Work Capacity of Older Adults in Japan*

By

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Abstract

This study examines work capacity of older adults in Japan. To this end, we first estimate the relationship between a variety of health indicators and work status, which divided into full-time work, part-time work and retired for the 50s, who are not yet age-eligible for public pension benefits. Given their observed relationship between health and work statuses, we simulate work capacity for the pension-eligible 60s and the first half of the 70s. The simulation results indicate large work capacity. The health status of the 60s suggests that their labor force participation could substantially rise by reforming social security programs.

JEL classification Codes: J26; I10; H55.
Key words: Work capacity; health; retirement; simulation; JSTAR.

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1. Introduction

A combination of shrinking labor force and large fiscal deficits are urgent and common challenges among developed countries. The main driving force for those two serious concerns is a rapid speed of population aging; population aging dampens labor force participation with a continuing lower fertility and expands fiscal deficits under a pay-as-you-go public pension program.

A natural and simultaneous solution for those two policy challenges is to encourage older adults to continue to work as late as possible. Thus, the main visible target of recent pension reforms is to raise eligible pension ages, although pension reforms are often accompanied with revisions in a variety of aspects such as coverage, adequacy and sustainability as well as work incentives (OECD, 2013). Indeed, many developed countries have implemented or will execute public pension reforms to extend the normal retirement (i.e. pensionable) age. Figure 1 shows the evolutions of the normal pensionable ages in major countries. While the ages had been lowered up to 1990s, they have been extended since the 2000s or will be extended in future.

Japan has also confronted with a declining labor force and enormous fiscal deficits, both of which are the most pronounced among OECD countries. Figure 2 shows the long-term trend of labor force participation (LFP) rate in Japan. The female LFP rate has been on a modest increasing trend, which is particularly the case for those aged 55-59. In contrast the male LFP rate has been declining for the 60s, despite a slight recovery in recent years. Although the LFP rate in Japan is higher than in most of other developed countries, there have been many policy debates on enhancing the normal eligibility of pensionable age.

Japan has been extending the pension eligible age. For male pensioners, the eligibility age for the flat-rate component has increased from age 60 since 2001 by one year for every three years to reach 65 years in 2013. Furthermore, the eligibility age for the wage-proportional component has been scheduled to rise from 2013 by one year for every three years to reach 65 years in 2025. For female pensioners, while keeping a five-year lag relative to that for men, the eligibility age for the flat-rate benefit was raised in 2006 and that for the wage-proportional benefit will be raised in 2018 in the same manner (Oshio, Oishi and Shimizutani, 2011).

However, there is the possibility that a simple extension of pensionable eligible age may not work, because all older adults are not necessarily able to work even if they are willing to. In particular, one large possible constraint on working is health, either physical or mental, which may also be associated with a declining cognitive function. If this is the case, a simple extension of pension eligible age, which stands at fiscal consolidation and ignores heterogeneity among older adults, may result in raising inequality between the healthy and the unhealthy individuals and exacerbate living standard of older adults as a whole.

This study simulates spare work capacity of older individuals in Japan, which is to our knowledge is the first evidence. We share the spirit with Cutler, Meara and Richands-Shubik (2012) (henceforth, the CMR model), who estimated the elderly's work capacity in the United States. They simulated work capacity of the age group entitled to receive social security benefits, based on the estimated association between work and health statuses of the age group just below the eligibility age. Based on the simulation results, they concluded that the elderly's work capacity is substantial; specifically, the health status of those aged 62–64 suggests their labor force participation could rise for all groups, rising by over 15 percentage points among white males if avoiding access to early social security retirement benefits.

We apply the CMR model to micro-level data from JSTAR (Japanese Study on Aging and Retirement) with detailed information on health and work status at individual level. Unlike the CMR model, we divided work status into full- and part-time work, considering the fact that a substantial portion of Japanese employees shift to part-time work after retiring from primary full-time work, rather than fully going out of labor force.

This study proceeds as follows. Section 2 explains our analytic strategy and Section 3 describes the data set. Section 4 illustrates health trend of older adults and presents the empirical and simulation results. Section 5 performs alternative estimations and presents the results. Section 6 concludes.

2. Empirical strategy

We employ the CMR model in this study. The basic idea of the CMR model is to examine the relationship between health and work prior to the current pension eligible age (57-61 years old in their paper) and uses the observed association to gauge spare work capacity in ages eligible for public pension benefits (62-64 years old).The CMR model implicitly assumes that the relationship between health and work among groups prior to the eligibility age is stable and holds for the age group posterior to the age. Correspondingly, any decline in work given the same level of health status is attributable to factors other than health deterioration, particularly social security benefits. If that is the case, we can conclude that pension benefits discourage pension beneficiaries to work.

The CMR model originally takes three states of work; in labor force, retired and disabled as dependent variables in a multinomial logit estimation. The health status is expressed by a variety of indicators; self-rated (subjective) health status, physical function limitations, IADL (instrumental activity of daily living) limitations, depression (CES-D), any incidence of diagnosed disease (heart disease, lung disease, stroke, psychiatric disorder, cancer, hypertension, arthritis, diabetes, back pain as well as BMI (body mass index) and smoking status. Moreover, demographic variables such as educational attainment, household composition including family size and economic status are considered as covariates. Those variables are collected in the same manner from the Health and Retirement Study (HRS), which the CMR model used, and its family-surveys including JSTAR (Japanese Study on Aging and Retirement), which is explained in the next section.

