Real and Phantom Constraints: Tax Misperceptions and Female Labor Supply in Japan *

Naomi Feldman† Taiyo Fukai‡ Ayako Kondo§

August 28, 2026

PRELIMINARY AND INCOMPLETE.

Abstract

This paper shows that tax and social insurance complexity distorts female labor supply in Japan by creating a salient but misleading income threshold. Using administrative data on married women, we document sharp bunching at multiple earnings cutoffs. Strikingly, women respond more strongly to a threshold with little true income effect than to a nearby threshold involving a large discrete loss. We show that this pattern is inconsistent with full-information labor supply and reflects systematic misperceptions of marginal incentives. Rising minimum wages exacerbate these distortions by pushing workers toward salient cutoffs. Correcting misperceptions yields nontrivial gains in aggregate labor income and GDP.

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

*We thank seminar participants from the CEPR Public Economics Annual Symposium, Harris School of Public Policy (University of Chicago), The Wharton School of the University of Pennsylvania, Doshisha University, Yokohama City University, Bank of Japan and Kansai Labor Workshop for excellent comments. This work was supported by JSPS KAKENHI Grant Numbers JP22H05009, JP22H05011 and JP22H05007. Municipality administrative data used in this paper were provided by the Center for Research and Education in Program Evaluation (CREPE), the University of Tokyo. The approval of use of the Labour Force Survey was granted by the Statistics Bureau to Kondo and Fukai based on JSPS KAKENHI Grant JP22H05009. The data of Japan Panel Survey of Consumers were provided by Panel Data Research Center at Keio University. Declarations of interest: none.

†Department of Economics, Hebrew University of Jerusalem, Israel. naomi.feldman@mail.huji.ac.il.
‡Department of Economics, Gakushuin University. taiyo.fukai@gakushuin.ac.jp
§Institute of Social Science, University of Tokyo. akondo@iss.u-tokyo.ac.jp

1 Introduction

Many advanced economies facing below-replacement fertility and population aging increasingly view higher female labor supply as essential for sustaining economic growth and fiscal capacity. While policy discussions often emphasize childcare provision, parental leave, and workplace flexibility, less attention has been paid to how the design and complexity of tax and social insurance systems themselves shape labor supply behavior. Beyond the standard disincentive effects of taxation, complex systems with multiple thresholds, exemptions, and interactions can distort work incentives in ways that are difficult for individuals to fully understand, potentially discouraging additional work effort even when statutory marginal tax rates are modest.

Japan provides a particularly salient setting in which to study these issues. As one of the world's largest economies, Japan faces a rapidly aging population and a shrinking workforce, making the efficient use of all potential labor, especially female labor, increasingly important. Although female labor force participation has risen substantially over recent decades, many women remain concentrated in part-time and low-earning jobs with limited opportunities for advancement. This pattern suggests that institutional features may constrain women's labor supply decisions not only at the participation margin, but also in terms of hours, earnings, and job choice, with implications for human capital accumulation and aggregate productivity.

A central institutional feature affecting female labor supply in Japan is the income tax and social insurance system, which treats secondary earners (typically married women) very differently from primary earners. The system includes multiple income thresholds tied to spousal tax exemptions and social insurance eligibility, generating kinks and notches in net income that depend not only on earnings but also on firm size, spousal income, and whether the spouse is salaried or self-employed. As a result, secondary earners face a highly nonlinear and opaque incentive structure, making it difficult to map additional work effort into changes in net income.

Figure 1 illustrates the empirical motivation. The distribution of annual labor earnings

among married female employees exhibits pronounced clustering at two income levels: 1.03 million and 1.3 million JPY.[1] These thresholds correspond to salient points in the tax and social insurance schedule. Earnings above 1.03 million JPY are subject to income tax, while crossing 1.3 million JPY triggers a discrete loss of spousal benefits. The observed bunching suggests that many women adjust their labor supply to remain within specific income ranges, potentially discouraging higher earnings, increased hours, or transitions into more stable employment.

Importantly, this bunching reflects real labor supply adjustments rather than reporting behavior. Unlike many contexts studied in the bunching literature, where responses may reflect income shifting or evasion (Saez, 2010; Kleven et al., 2011; Kleven and Waseem, 2013; Le Maire and Schjerning, 2013), earnings in our setting are largely third-party reported by employers. We observe substantial clustering even among workers with fully reported wage income, indicating that these patterns arise from genuine changes in labor supply.

A striking feature of the data is that bunching at the 1.03 million JPY threshold (a kink where the marginal tax rate increases modestly) is substantially larger than bunching at the nearby 1.3 million JPY notch, which involves a much larger mechanical reduction in net income (the threshold where social insurance obligations become mandatory). Under standard models of labor supply with full information, this pattern is difficult to reconcile. We argue that it is instead consistent with widespread misperceptions or incomplete understanding of the tax and social insurance system, induced by its complexity and overlapping provisions. In particular, women appear to behave as though the 1.03 million JPY threshold represents a much larger penalty than it actually does.

These patterns highlight why examining the effects of income tax policies on female labor supply in Japan is of broader interest. Institutional features of Japan's tax and social insurance systems continue to generate strong disincentives for secondary earners, despite sustained policy efforts to promote female labor force participation. In particular, the

[1]The average exchange rate from 2015–2021 was approximately \$1 USD = 110 JPY, implying that 1.03 million JPY equals about \$9,300 and 1.3 million JPY about \$11,700.

dependent spouse exemption and associated contribution thresholds create pronounced nonlinearities in budget constraints that discourage women from working beyond specific income levels. Such nonlinear budget sets are well known to generate sharp behavioral responses at policy-induced kink points (Saez, 2010). Comparable mechanisms have been documented elsewhere. In the United States, joint taxation has historically imposed high marginal tax rates on married secondary earners, substantially reducing married women's labor supply (Eissa, 1995; Eissa and Hoynes, 2004). In several European countries, family-based taxation and benefit withdrawal rules generate high effective marginal tax rates for secondary earners, implying substantial disincentives to female labor supply, particularly along the intensive margin (Figari et al., 2011; Selin, 2014). In contrast, reforms toward individual taxation in Sweden have been associated with sustained increases in female labor force participation (Selin, 2014). In 2026, Switzerland became the most recent country to pass individual taxation of couples, recognizing the negative impact on female labor supply. Japan's provisions, introduced in 1986 and originally intended to protect household welfare, now distort labor supply choices in ways that reduce aggregate labor input at a time of severe worker scarcity.

Recent work in behavioral public finance emphasizes that these distortions may be amplified when tax systems are complex and imperfectly understood. When tax schedules are nonlinear and nontransparent, marginal incentives may not be fully salient, leading behavior to diverge from full-information benchmarks. In particular, Ferey et al. (2024) show that optimal tax design and welfare analysis differ substantially when agents face nonlinear tax schedules that are not fully salient, providing a theoretical foundation for empirical labor supply responses that cluster around salient thresholds rather than adjust smoothly. In practice, modern tax systems often combine multiple provisions such as joint filing rules, spousal exemptions, and social insurance thresholds into incentive structures that are difficult for taxpayers to internalize. When net-of-tax incentives are hard to perceive, responses to statutory marginal rates may be muted or distorted, and behavior may instead reflect simplified heuristics or salient cutoffs. In this context, exam-

ining female labor supply responses to Japan's tax system provides insight into how tax complexity and limited salience interact to shape decisions with long-lasting implications for labor markets and macroeconomic outcomes

This paper makes four main contributions. First, using administrative panel data, we document large and persistent bunching of married women's earnings at secondary-earner thresholds, even in the presence of third-party reporting. Second, by comparing responses at a kink and a nearby notch, we quantify the degree of misperception implied by observed behavior and show that it cannot be explained by standard labor supply elasticities alone. Third, we provide experimental survey evidence from an information intervention in one of the municipalities in our data that our target population exhibits significant misunderstanding of the income tax and social insurance systems. Finally, we quantify the macroeconomic implications of these misperceptions using results from our information intervention . Eliminating the *perceived* penalty at the 1.03 million JPY threshold reallocates earnings toward higher income ranges and generates nontrivial gains in aggregate labor income and GDP in an economy facing persistent labor scarcity.

We find that married women significantly misperceive marginal tax rates at the 1.03 million JPY threshold–in fact, overestimating them four fold based upon our structural elasticity estimate. That is, rather than respond to a kink of 15% (the actual marginal rate at the threshold), they respond as if the marginal tax rate were closer to 75%. We further find that the salience of the 1.03 million JPY threshold is sufficiently strong that, as minimum wages rise, an increasing number of women reduce their labor supply to avoid crossing the threshold. The growth rate in labor earnings approaches zero (despite increases in the minimum wage) as total earnings approaches 1.03 million JPY. We estimate that eliminating misperceptions at the 1.03 million JPY threshold would generate a one-time increase in GDP of about 0.05 percentage points, nearly a 4 percent gain relative to average growth in 2018-2021, achievable largely through information provision rather than substantial government spending.

2 Background

2.1 Trends in female labor supply and earnings

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 LFP, 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 80% 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.[2] Figure 2a plots age profiles of LFP by 5-year age cohorts from the Labour Force Survey (LFS).[3] As the figure shows, for a given age cohort, LFP has been consistently increasing over time. LFP falls for all cohorts during main childbearing years but then grows again as women return to the labor force. This fall of LFP during the childrearing years is smaller for younger cohorts, implying that increasingly more mothers stay in the labor force and in regular employment. Figure 2b 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 employed women

[2] "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.

[3] See Appendix Section A for details on the LFS.

progress through the life-cycle, they are more likely to take on non-regular employment. The trajectories show that each cohort reaches (or shows indications that will reach) at least 50% of married women at some point over the prime earning ages of 35 to 54.

The majority of non-regular employees are married women who earn in a range around one million JPY per year as secondary earners. Table A.2 reports the distribution of employment status for women aged 25–60 over 2015-2021 (the same period covered by our administrative tax data that we will describe in Section 3). Among all married women, 39% are non-regular employees. Restricting the sample to those with annual incomes between 0.5 and 1.5 million JPY, the share of non-regular employees rises sharply to 83%.[4]

A substantial fraction of non-regular workers are paid at or near the minimum wage. Minimum wages are subject to a 3% annual increase in Japan (with the recent exception of 2021, when minimum wages remained flat due to a Covid-19 era policy). In large part due to this, the hourly wages of part-time married women have followed an upward trend, making the income thresholds increasingly binding, as documented by Mori and Okudaira (2025). An annual income of one million JPY combined with 20 hours of work per week corresponds to an hourly wage of approximately 960 JPY. Until October 2018, this level exceeded the minimum wage in all 47 prefectures; however, minimum wages in Tokyo and Kanagawa surpassed 960 JPY in October 2018, followed by Osaka in October 2019. Mori and Okudaira (2025) show that although hourly wages of female part-time workers increased in response to higher minimum wages, their annual earnings rose by much less, suggesting a reduction in hours worked. We return to this issue in Section 4.

2.2 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

[4]Ideally, we would focus on incomes below 1.3 million JPY; however, the survey reports income only in brackets, with the closest category being 1.0–1.49 million JPY.

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. Our empirical analysis focuses on women married to salaried workers (not self-employed) with annual total income [5] less than 9 million JPY because social insurance burdens are impacted by the type of employment for both spouses and primary earners with annual total income above 9 million JPY face different deduction schemes.

2.2.1 Take-home income in 2018-2021

Our main analyses focus on the period 2018–2021. Figure 3 illustrates the relationship between gross salary and take-home income for salaries ranging from 0 to 1.5 million JPY. 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 take-home 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. In addition, local residential tax kicks in at one million JPY at a marginal rate of 10%. Second, 1.03 million JPY of gross annual salary income corresponds to the maximum total income to be qualified as a "dependent family member" in the tax

[5] "Total income (*gokeishotoku*)" is the sum of income from various sources such as salary, business, and public pension. Some deductions corresponding to the necessary cost for the earning, including salary income deduction, are applied; thus total income is smaller than gross salary income for salaried workers with no other income.

system. Although the dependent status no longer affects the spouse's tax liability, the threshold remains salient for historical reasons that will be described in Section 2.2.2, and also often used to determine eligibility for spousal allowannces added to salary by the employers. [6]

Next, there is a second threshold for social insurance payments at 1.3 million JPY. 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. All eligible employees have to enroll in the employee's insurance, where both employers and employees contribute to the social insurance system through payroll deductions. The amount of employee's contribution is about 14.2% of the gross salary.

Most primary earners are covered by insurance provided by the employer. For secondary earners, 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 JPY, 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. [7] 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, about 23% of total

[6] Some employers add spousal allowances to a primary earner's salary. They have become less popular as of late. According to a survey by the National Personnel Authority from 2015, 40.3% of private companies paid such annual allowances that amounted to about 156,000 JPY. The number of firms that offered such a benefit had fallen to 21.7% by 2021. Because such bonuses are rolled into salary income, our administrative tax data do not distinguish between spousal allowances and base salary. Technically, this potential loss of spousal allowances is included in our estimated perceived cost of passing 1.03 million JPY.

