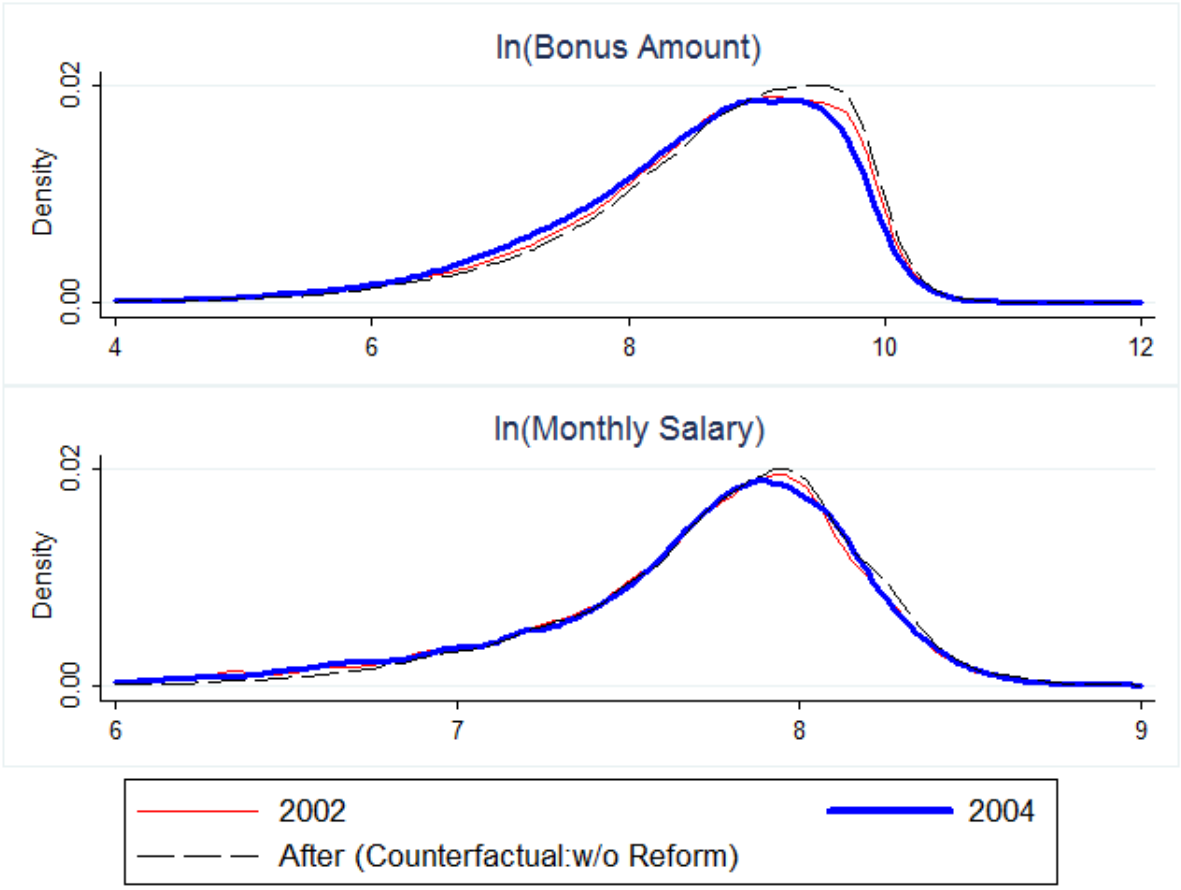
Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Table 8: (Panel C) Dependent Variable: ln(Work Hours per Person)

Dependent Variable:	(1)	(2)	(3)	(4)
	Manufacturing		Non-manufacturing	
ln(Work Hours per Person)	Large Enterprises	Small and Medium-sized Enterprises	Large Enterprises	Small and Medium-sized Enterprises
After×Treatment$_{i(02)}$	0.006***	0.003	0.007***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Year2004	-0.010	-0.008	-0.017**	-0.021***
	(0.008)	(0.007)	(0.007)	(0.006)
Female	-0.022	-0.228***	-0.209***	-0.201***
	(0.068)	(0.059)	(0.047)	(0.052)
Experience	0.003	-0.002	-0.010*	-0.006
	(0.006)	(0.004)	(0.005)	(0.004)
Experience$^2/100$	-0.017	0.002	0.019	0.007
	(0.013)	(0.007)	(0.014)	(0.008)
Tenure	-0.003	0.007*	0.019***	0.010***
	(0.005)	(0.004)	(0.004)	(0.004)
Tenure$^2/100$	0.012	-0.017*	-0.049***	-0.020**
	(0.012)	(0.010)	(0.013)	(0.009)
High School Graduates	-0.029	0.022	0.011	0.020
	(0.033)	(0.035)	(0.038)	(0.038)
Two-year College Graduates	-0.014	-0.001	0.003	0.005
	(0.040)	(0.042)	(0.044)	(0.052)
University Graduates	-0.069*	-0.094*	0.025	-0.019
	(0.038)	(0.051)	(0.042)	(0.057)
ln(Firm Size)	-0.001	0.007	0.001	-0.018**
	(0.005)	(0.010)	(0.006)	(0.009)
Industry Dummies	Yes	Yes	Yes	Yes
R-squared	0.030	0.032	0.067	0.049
N	5,812	13,470	16,319	23,426

