The Effects of Elderly Employment Stabilization Law on Labor Supply and Employment Status*

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Abstract

Given the fast aging population and resulting pressure on the social security system, the government of Japan has been trying to ensure that older people can continue to work. One of such attempts is the revision of the Elderly Employment Stabilization Law. Starting from 2006, employers are legally obliged to introduce a system to continue employment up to the pension eligibility age. This paper examines the effect of this legal enforcement on old men's labor supply and employment status, by comparing the affected cohorts and cohorts a few years older than the affected cohorts. We found that the revision actually increased the employment rate of men in the affected cohorts in their early 60s. At the same time, increase in non-regular employment comprise of substantial fraction of this increased employment, suggesting that productivity of those workers is lower than prevailing wages of regular employees of their age.

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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 in the OECD countries. Given this fast aging population and resulting pressures on the social security system, the government of Japan has been trying to ensure that older people can stay in the labor force longer. One of such attempts is the revision of the Elderly Employment Stabilization Law (here after EESL). Starting from 2006, employers have to institute a system to continue employment up to the pension eligibility age, which has already been gradually raised by a year from the age of 60, previous mandatory retirement age, in every two years since 2001.

This paper examines the effect of this revision on old men's labor supply and employment status. Using the individual data from Labour Force Survey, we compare cohorts affected by the EESL revision and those not affected. Specifically, cohorts born in 1946 or later (i.e., those who turn 60 in 2006 or later) are affected by both the rise in pension eligibility age and the EESL revision, whereas cohorts born in 1941-1945 (i.e., those who turn 60 in 2001-2005) are affected only by the rise in pension eligibility age. 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. Also, by comparing the cohorts born in 1941-1945 and the cohorts born before 1941, we can isolate the effects of the changes in pension eligibility age.

A large body of literature has found 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). 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 behavior, the EESL revision in Japan forced the employers to increase their labor "demand" to match the potential increase in the labor supply. If the legal obligation to continue employment actually increases employment after the previous mandatory retirement age, it implies that old men's employment is constrained by limited labor demand.

We find that the EESL revision actually increased the employment rate of men in the affected cohorts in their early 60s. Moreover, the effect of EESL on employment is larger than the effect of preceding increase in the pension eligibility age. This result implies that, in Japan in the 2000s, the limited demand of labor was binding the employment of men in their early 60s. Our findings are consistent with Neumark and Stock (1999), who find that legal protection of older workers' employment actually increases their employment rate in the United States.

We further decompose the increased employment into different types of employment contracts and find that an increase in non-regular staffs comprises of substantial fraction of the increase in overall employment. Since non-regular staffs are typically paid much lower wages than regular staffs, our result suggests that productivity of those workers is lower than prevailing wages of regular employees of their age. Hence, our finding can be viewed as evidence for Lazear (1979) type contracts in which older workers are paid more than their productivity, and it is consistent with the stylized fact of steeper earnings-tenure profile in Japan.

Our results are also consistent with the earlier study on the EESL revision by Yamamoto (2008).[1] Using data from Keio Household Panel Survey, Yamamoto (2008) finds that the revision of EESL in 2006 substantially increased both regular and non-regular employment of the affected cohorts among men who had been salaried workers in their 50s, whereas no such increase was observed for the control group that consists of those who had been self-employed in their 50s. There are two main differences between Yamamoto (2008) and our approach: first, we distinguish the effects of the EESL revision from the effect of pension reform, and second, we use a nationally representative data with a large sample size.

The main contribution of this paper is that we analyze the two policy changes (pension reform and legal obligation of continuous employment) in a unified framework. The gap in the timing of implementation between the two policy changes allows us to explore whether the limited labor demand is a binding constraint in the old men's labor market in Japan. Also our setting offers a unique opportunity to examine the types of the labor contracts employers choose, because the EESL allows employers to alter the employment contracts when workers reach the previous mandatory retirement age of 60.

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.

[1] 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.

2 Institutional Background

Japan's population is aging rapidly. According to Population Census, the ratio of elderly (65 years or older) has increased from 14.6% in 1995 to 23.1% in 2010, which is already the highest among the OECD countries. This ratio is expected to keep rising: according to the projection by National Institute of Population and Social Security Research, it is expected to exceed 30% by 2025. 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 trying to ensure that old workers can stay in the labor force longer by revising the Elderly Employment Stabilization Law (hereafter EESL). This revision is intended to make employers continue to employ older 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 of old-age pension for employees in private and public sectors had been 60 until 2001, most employers in private companies were able to work until they became eligible for 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, which is the prevailing mandatory retirement 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.[2] 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 as summarized in the right columns of Table 1. Specifically, starting in 2001, the eligibility age for male is raised from 60 by one year per every two years, and it will be completed in 2013, when the cohort born in 1949 reaches age 64. The oldest cohort affected by this gradual rise in pension eligibility age is those born in 1941, who were 60 years old in 2001. 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.

For female, the reform on pension eligibility age is going to take place 5 years after the change for male. Due to this difference in the timing, we limit our sample to male.

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

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.

This pension reform led to a series of further revisions of the EESL, as summarized in the left columns of Table 1.[3] The most notable change is the revision passed in 2004 and enacted in 2006, which legally mandated employers to institute a system to continue employment until the pension eligibility age.

There are three important features of this revision for our empirical analysis. First, there is a time lag between the rise in the pension eligibility age and the revision of EESL; the rise in pension eligibility age stated in 2001 whereas the revision of EESL enacted in 2006. Both reform 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 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 isolate the effect of mandated employment from the effect of the rise in pension eligibility age. Also, by comparing the cohort born in 1941-1945 and the cohort born before 1941, we can identify the effects of the changes in pension eligibility age.

Second, this revision does not require employers to raise the mandatory retirement age. Raising the mandatory retirement age means that the employer continues to hire the worker *on the same contract as a regular staff*. Under the current EESL, employers can terminate the contact as a regular staff and re-employ the same person as a non-regular staff with much lower wages.

[3] The final goal of the revision in EESL is to ensure employment until age of 65, which is the maximum age at which the government intends to raise the pension eligibility age.

Third, 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. Hence, it is not *a priori* obvious whether the revision actually had significant effects on employment of old men in their 60s.

3 Data: Labour Force Survey

Our primary sources of data are 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. The basic questionnaire is distributed to about 40 thousand households, and the questions on employment status are asked to 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 and employment status than the basic questionnaire, is distributed to 10 thousand households among the subset of the basic questionnaire. The survey is conducted as of the last day of each month, and the reference period is the last week of the month.

The data from the basic questionnaire are available from 1986-2011. Thus, the youngest cohort that can be followed up to age 65 is the cohort born in 1946, which is the first cohort fully affected by the EESL revision implemented in 2006 (i.e., cohort who is age 60 in 2006). We focus on the cohorts born between 1938 and 1950. The data from the special questionnaire is available only for 2002-2011, thus analyses based on the special

questionnaire are limited to cohorts born between 1943 (i.e., 59 years old in 2002) and 1950 (i.e., 61 years old in 2011).

In order to identify the discontinuity in outcome variables at the specific age, the precise information on age is essential. The Labour Force Survey asks the year and month of birth to all adult respondents, thus we can easily compute the age in months at the survey month.

The outcome variables we examine are the following: labor force participation rate, employment to population rate, population ratios of different types of employment, and the ratio of unemployment and discouraged worker in the population. The definition of each variable is listed in Figure 1. Data from the special questionnaire allow use to distinguish regular staffs ("*seishain*" in Japanese) from non-regular staffs ("*hiseiki*" in Japanese) and discouraged workers from other non-labor force.

Summary statistics of this dataset are presented in Table 3, and Figure 2 shows age-profiles of the selected outcome variables for the cohort born in 1938, i.e., those not yet affected by the pension reform or the EESL revision. Figure 2 shows sharp drops in labor force participation, employment, and the population ratio of regular employees at the age of 60, the prevailing mandatory retirement age for this cohort. There is also a small discontinuous jump in unemployment at the age of 60, probably due to the mandatory retirement. In contrast, there is no clear discontinuity in the ratios of self-employed and temporary employee, both of which are not subject to the mandatory retirement.

4 Empirical Strategy

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

Since each reform affects cohorts who turn 60 years old after the reform, we estimate the jumps at the age of 60 for various outcome variables in an age regression discontinuity design framework, and see the change in the magnitude of jumps across affected and non-affected cohorts.[4]

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 a 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-age-60 dummy, a dummy variable 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 have been multiplied by 100 unless otherwise specified, so 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-age-60 dummies, as described in equation (1). The right hand side of equation (1) includes a dummy for being exactly at the age cutoff in months ($1[A_i = c]$) for the following reasons. First, since age in months is constructed by subtracting the birth date (in months) from survey months, the age at exactly on the age cutoff include those just below and above age cutoff. Second, according to a survey conducted by the Ministry of

[4] Examples of past studies that use an age regression discontinuity design to examine various outcomes include Card et al., 2008, 2009; Chay et al., 2011; Anderson et al., 2012; Carptender and Dobkins, 2010; Lee and McCrary, 2009.

Health, Labor and Welfare, some firms define the date of mandatory retirement age as the exact day on which the worker reaches the retirement age, and some other firms define it as the end of the month when the worker reaches the retirement age.

