The Effectiveness of Government Intervention to Promote Elderly Employment: Evidence from Elderly Employment Stabilization Law*

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Abstract

Given the fast aging population and resulting pressure on the social security system, the government of Japan revised the Elderly Employment Stabilization Law (EESL) to ensure that older people can continue to work longer. Starting from 2006, employers are legally obliged to introduce a system to continue employment up to the pension eligibility age, which had already started to rise 5 years ago. This paper examines the effect of this legal enforcement on elderly men's labor supply and employment status, by comparing the affected cohorts and cohorts a few years older than them. We find that the EESL revision actually increase the employment rate of men in the affected cohorts in their early 60s. Also, this increase in elderly workers staying in the same employer does not decrease elderly workers who switch employers, suggesting that the revised EESL does not hinder elderly worker's mobility.

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Disclaimer required by the Statistics Bureau: (1) Since the Labour Force Survey is a sample survey, all results are potentially subject to sampling errors. (2) All the analyses in this paper are done by the author, not the Bureau, and thus their consistency with the Bureau's official reports is not guaranteed.

1 Introduction

Aging population is emerging as a serious social concern in many developed countries. Among others, Japan has experienced very rapid aging in the past few decades. As of 2010, the ratio of the elderly (65 years or older) in Japan's population is 23.1%, which is the highest among the OECD countries. Given this fast aging population and resulting pressure on the social security system, the government of Japan started to raise the eligibility age for full pension benefit in 2001. This was a gradual rise from the age of 60 to 65, taking 10 years to complete.

In the meantime, mandatory retirement age is still set to 60, and the growing gap between the mandatory retirement age and the pension eligibility age has emerged as a social problem. Thus in 2006, five years after the gradual rise in pension eligibility age started, the government revised the Elderly Employment Stabilization Law (here after EESL) and mandated employers to institute a system to continue to employ workers up to their pension eligibility age.

This paper examines the effect of this legal enforcement on elderly men's labor supply and employment status. The five-year lag between the rise in the pension eligibility age and the revision of the EESL allows us to distinguish the effect of the EESL from the effect of pension reform. Both reforms affect the cohorts who turn 60 at the time of implementation or younger. Thus, cohorts born in 1946 and after are affected by both the rise in the eligibility age for the full pension benefit and the revision of the EESL, while cohorts born in 1941-1945 are subject only to the rise in the eligibility age for full pension benefit. Comparing these two groups of cohorts, we can isolate the effect

of continued employment "mandated" by the revised EESL from the effect of the rise in pension eligibility age.

This policy change offers a unique opportunity to examine whether a policy that intends to increase labor *demand* rather than *supply* can be effective in promoting employment of the elderly. It is not *a priori* obvious whether the revision indeed affects employment of the elderly in their 60s for two reasons. First, even before the EESL revision, the firms were able to continue to employ workers older than 60; therefore, if there is no excess supply of labor, the EESL revision may have no effect. Second, the revised EESL has no clear guideline for wages and working hours for the "continued" employment of elderly workers. In fact, the law allows firms to induce "voluntary" retirement at 60 by offering very low wages for workers older than 60.

Even though the effectiveness of the EESL revision is theoretically ambiguous, we find that the EESL revision actually increases the employment rate of men in the affected cohorts in their early 60s. The employment to population ratio of 60-year-old men increased about 4-5 percentage point. We also find that the more than one in six men came to stay another year after the implementation of the revised EESL compared to the unaffected cohorts. These results imply that the government intervention in the demand side can increase employment of elderly men.

Furthermore, we find that, while this increase in employment mainly comes from an increase in workers who remain in the same employer, there was no decline in the number of workers who switch employers or move across industries. This result suggests that the increase in staying incumbents does not crowd out hiring of elderly workers who

"retired" from other employers. In this sense, the revised EESL does not hinder the mobility of elderly workers.

A large body of literature documents that an increase in the retirement age defined in the social security system increases elderly's labor supply and delays the actual age of retirement (e.g,. Krueger and Pischke 1992, Mastrobuoni 2009, Manoli and Weber 2012, Behaghel and Blau 2012).[1] This paper is distinct from these existing studies in that, while the changes in pension eligibility age in the past literature primarily affect the labor supply, the EESL revision in Japan is an intervention in the demand side.

Indeed, there are a few existing studies on the effects of demand side interventions to protect elderly workers.[2] The closest study to ours is von Wachter (2002), who examines the effect of the abolition of the mandatory retirement in the United States due to the Age Discrimination in Employment Act (ADEA) and finds a significant increase in the labor force participation among elderly men.

An important difference between the ADEA in the United States and the EESL revision in Japan is that the EESL explicitly targets workers in the early 60s and allows mandatory retirement after the age of 65. While Neumark and Stock (1999) argue that the ADEA steepens the age-earnings profile by making it easier for employers to commit to Lazear (1979) type long-term contract, the EESL in Japan is expected to flattening the age-earnings profile because it expands the length of implicit contract to which the

[1] Studies using Japanese data also show significant effects of pension benefits on elderly's employment (e.g. Abe 2001, Oishi and Oshio 2000, Ishii and Kurosawa 2009).

[2] As a different type of employment protection for elderly workers, there are a few studies on the higher lay-off taxes for workers older than 50 in European countries. In France, Behaghel, Crepon and Sedillot (2008) find a rather negative effect on hiring whereas the effect on layoffs is less clear cut. In Austria, in contrast, Schnalzenberger and Winter-Ebmer (2009) find a significant decrease in lay-offs of older workers without a decrease in hiring because lay-off tax in Austria is applied only to workers with a tenure of more than 10 years.

employers have to commit. Indeed, Clark and Ogawa (1992) show that the tenure-earnings profile in Japan became flatter in the late 1980s, when many firms switch the mandatory retirement age from 55 to 60.

Our results are also consistent with the earlier studies in Japan.[3] Using data from Keio Household Panel Survey, Yamamoto (2008) finds that the revision of the EESL in 2006 substantially increases employment of the affected cohorts among men who were salaried workers in their 50s. Our study extends Yamamoto (2008) by using a nationally representative data with a large sample size.

The rest of the paper is organized as follows. In the next section, we provide a detailed explanation of the institutional settings. Then Section 3 describes data and Section 4 presents our empirical models. Section 5 reports our findings, and Section 6 concludes.

2 Institutional Background

Japan's population is aging rapidly. The ratio of elderly (65 years or older) has increased from 14.6% in 1995 to 23.1% in 2010,[4] which is already the highest among the OECD countries. This ratio is expected to keep rising and exceed 30% by 2025, according to the projection by National Institute of Population and Social Security Research. Since the Japanese public pension program is designed as a pay-as-you-go system, this rapid aging of population makes it inevitable to raise the pension eligibility age. Along with the rise in pension eligibility age, the government of Japan has been

[3] Relatedly, Ishii and Kurosawa (2009) examine the effect of the rise in pension eligibility age using data for 2000-2004 from Survey on Employment Conditions of Older Persons and find a modest positive effect on full-time employment for the affected cohorts.
[4] Source: Population Census of Japan.

trying to ensure that elderly workers can stay in the labor force longer by revising the EESL. This revision is intended to force employers to continue to employ elderly workers until they become eligible for the pension benefits.

Established in 1971, the EESL initially intended to protect and promote employment of workers older than 50. The revision passed in 1994 and enacted in 1998 prohibited firms to set mandatory retirement age younger than 60. Since the eligibility age for old-age pension for employed workers had been 60 until 2001, most employees in private companies were able to work until they became eligible for the full pension benefit.

However, the pension reform act to raise the pension eligibility age gradually came into effect in 2001, and cohorts born in 1941 or later (i.e., those who turn 60 in 2001 or later) can no longer receive the full pension benefit at the age of 60, the prevailing mandatory retirement age. This pension reform led to the revision of the EESL passed in 2004 and enacted in 2006, which legally mandated employers to institute a system to continue employment until the pension eligibility age. The timings of revisions of the EESL and the pension system are summarized in Table 1.

As seen in Table 1, there is a five-year lag between the rise in the pension eligibility age and the revision of the EESL. Both reforms affect the cohorts who turn 60 at the time of implementation or younger. Thus, as summarized in Table 2, while cohorts born in 1946 and after are affected by both the rise in pension eligibility age and change in the EESL, cohorts born in 1941-1945 are subject to only the rise in pension eligibility age. Comparing these "gap" cohorts and cohorts born after 1946, we can identify the effect of mandated employment from the effect of the rise in pension eligibility age.

Prior to the EESL revision, employees typically retire from their current position as a regular staff either in the month in which they reach 60 or at the end of the fiscal year during which they reach 60. Regular staffs, or "*seishain*" in Japanese, work full time and are on an employment contract that does not specify the date of termination of the contract. They are usually thought to be on the lifetime employment track with increasing age-earnings profiles. Therefore, the mandatory "retirement" in Japan merely means a termination of such life-time employment contract. After this mandatory retirement, some workers leave the labor force or begin working for a new employer, but a substantial number of the "retired" employees are re-employed by the same employer on a different employment contract as a non-regular worker, which typically pays much lower wages. [5]

The EESL revision legally mandated firms to offer such re-employment opportunities to all employees below the pension eligibility age.[6] Since such kind of re-employment had been quite common in small companies even before the EESL revision, the effect of this revision is expected to be larger for employees in large firms.

Also, it is important to note that the revised EESL allows employers to terminate the contact as a regular staff and offer a re-employment contract with much lower wages. Employers can even offer a higher severance pay conditional on retirement at 60 to induce "voluntary" retirement. To this effect, the revised EESL is much less binding than

[5] The Japan's unemployment insurance system offers so-called Continuous Employment Benefits (*koyo keizoku kyufu*), compensating benefits to workers older than 60 who are paid significantly lower than wages paid before they reached the age of 60. This makes it easier for the employers to offer very low wages to the re-employed workers.

[6] Strictly speaking, until April 2013, employers can refuse to renew the contract for some of the employees who have reached mandatory retirement age, if these employees do not meet the "criteria" set by a labor-management agreement. However, according to a press release by the Ministry of Welfare, Labor and Health (http://www.mhlw.go.jp/stf/houdou/2r9852000002m9lq-att/2r9852000002m9q6.pdf), only 2.3% of those who wished continued employment was refused by such a criteria.

a requirement to raise the mandatory retirement age, which would mean that the employer would have to keep the worker *on the same contract as a regular staff*.[7]

Lastly, since our focus is on the effect of the EESL revision, we discuss the details of Japan's old age pension scheme and the effect of the pension reform in 2001 in the Appendix. Specifically, we compare the cohort born before and after 1941, the first cohort affected by the pension reform, to explore the effects of the changes in pension eligibility age. The size of the effect of pension reform on elderly men's employment is much smaller than that of the EESL revision.

3 Data: Labour Force Survey

Our primary source of data is the Labour Force Survey conducted monthly by the Statistics Bureau of the Ministry of Internal Affairs and Communications. The survey covers households residing in Japan. There are two types of questionnaire in the survey: basic questionnaire and special questionnaire. The basic questionnaire is distributed to about 40 thousand households, and the questions on employment status are asked to all the members who are 15 years old or older (about 100 thousand persons in total) in those household. In addition, the special questionnaire, which contains more detailed questions about demographic background (such as education) and employment status than the basic questionnaire, is distributed to 10 thousand households among the subset of the

[7] Although employers could have raised the mandatory retirement age or even abolish the mandatory retirement in response to the EESL revision, the majority of employers actually did not change the mandatory retirement system. According to the General Survey on Working Conditions by the Ministry of Welfare, Labor and Health, among establishments with 30 or more employees, 81% still set 60 as the mandatory retirement age, and most of them set up an explicit rule for re-employment (80%) or employment extension (20%) as of 2012.

respondents to basic questionnaire. The survey is conducted monthly as of the last day of each month, and the reference period is the last week of the month.

