The Tax Effects on Human Capital Accumulation in Japan *

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PRELIMINARY AND INCOMPLETE.

Abstract

While female employment rate substantially increased in recent decades in Japan, many women remain in part-time, low-skilled jobs. One of the key obstacles for female labor supply are tax notches for secondary earners caused by the tax and social insurance system. Consequently, married women's income distribution exhibits notable bunching at two thresholds: 1.03 million and 1.3 million JPY. Using the newly available municipality tax records combined with residential registration, we show that, while the steady increase of minimum wage pushes female part-time workers income upward, those right below the threshold keep their income below the threshold, presumably by decreasing hours of work.

JEL Codes: J20, J22, J24
Keywords: labor supply, human capital

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1 Introduction

Many countries facing below-replacement birth rates are increasingly turning to policies aimed at boosting female labor supply as a key strategy for addressing demographic and economic challenges. When immigration isn't a feasible option to supplement the labor force, encouraging higher workforce participation among women becomes crucial to offset the shrinking labor pool. This can involve reforms in areas such as childcare, parental leave policies, and flexible work arrangements, all aimed at reducing barriers to women's full economic participation. At the same time, the income tax system may work to discourage such participation above and beyond the standard effect of simply being taxed.

Japan, as one of the world's largest economies, has been grappling with a rapidly aging population and a shrinking workforce, making it crucial to maximize the participation of all potential workers, including women. Despite substantial improvements over the past decades in female labor force participation, many women work in part-time, low-skilled jobs with limited potential for promotion or pay increases, thus discouraged from further investment in their human capital. This underutilization of female talent represents both a challenge and an opportunity for Japan's economic growth and societal advancement.

One of the key factors influencing female labor supply in Japan is tax and social insurance system, which have included provisions that affect secondary earners—usually women—differently from primary earners. Japan's tax and social insurance systems are complicated with several thresholds applied to different types of secondary earners. To motivate ideas, consider Figure 1 that shows the outcome of a system that creates an incentive for the secondary earner to maintain their income within certain thresholds as to avoid notches in the tax and social insurance systems. More specifically, the figure shows that married women's income distribution exhibits notable bunching at two thresholds: 1.03 million and

1.3 million JPY. This policy structure that leads to such bunching potentially discourages women from pursuing higher-income jobs or working longer hours, thereby limiting their economic contributions and career advancements. In Section 3 we elaborate on how the income tax and social insurance structure cause an "income trap" that leads to such a behavioral response by secondary earners.

After establishing the presence of an "income trap," we will explore how it affects female labor supply focusing on the minimum wage rises, which made the constraint on the annual gross salary income more binding. The majority of married women whose annual gross salary income is below the threshold for dependent spouse are non-regular workers paid hourly, and their wages are close to the minimum wages. As the minimum wage is raised, their wages also rise, and the hours they can work within the threshold decreases. We show that those right below the threshold actually keep their income below the threshold, presumably by decreasing hours of work.

Examining the effects of income tax policies on female labor supply in Japan is critical for several reasons. Firstly, it sheds light on the broader implications of tax policy on labor market behavior and gender equality. While this is not in and of itself a novel insight, the Japan experience illustrates how tax policy can undo market forces pushing in the opposite direction. Additionally, when tax policy discourages full-time employment, this may further discourage investment in human capital. Finally, understanding these dynamics can inform policymakers in Japan and other countries facing similar demographic and economic challenges.

We are not the first to recognize that the Japanese income tax system disproportionately negatively impacts female labor supply. A number of papers (for example, Akabayashi (2006), Abe (2009), and Bessho and Hayashi (2014)) have studied how the spousal allowance

impacts labor allocation within the household within a more macro and structural model framework with a focus on policy simulation (i.e. the response of female labor supply when adjusting the spousal allowance). We are the first, to our knowledge, to present micro-based administrative panel data to illustrate the extent to which women hold back their earnings in order to not fall into the income trap whereby increased female earnings over a particular range of income actually lowers total after-tax household income. To give a more precise example, women who increase their earnings from 1.29 million JPY to 1.3 million JPY experience a loss in total household income (due to the loss of social insurance benefits from their spouse's income) and have to earn about 35% more before after-tax household income is the same as when she earned 1.29 million JPY.

Our results speak to the importance of aligning tax policy with stated policy goals such as encouraging labor supply. While Japan has made strides along many dimensions, for example, nationally supported child care programs, these may help to assist women entering the labor market but not at levels that utilize their full skills. This lack of alignment is not unique to Japan. For example, in the United States there is evidence that the EITC encourages labor supply of single mothers (Eissa and Liebman (1996), Meyer (2002), and Bastian (2020) but, at the same time, a lack of affordable childcare may hinder the full potential of the policy.

2 Trends in female labor supply

During the 1990s and 2000s, rising educational attainment along with Japan's economic stagnation that prompted more households to rely on dual incomes encouraged an increase in female labor force participation (LFP). Japan had traditionally experienced the "M-curve"

pattern of female labor participation, characterized by a high participation rate among young women, a sharp decline during child-rearing years, and a return to the workforce in later years with many women re-entering the labor force in non-regular roles, such as part-time, temporary, or contract work, often with lower wages and fewer benefits. In the 2010s, female LFP accelerated under Prime Minister Shinzo Abe's "Abenomics" policies, which prioritized expanding childcare facilities and encouraging family-friendly workplace practices. Additionally, Japan's aging population and shrinking labor force created economic pressure to include more women in the workforce.

By the 2020s, participation rates reached record highs, surpassing 70% and exceeding those of some Western nations like the U.S., with a gradual shift toward full-time and higher-skilled jobs, even as many women continued to occupy non-regular positions.[1] Figure 2, panel (a) plots LFP by 5-year cohorts, starting with women aged 25-29 in 1992 and ending with those 25-29 in 2012. As the figure shows, conditional on age, LFP has been consistently increasing over time. In 1992, LFP stood at just under 65 percent for women aged 25-29 and by 2012 it had reached 78 percent for the same age group. LFP falls for all cohorts during main childbearing years but then grows again as women return to the labor force. The bottom panel of the same figure shows that while LFP remains high, many women are employed in non-regular jobs. Panel (b) generally shows a decrease in the fraction of employees that are non-regular over time for a given age cohort. However, within a cohort, the pattern remains that the fraction grows over time. Thus, as employeed women progress through the life-cycle, they are more likely to take on non-regular employment. For most

[1] "Non-regular" (hiseiki) does not have a precise definition but is generally defined by what it is not. "Regular" workers (seishain) are usually on indefinite contracts and work full time. Everyone else is considered non-regular. This may mean fixed term contracts, part-time or some combination of these. It is also possible to be non-regular while on an indefinite contract and full time but these employees would be treated differently from regular employees, usually by being paid hourly rather than a monthly salary.

of the prime earning ages of 35 to 54, well over half of women are employed as non-regular workers. The one exception is the most recent 2012 cohort where at ages 35-39—the final data point we have for this cohort—they remain below 50 percent though on an upward trajectory.

3 The Japanese Income Tax System and Its Impact on Secondary Earners

The Japanese income tax system is individual-based and progressive with national income tax rates ranging from 5% to 45%. In addition to the national income tax, individuals are also subject to local resident taxes with a marginal tax rate of 10%. Furthermore, social insurance contributions are also roughly proportional to earned income for salaried workers covered by employer provided health and pension insurance (which we refer to as "employee insurance") while a different scheme is applied to those not covered by this program (which is typically the government provided national health and pension insurance).

A key feature of the Japanese tax and social insurance system is its treatment of secondary earners, who are predominantly women. The system includes several provisions that can create disincentives for secondary earners to fully participate in the labor market.

Before discussing these provisions, we also note that social insurance burdens are impacted by the type of employment for both spouses. For now, we focus on salaried workers (not self-employed) and then further break down secondary earners according to whether they are employed by large or small firms.[2]

Figures 3 and 4 illustrate how after-tax household income is impacted by a number of

[2]A large firm is one with 500 or more employees. Below that is considered small.

important thresholds broken down by the employer firm size. Focusing first on small firms[3] in Figure 3, we show how after-tax household incomes vary by the wife's gross salary while holding the husband's total income fixed at three different levels–2, 4, and 10 million JPY. [4] These income levels roughly correspond to 17, 53, and 94 percentiles of the distribution of the spouses of our sample.

There are two important thresholds that we highlight–1.03 and 1.3 million JPY. We focus on these thresholds because, as we will show, these are the thresholds that married women actually target. At the same time, the impact on after-tax household income is quite different between the two.