We also perform robustness checks by running the baseline specification without the dummy for being exactly at the age of 60, using triangular weights to put less weight for observations far from the cutoff, and adding quadratic terms in age fully interacted with the post-age-60 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

In order to see how the change at 60 has lasting impact on early 60s, we estimate relative changes in the retirement age by cohort, following Mastrobuoni (2009). Specifically, we estimate the following equation using the sample of men born in year 1938-1946 in the basic questionnaire:

$$y_i = \sum_{a=59}^{65} 1(A_i = a)(\alpha_a + \sum_{b \neq 1942} \beta_{a,b} 1(B_i = b)) + \varepsilon_i \ldots (2)$$

y_i represents one of the outcome variables (dummies for labor force participation, employment, and being a regular employee). A_i is the age of individual i, and B_i is his year of birth. Coefficients $\beta_{a,b}$ represents the difference in cumulative distribution function of retirement age at age a between cohort b and cohort 1942, the baseline cohort. As a robustness check, we control for education, which is available only from the special questionnaire, using cohorts born in 1942-1946. For this robustness check, we choose 1942, the oldest cohort whose employment status at age 59 is available from the special questionnaire, as the baseline cohort.

Under an assumption that a retired person never comes back to the labor force or employment,[5] a plot of $\alpha_a + \beta_{a,b}$over age a can be interpreted as 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 age 59 is the same across cohorts, $T(b) = \sum_{a=59}^{65} \beta_{a,b}$ can be interpreted as the difference in retirement age of cohort born in year b compared to the baseline cohort born in 1942.

Since both the rise in pension eligibility age and the revision of EESL are implemented in the beginning of fiscal year (i.e., April 1st), ideally, we should define the cohort based on fiscal year. However, at this moment, the data are available only up to December 2011, thus we cannot fully trace those born in the last quarter of fiscal year 1946. Thus, we estimate the same model defining cohorts by fiscal year and calendar year. Also, we estimate the same model that controls for education, using the special questionnaires for cohorts 1942-1946.

5. Results

5.1 Changes in employment status over age across cohorts

Figure 3 plots the average of selected outcome variables at age in months for the two groups of cohorts: born before 1946 (cohorts 1943-1945) and after 1946 (cohorts 1946-

[5] This assumption may be too restrictive for the cases of employment and regular employees, 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.

1948).[6] The former group is affected only by the change in pension eligibility age, while the latter is affected both by the change in pension eligibility age and the legal obligation of continuous employment.

Panel A and B visually shows that cohorts affected by the legal obligation are apparently more likely to stay in the labor force and to be employed after the age of 60 than cohorts affected only by the change in the pension eligibility age.[7] While the age profiles before the age of 60 are similar across the two groups, the decline in labor force participation and employment at the age of 60 became less pronounced for the cohorts affected by the legal obligation of continuous employment. Furthermore, labor force participation and employment of the group born after 1946 stay higher than the group born before 1946 until around the age of 64. This pattern suggests that the positive effect of obligation of continuous employment on employment and labor force participation persist for a couple of years after the cohort turns 60. Panel C also shows that the group born after 1946 are less likely to be unemployed than the group born before 1946.

Panel D and E shows that, while the revised EESL slightly increased the ratio of regular staffs in population right after the age of 60 (i.e., smaller drops at the age of 60 for those born after 1946), the ratio of non-regular staffs in population was also increased. These two graphs imply that the legal obligation of continuous employment increased the number of workers who can continue to work as regular staffs on the one hand, but on the other hand, a substantial number of workers are terminated the contract as regular staff at

[6] We also compare the cohorts that are affected by the change in the pension eligibility age (cohorts 1941-1943) and cohort that are not affected by it (cohorts 1938-1940) in Appendix Figure A1. The graphs suggest that that pension eligibility does not seem to substantially affect the labor force participation as well as employment.

[7] The graphs that just compare adjacent cohorts (the cohorts born in 1945 and 1946) can be found in the Appendix figure A2.

the age of 60 and switched to positions as non-regular staff, which are usually paid much less than regular staffs.

5.2 Estimates of discontinuity in employment at the age of 60

As shown in Figure 3, we find that cohorts affected by the legal obligation of continuous employment are more likely to stay in the labor force, and to be employed after the age of 60. The figures also show that the effects are pronounced at the age of 60. To gauge the size of the jumps at the age of 60, we estimate equation (1) for each cohort and for each outcome variables.

Table 4 summarizes the RD estimates of the jumps at the age of 60 for several employment related outcomes for each cohort separately.[8] Column (1) shows roughly 4-5 percentages points of drops in labor participation and roughly 9-10 percent points of drops in employment at the age of 60 for cohorts born before 1946. In contrast, for cohorts born after 1946, who are affected by the legal obligation law, the estimated drops in both labor force participation and employment are smaller. This result suggests a substantial increase in employment and labor force participation among men who have just reached the age of 60.[9]

Specifically, the decrease in labor force participation at the age of 60 is 4.9 percentages points for the cohort born in 1945 and 2.5 percentage points for the cohort born in 1946. This result means that the 2.4 percentage points increase (4.9 minus 2.5) in labor force participation at age 60 for the cohort born in 1946 than for the cohort born in 1945. The same patterns are observed for employment reported in column (2); the

[8] The graphs for each cohort separately for each outcome are summarized in Appendix Figures A3.
[9] The RD estimates from other specifications are summarized in Appendix Table A1.

absolute value of the decline in employment is 9.8 percentage points for the cohort born in 1945 and 5.4 percentage points for the cohort born in 1946, suggesting 4.4 percentage points increase in employment at age 60.

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 4.9 percentage points for those born in 1945 and 2.9 percentage points for those born in 1946, implying 2.0 percentage points decline in the unemployment-to-population ratio at the age of 60. Since the obligation of continuous employment decreased unemployment among men at the age of 60, the drop in employment at the age of 60 shrunk more than the drop in labor force participation.[10] Furthermore, columns (4)-(6) shows that increase in employment at age 60 are exclusively driven by the increase in the regular employees[11], and not by the temporary employees (which include workers who work on daily basis) or self-employed.

5.2 Estimated relative changes in the retirement age by cohort

So far, we have shown that the revision of EESL has brought substantial changes in men's employment status at the age of 60. This section explores how the revision of EESL beyond the age of 60 by estimating the relative changes in the retirement age by cohort.

We estimate equation (2) to calculate $T(b) = \sum_{a=59}^{65} \beta_{a,b}$, the estimated changes in retirement age of cohorts born in year b relative to cohort 1942. Table 5 reports the estimated *T(b)* for cohorts born in 1938-1946. In all specifications, cohorts born in 1944-1945 statistically significantly stay longer in the labor force than the older cohorts, and

[10] Note that labor force participation (LFP) is defined as the sum of employed and unemployed.
[11] Note that regular *employees* are not the same as regular *staffs*. See Figure 1 about the definition of each variable.

cohorts born in 1946 stay even longer. The point estimates for cohort 1946 imply that one in five 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 and regular employees as well. Our results show that the revision of the EESL indeed delayed retirement of men in the affected cohorts.

Compared to the changes after the EESL revision, the change around 1941, the cohort for whom the pension eligibility age started to rise, is not very clear. The estimated differences in retirement age between 1942 and earlier cohorts are not quite consistent. We do not find significant differences in labor force participation in both fiscal-year base and calendar-year base specifications, and employment rate in the fiscal-year base specification. On the other hand, however, the differences in the ratio of regular employee are statistically significant. Nonetheless, the increase in the length in employment as a regular employee seems to be accelerated for cohorts born after 1945, even for the regular employee.

For all outcome variables, adding control for education, as presented in the even columns of Table 5, does not qualitatively affect our estimates. These results indicate that potential differences in education across cohorts are not the sources of severe biases to our estimates.

Further, we estimate equation (2) for other employment outcomes such as being employed as regular staff and non-regular staff, unemployed and discouraged from labor force. We do not include these variables in Table 5 because, for these variables, the assumption that a person who exited from this status would never come back to the same status is not plausible, and thus $T(b) = \sum_{a=59}^{65} \beta_{a,b}$ are difficult to interpret. However, it

is informative to estimate $\beta_{a,b}$ for these outcomes as well, since $\beta_{a,b}$ represents the difference in the outcome variable at age a between cohort b and cohort 1942. Table 6 reports estimated $\beta_{a,b}$ for age 60-65.

Taken together, columns (2), (4) and (5) imply that, although the probability of employment as a regular staff increased substantially for cohorts born after 1944, some of the observed increase in employment due to the EESL revision comes from the increase in employment as a non-regular staff. That is, some employers offer positions as a non-regular staff for their employees who have reached the mandatory retirement age. This suggests that productivity of those workers is lower than prevailing wages of regular employees of their age. On the other hand, there are no clear pattern observed for unemployment and discouraged worker, although unemployment might have decreased for cohorts born in 1945 and 1946.