We limit our sample to men because women are less likely to be affected by the EESL directly. In fact, the proportion of full-time employees in population is as low as about 10-15% for women in their 50s (i.e. right below the retirement age), thus the majority of women are not subject to the continued employment mandated by the revised EESL.

The outcome variables from basic questionnaire include labor force participation rate, the employment to population ratio and the unemployment to population ratio. In addition, the ratios of regular and non-regular staffs are available from the special questionnaire. As a placebo check, we also explore the effect of the EESL revision on self-employment, who should not be affected.

Regarding explanatory variables, the precise information on age is essential in our analysis. The Labour Force Survey asks the year and month of birth to all adult respondents, thus we can compute the age in months at the survey month. Note that education is available only in the special questionnaire, thus our analyses using the basic questionnaire do not control for educational background.

The special questionnaire also asks industry and firm size of both current and previous jobs, and, if the respondent quit a job (i.e., leave a firm) in the past 3 years, year and month of quitting are available. Using these variables, we construct variables for employment status and industry in the month of the respondent turns 59 for those who were 61 years and eleven months old or younger as of the survey month.

The data from the basic questionnaire are available from 1986-2012. Thus, we can trace two birth-year cohorts (born in 1946 and 1947) who are fully affected by the EESL revision implemented in 2006 (i.e., cohort who turns 60 in 2006 or later) up to the age of 65. In some analyses that do not need to follow the same cohort up to the age of 65, we use cohorts born in 1938-1950. We exclude cohorts born before 1938, because it was legally allowed to set the mandatory retirement age younger than 60 until 1998. The data from the special questionnaire is available only for 2002-2012, thus analyses based on the special questionnaire are limited to cohorts born between 1943 and 1948. Summary statistics by selected cohorts are presented in Table 3.

4 Empirical Strategy

4.1 Estimation of discontinuity in employment status at the age of 60

Since the EESL revision affects cohorts who reached 60 in 2006 or later, we estimate the discrete change in employment status at the age of 60 in the regression discontinuity design (RDD) and examine the change in the magnitude of jumps across affected (born in 1946 or later) and non-affected (born before 1946) cohorts. Comparing these two groups of cohorts allows us to isolate the changes in employment and labor supply induced by additional employment opportunities generated by the EESL revision.

Since the RDD requires a large sample size around the cut off age, we use data from the basic questionnaires. We limit the sample to a bandwidth of one year around the age threshold and estimate the following equation:

$$Y_i = \alpha_0 + \alpha_1 1[A_i \geq c] + \alpha_2 1[A_i \geq c] * (A_i - c) + \alpha_3 (1 - 1[A_i \geq c]) * (A_i - c) + \alpha_4 1[A_i = c] + \varepsilon_i \quad \ldots(1)$$

where Y_i is the measure of employment for individual i, A_i is the age of individual i

in months, c is the age cutoff, and ε_i represents unobserved error components. In our case, c is 60 years old. $1[A_i \geq c]$ is a post-cutoff dummy that takes one if individual *i* is c years old or older. Our parameter of interest is coefficient α_1. All coefficients on $1[A_i \geq c]$ and their standard errors are multiplied by 100 unless otherwise specified, so that they can be interpreted as changes in percentage points.

As a baseline specification, we use a linear function in age fully interacted with the post-cutoff dummies, as described in equation (1). We also includes a dummy for being exactly at the age cutoff in months ($1[A_i = c]$) because we cannot observe the exact date of birth or retirement. According to a survey conducted by the Ministry of Health, Labor and Welfare, some firms define the date of mandatory retirement as the end of the month when the worker reaches the retirement age, and other firms define it as the exact day on which the worker reaches the retirement age. Since age in months is constructed by subtracting the birth date (in months) from survey date (also in months), the age at exactly on the age cutoff mechanically include both individual just below and above the threshold.

We also perform robustness checks by running the baseline specification without the dummy for being exactly 60 years old, using triangular weights to put less weight for observations far from the cutoff, and adding quadratic terms in age fully interacted with the post-cutoff dummies. To account for potentially common unobserved shocks within the same age cells, the standard errors are clustered at the age in month in all specifications, following Lee and Card (2008).

4.2 Estimation of relative changes in the retirement age by cohort

After establishing the abrupt change of employment at the age of 60 in a RD framework, we next examine whether the EESL had a long-term impact on employment at early 60s. Following Mastrobuoni (2009), we estimate relative changes in the retirement age by cohort. Specifically, we estimate the following equation using the sample of men born in 1938-1947 in the basic questionnaire:

$$y_i = \sum_{a=59}^{65} 1(A_i = a)(\alpha_a + \sum_{b \neq 1945} \beta_{a,b} 1(B_i = b)) + \gamma X_i + \varepsilon_i \ldots.(2)$$

y_i represents one of the outcome variables (either a dummy for labor force participation or employment). A_i is the age of individual i, and B_i is his year of birth. Coefficients $\beta_{a,b}$ represent the difference in cumulative distribution function of retirement age at age a between cohort b and cohort 1945, the baseline cohort. X_i represents explanatory variables other than age*cohort dummies; specifically, regional unemployment rates and 10 regional dummies.[8]

Under an assumption that a person never comes back to the labor force or employment once retired,[9] a plot of $\alpha_a + \beta_{a,b}$ over age a can be interpreted as the cumulative distribution function of the retirement age for each cohort born in year b. Furthermore, as shown in Mastrobuoni (2009), under an additional assumption that the probability of retirement before 59 is the same across cohorts, $T(b) = \sum_{a=59}^{65} \beta_{a,b}$ can be interpreted as the difference in the retirement age of cohort born in year b compared to the baseline cohort born in 1945.

[8] 10 regions are Hokkaido, Tohoku, Minamikanto, Kitakanto and Koshin, Tokai, Hokuriku, Kinki, Chugoku, Shikoku, and Kyushu.

[9] This assumption may be too restrictive for the cases of employment, because some people may become unemployed temporarily and then employed again. Even so, the ratio of individuals whose y_i is equal to zero can be interpreted as the lower bound of the ratio of ever-retired individuals.

5. Results

5.1 Changes in employment status at around 60 across cohorts

The revision of the EESL implemented in 2006 affected cohorts who reach 60 after the time of implementation. Thus the first cohort affected by the revision is those born in 1946. Figure 1 plots the average of selected outcome variables over age in months for the two groups of cohorts: born before 1946 (cohorts 1943–1945) and after 1946 (cohorts 1946–1948). Comparing these two groups of cohorts allow us to identify the effect of continued employment "mandated" by the revised EESL.[10]

Panels A and B in Figure 1 visually show that cohorts affected by the EESL revision are more likely to stay in the labor force and to be employed after the age of 60 than cohorts not affected by the EESL. While the labor force participation rate and employment rate before the age of 60 are similar across the two cohort groups, the decline at the age of 60 became less pronounced for the cohorts affected by the EESL revision. Furthermore, labor force participation and employment of the group born after 1946 stay higher until around the age of 64 than the group born before 1946. This pattern suggests that the positive effect of the obligation of continuous employment on labor force participation and employment persists for a couple of years beyond 60. Panel C also shows that the group born after 1946 are less likely to be unemployed than the group born before 1946.[11] It is reassuring that Panel D confirms no change in self-employed, who should not be affected by the EESL.

[10] We also compare the cohorts that are affected by the change in the pension eligibility age and cohorts that are not affected in the Appendix.

[11] Appendix Figure A2 presents the same figures as Figure 1 that limits the range of cohort into 1 year (i.e., 1945 vs. 1946). These graphs show a very similar pattern as Figure 1. Also to confirm that there was no macroeconomic shock around 2006, Appendix Figure A3 plots labor force

Panels E and F plot the ratio of regular and non-regular staffs. In these two graphs, outcomes are measured at age in quarter due to the small sample size of the special questionnaire. The graphs show a similar magnitude of increases for both regular and non-regular staffs among men in their early 60s. Indeed, the average increases in the ratios of regular and non-regular staffs for men between 60 to 61 years old are 2.0 and 2.3 percentage points, respectively, and those for men between 61 and 62 years old are 2.4 and 1.8 percentage points, respectively.

Figure 2 plots the labor force participation rate (Panel A) and the employment to population rate (Panel B) at the ages of 50, 55, 59, 60 and 61 (all defined in year, not month) over the birth-year cohort. The labor force participation rate is almost the same across cohorts until the age of 59, reassuring that there is no systematic difference across cohorts in their fifties. In contrast, there is a clear increase in the labor force participation rate at 60 and 61 for cohorts born in 1946, and labor force participation remain high for cohorts born after 1946. A similar pattern is observed for employment.

To gauge the size of the jumps at the age of 60, we estimate equation (1) for each cohort born between 1938 and 1950.[12] Table 5 summarizes the estimated jumps at the age of 60 for employment outcomes for each cohort separately. Column (1) shows that labor participation drops by roughly 5–6 percentage point for cohorts born before 1946, while the estimated drops shrinks to about 3 percentage point for cohorts born after 1946, who are affected by the revised EESL. The difference between the estimated jumps for cohort born in 1945 (–5.61) and 1946 (–3.09) are statistically significant at the conventional

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participation and employment for the same time period as Figure 1 for cohorts who are around age 50 (i.e., cohorts 10 years younger than those in Figure 1). It is reassuring that there is no visibly discrete changes at age 50.

[12] Appendix Figure A4 summarizes the separate graph for each cohort for each outcome.

level (t statistics = 2.04). Similarly, while column (2) shows the employment to population ratio drops at the age of 60 by roughly 9–11 percentage point for cohorts born before 1946, the estimated drops become smaller for cohorts born after 1946. The estimated jump at 60 for cohort born in 1946 is higher than that of cohorts born in 1945 by 4.53 (= –7.03– (–11.56)) percentage point, and this difference is statistically significant at the 1 percent level (t statistics = 3.16). These results confirm the observation from Panel A and B in Figure 1 that the EESL revision actually increases employment and labor force participation among men who have just reached the age of 60.[13]

Column (3) shows a substantial decrease in unemployment right after the age of 60. The estimated jump in unemployment at the age of 60 is 6.0 percentage points for those born in 1945 and 3.9 percentage points for those born in 1946, implying 2.1 percentage points decline in the unemployment-to-population ratio at the age of 60. The difference between the estimates for cohorts born in 1945 and 1946 is statistically significant at the 5 percent level (t = –2.21). Since the obligation of continuous employment decreased unemployment among men at the age of 60, the drop in employment at the age of 60 (column (2)) shrunk more than the drop in labor force participation (column (1)).[14] Column (4) confirms no change in self-employed, who should not be affected by the EESL.

5.2 Estimated relative changes in the retirement age by cohort

[13] The RD estimates from other specifications are summarized in Appendix Table A1.
[14] Note that labor force participation (LFP) is defined as the sum of employed and unemployed.

So far, we have shown that the revision of the EESL has brought substantial changes in men's employment status at the age of 60. This section quantify how much the revision of the EESL increase labor force participation and employment *beyond* the age of 60 by estimating the relative changes in the retirement age by cohort.

We estimate equation (2) to calculate $(b) = \sum_{a=59}^{65} \beta_{a,b}$, the estimated changes in retirement age of cohorts born in year *b* relative to cohort 1945. Table 5 reports the estimated *T(b)* for cohorts born in 1938‑1947. Cohorts born in 1946 and 1947 stay significantly longer in labor force and employment than cohorts born before. The point estimates for cohort 1946 imply that more than one in six men became to stay another year after the implementation of the revised EESL compared to the baseline cohort. The same trend is observed for employment as well. Our results show that the revision of the EESL indeed delayed retirement of men in the affected cohorts.[15] Interestingly, cohorts born before 1942 retired earlier than cohorts born in 1943-45. As we discuss in the Appendix, this might be due to the rise in pension eligibility age. Nonetheless, the size of the change in labor force participation due to the EESL revision is much larger than this change.