[7] More precisely, the pension and health insurance systems differ. For pensions, the system of "Category III insured persons" allows spouses of employees enrolled in Employees' Pension Insurance whose annual income is below JPY 1.3 million to be covered by the National Pension without paying National Pension premiums themselves. In the case of health insurance, family members with annual income below JPY 1.3 million, not just spouses, can be covered as dependents under the health insurance plan in which the head of household is enrolled, without any additional premium.

income for a secondary earner earning 1.3 million JPY. [8]

An important 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. Until September 2016, the threshold was working more than 30 hours per week, and very few workers with annual income within 1.3 million JPY exceeded this threshold. In October 2016, social insurance coverage was expanded to employees in firms with more than 500 employees whose monthly salary is above 88,000 JPY (corresponding to an annual income of 1.06 million JPY) and working more than 20 hours a week.[9] As such, secondary earners employed by large firms are exposed to different incentives than those employed by smaller firms.

This is shown as the dashed line in Figure 3. A discontinuous decline in take-home income at 1.06 million JPY, slightly to the right of the 1.03 million JPY threshold, corresponds to the monthly salary threshold. Note that even if employed by large firms, secondary workers working less than 20 hours still follow the schedule shown as the solid line. Therefore, this notch at 1.06 million JPY is relevant only if hourly wage is so low that working 20 hours per week makes monthly salary lower than 88,000 JPY. Those whose hourly wage is higher than 1,020 JPY (JPY 1.06 million divided by 20 hours per week and 52 weeks per year) switch to the dashed line when their weekly hours exceed 20 hours per week; the corresponding annual income increases with hourly wages.

If hourly wage exceeds 1,250 JPY, annual income reaches the 1.3 million threshold for national social insurance before weekly hours reach 20. Thus, the 1.3 million threshold is still relevant for them. In contrast, those employed by large firms with hourly wages less than 1250 JPY have to enroll in employee's insurance before their income reaches 1.3 million JPY. Thus, they do not face the notch at 1.3 million JPY. Instead, as expressed as the switch from the solid to dashed lines in Figure 3, take-home income discontinuously

[8]Payment for National Pension Insurance is about 200,000 JPY per year regardless of income level. Payment for National Health Insurance varies across municipality of residence, income and household composition, and on average about 100,000JPY for annual gross salary income of 1.3 million JPY and increases with income at the rate of 10%.

[9]The coverage was further expanded to firms with more than 100 employees in October 2022 more than 50 employees in October 2024.

decreases when weekly hours exceed 20. [10]

Note that, as described in Section 3, our data do not include information on firm size or social insurance status. Thus, as explained in Section 5, we assume 25% of our sample is working at large firms with hourly wages less than 1,250 JPY and facing the budget line shown as the dashed line when their income exceeds 1.3 million JPY, and the remaining 75% are facing the budget line shown as the solid line.

2.2.2 Spousal deduction until 2017

Although the Japanese income tax system is individual-based, a primary earner can claim deductions to reduce their taxable income if they support other family members. The income threshold for a family member to qualify as a dependent for tax purposes was originally set uniformly. However, in response to the growing number of married women working part-time as secondary earners, an additional deduction applicable exclusively to spouses was introduced in 1987. As a result, the income deduction available to individuals supporting a spouse is called the spousal deduction (*haigu-sha kōjo*) when the supported spouse's annual income is less than the threshold for dependent family members, and the special spousal deduction (*haigu-sha tokubetsu kōjo*) when the spouse's annual income exceeds the threshold.

In 2018, two major changes were made to the spousal deduction and special spousal deduction. First, the income threshold at which the special spousal deduction begins to phase out was raised from 1.05 million JPY to 1.5 million JPY. That is, the same amount of deduction (380,000 JPY) is applied to spouses of women with annual gross salary less than 1.5 million JPY. Thus we do not need to consider the spousal deduction in our main analyses using income earned in 2018-2021. Second, for primary earners with total incomes above 9 million JPY, both the spousal deduction and the special spousal deduction were reduced. To avoid complications arising from this second change, women married to men with total incomes above 9 million JPY were excluded from our sample.

[10] 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. In practice, however, the thresholds for newly covered employees are perceived as a new income trap.

Since our longer panel data starts from 2015, Appendix Figure A.1 shows the take-home pay minus increased tax liability due to the reduced amount of spousal deduction and gross salary income in 2015-2017. Also, Table A.1 summarizes tax and social insurance thresholds over time.

Prior to the 2018 reform, the deduction began phasing out once the spouse's gross salary income passed 1.05 million JPY. The amount of deduction was reduced to 360,000 JPY if the spouse's gross salary income was in the range between 1.05- 1.1 million JPY, and then each additional 50,000 JPY of spouse's income reduces the primary earner's deduction by 50,000 JPY, effectively adding the primary earner's marginal tax rate to the secondary earner's effective marginal tax rate. The small zigzag in the middle panel of Figure A.1 reflects the resulting increase in tax liability; the marginal tax rate for a primary earner with 6 million total income is assumed to be 30%. Although it is visually indistinguishable due to the lower marginal tax rate (15%), a spouse with total income 2 million also faces the same reduction in the deduction.

Second, for primary earners with total incomes above 9 million JPY, both the spousal deduction and the special spousal deduction were reduced to two-thirds of the amounts available to those with total incomes below 9 million JPY. They were further reduced to one-third for those with total incomes above 9.5 million JPY, and eliminated entirely for those with total incomes above 10 million JPY. Prior to this reform, primary earners with total incomes above 10 million JPY were eligible for spousal deduction but not for special spousal deduction. Thus, 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 in the bottom panel of Figure A.1; assuming that the marginal tax rate is 33%, the amount of loss is 125,400 JPY.

To summarize, prior to 2018 reform, the tax kink near the 1.03 million threshold was steeper for women married to higher earning men, and those married to men with more than total income 10 million faced a substantial notch instead.

In addition to these real impact on take-home income, it is worth reemphasizing

that the name of the deduction changes once the dependent spouse's gross salary income exceeds 1.03 million JPY, even though the amount deducted from the primary earner's taxable income remains unchanged. This renaming appears to have contributed to the persistent and mistaken belief that the spousal deduction is lost entirely once the wife earns more than 1.03 million JPY, even after the 2018 reform. For example, as will be shown in Section 6, even in 2025, 33.5% of women who adjusted their annual income cited the spousal deduction as a reason for limiting their annual income.

3 Data

Our primary source of data is administrative records 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.[11] We use data from 19 municipalities in 12 prefectures with complete household composition data from 2018 to 2022. In addition, we use data from two municipalities covering 2016-2025 as supplementary analyses that require longer panel data. [12]

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 (all women whose spouse is identified to be living in the same household [13] are defined as married), spousal

[11] Fukuda (2025) describes the details of this project.

[12] 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 (Table A.4) show that the sampled municipalities are similar to the national average in terms of the share of college graduates, marriage rate, employment status and industry compositions. Population sizes significantly vary across the participating municipalities, with the largest municipality accounting for about 28% of the total sample, and the four largest cities accounting for 69%.

[13] Specifically, there are four patterns: a household head living with a spouse of the head, a spouse of the head living with the head, the only child of the head living with a spouse of the head's child, and a spouse of the head's child living with the head's child

income, and the age of children living in the same household.

The demographic and household composition variables described above are reported for the beginning of year t and combined with income earned in year $t-1$ from the tax record. Thus, our sample includes income earned between 2017 and 2021, although we mainly use income earned in 2018-2021 to avoid complication from tax reform in 2018. We focus on gross salary income as the main outcome variable that represents annual salary before any deductions or social insurance premiums. Note that the salary income is reported by the employer to the Tax Agency for the majority of salaried workers including part-time employees. [14] Thus, there is little room for individuals to manipulate reported salary income without actually changing the labor supply.

We limit the sample to married women aged 25-60 to exclude college students and to minimize the presence of pension-recipient spouses, who are subject to a different tax scheme. Then, we exclude women married to men with no gross *salary* income because these husbands are not covered by the Employee's Insurance scheme and thus the social insurance notch at 1.3m is not relevant to them. Further, we exclude women married to men earning more than 9 million JPY in total income because they are not eligible for full-amount of spousal deductions. As shown in Table 1, our final sample covers roughly 82% of all married women aged 25-60 living in the sampled municipality.

Table 2 presents the descriptive statistics. The sample comprises 832,918 unique individuals. The average annual salary income is 1.66 million yen. Notably, the 10th percentile of salary income is zero, indicating that a certain share of the sample does not work at all. The median annual wage income is 1.00 million yen, which is below the thresholds for dependent spouses.

The important advantage of these administrative data over the survey data is the preciseness of income, which is crucial given the multiple income thresholds we study. Accurate gross salary income is observable even for those who earn below the minimum

[14] Salaried workers employed by only one employer do not have to file a tax return unless their earnings exceeds 20 million JPY or other income exceeds 200,000 JPY. Instead of filing tax return, they submit documents to verify various deductions including dependent spouse's status to their employers, and the employers adjust the amount of tax withheld from salary at the end of the year based on these documents.

threshold for being subject to local residential tax. We know of no survey data that is able to break down income to such precise thresholds. Furthermore, the household registry data enables to connect individuals with their families living together. 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. To cover this weakness, we use several surveys as supplemental data. Details of these data are described in Appendix Section A.

4 Descriptive evidence for income adjustment

Figure 1 has shown that the distribution of gross salary income exhibits pronounced clustering at 1.03 million and 1.3 million thresholds. Taking advantage of the panel nature of our data, Figures 4 and 5 furthermore, illustrate the dynamics of income growth.

Salary income of married female part-time workers tends to grow overtime for several reasons. First, minimum wage increased at 3% annually. Because a large share of married women work part time at hourly wages close to the minimum wage,[15] increases in the minimum wage mechanically push annual earnings toward salient income thresholds, even if hours worked are held fixed. In addition, in some occupations, labor shortage has pushed up hourly wages more than the minimum wage increases. Furthermore, women with young children may increase hours worked as their children grow.

In Figure 4 we plot annual changes in labor income over 2017-2021. The blue and red symbols represent the mean and median annual changes with year t as the base year. The light blue bars represent the 25th to 75th percentiles and the gray bars the 10th to 90th percentiles. As the subfigures show, far below the thresholds, the mean change in income (and often the median as well) is large and positive reflecting increases in the hourly wage and increases in hours from a low base. The mean and median changes in annual income approach zero as women near the first threshold and remain there through the second

[15] See Appendix Section C.

threshold at 1.3 million JPY. Moreover, the variances of income changes are substantially smaller in the regions near the two thresholds–illustrating that the practice of minimizing income growth upon approaching the thresholds is widespread among married women. Given annual increases in 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. Upon passing the upper threshold, there is no reason to restrict income (other than standard responses to marginal tax rates) and the minimum wage becomes less important. The distribution of income changes is substantially wider and more variable, reflecting market and other forces that drive wages.

Figure 5 further illustrates the relevance of the income trap. In this figure, we fix the base year at 2017 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 2017 versus 2018. The next panel plots income in 2017 versus 2019 and so forth. The final panel plots income in 2017 versus 2021. In each case, the diagonal black line represents the 45 degree 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 2017 earn more in 2018 with the means and medians lying above the 45-degree line. As 2017 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 median just below the 1.03 million JPY threshold tend to hug the same value in 2018 and similarly for incomes within the center box. Over time, the pattern becomes more stark–particularly for the median. Consider now 2021 and the median income. For incomes that were below 1.03 million JPY in 2017, the median income in 2021 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 2017 increases earnings a bit but

its clear that the median woman earning below 1.3 million in 2017 aims to remain under the 1.3 million JPY threshold even in 2021. Once past the second threshold, incomes show positive growth, all above the 45-degree line.

5 Estimation of labor income elasticity and perceived cost

5.1 Model setup

We estimate the elasticity of labor supply for married women by exploiting distributional bunching induced by nonlinearities in the tax schedule,that is, nonlinear budget constraints. The basic idea is to focus on individuals' behavioral responses around income thresholds such as kinks, where marginal tax rates increase, and notches, where after-tax income drops discontinuously. If individuals are highly responsive to taxation, they tend to bunch around such thresholds to avoid losses; if not, such bunching will be limited. Thus, the degree of bunching provides information about the income elasticity of labor supply, which we use to estimate the elasticity parameter.

Following Saez (2010) and Kleven (2016), we assume a quasi-linear utility function of the following form:

$$u = z - T(z) - \frac{n}{1+1/e} \cdot \left(\frac{z}{n}\right)^{1+1/e}, \tag{1}$$

where z denotes income, n captures individual heterogeneity such as ability, $T(z)$ is the tax function, and e is the elasticity of labor income with respect to the net-of-tax rate to be estimated. We further assume that individual heterogeneity n follows a smooth distribution $f(z)$.

We consider a setting in the Japanese tax system, under the utility function in equation (1), where both a kink, characterized by a change in the marginal tax rate, and a notch, defined as a discontinuous drop in net income exist. Specifically, the tax function

$T(z)$ takes the following form:

$$T(z) = t \cdot z + \Big[\Delta T + \Delta t \cdot (z - z^*)\Big] \cdot \mathbf{1}[z > z^*], \tag{2}$$

where t is the marginal tax rate below the threshold, ΔT is the lump-sum increase in social insurance tax at the threshold, Δt is the increase in the marginal income tax rate above the threshold, and z^* is the income threshold.

In this context, we apply the methodology developed by Kleven and Waseem (2013) and Kleven (2016) to estimate the compensated elasticity of labor supply. The estimation is based on the amount of the drop in net income at the notch, the location of the threshold z^*, and the behavior of marginal bunchers. Marginal bunchers are those who are indifferent between bunching and not bunching, and the income they would have earned in the absence of the kink or notch is denoted by $z^* + \Delta z^*$.