In order to simulate work capacity of older adults in Japan, we need to modify the CMR model to fit the Japan's case. While the average effective retirement age in Japan is one of the highest levels among OECD countries (OECD, 2014), all adults are not working on a full-time basis. Instead, the proportion of full-time workers declines after age the 60s and dominant are part-time workers with shorter working hours, which is more pronounced for males than females (Shimizutani, 2011).[1] Consistently, the Labor Force Survey shows that among workers, those working for 35 hours or more shared 77.7% and 41.9% for males aged 55–64 and 65 and above, respectively, and 44.4% and 37.7% for females in 2013. Similarly, the Survey shows the proportion of non-regular employees was 69.9% for those aged 65 years, well above 32.5% for males aged 55–64. The difference was less remarkable for women (67.5% vs. 73.7%). These facts indicate that workers, especially male ones, tend to reduce working hours in the late 60s. A choice between full- and

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[1] OECD (2014) shows that the average effective age of retirement during 2007-2012 was 69.1 years old for male, which is ranked 4th among 34 OECD countries and 66.7 years old for female, which is ranked 5th.

part-time works, as well as its association with health, differs from that between work and retirement. Hence, it is reasonable to differentiate part-time workers from full-time ones to precisely gauge spare work capacity in Japan.

Another modification to the CMR model is on disability pension benefits. The proportion of their recipients is very small in Japan, contrasting to some European countries (Oshio and Shimizutani, 2012). Hence, we do not consider the outcome of disabled as work status and merge it into retired. In all, our work outcomes are categorized as three states; working on a full-time basis, working on a part-time basis and retired.

Taking working on a full-time basis as reference, our specification is described as:

$$\Pr(fulltime) = \frac{1}{1 + \exp(X_i\beta_{parttime}) + \exp(X_i\beta_{retired})}$$

$$\Pr(parttime) = \frac{\exp(X_i\beta_{parttime})}{1 + \exp(X_i\beta_{parttime}) + \exp(X_i\beta_{retired})}$$

$$\Pr(retired) = \frac{\exp(X_i\beta_{retired})}{1 + \exp(X_i\beta_{parttime}) + \exp(X_i\beta_{retired})}$$

where *i* stands for individual *i* and *full-time* refers to state of working on a full-time basis, *parttime* to state of working on a part-time basis and *retired* to state of being out of labor force. X_i is the vector of health indicators which were described above for individual *i*.

We make a reservation on the specification. We estimate the relationship between work and health statuses prior to pensionable age (i.e., in the 50s) and then use it to simulate work capacity after age 60. Thus, we implicitly assume that choice of work status in the 50s is affected by health status. However, choice of work status is also affected by other factors. For example, a woman in the 50s may choose work on a part-time basis not because her health condition is not good but because she needs to provide care for parents, and she may work on a full-time basis in the 60s if she no longer needs to provide care after parents die. Thus, more precisely, our specification is based on an assumption that the relationship between work and health statuses is not changed between in the 50s and thereafter. We stipulate that we need to examine this assumption.

3. Data description

We use individual-level data from JSTAR. JSTAR is family surveys in other countries such as HRS in the U.S., ELSA (English Longitudinal Survey on Ageing) in the U.K, SHARE (Survey on Health, Aging and Retirement in Europe) in the continental Europe as well as CHARLS (Chinese Health and Retirement Survey) in China, Korean Longitudinal Study of aging in South Korea and Longitudinal Aging Study in India (LASI) in India. Those surveys innately retain common features which make international comparison feasible in terms of longitudinal structure (survey the same person every two year) and a rich variety of variables to capture living aspects in terms of economic, health, family, as well as social and work status.

JSTAR conducted the first wave data collection in 2007 on the baseline from five municipalities (Takikawa city in Hokkaido Prefecture, Sendai city in Miyagi Prefecture, Adachi ward in Tokyo, Shirakawa town in Gifu Prefecture and Kanazawa city in Ishikawa Prefecture). Then JSTAR performed the second wave data collection in 2009; re-interviewing respondents in the first wave in the five municipalities and starting to collect the baseline data from new two municipalities (Naha city in Okinawa Prefecture and Tosu city in Saga Prefecture) in 2009. Moreover, JSTAR implemented the third wave to collect data from the third interview for respondents in the second round in the initial five municipalities, the second interview for the respondents in the first round in two municipalities as well as the baseline interview for new samples in three new municipalities (Chofu city in Tokyo Prefecture, Tondabayashi city in Osaka Prefecture and Hiroshima city in Hiroshima Prefecture).

The sample at the baseline in each municipality is males and females aged 50 to 74 years old, who were randomly chosen from the household registration. The sample size at the baseline in each municipality is about 8,000 and the average response rate at baseline is about 60 percent. We pool all the observations from the first to third waves in the estimation.[2]

Table A1 shows the summary statistics of the main variables used in the estimation; with Panel (A) and Panel (B) for males and females, respectively. For males, the proportion of full-time workers decline sharply after age 60–64, shifting to part-time workers or retired. Self-assessed health and other health measures gradually deteriorate as the age increases, but the changes over ages are much more limited compared to those of work status as discussed later in more detail. The similar pattern is observed for females, but the proportion of full-time workers is much lower in all age groups than for males.

4. Health trends and empirical and simulation results

In this section, we perform three sets of empirical analyses, based on the JSTAR data. First, we describe the health trend in the 50s through the 70s. Second, we estimate the relationship between work outcome and health status. Third, we simulate spare work capacity in the 60s based on their observed relationship.

[2] As of the timing of the submission, the data from the fourth wave is not available to researchers.

First, Figure 3 shows the evolution of the share of respondents who assess their health as good, very good, or excellent over ages between the 50s and 70s by age. We observe that health status deteriorates very gradually until age 70 for both males and females. For males, the total share of respondents who assess their health as good, very good, or excellent declined from 90.1% in age 51–54 to 84.2% in age 65–69, and then drops to 77.1% in age 70–74. The drop of the share from age 51–54 to age 65–69 is 0.059% point, smaller than 0.071% point from age 65–69 to age 70–74. The same pattern is observed for females as well, although the share of those of high self-assessed health is somewhat lower in all age groups compared to males. These findings indicate that health status remains relatively stable until age 70, supporting the relevance of the methodology of the CMR model, which assumes stable associations between health and work statuses, as long as the model is applied to those younger than age 70.