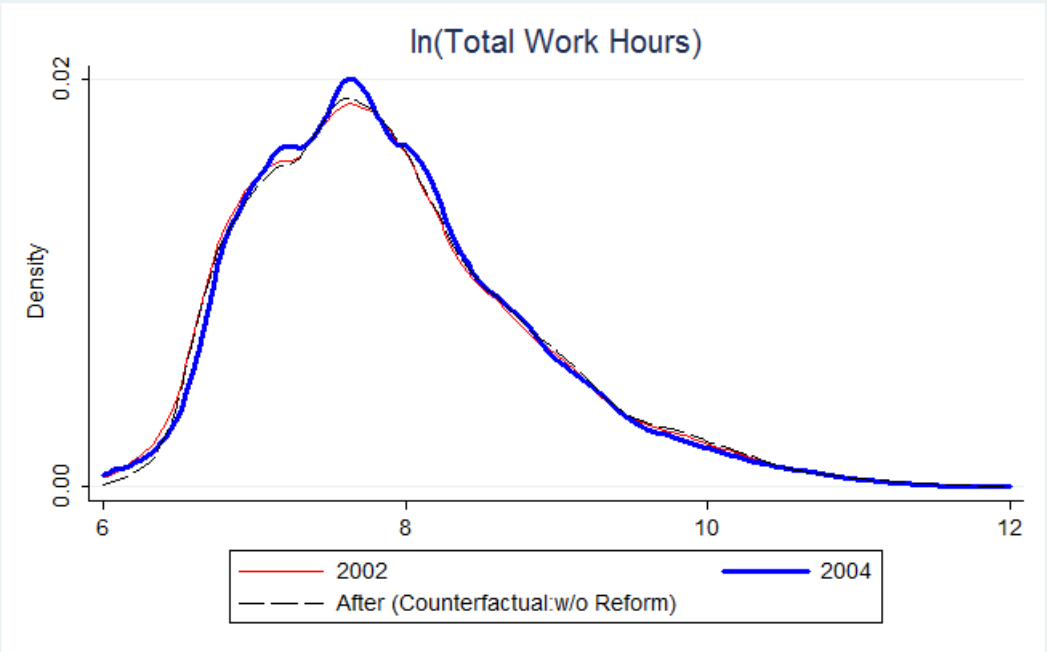
Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.

Figure 1: DFL Results for ln(Bonus) and ln(Monthly Salary)



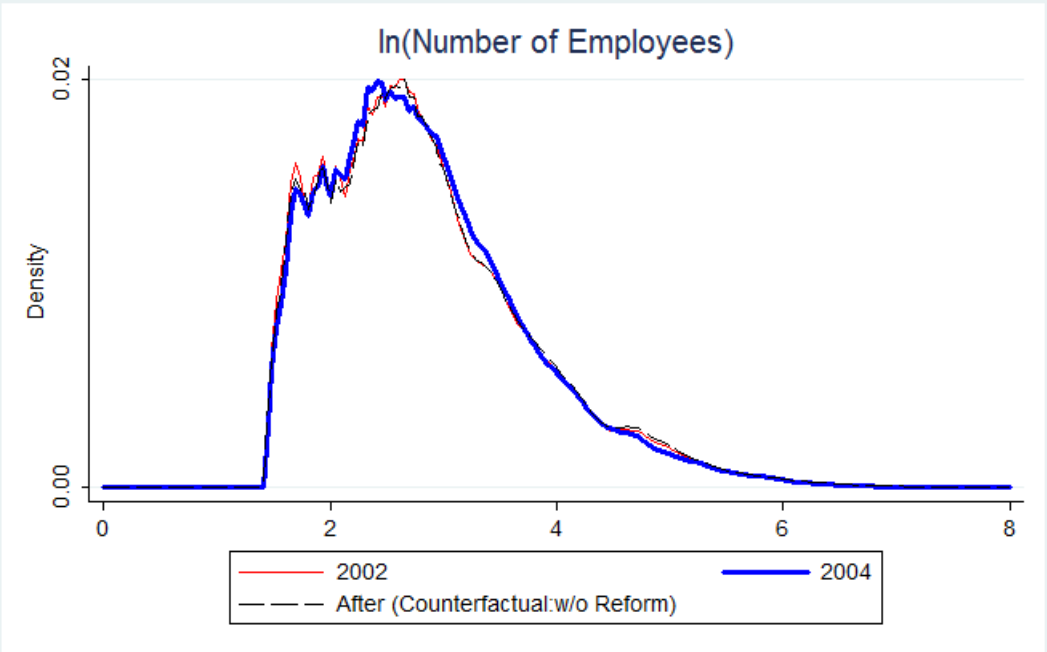
Note: The red line is the kernel density of the bonus amount in 2002, and the blue line is that in 2004. The counterfactual distribution represents a distribution that would have been realized if the 2003 reform had not occurred.