The elasticity e is implicitly defined by the following equation:

$$\begin{aligned} \frac{1}{1 + \Delta z^*/z^*}\Big[1 + \frac{\Delta T/z^*}{1-t}\Big] - \frac{1}{1+1/e}\Big[\frac{1}{1+\Delta z^*/z^*}\Big]^{1+1/e} \\ - \frac{1}{1+e}\Big[1 - \frac{\Delta t}{1-t}\Big]^{1+e} = 0, \end{aligned} \tag{3}$$

where e is the compensated elasticity. Solving this equation with respect to e yields the elasticity estimate.

A crucial quantity in this estimation is Δz^*, which reflects the income range over which individuals bunch at the threshold. Specifically, individuals with incomes in the interval $(z^*, z^* + \Delta z^*)$ are assumed to shift their income to exactly z^* in response to the kink or notch. The value of Δz^* is inferred from the degree of bunching observed in the data. We use the excess density mass of the income distribution at the threshold, denoted B, to compute Δz^* as follows:

$$B = \int_{z^*}^{z^* + \Delta z^*} b_0(z) dz \simeq b_0(z^*) \cdot \Delta z^*, \tag{4}$$

where $b_0(z)$ represents the counterfactual income density that would have been observed in the absence of the notch or kink. In other words, by comparing the observed excess mass B to the counterfactual density $b_0(z^*)$, we can infer how far up the income distribution individuals must be bunching to generate the observed excess. Both B and $b_0(z^*)$ are estimated from the data, allowing us to recover Δz^* consistent with the equation above.

We now extend the analysis to account for situations in which labor supply is subject to frictions and cannot be freely optimized. Although individuals attempt to stay below a threshold, some may fail to do so due to adjustment difficulties, resulting in earnings above the threshold. In such cases, the excess density at the threshold observed in the data may be attenuated, leading to downward-biased estimates of the elasticity.

Positive density in the dominated region above the 1.3 JPY million threshold reveals the presence of adjustment frictions, but it does not necessarily imply that these workers are entirely unresponsive. In particular, Anagol et al. (2026) show that such density can arise when workers choose among a sparse set of feasible earnings opportunities. In our setting, these opportunities may reflect discrete hours, employer scheduling constraints, or uncertainty about annual earnings. We therefore interpret mass above the notch as evidence that women cannot continuously fine-tune annual labor income, rather than literally as the fraction of workers who do not respond to the incentive.

Formally, let a denote the fraction of individuals who are unable to optimize due to adjustment costs or other frictions. Since these individuals would have otherwise bunched at the threshold, the observed bunching mass Δz^* should be scaled up by a factor of $1/(1-a)$ in order to recover the true bunching that would have occurred in the absence of frictions. Accordingly, the elasticity e is estimated using this adjusted bunching range[16].

The share a is calculated based on the proportion of individuals observed in the dominated region just above the threshold. Specifically, it is computed as the ratio of the number of individuals in this region to the counterfactual density that would have existed in the absence of the notch. The elasticity estimate that incorporates this optimization friction is referred to in this study as the *structural elasticity*, while the elasticity esti-

[16]For a more rigorous discussion, see Kleven (2016).

mated directly from the observed bunching—without any correction—is referred to as the *observed elasticity.*

5.2 Estimation procedure

We apply the method described above to estimate the elasticity of labor income for married women in Japan by exploiting behavioral responses to nonlinearities and discontinuities in the tax schedule, using administrative tax data. Our goal is to understand how the complex tax system impacts behavior and quantify the distortion on labor supply. For this purpose, we assume that married women understand the total change in tax and social insurance burden they face when they increase their income from 0.96m (below the bunch) to 1.3m, although they do not understand the details inside the range due to institutional complexity. Then, we treat the excess mass of density between 0.96m and 1.3m as a single large bunch.

The estimation relies on the identification of marginal bunchers, represented by Δz^*, and the estimation of the counterfactual density. We estimate the counterfactual income distribution using the observed distribution of individuals with annual incomes between 0.36 and 4.8 million JPY. From this range, the "bunching region" is excluded and a smooth polynomial is fitted to the area below and above the bunching region. Specifically, the beginning of the bunching region, denoted by Z_L, is set to 0.84m. [17] The end of the bunching region, Z_U, is set to $z^* + \Delta z^*$. The number of individuals is counted in bins of 10,000 JPY, and a polynomial is fitted to these counts in the range [0.36m, Z_L] and [Z_U, 4.8m] to estimate the counterfactual density.

Following standard practice, we run the following regression:

$$c_j = \sum_{k=0}^{p} \beta_k \cdot (z_j)^k + \sum_{r \in R} \rho_r \cdot \mathbf{1}\left[\frac{z_j}{r} \in \mathbb{N}\right] + \sum_{k=z_L}^{z_U} \gamma_k \cdot \mathbf{1}[z_j = k] + v_j, \tag{5}$$

[17] Following Kleven (2016), we deduded Z_L by eyeballing the density graph. Also, annual gross salary income of 0.96m corresponds to monthly salary of 80k JPY, the largest round number not to exceed the 1.0m and 1.03m thresholds. We confirmed that many individuals have exact 0.96m annual income, as supportive evidence that the spike at 0.96m in the density graph is due to this rounding at monthly salary of 80k JPY. In contrast, few have exact 1.03m of annual income, suggesting that the bunching below the 1.03m threshold is a consequence of adjustment through hours of work by those paid hourly.

where j indexes income bins, c_j is the count of individuals in bin j, z_j is the income level of bin j, p is the order of the polynomial, $\mathbb{N}$ is the set of natural numbers and $R = \{0.12m, 0.60m\}$. Since rounding behaviors are observed in the income distribution—particularly at multiples of 12 months—we account for this by including fixed effects for multiples of 0.12 million JPY for incomes below 1 million JPY, and for multiples of 0.6 million JPY for incomes above 1 million JPY (i.e., 50,000-JPY per month intervals).

The value of Δz^* is not known a priori, and is determined by identifying the range in which the excess mass (bunching) below the threshold is offset by the missing mass above the threshold when compared to the counterfactual. That is, Δz^* is determined so that $\sum_{i=z_L}^{z_U} \gamma_i = 0$.

5.2.1 Heterogeneity in tax schedules across individuals

The analysis period spans from 2018 to 2021. During this period, the tax and social insurance systems faced by married women are not uniform across individuals. In particular, since 2017, eligibility for enrollment in employees' social insurance has depended on working hours and firm size, resulting in heterogeneity in the tax schedule individuals face. To account for this institutional feature, we explicitly incorporate heterogeneity in tax schedules into the elasticity estimation.

Table 3 summarizes the tax and social insurance systems faced by individuals in each year. Workers can be classified into two groups: those who are not enrolled in employees' social insurance (hereafter, type a) and those who are enrolled (type b). While the administrative data do not allow us to directly observe which group an individual (i) belongs to, government statistics indicate that the proportion of type a workers is 0.75, implying $\Pr(i \in a) = 0.75$ and $\Pr(i \in b) = 0.25$.

As a result, the marginal bunching range Δz^* observed in the data is a weighted average of the type-specific marginal bunching ranges:

$$\Delta z^* = 0.75 \cdot \Delta z_a^* + 0.25 \cdot \Delta z_b^*, \tag{6}$$

where Δz^* is identified from the observed excess mass, while Δz_a^* and Δz_b^* are not directly observable.

Given the tax schedule faced by each type of worker, the marginal buncher conditions can be written as the equation (3) which yields two type-specific equations, denoted by

$$g(\Delta z_a^*; e_a) = 0 \quad \text{and} \quad h(\Delta z_b^*; e_b) = 0,$$

where e_a and e_b denote the compensated labor supply elasticities of type a and type b workers, respectively. Both elasticities are a priori unknown.

If we impose the assumption that the elasticity of labor supply is identical across the two groups, i.e., $e_a = e_b \equiv e$, then the elasticity can be identified by jointly solving the following system of nonlinear equations:

$$\begin{aligned} \Delta z^* &= 0.75 \cdot \Delta z_a^* + 0.25 \cdot \Delta z_b^*, \\ g(\Delta z_a^*; e) &= 0, \\ h(\Delta z_b^*; e) &= 0. \end{aligned}$$

This system contains three equations and three unknown parameters—e, Δz_a^*, and Δz_b^*—and can be solved numerically. In the empirical analysis, we report the elasticity estimate obtained from this procedure, which explicitly accounts for heterogeneity in the tax and social insurance systems faced by individuals.

5.2.2 Calculation of standard errors

The counterfactual density $b_0(z)$ is estimated by fitting a smooth polynomial to the binned income distribution outside the excluded (bunching) region. Because the estimated counterfactual—and hence the implied excess mass and elasticity estimate—can be sensitive to the choice of the polynomial order, we estimate the elasticity under multiple specifications indexed by the polynomial order p. Specifically, we consider polynomial orders ranging from $p = 5$ to $p = 8$. This multi-specification approach is intended to mit-

igate concerns that the estimated excess mass is driven by a particular functional-form assumption for the counterfactual density.

Let $\hat{e}_{yp}$ denote the elasticity estimate obtained for year y using polynomial order p. In addition to reporting year-by-year estimates for each specification, we summarize the overall magnitude of the elasticity by reporting the average across years and polynomial orders:

$$\overline{e} \equiv \frac{1}{|\mathcal{Y}| \cdot |\mathcal{P}|} \sum_{y \in \mathcal{Y}} \sum_{p \in \mathcal{P}} \hat{e}_{yp}, \tag{7}$$

where $\mathcal{Y}$ denotes the set of years in the sample and $\mathcal{P} = \{5, 6, 7, 8\}$ denotes the set of polynomial orders considered.

Standard errors are computed using a clustered bootstrap procedure at the individual level. Specifically, for each bootstrap replication, we resample individuals with replacement, thereby preserving within-individual dependence in earnings across observations. For each resampled dataset, we reconstruct the binned income distribution, re-estimate the counterfactual density under each polynomial specification, and re-compute the implied bunching statistics and elasticity estimates. This procedure is repeated 1,000 times, and the standard error of $\hat{e}_{yp}$ is calculated as the standard deviation of its bootstrap distribution. When reporting $\overline{e}$, we compute the average elasticity within each bootstrap replication and use the resulting bootstrap distribution of $\overline{e}$ to obtain its standard error.

5.3 Backing out misperceived tax burdens

In the baseline estimation, we jointly analyzed the income range between 0.96 million JPY and 1.3 million JPY, treating the observed excess mass in this interval as a single large bunch. This approach was motivated by the institutional complexity of the Japanese tax and social insurance system and the possibility that individuals may not fully understand the detailed structure of tax incentives within this range. While this assumption allows us to recover a reduced-form elasticity of labor supply, the observed density patterns around specific thresholds suggest that individuals may misperceive the tax schedule in systematic ways.

In particular, the threshold at 1.03 million JPY corresponds to a kink at which the marginal tax rate increases by 15 percentage points. Despite the relatively modest statutory change, the excess mass observed at this kink is larger than that observed at the 1.3 million JPY notch, where the drop in net income due to social insurance contributions is substantially larger. Moreover, the density around 1.03 million JPY exhibits pronounced left-bunching, whereas a standard tax kink would be expected to generate more symmetric bunching around the threshold (Gelber et al., 2025). These patterns suggest that individuals perceive a fixed cost of exceeding the threshold rather than a change in the marginal tax rate.

To quantify the extent of such tax misperception, we exploit the fact that the elasticity of labor income has already been estimated in the baseline analysis. Using the estimated elasticity together with the observed bunching behavior at the 1.03 million JPY threshold, we back out the perceived tax incentives that would rationalize the observed responses. We consider two alternative representations of tax misperception: (i) misperception expressed as an overestimation of the marginal tax rate, and (ii) misperception expressed as a perceived fixed cost (notch) associated with exceeding the threshold.

5.3.1 Misperceived marginal tax rates

We first consider a benchmark model in which individuals correctly understand the structure of the tax schedule but overestimate the increase in the marginal tax rate at the 1.03 million JPY threshold. Specifically, suppose that individuals perceive the marginal tax rate above the threshold to increase by $\Delta t + \rho^k$, where Δt is the true statutory increase in the marginal tax rate (15 percentage points) and ρ^k captures misperception of the marginal tax rate.

Under this perception, the after-tax income schedule can be written as

$$z - T(z) = (1 - t)z - \Big[(\Delta t + \rho^k)(z - z^*)\Big] \cdot \mathbf{1}[z > z^*], \tag{8}$$

where $z^* = 1.03$ million JPY denotes the threshold income level. In this kink-only en-

vironment, the relationship between the elasticity of labor income e and the marginal bunching range Δz^* admits a closed-form expression:

$$\hat{e} = -\frac{\log(1 + \Delta z^*/z^*)}{\log\left(1 - \frac{\Delta t + \rho^k}{1-t}\right)}. \tag{9}$$

where $\hat{e} \in \{\hat{e}_{obs}, \hat{e}_{str}\}$ denotes the elasticity estimated in the baseline analysis.

We use this expression to back out the perceived marginal tax rate distortion ρ^k. In doing so, we treat the elasticity e as given by the baseline estimates (either the observed or structural elasticity) and estimate Δz^* using the bunching behavior observed locally around the 1.03 million JPY threshold. Solving the equation above for ρ^k yields an estimate of the extent to which individuals overestimate the marginal tax rate increase at the kink.