5.3 Suggestive evidence from decomposition by jobs at 59

So far, we have shown that the EESL revision actually increased the employment of men in their early 60s. This subsection exploits the information from special questionnaire to compare the characteristics of employers of the respondent at the age of 59 and 61, and investigate whether the EESL revision reduced the mobility of other

[15] For robustness check, we add controls for education using cohorts born 1942-1946 in the special questionnaire. The results remain qualitatively the same.

workers in their early sixties. Since the EESL revision prompted the employment by the same employer beyond the age of 60, it may crowd out the employment opportunities of other elderly workers who would have switched employers.

Panel A in Figure 3 plots the proportion of workers who remain in the same job since the age of 59 over age. Note that the sample includes only those who were employed at the age of 59. The graph in the left column of Figure 3 confirms that more workers stay in the same employer after the age of 60 in the affected cohorts (i.e., born 1946 or later) than the older cohorts. Specifically, the ratio of people who were employed at 61 increased by about 6.0 percentage point. Panel B shows plots the proportion of workers who work at a different employer than one by which they were employed at the age of 59. The decrease in the ratio of workers who switch employers is very small, suggesting that the increase in staying incumbents did not crowd out new hires of the elderly.

Further, we explore the differences between those who were employed at large firms and small firms at the age of 59. As explained in Section 2, re-employment after the age of 60 had been already common in small companies even prior to the EESL revision in 2006, thus the EESL is expected to have a larger effect for larger firms. To confirm this point, we repeat the same excise by examining the following two groups separately: those who were employed at large firms (500 or more employees) and small firms (less than 100 employees) at the age of 59.

Comparing the middle and the right graphs in Panel A in Figure 3, as expected, the ratio of people who remain in the same employer beyond 60 is much higher for the smaller firms. However, the *increase* in the ratio after the EESL revision is larger for large firms: the change in the ratio at 61 is 5 percentage point for the small firms and 19

percentage point for the large firm. Also, among those who were employed in a large firm, the ratio of those who switched employer is declined by about 5 percentage points, whereas the change was negligible for those employed in a small firm. This suggests that, before the EESL revision, a substantial number of workers were forced to quit the large firm and move to (probably) smaller firms.[16]

6 Concluding remarks

Aging population imposes enormous pressure on the stability of social security system. One way to maintain the social security system is to ensure that the elderly continue to stay in employment longer. To understand the effectiveness of such a policy, we examine the revision of the EESL in Japan, which legally obliged employers to introduce a system to continue employment up to the pension eligibility age.

We find that the revision actually increased the employment rate of men in the affected cohorts in their early 60s. This result indicates that the limited labor demand is likely to be a binding constraint for policies attempting to promote employment among older workers. Furthermore, the increase in workers who remain in the same employer does not lead to a decline in the number of workers who switch employers or move across industries. This result suggests that the increase in staying incumbents does not hinder the mobility of elderly workers who left other employers.

Lastly, it is important to emphasize that it had not been prohibited to hire workers older than the mandatory retirement age of 60 even before the revision of the EESL.

[16] Indeed, the ratio of workers who moved to a smaller firm declined by 2.3 percentage points, whereas the ratios of those who moved to a larger firm and those who moved to public sector did not change.

Therefore, the increase in employment after the EESL revision can be viewed as a distortion brought to the market by a government intervention. If the EESL actually forces employers to hire workers whom they would not hire otherwise, there must be some adjustment in response to this forced employment. Examining whether such adjustment indeed takes place and, if so, where such adjustment takes place – e.g. whether firms limit new hires or induce quitting before the age of 60 – is left as the avenue for future work.

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Appendix: Japan's Public Pension System and Gradual Rise in Eligibility Age

Japan's public pension system consists of three subsystems, and everyone at age 20-60 is mandated to enroll in one of them: Employee's Pension for employees of private companies, Mutual Aid Pension for public servants, and National Pension for others.[17] People who have enrolled only in the National Pension are supposed to receive so called "basic" benefits from the age of 65. Enrollees of Employee's Pension or Mutual Aid Pension pay extra premium, which is proportional to their earnings, and they are supposed to receive extra benefits after retirement.

More specifically, the benefits for Employee's Pension Plan consist of the basic part, which are determined only by the number of months that the person had paid the contribution, and the proportional part, which is proportional to the amount of premiums paid in the past. The basic part is designed to be equivalent to the basic benefit of National Pension Plan, except that the eligibility age for National Pension benefits has been 65 since the introduction of the system in 1961, whereas the eligibility age for Employee's pension benefits had been 60 until 2001.

The pension reform plan enacted in 1994 announced that the eligibility age for basic part of Employee's Pension would be raised from 60 to 65. The timing of the change for male is summarized in the right columns of Table 2 in the main text. For female, the reform on pension eligibility age is going to take place 5 years after the change for male. The same reform was implemented to Mutual Aid Pension Plan for public sector employees, except that there is no delay in timing of rises for female.

[17] In Japanese, Employee's Pension, Mutual Aid Pension, and National Pension are called *Kosei Nenkin*, *Kyosai Nenkin*, and *Kokumin Nenkin*, respectively.

In the meantime, the eligibility age for the proportional part has remained 60 until 2013, although it is also supposed to be raised to 65 by 2025. According to the Annual Report of Social Security, the monthly benefit of the basic part is about 56,000 yen, and the average monthly benefit of the proportional part is about 93,000 yen, though the amount of the proportional part varies a lot depending on the earnings before retirement. Although it is possible to receive pension benefits while working, the amount of monthly pension benefit is reduced as earnings of the recipient increases.[18]

Appendix Figure A1 plots the labor force participation rate and the employment to population ratio of the following three cohorts: born in 1939-40, 1941-42, and 1943-44. The eligibility age for the basic pension for these three cohorts is 60, 61, and 62, respectively as shown in Table 2 in the main text. Although there is no visible difference between cohorts born in 1939-40 and 1941-42 for both outcome variables, there is a slight increase in labor force participation and a clearer increase in employment for cohorts born in 1943-44.

The lack of changes between cohorts born in 1939-40 and 1941-42 may be because workers who actually retired can claim unemployment benefit by pretending to be seeking for a job. The unemployment benefits typically pays a half of the previous salary up to 150 days, and this could help retired workers to partially fill the loss of basic pension benefit for one year. Note that it is not allowed to receive both the old age

[18] Specifically, if the sum of pension benefit and earnings exceeds 280,000 yen/month, (the sum of pension benefit and earnings – 280,000 yen)/2 is subtracted from the pension benefit. Furthermore, the sum of pension benefit and earnings exceeds 460,000 yen, (the sum of pension benefit and earnings – 460,000 yen) is subtracted, i.e., the sum of pension benefit and earnings never exceeds 460,000 yen. In addition, until 2004, all recipients with positive earnings received 20% reduction in their pension benefit, regardless of their earnings.

pension and unemployment benefits simultaneously. Thus, if the amount of unemployment benefit exceeds the basic part of the pension, which is quite likely, the actual loss of benefit is only about half a year.

However, when the gap between the retirement and the eligibility for full pension benefit became two years, the unemployment benefit is not likely to be enough to cover the gap. This may be the reason why labor force participation and employment increased for cohorts born in 1943-44. Yet, compared to Figure 1 in the main text, the changes in the outcomes are smaller than the case of the EESL revision.

Table 1: Major revisions of Elderly Employment Stabilization Law and related pension reforms; 1986-2011

	Employment		**Pension**	
year	Contents	Cohort affected	Contents	Cohort affected
1986	Obligation to make an effort not to set the mandatory retirement age younger than 60	1926-		
1990	Obligation to make an effort to continue employment after mandatory retirement age	1930-		
1994	Announcement that mandatory retirement younger than 60 would be prohibited from 1998		Announcement of the gradual rises in eligibility age of Old-age Basic Pension from 2001	
1998	Mandatory retirement younger than 60 became illegal Obligation to make effort to continue employment until age 65	1938-		
2001			**The eligibility age of Old-age Basic Pension started to rise (by one year of age in every two years until 2013)**	**1941-**
2004	Announcement that continuing employment until the pension eligibility age would be legally mandated from 2006.		Revision of Old-age Employees' Pension earnings test to encourage labor supply.	
2006	**Legal obligation to continue employment until the pension eligibility age**	**1946-**		

Table 2: Legal lower limit of mandatory retirement age and age until which employers are obliged to continue employment

Cohort born	Legal lower limit of mandatory retirement age	Age until which employers are legally obliged to continue employment	Eligibility age of Old-age Employee's Basic Pension
1938	60	60	60
1939	60	60	60
1940	60	60	60
1941	60	60	61
1942	60	60	61
1943	60	60	62
1944	60	60	62
1945	60	60	63
1946	60	**63**	63
1947	60	64	64
1948	60	64	64
1949	60	65	65
1950	60	65	65

Table 3: Summary statistics

A. From basic questionnaire

	All	By cohort groups		
	1938-1950	1938-1940	1941-1945	1946-1950
Sample size	800,943	189,939	315,356	295,648
Labor force	76%	73%	73.9%	80.5%
Employed	71%	68%	69.2%	76.0%
Unemployed	5%	5%	4.7%	4.5%
Self employed	16.0%	18%	15.8%	15.6%

B. From special questionnaire

	All	By cohort groups	
	1943-1948	1943-1945	1946-1948
Sample size	95,412	43,941	51,471
Labor Force	77.0%	74.5%	79.2%
Employed	72.6%	70.1%	74.9%
Regular staffs	38.4%	36.5%	39.9%
Non-regular staffs	17.8%	17.4%	18.1%
Unemployed	4.4%	4.5%	4.3%
Education			
High school or less	70.1	72.4	68.2
Jr. college	4.6	4.2	5.0
4yr college or more	20.1	18.5	21.4
Never go to school	0.2	0.2	0.1
Unknown	5.0	4.8	5.2

Note: Data come from Labour Force Survey. The sample is limited to 58-65 years old male.

Table 4: RD Estimates at Age 60 (Basic Questionnaire)

Cohort	LFP (1)	Employed (2)	Unemployed (3)	Self-employed (6)	N
1938	-6.17***	-11.35***	5.18***	-2.21*	15,437
	(0.85)	(1.31)	(0.82)	(1.32)	
1939	-4.00***	-10.52***	6.53***	0.34	16,464
	(0.93)	(0.83)	(0.68)	(1.44)	
1940	-5.23***	-10.09***	4.85***	-0.80	17,576
	(0.79)	(1.22)	(0.66)	(0.99)	
1941	-2.66***	-11.06***	8.40***	-1.04	19,106
	(0.75)	(0.79)	(0.61)	(1.08)	
1942	-6.26***	-14.12***	7.87***	-2.69**	17,400
	(0.99)	(1.11)	(0.67)	(1.11)	
1943	-2.53***	-9.30***	6.77***	0.45	18,132
	(0.77)	(1.08)	(0.82)	(1.57)	
1944	-5.68***	-10.11***	4.43***	-0.42	15,565
	(0.76)	(0.80)	(0.88)	(0.93)	
1945	-5.61***	-11.56***	5.95***	-2.53***	11,992
	(1.09)	(1.22)	(0.76)	(0.93)	
1946	-3.09***	-7.03***	3.94***	0.30	16,925
	(0.61)	(0.79)	(0.52)	(0.97)	
1947	-3.67***	-6.76***	3.08***	-1.54	22,070
	(0.68)	(1.40)	(0.82)	(1.07)	
1948	-1.52***	-5.71***	4.18***	0.56	21,572
	(0.47)	(0.83)	(0.81)	(0.86)	
1949	-3.74***	-9.45***	5.71***	-1.02*	20,551
	(0.54)	(0.75)	(0.80)	(0.62)	
1950	-0.19	-3.60***	3.41***	1.08	18,605
	(0.98)	(0.85)	(0.67)	(0.99)	

Note: Data are taken from basic questionnaire of Labour Force Survey. Each cell is the estimate from separate estimated regression discontinuities at age 60. The specification is a linear in age, fully interacted with dummy for age 60 or older among people between ages 59-61. We also include a dummy for those just at age 60. Robust standard errors clustered at age in months are in parenthesis. ***, **, * denote significance at the 1%, 5% and 10% levels respectively. All coefficients on RD estimates and their standard errors have been multiplied by 100, so they can be interpreted as percentage changes. Note that sum of RD estimates from (2) and (3) is the RD estimates from (1) since labor force participation (LFP) is defined as the sum of employed and unemployed.

