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Revisiting the Labor Supply Effect of Social Security Earnings Test: New evidence from its elimination and reinstatement in Japan*

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Abstract

We explore the labor supply effect of the social security earnings test in Japan on those aged 65–69 years through a combined examination of the elimination of the earnings test in 1985 and its reinstatement in 2002. We present evidence showing that the effects of changes in the earnings test on the labor supply of the elderly are not symmetric, controlling for changes in the attributes of workers and firms. The repeal of the earnings test in 1985 did affect the earnings distribution of the elderly (especially for men), while its reinstatement in 2002 did not alter the earnings distribution.

Keywords: Social security earnings test; *zaishoku rorei nenkin seido*,
Labor supply of the elderly; Japan; Wage distribution;
DiNardo-Fortin-Lemieux decomposition
JEL classification: H55, J26

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1. Introduction

For a country with a rapidly aging population and a historically low birth rate, a decline in the labor force is a major challenge since it will lead to a sharp increase in social security benefits for retired persons and increase the burden on the younger generation. As is often debated in the policy arena, a natural solution for mitigating the negative impacts of the declining labor force is to encourage the elderly to remain in the labor force for longer periods.

The impact of a rapid pace of aging on social security programs is a common concern for Japan and other developed countries. Undoubtedly, the retirement age in Japan is the highest among OECD countries, a fact often considered to be one of the most distinctive features of the Japanese labor market. Indeed, the effective retirement age of Japanese workers during the period 2006–2011 was 69.3 years for males and 66.7 years for females (OECD, 2012), higher than the corresponding ages for all European countries and the US.[1] However, the current pace of aging in Japan is much more rapid than it is in other developed countries. This calls for major labor policy reforms to support the elderly. The proportion of individuals aged 65 years is expected to reach 25% in 2013, and the pace of aging is expected to accelerate further (National Institute of Population and Social Security Research 2012). In the projection, the share of the elderly is projected to exceed 33.4% in 2035 and reach 39.9% in 2060. The extremely rapid pace of aging in Japan is likely to offset the positive effects of late retirement on overall labor force participation.

One popular view in policy debates on labor force participation of the elderly in Japan is that the social security earnings test (*Zaishoku Rorei Nenkin* scheme) is a major disincentive to the elderly to engage in paid work because wages are heavily taxed. This scheme is part of *Kosei Nenkin*, or the Employees' Pension Insurance (EPI) program, which

[1] The effective retirement age is defined as a weighted average of net withdrawals from the labor market at different ages over a five-year period for workers initially aged 40 and above (OECD, 2008).

is the core public pension scheme and covers approximately half of the pensioners in Japan. The earnings test leads to reduction of social security benefits to EPI pensioners whose labor income, or labor income plus a portion of pension income (hereinafter called "earnings"), exceeds a certain threshold. It is commonly believed that, as in the US, the earnings test penalizes the elderly and is a disincentive to supply labor (Gruber and Orszag, 2003).

This study provides new evidence on the labor supply effect of the social security earnings test on workers aged 65–69 years, with a focus on two major episodes since the 1980s—the elimination of the earnings test in 1985 and its reinstatement in 2002. We focus on workers aged 65–69 years for two reasons. First, they are becoming the target age group for measures to enhance labor force participation in Japan because they have a lower participation rate than the 60–64 years age group.[2] In Japan, the mandatory retirement age is effectively equivalent to the age of eligibility for public pension benefits in Japan, which is now in transition from 60 to 65 by 2013[3]. Second and more importantly, the earnings test rule is simple for workers aged 65–69 with a single threshold and rate of benefit reduction, and detection of labor supply effect, if any, on the elderly relatively easy. Further, the test has a clear history: it was abolished in 1985 and reinstated in 2002. For workers aged 60–64 years, on the other hand, the earnings test has multiple thresholds, and reduction rates differ across earning ranges. In addition, there have been periodic test revisions, as well as other reforms with regard to public pension eligibility age and mandatory retirement age, for this age group. These revisions made it difficult to precisely examine the labor supply effect of the earnings test.

[2] In 2010, the labor force participation rates for males were 92.8% for workers aged 55–59 years, 76.0% for those aged 60–64, and 48.9% for those aged 65–69 years; the corresponding rates for females were 63.3%, 45.7% , and 27.4%, respectively. A detailed description of the long-term development of the elderly labor market in Japan since 1980s is provided by Shimizutani (2011). Shimizutani (2012) examined the sensitivity of the labor supply decision of workers aged between 60 and 64 with respect to the earnings test and showed a discouraging effect on working in a large proportion of these workers in Japan.

[3] Shimizutani and Yokoyama (2009) showed that the average tenure for Japanese workers has increased since the 1990s due to the extension of mandatory retirement from 55 to 60 years.

We view the reforms as clear-cut natural experiments to examine the effects of revisions to earnings test rules on labor supply of the elderly. This study was facilitated by a large cross-sectional micro-level data set from *Konenreisha Shugyo Jittai Chosa,* or the Survey on Employment of the Elderly (SEE), compiled by the Japanese government, with information on both employment status and social security eligibility. This study provides new evidence on the labor supply effect of the social security earnings tests in Japan, and thus adds a new dimension to the extensive literature on the subject. First, and most important, we examine two major and contrasting episodes, the elimination and reinstatement of the earnings test, whose effect on work incentives to the elderly may be asymmetric. As with many countries, Japan abolished its social security earnings test in the mid-1980s, but, unlike other countries, reintroduced a tougher version of the test in 2002, which offers an interesting potential "double treatment." To our knowledge, however, there have been few studies that deal with both repeal and reinstatement episodes, and a combined examination of these reforms is unique to this paper.

Second, we employ the methodology of DiNardo, Fortin, and Lemieux (1996) to examine changes in earnings distributions before and after the reforms. One popular approach to examining the labor supply effect of revisions to the earnings test rules is to employ a bunch analysis (analysis of clustering), frequently used in the literature (e.g., Friedberg, 2000; Haider and Loughran, 2008). Unlike previous empirical studies, the time interval of our data set is 4 or 5 years, and we are unable to employ a straightforward application of bunch analysis. Instead, we examine the change in overall earnings distributions using the methodology of DiNardo, Fortin, and Lemieux (1996), which permits us to decompose changes in the earnings distributions into two parts: change in the distributions of worker and firm attributes and change in the effect of the attributes on earnings. We compare actual distributions before the reforms with the counterfactual distribution after the reforms,

controlling for changes in worker and firm attributes.

Third, we endeavor to extract lessons from the Japanese experience, which may be useful for other countries. If we find that rule revisions lead to a large labor supply effect on work incentives, policy makers worldwide can take a cue from this study and further increase even high levels of elderly labor force participation by reducing disincentives. However, if this study does not reveal such results, we may conclude that the elderly Japanese worker's decision to remain in the workforce is less likely due to monetary benefits than to other factors that are likely responsible for the late retirement age.

Here, we present a preview of our empirical results. We show, after controlling for changes in worker and firm attributes, that earnings test revisions seems not to cause symmetric effects on the labor supply of the elderly. The repeal of the earnings test in 1985 did affect the earnings distribution of the elderly (especially for male), whereas the reinstatement of the test in 2002 did not alter the earnings distribution. To obtain these results, this paper proceeds as follows: Section 2 overviews previous research on the labor supply effect of the social security earnings test. Section 3 briefly describes the revisions to earnings test rules in Japan. Section 4 describes the data set used in this study. Section 5 presents the results of bunch analysis using histograms and decomposition analysis of the earnings distribution before and after the elimination as well as reinstatement of the earnings test. Our findings are summarized in Section 6.

2. Previous studies

The results of social security earnings tests are often analyzed according to a labor supply framework found in standard textbooks (see Borjas (2005) for a graphical presentation), with a kinked budget constraint, corresponding to the threshold (Friedberg, 2000). Contrary to the prevailing view, economic theory shows that an *a priori* prediction of

the sign and magnitude of an earnings test rule's effect on labor supply is impossible; the net effect depends on whether the substitution or income effect dominates, which is an issue that must be examined empirically (Borjas, 2005). As summarized by Gruber and Orszag (2003), two branches of studies have examined labor supply effects. One approach relates to bunch (cluster) analyses employed to examine earnings concentration at the test threshold. The other employs sophisticated econometric analyses of the test's aggregate impact on conditional hours worked under the kinked budget constraint, which requires a variety of structural assumptions.

