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Labor Market Impacts of Expanded Employee Social Insurance Coverage in Japan

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Abstract

As the Japanese population ages and the number of non-regular workers continue to grow, maintaining the social insurance system has become an integral challenge for alleviating poverty. This paper examines the impact of the recent employee social insurance reform in October 2016, which extended benefits to a portion of non-regular workers. Utilizing basic and special tabulations from the monthly Labor Force Survey, we construct a longitudinal panel which covers the period 2013 to 2017, both before and after the reform. Utilizing this panel, we are able to track individuals from a nationally representative sample of households across Japan and perform a difference in difference analysis to determine the impacts of the expansion policy on the work hours of individuals. We find that the reform has positive effects with respect to age and gender, and the working hours of the following groups increased following the reform: young, prime and elderly males, as well as prime and elderly females, dependent housewives and also the single sole-heads of household. We conclude that the expansion of coverage can incentivize labor force participation for such workers even in spite of increasing the social insurance premiums of certain workers, i.e., dependent housewives, while decreasing that of single sole-head of households by reducing their social insurance premiums. In light of these competing incentives on the labor force, it may be necessary to reconsider changes to the employee social insurance premiums in order to avoid potential distorting effects on the labor market.

JEL Classification Codes: H55, J26, J32

Key words: aging, pension, social insurance, expansion of coverage, non-regular workers

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1. Introduction

Japan represents one of the oldest populations in the world. This has made sustainability a major challenge as significant pressure has been placed in recent years on the financing of benefits to the elderly through the social security system.

Historically, it has been compulsory for regular employees of private companies to contribute to both their employees' pension insurance (EPI, *Kosei Nenkin*) and employees' health insurance (EHI, *Kenko Hoken*), collectively this is Japan's employee social insurance (ESI) program. However, as the share of non-regular employment has increased, their lack of employee social insurance support has become a growing concern. For example, one third of the participants in the National Pension Insurance (NPI, *Kokumin Nekin*) program are non-regular workers whom are not covered by employee social insurance programs (MHLW 2019a; 10). As a result, such workers bear the entire cost of their insurance premiums while receiving a lesser benefit compared to workers enrolled in ESI. With these workers in mind, the government has taken incremental steps at reforming its social insurance programs to include these non-regular workers (Nomura 2019), as we will see in the next section.

There has been a large body of literature examining the labor market impacts of such social insurance policy reforms. Such reforms typically affect labor costs and contribute through the demand-side of the labor market or through labor supply (i.e., changes in income, worker's taxable status, and so on). This paper investigates both labor and demand side effects of the recent employee social insurance expansion (*Tekiyou Kakudai*) in 2016. This policy expanded coverage by requiring large firms that employ non-regular workers to begin contributing to the worker premiums. As of October 2016, coverage of employee social insurance increased to cover some 250,000 more non-regular workers.

This paper utilizes the Labor Force Survey (*Rodoryoku Chousa,* LFS) administered by the Ministry of Internal Affairs and Communications of Japan to construct a panel data set. We perform a difference-in-difference analysis in order to determine outcomes on the hours worked by these newly covered employees.

We uncover positive effects on all genders and age groups including housewives who were potentially classified as “No.3 insured” (No.3, *Dai 3 gou hihokensha*) after the reform.

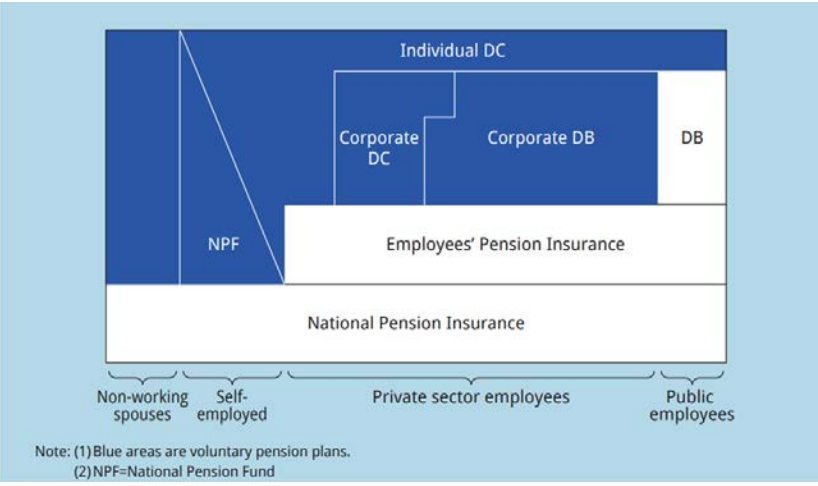
The results in this paper are from research conducted between 2019-2020 for the Economic and Social Research Institute (ESRI) for International Collaboration Project. This paper is organized as follows: in the next section, we describe the institutional background of employee social insurances, and in section 3, we discuss related literature and clarify issues that have not yet been uncovered. Section 4 describe the data set, and in section 5, we present our empirical framework based on a difference-in-difference strategy. In section 6 and 7, we show the results of our descriptive and econometric analysis respectively. Section 8 presents our concluding remarks.

2. Institutional Background

2.1 Pension System of Japan

The Japan pension system is composed of both a public pension system and a private-sector system, **Figure 1** (MHLW, Nomura 2019). The former system is part of the nation’s social security system and contains NPI and the EPI. Moreover, all resident’s participation in NPI is mandatory. While the NPI is a flat-rate portion that covers everybody, the EPI is an income related portion which covers employees.

Figure 1: Japan’s Pension System



Source: Ministry of Health, Labour & Welfare, Nomura Institute of Capital markets Research (2019)

Within the private pension plans there are sub-categories known as the defined benefit (DB) type and also a defined contribution (DC) type. Because these private pension plans are voluntary, employers are not mandated to offer them. Furthermore, all public employees are covered by DB plans.

National Pension Funds (NPFs) and individual DC plans are individual pension plans while NPFs are for the self-employed and individual DC plans are for most of the working-age population, including non-working spouses. Eligible individuals can join at their discretion.

