Relationship between social security programs and elderly employment in Japan

Takashi Oshio, Satoshi Shimizutani, and Akiko Oishi

September 2022

Abstract

This study examines how elderly employment is associated with social security programs and how it responds to recent reforms in Japan. To this end, we employed a rich and longitudinal dataset of middle-aged and older individuals collected between 2005 and 2018. By incorporating various factors related to social security incentives into a single index of implicit tax (ITAX), we confirmed that the index successfully captured the incentives and their changes incorporated in recent social security reforms. We further estimated the association of ITAX with an individual's decisions concerning retirement and pension benefit claims. Lastly, we conducted counterfactual simulations to assess the effect of recent social security forms on retirement based on the estimated regression parameters. The results showed that a higher ITAX drove individuals, especially men, to retire and claim benefits earlier.

1. Introduction

It is commonly and distinctly observed that the employment of older generations—or elderly employment—in advanced countries had been declining in the second half of the last century. However, elderly employment increased in the mid- to late 1990s (Coile et al., 2020). This U-shaped reversal of older individuals' employment rate applies to Japan as well. However, in Japan, the timing of the reversal lagged until the mid-2000s. This is encouraging news, as rapid population aging in Japan is a serious policy issue. The population aging issue is expected to result in labor shortage as well as financial pressure on the sustainability of social security programs. In our previous work, we analyzed the mechanism of the upsurge in elderly employment by examining a variety of factors that appear to have contributed toward it. We found that the upsurge was closely related to a series of social security reforms, notably the extension of the eligibility age for public pension benefits (Oshio et al., 2019).

We further examined and quantified the association between elderly employment and social security reforms in Japan during 1980–2018 (Oshio et al., 2018). We used aggregated data to summarize a variety of institutional changes that include extending the eligibility age, reducing the actuarial adjustment factors, and revising the earnings-tested social security program and the wage subsidy for elderly employment into one key parameter referred to as "implicit tax" (ITAX), incurred by individuals working longer or claiming later. Oshio et al. (2018) concluded that a reduction in ITAX under a series of social security reforms was associated with a recent increase in elderly employment rates. This increase is particularly apparent in men and women aged 60–69 and 55–64 years, respectively. This finding was supported by a negative and significant association between ITAX and the elderly employment rate in several regression analyses.

This study attempts to expand on these previous analyses to examine how elderly employment is associated with social security programs and how it has responded to recent reforms. We employed a rich longitudinal dataset of middle-aged and older generations. The advantage of employing individual-level panel data as opposed to aggregated data can be ascribed to three aspects. First, the response of employment to social security reforms can be estimated more accurately using a large sample of individuals with rich variations. Second, we can incorporate heterogeneity among older generations and across cohorts, which is not as effective with aggregated data.[1] Third, further to the second point, we can obtain a more nuanced policy implication concerning social security reforms by scrutinizing a variation in the effect of social security reforms among individuals and different cohorts.

This paper proceeds as follows. Section 2 explains the dataset used in the study and Section 3 describes the background of elderly employment in Japan. Section 4 presents the computation of ITAX and a descriptive analysis based on it. Section 5 presents a regression analysis that examines the association of ITAX with retirement and benefit claiming. Section 6 presents counterfactual simulations to assess the effect of recent social security reforms on the probability of retirement, based on the estimated association between ITAX and retirement. Section 7 concludes this paper.

2. Data description

We employed a twelve-wave panel dataset from “The Longitudinal Survey of Middle-Aged and Older Adults” (LSMOA). The survey in question is conducted annually by the Japanese Ministry of Health, Labour and Welfare (MHLW); the data for this study are from 2005 to 2018. The

[1] Oshio and Shimizutani (2019) carefully examined both the average and the distribution of “health capacity to work” among older generations in Japan to further extract a nuanced policy implication.

survey was conducted in a nationwide, population-based manner. Samples from the first wave were collected in November 2005 using a two-stage random sampling procedure. First, 2,515 districts were randomly selected from the 5,280 districts included in the MHLW's nationwide population-based "Comprehensive Survey of the Living Conditions of People on Health and Welfare," which was conducted in 2004. The 5,280 districts in this survey were further randomly selected from approximately 940,000 national census districts. Second, 40,877 residents aged 50–59 years as of October 30, 2005, were randomly selected from each of the selected districts based on the population of each district. The questionnaires, which the respondents completed by November 2, 2005, were manually distributed to their homes and manually collected several days later.

A total of 34,240 individuals responded to the LSMOA (response rate:83.8%). These individuals represent the baseline sample for the subsequent survey waves in this study. The second to fourteenth waves of the survey were conducted in early November of each year from 2006 to 2018; 20,677 individuals further continued participating in the study until the fourteenth wave.[2] No new respondents were included after the first wave. We used data from ten cohorts—born from 1946–1955—in the empirical analysis below. The survey covered a variety of variables including employment, health, education, and family status, which were used as covariates in the regression analysis. The unit of the survey is an individual, as opposed to a couple. Therefore, information concerning spouses is rare and does not allow us to perform an analysis of couples' joint retirement decisions.[3]

3. Background

---

[2] The average attrition rate per wave is quite low at approximately 4.0%.

[3] The survey asked a spouse's income and its source (work or pension benefit) but did not require the work or pension status of a spouse in detail.

3.1 Social security reforms

This section presents important features concerning social security reforms and elderly employment in Japan, which are key variables in this study. First, we briefly describe a series of social security reforms that took place during the study period. The Japanese government implemented a large reform in the mid-1980s, which has continuously reduced its benefits to date. The reforms implemented between 2005 and 2018 were consistent with an ongoing trend toward lower generosity; gradual increases in eligibility age, minor changes in parameters in the earnings-tested (*Zaishoku*) pension program, and a revision of the Elderly Employment Stabilization Law that requires firms to either abolish the mandatory retirement age or raise it to 65 years (effective as of April 2006) have been implemented.

While the effects of these reforms on retirement are likely to have interacted with each other, previous studies suggest that extending the eligibility age for public pensions is a key driver that affects social security benefits. In Employee Pension Insurance (EPI), a program covering company employees and public sector workers and a pension program mainly examined in this study, a gradual extension of the eligibility age was enacted during the study period. For men, the eligibility age for the flat-rate (first-tier) benefit was 62 in 2005 and 2006 but revised to 63 in 2007 and 64 in 2010. This was lastly revised to 65 in 2013, and remained at this level. For women, the corresponding eligibility age for the flat-rate component was 61 years in 2005, which was further revised to 65 years in 2018, with a five-year lag with men. Meanwhile, men's eligibility age for the wage-proportional (second-tier) benefits began increasing from 60 to 61 in 2011 and was scheduled to gradually increase to 65 in 2025; for women, the increase was scheduled to follow the increase with a five-year lag with men.[4]

[4] Women's eligibility age for the wage-proportional benefit remained at age 60 throughout 2005–2018. There was no change in the benefit multiplier of the wage-proportional benefit, which was fixed at 7.125/1000 for all individuals in the LSMOA sample used for this study.

3.2 Employment and benefit claiming

We further review employment status and benefit-claiming, both of which are key dependent variables in the regression analyses. Figure 1 depicts the percentage of those with no paid employment and those receiving pension benefits according to age. The sample pools all individuals in all waves (2005–2018), including the self-employed. “No work” in the figure refers to those who had no paid job. “Receiving pension benefits” indicates those who received any type of public pension benefits, including disability and survivor pension benefits, regardless of their job status.[5]

For men (Panel A), the percentage of those in their 50s with no paid employment is less than 10%. This percentage increased to approximately 20% for those in their 60s, after which it gradually increased with age during their 60s to reach approximately 50% at the age of 70. The percentage of those receiving pension benefits was negligible in their 50s, but surged to over 30% at the age of 60 (the earliest age at which old-age pension benefits can be claimed). It further increased to 80% at the age of 65 years and exceeded 90% for men in their late 60s. For women (Panel B), the percentage of those with no paid employment was approximately 30% in their late 50s and exceeded 40% at the age of 60, gradually increasing with age. The percentage of women pension claimers was small but larger than that of men in their 50s and increased to more than 40% at the age of 60. The gap in the proportions of pension claimers between the ages of 59 and 60 was larger for women than men. The percentage of those receiving pension benefits exceeded 90% from the age of 65 and above.

[5] LSMOA does not contain information concerning whether an individual receives either flat-rate or wage-proportional benefit or both. The survey only examined whether a respondent received any benefit from public pension program. These benefits include not only old age pension but also other pension programs (i.e., disability pension program). The survey also examined whether a respondent received private pension benefit. However, it did not examine the relevant amount.

Figure 2 shows the evolution of work status and pension benefit claims for the cohort born in 1948 (age 57 in the 2005 wave). In this figure, we divided work status into full- and part-time work by determining whether an individual worked more than 30 hours per week. The distinction between full- and part-time workers is relevant in Japan, as the country has a large segment of "working pensioners" (Shimizutani, 2011).

For men (Panel A), the percentage of those working and not receiving pension benefits occupied approximately 95% of individuals in their 50s, which declined significantly to approximately half of that at age 60, declined even further for those aged 61–65 years, and became negligible above the age of 65. In contrast, the percentage of those not working and receiving benefits began increasing at the age of 60, reaching 35% at the age of 65. The percentage of working pensioners who were full- or part-time workers receiving pension benefits, was approximately30% at the age of 60 and increased with age to more than 55% at the age of 65 and above. For women, although the percentage of those not working and claiming benefits was larger than that of men, the development of their work status and pension claiming according to age was similar to that of men, accordingly reducing the share of working pensioners.