Although a large number of studies have been carried out, we focus only on some important studies published since around 2000. In the US, many early studies found that the earnings test had only an insignificant effect on labor supply of the elderly.[4] Gruber and Orszag (2003) used changes in the earnings test format over the past three decades to identify the effects of exogenous test rule revisions on labor supply and benefits received. By performing both graphical analyses of breaks in labor supply trends and reduced-form regression estimates based on a difference-in-difference approach, they found no robust influence on male workers' labor supply decisions but some evidence suggestive of an influence on female workers.

However, more recent studies have found that the earnings test has a sizable labor supply effect. Friedberg (2000) performed both bunch analysis and structural model estimation of the aggregate impact of the earnings test on elderly workers as a result of the kinked budget constraint and found that workers had responded significantly to three past changes in earnings test rules. She found the earnings distribution clearly concentrated just below the threshold and confirmed that the bunching had shifted in response to the revision of test rules. Further, structural estimation revealed that abolition of earnings tests

[4] For example, Burtless and Moffitt (1985) as well as Gustman and Steinmeier (1985) performed simulations and suggested that elimination of earnings tests would only have minor effects on labor supply.

significantly affected the number of working hours for workers aged 65 years and more. Haider and Loughran (2008) also found a consistent and significant response to the earnings test, particularly for younger men, and insisted that the survey data results are obfuscated by measurement errors and labor market rigidities. Engelhardt and Kumar (2009) also found that much of the labor supply response of the lesser educated males to the repeal of the earnings test in 2000 who found the actuarial adjustment built in the earnings test disadvantageous because of high mortality risk, higher rates of pure time preference or liquidity constraints.

Several studies have been carried out in other countries as well; major studies outside the US have found the earnings test has a significant labor supply effect. For example, Disney and Smith (2002) and Baker and Benjamin (1999) have examined the effects of the abolition of earnings tests in the UK and Canada, respectively; both studies found that removal of the test increased the employment and earnings of affected male workers. A number of studies on the social security earnings test's labor supply effect have been conducted in Japan, too, up until around 2000, with most studies finding significant effects. In contrast, Abe (1998) employed a difference-in-difference method to estimate the labor supply effect of the 1989 reforms on workers aged 60–64 years and found that the revised rules had little effect on their labor supply. Although extensive research work has been carried out in the US, Canada, Europe, and Japan, no comparative studies on the labor supply effects of the earnings test repeal and reinstatement episodes have been conducted, to our knowledge. Our aim in undertaking this study is to fill this research gap and, thus, contribute to the literature on the subject.

3. The social security earnings test and relevant policies in Japan

This section overviews the revisions to the social security earnings test rules, focusing on revisions since the 1980s affecting workers aged 65–69 years. The earnings test program,

which is known as *Zaishoku Rorei Nenkin*, was introduced in Japan for the first time in 1965 and has been revised every 4–6 years. We should note that earnings test rules apply only to beneficiaries of the EPI program, one among three public pension programs, not to those of the NPI or MAI program. The EPI program is applicable to employees in the private sector and includes 48% of all pensioners in Japan.[5]

In this paper, we confine our interest to EPI pensioners aged 65–69 years because revisions to earnings test rules for workers in this age group are clear-cut and unambiguous. The earnings test for these workers was eliminated in 1985 and reinstated in 2002. From 1980 through 1984, workers aged 65–69 years lost social security benefits of 1 yen for every 5 yen of monthly earnings above 156,000 yen (about $650, by the average nominal exchange rate in 1985) as a result of earnings tests. This translated to a marginal tax rate of 20% on labor income above the threshold of 156,000 yen.[6]

In 1985, the earnings test rule for workers aged 65–69 was eliminated, while reduced rates continued to be applied to workers aged 60–64 years. The test rule was revised again in 1989, 1992, and 1996 for workers aged 60–64 years, but no tests were administered to workers aged 65–69 years between 1985 and 2002. In 2002, the earnings test for workers aged 65–69 years was reinstated. According to the Ministry of Labor, Health and Welfare (MLHW, 2002), reinstatement was intended to improve the fiscal balances of the social security programs, and the labor supply effect was largely ignored. From 2002, 1 yen of social security benefits was withheld for every 2 yen earned if the sum of monthly income and second-tier social security benefits was above 370,000 yen (about $3,000, by the average

[5] The source of this section is Kemporen's *Social Security Yearbook* (various years). The pensioners under the other two types of public pension are exempted from earnings tests—the National Pension Insurance (NPI; *Kokumin Nenkin*) for self-employed persons (45.5%) and Mutual Aid Insurance (*Kyosai Nenkin*) for employees in the public sector and private schools (6.5%). The percentage shares of EPI, NPI, and MAI pensioners are from Komamura (2007).

[6] In Japan the earnings test is based on monthly labor income, not annual income as in the US. The effective tax rate was higher for workers aged 60–64 years—20% on monthly income below 95,000 yen, 50% on 95,000–130,000 yen, 80% on 130,000–155,000 yen, and 100% on the income above 155,000 yen.

nominal exchange rate in 2002). Hence, workers who earned more than 370,000 yen from labor income and pension benefits faced a marginal tax rate of 50%.

It must be noted that the sum of labor income and second-tier benefits, not just labor income, has been tested since 2002.[7] The EPI program benefits comprise a flat-rate component (first tier), similar to NPI, and a wage-proportional component (second tier). For workers aged 65–69 years, the first-tier pension benefits are not tested, but for workers aged 60–64 years they are. In 2004, the rules were revised slightly to treat bonuses as labor income, and the reduction rate was changed correspondingly; however, there has been virtually no change to the rule since 2002.

As stated in Section 4, the time interval between the surveys on which this study is based is quite long, and some important policy changes affecting labor supply behavior of those aged 65–69 years, other than earnings test revisions, could possibly have occurred. Such shifts in policy may include changes of the mandatory retirement age or the eligible age for public pension programs. However, such changes may have no direct effect on workers aged 65–69 years.[8]

[7] In 2002, the effective rule was revised for workers aged 60–64 years also. By this reform, the threshold for the 60% rate was increased from 340,000 yen to 370,000 yen. In 2007, the earnings test was enforced on workers aged 70 years and more, too.

[8] Between 1973 and 2000, the male eligibility age for public pension programs remained unchanged at 60 years. An increase of 1 year in the male eligibility age has been scheduled every 3 years, from 2001 for the flat-rate component and 2013 for the wage-proportional component. For female beneficiaries, the eligibility age was 55 years until 1985 and then was gradually raised until it was fixed at 60 years in 1999. It is set to increase with the male retirement age, albeit with a 5-year lag: from 2006 for the flat-rate benefit and 2018 for the wage-proportional benefit. Extensions of the mandatory retirement age have been allowed in accordance with social security reforms. In 1973, the mandatory retirement age was extended, and a subsidy was introduced to compensate employers who provided extensions up to 60 years. In 1986, the mandatory retirement age was extended to 60 years or above as a legal obligation. In 1994, a new type of wage subsidy was introduced as compensation for the reduced wages of older workers who continue to be employed after the mandatory retirement age, and, in 2004, firms were required to gradually raise the mandatory retirement age to 65 years or above by 2013 or to completely abolish it (Oshio, Oishi and Shimizutani, 2011; Oshio, Shimizutani, and Oishi, 2010). While changes in eligibility age for public pension programs and mandatory retirement age may affect labor supply behavior of workers aged 60–64 years, especially those relatively younger, it is less likely that the reforms directly altered labor supply decisions of those aged 65–69 years.

4. Description of data

This study uses micro-level data from the SEE, compiled by the MLHW. The survey was conducted in 1983, 1988, 1992, 1996, 2000, and 2004. We used data for the years 1983, 1988, 2000, and 2004 to examine the effects of the 1985 abolition and the 2002 reinstatement of the earnings test for those aged 65 years and older. The individuals in the sample were aged between 55 and 69 years and were randomly chosen from all regions of Japan. Workers aged 65–69 years comprised one-third of the total number of individuals in the samples: 7,186 in 1983; 6,702 in 1988; 6,060 in 2000; and 5,260 in 2004.[9]

The SEE is a cross-sectional study, and the data set is the only large-scale compilation by the Japanese government that provides detailed information on both employment status (including labor income) and social security eligibility and benefits. This information is indispensable when examining the labor supply effects of the earnings test.[10] The SEE also contains a variety of variables, including the demographics and employment status of individuals (age, sex, health status, description of job, monthly labor and non-labor income, working days per week, and hours worked per day, etc.) and the characteristics of current and previous firms (e.g., firm size). At the same time, when analyzing the results, we need to pay attention to the limitation the SEE has in terms of representativeness.[11]

First, we must identify those eligible for EPI benefits and confine our sample to them.