Now, we turn to estimate the relationship between work status and health indicators. We chose the sample in the 50s to estimate the association, because the age 60 is the earliest age to claim public pension benefits. Table 1 reports the results of multinomial logit models of reporting the relative risk ratios (RRRs) of reporting retired or part-time work, relative to full-time work. Panel (A) and (B) show the results for men and women, respectively. We performed a Hausman test which supports that the odds are independent of other alternatives.

In line with expectations, lower health statues are positively associated with the possibilities of retirement and part-time work. This is especially true of the males' choice of retirement. While the associations with health variables were somewhat different between men and women, psychiatric disorder had the highest RRR for retirement for both sexes. It should be noted that the observed associations do not mean a one-way causality from health to work; it cannot be ruled out that retirement makes individuals more depressed and more nervous about health.

Turning to simulation analysis, Table 2 shows the results for males (top panel) and for females (bottom). The third to fifth columns report the actual proportions of the retired, part-time workers, and full-time workers, while the sixth to eleventh columns present simulations results based on the estimated associations for those aged 50–59.

For males, the actual proportion of the retired increases from 20.5% in age 60–64 to 67.4% in age 70–74. While the proportion of part-time workers increases from 17.6% in age 60–64 to 22.0% in age 65–69 and then declines 15.3% in age 70–74. The proportion of full-time workers declined from 62.0% in age 60–64 to 17.3% in age 70–74.

By comparison, the predicted proportions of the retired are 4.7%, 6.6%, and 10.1% in age 60–64, 65–69 and 70–74, respectively. Reductions in their proportions in response to age increases are much smaller compared to their actual ones, presumably reflecting limited changes in health status. Correspondingly, the work capacity, which is defined as the gap between the predicted and the actual proportion of the retired is 15.8% in age 60-64, which jumps to 42.1% in age 65–69 and 57.3% in age 70–74. These figures are interpreted to as "spare" work capacity, which shows the proportion of those who are able to shift from retirement to work

In contrast, the predicted proportions of male part-time workers are 7.0–10.1%, which are lower than the actual ones, indicating that there are *excess* part-time workers among the Japanese elderly males. Meanwhile, the predicted proportion of full-time workers is 79.7–88.2%, much higher than the actual ones. These results suggest that a substantial shift from full-time works to retirement or part-time workers after the late 60s is not attributable entirely to changes in health status, which was relatively limited as suggested by Figure 3.

Based on these simulation results, it is reasonable to argue that social security benefits, which become eligible in the late 60s, discourage male workers to stay as a full-time worker in the labor market, even if they are not much less healthy as in the 50s. In reality, however, a substantial portion of them move to part-time works, rather than completely leaving favor force, after retiring from their primary works (Shimizutani and Oshio, 2010).

The simulations for females provided almost similar results, but the magnitude of work capacity is somewhat smaller than for males presumably reflecting their more diversified lifestyle. A higher portion of females have retired in the 50s and are working on a part-time basis. The most remarkable difference from the results for males is that there is work space for part-time work as well. This result highlights excess part-time workers among the elderly males.

Moreover, we perform two additional simulations. First, we decompose the simulation results by educational levels using the estimation result reported in Table 1. We divide the educational attainment into (1) high school graduates or less and (2) some college or more. Table 3 reports the results for males in the upper panel and females in the lower. For males, the proportion of the retired is slightly smaller for college graduates except those aged 65–69 and that of part-time workers are larger for high school graduates in the 60s. The share of full time workers is higher for higher educated males in those aged 60–64 but lower in those aged 65–69. The predicted proportion of the retired increases along with age and the size and age gradient are larger for high school graduates or less. The estimated proportion of part-time workers is also higher for high school graduates while it levels off after age 65 for college graduates and that of full time workers are larger for higher educated groups. Consequently, the estimated “spare” capacity is larger for college graduates, which is particularly the case for those aged 60–64. We also see *excess* part-timers for all age groups, which is largest for high school graduates and spare capacity of full timers which is larger for college graduates aged 65–69 and 70–74.

For females, we observe a similar pattern by educational attainment in work capacity. The spare capacity for the retired is larger for higher educated aged 65-69 and 70-74 and this is the case for all age groups for full time workers. The difference between females and males is found in part-time workers. While the size is smaller than full time workers, we see spare work capacity for part-time workers except higher educated women aged 60–64, implying excess part time workers in this age group. Another simulation is to estimate a multinomial probit model including a linear age trend as additional covariate and then use the relationship to perform simulate work capacity. A rationale to include age trend is to control for taste shift along with age since older adults may place a higher preference to spend their time at home, not on work. As discussed in Section 2, we performed the regression analysis, assuming that the relationship between work status and non-health factors is not altered between in the 50s and in the later ages and the age trend is designed to capture the change in non-health factors.

Table 4 reports the simulation results, which correspond to Table 3.[3] We observe that the predicted work capacity is generally smaller if including an age trend as a covariate. For males, the work capacity (the actual proportion of the retired minus the predicted proportion) is smaller in older age groups. The work capacity for males aged 65–69 (70–74) is 42.1% (57.3%) in Table 2, which is now 16.9% (9.6%) in Table 4. This is also the case for females; the work capacity is 32.3% (43.4%) in Table 2, which is now 15.1%

[3] To save space, we do not present the estimated coefficients including age trend, which is similar to those in Table 1. The results are available upon request from the authors.