The first threshold is relevant for two reasons. First, the national income tax kicks in at 1.03 million JPY at a marginal rate of 5%, though this has an overall small impact on after-tax incomes. Second, a provision called the "spousal tax deduction" (haigūsha kōjo) is also impacted by this same threshold. It allows a primary earner (the husband) to reduce their taxable income if their spouse (the wife) earns below 1.03 million yen. If the spouse's income remains below this threshold, the primary earner can claim a deduction of up to 380,000 JPY, thereby reducing their overall tax liability. Prior to 2018, this threshold had important tax implications for women married to men who earned at least 10 million JPY. In this case, upon passing the 1.03 million JPY threshold, the spousal tax deduction was reduced to zero, increasing the income tax burden of the husband. This tax notch is illustrated by the solid red line in Figure 3, panel (c). A 2018 national income tax reform made those earning more than 10 million yen ineligible for the spousal tax deduction, thereby lowering after-tax

[3]According to the Labour Force Survey, about 75% of married women earning 1.0-1.49 million JPY work in firms smaller than 500 employees.

[4]Gross salary income (kyūyo shūnyū) is salary income before deductions. Total income (gōkei shotoku) is income including other sources after some deductions. We use total income for husband to avoid detailed calculation of deductions other than spousal deductions.

income and eliminating the notch. This is illustrated by the solid black line.

In contrast, primary earners with total incomes below 10 million JPY receive the spousal tax deduction and an additional deduction called the "special" spousal deduction (haigūsha tokubetsu kōjo). This latter deduction, despite receiving a new name, simply extends the eligibility of the spousal deduction from 1.03 to 1.05 million JPY. Prior to 2018, the deduction began phasing out once the wife's gross salary income passed 1.05 million yen. The 1.05 million JPY threshold was moved to 1.5 million by the 2018 reform. This can be seen in panels (a) and (b) where the red line lies below the black line post 1.05 million JPY.

All in all, Figure 3 clearly indicates that the impact of exceeding the 1.03 million threshold on after-tax household income is negligible except for women married to men who earned at least 10 million JPY prior to 2018, which is only 7% of our sample. Nonetheless, many married women—even those whose spouses earn well below 10 million JPY—target their income to this threshold both before and after 2018.

Next, there is a second threshold for social insurance payments. Social insurance is a mandatory system that provides health insurance, pension benefits, and other welfare services. Japan's social insurance system consists of two systems, employee's social insurance for eligible salaried workers and the national system for those not covered by insurance provided by the employers. Most primary earners are covered by insurance provided by the employer, where both employers and employees contribute to the social insurance system through payroll deductions. For secondary earners–again, primarily women–the national social insurance threshold is set at an annual income of 1.3 million JPY. If a secondary earner's annual income is below 1.3 million yen, and the household head is a salaried worker covered by the employer's social insurance scheme, the secondary worker is generally exempt

from making contributions to the national social insurance system.[5] This means that wives still receive health insurance and pension benefits without having to contribute directly. This exemption can result in substantial cost savings for the household, as it avoids the additional financial burden of social insurance contributions, which can be significant at around 300,000 JPY.

Put together, these deductions and exemptions create a notable "income trap" for secondary earners. Married women may choose to limit their work hours or take on lower-paying jobs to remain under the threshold and maximize their household's after-tax income within a certain earnings range. This has the effect of discouraging women from seeking full-time employment and career advancement opportunities, perpetuating traditional gender roles and contributing to the persistent gender wage gap in Japan. Figure 3 shows that the income trap upon crossing the 1.3 million JPY threshold is quite substantial. While our calculations here are a bit stylized, they nonetheless capture the important elements of the design of the tax and social insurance system. If we take panel (b) as an example, assuming the husband earns 4 million JPY and the wife earns 1.29 million JPY, they have a combined income of about 4.29 million JPY after-tax. Upon the wife earning another 10,000 JPY, their total after-tax income falls to 3.94 million and the wife has to earn around 1.74 million JPY before total household income is the same as when she earned 1.29 million JPY–nearly 35% more than her income when she hit the threshold. Thus, it is easy to see why the 1.3 million JPY threshold presents a challenge to increasing female labor supply and income.

As further testament to complications built into the Japanese tax and social insurance systems, secondary earners who are employed by large firms are exposed to different incen-

[5]An exception is the case where the secondary earner's salary and work hours exceed the threshold for the mandatory coverage of Employee's social insurance. Prior to October 2016, the threshold was working more than 30 hours per week, and very few workers with annual income within 1.3 million yen exceeded this threshold.

tives and additional tax reforms. In October 2016, social insurance coverage was expanded to all employees whose monthly salary is above 88,000 JPY (corresponding to annual income of 1.06 million) and working more than 20 hours a week, primarily impacting secondary workers. [6] This is shown in Figure 4 as a discontinuous decline in after-tax household income at 1.06 million JPY, slightly to the right of the 1.03 million JPY threshold for years after 2016 regardless of the primary earner's income. The notch at 1.3 million JPY, that exists for secondary earners at small firms, no longer exists for those employed at large firms post October 2016. [7]

Some similarities could be made with the Mini-Job system in Germany, a form of marginal part-time employment that has notable implications for female labor supply. Mini-Jobs allow women to earn up to €520 per month with reduced social security contributions and income tax obligations, offering flexibility that supports balancing work and family responsibilities. However, while they encourage labor force participation, particularly among married women, studies highlight drawbacks. Research by Steiner and Wrohlich (2005) and Caliendo and Wrohlich (2010) shows that Mini-Jobs boost employment, especially in part-time positions, but can trap women in low-wage roles, limiting career progression and reinforcing gender inequalities in the labor market. Carrillo-Tudela et al. (2021) found that Mini-Jobs contribute to the persistence of the gender wage gap by making it harder for women to transition to regular employment.

Unlike Germany, Japan's system isn't tied to a particular designated type of job, but rather to annual income. If anything, the type of non-regular position that exists in Japan

[6]The coverage is further expanded to smaller firms in 2022 and 2024, while these latter expansions are beyond the scope of our data.

[7]Strictly speaking, the coverage by the Employee's insurance increases future pension benefits, so it is not a pure cost like the payments for the national system imposed after crossing the 1.3m threshold. Also it is possible to avoid the coverage by working less than 20 hours per week. In practice, however, the 1.06m threshold is perceived as a new income trap.

is arguably an outcome of the secondary earner tax and social insurance systems. Demand and supply effects are difficult to separate at this point. Employees choose to earn below the threshold, which gives rise to non-regular employment, but then this sort of employment has become the socially acceptable norm for married women. Earning below 1.03 million JPY has become such a powerful anchor, despite that this threshold is not tied to a sizable decrease in a household's disposable income for the large majority of women prior to 2018 and essentially none since 2018. Social norms and tax policy have intertwined in a way that is difficult to separate. The most costly threshold is set at 1.3 million JPY when secondary earners are no longer eligible to be covered by the primary earner's employee's social insurance. Yet, as shown in Figure 1, significantly more women bunch at 1.03 million yen rather than 1.3 million yen.

4 Data

We use three primary data sources. The first data set we use is administrative record data on resident registration and local residential tax provided by municipalities participating in the "Project for Utilizing Municipal Tax Data to Promote Evidence-Based Policy Making (EBPM)," led by the Center for Research and Education in Program Evaluation (CREPE) at the University of Tokyo. We use data from 16 municipalities in 11 prefectures that participated in the project in 2022, with complete household composition data from 2018 to 2022 ("short sample"). Additionally, six out of the 16 municipalities cover an additional two years of data for a 7-year period ranging from 2016 to 2022 ("long sample").[8] For most of

[8]Because participation in the CREPE project is voluntary, municipalities in the sample are not a random sample of all municipalities in Japan. The municipality-level tabulations from the Population Census 2020 show that the populations of participating municipalities are slightly younger, with a higher proportion of university graduates and slightly less representation from the manufacturing sector than the national

our analysis we rely on the long-sample but will later present a number of robustness tests using the short sample.

The resident registration records contain information on all individuals registered in the municipality as of January 1st of each year, including gender, birth date (or birth quarter), and relationship to the head of household. Each person is assigned a unique ID, allowing us to follow the same individual as long as they live in the same municipality. In addition, the unique household ID enables us to identify marital status, spousal income, and the age of children living in the same household.

The demographic and household composition variables described above are reported for year t and income earned for year $t-1$. Thus, our long sample of 2016-2022 covers income earned from 2015-2021 and the short sample of 2018-2022 covers income earned in 2017-2021. We focus on gross salary income as the main outcome variable that represents annual salary before any deductions or social insurance premiums.

Table A.1 presents the descriptive statistics for the "long sample" used in our main analysis, which focuses on married women aged 25 to 60. The sample comprises 61,391 unique individuals. The average annual salary income is 1.84 million yen. Notably, the 10th percentile of wage income is zero, indicating that a certain share of the sample does not work at all. The median annual wage income is 1.09 million yen, and it is worth highlighting that more than half of these women earn less than 1.3 million yen.