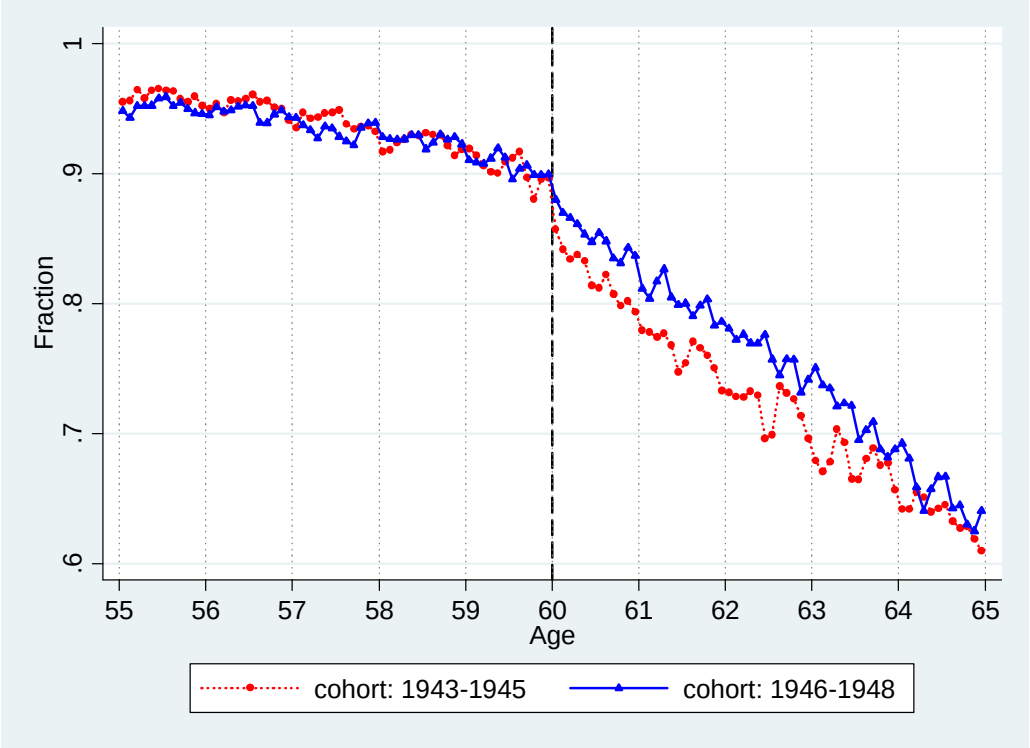
Table 5: Relative changes in retirement age

	Labor force	Employment
1938	-0.037**	-0.151***
	(0.019)	(0.020)
1939	-0.074***	-0.146***
	(0.019)	(0.020)
1940	-0.079***	-0.133***
	(0.019)	(0.020)
1941	-0.031	-0.083***
	(0.019)	(0.020)
1942	-0.091***	-0.140***
	(0.019)	(0.018)
1943	0.008	-0.025
	(0.019)	(0.020)
1944	0.053***	0.026
	(0.019)	(0.020)
1945	Base Year	
1946	0.174***	0.164***
	(0.018)	(0.019)
1947	0.247***	0.245***
	(0.018)	(0.019)

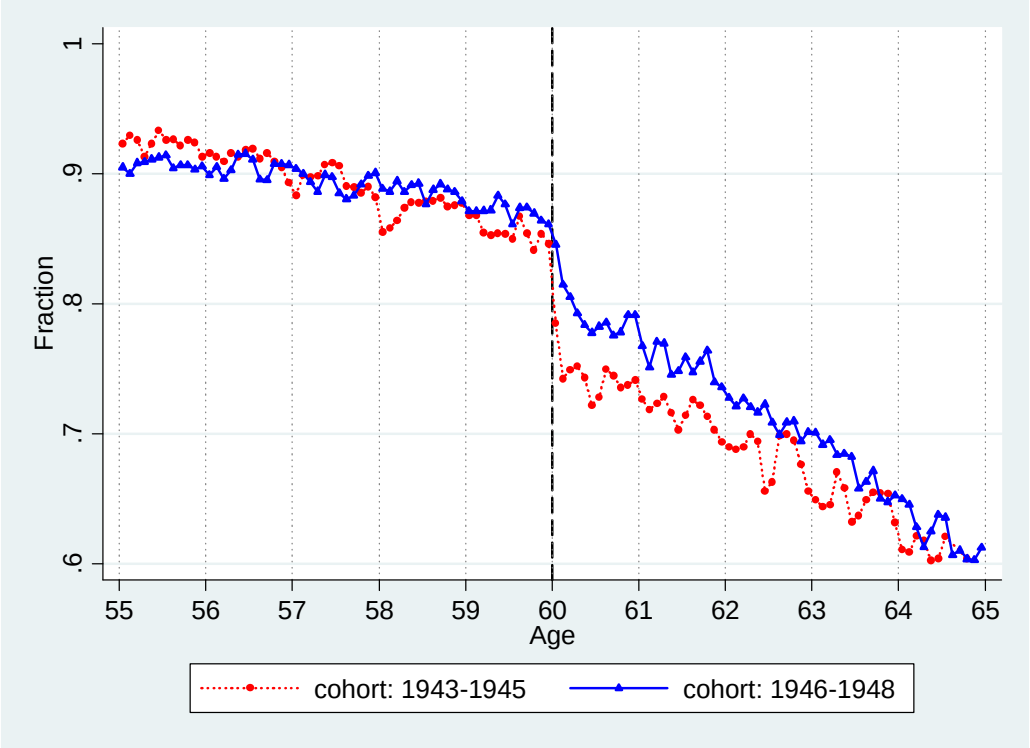
Note: Data are taken from basic questionnaire of Labour Force Survey. Each cell reports estimated relative changes of retirement age of cohort b, $T(b) = \sum_{a=59}^{65} \beta_{a,b}$ from separate regressions of equation (2) for each cohort. Standard errors are in parenthesis. ***, **, * denote significance at the 1%, 5% and 10% levels respectively, obtained from the test for T(b)≠0. Baseline is cohort born in the fiscal year 1940.

Figure 1: Age Profiles of Employment Outcomes for Cohorts born Before and After 1946