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 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. Also, a substantial portion of the increased employment comes from an increase in non-regular staffs, who are typically paid much lower than regular staffs. This

result suggests that the productivity of these workers who were not hired as regular staff is lower than the prevailing wages of regular staffs in their age. Thus, our results can be interpreted as evidence for the existence of Lazear (1979) type contracts, in which young workers are paid lower than their productivity and older workers are paid higher than their productivity. It also implies that regular staffs in their late 50s tend to be over-paid and this might be a reason of the limited labor demand.

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 EESL. 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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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

	1938-1950	1938-1940	1941-1945	1946-1950
Sample size	752,163	189,939	315,356	246,868
Labor force	76.6%	73.1%	73.9%	82.8%
Employed	71.7%	67.7%	69.2%	78.0%
Unemployed	4.9%	5.3%	4.7%	4.8%
Regular employee	47.1%	41.6%	44.5%	54.6%
Self employed	16.4%	18.2%	15.8%	15.6%

B. From special questionnaire

	1942-1950	1942-1945	1946-1950
Sample size	106,105	56,799	49,306
Labor Force	79.2%	74.0%	85.1%
Employed	74.4%	69.3%	80.2%
Regular employees	50.5%	44.5%	57.5%
Regular staffs	30.0%	24.5%	36.3%
Non-regular staffs	16.5%	17.2%	15.6%
Unemployed	4.8%	4.7%	4.9%
Discouraged	2.2%	2.5%	1.8%
Education			
High school or less	70.7%	73.2%	67.9%
Jr. college	4.6%	4.1%	5.1%
4yr college or more	19.7%	18.0%	21.8%
Never go to school	0.1%	0.2%	0.1%
Unknown	4.9%	4.6%	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)

	LFP	Employed	Unemployed	Regular employee	Temporary employee	Self-employed	
Cohort	(1)	(2)	(3)	(4)	(5)	(6)	N
1938	-5.96***	-10.13***	4.17***	-10.72***	2.07***	-2.19**	15,437
	(0.81)	(1.39)	(0.95)	(1.95)	(0.45)	(1.03)	
1939	-4.51***	-9.62***	5.10***	-10.06***	0.35	0.47	16,464
	(0.84)	(0.99)	(1.19)	(1.60)	(0.55)	(1.37)	
1940	-4.25***	-8.22***	3.97***	-8.27***	0.69	-0.51	17,576
	(0.90)	(1.55)	(0.77)	(1.87)	(0.55)	(0.89)	
1941	-2.48***	-8.94***	6.46***	-9.29***	1.02**	-0.74	19,106
	(0.62)	(1.80)	(1.55)	(2.02)	(0.47)	(0.90)	
1942	-5.12***	-11.99***	6.87***	-11.38***	1.50*	-2.28**	17,400
	(1.09)	(1.82)	(1.03)	(1.64)	(0.77)	(0.96)	
1943	-2.29***	-7.94***	5.65***	-7.82***	-1.29***	1.10	18,132
	(0.71)	(1.38)	(1.08)	(1.24)	(0.30)	(1.47)	
1944	-5.64***	-9.52***	3.87***	-9.49***	0.64	-0.32	15,565
	(0.69)	(0.83)	(0.78)	(1.08)	(0.57)	(0.78)	
1945	-4.92***	-9.79***	4.88***	-9.40***	1.82***	-1.95**	11,992
	(1.07)	(1.67)	(1.06)	(1.86)	(0.67)	(0.86)	
1946	-2.50***	-5.40***	2.90***	-6.55***	0.36	0.21	16,925
	(0.69)	(1.32)	(0.83)	(1.79)	(0.54)	(0.73)	
1947	-3.32***	-5.36***	2.04**	-5.38***	0.27	-0.81	22,070
	(0.59)	(1.46)	(0.99)	(1.71)	(0.69)	(1.12)	
1948	-1.59***	-4.74***	3.15***	-8.03***	2.35***	0.75	21,572
	(0.38)	(0.93)	(0.92)	(1.43)	(0.63)	(0.84)	
1949	-3.34***	-7.94***	4.59***	-9.50***	2.53***	-1.06**	20,551
	(0.58)	(1.37)	(1.04)	(1.72)	(0.65)	(0.53)	
1950	0.11	-2.72***	2.84***	-2.57*	-0.25	0.39	18,394
	(0.77)	(1.01)	(0.75)	(1.42)	(0.56)	(0.81)	

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

A. Fiscal year base

	Labor force		Employed		Regular employee	
	(1)	(2)	(3)	(4)	(5)	(6)
1938	0.046***		-0.011		-0.078***	
1939	0.007		-0.029		-0.094***	
1940	0.006		-0.017		-0.064***	
1941	0.056***		0.041**		0.035*	
1942			base year			
1943	0.103***	0.133***	0.132***	0.181***	0.112***	0.160***
1944	0.147***	0.144***	0.187***	0.202***	0.203***	0.229***
1945	0.097***	0.114***	0.166***	0.200***	0.401***	0.436***
1946	0.264***	0.240***	0.326***	0.325***	0.354***	0.318***
control for education	No	Yes	No	Yes	No	Yes

B. Calendar year base

	Labor force		Employed		Regular employee	
	(1)	(2)	(3)	(4)	(5)	(6)
1938	0.008		-0.088***		-0.169***	
1939	-0.015		-0.055***		-0.115***	
1940	-0.032*		-0.054***		-0.131***	
1941	0.037*		0.024		-0.012	
1942			base year			
1943	0.046**	0.054	0.069***	0.094**	0.067***	0.084**
1944	0.139***	0.147***	0.182***	0.194***	0.189***	0.197***
1945	0.081***	0.102**	0.139***	0.163***	0.332***	0.353***
1946	0.231***	0.239***	0.304***	0.320***	0.392***	0.365***
control for education	No	Yes	No	Yes	No	Yes

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

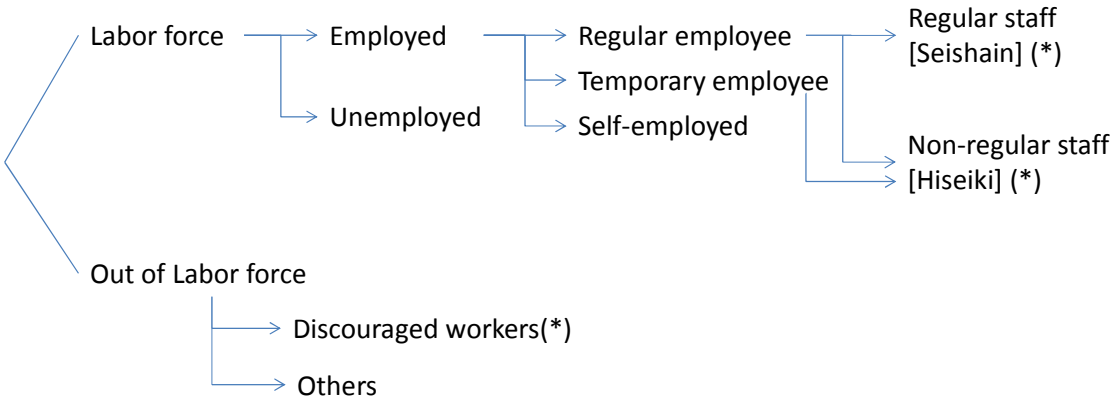
Table 6: Coefficients of cohort * age dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Labor force	Employed	Regular employee	Regular staff	Non -reg staff	Unemp.	Discouraged worker
cohort1943_60	0.007	0.007	0.004	-0.014	0.010	-0.001	0.001
	(0.010)	(0.011)	(0.017)	(0.015)	(0.009)	(0.007)	(0.004)
cohort1943_61	0.008	0.030**	0.013	0.001	0.018	-0.022***	-0.013**
	(0.012)	(0.014)	(0.017)	(0.013)	(0.011)	(0.009)	(0.005)
cohort1943_62	0.027**	0.037***	0.040**	0.027**	0.019	-0.009	-0.009*
	(0.013)	(0.014)	(0.017)	(0.012)	(0.012)	(0.007)	(0.005)
cohort1943_63	0.001	0.009	0.014	0.005	0.013	-0.008	0.006
	(0.015)	(0.015)	(0.017)	(0.012)	(0.013)	(0.006)	(0.005)
cohort1943_64	0.042***	0.050***	0.068***	0.015	0.013	-0.007	-0.005
	(0.015)	(0.015)	(0.017)	(0.011)	(0.013)	(0.006)	(0.005)
cohort1943_65	0.024	0.024	0.023	-0.001	0.010	0	-0.009*
	(0.015)	(0.015)	(0.016)	(0.010)	(0.013)	(0.005)	(0.005)
cohort1944_60	0.002	0.007	0.014	0.011	0.011	-0.007	-0.002
	(0.010)	(0.012)	(0.018)	(0.015)	(0.009)	(0.007)	(0.004)
cohort1944_61	0.007	0.048***	0.014	0.020	0.032***	-0.043***	-0.008
	(0.013)	(0.014)	(0.018)	(0.014)	(0.012)	(0.008)	(0.006)
cohort1944_62	0.015	0.024	0.037**	0.031**	0.024*	-0.008	-0.007
	(0.014)	(0.015)	(0.018)	(0.013)	(0.013)	(0.007)	(0.005)
cohort1944_63	0.048***	0.054***	0.092***	0.041***	0.023*	-0.006	0.000
	(0.015)	(0.015)	(0.018)	(0.012)	(0.013)	(0.006)	(0.005)
cohort1944_64	0.050***	0.056***	0.069***	0.025**	0.013	-0.007	-0.005
	(0.015)	(0.015)	(0.017)	(0.011)	(0.013)	(0.006)	(0.005)
cohort1944_65	0.026*	0.012	0.012	-0.001	0.009	0.013**	-0.012**
	(0.016)	(0.016)	(0.017)	(0.011)	(0.013)	(0.006)	(0.005)
cohort1945_60	-0.008	0.005	0.045**	0.021	0.011	-0.013*	0.004
	(0.011)	(0.013)	(0.019)	(0.017)	(0.010)	(0.008)	(0.005)
cohort1945_61	0.006	0.045***	0.064***	0.011	0.055***	-0.041***	-0.018***
	(0.014)	(0.015)	(0.020)	(0.015)	(0.013)	(0.009)	(0.006)
cohort1945_62	0.033**	0.050***	0.116***	0.070***	0.032**	-0.016**	-0.010*
	(0.015)	(0.016)	(0.020)	(0.014)	(0.014)	(0.007)	(0.006)
cohort1945_63	0.037**	0.046***	0.093***	0.037***	0.033**	-0.01	-0.008*
	(0.016)	(0.016)	(0.020)	(0.013)	(0.014)	(0.007)	(0.005)
cohort1945_64	0.024	0.024	0.069***	0.042***	0.000	-0.001	0.006
	(0.016)	(0.017)	(0.019)	(0.013)	(0.014)	(0.006)	(0.006)
cohort1945_65	0.015	0.007	0.064***	0.006	0.009	0.006	-0.003
	(0.017)	(0.017)	(0.019)	(0.012)	(0.014)	(0.006)	(0.006)
cohort1946_60	0.01	0.033***	0.034*	0.006	0.029***	-0.023***	0.000
	(0.010)	(0.011)	(0.018)	(0.015)	(0.009)	(0.007)	(0.004)
cohort1946_61	0.039***	0.087***	0.098***	0.038***	0.052***	-0.049***	-0.016***
	(0.012)	(0.014)	(0.018)	(0.014)	(0.012)	(0.008)	(0.005)
cohort1946_62	0.074***	0.088***	0.103***	0.055***	0.055***	-0.014**	-0.008
	(0.013)	(0.014)	(0.018)	(0.012)	(0.013)	(0.007)	(0.005)
cohort1946_63	0.072***	0.067***	0.089***	0.046***	0.022*	0.003	0.000
	(0.014)	(0.015)	(0.018)	(0.012)	(0.013)	(0.007)	(0.005)