[9] The total sample size was 26,954 in the 1983 survey; 26,290 in 1988; 19,595 in 2000; and 17,853 in 2004.

[10] Other large-scale data sets on employment collected by the government are the *Labor Force Survey* (Rodo Ryoku Chosa) and the *Basic Survey on Employment Structure* (Shugyo Kozo Kihon Chosa), based on a large number of observations randomly selected from all regions of Japan. Even if we confine the sample to the elderly, their sample sizes are quite large; however, there is no information on pension eligibility, which is indispensable to this study.

[11] There are some complications with the questionnaire. Public pensions are not comparable year on year, and the questionnaire was distributed to respondents via public employment security offices in the past. As a result, there seems to be a gap between the SEE data and other official/administrative data. For example, the employment rates (the share of people with a job in a total population) for the age groups 55–59, 60–64, and 65–69 are comparable to, but slightly higher than, those in the *Labor Force Survey*. With respect to pension benefits, we are not able to compare the SEE dataset and the administrative dataset according to the proportion of those who are *receiving* public pensions, because the administrative dataset lacks age information. When we compare the administrative data and the 2004 SEE with respect to the proportion of persons who are *eligible* for the EPI, the share is higher in the SEE data.

This is because the earnings test is only applicable to EPI pensioners. The 1983, 1988, and 2000 surveys asked respondents whether they actually receive EPI benefits. However, respondents in the 2004 survey were asked about pension benefits actually received, regardless of the type of pension, but not about private pensions. In addition, the 1983 and 2004 surveys asked respondents whether they were eligible for EPI benefits, allowing EPI pensioners to be identified directly. However, it is difficult to precisely identify who were EPI pensioners in 1988 and 2000 based on the information in the data set, so we assume that all individuals who actually receive benefits from EPI are eligible for EPI benefits. While it is possible that this definition excludes those who are eligible for EPI benefits, but do not currently receive any EPI benefits, we believe the number of such cases would not be significant for those aged 65 or over. Therefore, this definition can be considered to be reasonable.[12] While comparing earnings distributions in 1983 and 1988, we employ the same definition of EPI eligibility for both years. However, for the 2004 survey, we use eligibility information in the data set, as this survey does not identify EPI or other benefits.

Further, we exclude a small number of individuals whose monthly labor income or non-labor income in the month prior to the surveys exceeded a million yen, because these are exceptional cases. The 1983 and 1988 SEEs asked respondents to report the labor income earned in May (as an integer, in units of 10,000 yen), just one month before the survey, conducted in June. Similarly, the SEEs of 2000 and 2004, performed in October, looked at the September income. The time interval is short, and the information on labor income is reliable. Moreover, we confine our sample to individuals who claimed to be healthy, because those with an adverse health status are less likely to work at full capacity and to be subjected to the

[12] According to the administrative data, the proportion of EPI pensioners who are indeed receiving EPI benefits was close to 99% in the 1980s (the proportion is 98.2% for those aged 65–69 in the SEE sample in 1983, the year in which both eligibility and receipt of benefits are available). However, this figure did decline to 94% by 2004. The figures available in the administrative data are computed for all age ranges, and the proportion is larger for those aged 65–69, who we examine in this paper. Therefore, this justifies our assumption.

earnings test. The sample sizes after these adjustments are 651 (500 males and 151 females) in 1983, 760 (533 males and 227 females) in 1988, 986 (708 males and 278 females) in 2000, and 890 (656 males and 234 females) in 2004.

The summary statistics of variables used as attributes of workers and firms in the decomposition analysis are reported in Table 1. The variables include dummy variables for each age between 65 and 69, type of prime job (9 types), firm size of prime job (5 categories), working days per week, and working hours per day.[13] If a person works for 30 hours or more per week, he or she is classified as a fulltime worker. We include the fulltime dummy variable because a part-time worker (less than 30 hours per week) is not insured in the EPI program and is not covered by the earnings test program. Note that the sum of the proportions of job type and firm size is not 100%. This is because the prime job information is only available if a person was employed at the time of mandatory retirement (the 1983 and 2000 surveys) or at age 55 (the 1988 and 2004 surveys).

5. Bunch and decomposition analysis of earnings distribution

We confine our sample to individuals who actually worked in the month prior to the survey months, on the assumption that the earnings test did not affect the work decision. We perform two types of analysis. First, we perform a bunch analysis by comparing histograms of earnings before and after the elimination (1983 and 1988) and reinstatement (2000 and 2004) of the earnings test. Second, we perform a decomposition analysis to explore what

[13] Unfortunately, the information on educational background is available only in the 1983 and 2000 surveys. We control for the characteristics of prime job, not the current job. Since a worker wanting lower earnings may choose a low-paying job, changes in job types may be part of the effect of the earnings test. Thus, we define “prime job” (the main job during a person's lifetime) as the job held at mandatory retirement, dispatch before mandatory retirement (1983 and 2000 surveys), or a job at age 55 (1988 and 2004 surveys). The transition from a prime job to a second job was intensively examined by Shimizutani and Oshio (2010). The classifications of type of job vary in each survey, so we adjusted them to make them comparable between 1983 and 1998 and between 2000 and 2004. The sample in this study is confined to those who are eligible for EPI benefits, regardless of the current job status (employed or self-employed, either full-time or part-time).

accounted for the change in income distributions before and after earnings test reforms.

One might wonder why a difference-in-difference approach is not employed. There are two possible strategies in this approach. One alternative is to use workers aged 60–64 years as a control group. However, this would not be appropriate because all changes in earnings test rules for workers aged 65–69 years were accompanied by similar changes for the 60–64 years age group, but the reverse was not true. While it is a good idea to use individuals aged 70 years and above as a control group, our sample unfortunately consists only of persons aged 55 to 69 years. The second alternative is to use workers in non-EPI programs (i.e., NPI and MAI pensioners), who are exempt from the earnings test. However, NPI pensioners are self-employed, and employment trends for the self-employed are likely to be different to those for wage earners. A better control group would be a sample of MAI pensioners, consisting of government officials, but their number is not significant.[14] Since a control group is difficult to find, we do not employ a difference-in-difference approach in this study.

Figure 1 compares monthly labor income distributions in 1983 and 1988. The values on the *x*-axis range from 0 to 1,000,000 yen (100 units of 10,000 yen), and each cell represents a 10,000-yen bracket. If social security earnings tests constrain labor supply, we would observe a bunch below the threshold (156,000 yen, marked “15.6” in the figure) in 1983, but not in 1988 after the earnings test was eliminated.

First, we observe the concentration in the 150,000-yen cell in 1983, just below 156,000 yen, the threshold prior to 1985. The frequency for the 150,000-yen cell in 1983 is 9.6% and 8.9% in 1988 for males. The frequency for the same cell for females is 2.0% in 1983 and 3.7% in 1988. Thus, the share “just below” the threshold prior to the elimination of the earnings test, measured in the 150,000-yen cell, declined only slightly for males, but increased for females. However, if we extend the share “below the threshold” to a broader

[14] Moreover, the 2004 survey does not allow us to identify an MAI pensioner.

range of cells, between 100,000 and 150,000 yen, the share declines from 34.0% to 28.0% (6 percentage points) for males and from 22.5% to 19.6% (2.9 percentage points) for females, over a five-year period. These observations indicate that the bunch observed below the threshold decreased in response to the elimination of the earnings test in 1985.