These administrative data contain many advantages over the survey data. First, gross salary income is observable even for those who earn below the minimum threshold for being subject to local residential tax. Second, these data provide accurate gross salary income and household composition for individuals and their families living together. The preciseness of

average. Population sizes significantly vary across the participating municipalities, with the three largest municipalities accounting for more than half of the total sample.

income is crucial given the multiple income thresholds we study. We know of no survey data that is able to break down income to such precise thresholds. A weakness of the municipality administrative data is that it lacks all other information not needed for local government operations. In particular, hours worked, employment status, industry and other employer characteristics, as well as educational background.

The second data set we use is the Japan Labor Force Survey (LFS). The LFS, conducted monthly by the Statistics Bureau of Japan since 1947, is a comprehensive national survey that measures employment and unemployment in the country. It targets around 40,000 randomly selected households, representing approximately 100,000 individuals aged 15 and older, ensuring a nationally representative sample. The survey covers all regions and prefectures of Japan, with data benchmarked to the 2015 national census. It provides key labor market indicators such as employment status, unemployment rate, hours worked, and industry classifications.

The LFS serves a primary purpose in our analysis and that is to be able to link minimum wage changes to annual income and labor hours in the administrative data. On the one hand, the administrative tax return data contain only individual-level annual income and no information on hours worked or hourly wages. On the other hand, the LFS contains information on hours worked, type of employment and income, though the latter is only reported in buckets that unfortunately do not match the thresholds of interest precisely. Thus, we make use of information from the LFS to provide evidence that women who earn a certain level of income are more likely to be non-regular workers and, hence, earn the minimum wage. The details are presented in Appendix A.

The final dataset is the annual Japan Panel Survey of Consumers (JPSC). The JPSC is a comprehensive, longitudinal study that exclusively interviews women and aims to capture

detailed information about the economic and social behaviors of Japanese households. Initiated in 1993 by the Institute for Research on Household Economics, the survey focuses on various aspects of consumer behavior, including income, expenditures, savings, and investments. It gathers data annually from a representative sample of women aged 24 to 34 at the start of the survey, expanding the sample over time to include newer cohorts. The data are panel, which allows us to follow the respondents over time.

Importantly for our study, the survey asks individual and household income, sources of income, employment status, hours, job changes and many variables related to education, and career trajectories. There are also detailed questions related to family structure, marital status, and children. It also asks a direct question about whether the respondents adjust their income below a certain threshold to avoid tax and social security burden. The weakness of the JPSC relative to the other two datasets are smaller sample size and measurement errors in income due to self-reporting.

In the current version of this study, we use the JPSC to check how many married women are affected by minimum wage changes. Descriptive statistics of the sample used for this analysis is presented in Appendix Table A.4.

5 Results

Figure 5 presents annual changes in salary of women who earn between zero and 2 million JPY in the base year. The minimum wage increases annually at about 3 percent and so holding hours fixed we would expect salaries to mechanically increase each year for those earning the minimum wage or a higher wage that may correlated with changes in the minimum

wage.[9] The higher the salary, the less we expect it to be correlated with the minimum wage. Of course, salaries can change for many reasons–hours can change, wage raises, job switches and more. In the Appendix, we show that The majority of married women whose annual gross salary income is below the threshold for dependent spouse are non-regular workers paid hourly, and their wages are responsive to the minimum wage changes using the LFS and JPSC.

In the figure, we can see that relatively low annual salaries, below roughly 0.5 million JPY exhibit income growth with the dots representing the median observation, the light blue bars the 25th to 75th percentile and the gray bars the 10th to 90th percentile. There are a number of interesting observations to make here. First, the annual growth in salary of the median female worker approaches zero as income in the base year approaches the 1.03 threshold. Even stronger, the 25th to 75th percentile is also approximately a zero change in salary. Salary changes remain close to zero until the second threshold of 1.3 million JPY and then start to grow again upon passing the second threshold.

Given annual increases the minimum wage and that many women who earn under 1.3 million JPY earn either the minimum wage or a wage highly correlated with changes in the minimum wage, it is conceivable that reducing hours is the primary method to keeping annual income stable under the thresholds.

Figure 6 further illustrates the relevance of the income trap. In this figure, we fix the base year at 2015 income and then plot the mean and median income in the labeled year in bins of size 0.01 million JPY. For example, the top left panel plots income in 2015 versus 2016. The next panel plots income in 2015 versus 2017 and so forth. The final panel plots income in 2015 versus 2021. In each case, the diagonal black line represents the 45 degree

[9]There is one exception. In response to the Covid-19 pandemic, the minimum wage did not increase in 2021.

line and the horizontal and vertical black dashed lines represent the two thresholds of 1.03 and 1.3 million JPY. When incomes do not change, the data lie upon the 45-degree line. When incomes increase, they lie above. Looking first at the top left panel. Here we see that individuals with relatively low income in 2015 earn more in 2016 with the means and medians lying above the 45-degree line. As 2015 incomes approach the first threshold, we see that the median returns to the 45-degree line, staying there until incomes pass the second threshold at 1.3 million JPY. The mean just below the 1.03 million JPY threshold tends to hug the same value in 2016 and similarly for incomes within the center box. Here the mean does not go over 1.30 million JPY. Over time, the pattern becomes more stark–particularly for the median married female employee. Consider now 2019 and the median income. For incomes that were below 1.03 million JPY in 2015, the median income in 2019 remains below 1.03 four years later. A similar pattern is observed within the center box. The median woman earning just over the first threshold in 2015 increases hear earnings a bit but its clear that the median woman earning below 1.3 million in 2015 aims to remain under the 1.3 million JPY threshold even in 2019. By 2021, the 1.03 is still a binding threshold for half of employed women, though some begin to break beyond the 1.3 million threshold by 2021. Once past the second threshold, incomes show positive salary growth, all above the 45-degree line.

Figures 5 and 6 imply that married women whose income were near the threshold keep their income within the threshold. Despite that women who were outside of the income trap experience steady income growth, those within the trap are literally caught in the same income level.

Next, we turn to the year-to-year change in the distribution of annual salary of these women. Figure 7 shows the kernel density estimates of annual salary income for each year from 2015 to 2021, calculated using a bandwidth of 5,000 JPY (plus/minus total = 10,000

yen). Figure 8 draws the first difference of the kernel density, i.e. the year-to-year change in the distribution, and Figure 9 shows the cumulative change from 2015. In all figures, the first vertical line indicates 1.03 million JPY, while the second vertical line indicates 1.3 million JPY.

Figure 7 shows that the bunching at 1.03 and 1.3 million thresholds is quite stable. At the same time, the density between 1.03 and 1.3 million slightly increased since 2018. This change is also shown in the panel "2018-2017" of Figure 8, and more clearly in panels after 2018 in Figure 9. This change is probably due to the change in the spousal deduction in 2018.

Figure 9 also show that fewer women earn less than 1 million yen recently, indicating the increasing trend of female part-time worker's earnings in general. In contrast, the density above 1.3 million yen has been stable for the years covered in our data.

6 Conclusion

We establish thus far that the tax and social insurance system in Japan has significant impacts on labor earnings for married women. They can influence women's decisions about whether to enter the workforce, how many hours to work, and what types of jobs to pursue. The resulting underutilization of female labor has significant economic consequences, limiting the potential growth and productivity gains that could be achieved if more women participated fully in the labor market.

Understanding the intricacies of the Japanese income tax system and its impact on secondary earners is essential for designing effective policy interventions. By addressing these tax-induced disincentives, policymakers can help to create a more equitable labor market,

enhance female labor force participation, and support the broader goals of economic growth and social inclusion in Japan.