While this representation provides a transparent benchmark, it does not naturally account for the pronounced left-bunching observed in the data, nor does it capture the intuition that individuals may perceive exceeding the threshold as triggering a discrete loss rather than a marginal change in incentives. We therefore turn to an alternative representation in which misperception takes the form of a perceived fixed cost.

5.3.2 Misperceived fixed costs (Notches)

We next consider a model in which individuals correctly perceive the marginal tax rate increase Δt at the threshold but mistakenly believe that exceeding the threshold entails an additional fixed cost ρ^n. Anagol et al. (2026) develop a method for recovering an unobserved "as-if" notch when taxpayers display notch-like behavior at a statutory kink. We apply the same broad behavioral insight in a distinct setting: married women's real labor-supply responses to a salient secondary-earner threshold. Our institutional and survey evidence allows us to connect the implied notch to specific beliefs about taxation, social-insurance eligibility, and spousal allowances. In this case, the perceived after-tax

income schedule is given by

$$z - T(z) = (1-t)z - \left[\rho^n + \Delta t(z - z^*)\right] \cdot \mathbf{1}[z > z^*], \tag{10}$$

where ρ^n represents the perceived notch associated with crossing the threshold.

Under this perceived tax schedule, the marginal buncher condition implies the following relationship between the elasticity e, the marginal bunching range Δz^*, and the perceived fixed cost ρ^n:

$$\frac{1}{1+\Delta z^*/z^*}\left[1+\frac{(\rho^n - \Delta t \cdot z^*)/z^*}{1-t}\right] = \frac{1}{1+1/\hat{e}}\left[\frac{1}{1+\Delta z^*/z^*}\right]^{1+1/\hat{e}} - \frac{1}{1+\hat{e}}\left[1-\frac{\Delta t}{1-t}\right]^{1+\hat{e}}, \tag{11}$$

where $\hat{e} \in \{\hat{e}_{obs}, \hat{e}_{str}\}$ denotes the elasticity estimated in the baseline analysis. Given $\hat{e}$ and the observed marginal bunching range Δz^* at the 1.03 million JPY threshold, this equation can be solved for ρ^n.

The estimation of Δz^*, the counterfactual density, and the averaging across polynomial specifications follows exactly the same procedure as in the baseline estimation. Standard errors are computed using the same clustered bootstrap procedure described above.

This representation allows the misperception of the tax schedule to be interpreted as a perceived discrete loss associated with exceeding the threshold, which is consistent with the observed left-bunching and the disproportionate behavioral response to the 1.03 million JPY kink. Together, the two approaches provide complementary perspectives on how tax misperception shapes labor supply responses in a complex tax system.

5.4 Decomposing bunching into statutory and misperceived incentives

To assess the aggregate implications of tax misperception, it is necessary to quantify how much of the observed bunching behavior can be explained by the true statutory tax incen-

tives, as opposed to misperceived tax incentives. In particular, we aim to decompose the observed bunching at the 1.03 million JPY threshold into a component that is consistent with rational responses to the true marginal tax rate increase of 15 percentage points, and a residual component attributable to tax misperception.

Our approach builds on the theoretical framework in Kleven (2016). Under standard assumptions, the excess mass of bunching at a threshold can be approximated by

$$B \simeq b_0(z^*) \cdot \Delta z^*, \tag{12}$$

where B denotes the excess density mass at the threshold, $b_0(z^*)$ is the counterfactual density evaluated at the threshold, and Δz^* is the marginal bunching range.

Using this relationship, we compute two versions of the marginal bunching range at the 1.03 million JPY threshold. The first, denoted Δz^*_{obs}, is inferred directly from the observed income distribution using the bunching estimation procedure described above. This value captures the total observed bunching response at the threshold. The second, denoted $\Delta z^*_{0.15}$, is obtained by plugging the true statutory marginal tax rate increase $\Delta t = 0.15$ together with the estimated elasticity of labor income into the theoretical bunching formula. This value represents the marginal bunching that would arise if individuals responded optimally and fully understood the true tax schedule.

These two marginal bunching ranges imply corresponding excess mass measures,

$$B^{\text{obs}}_{1.03} \simeq b_0(z^*) \cdot \Delta z^*_{\text{obs}}, \tag{13}$$

$$B^{0.15}_{1.03} \simeq b_0(z^*) \cdot \Delta z^*_{0.15}, \tag{14}$$

where $B^{\text{obs}}_{1.03}$ denotes the observed excess mass at the threshold and $B^{0.15}_{1.03}$ denotes the excess mass predicted under rational responses to the true marginal tax rate.

Taking the ratio

$$\frac{B^{0.15}_{1.03}}{B^{\text{obs}}_{1.03}} = \frac{\Delta z^*_{0.15}}{\Delta z^*_{\text{obs}}}, \tag{15}$$

yields an estimate of the share of observed bunching that can be explained by the true

statutory marginal tax rate increase. The remaining share, $1 - B_{1.03}^{0.15}/B_{1.03}^{\text{obs}}$, can be interpreted as the fraction of bunching attributable to tax misperception. This decomposition provides a quantitative measure of the prevalence of misperceived, or behaviorally non-rational, responses at the threshold, which we subsequently use to assess the aggregate labor supply implications of correcting tax misperception.

5.5 Results

5.5.1 Estimated elasticity parameters

Figure 6 illustrates the estimation result for year 2018. The black solid line is the observed density, and the dashed lines in different colors are counter factual density estimated by equation (5) corresponding to different order of polynomial (p). Z^L is set to 0.84, and Z^U is estimated so that the excess mass between the observed and counter factual densities in the left to $Z^* = 1.3m$ equals the missing mass in the right to Z^*. Then we take average of estimates from different p; for 2018, observed elasticity is 0.452 and structural elasticity is 0.791.

We next summarize the estimates across years and polynomial specifications. Table 4 reports our preferred elasticity estimates, obtained by averaging the year-specific estimates over 2018–2021 and across polynomial orders (p=5,…,8). The resulting observed elasticity is 0.473, while the structural elasticity, which corrects for optimization frictions, is 0.813. The structural estimate is substantially larger than the observed estimate, indicating that optimization frictions attenuate the bunching response observed in the earnings distribution

The estimates are also relatively stable across years. The observed elasticity ranges from 0.427 in 2020 to 0.520 in 2021, while the structural elasticity ranges from 0.744 to 0.872. Thus, although there is some year-to-year variation, the magnitude of the estimated labor supply response is broadly consistent throughout the 2018–2021 period. This stability supports our use of the estimates averaged across years as the main elasticity parameters in the subsequent analysis of tax misperceptions.

5.5.2 Estimated misperceived tax rates

Table 5 presents the perceived cost at the 1.03 million threshold in addition to the actual kink of 15% marginal tax rate. Following Table 4, both calculations based on observed and structural elasticities for periods 2018-2021 are presented. Furthermore, to interpret the cost, the table shows both in terms of marginal tax rate (kink) and in terms of fixed cost (notch).

For example, if we interpret the cost as an additional marginal tax rate increase, the estimated misperceived marginal tax rate based on the structural elasticity is 50.3%. The total cost perceived by individuals is 15%+50.3% = 65.3% increase of marginal tax rate. If we interpret the same cost as a fixed cost, it is equivalent to 0.286 million JPY in addition to the 15% kink that actually exists.

The estimated costs based on the observed elasticity are larger because the observed elasticity is an underestimate (or lower bound) of the true elasticity. Therefore, the estimated misperceived costs based on the observed elasticity should be interpreted as the upper bound. The estimates imply that the cost could be as large as MTR of 68.8% or, equivalently, 0.480 million JPY.

Note that the perceived cost at the 1.03 million threshold may include the spousal allowances as a part of husband's salary. Among employers that pay the spousal allowances, the annual amount is about 156,000 JPY. As will be shown in Table 7, 29.0% of women who adjust their income answered spousal allowances as one of the reasons to adjust income, 156,000 times 29.0%=45,240 JPY can be attributed to the lost spousal allowances, which is not really a "misperceived" cost.

6 Letter survey and intervention in City A

6.1 Sample and Data Collection

In July 2025, we partnered with one of the municipalities represented in our administrative data (hereafter referred to as "City A" to preserve confidentiality) to conduct a

household survey and field experiment.[18] The study had two primary objectives. First, we sought to identify the circumstances under which misperceptions arise and assess their prevalence. Second, we implemented an information intervention that provided respondents with information about the income tax system applicable to women earning less than JPY 2 million annually, with the aim of correcting the hypothesized misperceptions. The survey population consisted of women aged 25–60 registered as residents of "City A" as of January 1, 2025. Half of the eligible resident population was randomly selected as the target of this survey.

Questionnaires were mailed to 7,509 individuals after verifying that they were all residents of the city. Respondents could complete the survey either online or by returning a paper questionnaire by mail. For online responses, we identified instances of multiple submissions under the same respondent ID and retained only the highest-reliability response for each ID, yielding 1,433 usable online responses. An additional 421 paper responses were received by mail; of these, 89 lacked the required consent checkbox and were dropped, leaving 332 usable mail responses. In total, the survey yielded 1,765 valid responses, corresponding to a response rate of 23.5%.

What is particularly appealing about this random survey is that we are able to link the questionnaires to the respondent's income tax returns (with anonymity preserved) and so we are able to compare and verify the answers provided with actual earnings behavior. For example, as we describe below, we ask respondents if they limit their income to a particular threshold. For those who say yes, we then ask what threshold they target. We can then compare this response to their actual income from their tax return thus verifying that survey responses are consistent with actual behavior.

Just under 19% of respondents reported that they adjusted their income in 2024. Figure 7 shows the income distributions for those respondents who said they did and for those who said they did not adjust their income. As the left panel shows, respondents who

[18]The survey was conducted with support from a Grant-in-Aid for Scientific Research (Grant Number 25H00537), Analysis of the Impact of Welfare and Social Insurance Systems on the Labor Market Using Administrative Data," and was approved by the Research Ethics Committee of the Institute of Social Science at the University of Tokyo.

reported adjusting their income do indeed earn annual income that is consistent with this with evidence of significant bunching at around 1.03 and 1.3 million JPY. Alternatively, the right panel shows that respondents who report not adjusting their income in 2024 do not show any consistent evidence that they adjust. Hence, the survey answers and actual earnings from the administrative data are internally consistent with each other.

We next asked respondents why they target their chosen income level. Evidence of misunderstanding of the tax system become evident as respondents target income thresholds that are inconsistent with their motivations. Table 7 reports the reasons provided by the respondent conditional upon the targeted income level. We identify the correct answer by bolding the cell. For example, we find that 40 respnodents wrote that they targeted 1 million yen or less because beyond that they would be subject to tax. This is the correct answer because the municipal tax of 10% is applicable to earnings above 1 million yen. At the same time, 101 respondents who answered this reason targeted at a threshold above 1 million.

In September 2026, data for actual income earned in 2025 will become available. With this data, we will examine whether the information provided with the survey moved targeted women away from 1.03 million threshold.

7 Interpreting and implications of tax misperception

Our analysis thus far establishes that married women in Japan respond strongly to salient income thresholds, even when these thresholds correspond to modest true marginal incentives. Using administrative data, we show that the implied perceived marginal tax rates substantially exceed statutory rates, and that these misperceptions lead women to constrain earnings within a narrow range over extended periods of time. This persistence suggests that tax misperception does not merely affect short-run timing of labor supply, but results in a sustained reduction in aggregate labor input.

In this section, we quantify the potential macroeconomic importance of this behavioral distortion. We conduct a simple thought experiment in which misperceptions of the

tax and social insurance schedule are eliminated, so that women supply labor according to the true marginal tax rate they face. Using our estimated labor supply elasticities and the observed distribution of earnings, we translate the implied increase in female labor input into an approximate change in aggregate output using standard production-accounting logic. This exercise is intentionally partial equilibrium and abstracts from general-equilibrium wage adjustments or long-run human capital responses. Its purpose is to provide an order-of-magnitude benchmark for the efficiency costs of tax complexity and the potential gains from improved transparency or simplification.

To be even more specific, we calculate the impact on GDP growth if "misperceiver bunchers" were to move from the 1.03 million JPY threshold to the 1.3 million JPY threshold. Hence, this is not a calculation of the impact of removing bunching due to kinks or notches but the more modest calculation of eliminating misperceptions. In other words, we estimate the number of women who would bunch at the 1.03 million JPY threshold due to the kink based upon our elasticity calculations (call them "legitimate bunchers") and then calculate the number we observe in the data minus these legitimate bunchers as the number of "misperceiver bunchers". We then assume that eliminating the misperception of the marginal tax rate at the 1.03 million JPY threshold would, at a minimum, move them to the notch at 1.3 million JPY. Table 6 presents a back-of-the-envelope calculation that shows that eliminating the excess bunching due to misperceptions represents about a additional 0.04 percentage point increase in GDP growth, where the average of the absolute growth rate over 2018-21 was 2.25%. After this one time shock, GDP would be permanently higher. Over ten years, this would add about 203 billion JPY to GDP. The effect is small due to the modest nature of the experiment, but not trivial, especially because this is akin to a free lunch.