Figure 2 is a histogram of earnings (monthly labor income and the full second-tier benefit) in 2000 and 2004. If the earnings test creates a bunch, we would not see it below the threshold (370,000 yen, marked "37" in the figure) in 2000, but would see it in 2004, after the earnings test was reinstated in 2002. The full second-tier benefits for each individual in 2004 are calculated using the pension formula.[15] Because the second-tier benefits are not necessarily an integer measured in a 10,000 yen bracket, we take a broader range as being "below the threshold" to identify a bunch. The share of individuals whose monthly labor income and full second-tier benefit are between 300,000 yen and 370,000 yen declined between 2000 and 2004; from 15.1% to 5.4% for males and from 12.0% to 4.3% for females. These observations indicate that, contrary to the prediction of the bunch analysis, the share of individuals below the threshold declined after the earnings test was reinstated. However, the cumulative frequency below 370,000 yen increased significantly; from 79.4% in 2000 to 94.2% in 2004 for males, and from 75.9% in 2000 to 95.3% in 2004 for females.

In brief, the share of individuals whose earnings were below the threshold declined between 1983 and 1988 for both sexes after the elimination of the earnings test in 1985. This

[15] The methodology of the calculation is summarized as follows. P_F is denoted as the full second-tier pension benefit, P_A as the actual second-tier pension benefit, and W as labor income, all of which are on a monthly basis. In the 2004 survey, the data provide the sum of public pensions (first and second tiers) and employer-provided pension programs (third tier). P_A is computed by subtracting the full basic pension benefits (66,208 yen per month in 2004) from the sum of the first- and second-tier benefits. Under the earnings test, a person eligible for the full benefit is entitled to receive P_F when W is zero and $P_F + W$ when the sum of P_F and W is less than 370,000 yen ($P_A = P_F$). When the sum of P_F and W exceeds 370,000 yen, a marginal tax of 50% is applied to the additional benefit; i.e., P_A is calculated as $18{,}500 + 0.5P_F - 0.5W$. What we know in the data set is W and P_A, and P_F is computed as $W + 2 \times (P_A - 18{,}500)$. Finally, when monthly labor income exceeds the sum of the full second-tier pension benefits, 370,000 yen, second-tier pension benefits are reduced to zero. Because we assume that all the persons are eligible for full benefits of the first tier, a limited number of individuals in the sample, who were excluded from the estimation, show a negative value for the sum of labor income and second-tier benefits. Moreover, we compute the second-tier benefit assuming no third-tier benefit.

change indicates that the earnings test abolition eliminated the bunch. However, the reverse was not true, as we do not observe any new bunch below the threshold in 2004 after the earnings test was reinstated in 2002, though the cumulative frequency under the threshold increased.

It may be tempting to conclude that the abolition of the earnings test in 1985 affected the labor supply of the elderly, but reinstatement in 2002 did not. However, it is possible that factors other than the revisions to the earnings test contributed to the change in the distributions between 1983 and 1988 and between 2000 and 2004. These other factors may have obscured the effect of the earnings test reforms. Moreover, we need to pay attention to the changes in business cycle conditions, particularly in the 1980s, during the bubble economy. The right shift of the distribution in 1988 may be as a result of the boom. However, such shifts are not peculiar to people close to the threshold, and would not determine whether there is a bunch just below the threshold.

To address this issue, we employ a DiNardo-Fortin-Lemieux decomposition (DiNardo, Fortin, and Lemieux, 1996; DiNardo, 2002). This is a semi-parametric approach and visually decomposes the change of earnings distributions into two parts: the change in the distributions of the attributes, including prime job characteristics, and the effect the attributes have on earnings distributions. First, we compare the actual earnings distribution in 1983 (before elimination) to the counterfactual distribution, defined as what the density of earnings would have been in 1988 (after elimination) if the attributes of workers and firms had remained at their 1983 levels. Second, we compare the actual earnings distribution in 2000 (before reinstatement) to the counterfactual distribution, in this case defined as what the density of earnings would have been in 2004 (after reinstatement) if the attributes of workers and firms had remained at their 2000 levels. In the analyses, the attributes kept fixed in the counterfactual distribution are the variables reported in Table 1, which indeed shows some

differences between 1983 and 1988 and between 2000 and 2004.

Our prediction is summarized as follows. It is unlikely that the change to the earnings test rule alters the attributes of workers and firms used in the analysis. Therefore, it is natural to assume that the effect of the earnings test reforms, if any, will be observable in the effect of the attributes of workers and firms on earnings, rather than in a change in those attributes. In other words, we use a shift-share decomposition analysis to test whether observed changes are attributable to changes in worker and firm characteristics, attributing the residual effect to the policy changes. However, if the counterfactual distribution overlaps the actual distribution prior to the reforms, the change in the distributions is caused by a change in the attributes, and not the effect of the attributes on earnings. In this case, the change to the earnings test is not responsible for the change in earnings distributions. The procedure is summarized in the appendix. This strategy can be justified, since there are no other major policies affecting labor supply decisions for people aged 65–69 years in each interval, as discussed in Section 3. In addition, it is not reasonable to assume that the return to each attribute substantially changed between the surveys. While we present our analyses using the distributions of the levels of earnings, the main findings are unchanged if we examine the distribution of the logarithm of earnings.

Figure 3 reports the actual distributions in 1983 and 1988, as well as the counterfactual distribution that assumes the attributes of workers and firms remained at their 1983 level. The upper panel of Figure 3 shows the results for males, and the lower panel shows the results for females. First, we compare the actual distributions in 1983 and 1988 for both males and females. For males, the peak around 100,000 yen declined and shifted to the left between 1983 and 1988, and the distribution in 1988 is flatter than in 1983. For females, both distributions largely overlap, though the height of the peak slightly increased in 1988. Second, for males, the counterfactual distribution shifted to the right relative to the actual distribution

in 1983. In addition, the density around 200,000 yen was higher in 1988 than in 1983, providing evidence of the positive effect of the elimination of the earnings test on the labor supply for males. For females, the counterfactual distribution largely overlaps the actual distribution in 1983, below the threshold. This implies that, if the attributes of workers and firms were unchanged between 1983 and 1988, the entire distribution would barely have changed. Those results show that the elimination of the earnings test in 1985 encouraged the labor supply of male workers, but that this was not the case for the female labor supply.

Figure 4 presents the actual distributions in 2000 and 2004, as well as the counterfactual distribution, in which we assume that the attributes of workers and firms had remained at their 2000 level. The upper panel of Figure 4 shows the results for males, and the lower panel shows the results for females. First, for males, the actual distribution of earnings was flatter in 2000 than in 2004. In addition, the peak shifted to the left and gained height. For females, the distribution mostly remained unchanged between 2000 and 2004. Second, for males, the density just below the threshold in the counterfactual distribution became less than the actual distribution in 2000, and the peak shifted to the left. This may suggest a negative effect of the reinstatement of the earnings test. For females, the peak of the counterfactual distribution also shifted to the left, but was located approximately 100,000 yen below that of the male distribution.[16]

In order to explore the mechanism of the change in the distribution between 2000 and 2004 further, we perform the same decomposition analyses. Here, we divide the sample into fulltime workers, whose earnings are tested, and part-time workers, whose earnings are not tested. The upper panel of Figure 5 shows the result for fulltime male workers, and the lower

[16] We acknowledge the limitations of our calculation of the full second-tier benefit from our data set. One strong assumption is that all the respondents are eligible for the full first-tier pension benefit, which underestimates the second-tier benefit. At the same time, we disregard the employer-provided pension benefit (third-tier) simply because we are not able to compute it from the data set, which overestimates second-tier benefits. In general, the amount of the employer-provided pension benefit is larger than that of the first-tier benefit. This implies that the actual second-tier benefit is smaller than our computed value and so the distribution would move to the left if we were to use precise data for the second-tier benefit.

panel shows the results for part-time male workers. On the one hand, we see that the peak of the actual distribution declined in 2004, and that the counterfactual distribution shifted to the left and lost height for fulltime male workers. On the other hand, while the peak of the counterfactual distribution gained height for part-time workers, the density below the threshold was largely unchanged. These results show that the counterfactual distribution's shift to the left and gain in height relative to the actual distribution in 2000 (see Figure 4) was affected by the part-time workers, who were not insured in the EPI program. If we focus on fulltime workers, whose earnings are tested, we do not see a new bunch below the threshold after the reinstatement of the earnings test. Thus, we find little evidence of a discouraging effect. In contrast, Figure 6 presents the results for females. The sample is again divided into fulltime and part-time workers. We again see that the left-shift of the counterfactual distribution relative to the actual distribution in 2000 was affected by part-time workers. In the case of fulltime workers, we do not see any bunches below the threshold.