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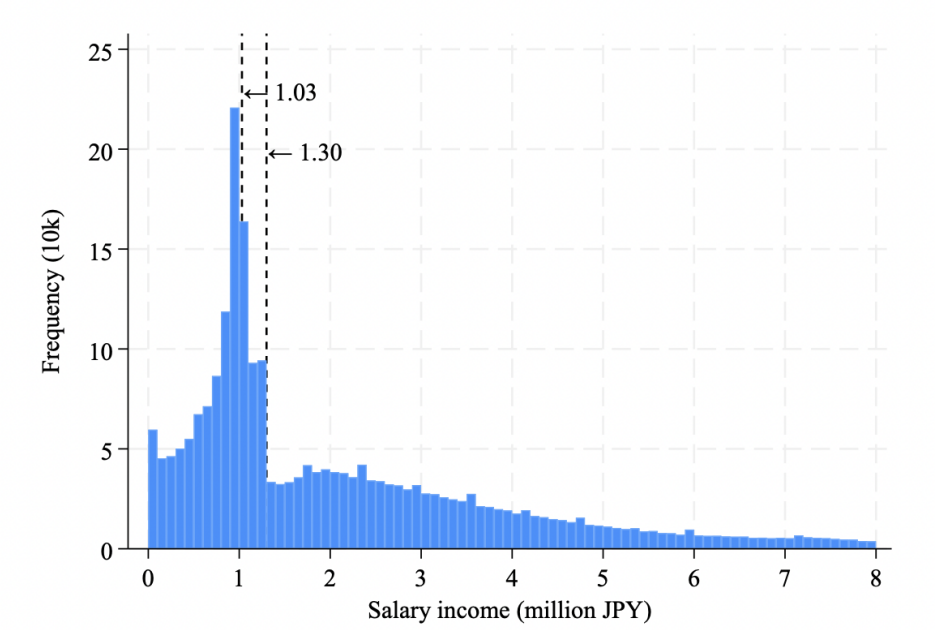
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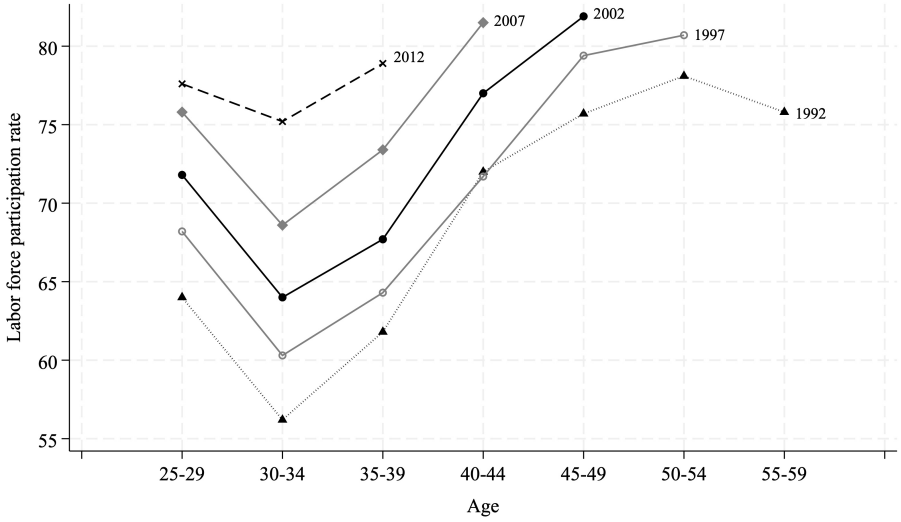
Figure 1: Distribution of annual salary income



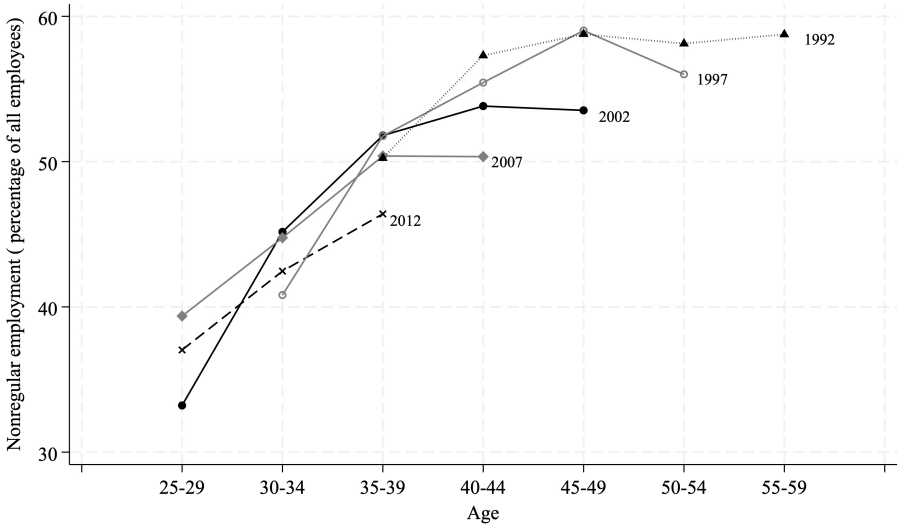
Notes: This figure shows the distribution of salary income of married women age 25-60. The vertical black dashed lines represent the thresholds 1.03 and 1.3 million JPY. Source: CREPE project municipality tax data

Figure 2: Female employment (base cohort = 25-29 years old)

(a) Labor Force Participation



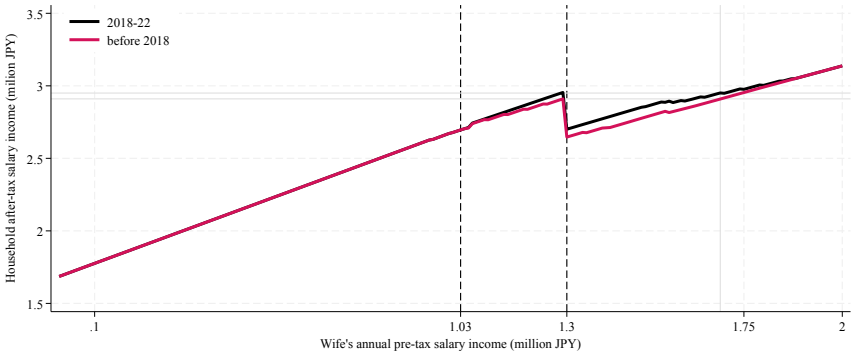
(b) Nonregular employment



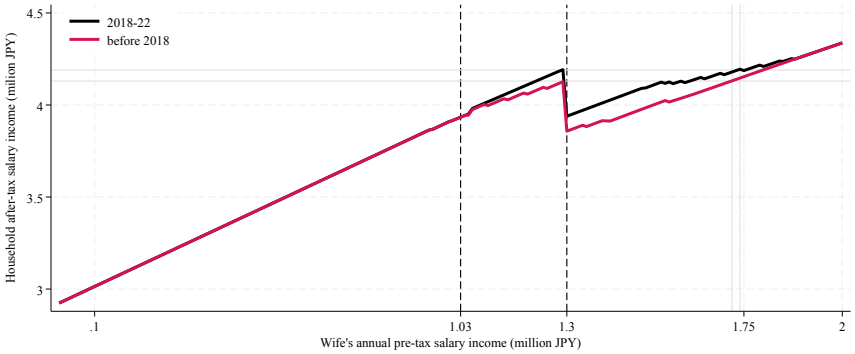
Notes: Labor Force Survey, authors' calculations. Each line represents the LFP or nonregular employment of a cohort that is age 25-29 in the labeled year. Cohorts of age 25-29 in 1992 and 1997 in panel (b) are missing earlier data points due to data availability (points for ages 25-29 and 30-34 in the former and 25-29 in the latter).

Figure 3: After-tax household income, wife employed at small firm

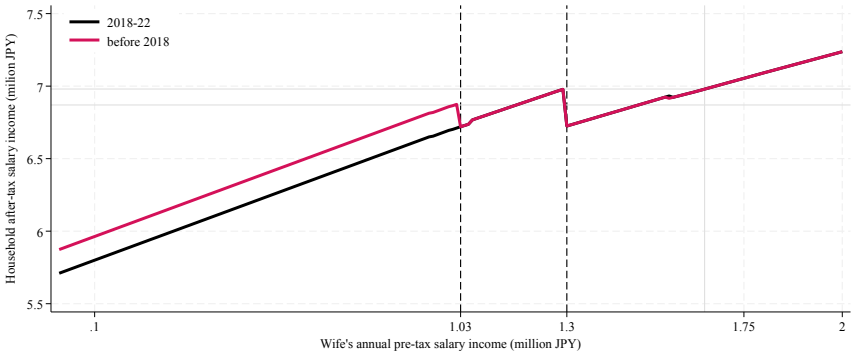
(a) Husband's income = 2 million JPY



(b) Husband's income = 4 million JPY



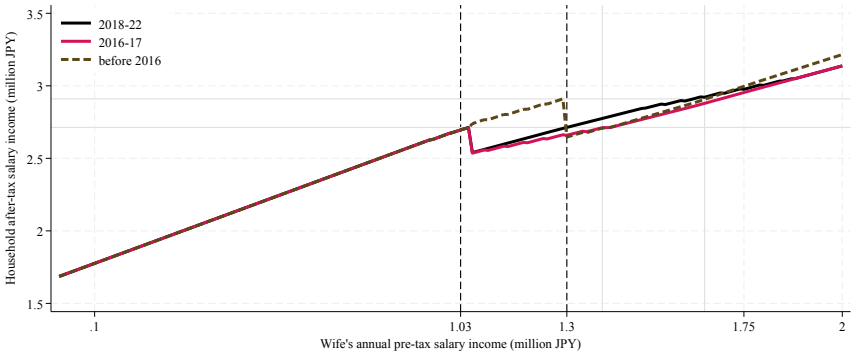
(c) Husband's income = 10 million JPY



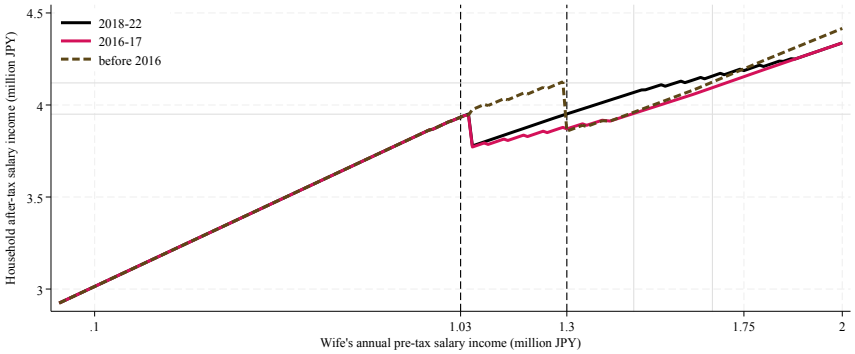
Notes: Simulated calculations.