4. ITAX computation and descriptive analysis

4.1 Two decision types: retirement and benefit claiming

This section presents the description and calculation of ITAX, a key determining measure of the effects of social security incentives on retirement and benefit claiming. Because social security incentives that affect decisions concerning retirement and benefit claiming cover various aspects of public pensions as well as other programs, summarizing them into ITAX—a single index representing tax forces that motivate these decisions—is appropriate.

To operationalize ITAX, which is incurred on individuals working longer and claiming benefits later, we assume that an individual has two decisions to make at each age: (1) whether to keep working or retire and (2) whether to claim benefits. As seen in Figure 2, these two decision types should not be considered similar, as, for example, there is a large number of "working pensioners" in their 60s, implying that these two decision types are two separate factors although likely related to each other.

Regarding the first decision (retirement), we examine individuals who have stayed in the labor force as employees in both the private and public sectors (i.e., excluding the self-employed) up to one year before the survey year. Regarding the second type of decision (benefit claiming), we examined individuals who had never claimed benefits until one year before the survey year.

4.2 Social security wealth (SSW) and its accrual (SSA)

To construct ITAX, we first compute social security wealth (SSW), the discount value of all future social security benefits, by applying the benefit formulae to each age and cohort. While computing social security benefits, we incorporate all institutional parameters related to social security programs, including eligibility ages and benefit multipliers (see the Appendix for the validation of the pension benefit calculator). We also performed a lifetime average estimation for each individual to calculate their old-age pension benefits. Specifically, we conduct a simple projection conditional calculation by assuming that an individual had received the same wage observed in Wave 1 (2005) during the period before that wave.[6] When an individual considers

[6] For this study, we did not compute past wage profiles, considering the formula of wage-indexation of social security benefits in Japan. When calculating the benefits in the formula, the formula reevaluates past wages using the average wage growth rate in the overall economy from the time of receiving the wage in the past to the time of claiming in the present. For simplicity, we assumed that the wage growth rates in previous years were equal across all industries and occupations. We further assumed that each individual had received the same wage

whether to work for one more year, we assume that they expect their wages to be consistent with those from the previous year. This assumption is justified in examining the *ex-ante* effect of ITAX on retirement decisions, considering that many individuals tend to accept reduced wages to avoid an earnings-tested reduction in benefits.

To calculate the SSW, we assume that the annual discount rate is 3% for all individuals in the sample. We also calculate the survival rates at each age by the death rates for each year obtained from the MHLW's Life Tables during 2005–2018 and assume that each individual expects their future survival rate to be consistent with that observed in that year.[7]

We further calculate the SSA and the accrual of the SSW by considering two versions of the SSW, each corresponding to the abovementioned two types of decisions on retirement and benefit claiming. The first is a "retirement version" aimed at capturing the SSA that is realized upon delaying retirement for one year. In this case, we assume that an individual will claim benefits upon reaching the eligibility age, regardless of their retirement decision, and that the benefits will be earnings-tested and possibly reduced under the *Zaishoku* pension program.

The second is the "claiming version" aimed at capturing the SSA obtained by delaying claiming for one year. In this version, we assume that an individual will continue working for an additional year, regardless of their retirement decisions. If an individual delays claiming benefits, they will lose one year of benefits, but will obtain additional benefits in future owing to the additional premium contribution.

In both decision types, SSA can have both positive and negative values. A positive value indicates an incentive for delaying retirement and postponing benefit claiming, whereas

---

observed in wave 1 over the entire period before wave 1. We also simply projected each individual's contribution months (which were not available from the LSMOA) at each age by applying the average of months of contribution (392 months for men at age 61 and 383 months for women at age 60) according to MHLW statistics in 2016.

[7] We examined a dichotomous choice of either working or claiming and did not consider other pathways to retirement, as they are limited in Japan (Oshio and Shimizutani, 2012).

negative values indicate a disincentive for these behaviors.

4.3 ITAX

Corresponding to the two decision types, we calculate the two types of ITAX. For the retirement version of ITAX, we incorporate (i) an earnings-tested reduction in benefits under the *Zaishoku* pension program, (ii) wage subsidy for the elderly, (iii) employment insurance premium, and (iv) personal income tax,[8] in addition to the retirement version of SSA. This is calculated as follows:

Retirement ITAX = – *Retirement SSA* + (i) – (ii) + (iii) + (iv). (1)

For the claiming version of ITAX, we incorporate only benefit reduction under the *Zaishoku* pension program. This is because we assume that an individual will keep working despite claiming benefits, meaning that they will continue paying the employment insurance premium and personal income tax and obtain a wage subsidy. Therefore, we calculate the claiming version of ITAX as follows:

Claiming ITAX = – *Claiming SSA* – (i). (2)

In this equation, an earnings-tested reduction in benefits is subtracted from, rather than added to, ITAX, in contrast to the retirement version of ITAX (see Equation [1]), because an individual can avoid an earnings-tested reduction in benefits if they postpone their benefit claiming. It

[8] Almost no income tax needs to be paid if there is no income other than public pension benefits, owing to income deduction applied to public pension benefits.

should also be noted that individuals may prevent an earnings-tested reduction in benefits if their wages are expected to be sufficiently low.

4.4 Descriptive analysis

Figure 3 represents the evolution of the retired version of ITAX along with age for three different cohorts (born in 1947, 1950, and 1953) for men (Panel A) and women (Panel B). For men, ITAX was negative in their 50s for all cohorts, suggesting that individuals were motivated to continue working in this age range. However, ITAX turned positive at the age of 60 years and above, suggesting that individuals had an incentive to retire early in their 60s. ITAX peaked at the age of 60 for men in the 1947 and 1950 cohorts, showing that they were the most highly motivated to retire at that age, whereas ITAX peaked at age 61 for men in the 1953 cohort. This shift in the peak age of ITAX can be attributed to an extension of the eligibility age for claiming the wage-proportional benefit (ERA: early retirement age) from 60 to 61 years.

Panel B depicts the development of ITAX for women. Similar to men, ITAX changed from negative to positive at the age of 60 years. However, women’s ITAX had larger negative values before the age of 60 years and smaller positive values in their 60s. The shift in the peak after the age of 60, albeit less pronounced than that of men, is attributable to the gradual increase in the eligibility age for the flat-rate benefit (NRA: normal retirement age) from age 61 (for the 1947 cohort) to age 64 (for the 1953 cohort).

Figure 4 uses, as an example, the 1948 cohort to decompose the retirement version of ITAX for men (Panel A) and women (Panel B). The decomposition is based on Equation (1). Moreover, all factors are evaluated in terms of the ratio (percentage) of the pre-retirement wage. For men, ITAX was negative for the ages of 58 and 59 when SSA was negative, indicating that individuals expected future social security benefits to increase if they stayed in the labor force until they reached the eligible age. The major change occurred at the age of 60, when ITAX turned from negative to positive for two major reasons. First, the negative effect of SSA on ITAX decreased markedly despite SSA remaining positive, meaning that the core component of the public pension program did not provide a disincentive to work. Second, an earnings-tested reduction in benefits under the *Zaishoku* program substantially raised ITAX for individuals in their early 60s. This negative effect of the *Zaishoku* program persisted for the age of 65 years and above. However, the effect was diminished. Personal income raised ITAX across all ages from 58 to 68, consistently discouraging individuals from working. However, the wage subsidy reduced ITAX for those aged 60 to 64. Similar patterns are observed for women in Panel B of Figure 4, with a notable change from positive to negative ITAX at the age of 60. Compared with the results for men, ITAX showed significantly larger negative values for women before the age of 60.

Figure 5 shows the distribution of ITAX at ages 58, 60, and 65 years for men (Panel A) and women (Panel B), both for the cohort born in 1948. Because the pension formulae and other institutional factors were common for individuals across cohorts, the observed variations were mainly attributed to past total wages. For men, Panel A shows that ITAX was negative at the age of 58, except for the fifth (i.e., highest) quintile, and positive at the ages of 60 and 65, except for the first (i.e., lowest) quintile. For those aged 65, ITAX in the fifth quintile was significantly higher than that in the lower-income groups, possibly because the earnings test under the *Zaishoku* program was applied to the highest-income group.

Panel B shows that ITAX for women was distributed in patterns similar to those for men. However, ITAX was negative for all quintiles at the age of 58 years, with absolute values much higher than those for men. Even at the age of 60 years, ITAX was negative for the three lower quintiles, and the value in the fifth quintile was significantly lower than that of men. An ITAX jump in the fifth quintile suggests that the earnings test was applied only to the highest-income group. At the age of 65 years, ITAX was generally lower for women than for men. Moreover, there was no increase in the fifth quintile, probably reflecting women's lower wage income.