cohort1946_64	0.042***	0.030**	0.059***	0.020*	0.001	0.010*	-0.002
	(0.015)	(0.015)	(0.017)	(0.011)	(0.012)	(0.006)	(0.005)

Note: Data are taken from Labour Force Survey. Each cell reports estimated β_{ab} in separate regressions of equation (2) for each cohort. Heteroskedasticity-robust standard errors are in parenthesis. ***, **, * denote significance at the 1%, 5% and 10% levels respectively.

Figure 1: Definition of Workers

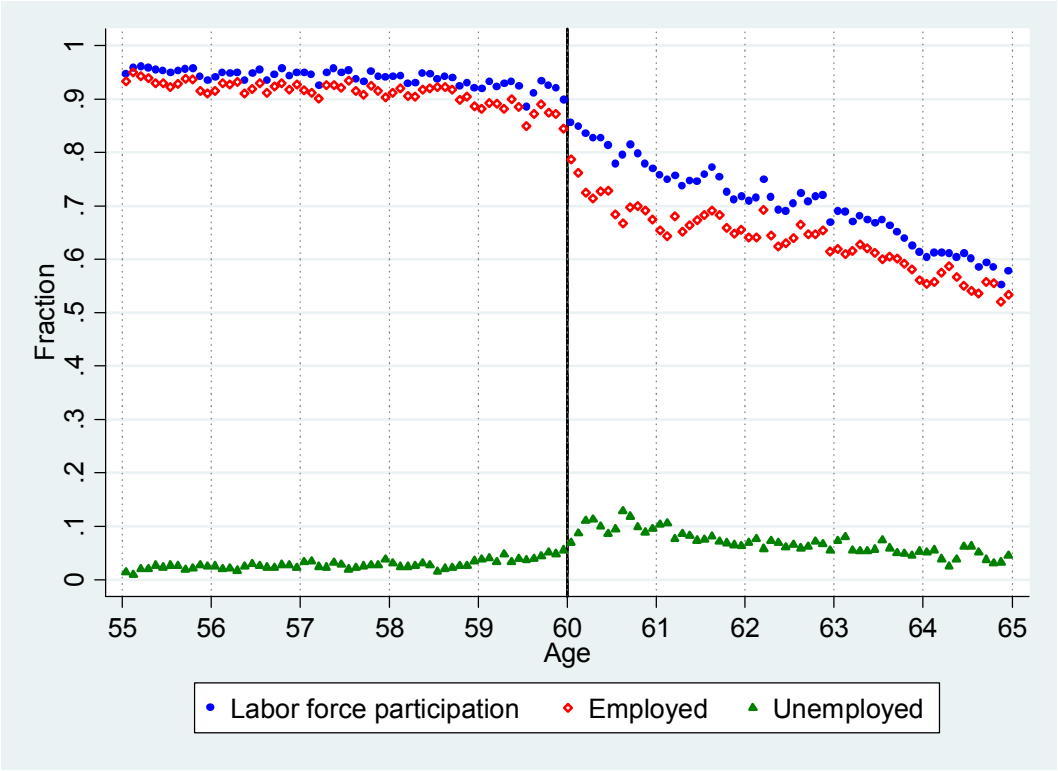


(*) only available in special questionnaire

Variable name	Definition	Questionnaire
Labor force	Employed + unemployed	basic
Employed	Persons with any kind of paid jobs, including self-employed and those on a temporary leave	basic
Regular employees	Persons who work on contract of no specific period or a year or more of employment.	basic
Temporary employees	Persons who work on contract of less than a year	basic
Regular staff	Core employees, corresponding to Japanese word "Seishain," based on how they are called at their workplaces.	special
Non-regular staff	Employees other than regular staff, corresponding to Japanese word "Hiseiki," based on how they are called at their workplaces.	special
Unemployed	Persons without a job and seeking for a job	basic
Discouraged worker	Persons without a job, who wish to work but are not seeking for a job	special

Figure 2: Age Profiles of Several Employment Outcomes (cohort 1938)

A. Labor force participation, employed and unemployed



B. Various Employment Status

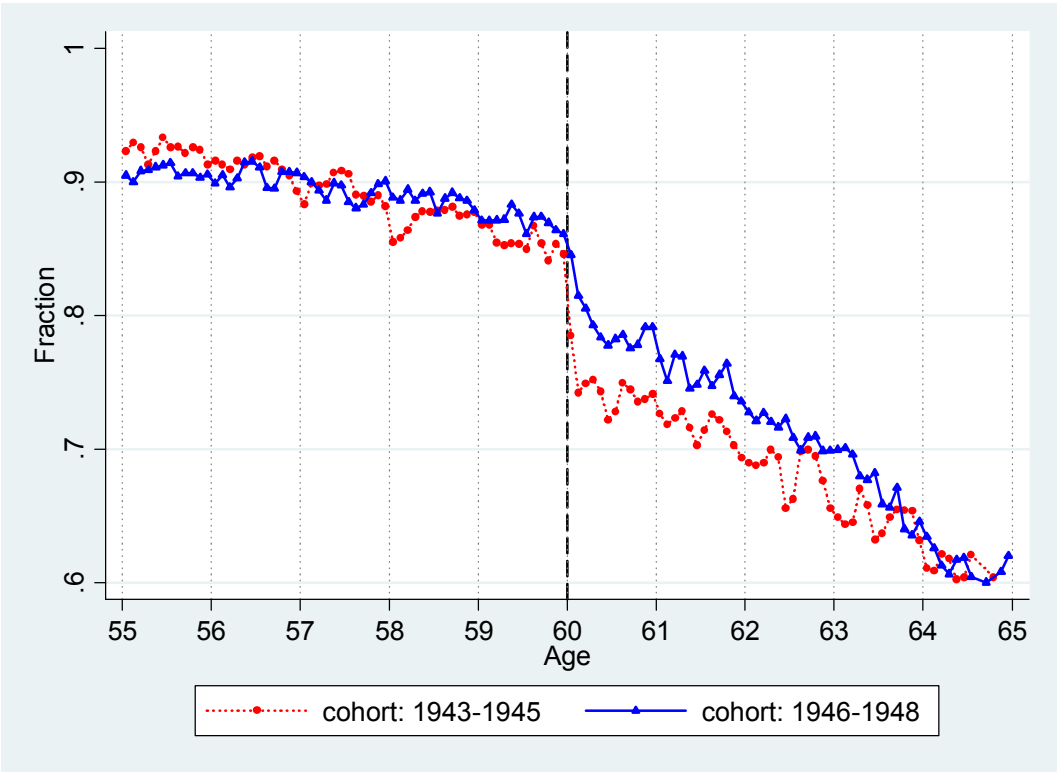
Note: Data comes from the basic questionare of Labour Force Survey. The markers represent the averages of

outcomes at age in month.