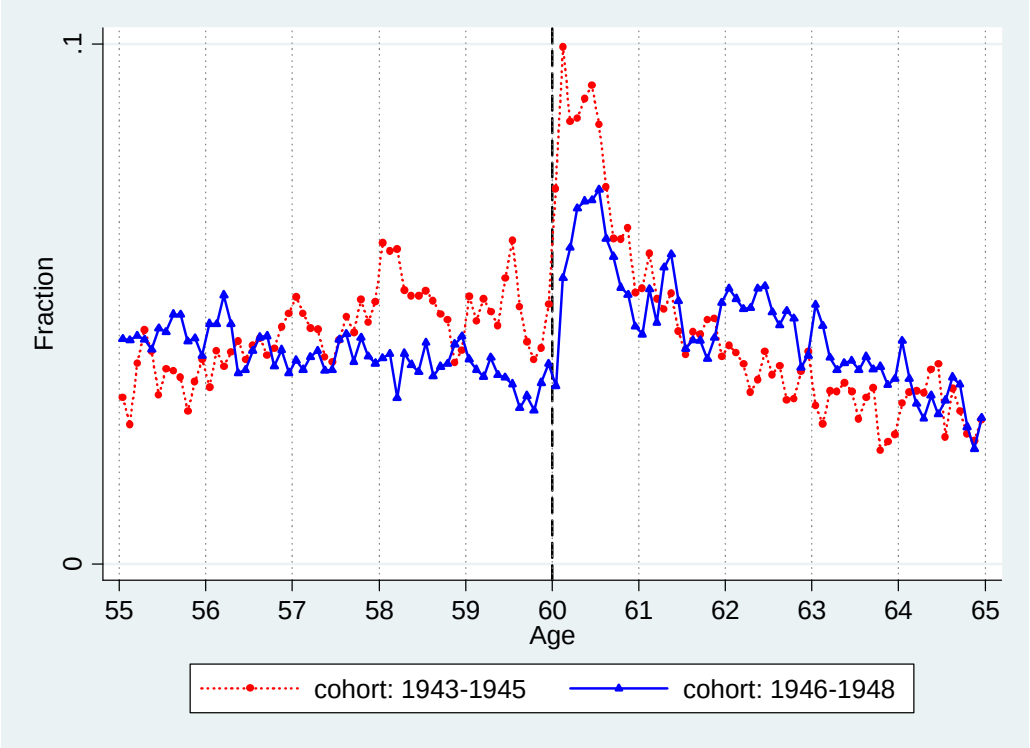
A. Labor force participation



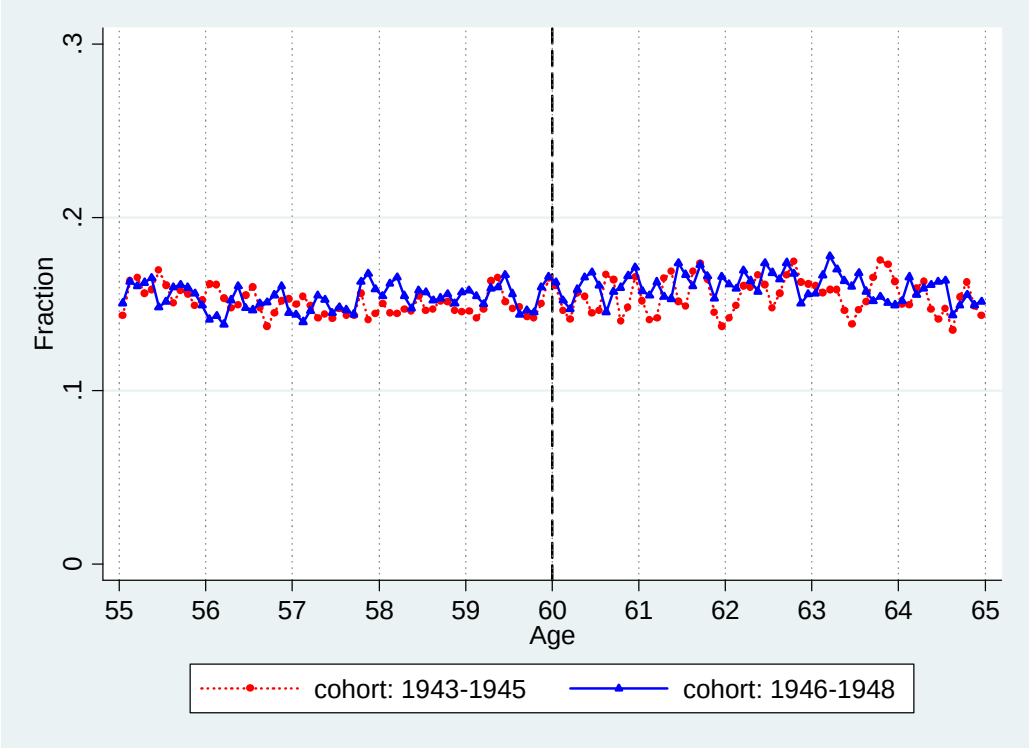
B. Employed



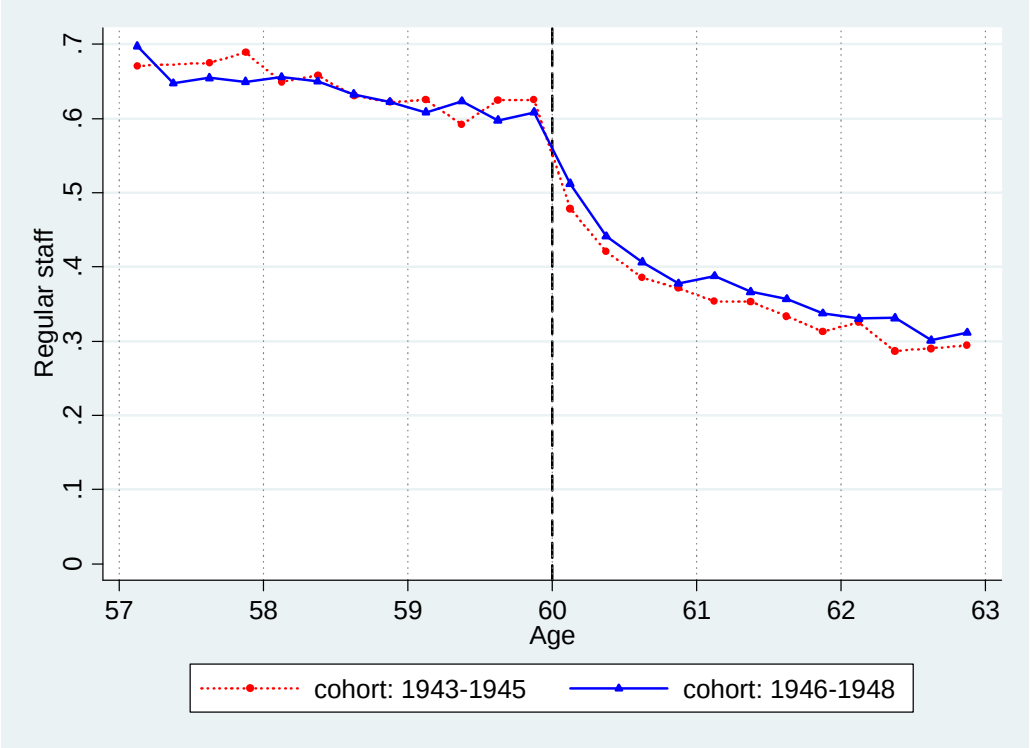
C. Unemployed



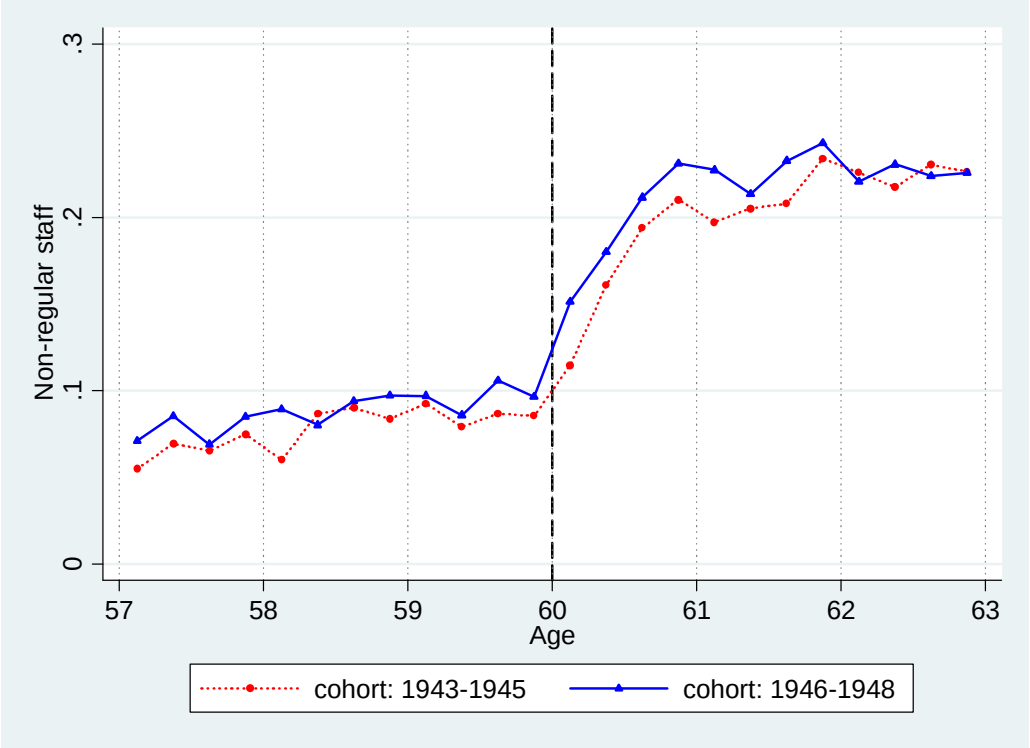
D. Self-employed (placebo)



E. Regular staff



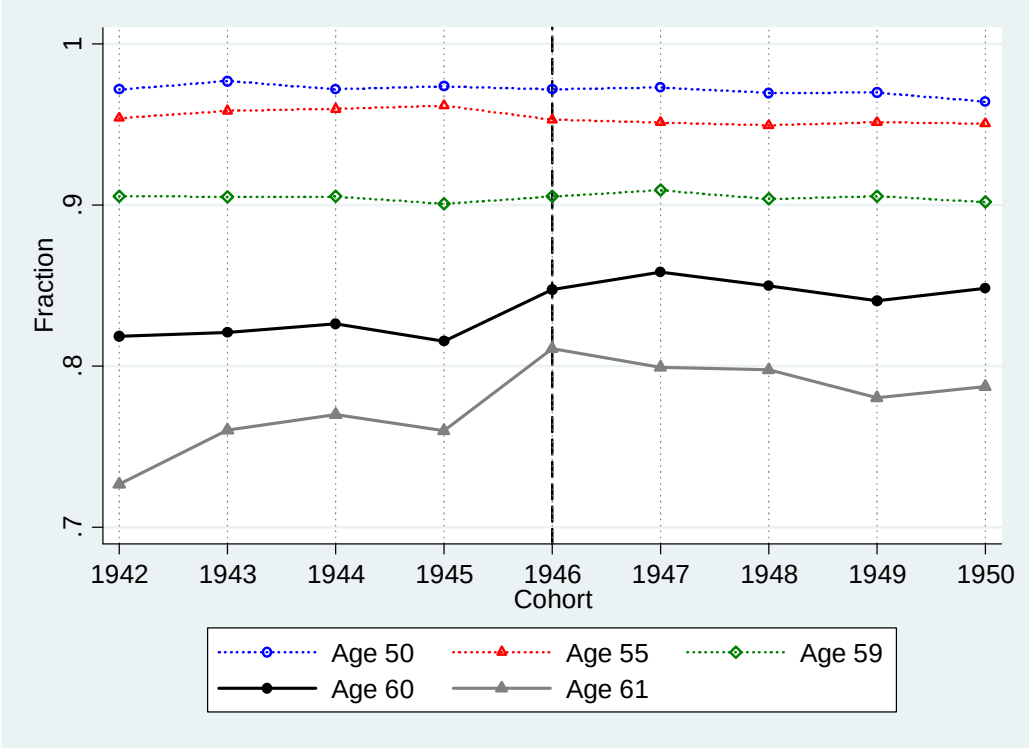
F. Non-regular staff



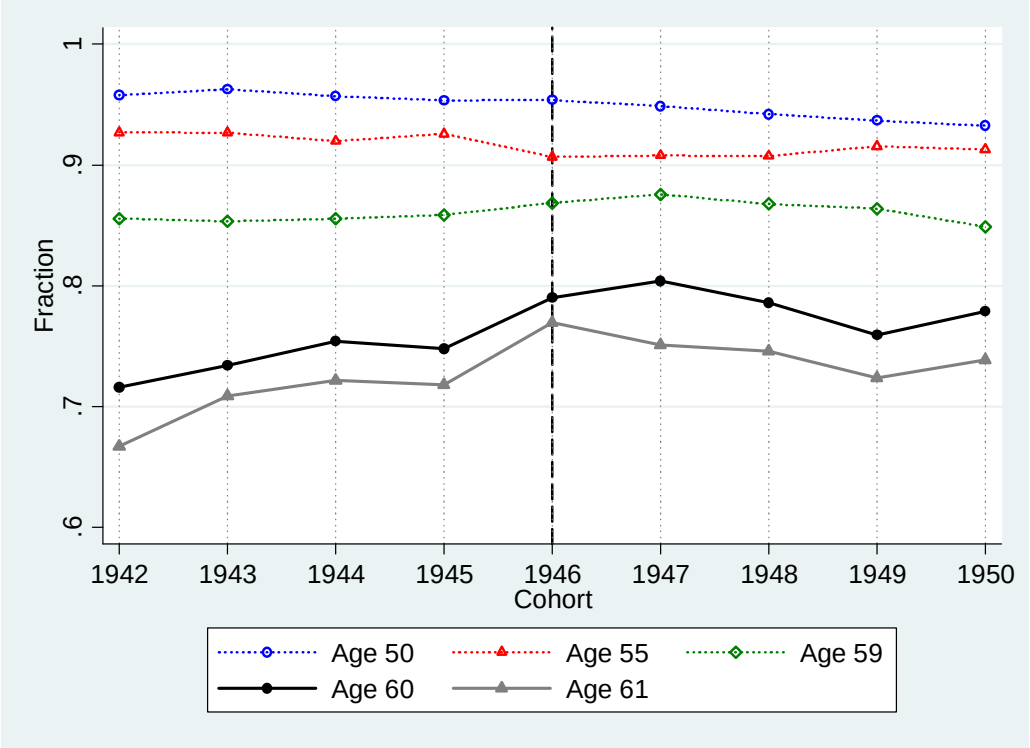
Note: Data for Panel A-D come from the basic questionnaire of Labour Force Survey, and the markers represent the averages of outcomes at age in month. Data for Panel E and F come from special of Labour Force Survey, and the markers represent the averages of outcomes at age in quarter instead of month due to small sample size.