5. Regression analysis

5.1 Model specification

This section presents a regression analysis that links retirement and claiming decisions to ITAX and determines the effect of institutional changes on decisions concerning retirement and benefit claiming. For simplicity, we treat retirement and claiming decisions separately and ignore their interdependent relationships. Therefore, we estimate the following two models (of men and women) separately for the ages between 58 and 70.

$$Retirement_{i,t} = \alpha + \beta\ retiremnt\ ITAX_{i,t} + \boldsymbol{X}_{i,t}\boldsymbol{\gamma} + e_{i,t} \quad (3)$$

$$Claiming_{i,t} = \alpha + \beta claiming\ ITAX_{i,t} + \boldsymbol{X}_{i,t}\boldsymbol{\gamma} + e_{i,t} \quad (4)$$

In equation (3), $Retirement_{i,t}$ is a binary variable of retirement, indicating whether individual *i* retired in year *t* (= 1) or not (= 0), conditional on continuing work until year *t*-1. For this equation, we assume that an individual claims benefits upon reaching the eligibility age regardless of their retirement decision. Respondents remained in the sample if they kept working and were excluded once they stopped working. In equation (4), $Claiming_{i,t}$ is a binary variable of benefit claiming, indicating whether individual *i* claimed in year *t* (= 1) or not (= 0), conditional on not claiming until year *t*-1. Here, we assume that an individual keeps working regardless of their decision concerning benefit-claiming. Respondents remained in the sample if they did not claim benefits and were excluded once they did.

A vector of covariates is indicated by $\boldsymbol{X}_{i,t}$, which includes (i) SSW and lifetime income earnings, both evaluated in terms of the ratio to income one year before the survey year, (iii) engaged in full-time work and white-collar work one year before the survey year, (iii) binary variables of health (measured by diagnosed prevalent non-communicable diseases, poor self-rated health[9], any problems concerning ADLs, and smoking), (iv) caring for family member(s), (v) marital status (having a spouse) and (vi) education (graduated from junior college or college and above; the baseline value is high school or below), as well as (vii) age and its square.

We performed a regression analysis by estimating five types of methods: linear probability models (pooled, fixed-effects, and random-effects models) and probit models (pooled and random-effects models) for men and women, respectively. The error term $e_{i,t}$ is decomposed into an individual-level fixed effect and residuals in the random- and fixed-effects models. Educational attainment is automatically excluded in fixed-effects models because it is a time-indifferent individual attribute.

5.2 Estimation results

Table 1 shows the estimated coefficients (or the marginal effects for the probit models) of ITAX, the main variable of interest, and other variables across the five models that explain retirement for men. The size of the coefficient varied from 0.140 to 0.229. For example, the coefficient was 0.229 in the LPM with fixed effects, meaning that a 10% reduction in ITAX increases the probability of retirement by approximately 2.3%. As shown in Figure 3, ITAX increased by approximately 32% between the ages of 59 and 60 years for men born in 1950. Considering

[9] The LSMOA asks respondents to choose their self-rated health from *very good*, *good*, relatively *good*, relatively *poor*, *poor* and *very poor*. We construct a binary variable of poor self-rated health by allocating 1 to those who chose *poor* or *very poor* and 0 to others.

this together with the estimated coefficient, it is safe to conclude that the change in ITAX from age 59 to 60 years increased the probability of retirement by 7.3%. For the LPM regressions, the *F* test rejects the null hypothesis that all individual effects are equal to zero, and the Hausman test rejects the null hypothesis that the individual effects are uncorrelated with the other explanatory variables. In addition to the key results, we observe that higher SSW encourages retirement, while higher lifetime income and white-collar work one year before the survey year discourage it. As expected, poor health conditions and caring for family members (s) tended to be positively associated with retirement.

Table 2 summarizes the estimated associations between ITAX and retirement and benefit claims for men and women. As shown in this table, ITAX is positively associated with both retirement and benefit-claiming for both men and women. By comparing the sizes of the estimated coefficients and marginal effects, we observe that men are more sensitive to ITAX than women, and that benefit claiming is more sensitive to ITAX than retirement for both men and women.

6. Counterfactual simulations

6.1 Assumptions

Based on the estimated association between ITAX and retirement decisions, we conducted counterfactual simulations to assess the effect of recent social security reforms on the probability of retirement. Accordingly, we first calculated the counterfactual values of ITAX and SSA for each individual in each year by assuming that institutional parameters related to social security programs were fixed at their values/schemes before the 1985 Pension Reform, which incorporated major changes in public pension programs. Most importantly, we suppose that the eligibility age was fixed at 60, contrary to their gradual increase starting in 2001. We also suppose that the benefit multipliers for the wage-proportional benefit, the benefit per month of contribution for the flat-rate benefit, EPI and NPI premium rates, the formula of an earnings-tested reduction in benefits under the *Zaishoku* pension programs, and other institutional parameters and schemes remained intact, to elucidate the effect of the 1985 Pension Reform and their subsequent reforms.

We further substitute the actual ITAX and SSW by their counterfactual values and simulate the evolution of the counterfactual probability of retirement of those aged 60–69 years in 2006 and 2018 using the estimated regression parameters. All the other variables were maintained at their actual values. For the simulations, we use the estimation results of the LPM with fixed effects.

6.2 Simulation results

The simulation results are summarized in Figures 6–10. Figure 6 compares the age evolutions between the actual and counterfactual values of ITAX in 2006 and 2018. This figure underscores the fact that a series of reforms in the past two decades have substantially reduced the disincentive for work, especially for those aged 60–64 years. For both men and women in this age group, the actual ITAX is 25–38% and 23–25% lower than the counterfactual ITAX for men and women, respectively. This difference is largely accounted for by a reduction in the threshold for the earnings test under the *Zaishoku* program and the introduction of a wage subsidy for elderly employment. Meanwhile, Figure 7 shows a substantial reduction in SSW for ages 55–59 largely owing to postponed eligibility ages from 60, encouraging individuals to stay in the labor force during the late 50s.

We further move to the simulation results for employment. First, Figure 8 compares the observed and predicted probabilities of retirement at age 60 by year based on the results of the LPM with FE. For both men and women, the predicted probabilities of retirement are relatively upwardly biased toward the actual ones, but roughly trace their levels and changes.

The effect of a series of social security reforms since the mid-1980s is demonstrated by the gaps between the curves of the predicted and counterfactual retirement probabilities, as shown in Figure 9. Panel A in this figure shows that the curve of the predicted probability remains below that of the counterfactual probability; the vertical distance between the two curves ranges from 6–12% and 3–4% for men and women, respectively.

Panel B depicts the curves for those born in 1948, who were 58 years old, in 2006. The vertical distance between the two curves remained relatively stable at approximately 9 and 3% for men and women, respectively, until approximately 2012 (when the cohort was 64 years old), and then became negligible after a sharp drop in the curves of counterfactual probabilities in 2013 (when the cohort was 65 years old). This result suggests that the effect of a series of reforms has concentrated largely on those aged 64 years or below, while there is a limited effect on those aged 65 years or above.

Lastly, Figure 10 compares the predicted and counterfactual employment survival curves for men and women, based on the estimated cross-sectional employment probabilities. As seen in this figure, the predicted employment curve in 2018 is located above the counterfactual curve in that year for both men and women, pointing to the positive effect of a series of reforms on employment. We also noticed no substantial differences between the predicted curves in 2006 and 2018, suggesting that a large portion of the effect of social security reforms since the mid-1980s was realized in the early 2000s.

7. Conclusion

A previous study (Oshio et. al., 2018) employed aggregated data to confirm that a reduction in the tax force under a series of social security reforms to reduce generosity between 1980 and 2018 was associated with the recent rebound of elderly employment rates. This study aims to elaborate on the association between the tax force, retirement, and benefit claiming using a rich longitudinal dataset in Japan. Furthermore, we aimed to determine the effect of social security incentives from other factors, such as health status, on an individual’s decisions concerning retirement and benefit-claiming. Lastly, we assess the effect of a series of recent social security reforms on retirement by conducting counterfactual simulations.

Our findings confirm that an individual’s decisions on retirement and benefit claiming are closely associated with social security incentives evaluated based on the ITAX construct. Furthermore, the counterfactual simulation results suggest that a series of social security reforms in recent years aimed at reducing generosity have encouraged individuals to keep working and postpone claiming benefits, especially among men aged 60–64 years.

However, this study has several limitations. First, we ignore the possibility that social security reform (or its absence) affects covariates in our counterfactual prediction. For instance, the change in net income caused by the reform affects health, which may consequently affect the elderly’s decisions on work and retirement, despite the magnitude of such a feedback effect being limited.

Second, this study ignores the simultaneity of decisions concerning retirement and benefit claims. The fact that working pensioners shape a key pathway from being a part of the workforce to retirement suggests that the two decisions are not identical. However, we estimate regression models to explain these two decisions separately, assuming, for simplicity, that one decision does not affect the other. There is need to analyze the joint decision making of retirement and claiming behavior to fully understand the elderly’s behavioral responses to social security incentives.

Third, employment status could have been divided into full-time and part-time employment, especially because a large portion of working pensioners are part-time workers, as shown in Figure 2. To avoid complexity when computing SSW, we assumed a dichotomous choice of either working or exiting the labor force, regardless of the hours worked. Furthermore, the possibility of returning to work after staying outside the labor market for some time needs to be considered. We excluded individuals from the analysis once they had retired (or initially claimed benefits), ignoring the complexity of the dynamics of the elderly's decisions on work.

Future research should explore specific policy scenarios using the framework of this study. One possible agenda is the effect of an extension of the mandatory retirement age—for instance, up to the age of 70—or an extension of the eligibility age to claim public pension benefits above the age of 65. We believe that these simulations could be particularly informative for a more effective policy that considers the heterogeneity of older generations.