As an additional thought experiment, we can compare the impact of eliminating misperceptions with another policy meant to increase female labor supply–the expansion of publicly subsidized childcare. Fukai and Kondo (2024) find that access to public childcare for a mother with a child under the age of one increases annual labor income by about 1

million JPY, on average. To increase labor income by the same 0.203 trillion JPY (the population total of increased labor income due to eliminating the misperception as shown in Table 6), 203,000 additional childcare slots would be needed. Given that there are about 700,000 births per year in Japan, this is equivalent to offering public childcare to roughly 29 percent of a birth cohort. Of course such a massive expansion would likely have other general equilibrium effects not captured by the marginal increase estimated by Fukai and Kondo (2024), but this suggests that the size of the impact of eliminating misperceptions is very large compared to other existing policies.

8 Conclusion

We show in this paper that Japan's tax and social insurance system distorts married women's labor supply not only through statutory incentives, but also through misperceived incentives created by complexity and salience. Using administrative tax data, we document pronounced bunching of female earnings at salient thresholds. Women respond far more strongly to the 1.03 million JPY threshold, where the true marginal tax increase is small, than to the nearby 1.3 million JPY threshold that involves a large discrete income loss. This pattern is inconsistent with full-information labor supply models and instead reflects systematic misperceptions of marginal incentives.

By comparing responses at kinks and notches, we quantify these misperceptions and show that women behave as though crossing the 1.03 million JPY threshold entails a much larger penalty than it actually does. On average, married women act as if they were facing a marginal tax rate of about 65%, rather than the true rate of 15%. As a result, these beliefs generate persistent earnings compression. As minimum wages rise, women reduce hours to remain below salient cutoffs rather than allowing earnings to grow, leading to sustained income stagnation within the income trap.

The aggregate implications are meaningful. A back-of-the-envelope counterfactual that eliminates misperceptions at the 1.03 million JPY threshold, without altering the true tax schedule, yields a nontrivial one-time increase in GDP of 0.04 pp. While modest

in size, this gain arises without fiscal cost, highlighting the efficiency losses created by opaque policy design.

More broadly, our findings show that tax complexity can act as a behavioral barrier to labor supply even when statutory disincentives are small. Policies aimed at increasing female labor supply should therefore focus not only on changing incentives, but also on simplifying and clarifying them. Reducing salient but misleading thresholds may offer substantial efficiency gains at low cost.

References

Anagol, S., Davids, A., Lockwood, B. B., and Ramadorai, T. (2026). Diffuse bunching with frictions: Theory and estimation. Working paper, June 23, 2026.

Eissa, N. (1995). Taxation and labor supply of married women: The tax reform act of 1986 as a natural experiment. *American Economic Review*, 85(4):1003–1022.

Eissa, N. and Hoynes, H. W. (2004). Taxes and the labor market participation of married couples: The earned income tax credit. *Journal of Public Economics*, 88(9-10):1931–1958.

Ferey, A., Lockwood, B., and Taubinsky, D. (2024). Sufficient statistics for nonlinear tax systems. *American Economic Review*, 114(5).

Figari, F., Immervoll, H., Levy, H., and Sutherland, H. (2011). Inequalities within couples: Market incomes and the role of taxes and benefits in Europe. *Eastern Economic Journal*, 37(3):344–366.

Fukai, T. and Kondo, A. (2024). Access to formal childcare for toddlers and parental employment and earnings. Working Paper 387, Economic and Social Research Institute.

Fukuda, R. (2025). Administrative tax data of japanese municipalities: A review. working paper CREPEDP-177, Center for Reserach and Education for Program Evaluation, the University of Tokyo.

Gelber, A. M., Jones, D., Lurie, I., and Sacks, D. W. (2025). Misperceptions of nonlinear budget sets: Evidence from administrative tax data. Working Paper 33496, National Bureau of Economic Research.

Kleven, H. J. (2016). Bunching. *Annual Review of Economics*, 8:435–464.

Kleven, H. J., Knudsen, M. B., Kreiner, C. T., Pedersen, S., and Saez, E. (2011). Unwilling or unable to cheat? Evidence from a tax audit experiment in Denmark. *Econometrica*, 79(3):651–692.

Kleven, H. J. and Waseem, M. (2013). Using notches to uncover optimization frictions and structural elasticities: Theory and evidence from Pakistan. *The Quarterly Journal of Economics*, 128(2):669–723.

Le Maire, D. and Schjerning, B. (2013). Tax bunching, income shifting and self-employment. *Journal of Public Economics*, 107:1–19.

Mori, Y. and Okudaira, H. (2025). Higher minimum wage, stagnant income? the case of women's work hours in japan. Working Paper 25-E-042, The Research Institute of Economy, Trade and Industry.

Saez, E. (2010). Do taxpayers bunch at kink points? *American Economic Journal: Economic Policy*, 2(3):180–212.

Selin, H. (2014). The rise in female employment and the role of tax incentives: An empirical analysis of the Swedish individual tax reform of 1971. *International Tax and Public Finance*, 21(5):894–922.

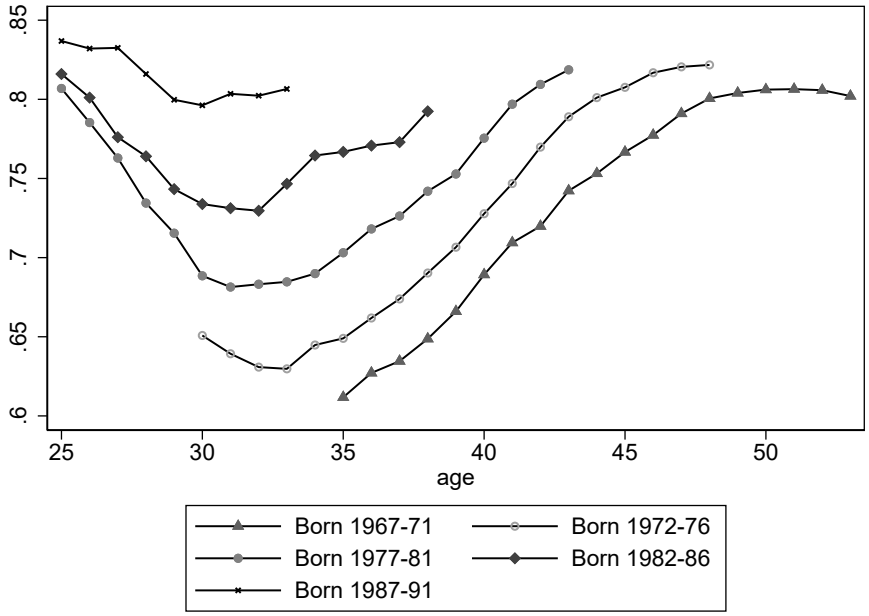
Figure 1: Distribution of annual salary income



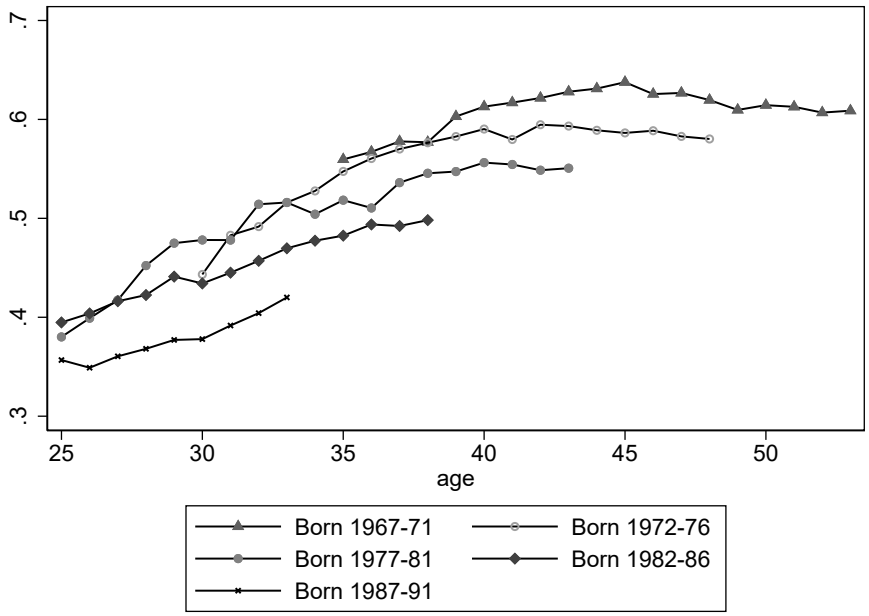
Notes: This figure shows the distribution of annual salary income among married women aged 25–60, pooling observations from 2017 to 2021. The sample covers 19 municipalities in 12 prefectures and is restricted to women whose spouses have total income below 9 million JPY. The distribution is constructed using bins of 0.1 million JPY. The vertical dashed lines indicate the income thresholds at 1.03 and 1.30 million JPY. Source: CREPE project municipality tax data.

Figure 2: Female employment by birth year cohort

(a) Labor Force Participation



(b) Nonregular employment (% in all employed)



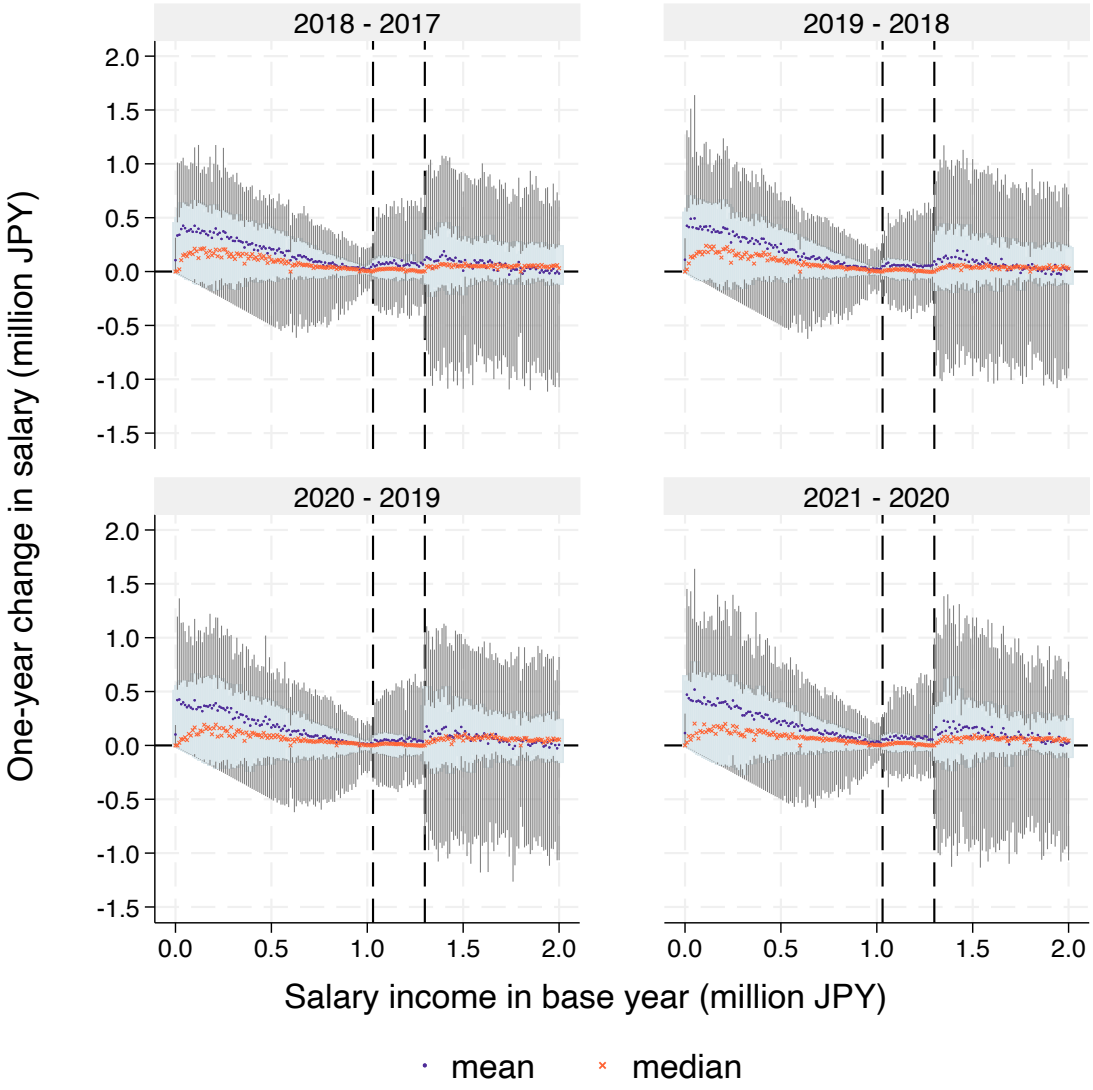
Notes: Labor Force Survey 2002-2024, authors' calculations. Cohorts born before 1976 are missing earlier data points due to data availability (they were older than 25 in 2002).