2.2 Achieving Universal Coverage

Through a series of gradual reforms, Japan eventually achieved universal coverage of its pension system with reforms in 1985/1986 (Takayama 2002). This was accomplished by gradually introducing the above pension plans, which were modeled on the workplace insurance systems at the time. The mandatory pension plan for private company workers was introduced in 1942 and this is what is now called EPI. The pension plan for government employees and private school teachers was then established in the 1950s. By 1961, the NPI for the self-employed was introduced. At this point all workers were theoretically covered. However, the system as a whole was fragmented into different pension plans and not integrated.

Because of this, the Basic Pension system was implemented by 1986, the NPI was rebranded as the Basic Pension which included part of EPI and with it a requirement for non-working spouses to join this system (Takayama 2002). Thus, it assured that all individuals of the households regardless of their working status were covered by a common system.

2.3 Policy Reforms to the Pension System

The advancement of ageing in Japan has exceeded what was originally projected. Simultaneously, there has been a drop in the number of regular workers which has coincided with an increase in the ratio of non-regular employees, from roughly 16.4% in 1985 to approximately 38% by 2014 (MHLW 2017). As

these non-regular workers now support a significant share of Japan's labor force, they are more likely to encounter job insecurity, receive a lower average wage, are less likely to receive on-the-job training in comparison to regular workers, and are at greater risk of remaining below the poverty line (Takahashi 2015).

Because of this, policy reforms have been necessary to sustain continued funding of the pension system and in more recent years, to expand benefits to the non-regular workforce. Historically, policy has been focused on increasing the retirement age, increasing the employer's contribution, increasing the premium itself, or creating alternative sources of funding. Below are some key policy reforms.

In 2001, Japan decided to raise the retirement age from 60 to 65. This is a strategy which has been adopted by a number of developed countries. To give people sufficient time to prepare, the retirement age changes must be introduced gradually over a long period of time. The current increase is set to continue at a staggered pace, reaching 65 in 2025 for men and 2030 for women.

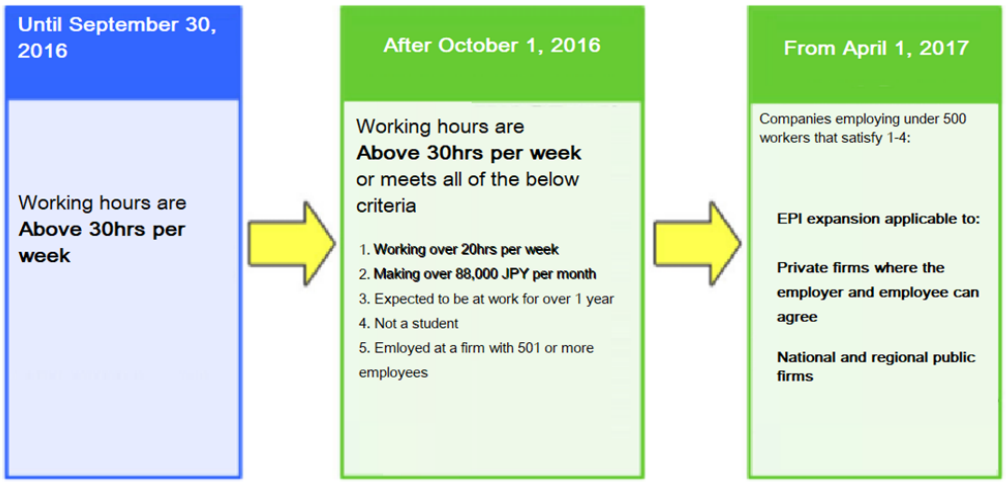
In 2003, the Ministry of Health, Labour and Welfare (MHLW) changed the standard for calculation of the social insurance premium-to-salary ratio to a "total reward" system with the aim of rectifying the imbalance between monthly-salary and bonuses. Effectively, this reform changed the rate of the total insurance premiums on bonuses from roughly 2% to 22%, and that on the monthly salary from roughly 26% to 22% (Kodama and Yokoyama 2018). This created higher insurance costs for firms with a higher bonus-to-salary ratio provided they paid exactly the same amount in annual earnings.

In 2004, a comprehensive reform to public pension took place which raised the premiums gradually, between 2005 and 2017, from roughly 13.5% to 18%. This policy also allocated financing half of Basic Pension income from government revenues and in 2012, Japan decided to raise its consumption tax, first from 5% to 8% and then eventually to 10%. The additional revenue generated has been contributing to the social security system. The consumption tax rate was raised to 8% in April 2014, and the most recent increase to 10% occurred in October 2019 (Kodama and Yokoyama 2018).

In October 2016, EPI was expanded to cover non-regular workers working between 20-30hrs with the aim of making firms that employ part-time workers contribute to EPI because the percentage of such workers has steadily grown (Nomura 2019).

As mentioned in Figure 1, until October 2016 a large portion of such workers were treated the same as self-employed individuals in that they paid their entire pension contribution. It is important to note that the conditions for EPI coverage are the same as the employees' health insurance (EHI) coverage. Because of the joint requirement for EPI and EHI, this paper refers collectively to the coverage of these plans as the employee social insurance plan (ESI). The following **Figure 2** outlines the policy agenda:

Figure 2: Changes in ESI Qualifications



Source: Public Relations Office of the Government of Japan (2017)

The new ESI policy covers all workers who work 1) at least 20hrs per week, 2) make at least 88,000 JPY monthly, 3) have been employed for at least 1 year, 4) who are not students, and 5) who work in firms of 500+ employees must be enrolled into ESI, with private firms under 500+ potentially paying contributions after April 2017.