References

Coile, Courtney, Kevin Milligan, and David Wise eds. *Social Security Programs and Retirement around the World: Working Longer*, University of Chicago Press, forthcoming in 2020.

Oshio, Takashi, Akiko Oishi and Satoshi Shimizutani (2018). "Social Security Programs and elderly employment in Japan," *NBER Working Paper* 25243.

Oshio, Takashi and Satoshi Shimizutani (2012). "Disability Pension Program and Labor Force Participation in Japan: A Historical Perspective," in David Wise editor. *Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reform*s, The University of Chicago Press, pp. 391-417.

Oshio, Takashi and Satoshi Shimizutani (2019). "Health capacity to work and its long-term trends among the Japanese elderly," *Journal of the Japanese and International Economies*, vol. 51, pp. 76-86.

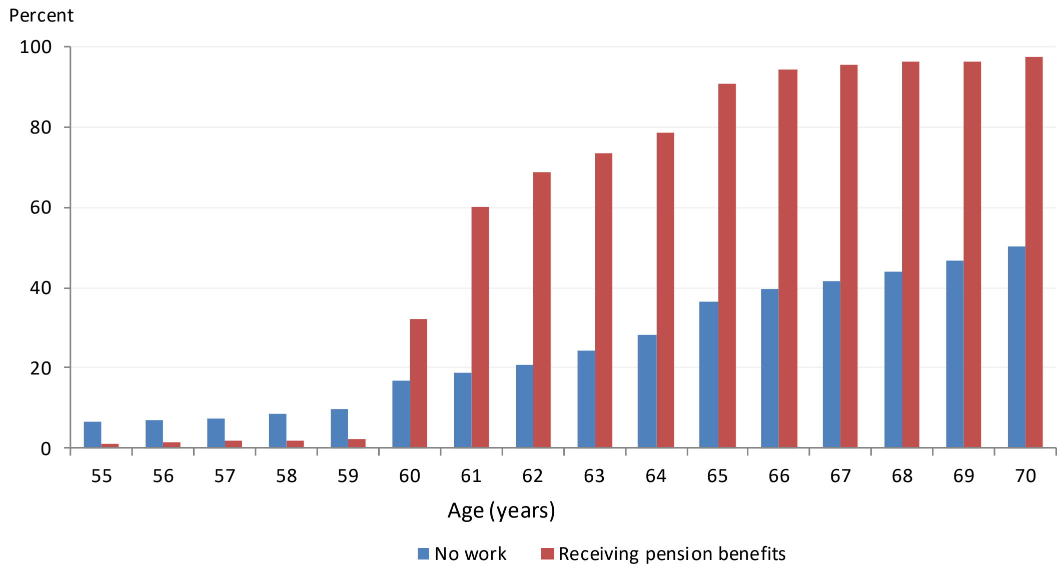
Oshio, Takashi, Emiko Usui and Satoshi Shimizutani "Labor Force Participation of the Elderly in Japan," Courtney Coile, Kevin Milligan, and David Wise eds. *Social Security Programs and Retirement around the World: Working Longer*, University of Chicago Press, forthcoming in 2019.

Satoshi Shimizutani (2011). "A new anatomy of the retirement process in Japan," *Japan and the World Economy*, vol. 23, no. 3, pp. 141-152.

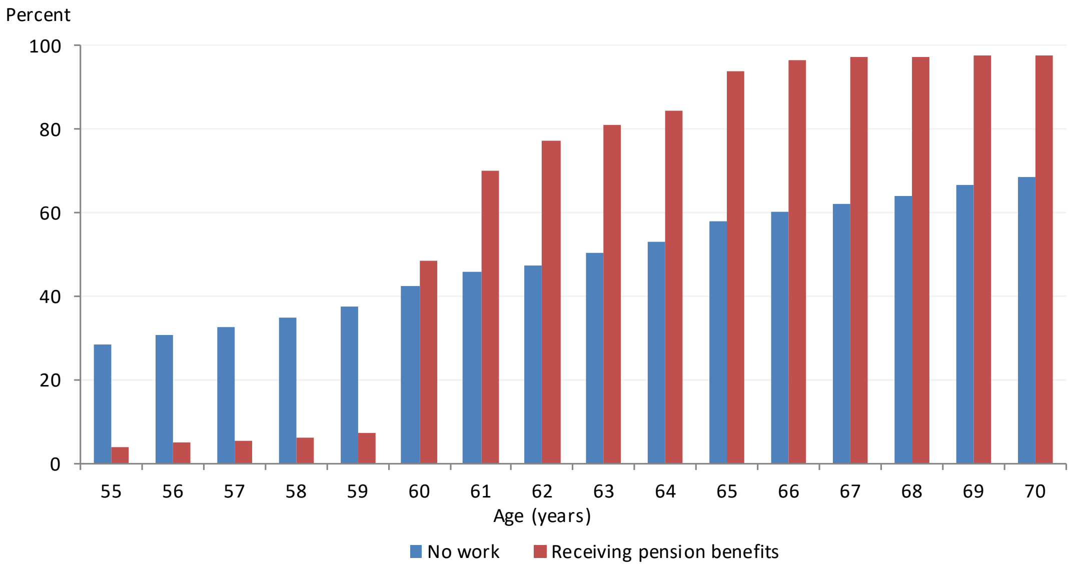
Satoshi Shimizutani and Takashi Oshio (2013). "Revisiting the labor supply effect of social security earnings test: new evidence from its elimination and reinstatement in Japan," *Japan and the World Economy*, vol. 28, pp. 99-111.

Figure 1. Work status and benefit claiming (updated)

Panel A: Men



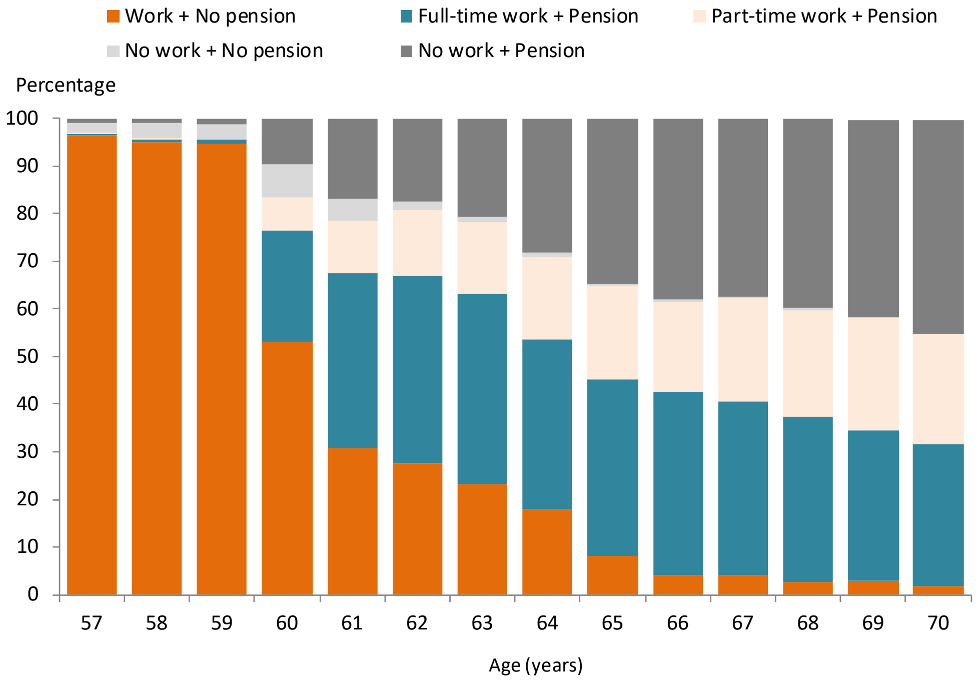
Panel B: Women



Note: The sample pools all observations for all waves (2005–2018).

Figure 2. Evolution of work status and benefit claiming: the case of the cohort born in 1948 (updated)