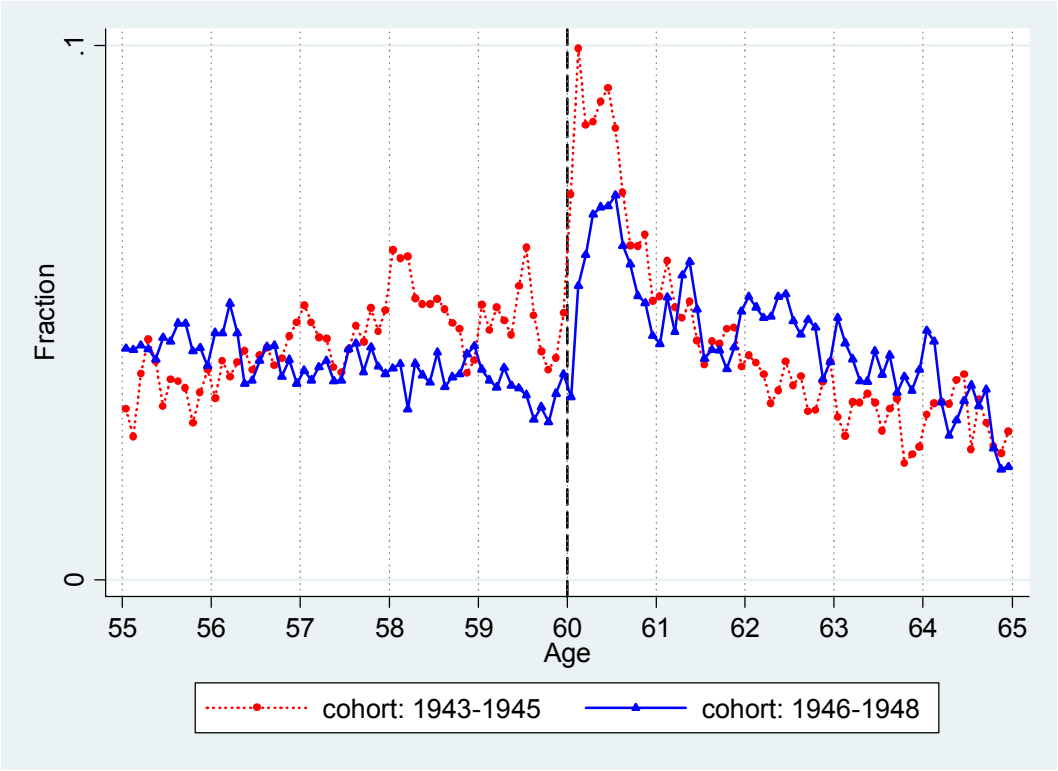
Figure 3: Age Profiles of Employment Outcomes (before and after 1946)