Figure 3: Take-home income of married female workers (2018–2021)

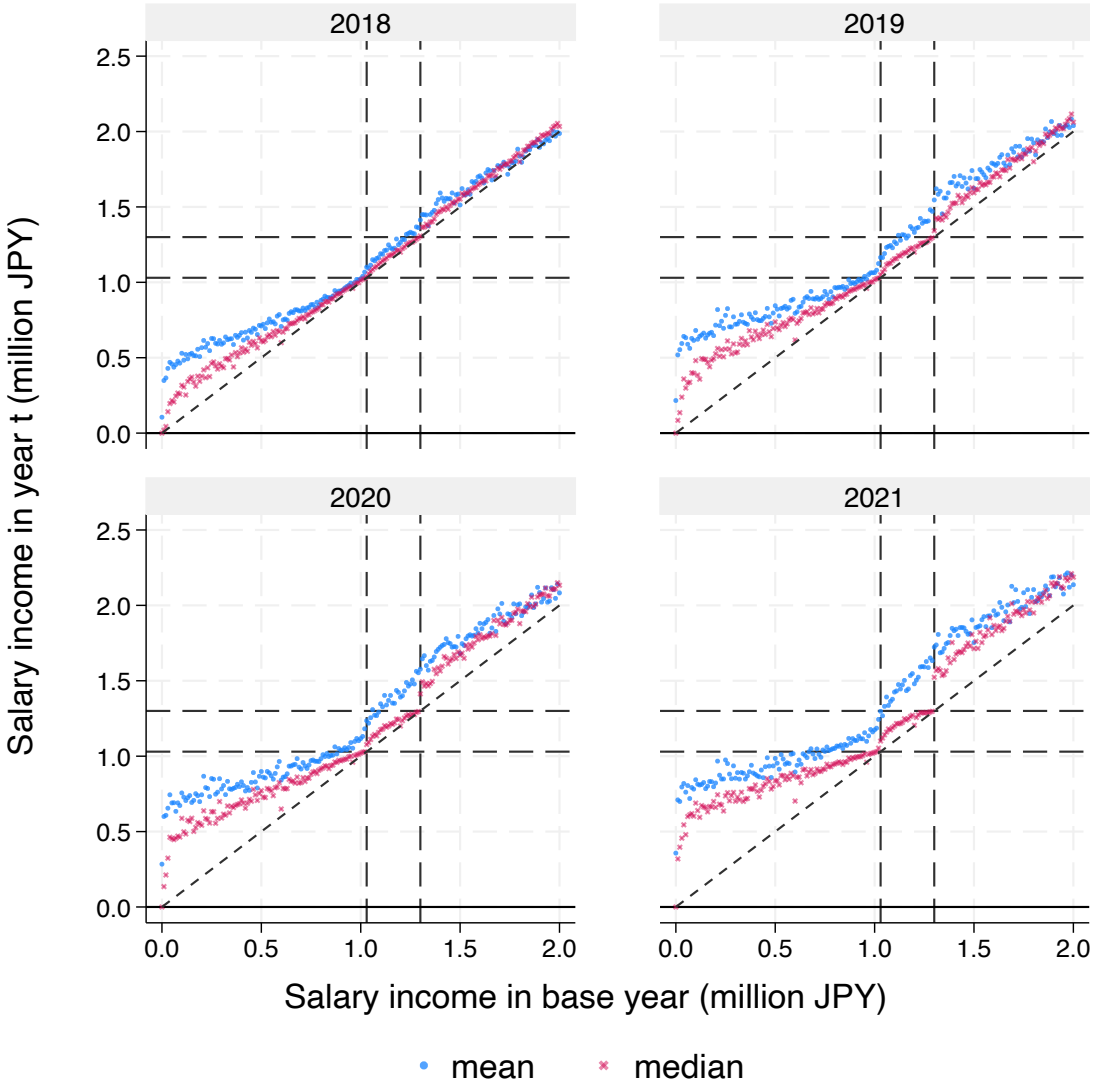
Notes: Women married to salaried worker with total income less than 9 million. Take-home pay is gross salary income minus tax and social insurance payments. For those employed at large firm (with 500 employees or more), they switch from the solid line to the dashed line when their weekly hours exceeds 20. Annual gross salary corresponding to 20 hours per week varies with the hourly wages, and we estimate that about 25% of our sample are employed at large firms and could reach 20 hours oer week before hitting the 1.3 million threshold (see Appendix B).

Figure 4: Annual change in the salary income



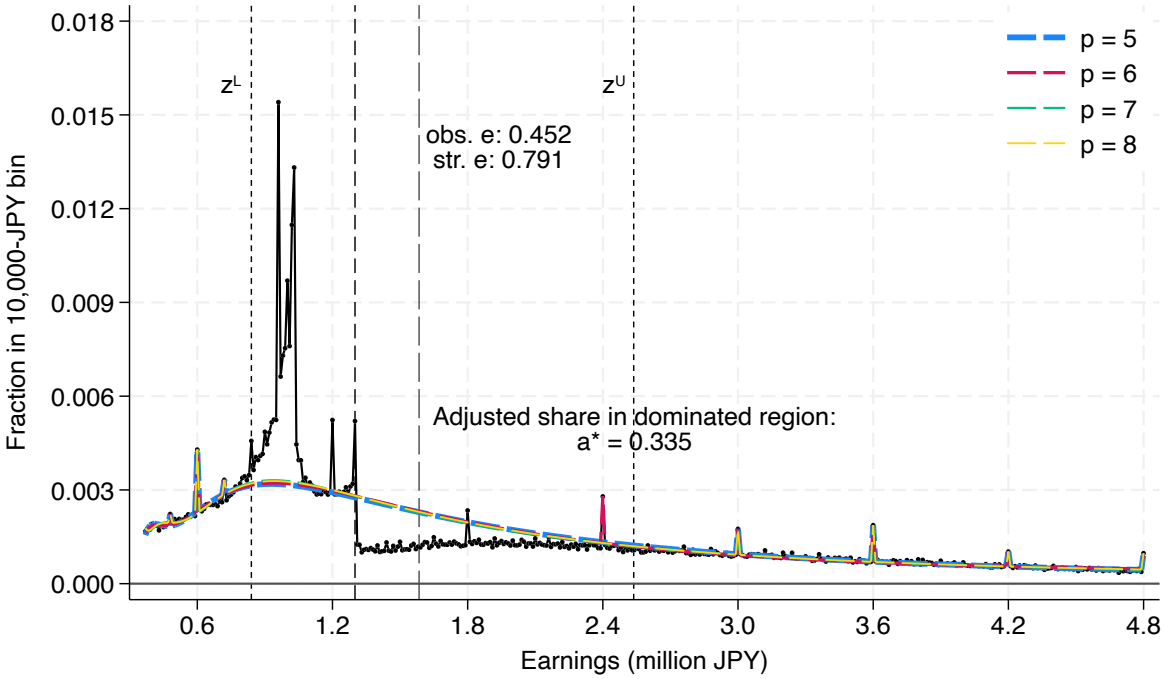
Notes: This figure shows the distribution of one-year changes in annual salary income by salary income in the preceding year. The x-axis reports salary income in year (t), grouped into bins of 0.01 million JPY, and the y-axis reports the change in salary income between years (t) and ($t+1$). The blue points indicate the mean and the orange points indicate the median. The bluish-gray bands span the 25th to 75th percentiles, while the gray whiskers span the 10th to 90th percentiles. The sample consists of married women aged 25–60 whose spouses have total income below 9 million JPY, using data from 19 municipalities in 12 prefectures. The vertical dashed lines indicate the income thresholds at 1.03 and 1.30 million JPY. Source: CREPE project municipality tax data.

Figure 5: Salary growth over 2018 to 2021, base year = 2017



Notes: This figure plots subsequent annual salary income by salary income in the base year, 2017. The x-axis reports salary income in 2017, grouped into bins of 0.01 million JPY, and the y-axis reports salary income in each subsequent year from 2018 to 2021. The blue points indicate the mean and the orange points indicate the median within each 2017 income bin. The short-dashed diagonal line is the 45-degree line. The vertical and horizontal dashed lines indicate the income thresholds at 1.03 and 1.30 million JPY. The sample consists of married women aged 25–60 whose spouses have total income below 9 million JPY, using data from 19 municipalities in 12 prefectures. Source: CREPE project municipality tax data.

Figure 6: Empirical and Counterfactual Earnings Distribution around Notches in 2018



Notes: This figure illustrates the bunching estimation for 2018. The earnings distribution is constructed using bins of 10,000 JPY. The solid black line shows the empirical fraction of observations in each earnings bin, and the colored lines show the corresponding counterfactual distributions obtained from polynomial fits of orders 5 through 8. The counterfactual density estimates are multiplied by the bin width of 10,000 JPY so that they are expressed on the same scale as the empirical bin fractions. The counterfactual distribution is estimated excluding the bunching region ($[z_L, z_U]$), where (z_L) is set to 0.84 million JPY and (z_U) is determined such that the excess mass below the 1.30 million JPY threshold is equal to the missing mass above the threshold. The vertical dashed lines indicate (z_L), (z_U), the earnings threshold ($z^* = 1.30$) million JPY, and the boundaries of the dominated region. "obs. e" denotes the observed elasticity estimated from the observed bunching mass without correcting for optimization frictions, while "str. e" denotes the structural elasticity after correcting for such frictions. "Adjusted share in dominated region" measures the extent of optimization frictions. It is based on the ratio of the observed mass in the dominated region to the counterfactual mass predicted for the same region. In the absence of optimization frictions, no individuals would be observed in the dominated region and this ratio would be zero. Because approximately 25% of the sample face a different social insurance schedule under which this region is not dominated, we multiply the conventional dominated-region share by 0.75.
The sample consists of married women aged 25–60 whose spouses have total income below 9 million JPY, using 2018 data from 19 municipalities in 12 prefectures. Source: CREPE project municipality tax data.

Figure 7: Earnings distribution of survey respondents by income adjustment status

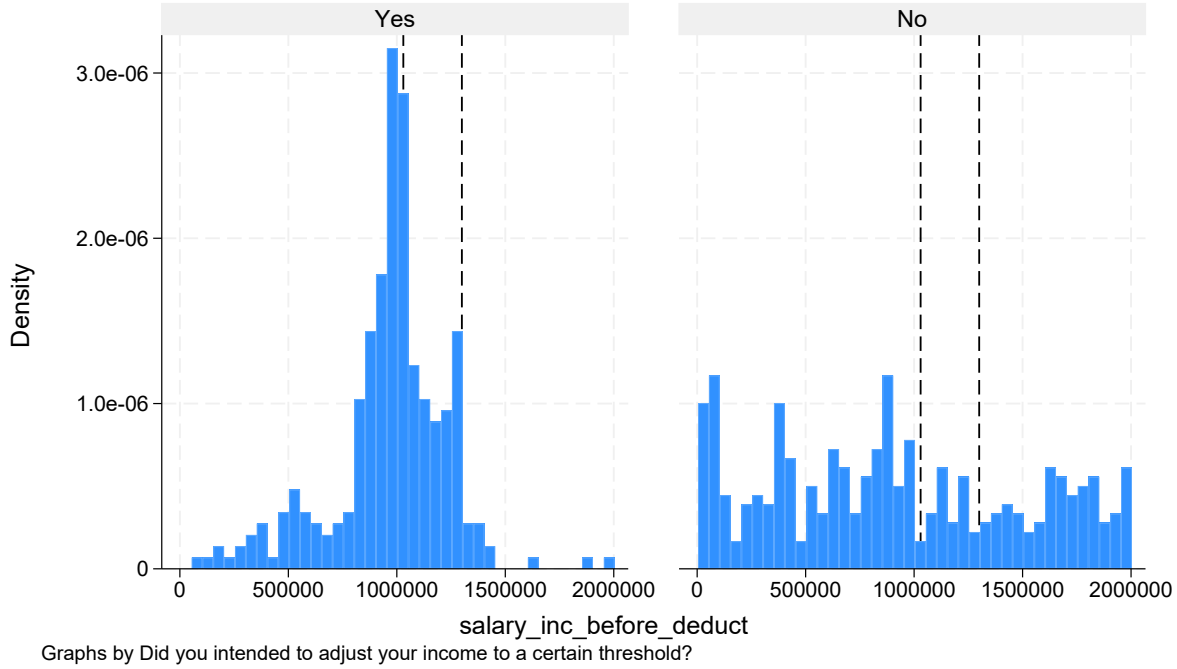


Table 1: Sample construction

	Obs	**% deleted**
All women living with spouse and aged 25–60 as of January 1st	3,855,194	
Spouses with positive salary income (excludes self-employed)	3,466,042	10.1
Spouses' annual total income is < 9 million yen	3,161,170	8.8

Note: The table describes the construction of the main analysis sample using pooled person-year observations from 2017 to 2021 across 19 municipalities in 12 prefectures. The sample is restricted to married women aged 25–60. Sample restrictions are applied sequentially. "% deleted" reports the percentage of observations removed at each step relative to the preceding row.

Table 2: Summary statistics of administrative record data

	mean	sd	min	10%tile	25 %tile	50 %tile	75%tile	90%tile	max
Salary income (million JPY)	1.66	1.95	0	0	0.01	1.00	2.48	4.35	
Age	43.83	9.24	25	31	36	44	51	57	60
Husband's total income (million JPY)	4.08	1.93	0	1.81	2.67	3.85	5.39	6.83	9.00
Age of husband	45.74	10.10	18	32	38	46	54	60	90
N. of children under 18	0.97	1.06	0	0	0	1	2	2	10
N. of observations	3,161,170								
N. of unique individuals	832,918								

Notes: This table reports summary statistics for the analysis sample, pooling observations from 2017 to 2021. The sample consists of married women aged 25–60 whose spouses have positive salary income and total income below 9 million JPY, using data from 19 municipalities in 12 prefectures. Monetary variables are reported in million JPY. Observations are at the person-year level.