(20.4%) in Table 4. While the part-time capacity is not much changed between Table 2 and Table 4, the full time capacity is much smaller in Table 5; 26.3% (55.1%) in males aged 60¥64 (65-69) in Table 4, contrasting to 17.0% (29.2%) in Table.2. The largest difference is found for males aged 70-74. Those patterns are found for females too and the full time capacity is much smaller in Table 4.

Those additional simulations show that the work capacity may vary across educational attainment and that the estimated size may be smaller once an age trend is controlled. However, the estimated spare work capacity is still large, which is especially the case for those aged in the 60s.

5. Conclusion

We have examined work capacity of older adults in Japan, based on micro-level data from JSTAR (Japanese Study on Aging and Retirement). Large work capacity predicted by our simulations offers reasons to be cautiously optimistic about the ability of many Japanese older Japanese to continue working beyond current retirement ages. The results suggest that key constraint on their work is not deteriorating health status but institutional factors, especially social security programs.

We recognize a number of limitations to the current study and future research issues to be addressed. First, we have to tackle endogeneity issues. We assume that the associations between health and work statuses observed in the 50s remain intact in later life, but work is likely to affect health in both positive and negative ways. Second, we can extend the methodology of the CMR model. We included a variety of health variables as explanatory variables, but other aspects of health such as cognitive functions and grip, which can be objectively measured. Third, it is of great interest to compare work capacity between elderly with different attributes. Cutler, Meara and Richards-Shubik (2012) separated individuals by race and educational background as well as sex. In addition, the elderly with highly specialized skills may have different work space than others.

Despite these issues to be addressed, our results have clear policy implications. Considering that the elderly enjoy good health throughout their 60s, social security reforms including raising the eligibility ages, may both reduce the costs of the public pension program and enhance growth potential.

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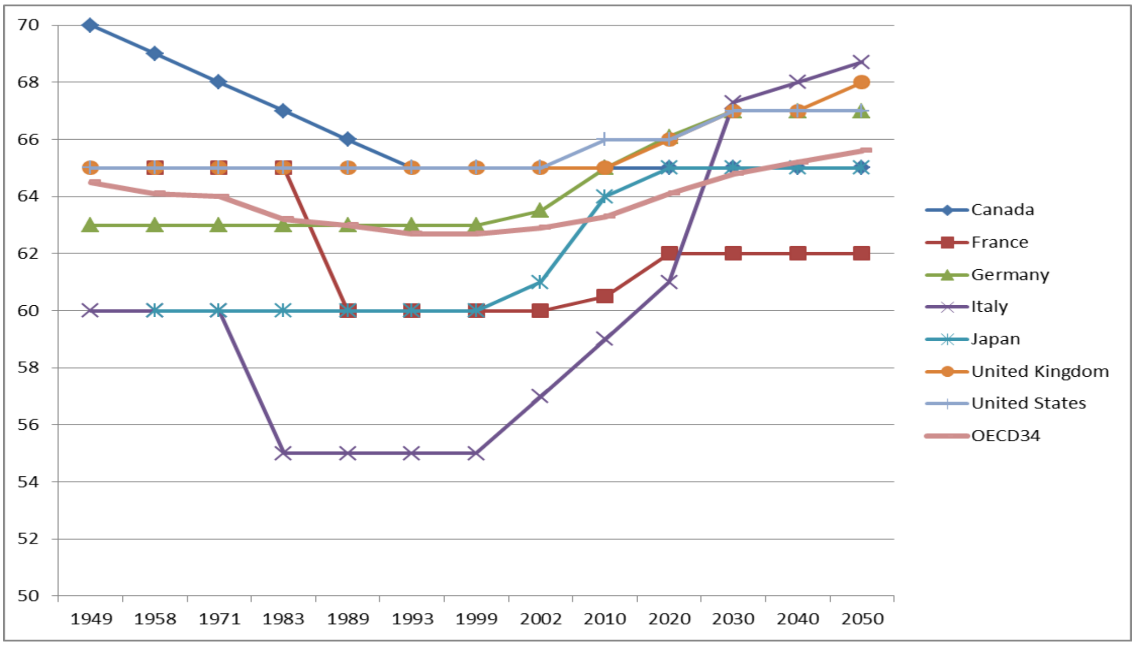
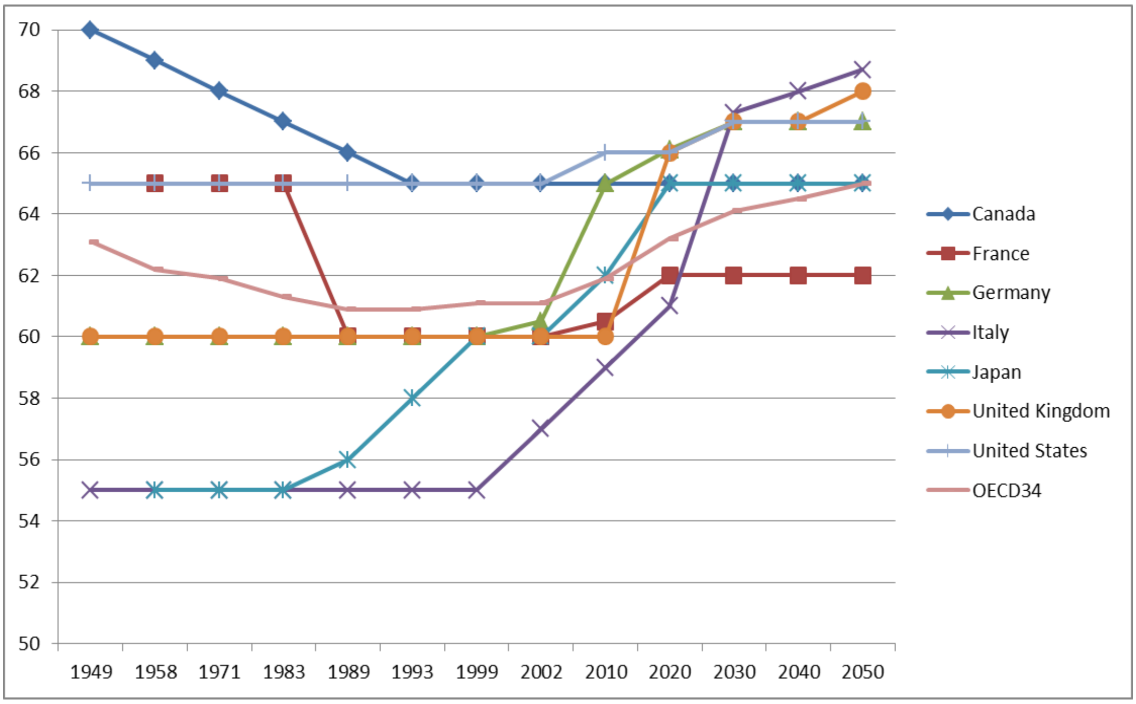
Figure 1. Normal pensionable age in developed countries