A critical point is that this newly covered group will experience both premium burdens and benefits, the degree to which depends on their family structure and working style. This is illustrated in the following

Table 1: Changes in Pension Insurance Contributions (JPY Monthly)

Part-time working type	Pre	Post
Single	Worker: 10,500	Worker: 8,000 Employer: 8,000
Wife of a full-time company employee	None	Worker: 8,000 Employer: 8,000

Source: MHLW (2012)
Note: Model case using 100,000 JPY monthly salary

In this model case, a single part time worker with a monthly income of 100,000 JPY, half of their pension burden is transferred to their employer as a result of switching to ESI. This incentivizes such workers' contribution to the labor supply while it creates an additional labor cost for their employers.

In contrast, in the same model case, a part-time housewife who has a full-time working husband, defined as a No.2 insured (No.2, *Dai 2 gou hihokensha*) incurs a new premium in addition to her employer. This is because, as a No.3 dependent of her husband, she had no premium burden. Moreover, company family allowances of such insured husbands are often tied to their wife's No.3 status, which are also lost upon entering the ESI system (IPSS 2011).

As for the health insurance premiums, as shown in the following **Table 2**, for single mothers and sole-heads of household, their health insurance premiums become reduced by the ESI expansion. On the other hand, the health insurance premiums for a self-employed individual's housewife increase to about 900 JPY a month.

Table 2: Changes in Health Insurance Contributions (JPY Annually)

Household	Pre	Post
Single Head	72,337	64, 739 (Decreased by 600 monthly)
Single Mother	66, 208	64, 739 (Decreased by 100 monthly)
Wife of Self-Employed Worker	54, 144	64, 739 (Increased by 900 monthly)

Source: MHLW (2012)
Note: Model case using 100,000 JPY monthly salary. An estimated 65,000 JPY injury/illness (*Shōbyō teate*) and 21,000 JPY are maternity leave *Shussan teate*) allowances.

Japan has had an overall downward trend in the number of hours worked in recent years (Kawaguchi & Mori 2019) and it has been noted that even before the 2016 reform a large majority of firms were aware of the 1.3mil JPY ceiling for ESI. This means that firms targeted by the expansion may reduce the hours of their workers as a result. Particularly for the No.3 females (who constitute a large proportion of the part-time workforce) who had been earning between 1.06M and 1.3M JPY (approximately 88k to 130k monthly), these limits are known colloquially as the "wall." That is, unless a wife can earn enough income through part-time work to absorb the subsequent income taxes and/or forgo spousal benefits, it makes little sense to increase her working hours.

Table 3 represents a breakdown of the pension contributions by dependent status. The legal requirements for the No.3 status are of prime concern and details on how this paper defines this group will be discussed in the data section.

Table 3: Pension Contributions by Dependent Status

Dependent Status	Qualifying Individuals	Premium
No.1 Insured	Self-employed, Farmer and their family members, Students, Unemployed,	The insured person is the head of the household / spouse who is obliged to pay the insurance premiums together.
No.2 Insured	Private/public employees enrolled in Public Pension	Calculated by multiplying the monthly salary (standard monthly salary) and bonus (standard bonus) by a common premium rate, and the employer and the insured bear half each.
No.3 Insured	A dependent of a No.2 Insured Person	No requirement to pay (paid out via the spouse's pension system)

Source: MHLW (2019b)

3. Related literature and research question

As this paper examines the relationship between labor costs (the new employees' social insurance burden for the employer-side) and workers (a change in working hours for the employee-side) it follows a wide body of related literature. Particularly in the case of insurance contributions, while related studies have focused on different outcome variables, there is ample empirical evidence that increased labor costs are associated with reduced wages, reduced working hours and displacement effects for the employees.

As for wage reductions, Komamura and Yamada (2004) analyzed the incidence of the employers' contribution rates to health insurance and long-term care insurance. They used panel data from the individual health insurance societies (*Kenkou Hoken Kumiai Rengoukai*) throughout Japan from 1995 to 2001 and concluded that a majority of the employer's contributions resulted in wage reductions.

In the case of a specific group, 40+ aged males, Sakai and Kazekami (2007) utilized a difference-in-difference estimate using the Basic Survey on Wage Structure (*Chingin Kousei Kihon Toukei Chousa*, BSWS) and found a decrease in this group's wages after the introduction of Long Term Care Insurance.

Another case of a specific group, married women, was studied by Akabayashi. In line with prior research by Hausman (1980) and Hausman et al. (1985) on the relationship between taxation and the labor supply, Akabayashi uses cross-sectional data to estimate the effect on the labor supply of No.3 Insured housewives based on a linear budget constraint imposed by taxation and the social security system, concluding that there is a greater negative supply effect from these females in response to their premium costs than to their tax rates.

Iwamoto (2008)'s reappraisal[1] of Tachibana and Yokoyama's 2007 paper which used data from the Labor Force Survey and Yearbook of Social Security (*Shakai Hoken Toukei*, YSS*)* concluded that ESI contributions resulted in decreased wages for employees.

As for displacement effects, Miyazato and Ogura (2010) used micro wage data from the Employee Status Survey (*Shuugyou Kousei Kihon Chousa*, ESS) and insurance data and found no statistically significant negative effect on regular workers wage rates, but instead found negative effects on relative wage rates of regular workers to those of irregular workers, concluding that the employer's costs result in a substitution of regular workers for irregular workers.

Similar to this study but focusing on an earlier reform, Kodama and Yokoyama (2018) finds firms reduced employment after the "total coverage" pension reform of 2003. He conducts a difference-in-difference analysis, fixed effects model and a DiNardo-Fortin-Lemieux decomposition using the BSWS, utilizing variations in labor cost increases due to the 2003 reform. He concludes that those firms create longer working hours in response to an exogenous increase in labor costs without productivity gains.

Another detailed analysis of work hour reduction has been done by Kawaguchi & Mori (2019), who found negative but heterogeneous effects from minimum wage hikes on hours worked. Both the empirical study and results are closely related to this paper in that a panel data set is constructed from the LFS, work hours are treated as the dependent variable, a common trend is checked between groups, and

[1] Although the original study found no statistically significant effect, Iwamoto modified the empirical strategy by 1) using the monthly wage/work hour data from the LFS instead of the annual reports used in the original paper that potentially bias the employer's contribution rate upwards and 2) excluded observations from the YSS in the mining/real estate industries to remove short-term wage fluctuations due to sampling errors.

heterogeneous effects were discovered as they conclude that while effects vary between education and sex, there is a negative effect on hours worked.