Panel A: Men



Panel B: Women

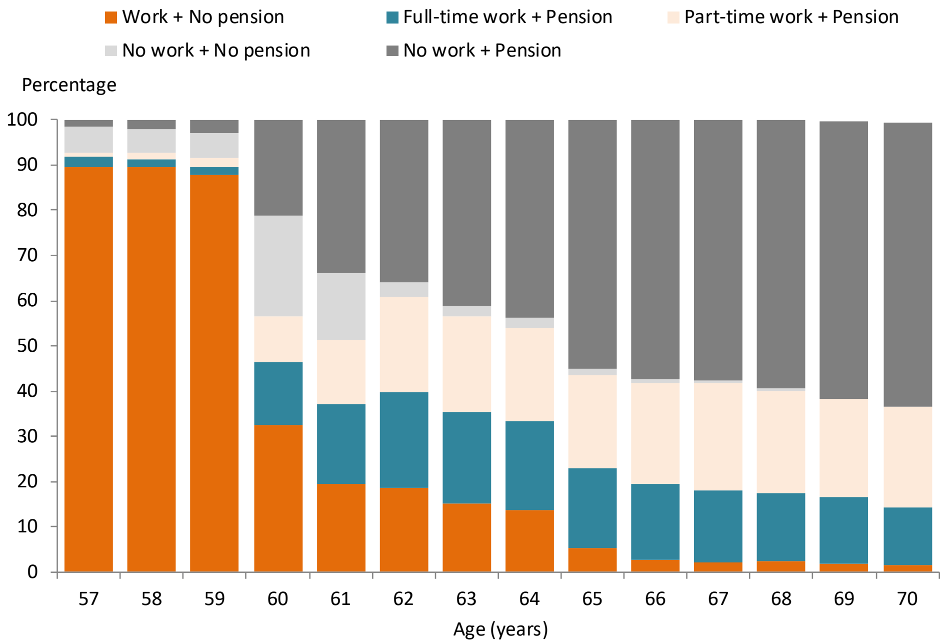
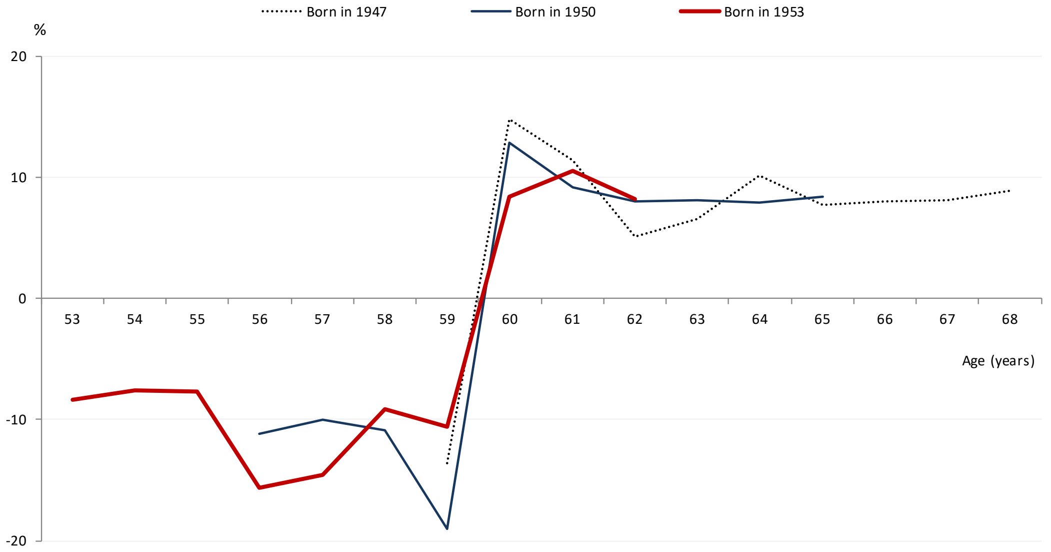
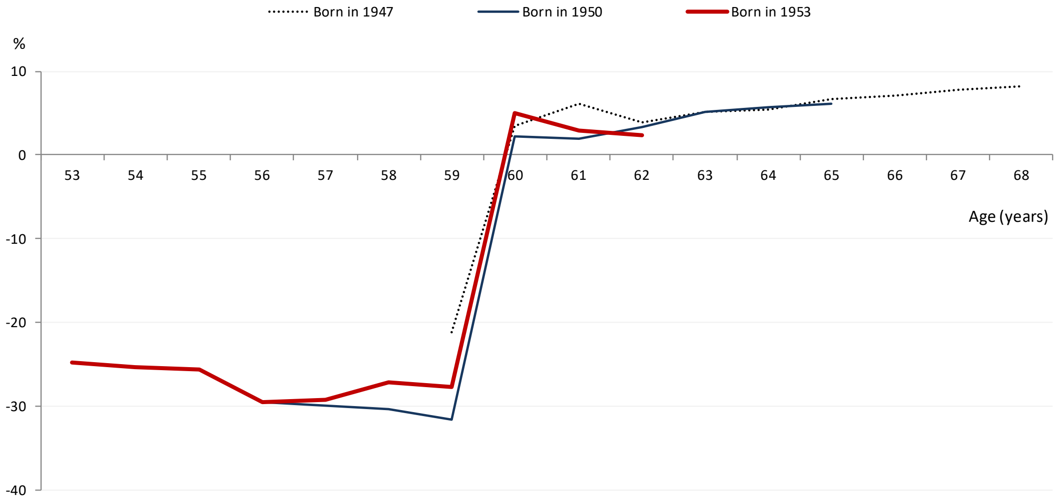


Figure 3: Development of ITAX with age by cohort (updated)

Panel A: Men



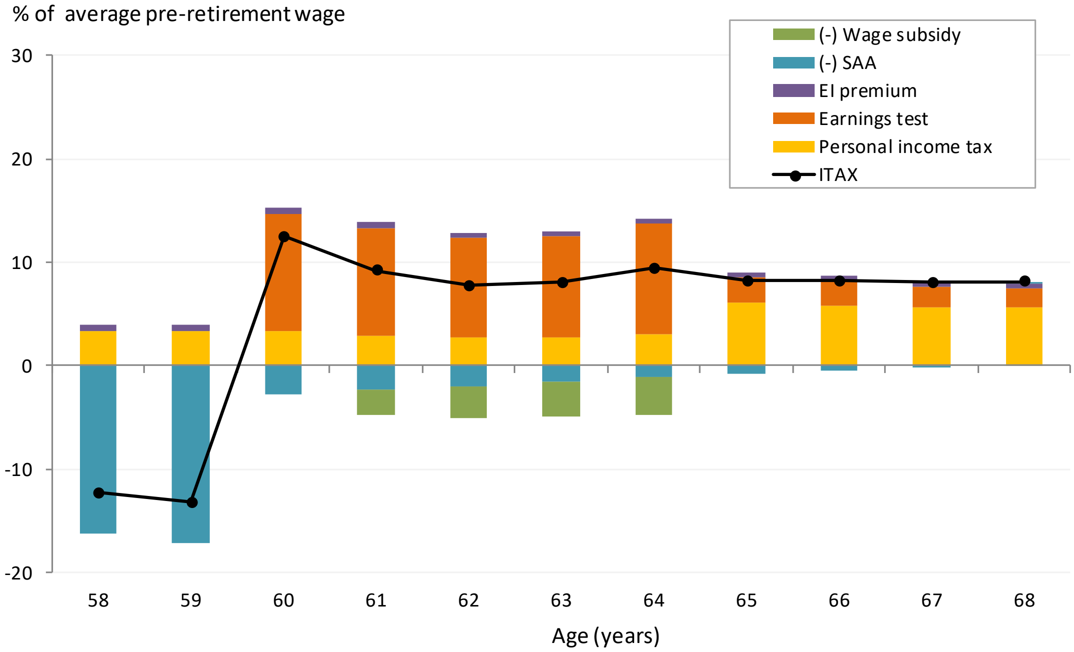
Panel B: Women



	Men			Women		
Born in	1953	1950	1947	1953	1950	1947
Age in wave 1	52	55	58	52	55	58
ERA	60-61	60	60	60	60	60
NRA	65	65	63-64	64	62-63	61

Figure 4: Decomposition of ITAX for each age: the case of the cohort born in 1948 (updated)

Panel A: Men



Panel B: Women

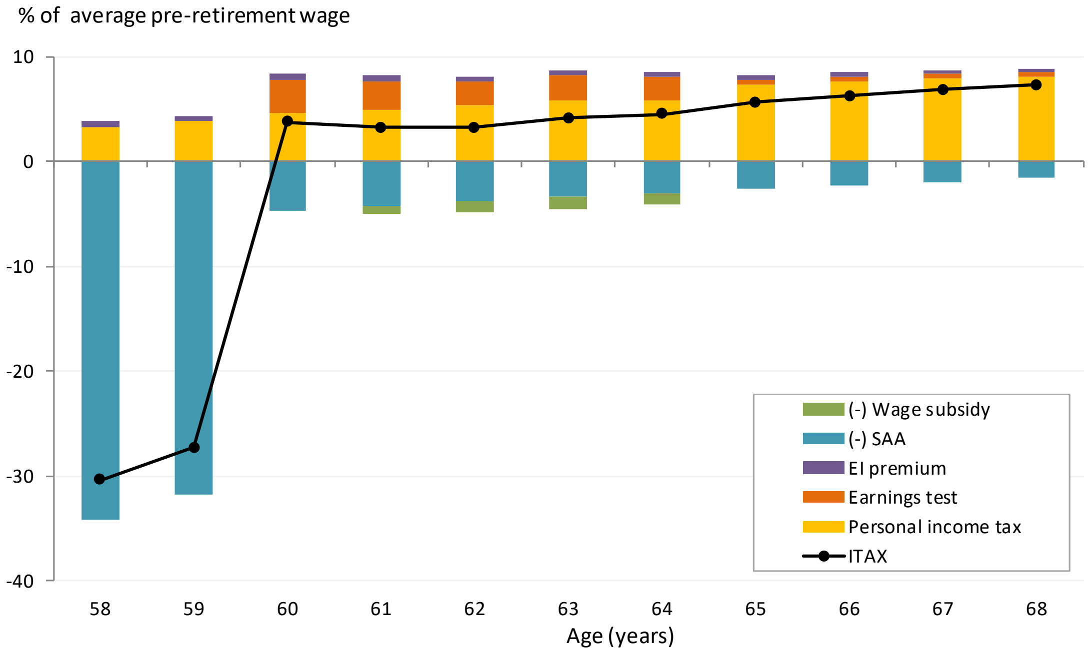
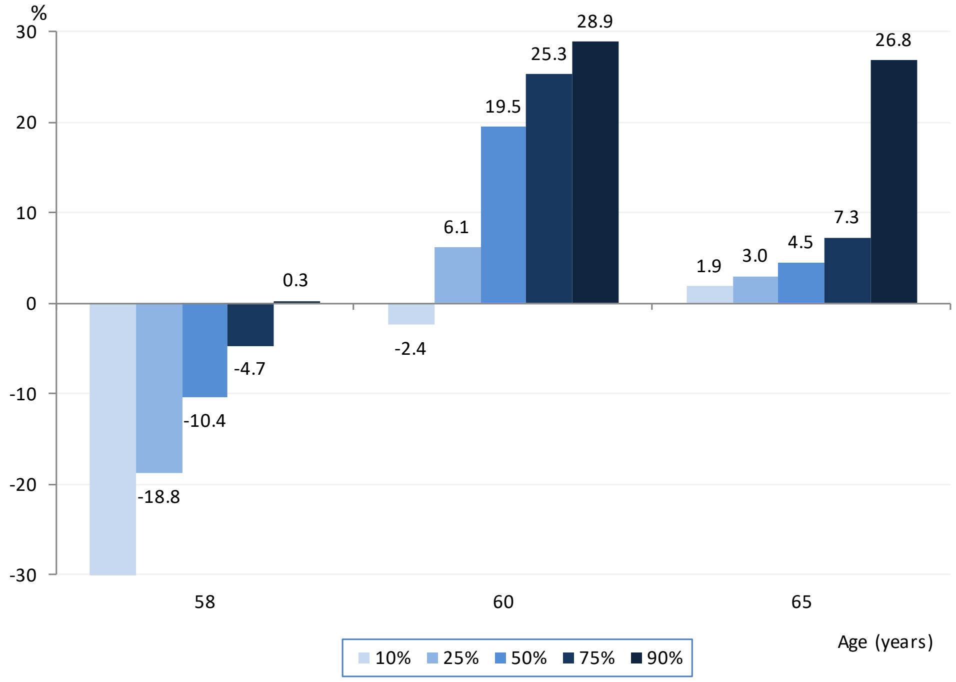