(A) Males



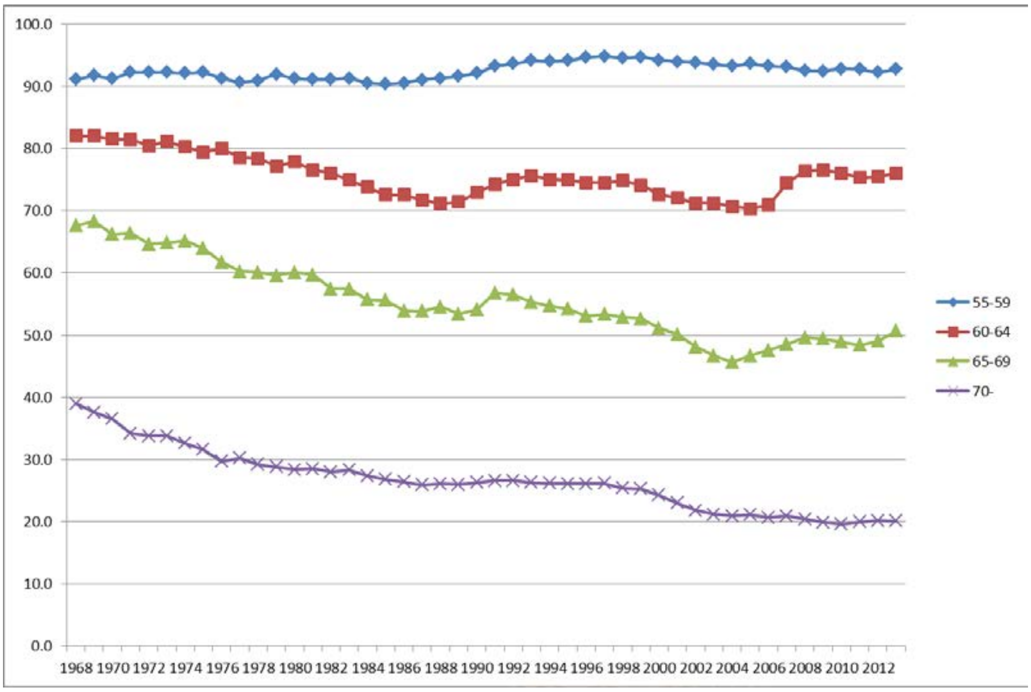
(B) Females



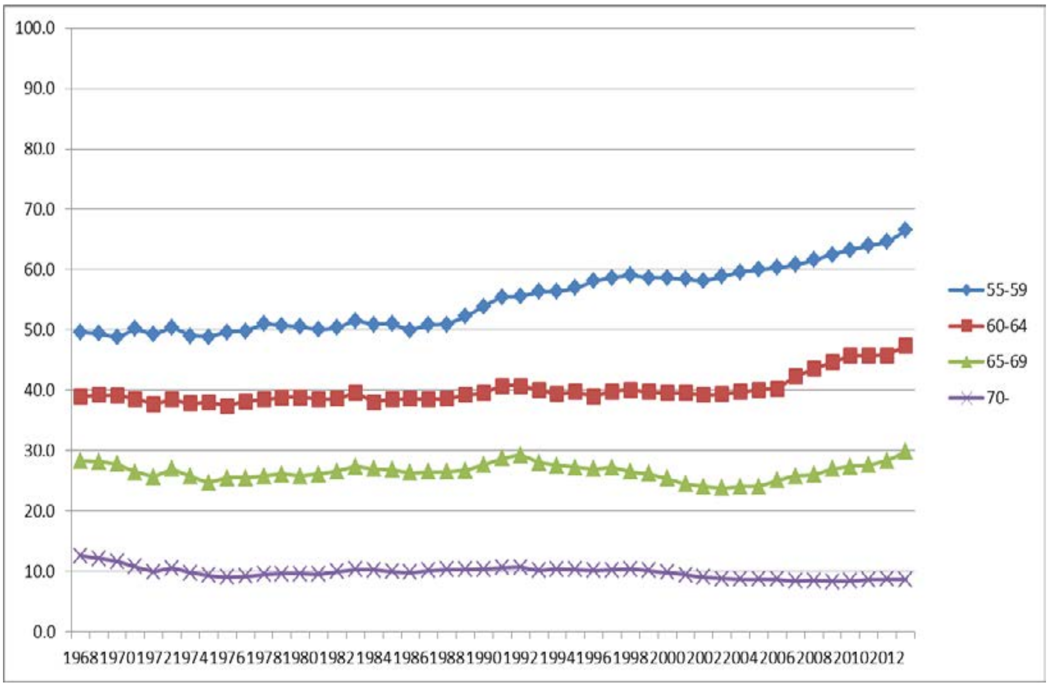
(Source) OECD Pensions Outlook, 2012.