A. Labor force participation

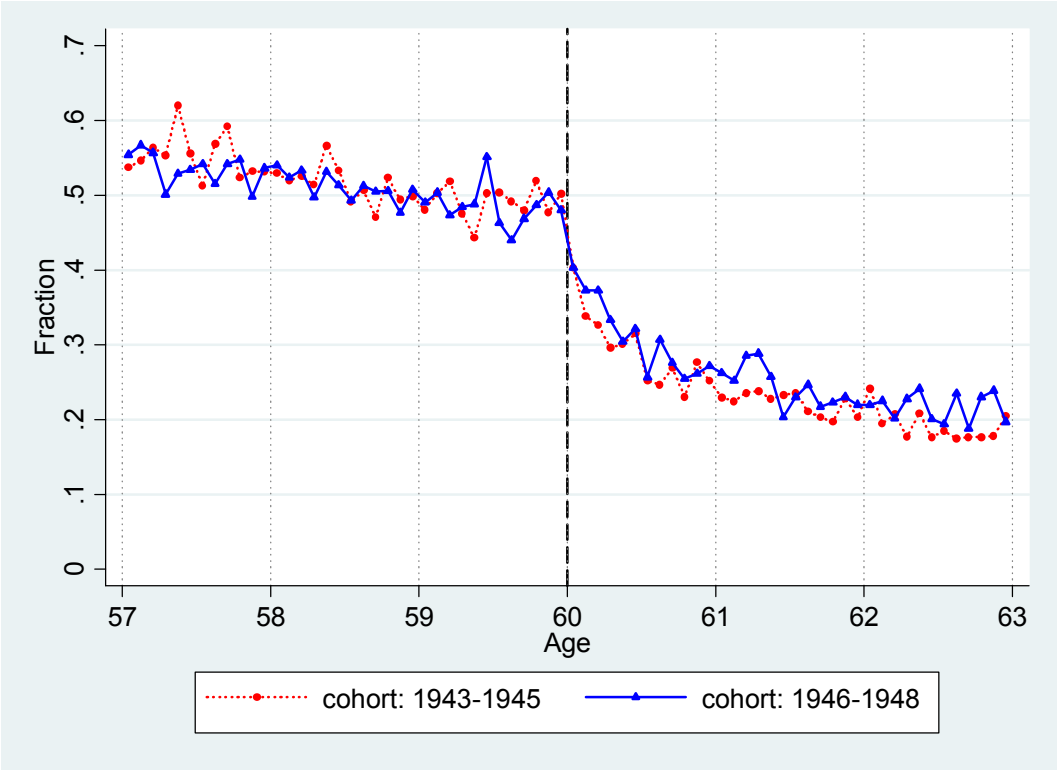
B. Employed



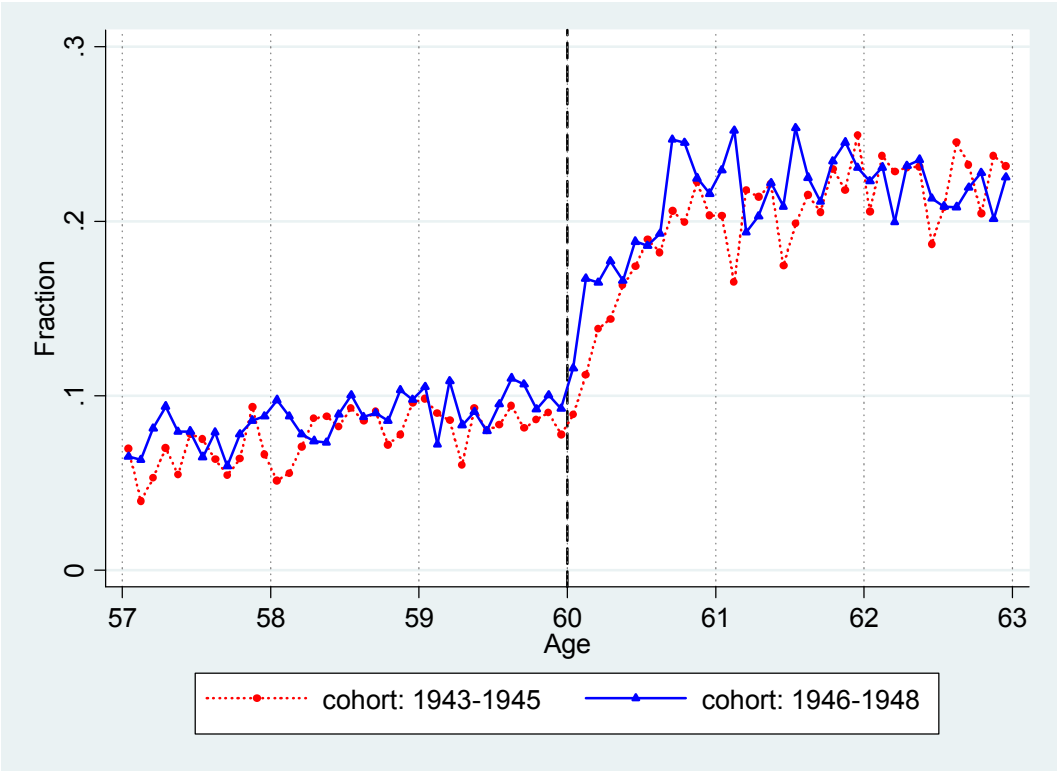
C. Unemployed



D. Regular staff



E. Non-regular staff

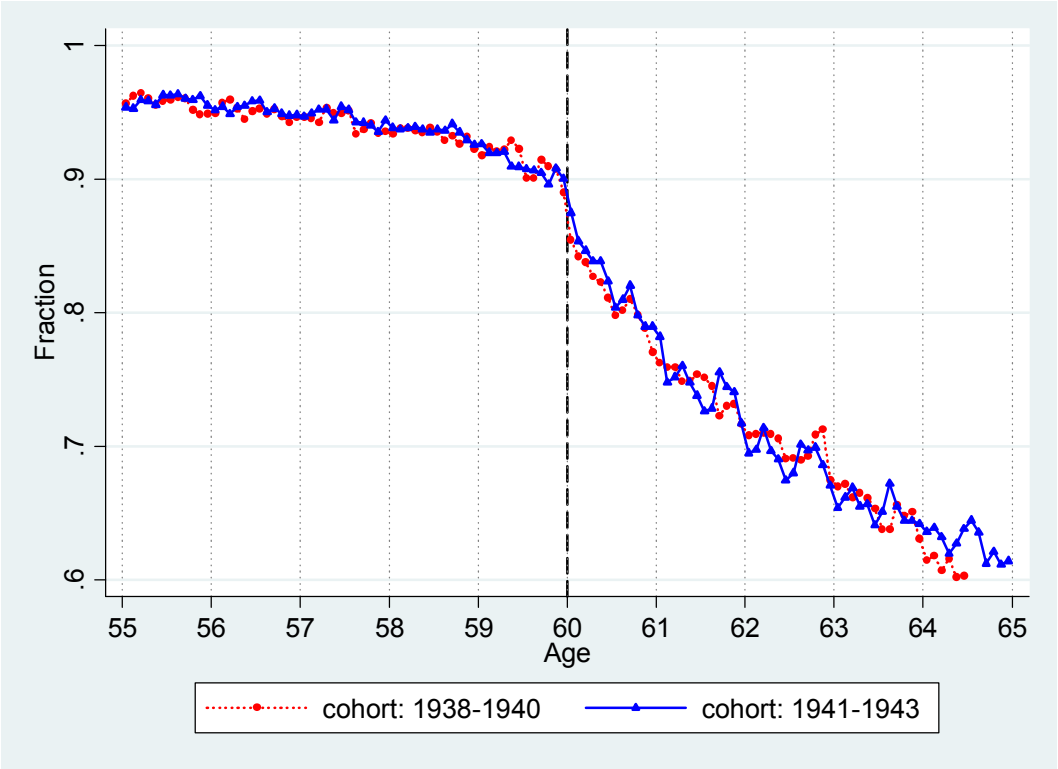


Note: Data for Panel A, B and C come from the basic questionnaire of Labour Force Survey, and panel D and E comes from the special questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in month.

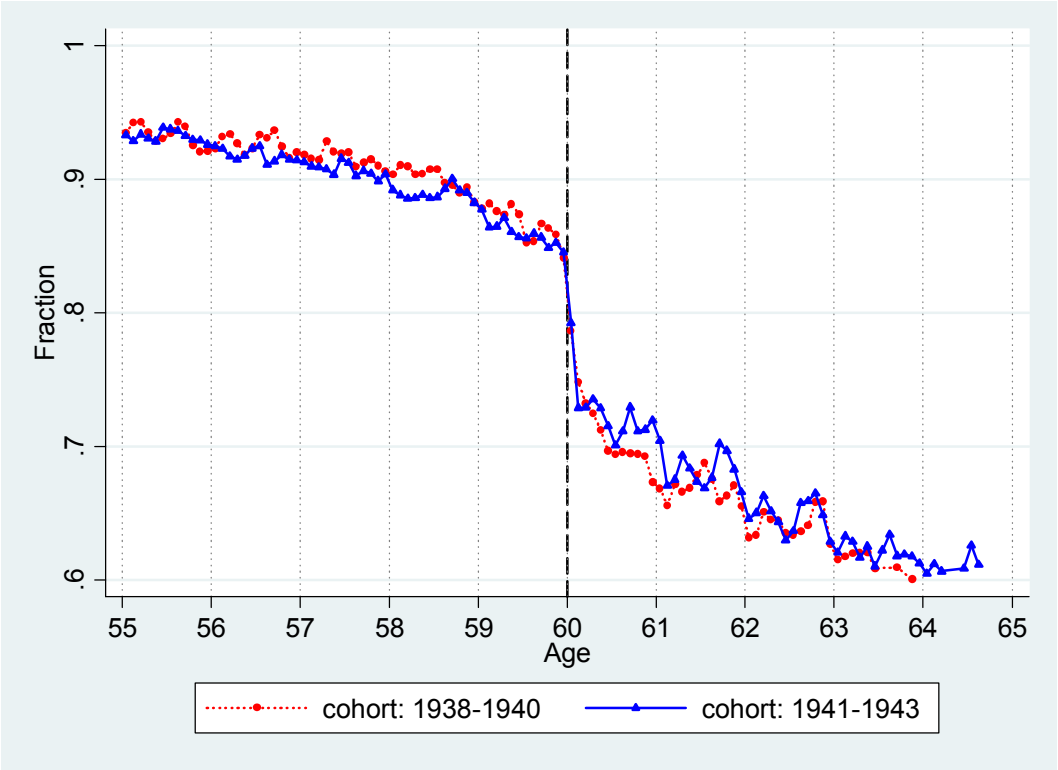
Appendix Figures and Tables

Figure A1: Age Profiles of Employment Outcomes (before and after 1941)

A. Labor force participation



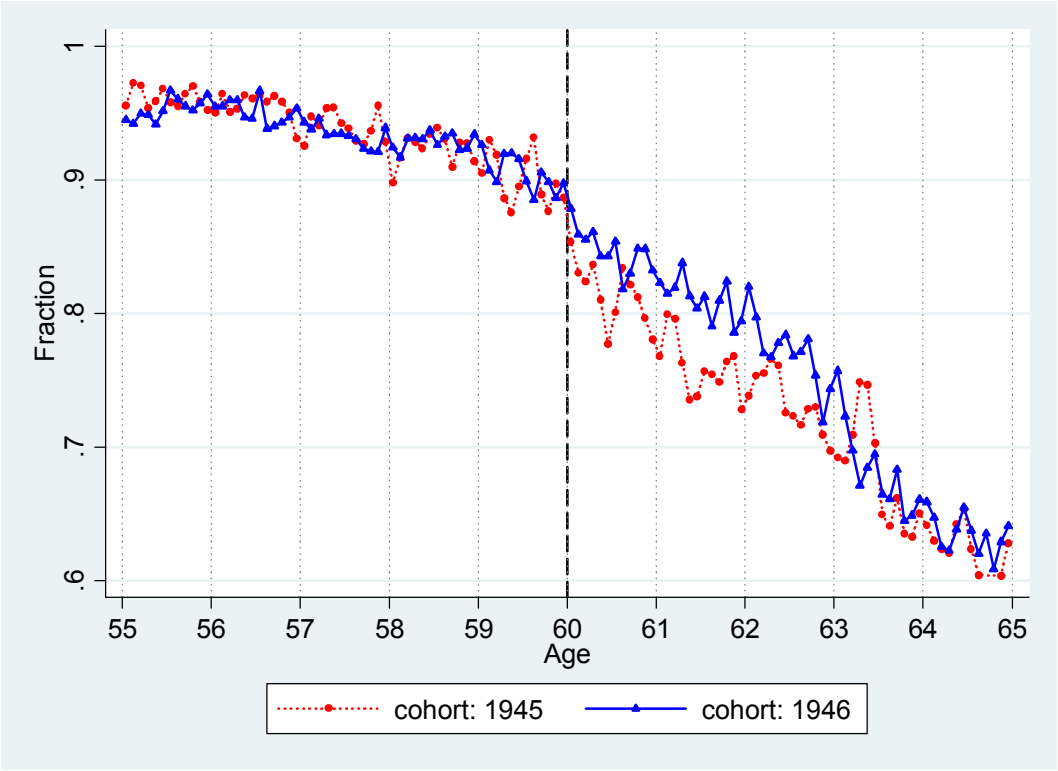
B. Employed



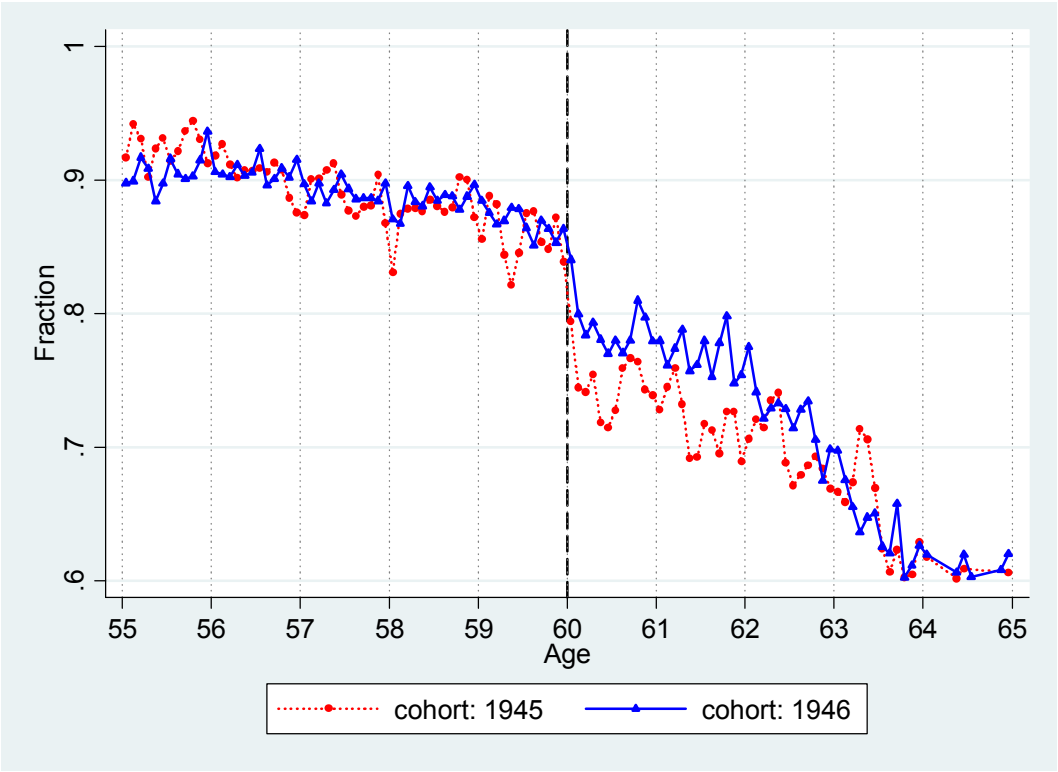
Note: Data from the basic questionnaire. The markers represent the averages of outcomes at age in month.