Figure 2: Cohort Comparison at the Same Age

A. Labor force participation



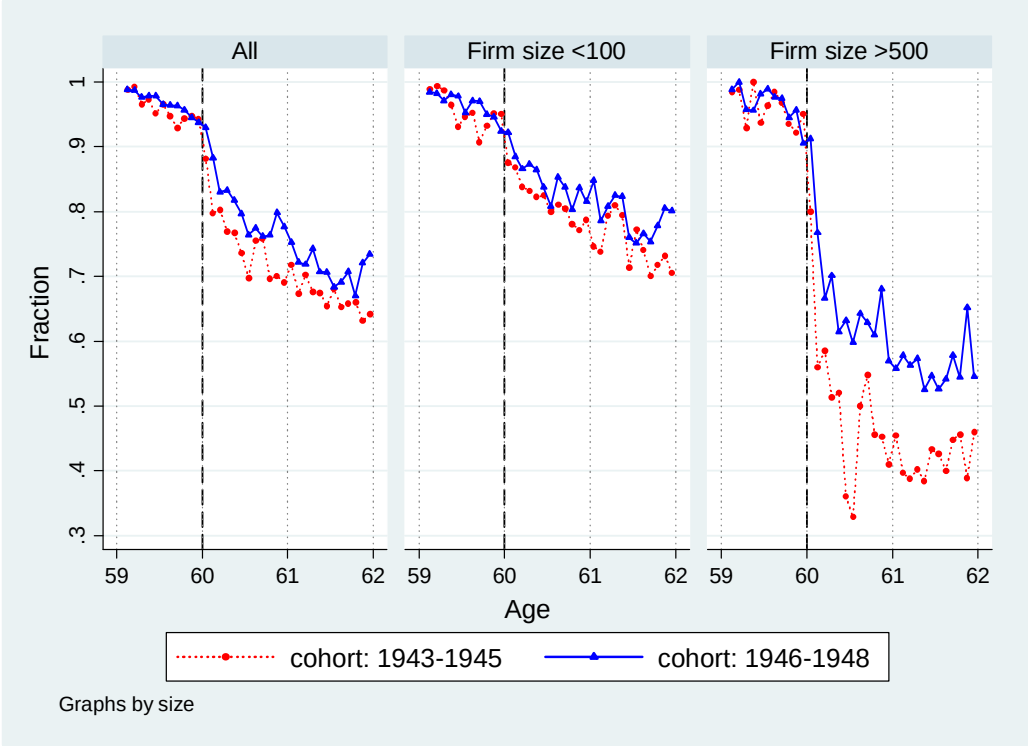
B. Employed



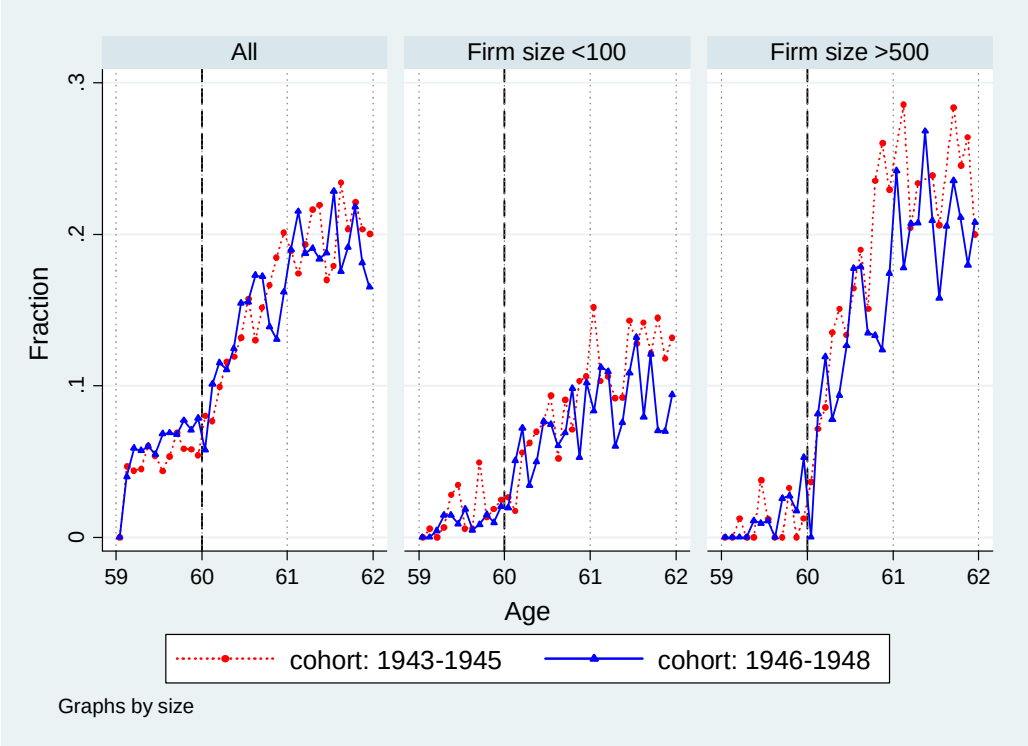
Note: Data are taken from basic questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in year instead of months.

Figure 3: Age Profiles of Employment Status among Those Employed at Age 59 (before and after 1946)

A. Remaining the same job as age 59



B. Employed in a different job than age 59



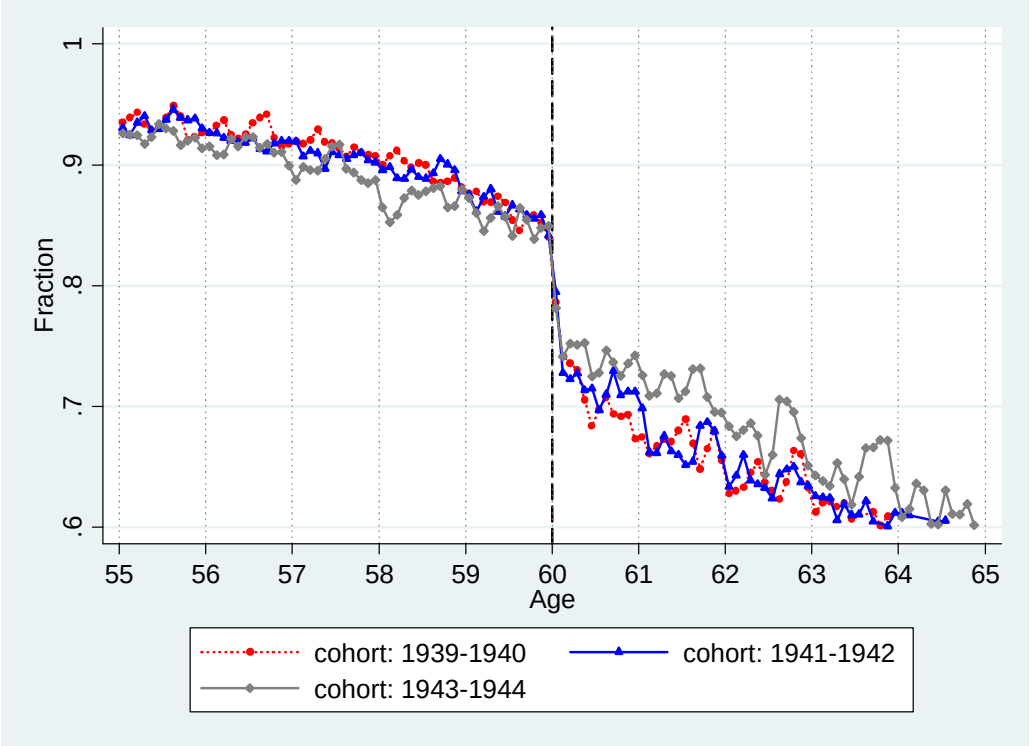
Note: Data come from the basic questionnaire. The markers represent the averages of outcomes at age in month.

Appendix Figures and Tables

Figure A1: Age Profiles of Employment Outcomes for cohorts grouped by pension eligibility age

A. Labor force participation

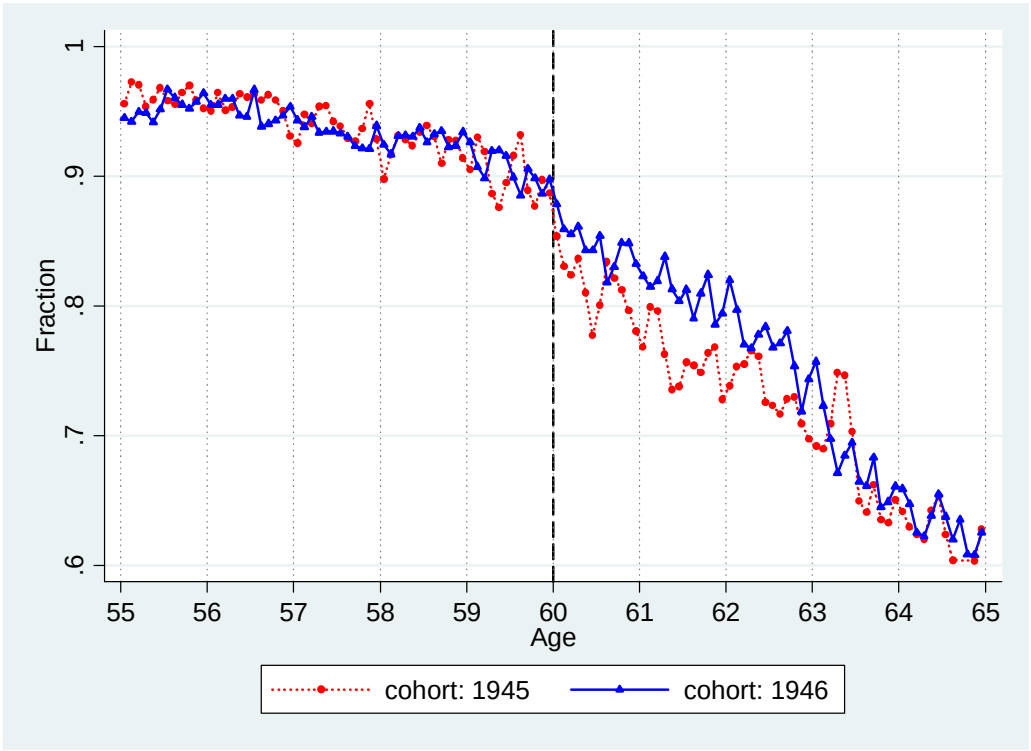
B. Employed



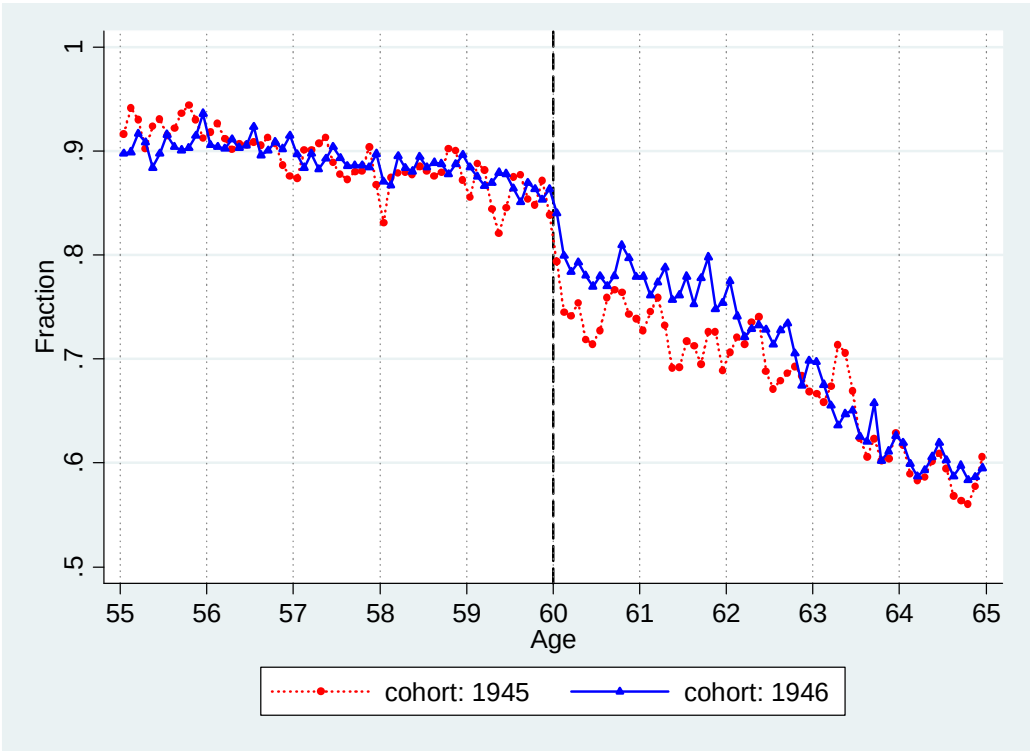
Note: Data come from the basic questionnaire. The markers represent the averages of outcomes at age in month. Pension eligibility age for cohorts born 1939-1940, 1941-1942, and 1943-1944, are 60, 61, and 62 respectively.