What we observed in the decomposition analysis of the earnings distribution before and after the reforms is summarized as follows. We find evidence that the repeal of the earnings test in 1985 affected the earnings distribution of the male elderly, after controlling for changes in the attributes of workers and firms. This implies that the elimination of the earnings test rule did encourage the labor supply decision of elderly males, but that this was not the case for females. In contrast, we have little evidence that reinstating the test in 2002 altered the earnings distribution. This implies that the reintroduction of the earnings test in 2002 did not alter the labor supply of the elderly. Our findings show that the effect of the changes in the earnings test on the labor supply of the elderly may not be symmetric. This is because the elderly were encouraged to work after the elimination of the earnings test, which is consistent with most previous studies, but they were not discouraged after it was reinstated.

So far, we implicitly assume that the earnings test did not affect the decision to work.

However, in reality, job seekers often face a choice between working and not working at all. We believe that changes in the labor force participation (LFP) rate support our assumption. First, we consider the case of males. Between 1983 and 1988, the LFP rate declined from 74.9% to 71.1% (a reduction of 3.8%) for those aged 60–64, and from 57.4% to 54.5% (a reduction of 2.9%) for those aged 65–69. Between 2000 and 2004, the LFP rate declined from 72.6% to 70.7% (a reduction of 1.9%) for those aged 60–64, and from 51.1% to 45.6% (a reduction of 5.5%) for those aged 65–69. So the reduction in the LFP rate was smaller for those aged 65–69 than for those aged 60–64 when the earnings test for those aged 65 and over was abolished, but larger when the test was revived. Next, we consider the case of females. Between 1983 and 1988, the LFP rate declined from 39.6% to 38.6% (a reduction of 1.0%) for those aged 60–64, and from 27.4% to 26.5% (a reduction of 0.9%) for those aged 65–69. Between 2000 and 2004, the LFP rate increased from 39.5% to 39.7% for those aged 60–64, and decreased from 25.4% to 24.0% for those aged 65–69. This observation implies that the reduction in the LFP rate was larger for those aged 65–69 than it was for those aged 60–64 when the earnings test was reinstated.

Together with these patterns, one possible explanation for the asymmetry is the difference in the labor market conditions during each period. In the mid-1980s, when the earning test was abolished, the Japanese economy was in a boom and labor demand was very strong. In this period, the abolition of the earnings test pushed workers, including marginal workers aged 65 or over, to earn more. In contrast, in the first half of 2000s, the Japanese economy was under deflation. This is when the earning test was reinstated. At this time, the labor demand was weak, and most workers earned less than the threshold. Hence, earnings were less affected by the reintroduction of the earnings test, making its discouraging effect barely observable. These observations suggest that the effect of reform on the earnings test may be affected by business and labor conditions.

6. Concluding remarks

Recent policy reforms in Japan aim to encourage elderly workers to remain in the labor force for a longer period and to retire in subsequent years. The discouraging effects of the social security earnings tests have been debated in both academic and policy arenas. We use micro-level data from a nationwide survey on the employment of the elderly to examine the change in the labor supply effect, for those aged 65–69, before and after two major reforms of the social security earnings test in Japan: its elimination in 1985 and reinstatement in 2002. Our analysis of those unique episodes provides some important findings. First, we find evidence that eliminating the earnings test in 1985 affected the labor supply decision of the elderly, especially for males. Second, we find little evidence that reinstating the test in 2002 affected the labor supply of the elderly. What is unique to this study is the finding that the effects of the repeal and reinstatement of the earnings test were not symmetric, and were affected by business and labor conditions.

Lastly, a further study must examine, in more detail, the factors that account for the asymmetric effect of the repeal and reinstatement of the social security earnings test on the labor supply of the elderly. We have suggested that economic conditions and general demand for labor may affect the labor supply effect of the earnings test. Other important factors that affect the labor supply decision include labor market rigidity, health status, family relationships, and the labor-leisure choice. This additional study will allow us to extract policy implications to motivate persons aged 65 and above to supply labor.

Appendix

Using a comparison of the 1983 and 1988 distributions as an example, we briefly describe the procedure of a DiNardo-Fortin-Lemieux decomposition. The earnings distributions in 1983 and in 1988 are written as

$$f^{1983}(Y) = \int f^{1983}(Y \mid X)h(X \mid t = 1983)dX,$$

$$f^{2003}(Y) = \int f^{2003}(Y \mid X)h(X \mid t = 2003)dX,$$

respectively, where $f^{1983}(Y \mid X)$ is the mechanism of the earnings determination in 1983 that maps the attributes of workers and firms X to the earnings distribution Y and $f^{1988}(Y \mid X)$ is the earnings determination in 1988. Moreover, what the earnings distribution would be in 1988 if the distribution of X remains unchanged since 1983 is written as

$$f_{1983}^{1988}(Y) = \int f^{1988}(Y \mid X)h(X \mid t = 1983)dX.$$

The DiNardo-Fortin-Lemieux approach employs a reweighting method to estimate the counterfactual distribution. The counterfactual distribution can be rewritten as

$$f_{1983}^{1988}(Y) = \int f^{1988}(Y \mid X)h(X \mid t = 1983)dX = \int \omega f^{1988}(Y \mid X)h(X \mid t = 1988)dX,$$

where $\omega \equiv \dfrac{h(X \mid t = 1983)}{h(X \mid t = 1988)}$. The Bayesian rule produces $\omega = \dfrac{P(t = 1983 \mid X)}{P(t = 1988 \mid X)} \dfrac{P(t = 1988)}{P(t = 1983)}$, where the conditional probabilities $P(t = 1983 \mid X)$ and $P(t = 1988 \mid X)$ are propensity scores for the specific observations in 1983 and 1988, respectively, conditioned on X, which are calculated by the logit model in this analysis (the estimation results of the logit model are available on request). The terms $P(t = 1983)$ and $P(t = 1988)$ are based on the proportion of the observations pertaining to 1983 and 1988 in the pooled data, respectively. The counterfactual distribution is calculated from the kernel density estimation, using calculated weight ω. The kernel density is also useful to adjust for reporting errors in this study. To make the results comparable with those from the histogram analysis, we take the level of

earnings as the dependent variable; however, the results are unchanged when we analyze the distribution of the logarithm of earnings.

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Figure 1 Histogram of the wage distribution in 1983 and 1988

Figure 2 Histogram of the distribution of wage plus full second-tier benefit in 2000 and 2004