Figure 2: DFL Results for ln(Total Work Hours Within an Establishment)



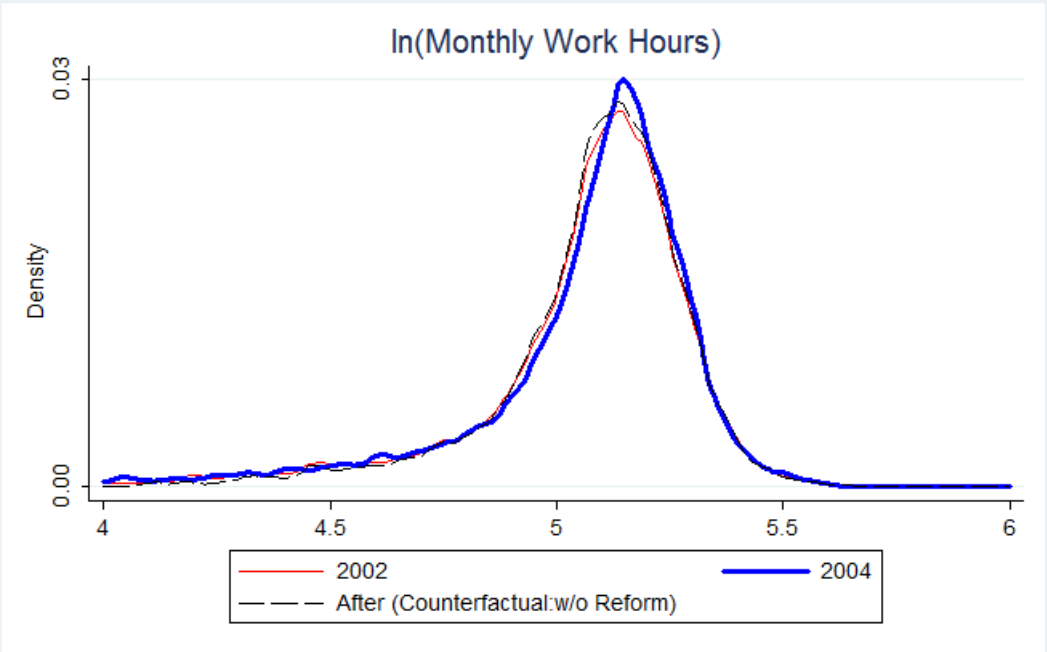
Note: The same note applies as Figure 1.

Figure 3: DFL Results for ln(Employment)