Table 3: After-tax income schedules by year and social insurance enrollment

Year	Group	After-tax income $z - T(z)$
2018–2021	Type a (75%)	$0.7650\,z$
	Type b (25%)	$0.7293\,z + 144,500$

Notes: Before crossing the income threshold, after-tax income is given by $z - T(z) = z$ for all individuals and years. Individuals are divided into two groups depending on enrollment in employees' social insurance. Type a workers are not enrolled, while type b workers are enrolled. Group shares are based on government statistics.

Table 4: Estimated elasticity parameters

Parameters	Period	Estimates (1)	(SE) (2)	l95 (3)	u95 (4)
Observed elasticity	2018 - 2021	0.473	(0.012)	0.449	0.497
(Estimates by year)	2018	0.452	(0.021)	0.411	0.492
	2019	0.493	(0.020)	0.453	0.532
	2020	0.427	(0.022)	0.385	0.469
	2021	0.520	(0.021)	0.479	0.560
Structural elasticity	2018 - 2021	0.813	(0.019)	0.778	0.848
(Estimates by year)	2018	0.791	(0.030)	0.732	0.850
	2019	0.845	(0.029)	0.788	0.901
	2020	0.744	(0.031)	0.683	0.806
	2021	0.872	(0.030)	0.815	0.930

Note: This table reports estimates of the compensated elasticity of labor income with respect to the net-of-tax rate using data from 2018 to 2021. For each year, the counterfactual earnings distribution is estimated using polynomial orders $p = 5, 6, 7$, and 8, and the year-specific elasticity reported in the table is the average across these four specifications. The estimate for 2018–2021 is the average across years and polynomial specifications.
The observed elasticity is estimated from the observed bunching mass without correcting for optimization frictions. The structural elasticity adjusts for optimization frictions using the share of individuals observed in the dominated region relative to the counterfactual mass predicted for the same region. Because approximately 25% of the sample face a different social insurance schedule under which this region is not dominated, this friction measure is multiplied by 0.75 before applying the correction. Standard errors are obtained from 1,000 individual-level bootstrap replications, resampling individuals with replacement. The reported 95% confidence intervals are normal-based intervals constructed using the bootstrap standard errors. The sample consists of married women aged 25–60 whose spouses have total income below 9 million JPY, using data from 19 municipalities in 12 prefectures.

Table 5: Estimated misperceived tax rates

Parameters	Estimates	(SE)	l95	u95
	(1)	(2)	(3)	(4)
Misperceived MTR ρ^k_{obs}				
Using obs. elasticity	0.688	(0.006)	0.676	0.700
Using str. elasticity	0.503	(0.006)	0.491	0.516
Misperceived FC (in mil. JPY) ρ^n_{obs}				
Using obs. elasticity	0.480	(0.010)	0.460	0.501
Using str. elasticity	0.286	(0.007)	0.272	0.300

Note: This table reports estimates of the perceived tax burden at the 1.03 million JPY threshold using the pooled 2018–2021 elasticity estimates reported in Table 4. We consider two alternative representations of misperception. "Misperceived MTR" (ρ^k) is the additional perceived increase in the marginal tax rate, over and above the actual 15 percentage-point increase at the threshold. "Misperceived FC" (ρ^n) is the additional perceived fixed cost associated with crossing the threshold and is reported in million JPY.
Estimates labeled "Using obs. elasticity" use the pooled observed elasticity from Table 4, while those labeled "Using str. elasticity" use the pooled structural elasticity corrected for optimization frictions. Counterfactual earnings distributions are estimated using polynomial orders (p=5,6,7,) and (8), and the resulting estimates are averaged across polynomial specifications.
Standard errors are obtained from 1,000 individual-level bootstrap replications, resampling individuals with replacement. The reported 95% confidence intervals are normal-based intervals constructed using the bootstrap standard errors. The sample consists of married women aged 25–60 whose spouses have total income below 9 million JPY, using data from 19 municipalities in 12 prefectures from 2018 to 2021.

Table 6: Estimated impact of eliminating misperceptions at 1.03 Million JPY

Variable	**Value**
Number of total bunchers at 1.03 million JPY	37,753
Number of legitimate bunchers (mtr = 0.15*)	3,923
Excess bunchers due to misperception	33,830
Total number of individuals aged 15 or older**	4,864,102
Population of Japan (above age 15) in 2020	108,258,569
Population-weighted number of excess bunchers	752,942
Increased labor income (trillions JPY)†	0.203
Average GDP (trillions JPY), 2018–2021‡	567.16
Average |annual GDP growth|, 2018–2021‡ (%)	2.25
Contribution to GDP growth (pp)	0.04

Note:
* Based upon structural elasticity.
** Excluding individuals with missing marital status and/or age.
† Calculated as $(1.3 - 1.03)$ million JPY per person.
‡Source: World Bank GDP indicators.

Table 7: Reasons for adjusting income, by targeted 2024 annual income

Reason for adjusting income	Target annual income (yen)							Overall
	≤ 0.99m	1.00m	1.02–1.03m	1.05–1.06m	1.07–1.29m	1.30m	≥ 1.31m	%
My own income would become subject to taxation	***55.6***	***68.2***	55.8	26.9	30.0	23.6	70.0	45.5
My income would increase the taxes imposed on my spouse's income	22.2	31.8	46.0	**26.9**	50.0	23.6	*10.0*	33.5
I would lose the spousal allowance included in my spouse's salary	27.8	22.7	45.1	19.2	20.0	19.1	0.0	29.0
I would no longer be covered by my spouse's health insurance	38.9	43.2	60.2	46.2	60.0	83.1	20.0	60.6
I would no longer qualify as a Category 3 insured person under the National Pension System	16.7	11.4	27.4	11.5	40.0	31.5	10.0	24.2
I would be covered by my employer's social insurance and would have to enroll in Employees' Pension Insurance and Health Insurance	27.8	20.5	28.3	65.4	40.0	28.1	20.0	30.3
Other	16.7	9.1	1.8	7.7	0.0	4.5	0.0	4.8
Number Obs. (Percent)	18 (5.81)	44 (14.19)	113 (36.45)	26 (8.39)	10 (3.23)	89 (28.71)	10 (3.23)	310 (100.00)

Notes: Entries are percentages within each target-income category. Multiple responses were permitted, so column percentages need not sum to 100. Percentages may differ slightly because of rounding. Bold = correct answer at time of data coverage in paper (2018-2022). Italics = correct at time of survey, 2024

A Supplemental data sources

A.1 Labour 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. In addition, the special questionnaire introduced in 2002 asks regular/non-regular status and labor income in brackets. We use the microdata from this special questionnaire for 2002-2024 to obtain descriptive tabulations mainly presented in Section 2 and the employer size composition for married female part-time workers in Appendix Section B.

A.2 Basic Survey of Wage Structure (BSWS)

Basic Survey of Wage Structure is an annual survey conducted by the Japanese government to provide detailed information on the wages and employment conditions of workers in Japan. It collects data on workers' earnings, working hours, employment status, age, gender, education, occupation, and other characteristics. We use this data to calculate the percentage of part-time workers whose hourly wage is lower or higher than the level corresponding to the income thresholds in Appendix Section B.

A.3 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.

The survey asks individual and household income, sources of income, employment status, hours, hourly wages if paid hourmy, and many variables related to education. There are also detailed questions related to family structure, marital status, and children. Importantly for our study, 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 (Appendix section C). Descriptive statistics of the sample used for this analysis is presented in Appendix Table A.6.

B Budget constraints used in the elasticity estimation

This section describes the relationship between gross salary income and take-home income after tax and social insurance payments near the 1.3m threshold in each year. To estimate the labor income elasticity, we simplify the budget constraint so that all changes that actually kick in different thresholds locating between 0.93-1.3m gross salary income kick in at 1.3m.

Let X and SI denote gross salary income and social insurance payment. In all years in 2015-2024, the national income tax is $max[(X - 1.03m - SI) * 0.05, 0]$. The local residential tax is $max[(X - 0.98m - SI) * 0.1, 0] + 5000$ if $X > 1.0m$. Each municipality sets a minimum income threshold $0.93m \leq L \leq 1.0m$ for lump-sum tax of 5000, and if $L < X \leq 1.0m$, the local tax amount is 5000, and if $X \leq L$, the local tax amount is zero.

SI, the amount of social insurance payment, is determined by monthly salary, employer's firm size and hours of work per week, and the scheme changed in October 2016 and October 2022. Also, until 2017, the spousal deduction applied to primary earners' taxable income started to phase out. Thus, we divide the analysis period into 2015-2016, 2017, and 2018-2022 and 2023-24. Let SD be the loss on household income by loosing the spousal deductions. For each period, the take-home income is calculated by $X - SI - national_tax - local_tax - SD$.

B.1 Justification for ignoring SI coverage due to working more than 30 hours

Employee's social insurance was applied to employees who work more than 30 hours per week regardless of the firm size. If hourly wage is higher than 833 yen, annual income exceeds 1.3m by working 30 hours per week. Although 833 yen was above the minimum wage except for Tokyo, Kanagawa and Osaka in 2015, according to a rough calculation based on the record of social insurance deductions, we decided to ignore this possibility

for the following reason.

6 municipalities (81% of the main sample) provided the record of social insurance deductions. To exclude the case that the worker pay Employment Insurance only,[19] we assume that those whose social insurance deductions exceeds 10,000 JPY are covered by own Employee's Insurance or National Insurance scheme. Among those who earned 0.96m-1.3m in 2015, 15.98% had social insurance deductions exceeding 10,000 JPY. However, the majority of them seem to be either those who left a fulltime job during the year or those started a fulltime job during the year. As an estimate for the % of those who were not in transition from or to fulltime work, we calculated % of those whose income were less than 1.3m for 2015-2017 among those who earned 0.96m-1.3m in 2016,[20] which was 37.5%. 37.5% of 15.98% is 5.99%. [21]

The calculation above implies only about 6% of married female part-time workers within the bunching region (0.96m-1.3m) were covered by Employee's Insurance prior to the expansion in October 2016. Since we cannot observe hours of work and thus the room for further adjustment is limited, we ignore the possibility that workers earning less than 1.3m enrolled to Employee's Insurance through their employer for simplicity. Note that women married to self-employed men are excluded from our sample, thus most of them would have been eligible to be covered by husband's insurance if they had not enrolled to Employee's Insurance by themselves. Hence, in the theoretical framework, they are considered as those who cannot adjust their earnings due to frictions because there is no reason to choose to pay the social insurance while earnings less than 1.3m.

B.2 Budget constraint for 2015-2016

Social insurance: If $X < 1.3m$, $SI = 0$. If $X \geq 1.3m$, $SI = 0.3m + (X - 1.3m) * 0.1$.

Spousal deductions: Spousal deduction started to phase out at 1.05m. Spousal

[19] Employment Insurance is mandatory for all employees working more than 20 hours per week, and the amount is about 0.5% of salary (exact rate changes every year).

[20] We use 2016 instead of 2015 because income earned in 2014 is not available.

[21] A similar number was obtained using the self-reported social insurance coverage and income from JPSC: among 473 married women whose annual income was below 1.3m in 2015, 29 were categry 2 insured (i.e. covered by own Employee's Insurance) and earned less than 1.3m in 2014 and 2016. 29/473=6.1%.

deduction was 380000 for national tax and 33000 for local tax if $X \leq 1.05m$. At $X = 1.3m$, the amount of deduction is 110000 for both local and national taxes. The deduction becomes zero at 1.41m, this is within the dominated region due to the social insurance notch. So, we simplify the phase out of spousal deduction as a lump-sum change in deduction from husbands income that kicks in at 1.3m.

Since the median national income tax rate for husbands of women whose income is between 0.96m-1.3m is 10.0%, the loss from losing the spousal deduction (SD)is 380,000* 10% of national income tax on huband's income + 33,000* 10% of local tax on husband's income = 71,000 JPY.

Budget constraint just above 1.3m

The take-home income just above 1.3m can be written as follows

$$X - SI - national_tax - local_tax - SD \tag{A.1}$$

$$= X - SI - (X - 1.03m - SI) * 0.05 - (X - 0.98m - SI) * 0.1 + 5000 - 71000 \tag{A.2}$$

$$= 0.85X - 0.85SI + 1.03m * 0.05 + 0.98m * 0.1 - 5000 - 71000 \tag{A.3}$$

$$= 0.85X - 0.85(0.3m + (X - 1.3m) * 0.1) + 73500 \tag{A.4}$$

$$= 0.765X - 71000 \tag{A.5}$$

B.3 Budget constraint for 2017

From October 2016, those working at firms with more than 500 employees have to enroll to Employee's Health and Pension Insurance if their monthly salary exceeds 88,000 yen and weekly work hours exceeds 20 hours. Hence, for those working more than 20 hours/week at firms with more than 500 employees and earns more than 88,000 yen/month, $SI = 0.142X$ and

$$X - SI - national_tax - local_tax - SD \tag{A.6}$$

$$= X - SI - (X - 1.03m - SI) * 0.05 - (X - 0.98m - SI) * 0.1 + 5000 - 71000 \tag{A.7}$$

$$= 0.85X - 0.85 * 0.142X + 1.03m * 0.05 + 0.98m * 0.1 - 5000 - 71000 \tag{A.8}$$

$$= 0.7293X + 73500 \tag{A.9}$$

According to the Labour Force Survey, among married non-regular female workers aged 25-60, 33% were working at firms with more than 500 employees. Among them, however, if the hourly wage exceeded 1250, the annual income reached 1.3m threshold before the weekly hours reached 20. According to the Basic Survey of Wage Structure, 1250 is around the 75 percentile of hourly wage distribution among female part-time workers, thus we assume that 33%*75% = 25% of married women in our sample started to face this insurance scheme from 2017.