Figure 5: Distribution of ITAX according to age: the case of the cohort born in 1948 (updated)

Panel A: Men



Panel B: Women

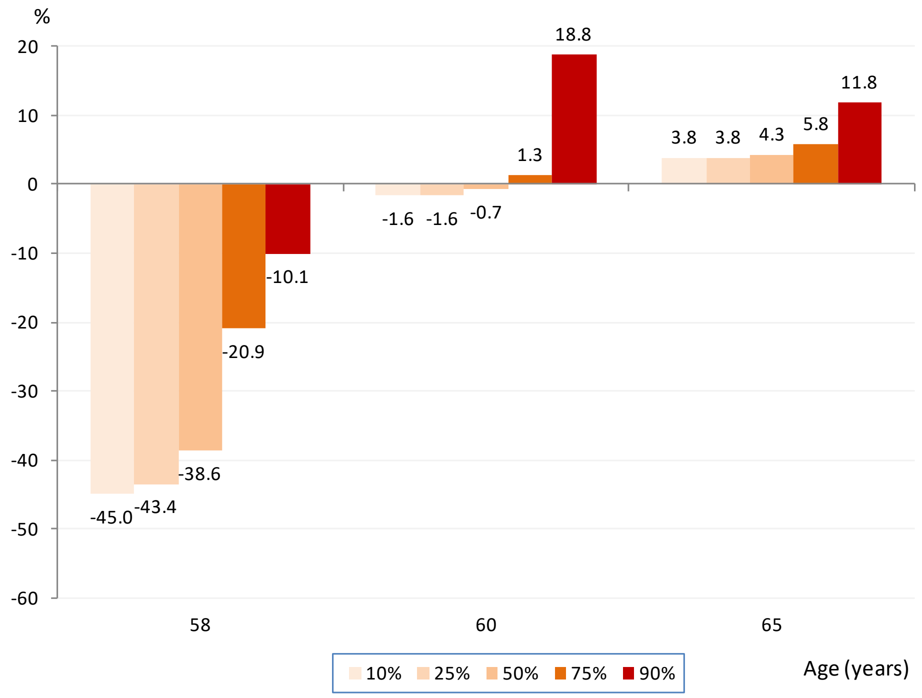


Table 1: Estimation results of the regression models to explain retirement for men

	Pooled LPM		LPM with FE		LPM with RE		Pooled probit		Probit with RE	
	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	*dy/dx*	(SE)	*dy/dx*	(SE)
ITAX	0.161 ***	(0.010)	0.229 ***	(0.011)	0.192 ***	(0.010)	0.140 ***	(0.010)	0.174 ***	(0.014)
SSW	0.011 ***	(0.001)	0.009 ***	(0.001)	0.011 ***	(0.001)	0.009 ***	(0.001)	0.010 ***	(0.001)
Lifetime income	-0.001 ***	(0.000)	-0.001 ***	(0.000)	-0.001 ***	(0.000)	-0.001 ***	(0.000)	-0.001 ***	(0.000)
Full-time work	-0.036 ***	(0.005)	-0.035 ***	(0.005)	-0.039 ***	(0.005)	-0.025 ***	(0.004)	-0.033 ***	(0.006)
White-collar work	0.000	(0.002)	0.000	(0.004)	-0.005	(0.003)	-0.001	(0.002)	0.001	(0.004)
Diabetes	0.008 *	(0.003)	0.000	(0.007)	0.006	(0.005)	0.007 *	(0.003)	0.007	(0.005)
Heart disease	0.010 +	(0.005)	0.004	(0.008)	0.012 +	(0.007)	0.009 *	(0.005)	0.016 *	(0.007)
Stroke	0.057 ***	(0.009)	0.089 ***	(0.013)	0.089 ***	(0.011)	0.041 ***	(0.007)	0.065 ***	(0.011)
Hypertension	-0.001	(0.002)	-0.002	(0.005)	-0.004	(0.004)	-0.001	(0.002)	-0.001	(0.004)
Hyperlipidemia	-0.016 ***	(0.003)	-0.017 ***	(0.005)	-0.019 ***	(0.004)	-0.016 ***	(0.003)	-0.022 ***	(0.005)
Cancer	0.052 ***	(0.008)	0.063 ***	(0.009)	0.061 ***	(0.009)	0.036 ***	(0.006)	0.048 ***	(0.009)
Poor SRH	0.017 ***	(0.003)	0.006	(0.004)	0.013 ***	(0.004)	0.016 ***	(0.003)	0.018 ***	(0.004)
ADL problem	-0.047 ***	(0.005)	-0.043 ***	(0.006)	-0.049 ***	(0.005)	-0.036 ***	(0.004)	-0.046 ***	(0.006)
Smoking	0.001	(0.002)	-0.038 ***	(0.005)	-0.012 **	(0.004)	0.002	(0.002)	-0.004	(0.004)
Caregiving	-0.020 ***	(0.004)	-0.024 ***	(0.005)	-0.023 ***	(0.004)	-0.018 ***	(0.004)	-0.026 ***	(0.005)
Married	-0.019 ***	(0.004)	0.009	(0.013)	-0.025 ***	(0.007)	-0.018 ***	(0.004)	-0.028 ***	(0.007)
Junior high school	0.006 +	(0.003)	0.000 ***	(omitted)	0.018 *	(0.007)	0.006 +	(0.003)	0.008	(0.006)
College or above	-0.011 ***	(0.003)	0.000 ***	(omitted)	-0.026 ***	(0.006)	-0.012 ***	(0.003)	-0.023 ***	(0.005)
Age	-0.001	(0.007)	-0.067 ***	(0.008)	-0.074 ***	(0.007)	0.017 *	(0.007)	0.050 **	(0.016)
$Age^2/100$	0.002	(0.006)	0.068 ***	(0.006)	0.071 ***	(0.006)	-0.012 *	(0.006)	-0.027 *	(0.013)

Note. 62,610 observations of 10,482 men.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.1$

Table 2: Estimated associations between ITAX and retirement/benefit claiming (updated)

	Pooled LPM		LPM with FE		LPM with RE		Pooled probit		Probit with RE	
	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	*dy/dx*	(SE)	*dy/dx*	(SE)
Retirement										
Men	0.161 ***	(0.010)	0.229 ***	(0.011)	0.192 ***	(0.010)	0.140 ***	(0.010)	0.174 ***	(0.014)
Women	0.119 ***	(0.011)	0.130 ***	(0.012)	0.122 ***	(0.011)	0.108 ***	(0.011)	0.121 ***	(0.013)
Beneficit claiming										
Men	0.209 ***	(0.013)	0.269 ***	(0.015)	0.209 ***	(0.013)	0.076 ***	(0.012)	0.103 ***	(0.014)
Women	0.609 ***	(0.014)	0.701 ***	(0.016)	0.617 ***	(0.014)	0.480 ***	(0.016)	0.546 ***	(0.018)

Figure 6: Actual and counterfactual ITAX during 2006–2018

(updated)