Figure 2. Long-term trend of labor force participation rate in Japan

(A) Males



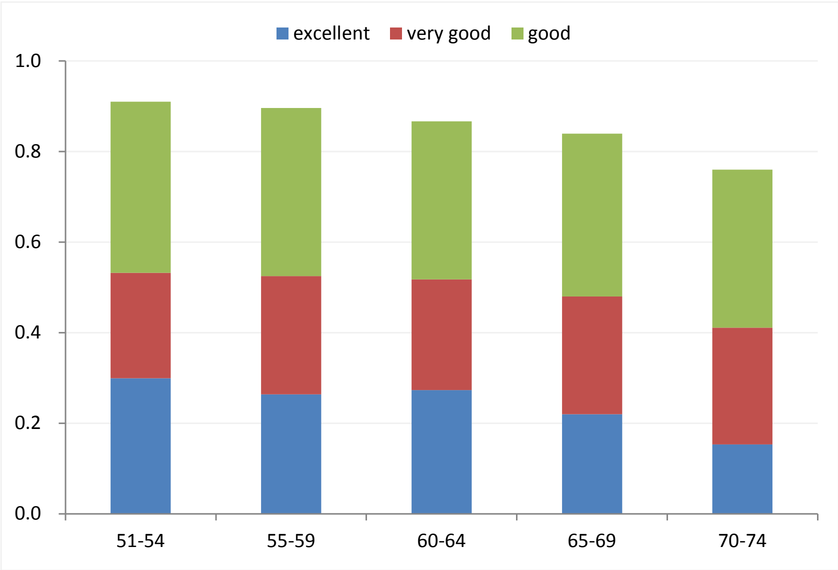
(B) Females



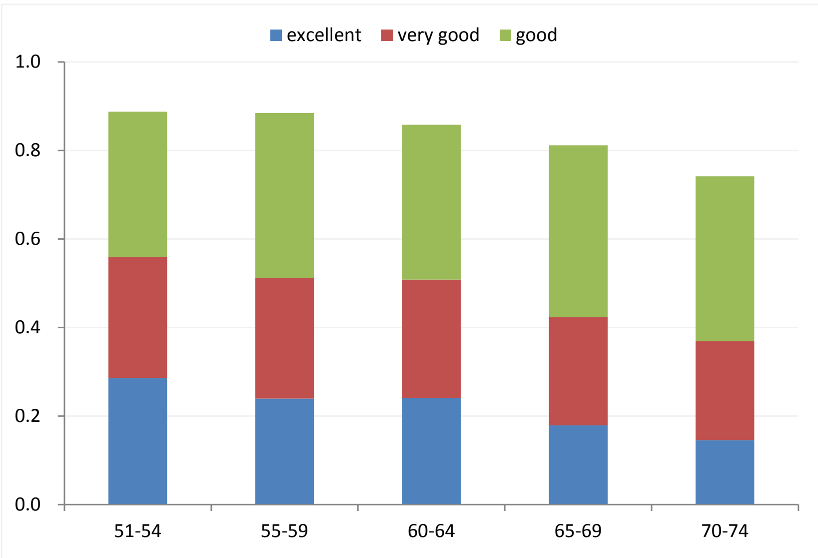
(Source) Labor Force Survey, various years.

Figure 3. Health status by age

(A) Males



(B) Females



(Source) Authors' calculations based on JSTAR.

Table 1. Results of multinomial probit regressions

(A) Males (age 50-59)

Variable	Retired RRR	Retired SE		Part-time RRR	Part-time SE	
Self-assessed health: very good	7.765	8.230	*	1.317	0.379	
Self-assessed health: good	10.501	11.090	**	0.922	0.274	
Self-assessed health: fair or poor	15.990	16.247	***	2.379	0.876	**
Physical functional limitation: 1	6.769	3.737	***	1.153	0.629	
Physical functional limitation: 2+	18.323	8.218	***	1.842	1.102	
Any ADL limitations	4.396	1.854	***	1.507	0.915	
Any IADL limitations	0.040	0.054	**	0.089	0.147	
CES-D	1.036	0.075		1.089	0.070	
CES-D: missing	4.194	3.840		5.179	4.538	*
Heart disease	3.183	1.811	**	2.291	0.860	**
Lung disease	3.903	3.260		0.980	0.912	
Stroke	2.632	2.943		4.449	2.419	***
Psychiatric disorder	22.056	14.106	***	0.998	0.773	
Cancer	3.712	2.751	*	0.989	0.828	
Hypertension	0.972	0.435		0.592	0.167	*
Arthritis	0.427	0.484		0.394	0.416	
Diabetes	2.315	1.185		1.064	0.332	
Illness:missing	1.267	0.739		0.742	0.225	
Underweight	2.113	1.092		1.158	0.847	
Overweight	0.664	0.284		0.783	0.204	
Obese	2.400	2.787		3.158	1.493	**
Weight: missing	0.981	1.238		0.000	0.000	***
Former smoker	0.874	0.458		0.753	0.215	
Current smoker	1.197	0.686		0.774	0.224	
Smoker: missing	6.275	7.068		1.676	1.757	
Below high school	0.522	0.272		1.247	0.402	
Some college	0.279	0.210	*	1.702	0.564	
College	0.448	0.203	*	0.719	0.210	
Education: missing	0.875	0.549		3.017	3.483	
Married	0.255	0.114	***	0.469	0.138	***
Marital status: missing	0.399	0.283		0.294	0.332	
Blue collar	0.360	0.244		0.531	0.152	**
Low-skilled services	0.591	0.587		0.280	0.192	*
Covered by a pension	0.810	0.386		0.640	0.180	
Year 2007	0.539	0.298		1.999	0.877	
Year 2009	0.687	0.380		2.050	0.855	*
Constant	0.012	0.011	***	0.125	0.076	***
# Obs				1,701		