As a relatively new reform, it remains to be seen what long term effects the employees' social insurance expansion will have on the labor force. For example, currently discussions have been held as to whether the requirement on the scale of the company's workforce should be eliminated because it would be irrational to treat employees differently in terms of pension coverage due to the size of their companies.

Considering these previous studies, it is expected that ESI expansion will also have heterogeneous effects across gender and age. In Japan, the number of empirical studies on both the minimum wage and pensionable age are numerous, but this particular reform has not been studied. Thus, this research aims to add new knowledge with an analysis of the effect of the 2016 expansion.

4. Data set

This paper utilizes micro data from the Labor Force Survey, which is conducted by the Statistics Bureau each month. Samples are randomly selected from about 40,000 households using a geographically stratified sample; the survey has a rotating, nationally representative sample structure where individual households are surveyed 4 times over a 2 year period: consecutively in the first 2 months, then consecutively again in the same 2 months of the second year. Additionally, during the last Basic Survey (*Kiso Chousei*) an additional survey known as the Special Survey (*Tokutei Chousei*) is administered which records additional variables such as education level and annual income through an additional set of questions. Individual households can be surveyed up to 4 times (with the Special Survey administered simultaneously alongside the final Basic Survey).

Individual respondents surveyed in different months are tracked using the following identifier variables: 1) Survey District ID 2) Birth Year, 3) Birth Month, 4) Sex, 5) Household Category 6) Marital Status and 7) Relationship to Head of Household to generate a unique personal identifier (hereafter, PIDs).

In order to add the additional variables recorded in the Special Survey, these PIDs were matched to their corresponding key identifying variables found in the Special Survey. These additional variables included important variables such as education and annual income.

Next, duplicate PIDs were checked. The average number of distinct PIDs in a given month is 15,000 for the Basic Survey whereas duplicate PIDs constituted, on average, about 0.2~0.3% in each month. These observations were dropped. There were roughly 0.01% of cases within the overall sample that contained PIDs which were observed over 4 times, these PIDs were also dropped.

The dataset used in our analysis contains approximately 85,000 individual observations from 2013-2017 (**Table 4**) when making use of only the Basic Survey data and roughly 70,200 observations when making use of the additional variables in the Special Survey. January 2013 – September 2016 is defined as before the reform, and October 2016–March 2017 as after the reform. As mentioned earlier, owing to a potential expansion of smaller sized firms in April 2017, the observation period has been limited to March 2017.

The dependent variable is set as the natural log of weekly hours worked and included covariates such as age.

The sample has been limited to the following in the pre-reform period: 1) 20-29hr weekly work hours (assuring that such workers were previously under the 30hr requirement) and 2) potentially eligible workers. Eligibility is defined as the following: firms over 500 workers, over 88,000 JPY in monthly wages, “Mainly working” or “Working/housework”, and neither of: “No income, going to school, in school, self-employed, family business, side-job, director, public official, ” nor “teacher”.

Because exact wage data is not included in the LFS, 2 indicators are used as proxies to check the ESI income requirement:

The first is a variable called the minimum possible monthly wage, which is constructed by using prefectural-level minimum wage data (MHLW 2017) in combination with weekly, daily and monthly work hour variables from the Basic Survey:

$$Min.PossibleWage(Mnth) = \frac{HrsWorked(Wk)}{DaysWorked(Wk)} \times Min.Wage(hr) \times DaysWorked(Mnth)$$

As shown in the above equation, the minimum possible monthly wage is calculated by first dividing the number of hours worked during the last seven days of the month by the number of days worked in that same period, then multiplying this value with the hourly minimum wage rate applicable to the individual's prefecture. Multiplying this value with the number of days worked during the current month gives the minimum possible wages for a PID in a given month. A minimum value of 88,000 JPY for this variable is set as the first income check.

As for the second indicator, because the annual wage recorded in the Special surveys do not make finer distinctions between 1mil and 1.06mil and instead are categorized in 12 tiers: i) No Income, ii) Under 0.5, iii) 0.5-0.99, iv) 1-1.49, v) 1.5-1.99,vi) 2-2.99, vii) 3-3.99, viii) 4-4.99, ix) 5-6.99, x) 7-9.99, xi) 10-14.99 and xii) Over 15 million JPY, a minimum value of 4 for this variable is set as the second income check.

From this sample, the treatment and control group are adjusted such that they differ only by firm size and wages: The control group consists of either sub-500 firm sizes or sub-88k monthly wages or sub-1mil annual wages while the treatment group is defined as 500+ and 88k+ and 1mil+, respectively.

Because work hour reductions have been shown to have heterogeneous effects (Kawaguchi & Mori 2019) on individuals, due in large part to the demographic composition of the non-regular workforce, the sample is divided into sex/age groups to isolate any potential differences. Recall from Table 3 that holders of the beneficial No.3 Insured status will have a higher take-home pay if they are not obliged to enroll in ESI whereas workers already paying premiums under the No.2 Insured status will see a reduction in their burden as it shifts to their employer. The former represents a worker with negative inducements to work while the latter represents a worker with a positive inducement. Moreover, because the regular workforce is, to date, overwhelmingly male, the irregular workforce remains predominately comprised of females in these prime age groups.

Dummy variables are thus created for age and sex. Namely, the sample is divided into 3 groups: young (aged 19-24), prime (aged 25-59), and old (aged 60-64). Because the control and sample are limited to those non-regular workers with below 30hr work weeks, the prime aged female group comprises a majority of the observations. Currently prime aged males comprise the majority of Japan's full-time workforce and thus are not applicable to this reform.