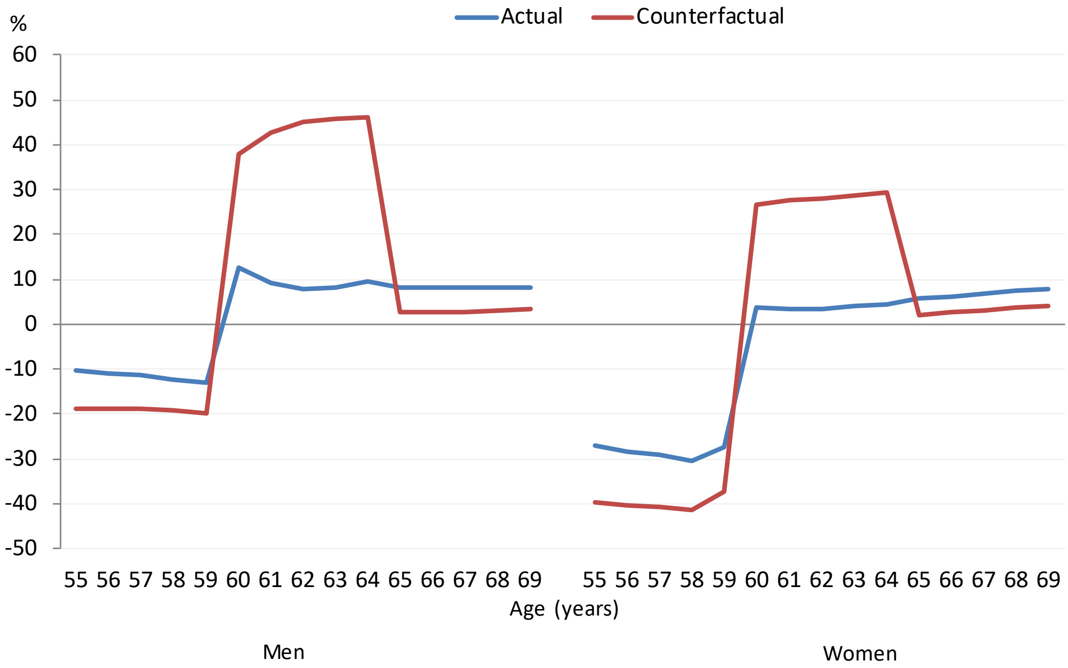


Figure 7: Actual and counterfactual SSW during 2006–2018 (updated)

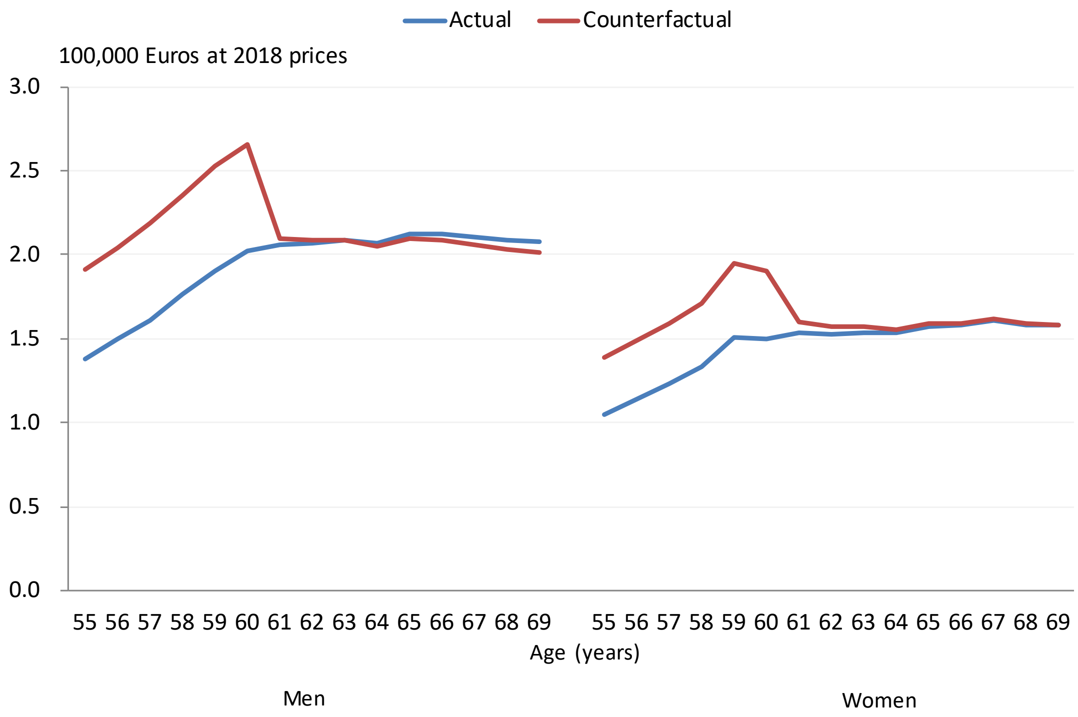


Figure 8: Actual and predicted probabilities of retirement at age 60 (updated)

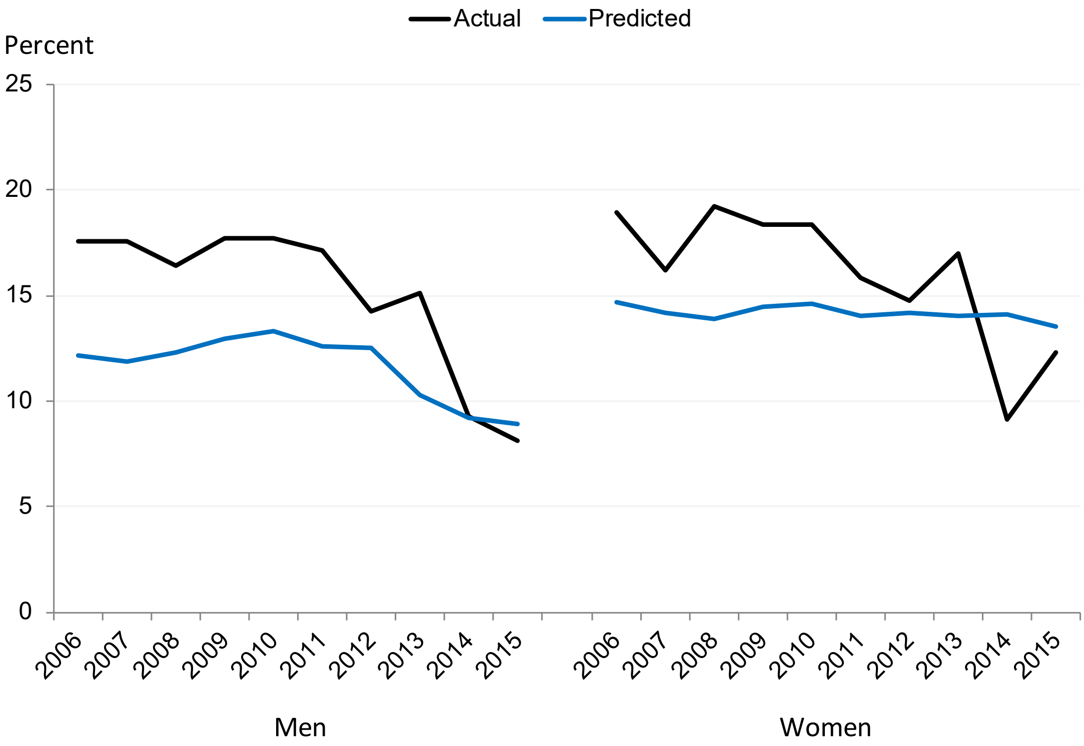
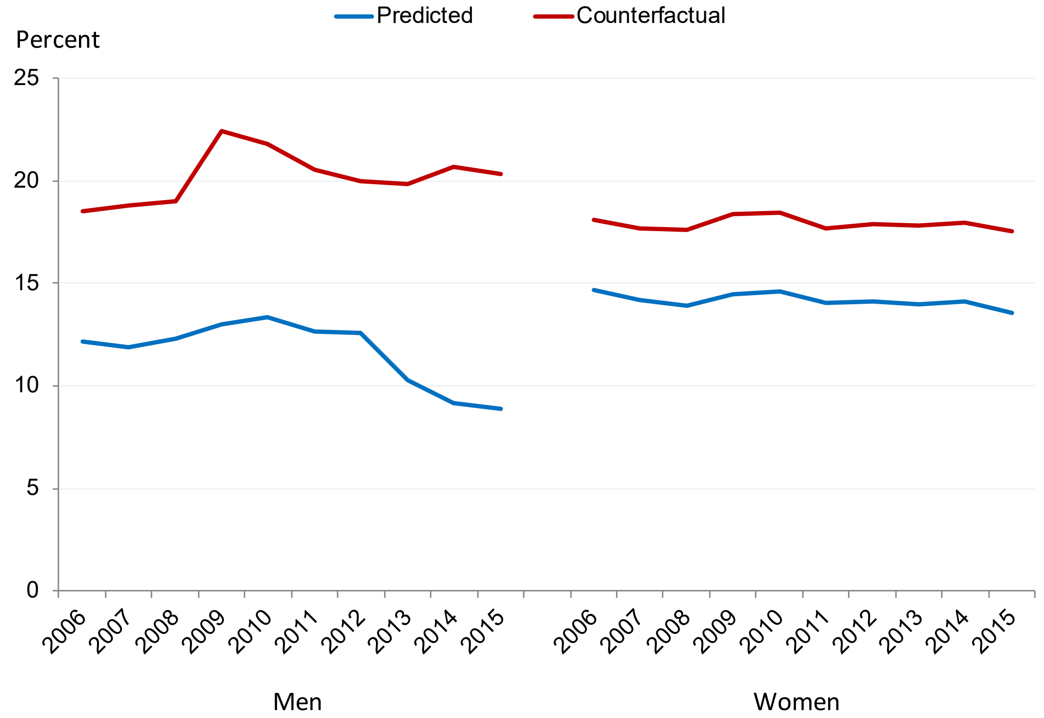