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

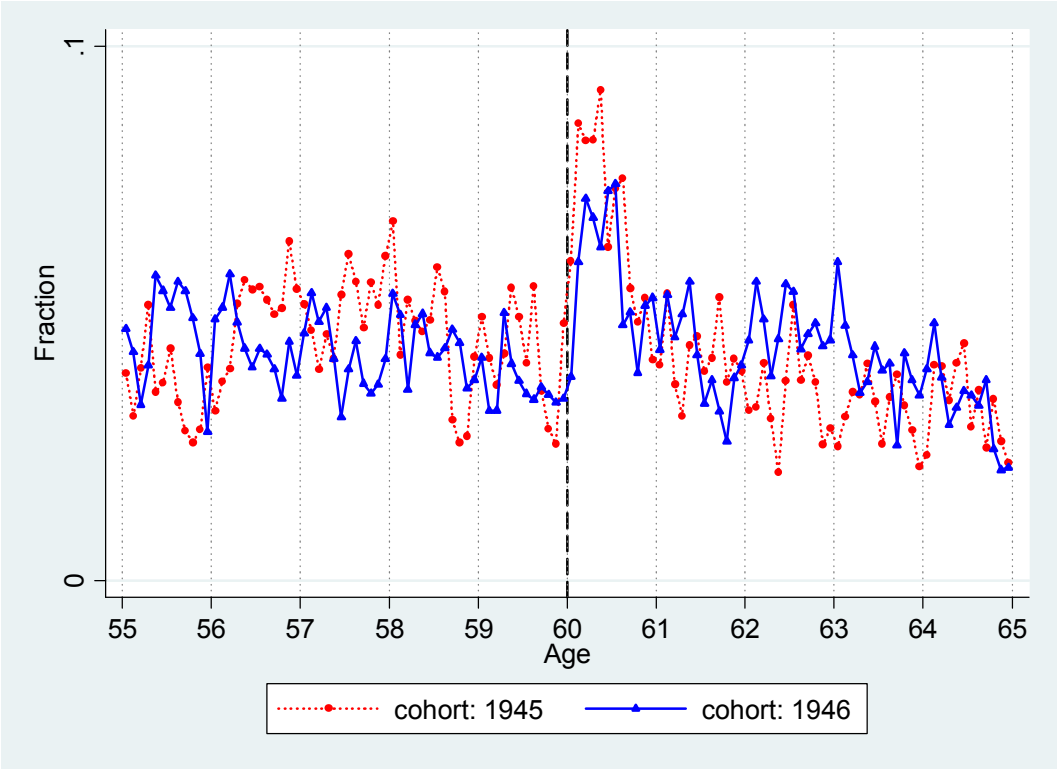
A. Labor force participation



B. Employed



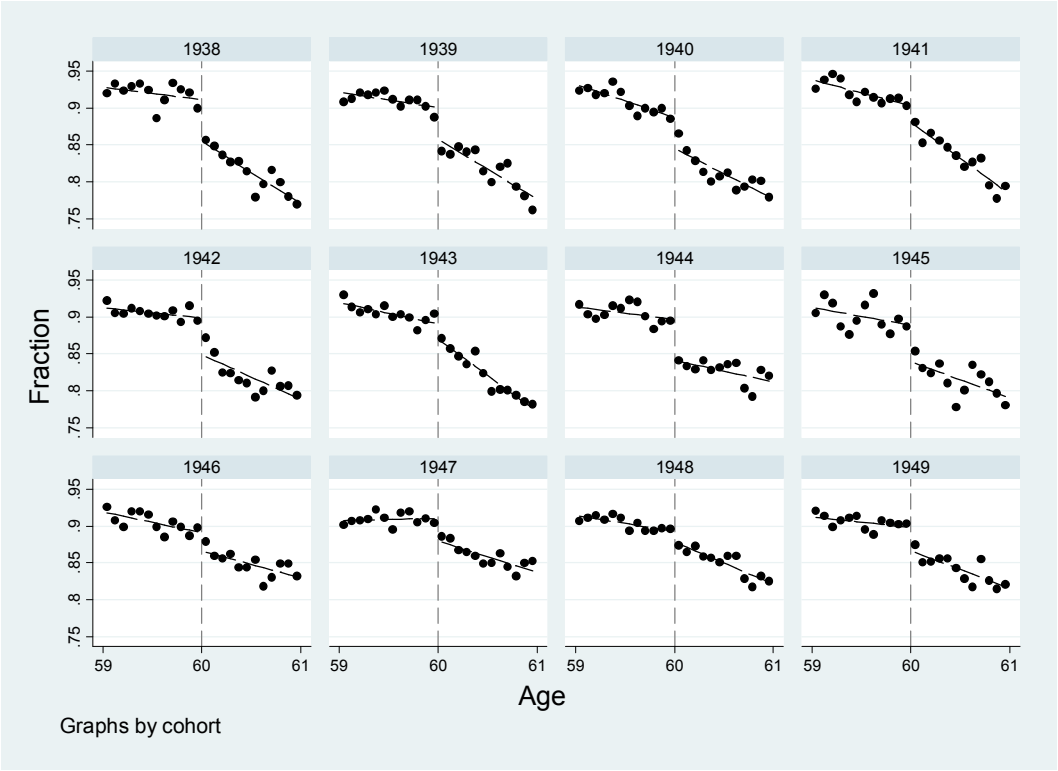
C. Unemployed



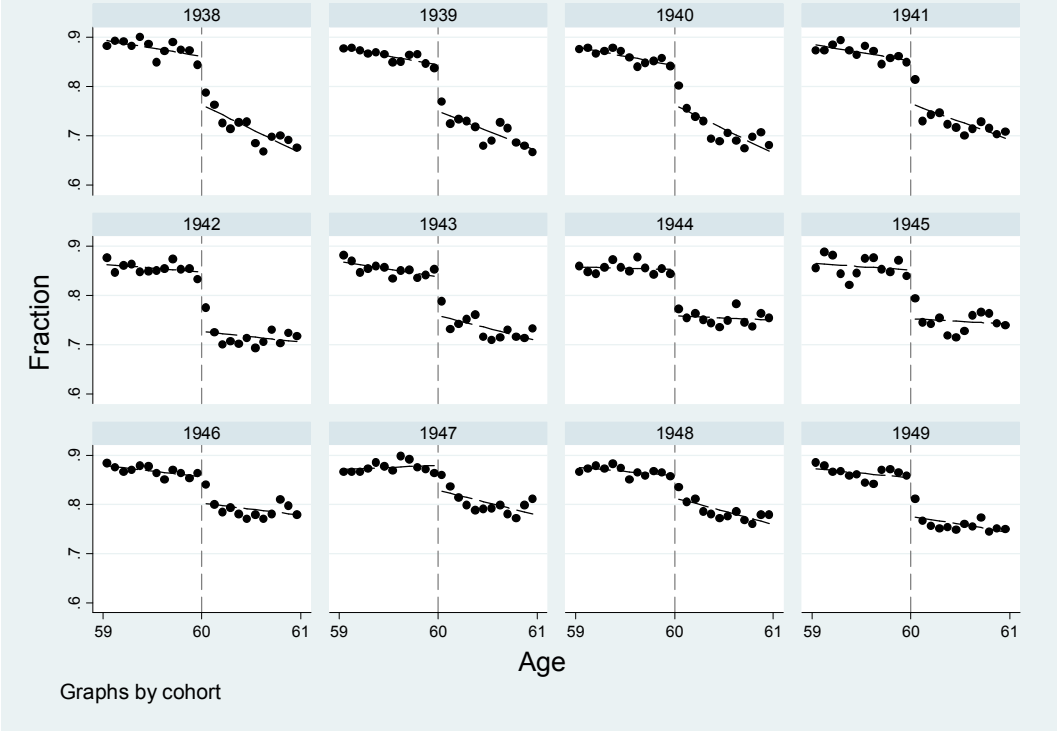
Note: Data from the basic questionnaire of Labour Force Survey. The markers represent the averages of outcomes at age in month.