However, even across these groups there may be heterogeneous effects in that there will be both individuals who want and who do not want to increase their own work hours. In other words, the ESI expansion increases the burden on some of these workers while decreasing it for others with respect to their take-home earnings. As mentioned in the Table 3, there are 3 insurance statuses, and depending on the individual's status, the ESI expansion may reduce, rather than increase their effective take-home earnings. For this reason, additional groups are created for housewives with No.3 dependent status as well as for single part time workers.

As for No.3 status, these individuals may seek to reduce their work hours to avoid their pension costs. However, because No.3 status requires a spouse with No.2 status, it is not possible to directly confirm this requirement using the LFS data. As an indicator of this status, No.3 status has been defined based on the legal requirements (See section 2): i) those who were between ages 20-59, ii) were married, iii) designated a spouse as the household head, iv) made annual wages under 1.49m and v) held a minimum monthly wage under 108k.

As for single part timers, as the primary income earner with no no.2 support, ESI expansion serves to reduce their insurance burden (See section 2), so they would likely not want to decrease their work hours. This group is thus defined as ages i) 20-59, ii) single head of household, iii) unmarried and iv) "would not like to reduce work hours".

Table 4 lists the descriptive statistics for the key variables, hours worked (log), weekly/daily/monthly work hours, age, minimum wage and minimum monthly wage info.

Table 4: Descriptive Statistics of Sample

Variable	Mean	Std. Dev.	Min.	Max.
Working hours (log)	3.15	.16	.69	4.78
Hours Worked (per Week)	23.67	4.13	0	120
Days Worked (per Week)	4.36	.94	0	7
Days Worked (per Month)	18.15	4.04	0	31
Age	47.53	11.76	19	66
Min. wage (per hour)	753.52	67.83	652	932
Min. possible wage (per month)	75,357	20,779	1,572	333,017
Observations	85,536			

Variable (Basic+Special)	Mean	Std. Dev.	Min.	Max.
Working hours (log)	3.15	.16	.69	4.62
Hours Worked (per Week)	23.67	4.09	0	102
Days Worked (per Week)	4.37	.94	0	7
Days Worked (per Month)	18.19	4.01	0	31
Age	47	11.53	19	66
Min. wage (per hour)	752	67.20	652	932
Min. possible wage (per month)	75,094	20,471	1,572	302,742
Observations	70,274			

The average work hours are 24 per week, and amongst firms who are exposed to the reform, larger firms of 1000+ workers comprise a majority. Due to the rotation sampling of the LFS, any unique ID may be observed up to 4 times. Because not all individuals are surveyed an equal amount of times, this results in an unbalanced panel.

5. Empirical Frame Work

To evaluate the effects of the ESI reform on individuals working hours, the following standard fixed-effect difference in difference model is used:

$$y_{it} = \alpha + \beta_1 After_{it} Treatment_i + \beta_2 After_{it} + \beta_3 Treatment_i + \beta_4 X_{it} + M_t + F_i + \mu_{it} \quad \textbf{(1)}$$

y_{it} represents outcomes for individual i in month t, here natural logarithm of weekly hours worked is used. $After_{it}$ is a dummy variable taking one for months after October 2016 and zero for months before October 2016. Periods before October 2016 are treated as the "before" period and the period after October 2016 is treated as the "after" period. $Treatment_i$ represents being in the treatment group for an individual$_i$.

$After_{it} \cdot Treatment_i$ is the interaction term with the $After_{it}$ dummy variable and $Treatment_i$. $\boldsymbol{\beta}_1$ is the estimated coefficient of $After_{it} \cdot Treatment_i$ and is of prime interest: a significant coefficient will indicate that the 2016 reform has had an impact on working hours. X_{it} includes covariates; here we use the individual characteristics of age and gender. M_t and F_i control for interaction effects common to all individuals, M_t are monthly effects, F_i are fixed-effects, and μ_{it} represents error terms in the estimation

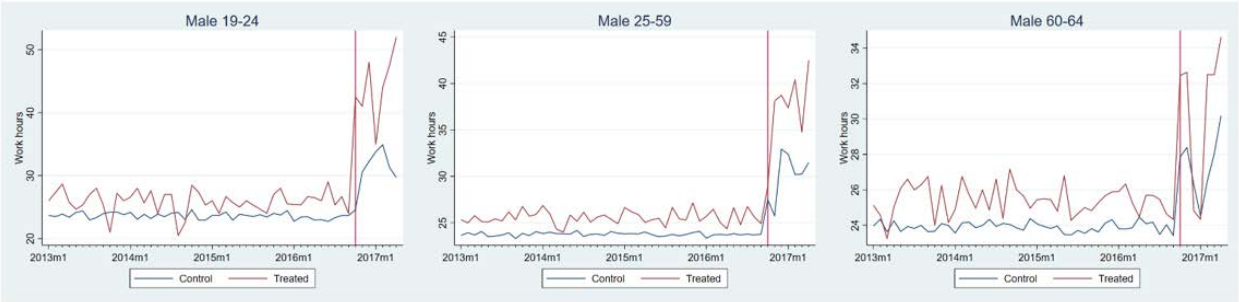
As mentioned in the previous section, however, in addition to age and gender, $After_{it} \cdot Treatment_i$ is expected to have heterogeneous effects due to the interaction of individuals who adjust their own work hours with employers who adjust their workers hours due to the ESI expansion. For this reason additional groups are created for housewives with No.3 dependent status as well as for single part time workers, the definitions of which have been covered in the data section.

6. Descriptive Analysis

To begin, we examine the time-series of mean weekly working hours for the treatment/control groups by gender and age as well as their distribution of working hours.

For males (**Figure 3**), there is an average difference of 2~3hrs. among the control group and treatment group, although the treatment groups have on average higher working hours leading up to the reform month, afterwards the there is a sharp increase across all groups. While there is a slight decline in the months following the reform (January-February 2017), all age groups rapidly increase their work hours with the treated groups experiencing the largest increase.