Figure 9: Predicted and counterfactual probabilities of retirement (updated)

Panel A. At age 60



Panel B. Cohort born in 1948

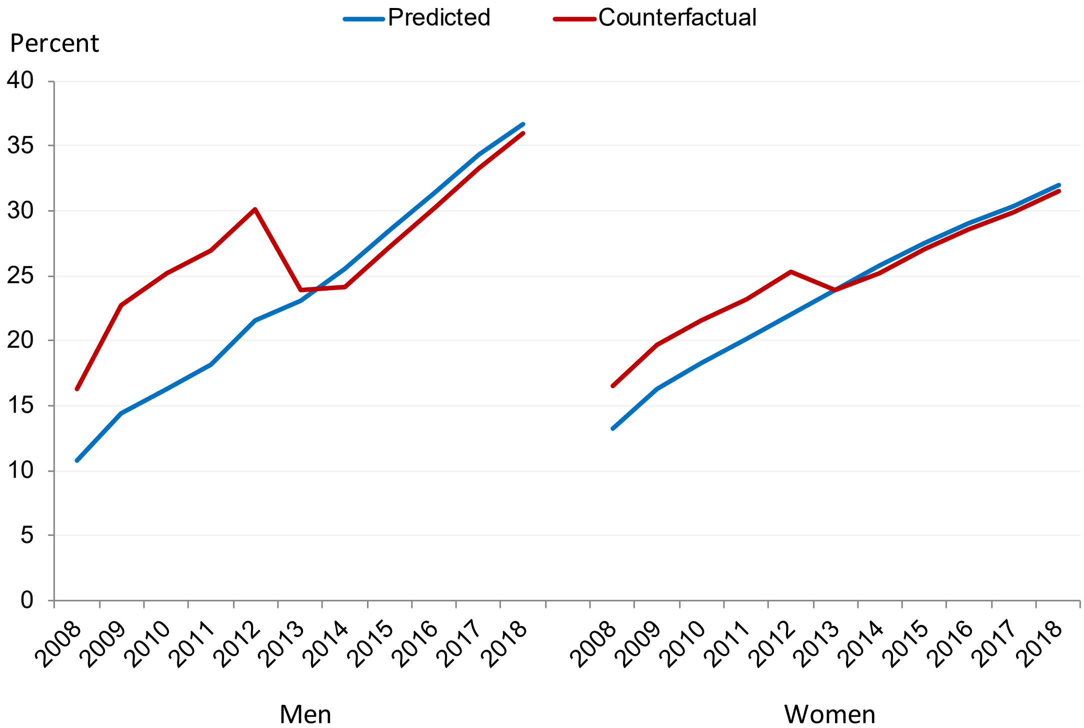
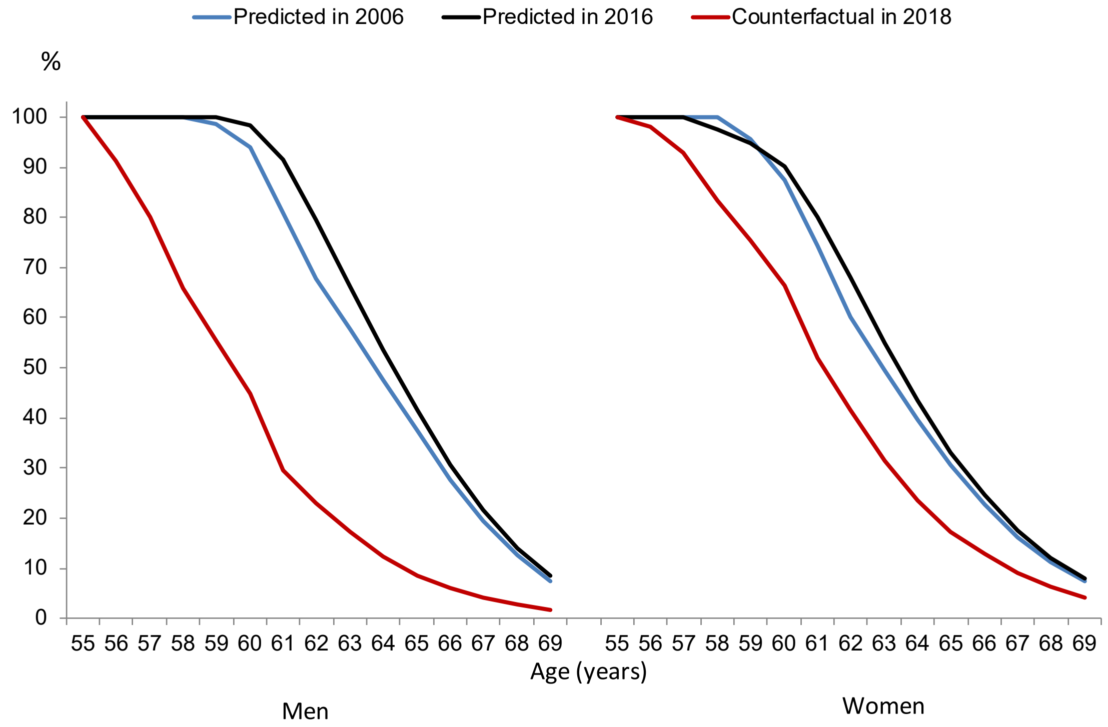


Figure 10: Employment survival curves: predicted vs. counterfactual (updated)

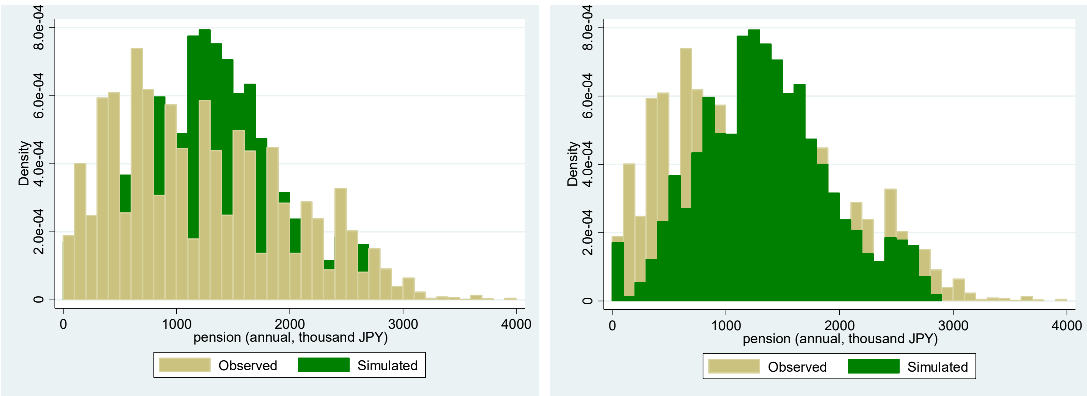


Appendix: Validation of the pension benefit calculator

This appendix confirms the validity of the pension benefit calculator employed in this study by comparing actual and projected social security benefits. For men, the distribution of the simulated pension benefits is on the right of the distribution of the actual benefits (the medium value was 1.14 million JPY for actual benefits and 1.33 million JPY for simulated ones). However, the simulated distribution failed to capture higher values (JPY ≥ 3 million). This was also the case for women. However, higher values were reasonably well predicted. Consequently, the bias, defined as the prediction error divided by the average, is upwardly biased for both genders, as shown in Figure A2.

Figure A1: Distribution of observed and simulated pension benefits

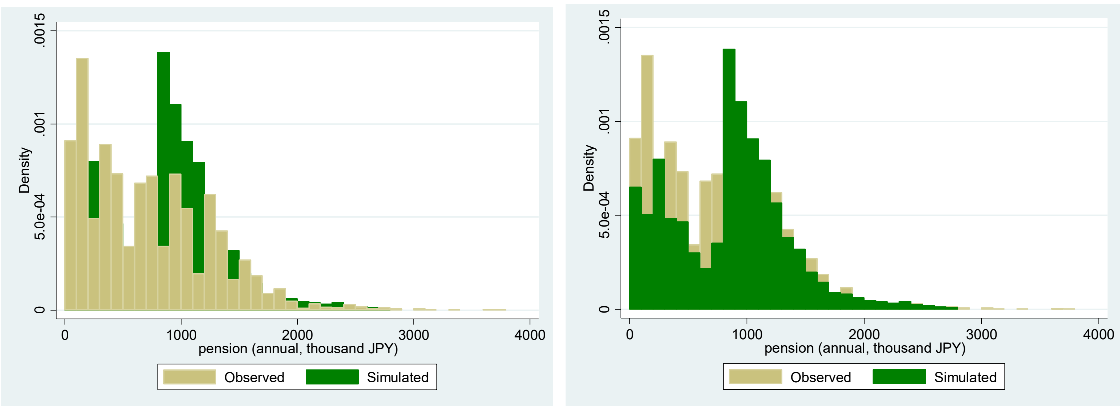
Panel A: Men



Observed: Mean 1212, Medium 1080, SD 758

Simulated: Mean 1329, Medium 1291, SD 622

Panel B: Women



Observed: Mean 700, Medium 600, SD 509

Simulated: Mean 853, Medium 892, SD 476

Figure A2: Estimation errors of pension benefits

Panel A: Men

Panel B: Women