The remaining 75% are facing the same budget constraint as 2015-2016:

$$X - SI - national_tax - local_tax - SD = 0.765X - 71000 \tag{A.10}$$

B.4 Budget constraint for 2018-2022

From income earned in 2018, the kink point of spousal deduction/special spousal deduction moved from 1.05m to 1.5m. Thus the loss of spousal deduction was no longer relevant for the 1.3m threshold. Thus, the budget constraint became as follows:

For those working at a firm smaller than 500 employees or working at hourly wages > 1250 (75% of the sample),

$$X - SI - national_tax - local_tax = 0.765X \tag{A.11}$$

For those working at a firm larger than 500 employees at hourly wages < 1250 (25%

of the sample),

$$X - SI - national_tax - local_tax = 0.7293X + 144500 \tag{A.12}$$

B.5 Budget constraint for 2018-2022

Based on LFS and BSWS, we assume 9% of our sample are working at a firm with 100-500 employees at hourly wages < 1250. Thus, 66% of the sample faces

$$X - SI - national_tax - local_tax = 0.765X \tag{A.13}$$

and 34% faces

$$X - SI - national_tax - local_tax = 0.7293X + 144500 \tag{A.14}$$

B.6 Dominated regions

For those working at firms with more than 500 employees with hourly wages lower than 1250 yen in 2018-2021:

$$0.7293X + 144,500 = 1.3m \tag{A.15}$$

$$X = 1584396 \tag{A.16}$$

Thus no one would have an incentive to choose gross salary income below 1,584,396 yen.

Note that for those working at firms with less than 500 employees in 2018-2021, the

dominated region is wider:

$$0.765X = 1.3m \tag{A.17}$$

$$X = 1699346 \tag{A.18}$$

And for years prior to 2018 reform, the dominated region is even wider due to the loss of spousal deduction.

We use 1,584,396, the narrower range, because we cannot observe firm size or hourly wages. Note that the dominated region is used only for calculation of the degree of frictions, and does not affect the observed elasticity. Since we chose a conservative range for the dominated region, we may underestimate the degree of frictions.

C Relevance of minimum wages for female part-time workers in Japan

This appendix section provides 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. Specifically, we check whether married women who are paid hourly are affected by the minimum wage using the JPSC.

The summary statistics of the JPSC analysis sample are summarized in Table A.6. 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.6 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:

$$\log(w_{pit}) = \beta \log(MW_{pt}) + \tau_t + \eta_i + \epsilon_{pit} \tag{A.19}$$

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.[22] The estimated β is interpreted as the change in the hourly wages caused by the change in the minimum wage.

Table A.7 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.6, 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.

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

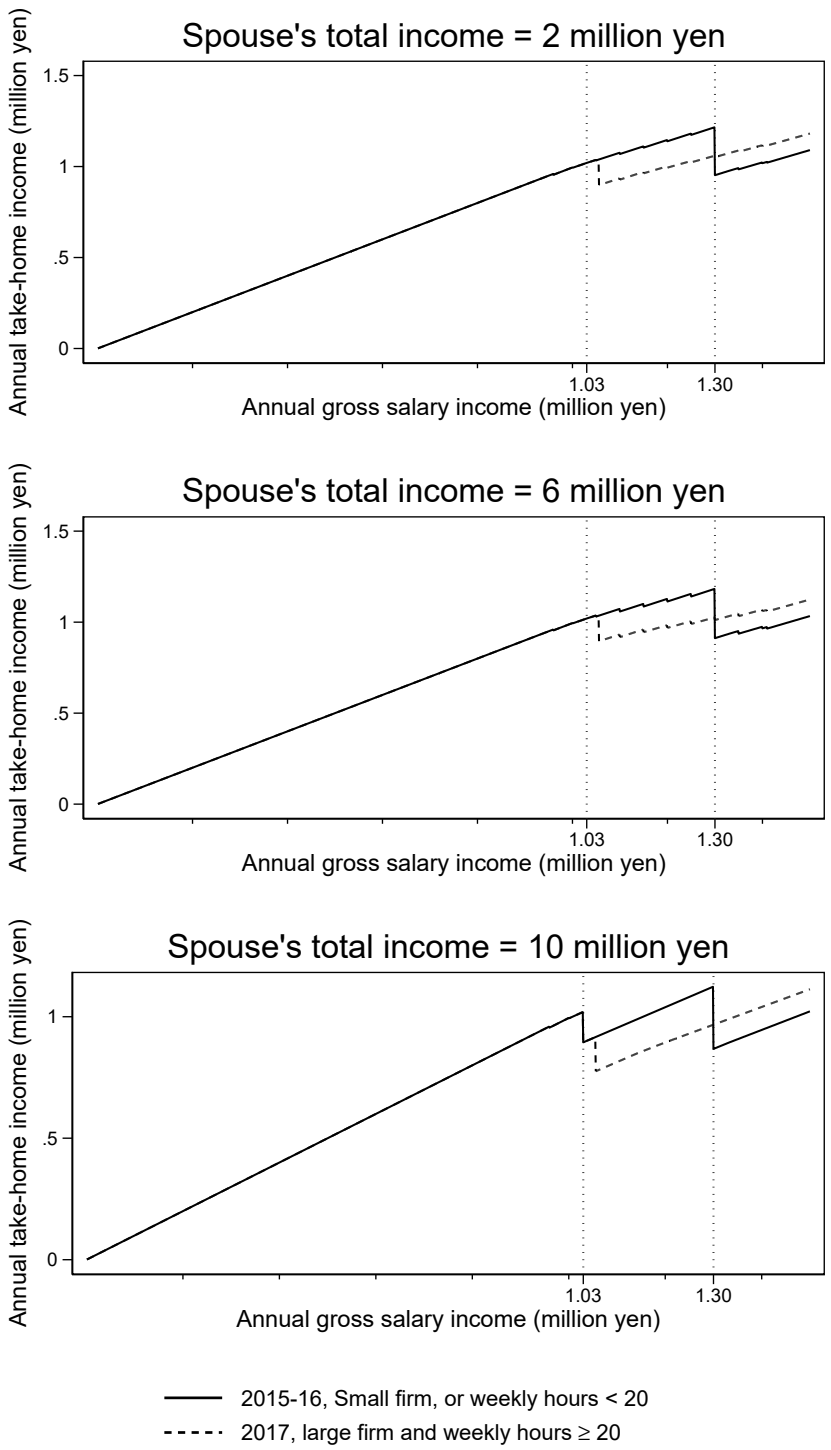
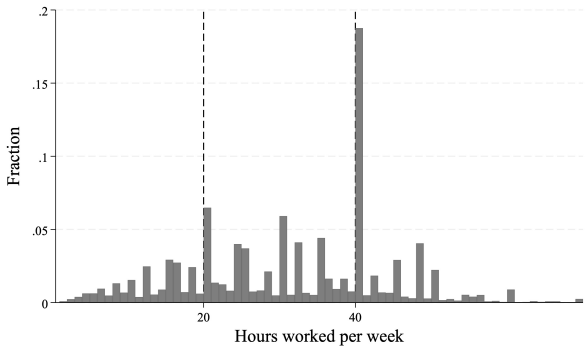


Figure A.1: Take home income minus tax increased due to spousal deduction phase-out, 2015-2017

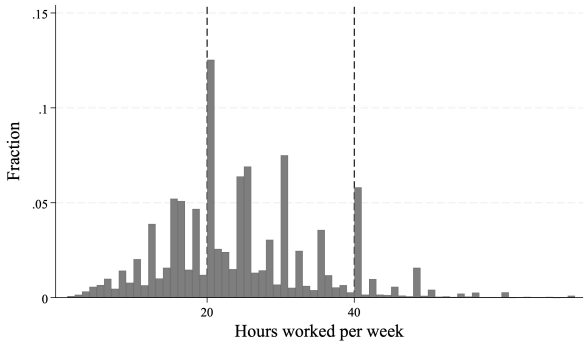
Notes: Simulated calculations.

Figure A.2: Hours worked by income, married women (2015-2021)

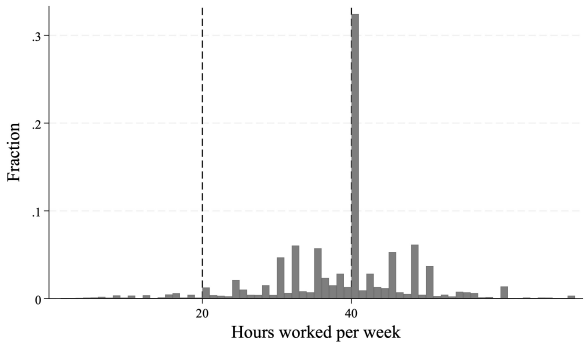
(a) All



(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.

Table A.1: Tax and Insurance Thresholds Over Time

Threshold (m = million JPY)	**Details**
	2018–2022
0.96–1.00m	Lump-sum part of local residential tax (5,000 JPY)
1.00m	Income-proportional part: (Income – 0.98) × 10%
1.03m	National income tax; marginal tax rate increases by 5 percentage points
1.06m†	Employer provided health insurance and pension. Approx. 150,000 JPY (plus about 150,000 JPY employer contribution)
1.30m	National Pension & National Health Insurance (if not covered by employee's insurance). Approx. 300,000 JPY
1.50m	Spousal deduction starts to decrease: 20k × husband's tax rate (typically 20% or 30%)
	October 2016–2017
0.96–1.00m	Lump-sum part of local residential tax (5,000 JPY)
1.00m	Income-proportional part: (Income – 0.98 million) × 10%
1.03m	National income tax; marginal tax rate increases by 5 percentage points
1.05m	Spousal deduction starts to decrease: 20k × husband's tax rate (typically 20% or 30%)
1.06m†	Employer provided health insurance and pension. Approx. 150,000 JPY (plus about 150,000 JPY employer contribution)
1.30m	National Pension & National Health Insurance (if not covered by employee's insurance). Approx. 300,000 JPY
	2007–September 2016
0.96–1.00m	Lump-sum part of local residential tax (5,000 JPY)
1.00m	Income-proportional part: (Income – 0.98 million) × 10%
1.03m	National income tax; marginal tax rate increases by 5 percentage points
1.05m	Spousal deduction starts to decrease: 20k × husband's tax rate (typically 20% or 30%)
1.30m	National Pension & National Health Insurance (if not working more than 30 hours/week). Approx. 250–300,000 JPY (gradually increasing as population ages)
Working > 30 hours/week	Employee's health insurance & pension: 10–15% of pre-tax salary (rate gradually increasing)

† Additional requirements: 88,000 JPY/month, 20 hours/week and firm size > 500 employees

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: Comparison between sampled municipalities and national average based on Population Census 2020, percent

	Female			Male		
	Main sample	Long sample	National avg.	Main sample	Long sample	National avg.
College graduates	27.6	26.3	25.6	44.0	43.8	40.8
Married	64.0	65.1	66.3	63.1	65.8	60.9
Employed	76.2	78.7	77.2	91.9	92.5	92.1
Self employed	3.6	3.6	3.4	7.9	8.6	7.5
Part-time employee	39.0	37.1	39.5	5.7	5.7	5.7
Share of employed (percent)						
Manufacturing	8.1	6.7	11.5	18.8	14.3	22.2
Wholesale and retail	18.6	17.7	17.7	14.6	15.7	13.0
Medical, health care and welfare	25.8	28.0	23.7	7.0	8.8	6.0
Other	47.5	47.6	47.1	59.6	61.2	58.8

Table A.5: Estimated misperceived tax rates by husband's tax brackets

Parameters	Period	15% (1)	20% (2)	30% (3)	33% (4)
Misperceived MTR using obs. elasticity ρ^k_{obs}					
	2015 - 2017	0.751	0.789	0.779	0.607
	2018 - 2021	0.633	0.704	0.740	0.644
	% change	-15.7%	-10.7%	-5.0%	6.2%
Misperceived MTR using str. elasticity ρ^k_{str}					
	2015 - 2017	0.438	0.506	0.604	0.477
	2018 - 2021	0.347	0.460	0.564	0.484
	% change	-20.8%	-9.0%	-6.6%	1.5%
Misperceived FC using obs. elasticity (in mil. JPY) ρ^n_{obs}					
	2015 - 2017	0.577	0.572	0.577	0.371
	2018 - 2021	0.455	0.488	0.506	0.393
	% change	-21.2%	-14.7%	-12.3%	6.0%
Misperceived FC using str. elasticity (in mil. JPY) ρ^n_{str}					
	2015 - 2017	0.231	0.254	0.351	0.246
	2018 - 2021	0.177	0.240	0.312	0.247
	% change	-23.4%	-5.3%	-11.3%	0.1%

Note: We estimate elasticity for each subgroup defined by husband's tax rate, p and year, and then take the average over the group p and year. MTR denotes marginal tax rates, and FC denotes fixed costs.

Table A.6: 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.7: 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).