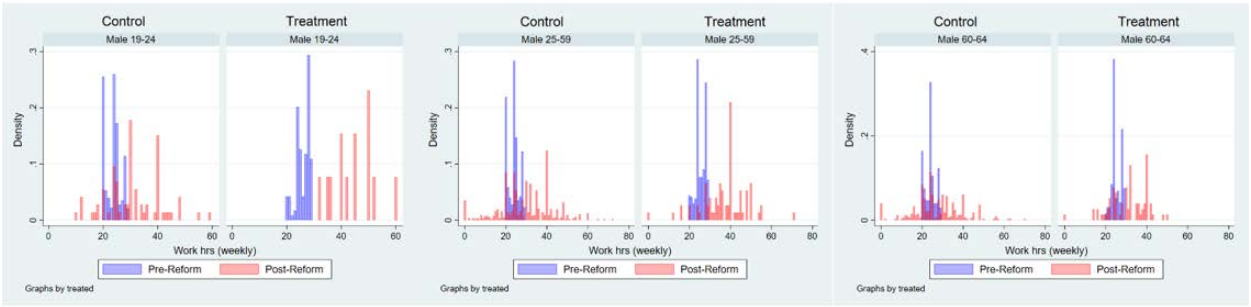
Figure 3: Trends in Work Hours (Male)



Note: Observations (19-24) 1,449, (25-59) 7,477, (60-64) 5,788

It is instructive to look not only at the trends in time for the control and treatment groups, but also the distribution of working hours (**Figure 4**). For the prime and elderly males, after the reform the distribution of workers in the median range for the treatment group becomes more varied and condensed in the mid to high end of the distribution while the control group has relatively an even distribution across all bins. The younger males sample size shows a more extreme distribution in the upper bins, post reform, while a majority of the control group is over 25hrs, the treated group maintain almost all individuals over 25hrs.

Figure 4: Trends in Work Hour Distribution (Male)



Note: Observations (19-24) 1,449, (25-59) 7,477, (60-64) 5,788

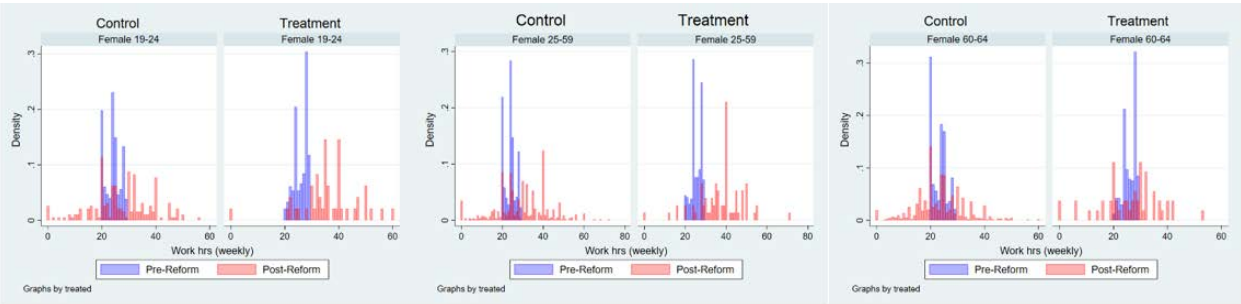
As for the female trends, there is a similar overall trend in increased working hours after the reform (**Figure 5**). In the prime aged female group it is noticeable that the control and treatment groups have the largest difference in working hours of about 4.5hrs, which may be indicative of a greater proportion of dependent part time workers in this control group than others whom experience the negative inducements of ESI mentioned in the previous section.

Figure 5: Trends in Work Hours (Female)

Note: Observations (19-24) 2,066, (25-59) 57,476, (60-64) 10,987

For the female's distribution (**Figure 6**), it is notable that all treatment groups underwent a greater change in distribution than the males, with the younger females working in the highest distribution after the reform, while the prime and older females maintained their distributions more evenly around the median bin of 40hrs.

Figure 6: Trends in Work Hour Distribution (Female)

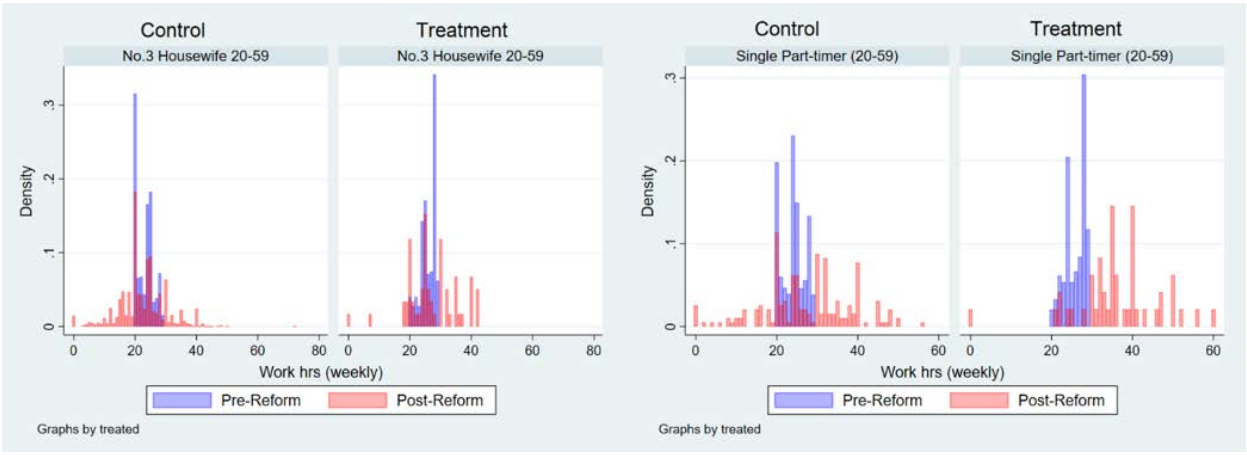


Note: Observations (19-24) 2,066, (25-59) 57,476, (60-64) 10,987

As the prime female group contains a large portion of the No.3 Insured dependents, it will be necessary to investigate whether this cross section experienced a different change in distribution of working hours in the last figure (**Figure 7**). Here we examine the No.3s and single workers. For the No.3s, there is a clear difference in the distributional changes of work hours when comparing them to the prime female group in the previous figure. In contrast, the treatment group does not exceed the median bin of 40hrs and covers the lower half of the distribution. Contrary to the No.3s, the Single part-timer

treatment group experienced an extreme shift to the highest distribution (over 40hrs) after the reform compared to the control group, which maintains an relatively even distribution.