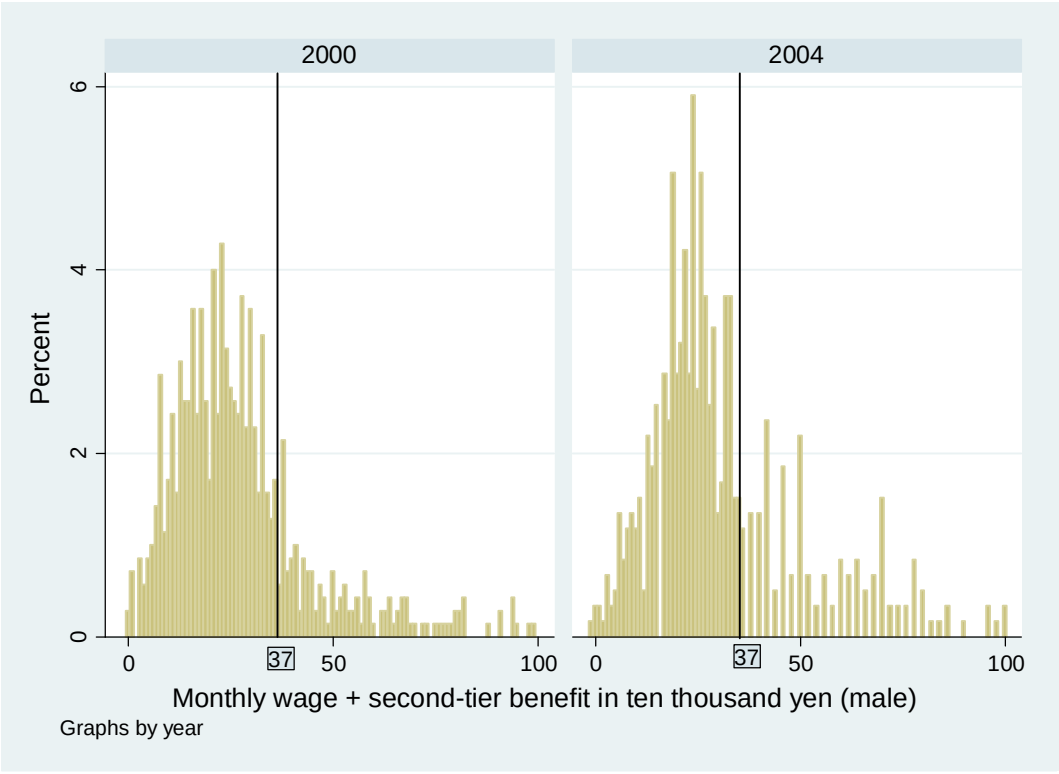
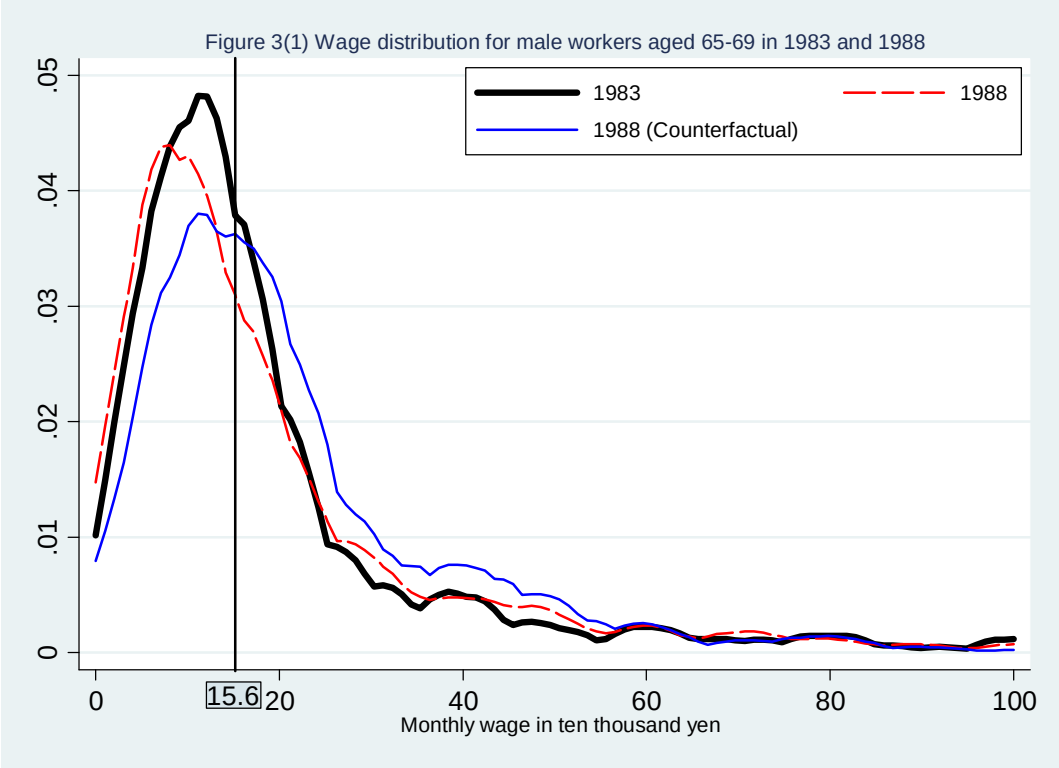


Figure 3 Wage distribution for workers aged 65-69 in 1983 and 1988



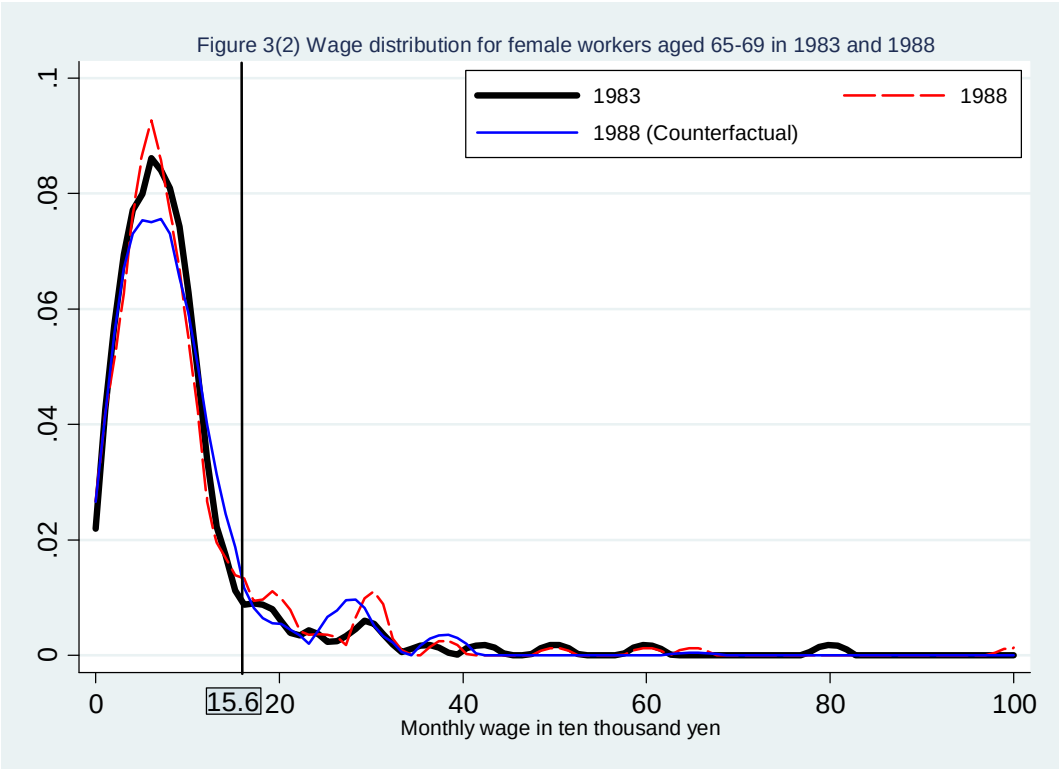
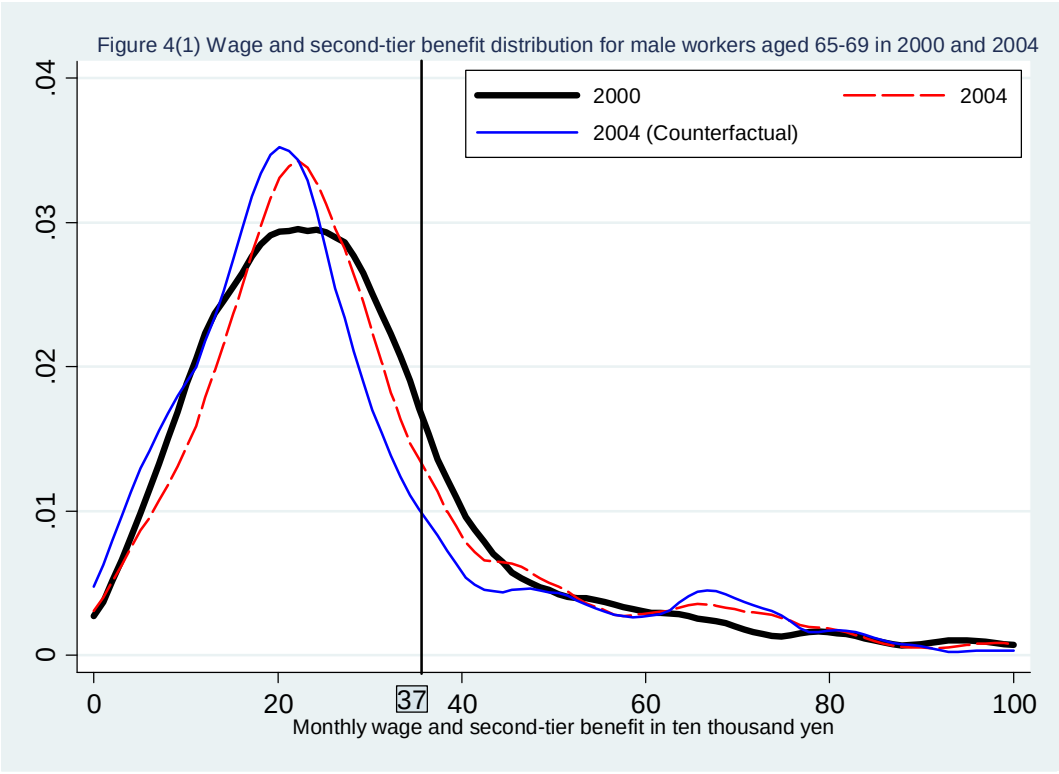