Figure 4: After-tax household income, wife employed at large firm

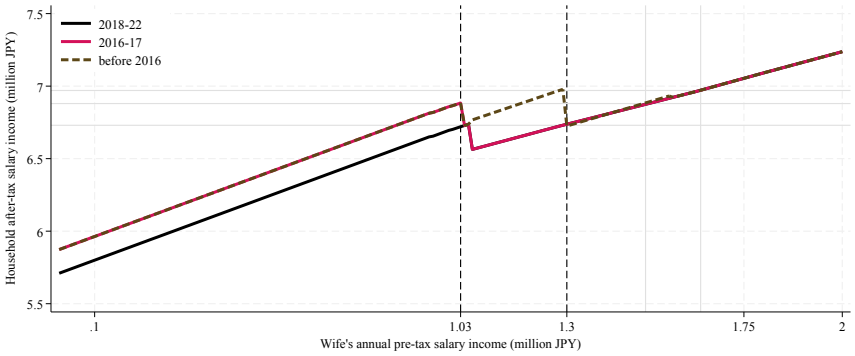
(a) Husband's income = 2 million JPY



(b) Husband's income = 4 million JPY

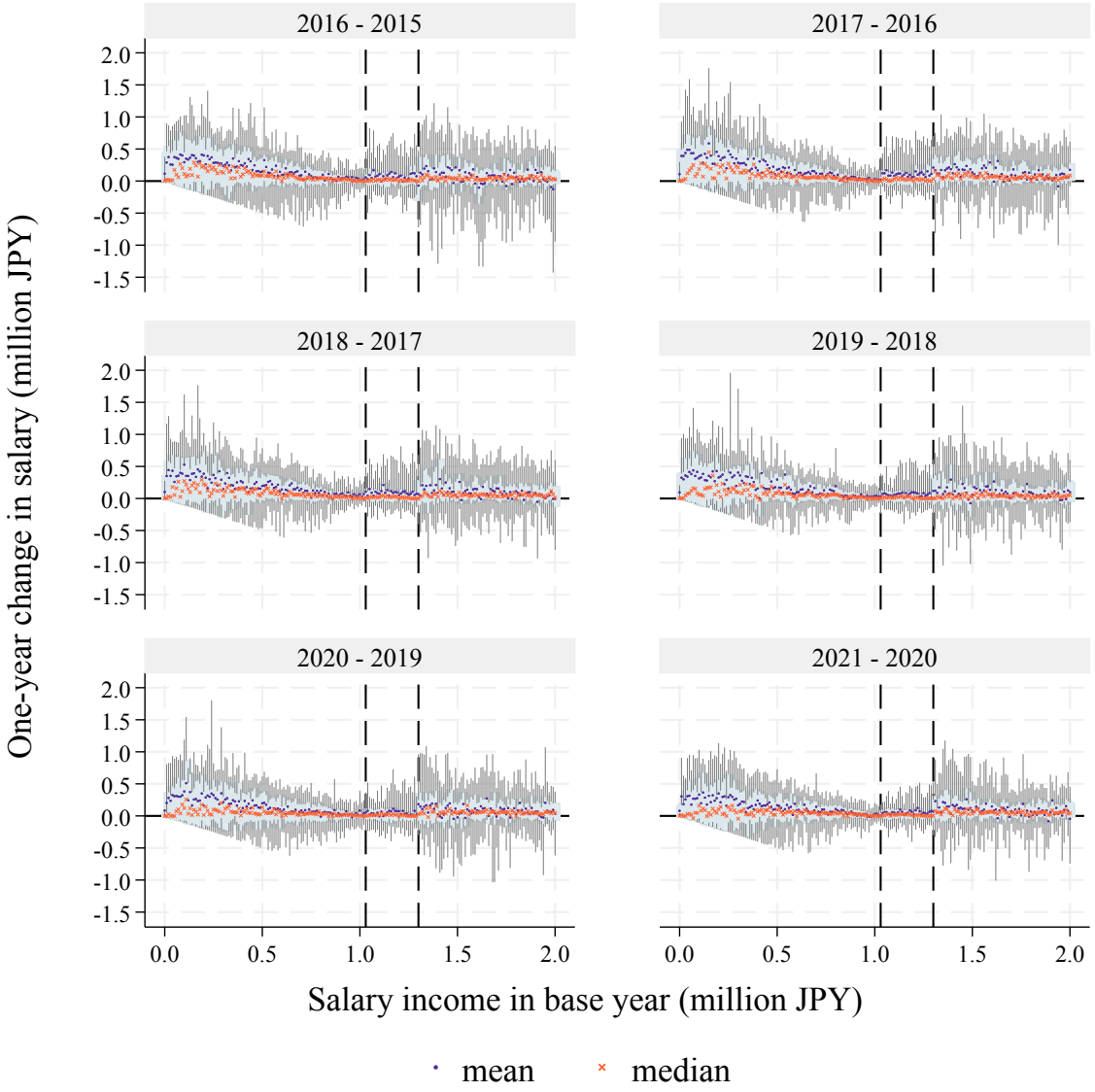


(c) Husband's income = 10 million JPY



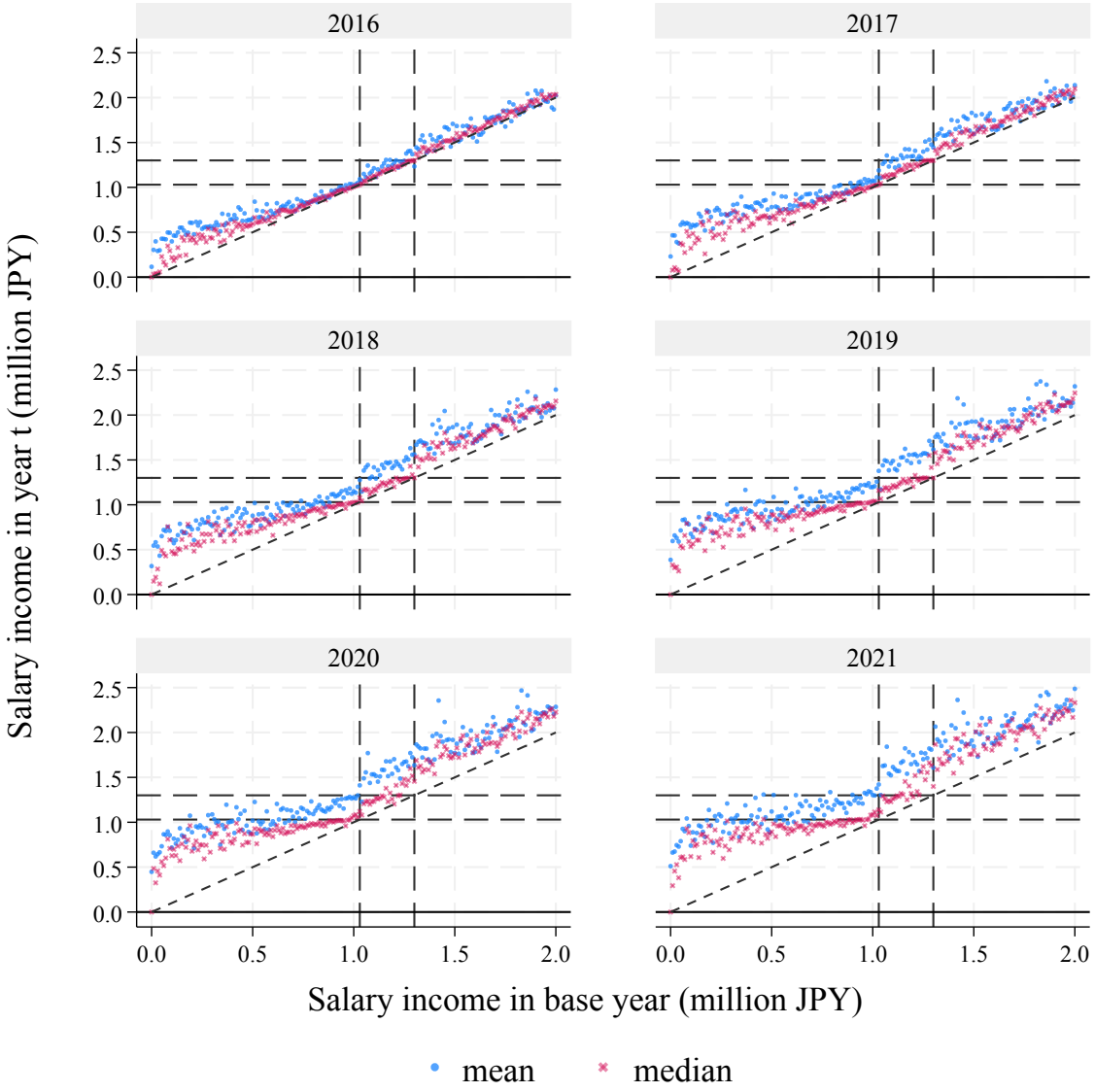
Notes: Simulated calculations.