Figure 7: Trends in Work Hour Distribution (No.3 & Single Part-timers)



Note: Observations (No.3 Housewife) 31,183, (Single Part-timer) 2,994

7. Econometric Analysis

The following **Table 5** presents the fixed-effects panel estimation as in equation **(1)**, using the data for 2013–Sept.2016 (before the reform) and Oct.2016–2017 (after the reform), including monthly effects. These are the difference in difference estimates for individuals covered by the ESI policy (the treatment).

Table 5: Change in Working Hours (Ln) Post-October 2016 Reform (Fixed Effect Model)

	M+F	Male			Female		
	(1) (19-64)	(2) (19-24)	(3) (25-59)	(4) (60-64)	(5) (19-24)	(6) (25-59)	(7) (60-64)
After・treatment	0.175*** (17.28)	0.352*** (5.23)	0.172*** (4.92)	0.0752* (2.55)	0.117 (1.49)	0.179*** (14.23)	0.0828* (2.27)
After	0.0852*** (3.48)	0.447* (2.35)	0.217* (2.01)	0.232* (2.48)	-0.221 (-0.83)	0.0663* (2.34)	0.0711 (0.99)
Age	-0.00346 (-0.71)	-0.0158 (-0.43)	0.00368 (0.17)	-0.0154 (-0.84)	0.0527 (1.07)	-0.00443 (-0.79)	0.00558 (0.38)
Constant	3.304*** (14.96)	3.455*** (4.70)	3.009*** (3.57)	4.164*** (3.75)	2.073* (2.09)	3.333*** (13.67)	2.795** (3.20)
R^2	0.0184	0.357	0.149	0.0716	0.0905	0.0190	0.0195
Observations	85,536	1,449	7,477	5,788	2,066	57,476	10,987
(Obs. groups)	49,706	1,032	5,056	3,728	1,469	32,339	6,568

Note: *t* statistics in parentheses. Monthly fixed effects included; observation period is between Jan.2013 and Mar.2017
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

There is a statistically positive overall effect, with the largest effects on the young/prime male and prime female groups (columns 2, 3, and 6, respectively). As mentioned in the data section, the number of observations for the prime females greatly outweighs that of males, covering roughly 67% of the entire sample; in contrast the young males sample size is roughly 1.6%. With the exception of the young female group (5), the *After・Treatment* coefficient is statistically significant for all groups

After・Treatment represents the average differences in the rate of change between the control and treatment group as time changes from pre-policy to post-policy. This is 18% overall (1), and ranges between the groups. The control variables, *Age* and *Month* represent confounding factors that should be removed from the effect of treatment. *Month* has been omitted from this chart, while *Age* has no statistically significant effects.

For the female groups, it is possible that some workers are affected differently than others depending on their distribution of work hours. In **Table 6,** the same equation (1) of the Empirical Model has been produced, this time using quantiles.

Table 6: Female Change in Working Hours (Ln) Post-October 2016 Reform (Quantile Regression Fixed Effect Model)

	Female											
	(19-24)				(25-59)				(60-64)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	20th	40th	80th	90th	20th	40th	80th	90th	20th	40th	80th	90th
After・treatment	0.0684	0.0853	0.165	0.175	0.191***	0.188***	0.166***	0.162***	0.117*	0.106*	0.0489*	0.0390*
	(0.35)	(0.53)	(1.54)	(1.41)	(0.30)	(0.35)	(1.75)	(0.81)	(0.28)	(0.31)	(0.25)	(0.16)
After	-0.222	-0.222	-0.220	-0.220	0.0666	0.0665	0.0660	0.0660	0.0711	0.0711	0.0712	0.0712
	(-0.51)	(-0.63)	(-0.93)	(-0.81)	(0.06)	(0.08)	(0.43)	(0.20)	(0.17)	(0.20)	(0.37)	(0.29)
Age	0.0625	0.0591	0.0429	0.0409	-0.00684	-0.00618	-0.00204	-0.00130	0.00345	0.00410	0.00770	0.00832
	(0.65)	(0.75)	(0.82)	(0.67)	(-0.03)	(-0.04)	(-0.07)	(-0.02)	(0.04)	(0.06)	(0.21)	(0.18)
Observations	2,066				57,476				10,987			
(Obs. groups)	1,469				32,339				6,568			

Note: *t* statistics in parentheses. Monthly fixed effects included; observation period is between Jan.2013 and Mar.2017
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

While the Fixed Effects model in equation (1) has coefficients representing the mean effect, the coefficients in the quantile estimates represent the effect with respect to a specified area within the group. In this case, PIDs have been divided into quantiles representing the 20th, 40th, 80th and 90th quantiles of the distribution of work hours.

For the prime ages females (5) to (8), those quantiles with a higher distribution of work hours appear to experience a smaller magnitude of increase in working hours, suggesting that those with the highest pre-reform work hours experienced a smaller increase in work hours after the reform, however the difference between the highest and the lowest quintile is less obvious than the elderly females. For example, the lowest quantile experiences a 19% increase of working hours, whereas the highest quantile experiences a 16% increase of working hours and there is only a 3% difference. In contrast, we find a more prominent difference among the elderly females (9) to (12). The greatest increase (12%) to work hours is occurring to those with the least work hours (9), whereas the smallest increase (4%) is occurring to those with the longest work hours (12).