Figure 4 Wage and second-tier benefit distribution for workers aged 65-69 in 2000 and 2004



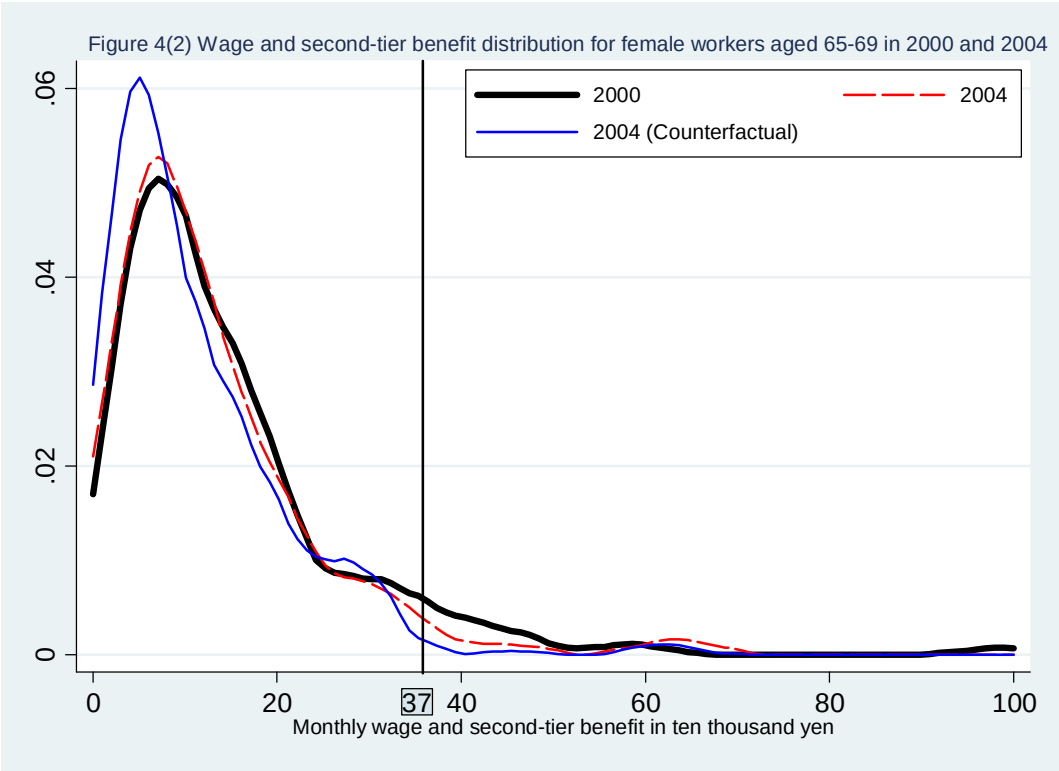
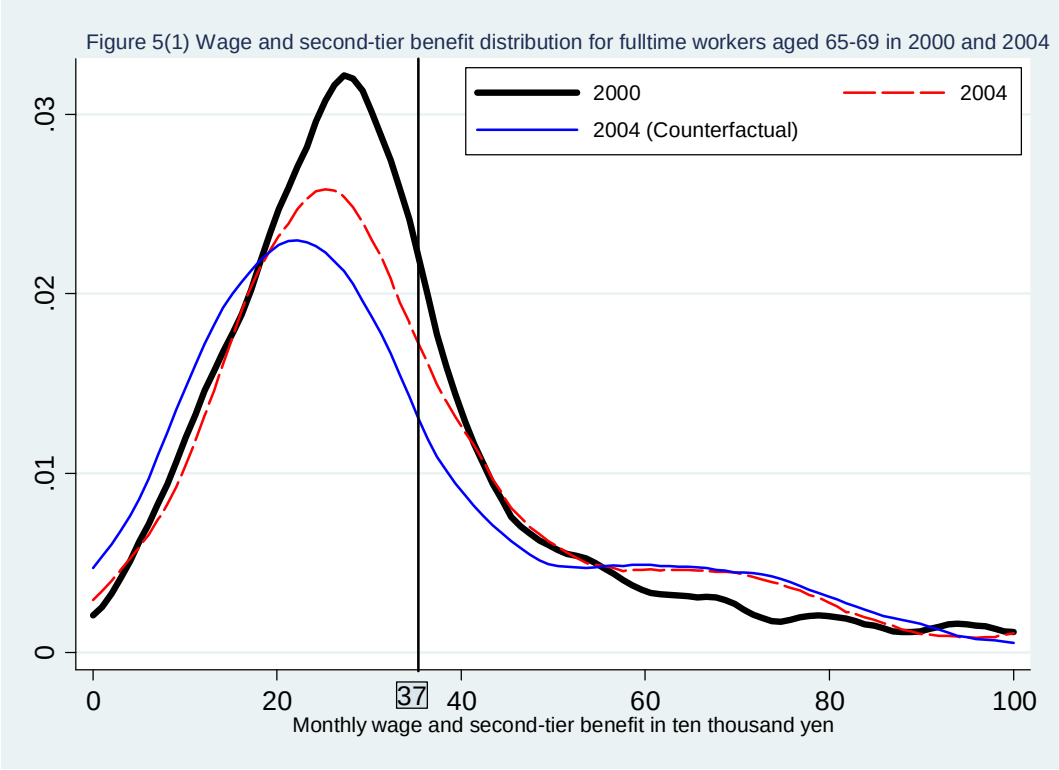


Figure 5 Wage and second-tier benefit distribution for fulltime/part-time male workers