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

(B) Females (age 50-59)

Variable	Retired		Part-time	
	RRR	SE	RRR	SE
Self-assessed health: very good	1.366	0.263	1.146	0.200
Self-assessed health: good	1.487	0.276 **	1.406	0.234 **
Self-assessed health: fair or poor	3.094	0.873 ***	1.745	0.495 **
Physical functional limitation: 1	1.345	0.364	0.874	0.262
Physical functional limitation: 2+	3.195	1.071 ***	0.789	0.304
Any ADL limitations	4.063	2.619 **	2.280	1.513
Any IADL limitations	0.655	0.596	0.345	0.265
CES-D	0.985	0.040	1.076	0.039 **
CES-D: missing	1.096	0.900	3.522	2.183 **
Heart disease	1.960	0.789 *	1.393	0.611
Lung disease	4.577	5.979	4.487	5.445
Stroke	3.153	4.362	1.501	2.022
Psychiatric disorder	8.628	6.125 ***	3.096	1.839 *
Cancer	1.240	0.628	0.660	0.340
Hypertension	1.498	0.331 *	1.907	0.407 ***
Arthritis	2.406	0.788 ***	1.213	0.413
Diabetes	0.845	0.332	0.530	0.230
Illness:missing	1.360	0.224 *	1.409	0.221 **
Underweight	0.956	0.280	1.628	0.436 *
Overweight	0.814	0.179	0.905	0.189
Obese	2.092	1.155	1.845	1.115
Weight: missing	0.378	0.286	0.738	0.533
Former smoker	0.723	0.206	1.422	0.379
Current smoker	0.757	0.191	1.030	0.222
Smoker: missing	1.001	0.494	0.863	0.387
Below high school	1.864	0.504 **	1.239	0.322
Some college	0.992	0.194	0.772	0.139
College	0.580	0.167 *	0.820	0.215
Education: missing	7.594	6.277 **	5.106	4.034 **
Married	3.990	0.910 ***	2.500	0.474 ***
Marital status: missing	0.247	0.204 *	0.391	0.308
Blue collar	0.251	0.096 ***	1.187	0.299
Low-skilled services	0.352	0.148 **	1.692	0.455 *
Covered by a pension	1.188	0.223	1.049	0.183
Year 2007	0.511	0.096 ***	0.986	0.182
Year 2009	0.604	0.109 ***	1.069	0.190
Constant	0.218	0.073 ***	0.208	0.062 ***
# Obs			1,697	

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

Table 2. Simulation of work capacity

Age Group	# Obs	Actual % Retired	Actual % Part-time	Actual % Full-time	Base age 50-59					
					Predicted % Retired	Work Capacity	Predicted % Part-time	Part-time Capacity	Predicted % Full-time	Full-time Capacity
(A) Men										
55-59					--	--				
60-64	1,225	20.5%	17.6%	62.0%	4.7%	15.8%	7.0%	-10.5%	88.2%	26.3%
65-69	1,243	48.7%	22.0%	29.3%	6.6%	42.1%	9.0%	-13.0%	84.4%	55.1%
70-74	1,248	67.4%	15.3%	17.3%	10.1%	57.3%	10.1%	-5.2%	79.7%	62.4%
(B) Women										
55-59					--	--				
60-64	1,289	51.9%	27.2%	20.9%	34.6%	17.3%	29.5%	2.2%	36.0%	15.1%
65-69	1,283	70.3%	18.8%	10.9%	38.0%	32.3%	29.1%	10.3%	32.9%	21.9%
70-74	1,356	84.1%	9.9%	6.0%	40.6%	43.4%	28.2%	18.3%	31.1%	25.1%

(Source) Authors' calculations based on JSTAR.

Table 3. Simulation of work capacity by educational attainment

(A) Males

Age Group	# Obs	Actual % Retired	Actual % Part-time	Actual % Full-time	Base age 50-59 Predicted % Retired	Work Capacity	Predicted % Part-time	Part-time Capacity	Predicted % Full-time	Full-time Capacity
(A) Men, HS/less										
55-59					--	--				
60-64	799	20.3%	18.3%	58.9%	0.052	15.1%	0.075	-10.8%	0.873	28.4%
65-69	886	46.8%	22.9%	30.2%	0.071	39.7%	0.092	-13.7%	0.837	53.4%
70-74	935	67.2%	15.6%	17.2%	0.101	57.1%	0.107	-5.0%	0.792	62.0%
(B) Men, Some college or more										
55-59					--	--				
60-64	358	19.6%	15.9%	64.5%	0.022	17.3%	0.056	-10.3%	0.922	27.6%
65-69	260	55.4%	17.3%	27.3%	0.047	50.7%	0.087	-8.6%	0.866	59.3%
70-74	205	66.3%	15.1%	18.5%	0.057	60.6%	0.085	-6.6%	0.857	67.2%

(B) Females

Age Group	# Obs	Actual % Retired	Actual % Part-time	Actual % Full-time	Base age 50-59 Predicted % Retired	Work Capacity	Predicted % Part-time	Part-time Capacity	Predicted % Full-time	Full-time Capacity
(A) Women, HS/less										
55-59					--	--				
60-64	894	52.6%	27.3%	20.1%	0.347	17.9%	0.309	3.6%	0.344	14.3%
65-69	988	69.8%	19.0%	11.1%	0.387	31.2%	0.296	10.6%	0.317	20.6%
70-74	1,075	83.4%	9.9%	6.7%	0.408	42.6%	0.289	19.1%	0.303	23.6%
(B) Women, Some college or more										
55-59						--				
60-64	275	50.5%	26.2%	23.3%	0.350	15.6%	0.253	-0.9%	0.397	16.4%
65-69	194	71.6%	19.6%	8.8%	0.367	35.0%	0.263	6.8%	0.370	28.2%
70-74	162	87.7%	9.9%	2.5%	0.402	47.5%	0.239	14.0%	0.360	33.5%

(Source) Authors' calculations based on JSTAR.