Figure 5: Annual change in the salary income



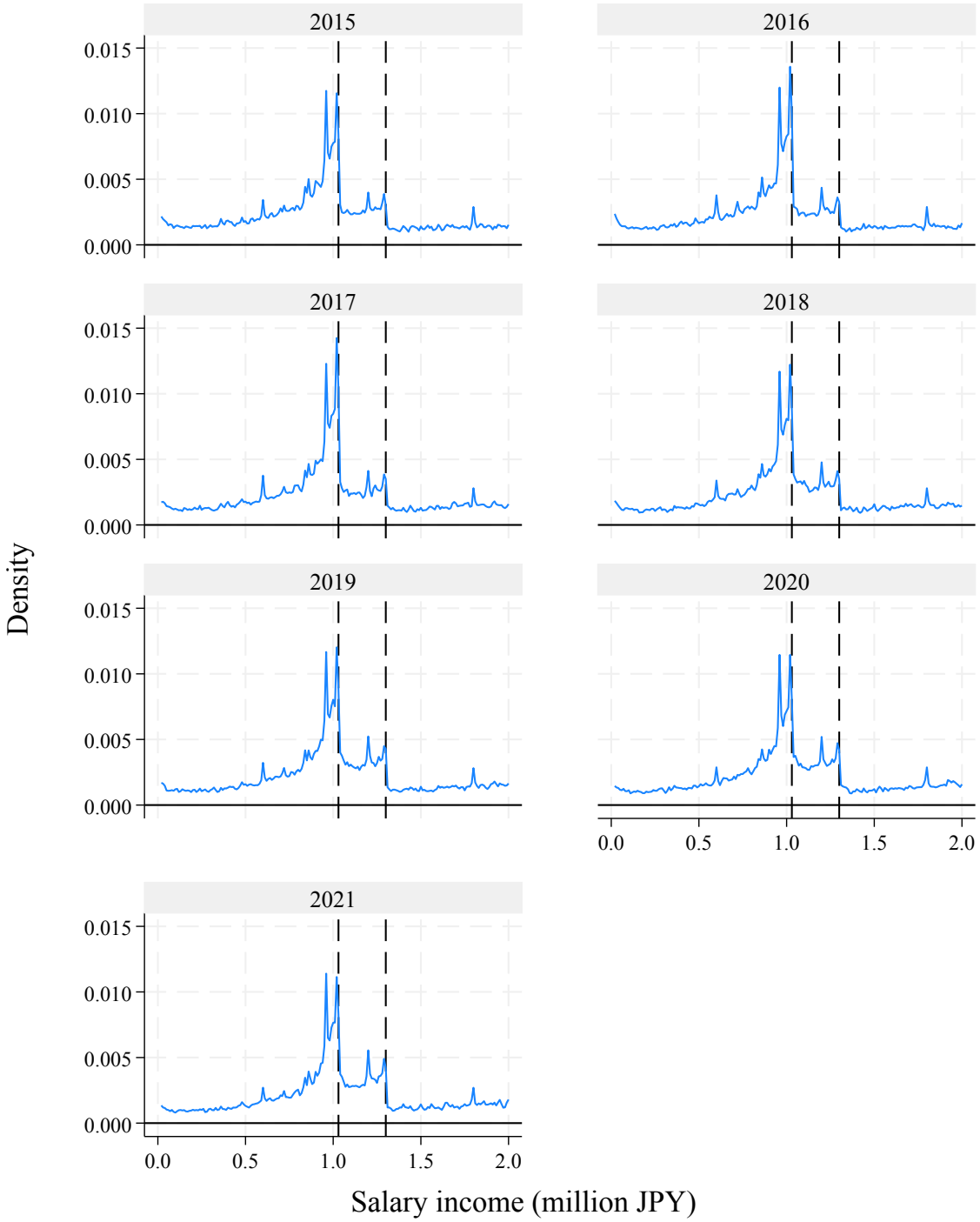
Notes: The base year (x-axis) is income in year t. The y-axis is the change in income between year $t+1$ and t. The vertical and horizontal dashed lines represent the thresholds 1.03 and 1.3 million JPY. The light blue bars represent the 25th to 75th percentiles. The gray bars represent the 10th to 90th percentiles. Source: CREPE project municipality tax data

Figure 6: Salary growth over 2016 to 2021, base year = 2015



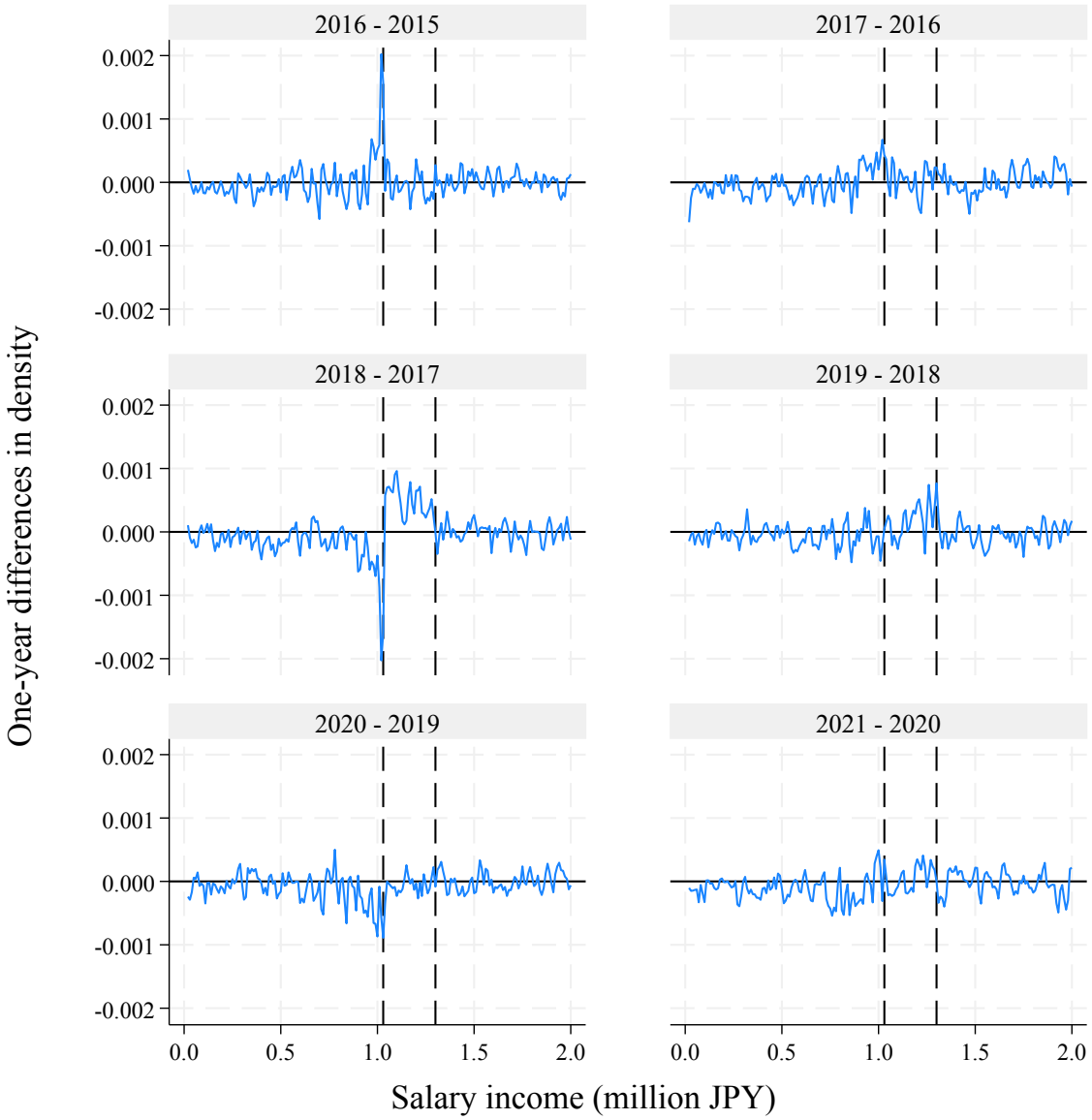
Notes: The base year (x-axis) is income in 2015. The y-axis is income in year t where each figure is a different year. The short-dash black line is the 45 degree line. The vertical and horizontal dashed lines represent the thresholds 1.03 and 1.3 million JPY. Source: CREPE project municipality tax data