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

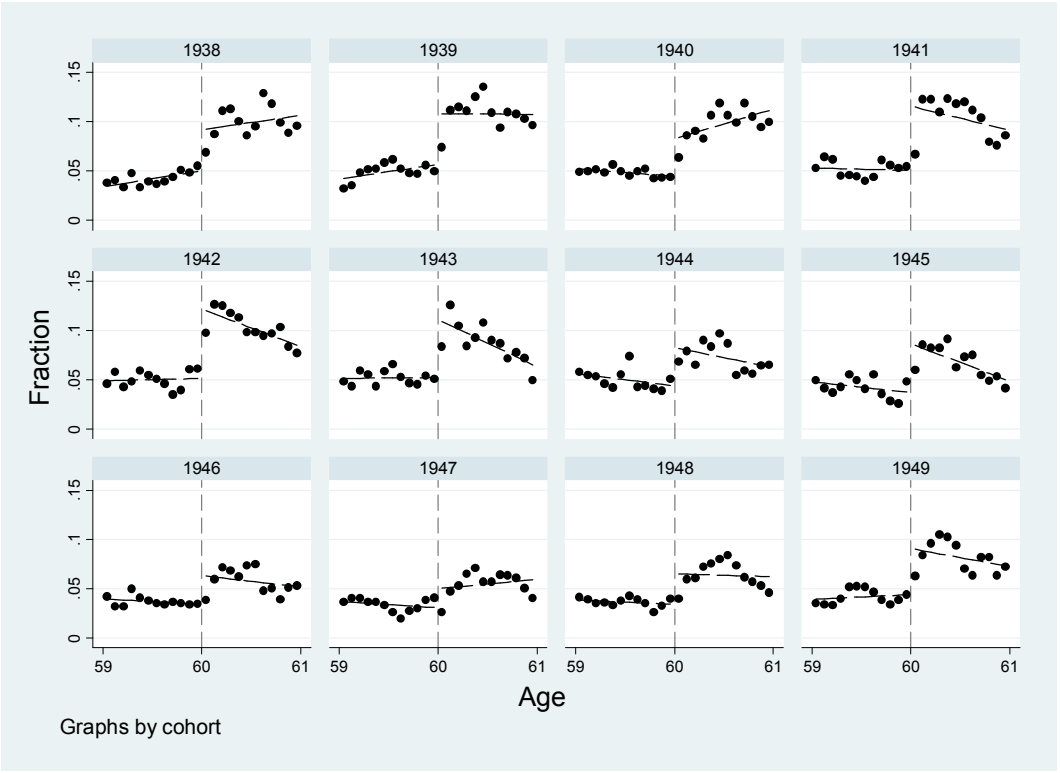
A. Labor force participation



B. Employed



C. Unemployed



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.

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	-5.96***	-6.17***	-5.70***	-5.30***	-5.35***	15,437
	(0.81)	(0.85)	(0.81)	(1.55)	(1.42)	
1939	-4.51***	-4.00***	-4.34***	-4.08**	-4.08***	16,464
	(0.84)	(0.93)	(0.72)	(1.60)	(1.00)	
1940	-4.25***	-5.23***	-3.43***	-2.22	-3.24***	17,576
	(0.90)	(0.79)	(0.85)	(1.51)	(0.93)	
1941	-2.48***	-2.66***	-2.66***	-2.93**	-3.82***	19,106
	(0.62)	(0.75)	(0.65)	(1.39)	(1.17)	
1942	-5.12***	-6.26***	-4.62***	-3.90***	-4.93***	17,400
	(1.09)	(0.99)	(1.11)	(1.49)	(1.45)	
1943	-2.29***	-2.53***	-2.49***	-2.78*	-2.88***	18,132
	(0.71)	(0.77)	(0.69)	(1.44)	(0.83)	
1944	-5.64***	-5.68***	-5.11***	-4.30***	-4.48***	15,565
	(0.69)	(0.76)	(0.55)	(1.66)	(1.06)	
1945	-4.92***	-5.61***	-4.75***	-4.50**	-5.85***	11,992
	(1.07)	(1.09)	(0.92)	(1.87)	(1.46)	
1946	-2.50***	-3.09***	-2.10***	-1.52	-2.01*	16,925
	(0.69)	(0.61)	(0.67)	(1.51)	(1.04)	
1947	-3.32***	-3.67***	-2.56***	-1.45	-1.23*	22,070
	(0.59)	(0.68)	(0.43)	(1.27)	(0.68)	
1948	-1.59***	-1.52***	-1.62***	-1.66	-1.85**	21,572
	(0.38)	(0.47)	(0.37)	(1.35)	(0.87)	
1949	-3.34***	-3.74***	-3.61***	-4.01***	-4.94***	20,551
	(0.58)	(0.54)	(0.54)	(1.36)	(0.87)	
1950	0.11	-0.14	-0.16	-0.56	-2.35**	18,394
	(0.77)	(1.03)	(0.59)	(1.43)	(0.99)	

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	-10.13***	-11.35***	-8.95***	-7.16***	-8.30***	15,437
	(1.39)	(1.31)	(1.40)	(1.85)	(1.82)	
1939	-9.62***	-10.52***	-9.39***	-9.04***	-11.10***	16,464
	(0.99)	(0.83)	(1.10)	(1.89)	(1.30)	
1940	-8.22***	-10.09***	-6.94***	-5.04***	-6.53***	17,576
	(1.55)	(1.22)	(1.41)	(1.76)	(0.91)	
1941	-8.94***	-11.06***	-7.72***	-5.83***	-9.50***	19,106
	(1.80)	(0.79)	(2.09)	(1.70)	(1.27)	
1942	-11.99***	-14.12***	-10.98***	-9.51***	-12.56***	17,400
	(1.82)	(1.11)	(1.97)	(1.82)	(1.70)	
1943	-7.94***	-9.30***	-7.96***	-8.01***	-9.96***	18,132
	(1.38)	(1.08)	(1.45)	(1.74)	(1.58)	
1944	-9.52***	-10.11***	-8.68***	-7.40***	-8.15***	15,565
	(0.83)	(0.80)	(0.73)	(1.93)	(1.17)	
1945	-9.79***	-11.56***	-9.31***	-8.57***	-11.45***	11,992
	(1.67)	(1.22)	(1.86)	(2.15)	(2.09)	
1946	-5.40***	-7.03***	-4.63***	-3.49**	-5.56***	16,925
	(1.32)	(0.79)	(1.38)	(1.71)	(0.95)	
1947	-5.36***	-6.76***	-3.43***	-0.55	-1.14	22,070
	(1.46)	(1.40)	(1.19)	(1.45)	(0.82)	
1948	-4.74***	-5.71***	-3.84***	-2.5	-3.13***	21,572
	(0.93)	(0.83)	(0.80)	(1.54)	(1.03)	
1949	-7.94***	-9.45***	-8.26***	-8.72***	-11.56***	20,551
	(1.37)	(0.75)	(1.44)	(1.60)	(1.16)	
1950	-2.72***	-3.69***	-2.54**	-2.26	-4.95***	18,394
	(1.01)	(0.87)	(1.08)	(1.69)	(1.26)	

Note: See Note A.

C. Unemployed

Cohort	Linear (main text) (1)	Linear No Dummy (2)	Linear + Weight (3)	Quadratic No Dummy (4)	Quadratic + Dummy (5)	N
1938	4.17***	5.18***	3.25***	1.86	2.95**	15,437
	(0.95)	(0.82)	(0.93)	(1.18)	(1.17)	
1939	5.10***	6.53***	5.05***	4.96***	7.02***	16,464
	(1.19)	(0.68)	(1.21)	(1.19)	(0.72)	
1940	3.97***	4.85***	3.51***	2.82***	3.29***	17,576
	(0.77)	(0.66)	(0.65)	(1.06)	(0.65)	
1941	6.46***	8.40***	5.06***	2.90***	5.68***	19,106
	(1.55)	(0.61)	(1.70)	(1.12)	(0.66)	
1942	6.87***	7.87***	6.36***	5.62***	7.62***	17,400
	(1.03)	(0.67)	(1.16)	(1.23)	(0.83)	
1943	5.65***	6.77***	5.48***	5.23***	7.09***	18,132
	(1.08)	(0.82)	(1.19)	(1.13)	(1.34)	
1944	3.87***	4.43***	3.57***	3.09***	3.66***	15,565
	(0.78)	(0.88)	(0.72)	(1.16)	(1.33)	
1945	4.88***	5.95***	4.56***	4.07***	5.60***	11,992
	(1.06)	(0.76)	(1.21)	(1.24)	(1.29)	
1946	2.90***	3.94***	2.53***	1.97**	3.55***	16,925
	(0.83)	(0.52)	(0.89)	(0.94)	(0.88)	
1947	2.04**	3.08***	0.86	-0.9	-0.09	22,070
	(0.99)	(0.82)	(0.88)	(0.80)	(0.51)	
1948	3.15***	4.18***	2.22***	0.85	1.28**	21,572
	(0.92)	(0.81)	(0.81)	(0.85)	(0.62)	
1949	4.59***	5.71***	4.65***	4.71***	6.61***	20,551
	(1.04)	(0.80)	(1.07)	(0.98)	(1.39)	
1950	2.84***	3.55***	2.38***	1.70*	2.60***	18,394
	(0.75)	(0.70)	(0.76)	(1.03)	(0.98)	

Note: See Note A.