In the proceeding **Table 7** are the panel estimation results for equation (1) with respect to the No.3 and Single Part-Timer Groups. Recall from the data section that the No.3 group attempts to capture workers who seek to reduce their own working hours to maintain the beneficial No.3 dependent status and has been defined as i) those who were between ages 20-59, ii) were married, iii) designated a spouse as the household head, iv) made annual wages under 1.49m and v) held a minimum monthly wage under 108k. The Single Part time group attempts to capture the opposite as workers who seek to increase their own working hours and has been defined as i) ages 20-59, ii) single sole head of household and iii) unmarried.

Table 7: Specified Sub-Groups' Change in Working Hours (Ln) Post-October 2016 Reform (Fixed Effect Model)

	No.3 Status Female	Single Part-Timers
	(1)	(2)
	(20-59)	
After・treatment	0.106***	0.262***
	(3.71)	(6.10)
After	-0.00200	-0.00288
	(-0.06)	(-0.02)
Treatment	-0.00193	0.0115
	(-0.56)	(0.32)
Age	-0.00180	-0.00241
	(-0.26)	(-0.08)
Constant	3.213***	3.299**
	(10.40)	(2.76)
R^2	0.0320	0.113
Observations	31,183	2,994
(Obs. groups)	16,923	1,911

Note: *t* statistics in parentheses. Monthly fixed effects included; observation period is between Jan.2013 and Mar.2017
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We find a 26% increase in the working hours of the single part-timers (2), which is relatively large. However, in contrast to our expectations in our grouping strategy, there is also a positive effect for the No.3 Status Female group of roughly 11% (1). This suggests that each group could have responded to the reform by adjusting their own working hours, whereas individuals who were the sole working household heads engaging in part-time work (2) could have experienced a decrease in their required social insurance contributions (section 2), the housewives in (1) would have experienced an increase in their required contributions *ceteris paribus*. The fact that the No.3's now have a tendency to work more could be explained if they were working significantly more hours to offset the new ESI deductions and possibly to get their own pension rights for Employees Pension, which would be an additional contribution that tops up their basic pension (section 2). In the next table, we confirm this possibility by examining the No.3's quantiles.

Similar to the estimates for the gender/age groups, **Table 8** represents the quantile estimates of the No.3/Single groups in order to detect whether the magnitude of effect of *After・Treatment* varies based on the distribution of working hours within these groups.

The Single Part-Timers experience a similar effect regardless of an individual's quantile, while the No.3s workers undergo greater change in the lowest quantiles. In the case of No.3 females, those with the lowest work hours (1) may be dedicating themselves to a far greater number of work hours to offset their increased contributions in the case they are losing their No.3 status.

Table 8: Specified Sub-Groups' Change in Working Hours (Ln) Post-October 2016 Reform (Quantile Regression Fixed Effect Model)

	No.3 Status Female				Single Part-Timers			
	(20-59)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	20th	40th	80th	90th	20th	40th	80th	90th
After・treatment	0.134***	0.125***	0.0788***	0.0704***	0.273***	0.269***	0.251***	0.248***
	(1.08)	(1.20)	(0.89)	(0.67)	(1.32)	(1.53)	(1.16)	(1.03)
After	-0.00906	-0.00678	0.00503	0.00718	-0.0690	-0.0458	0.0600	0.0755
	(-0.09)	(-0.08)	(0.07)	(0.09)	(-0.15)	(-0.12)	(0.12)	(0.14)
Age	-0.00424	-0.00345	0.000626	0.00137	0.00962	0.00540	-0.0139	-0.0167
	(-0.20)	(-0.20)	(0.04)	(0.08)	(0.12)	(0.08)	(-0.16)	(-0.17)
Observations	31,183				2,994			
(Obs. groups)	16,923				1,911			

Note: *t* statistics in parentheses. Monthly fixed effects included; observation period is between Jan.2013 and Mar.2017
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As for the single part timers, those with the highest work hours (8) may be experiencing the same demand reduction the No.3s receive from their employers, but in contrast the reform may have resulted in increased supply as these workers can increase their work hours without experiencing a reduction in their take home pay, the net effect of which might be offsetting some of the employer-induced work hour reduction.

8. Conclusion

In contrast to the prior body of research, the 2016 ESI reform has resulted in overall positive effects across age, gender and dependent status. While the overall effect is associated with working hours, it is not a straightforward task to determine which groups experience a direct reduction owing to demand-side

employer inducements (an increased employer contribution) and which groups voluntarily adjust their hours owing to supply-side employee inducements (a lessened employee contribution).

For this reason, this paper attempted to make distinctions between those non-regular workers who were likely to fall into the former group (the No.3 dependent status housewives) and the latter (Single workers who were the sole income-earners in their household).

However, there are limitations to the variables accessible in the Labor Force Survey and to this end there is some possibility these groups could not be precisely captured owing to a lack of more detailed monthly income, pension-insurance status (e.g. No.1, 2, 3 insured), and employment-history variables for individuals. Nevertheless, positive effects on working hours could be confirmed within statistically significant margins for the majority of groups, including the dependent housewife groups.

It is important to note that, as has been proposed in the April 2017 revision to the ESI expansion (Figure 2), the requirement on firm size is likely to be officially eliminated. In this case an estimated 1.25 million more workers will become eligible to join the ESI program.

At the time of this paper, the scope of the firm requirement is set to be reduced from 500 to 100 by October 2022, and from 100 to 50 by 2024, in which case an additional 450,000 and 200,000 workers, respectively, will soon be eligible for ESI (MHLW 2020). Under these conditions, business sectors that use large numbers of part-time workers will experience employer-related inducements on the order of 160 billion JPY more for the pension premiums of their workers (recall from the institutional background section that each worker's premium payment is split between the employer and employee).

Whether or not the government ultimately eliminates the "more than 50 employees" requirement by 2024, further studies will be critical in order to determine what impact the current changes will have on the labor market.

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