Figure 7: Distribution of annual salary income by year



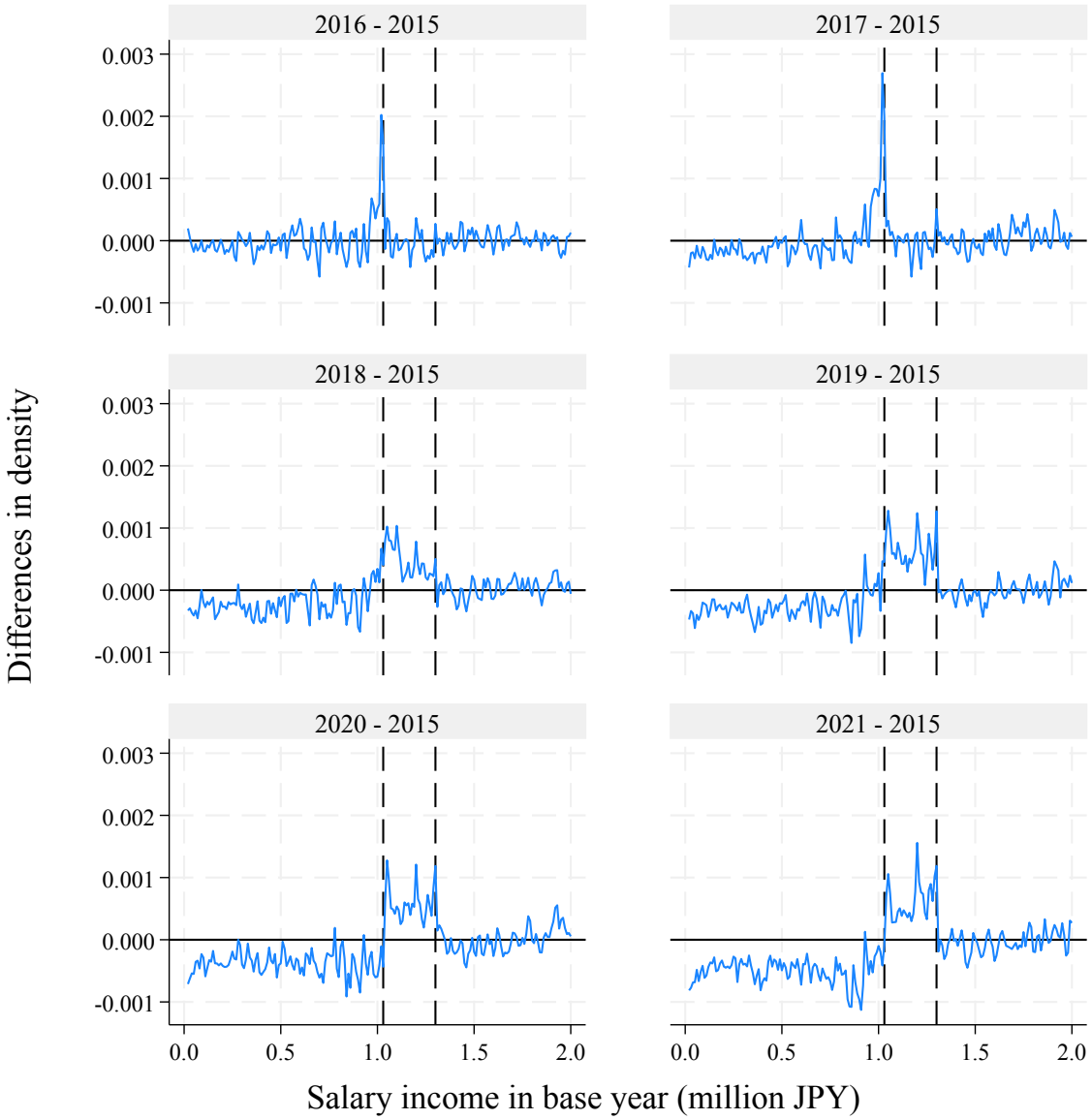
Notes: Source: CREPE project municipality tax data

Figure 8: Change in the distribution of annual salary income by year



Notes: Source: CREPE project municipality tax data

Figure 9: Change in the distribution of annual salary income by year, base year = 2015



Notes: Source: CREPE project municipality tax data

Appendix A: Relevance of minimum wages for female part-time workers in Japan

This appendix section provides some evidence supporting our assumption that the majority of married women whose annual salary income is near 1.03 million JPY are paid hourly wages close to the minimum wage. We begin with the cross tabulation from the Labour Force Survey to show the composition of employment types of married women in a certain income range. Then we use the JPSC to show that the majority of married women who are paid by hour actually earns hourly wages within 20% from the minimum wage, and their wages change parallel to the minimum wages.

First, Table A.2 show the decomposition of employment status of women aged 25-60 during the same period as the long panel of administrative tax data cover. Among all married women, 39% are non-regular employees. When further limited to those whose annual income is between 0.5-1.5 million JPY, 83% are non-regular employees.[10]

Table A.3 breaks down employment status by income categories. Here we focus on annual incomes under 1.49 million yen. Among the married female non-regular employees, 45% earn less than 1 million JPY, and another 30% earn between 1.0-1.49 million JPY. Given that very few earn between 1.30-1.49 million yen in Figure 1, this break down implies that three quarter of married female non-regular workers are below the threshold for 1.3 million yen.

Further, Figure A.1 shows that most of the married women earning 0.5-1.5 million yen work part time, with the largest mass at 20 hours per week.

Next, we check whether married women who are paid hourly are affected by the minimum wage using the JPSC.

[10]We would prefer to focus on incomes below 1.3 million JPY but the survey only records income that fall within the bucket of 1 – 1.49 million JPY.

The summary statistics of the JPSC analysis sample are summarized in Table A.4. The total number of married women in each wave is 1000–1600. The percentage of workers paid by hour is increasing, ranging from around 24% in the early 2000s to around 33% in the late 2010's.

Each observation is matched with the minimum wage of the prefecture of residence. Since the survey is conducted in October and the minimum wage is revised on around October 1st, we regress the hourly wage as of October of the year on the minimum wage that is effective in October of the same year.

The 5th-7th columns of Table A.4 the percentage of those whose hourly wage is within 5%, 10%, and 20% from the minimum wage, respectively. Specifically, we take the difference between the hourly wage and the minimum wage and see whether the difference is smaller than 5%, 10% or 20% of the hourly wage. The last two columns show average hourly wage and minimum wage of each year. As the minimum wage increases, the percentage of those near the minimum wage increases, and in the late 2010's, about 80% of married women who are paid by hourly wages are within 20% from the minimum wage.

Using this sample of married women paid by hour, we estimate the following equation:

$$\log(w_{pit}) = \beta \log(MW_{pt}) + \tau_t + \eta_i + \epsilon_{pit} \tag{A.1}$$

where subscripts i, t, p represent individual, year, and prefecture of residence, respectively, w_{pit} is hourly wage of individual i who lives in prefecture p in year t, and MW_{pt} is the minimum wage of the prefecture of residence in the year. τ_t and η_i represent year- and individual- fixed effects.[11] The estimated β is interpreted as the change in the hourly wages caused by the change in the minimum wage.

[11] Prefecture fixed effects are ignored because they are absorbed by the individual fixed effects.

Table A.5 present the estimated β, with and without year fixed effects. Focusing on the specification with year fixed effects, for all married women paid by hour, a 1% increase in the minimum wage increases the hourly wage by 0.4%. Columns (2)-(4) and (6)-(8) limit the sample to those whose $w_p i, t-1$ was within X percent from the minimum wage. Not surprisingly, whose whose previous year's wage was closer to the minimum wage are more affected by the minimum wage change. Combining the fact that about 80% of married women who are paid by hourly wages are within 20% from the minimum wage, shown in Table A.4, and that a 1% increase in the minimum wage increases the hourly wage by 0.8% for those whose last year's wage was within 20% from the minimum wage, shown in Column (6), changes in the minimum wage substantially affect the hourly wages of married women working part-time.