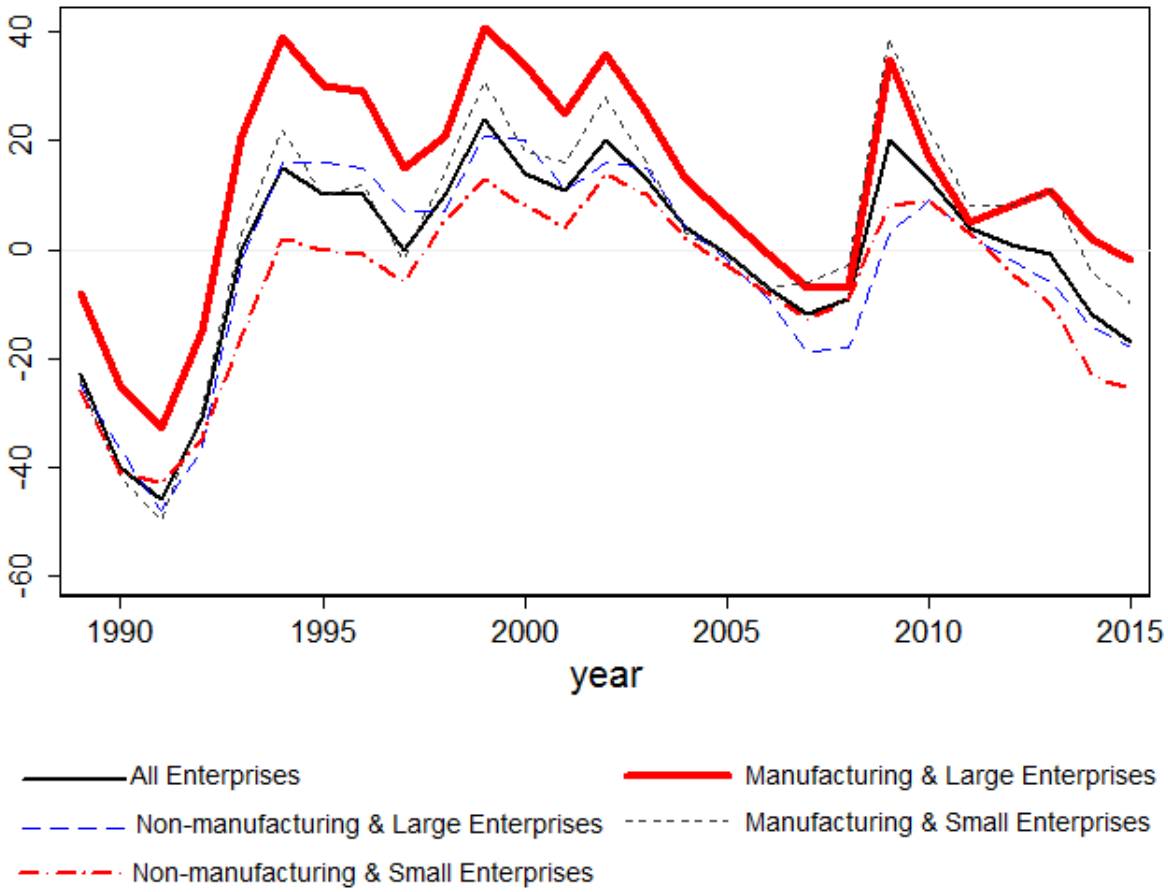
Note: The same note applies as Figure 1.

Figure 4: DFL Results for ln(Work Hours Per Person)



Note: The same note applies as Figure 1.

Figure 5: Diffusion Index on Employment



Note: This figure shows the diffusion index of "excessive employment" minus "insufficient employment," which is calculated from "Tankan" data provided by Bank of Japan. The definition of large enterprises as those with 1000 and more employees, and small enterprises as those with less than 300 employees in Tankan.

Appendix

Table A.1: FE DID Estimation Results (2002 (Before) VS 2004(After)): Bonus from Different Survey Year Used

	(1) ln(Total Work Hours Within an Establishment)	(2) ln(Employment)	(3) ln(Work Hours Per Person)	(4) ln(Annual Bonus)	(5) ln(Monthly Salary)
After×Treatment$_{i(02)}$	0.005	-0.002	0.007***	0.011***	-0.044***
	(0.003)	(0.003)	(0.001)	(0.002)	(0.009)
Year2004	-0.053***	-0.036***	-0.016***	-0.038***	0.088**
	(0.012)	(0.012)	(0.004)	(0.006)	(0.034)
Female	0.397*	0.547**	-0.168***	-0.634***	-0.491**
	(0.207)	(0.216)	(0.035)	(0.051)	(0.202)
Experience	0.005	0.012	-0.007**	0.014***	-0.000
	(0.008)	(0.008)	(0.003)	(0.003)	(0.013)
Experience$^2/100$	-0.012	-0.022	0.009	-0.025***	-0.011
	(0.015)	(0.014)	(0.006)	(0.006)	(0.030)
Tenure	-0.039***	-0.049***	0.010***	0.024***	-0.016
	(0.009)	(0.009)	(0.002)	(0.003)	(0.012)
Tenure$^2/100$	0.088***	0.109***	-0.022***	-0.022***	0.084***
	(0.025)	(0.025)	(0.006)	(0.007)	(0.032)
High School Graduates	-0.155**	-0.187**	0.029	0.076***	-0.024
	(0.079)	(0.073)	(0.023)	(0.025)	(0.123)
Two-year College Graduates	-0.194**	-0.216**	0.022	0.118***	0.081
	(0.095)	(0.090)	(0.028)	(0.029)	(0.155)
University Graduates	-0.333***	-0.362***	0.024	0.211***	0.165
	(0.116)	(0.113)	(0.027)	(0.034)	(0.148)
ln(Firm Size)	0.141***	0.154***	-0.013***	-0.003	0.017
	(0.019)	(0.019)	(0.003)	(0.004)	(0.021)
R-squared	0.107	0.135	0.048	0.347	0.061
N	34,678	34,678	34,678	34,678	29,805

Note: * p<0.10, ** p<0.05, *** p<0.01. FE stands for the fixed effects model. Standard errors clustered at establishment level are in parentheses.