Figure A2: Age Profiles of Various Employment Outcomes
(cohort 1945 vs. cohort 1946)

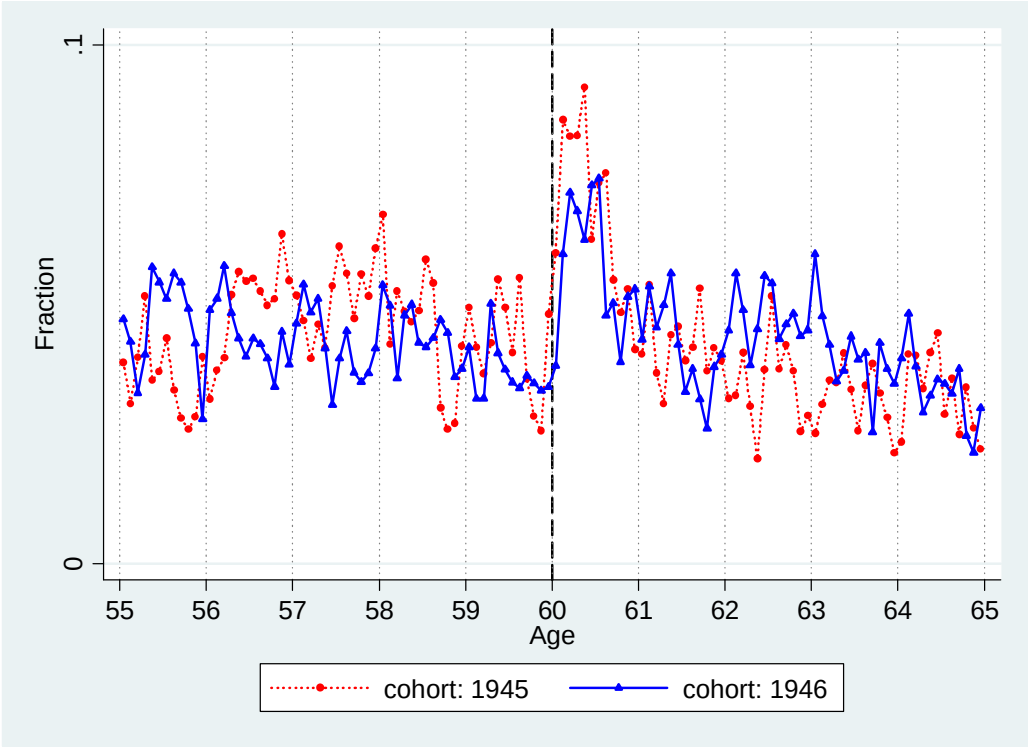
A. Labor force participation



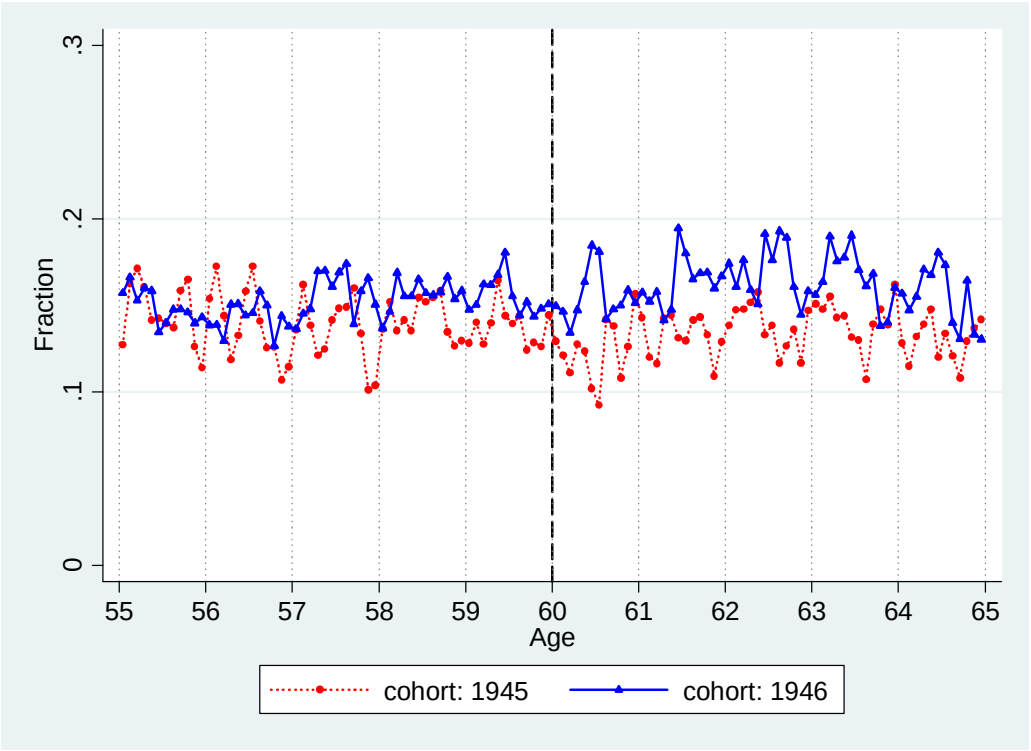
B. Employed



C. Unemployed



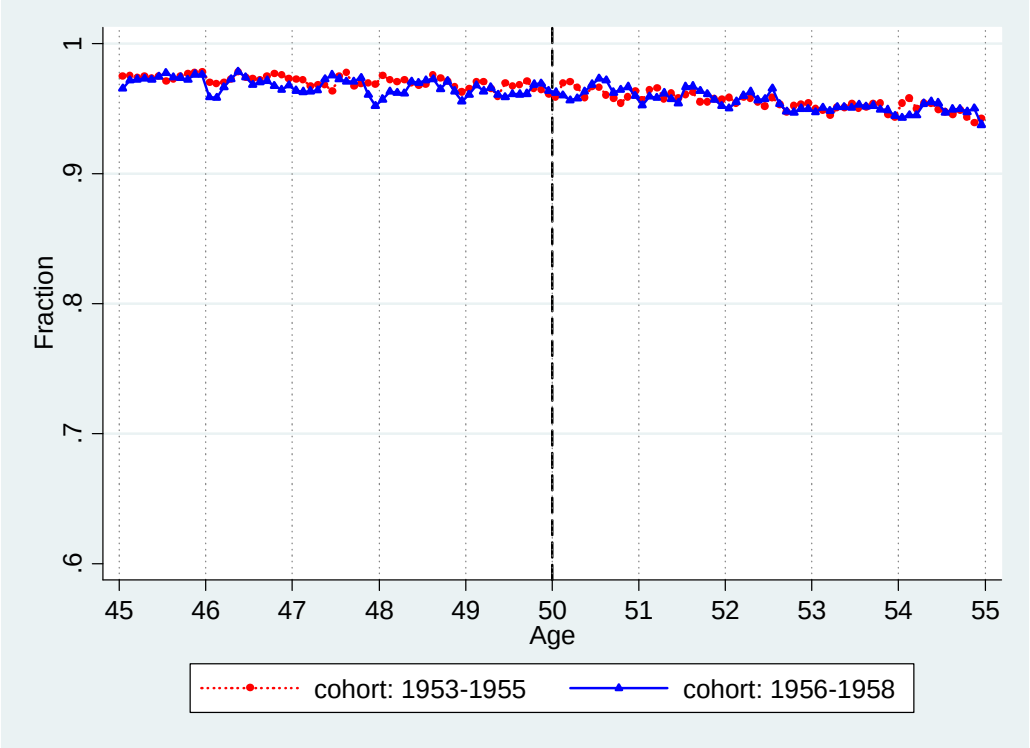
D. Self-employed



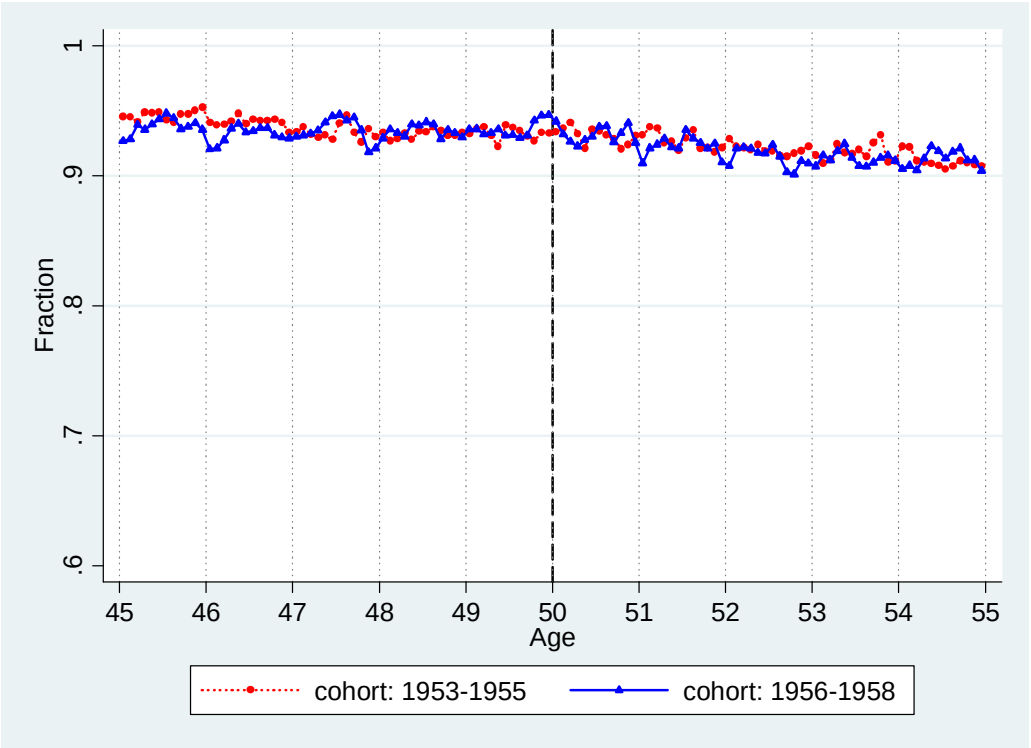
Note: Data come from the basic questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in month.

Figure A3: Age Profile of Employment Outcomes among Cohorts Who Reached 50 in Before and After the Period of EESL Revision

A. Labor force participation



B. Employed



Note: Data come from the basic questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in month.