Table A.1: Summary statistics of administrative record data

	mean	sd	min	10%tile	25 %tile	50 %tile	75%tile	90%tile	max
Salary income (million JPY)	1.84	2.21	0	0	0.25	1.09	2.66	4.60	36.01
Age	45.48	7.61	25	35	40	46	52	55	60
Salary income of husband (million JPY)	5.80	4.28	0	0.45	3.52	5.41	7.63	10.00	90.00
Age of husband	47.83	8.65	20	36	42	48	54	59	87
N. of children under 18	1.12	1.07	0	0	0	1	2	3	10
N. of observations	429,737								
N. of unique individuals	61,391								

Source: CREPE project municipality tax data in year 2015-2021. Sample is limited to married women aged 25-60.

Table A.2: Employment status of women aged 25-60, LFS 2015-2021

	0.5-1.5 (¥, mil) Married	All Married	All Single	All Total
Employed (%)				
Regular employee	6.74	25.44	49.07	32.77
Non-regular employee	82.7	39.07	30.35	36.37
Other employed	7.26	6.41	4.57	5.84
Unemployed (%)	0.95	1.23	3.70	1.99
Out of labor force (%)	2.36	27.85	12.31	23.03
Total	100	100	100	100

Source: Labour Force Survey Special Questionnaire, all months in year 2015-2021.

Table A.3: Income distribution of employed women aged 25-60 (2015-2021)

(a) Married women				
	Regular employees	**Non-regular employees**	**Other employed**	**All**
Percent of total employed	35.87	55.09	9.03	100
Income (¥, million) earned in the last 12 months				
No income	0.00	0.00	7.00	0.63
<0.5	1.37	10.07	13.70	7.28
0.5 – 0.99	3.07	36.15	20.18	22.84
1 – 1.49	5.19	29.88	15.17	19.70
1.5 – 1.99	6.99	9.78	6.63	8.49
2 – 2.99	21.94	10.21	11.70	14.55
3 – 3.99	22.78	2.59	9.13	10.42
4 – 4.99	16.19	0.74	5.49	6.71
5 – 6.99	15.60	0.39	4.78	6.24
7 – 9.99	5.84	0.13	3.04	2.44
10 – 14.99	0.84	0.05	2.13	0.52
>15	0.19	0.01	1.06	0.17

(b) Single women				
	Regular employees	**Non-regular employees**	**Other employed**	**All**
Percent of total employed	58.42	36.13	5.44	100
Income (¥, million) earned in the last 12 months				
No income	0.00	0.00	1.74	0.09
<0.5	0.52	5.52	19.89	3.38
0.5-0.99	0.84	12.69	10.91	5.67
1-1.49	3.54	26.21	11.61	12.17
1.5-1.99	7.49	21.34	9.31	12.59
2-2.99	28.90	25.17	16.44	26.87
3-3.99	27.27	6.69	10.54	18.92
4-4.99	15.36	1.53	7.21	9.92
5-6.99	11.58	0.64	5.76	7.31
7-9.99	3.73	0.13	3.42	2.41
10-14.99	0.65	0.07	1.99	0.51
>15	0.12	0.02	1.17	0.14

Notes: Those whose income is "no income" in the column of "Other employed" are unpaid family workers in self-employed households. The "All" column is the weighted average of all employees where the weights are individual percent of total employed.

Source: Labour Force Survey Special Questionnaire, 2015-2021.

Table A.4: Summary statistics of JPSC

Year	Number of married women	Number of married women paid by hour	% paid by hour	Among married women paid by hour				
				within 5% from MW (%)	within 10% from MW (%)	within 20% from MW (%)	avg. hourly wage	avg. minimum wage
2002	1064	252	23.7	7.9	25.8	65.5	850.4	661.1
2003	1366	337	24.7	8.0	23.7	60.5	907.7	661.9
2004	1310	330	25.2	7.9	19.7	58.8	874.1	663.6
2005	1275	331	26.0	8.2	18.7	56.8	881.9	667.1
2006	1243	358	28.8	7.3	16.8	53.4	932.0	670.8
2007	1216	349	28.7	10.3	21.5	58.5	908.6	685.2
2008	1415	392	27.7	12.2	22.7	59.4	911.3	701.2
2009	1403	421	30.0	13.5	26.8	58.4	927.6	710.2
2010	1400	431	30.8	17.9	34.3	68.9	918.6	727.4
2011	1394	432	31.0	18.5	33.8	67.6	944.8	734.1
2012	1377	423	30.7	18.0	36.4	68.8	942.7	744.0
2013	1552	476	30.7	23.7	37.6	71.2	956.1	758.9
2014	1512	481	31.8	25.6	42.0	72.6	963.3	775.1
2015	1471	472	32.1	32.4	49.4	73.1	995.0	793.9
2016	1429	477	33.4	35.2	53.0	76.7	991.7	818.4
2017	1420	476	33.5	43.3	58.8	79.6	1000.3	842.6
2018	1383	453	32.8	42.4	57.2	81.7	1023.6	868.6
2019	1349	446	33.1	47.1	65.7	82.3	1037.2	896.4
2020	1320	430	32.6	37.2	60.5	79.5	1056.6	896.6
2021	1278	436	34.1	45.6	60.3	79.1	1106.5	925.2
N. of obserevations.	27177	8203						
N. of unique individuals	2471	1354						

Notes: TBA.

Source: Japan Panel Survey of Consumers (JPSC).

Table A.5: Association between minimum wage and hourly wage

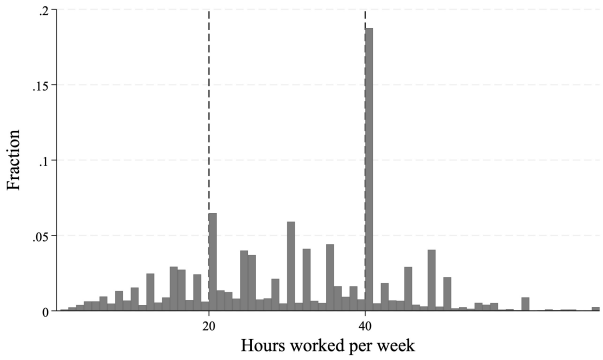
Sample	All	within 20%	within 10%	within 5%	All	within 20%	within 10%	within 5%
$\log(mw)$	0.626***	0.722***	0.841***	0.964***	0.408***	0.778***	0.833***	1.034***
	[0.014]	[0.012]	[0.014]	[0.018]	[0.071]	[0.069]	[0.113]	[0.175]
year FE	No	No	No	No	Yes	Yes	Yes	Yes
Observations	8,203	4,359	2,451	1,503	8,203	4,359	2,451	1,503
R-squared	0.229	0.516	0.673	0.716	0.24	0.529	0.685	0.726
Number of id	1,354	821	579	416	1,354	821	579	416

Notes: Standard errors in brackets. $***p < 0.01, **p < 0.05, *p < 0.1$.

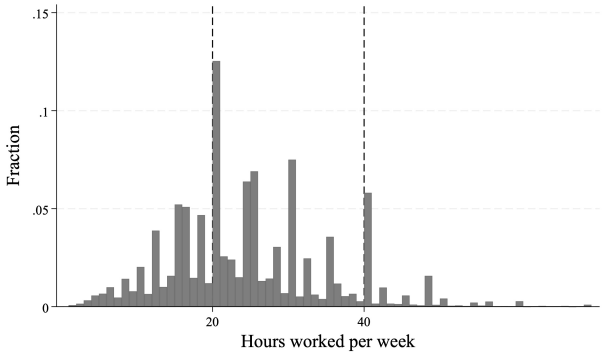
Source: Japan Panel Survey of Consumers (JPSC).

Figure A.1: Hours worked by income, married women (2015-2021)

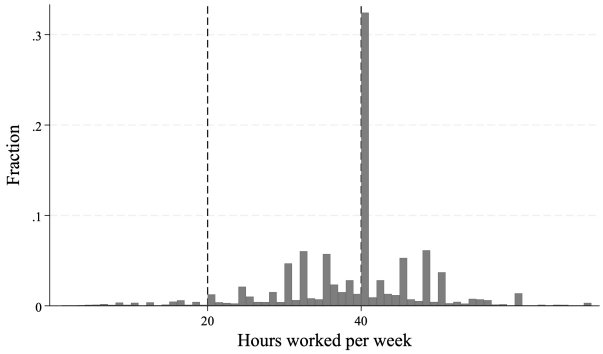
(a) All



(b) Earnings 0.5 - 1.5 ¥(million)



(c) Earnings 1.5+ ¥(million)



Notes: Sample is limited to married women aged 25-60 with positive working hours. Those who reported more than 70 hours (0.4%) or on leave (4.2%) are excluded.
Source: Labour Force Survey Special Questionnaire, 2015-2021.