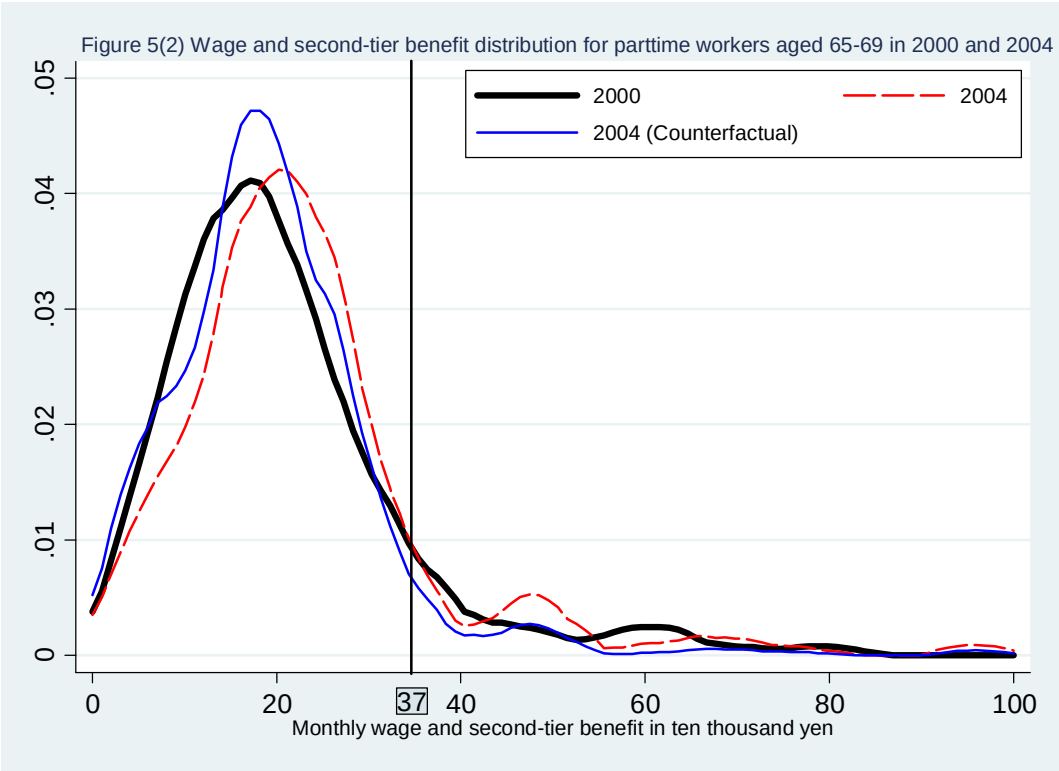
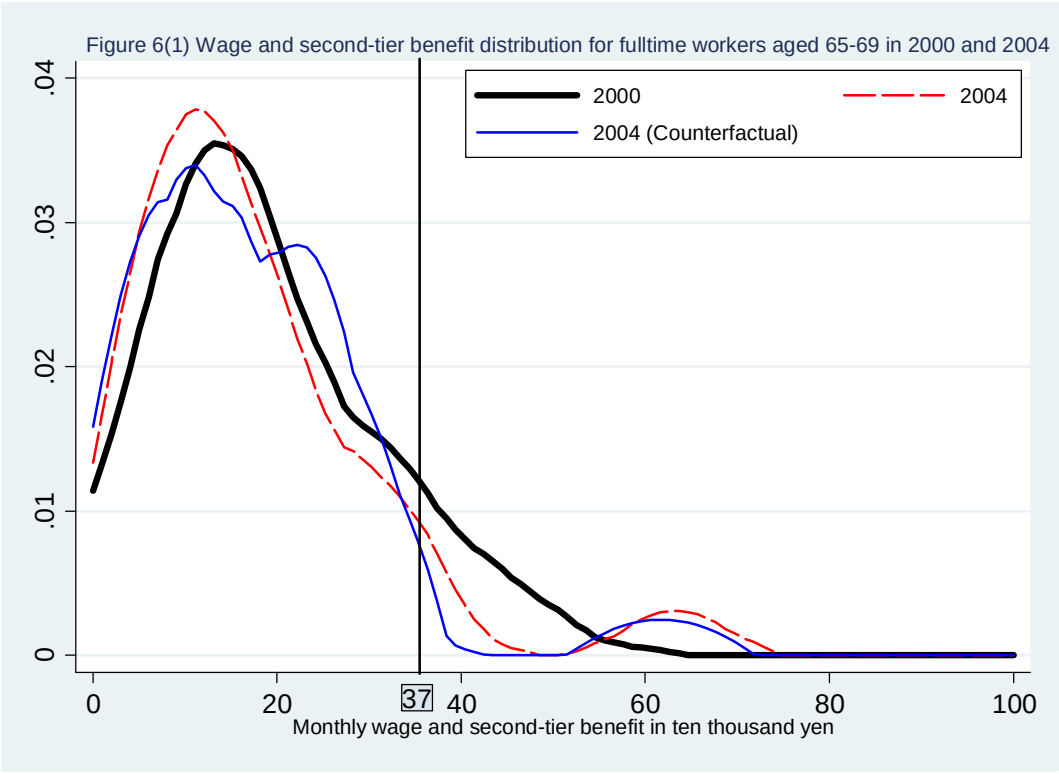


Figure 6 Wage and second-tier benefit distribution for fulltime/part-itime female workers



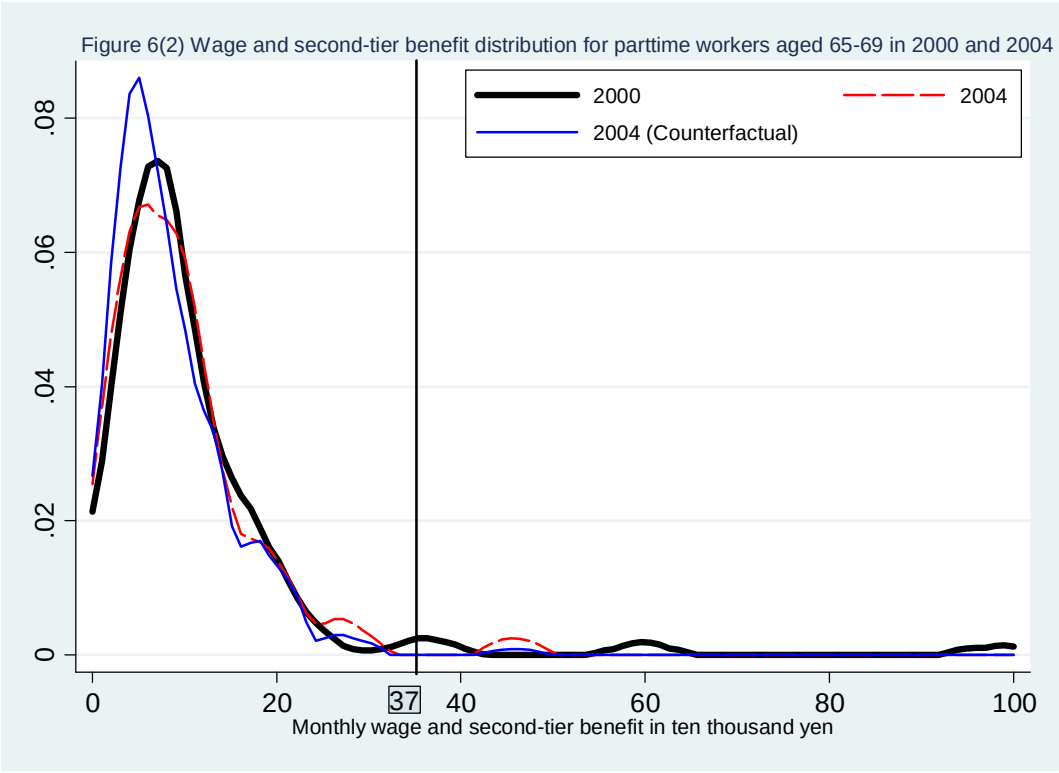


Table 1 Summary statistics of the main variables in the decomposition analysis

		1983		1988		2000		2004	
		Males	Females	Males	Females	Males	Females	Males	Females
Age (share)									
	age65	0.208	0.232	0.227	0.273	0.209	0.263	0.276	0.269
	age66	0.246	0.232	0.242	0.220	0.240	0.191	0.200	0.252
	age67	0.200	0.172	0.210	0.194	0.198	0.165	0.203	0.192
	age68	0.184	0.185	0.173	0.181	0.185	0.212	0.163	0.158
	age69	0.162	0.179	0.148	0.132	0.168	0.169	0.159	0.128
Type of prime job (share)									
	Expert or technical	0.062	0.020	0.105	0.053	0.064	0.083	0.168	0.107
	Management	0.114	0.000	0.184	0.070	0.114	0.022	0.252	0.034
	Administration	0.082	0.020	0.092	0.093	0.044	0.043	0.073	0.167
	Sales	0.028	0.046	0.06	0.106	0.042	0.050	0.038	0.124
	Services	0.000	0.053	0.019	0.159	0.024	0.079	0.030	0.162
	Security guard	0.026	0.000	0.021	0.000	0.023	0.000	0.014	0.000
	Agriculture, Forestry and Fishery	0.002	0.000	0.015	0.004	0.016	0.014	0.014	0.013
	Transportation and communication	0.032	0.007	0.062	0.000	0.076	0.000	0.072	0.004
	Production workers (all)	0.162	0.113	0.289	0.282	0.222	0.169	0.194	0.188
Firm size of prime job (share) if employed									
	1-4 persons	0.000	0.000	0.006	0.009	0.010	0.018	0.044	0.068
	5-29 persons	0.038	0.060	0.047	0.053	0.100	0.086	0.183	0.252
	30-99 persons	0.06	0.053	0.064	0.040	0.112	0.126	0.140	0.171
	100-299 persons	0.068	0.007	0,054	0.040	0.105	0.108	0.136	0.124
	300- persons	0.192	0.073	0.173	0.057	0.243	0.104	0.345	0.175
Fulltime (share)		0.822	0.623	0.647	0.511	0.640	0.432	0.561	0.427
Working days per week (mean)		5.474	5.179	4.837	4.551	4.694	4.524	4.451	4.373
	(S.E.)	1.178	1.400	1.666	1.844	1.660	1.693	1.627	1.676
Working hours per day (mean)		7.530	6.238	6.996	6.106	7.095	5.896	6.936	5.718
	(S.E.)	2.138	2.360	2.077	2.342	2.285	2.296	2.235	2.148
Number of observations		500	151	533	227	708	278	656	234

(Note) In addition to the variables in this table, indicator variables for each prefecture are used.