Figure A3. Age Profiles of Each Employment Outcomes by Each Cohort

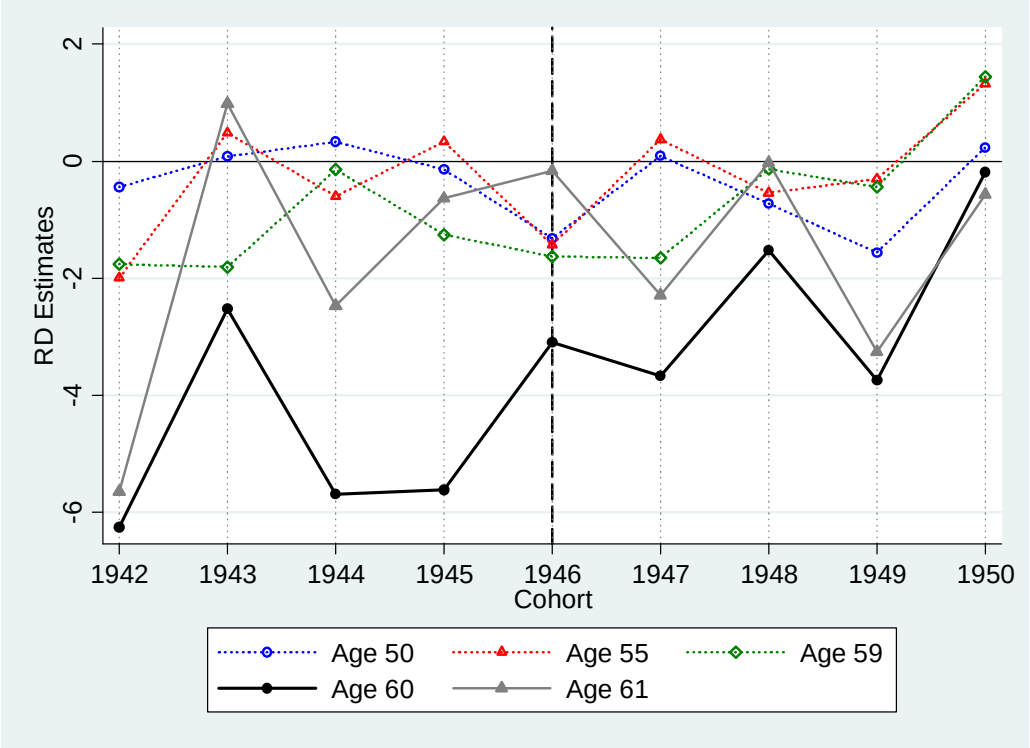
A. Labor force participation

B. Employed

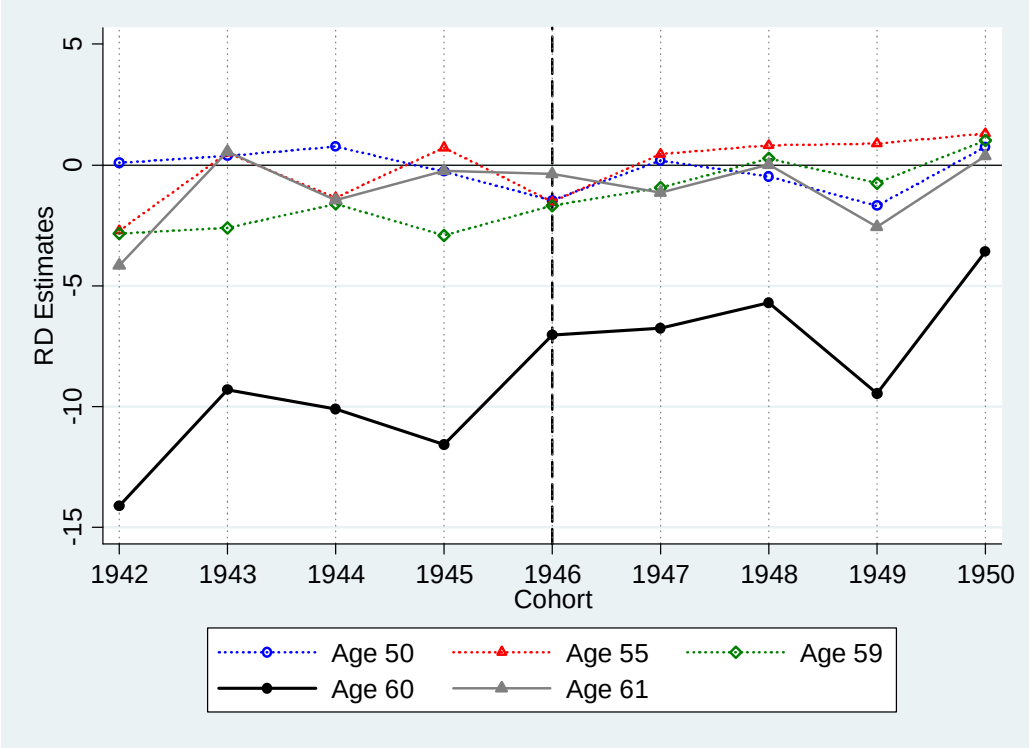
Note: Data come from the basic questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in month, and the lines represent fitted regressions from models that assume a linear in age profile fully interacted with a dummy for age 60 or older.

Figure A5: RD Estimates at Each Age by Cohort

A. Labor force participation



B. Employed



Note: Data come from the basic questionnaire of Labour Force Survey. Each markers represent the RD estimates from separate regressions for each cohort and each age cutoff.

Table A1. Robustness of Each Employment Outcome

A. Labor force participation

Cohort	Linear (main text) (1)	Linear No Dummy (2)	Linear + Weight (3)	Quadratic No Dummy (4)	Quadratic + Dummy (5)	N
1938	-6.17***	-5.96***	-5.70***	-5.30***	-5.35***	15,437
	(0.85)	(0.81)	(0.81)	(1.55)	(1.42)	
1939	-4.00***	-4.51***	-4.34***	-4.08**	-4.08***	16,464
	(0.93)	(0.84)	(0.72)	(1.60)	(1.00)	
1940	-5.23***	-4.25***	-3.43***	-2.22	-3.24***	17,576
	(0.79)	(0.90)	(0.85)	(1.51)	(0.93)	
1941	-2.66***	-2.48***	-2.66***	-2.93**	-3.82***	19,106
	(0.75)	(0.62)	(0.65)	(1.39)	(1.17)	
1942	-6.26***	-5.12***	-4.62***	-3.90***	-4.93***	17,400
	(0.99)	(1.09)	(1.11)	(1.49)	(1.45)	
1943	-2.53***	-2.29***	-2.49***	-2.78*	-2.88***	18,132
	(0.77)	(0.71)	(0.69)	(1.44)	(0.83)	
1944	-5.68***	-5.64***	-5.11***	-4.30***	-4.48***	15,565
	(0.76)	(0.69)	(0.55)	(1.66)	(1.06)	
1945	-5.61***	-4.92***	-4.75***	-4.50**	-5.85***	11,992
	(1.09)	(1.07)	(0.92)	(1.87)	(1.46)	
1946	-3.09***	-2.50***	-2.10***	-1.52	-2.01*	16,925
	(0.61)	(0.69)	(0.67)	(1.51)	(1.04)	
1947	-3.67***	-3.32***	-2.56***	-1.45	-1.23*	22,070
	(0.68)	(0.59)	(0.43)	(1.27)	(0.68)	
1948	-1.52***	-1.59***	-1.62***	-1.66	-1.85**	21,572
	(0.47)	(0.38)	(0.37)	(1.35)	(0.87)	
1949	-3.74***	-3.34***	-3.61***	-4.01***	-4.94***	20,551
	(0.54)	(0.58)	(0.54)	(1.36)	(0.87)	
1950	-0.19	0.07	-0.17	-0.52	-2.23**	18,605
	(0.98)	(0.74)	(0.59)	(1.43)	(0.89)	

Note: Data come from basic questionnaire of Labour Force Survey. Each cell is the estimate from separate estimated regression discontinuities at age 60. There are five alternative estimates of the RD at age 60: (1) the basic RD estimates from the main tables in the paper; (2) a RD estimate from the same specification as (1) without age 60 dummy; (3) a RD estimate from the same specification as (1) using triangular weight; (4) a RD estimate from a quadratic polynomial in age, fully interacted with dummy for age 60 or older, without age 60 dummy; (5) an RD estimate from the same specification as (4), with age 60 dummy. Robust standard errors clustered at age in months are in parenthesis. ***, **, * denote significance at the 1%, 5% and 10% levels respectively. All coefficients on RD estimates and their standard errors have been multiplied by 100, so they can be interpreted as percentage changes.

B. Employed

Cohort	Linear (main text) (1)	Linear No Dummy (2)	Linear + Weight (3)	Quadratic No Dummy (4)	Quadratic + Dummy (5)	N
1938	-11.35***	-10.13***	-8.95***	-7.16***	-8.30***	15,437
	(1.31)	(1.39)	(1.40)	(1.85)	(1.82)	
1939	-10.52***	-9.62***	-9.39***	-9.04***	-11.10***	16,464
	(0.83)	(0.99)	(1.10)	(1.89)	(1.30)	
1940	-10.09***	-8.22***	-6.94***	-5.04***	-6.53***	17,576
	(1.22)	(1.55)	(1.41)	(1.76)	(0.91)	
1941	-11.06***	-8.94***	-7.72***	-5.83***	-9.50***	19,106
	(0.79)	(1.80)	(2.09)	(1.70)	(1.27)	
1942	-14.12***	-11.99***	-10.98***	-9.51***	-12.56***	17,400
	(1.11)	(1.82)	(1.97)	(1.82)	(1.70)	
1943	-9.30***	-7.94***	-7.96***	-8.01***	-9.96***	18,132
	(1.08)	(1.38)	(1.45)	(1.74)	(1.58)	
1944	-10.11***	-9.52***	-8.68***	-7.40***	-8.15***	15,565
	(0.80)	(0.83)	(0.73)	(1.93)	(1.17)	
1945	-11.56***	-9.79***	-9.31***	-8.57***	-11.45***	11,992
	(1.22)	(1.67)	(1.86)	(2.15)	(2.09)	
1946	-7.03***	-5.40***	-4.63***	-3.49**	-5.56***	16,925
	(0.79)	(1.32)	(1.38)	(1.71)	(0.95)	
1947	-6.76***	-5.36***	-3.43***	-0.55	-1.14	22,070
	(1.40)	(1.46)	(1.19)	(1.45)	(0.82)	
1948	-5.71***	-4.74***	-3.84***	-2.5	-3.13***	21,572
	(0.83)	(0.93)	(0.80)	(1.54)	(1.03)	
1949	-9.45***	-7.94***	-8.26***	-8.72***	-11.56***	20,551
	(0.75)	(1.37)	(1.44)	(1.60)	(1.16)	
1950	-3.60***	-2.68***	-2.52**	-2.29	-4.99***	18,605
	(0.85)	(0.99)	(1.06)	(1.69)	(1.22)	

Note: See note in Panel A.

C. Unemployed

Cohort	Linear (main text) (1)	Linear No Dummy (2)	Linear + Weight (3)	Quadratic No Dummy (4)	Quadratic + Dummy (5)	N
1938	5.18***	4.17***	3.25***	1.86	2.95**	15,437
	(0.82)	(0.95)	(0.93)	(1.18)	(1.17)	
1939	6.53***	5.10***	5.05***	4.96***	7.02***	16,464
	(0.68)	(1.19)	(1.21)	(1.19)	(0.72)	
1940	4.85***	3.97***	3.51***	2.82***	3.29***	17,576
	(0.66)	(0.77)	(0.65)	(1.06)	(0.65)	
1941	8.40***	6.46***	5.06***	2.90***	5.68***	19,106
	(0.61)	(1.55)	(1.70)	(1.12)	(0.66)	
1942	7.87***	6.87***	6.36***	5.62***	7.62***	17,400
	(0.67)	(1.03)	(1.16)	(1.23)	(0.83)	
1943	6.77***	5.65***	5.48***	5.23***	7.09***	18,132
	(0.82)	(1.08)	(1.19)	(1.13)	(1.34)	
1944	4.43***	3.87***	3.57***	3.09***	3.66***	15,565
	(0.88)	(0.78)	(0.72)	(1.16)	(1.33)	
1945	5.95***	4.88***	4.56***	4.07***	5.60***	11,992
	(0.76)	(1.06)	(1.21)	(1.24)	(1.29)	
1946	3.94***	2.90***	2.53***	1.97**	3.55***	16,925
	(0.52)	(0.83)	(0.89)	(0.94)	(0.88)	
1947	3.08***	2.04**	0.86	-0.9	-0.09	22,070
	(0.82)	(0.99)	(0.88)	(0.80)	(0.51)	
1948	4.18***	3.15***	2.22***	0.85	1.28**	21,572
	(0.81)	(0.92)	(0.81)	(0.85)	(0.62)	
1949	5.71***	4.59***	4.65***	4.71***	6.61***	20,551
	(0.80)	(1.04)	(1.07)	(0.98)	(1.39)	
1950	3.41***	2.75***	2.35***	1.77*	2.76***	18,605
	(0.67)	(0.72)	(0.75)	(1.03)	(1.02)	

Note: See note in Panel A.