Table 4. Simulation of work capacity with age trend

Age Group	# Obs	Actual % Retired	Actual % Part	Actual % Full	Base age 50-59					
					Predicted % Retirec	Work Capacity	Predicted % Part	Part-time Capacity	Predicted % Full	Full-time Capacity
					MEN					
55-59					--	--				
60-64	1,225	20.5%	17.6%	62.0%	12.6%	7.9%	8.4%	-9.1%	78.9%	17.0%
65-69	1,243	48.7%	22.0%	29.3%	31.8%	16.9%	9.8%	-12.3%	58.5%	29.2%
70-74	1,248	67.4%	15.3%	17.3%	57.8%	9.6%	7.9%	-7.4%	34.3%	17.0%
					WOMEN					
55-59					--	--				
60-64	1,289	51.9%	27.2%	20.9%	44.8%	7.1%	30.3%	3.1%	24.8%	4.0%
65-69	1,283	70.3%	18.8%	10.9%	55.2%	15.1%	28.8%	10.1%	16.0%	5.1%
70-74	1,356	84.1%	9.9%	6.0%	63.7%	20.4%	25.9%	16.0%	10.4%	4.4%

(Source) Authors' calculations based on JSTAR.

Appendix

Table A1. Summary statistics

(A) Males

Variable	Age Group				
	51-54	55-59	60-64	65-69	70-74
Retired	0.015	0.042	0.205	0.487	0.674
Part-time worker	0.053	0.074	0.176	0.220	0.153
Full-time worker	0.932	0.883	0.620	0.293	0.173
Self-assessed health: excellent	0.299	0.264	0.273	0.220	0.153
Self-assessed health: very good	0.233	0.261	0.244	0.260	0.258
Self-assessed health: good	0.378	0.371	0.349	0.360	0.349
Self-assessed health: fair	0.078	0.087	0.112	0.129	0.187
Self-assessed health: poor	0.012	0.016	0.021	0.031	0.053
Physical functional limitation: 1	0.014	0.032	0.047	0.057	0.085
Physical functional limitation: 2+	0.022	0.029	0.055	0.102	0.160
Any ADL limitations	0.019	0.023	0.042	0.057	0.082
Any IADL limitations	0.073	0.061	0.047	0.053	0.062
CES-D	1.049	0.990	0.978	0.891	1.059
CES-D: missing	0.080	0.065	0.062	0.071	0.095
Heart disease	0.044	0.062	0.078	0.105	0.173
Lung disease	0.005	0.007	0.014	0.019	0.023
Stroke	0.009	0.011	0.027	0.064	0.071
Psychiatric disorder	0.014	0.015	0.005	0.008	0.010
Cancer	0.017	0.014	0.034	0.045	0.052
Hypertension	0.223	0.239	0.336	0.363	0.421
Arthritis	0.022	0.013	0.016	0.033	0.037
Diabetes	0.090	0.111	0.118	0.179	0.181
Illness:missing	0.362	0.219	0.160	0.139	0.086
Underweight	0.022	0.021	0.017	0.024	0.034
Overweight	0.299	0.266	0.291	0.278	0.268
Obese	0.048	0.048	0.038	0.028	0.031
Weight: missing	0.007	0.013	0.011	0.011	0.015
Former smoker	0.332	0.381	0.391	0.458	0.494
Current smoker	0.381	0.360	0.338	0.255	0.174
Smoker: missing	0.077	0.072	0.055	0.071	0.074
Below high school	0.099	0.164	0.223	0.319	0.391
High school	0.340	0.417	0.413	0.393	0.358
Some college	0.107	0.100	0.059	0.039	0.043
College	0.384	0.249	0.233	0.170	0.121
Education: missing	0.070	0.069	0.072	0.078	0.087
Married	0.789	0.806	0.820	0.834	0.829
Marital status: missing	0.063	0.072	0.073	0.088	0.091
Blue collar	0.303	0.245	0.207	0.293	0.317
Low-skilled services	0.054	0.042	0.038	0.031	0.038
Covered by a pension	0.800	0.688	0.599	0.294	0.234
# Obs	588	1156	1225	1243	1248

(B) Females

Variable	Age Group				
	51-54	55-59	60-64	65-69	70-74
Retired	0.250	0.343	0.519	0.703	0.841
Part-time worker	0.317	0.310	0.272	0.188	0.099
Full-time worker	0.433	0.347	0.209	0.109	0.060
Self-assessed health: excellent	0.286	0.239	0.241	0.179	0.145
Self-assessed health: very good	0.273	0.273	0.267	0.245	0.224
Self-assessed health: good	0.328	0.373	0.350	0.388	0.372
Self-assessed health: fair	0.089	0.098	0.121	0.152	0.208
Self-assessed health: poor	0.023	0.017	0.020	0.036	0.050
Physical functional limitation: 1	0.039	0.055	0.068	0.092	0.108
Physical functional limitation: 2+	0.055	0.062	0.079	0.161	0.263
Any ADL limitations	0.018	0.026	0.031	0.049	0.079
Any IADL limitations	0.050	0.056	0.045	0.056	0.049
CES-D	1.340	1.452	1.213	1.189	1.258
CES-D: missing	0.055	0.065	0.058	0.077	0.086
Heart disease	0.031	0.040	0.049	0.094	0.123
Lung disease	0.007	0.004	0.010	0.013	0.010
Stroke	0.002	0.008	0.019	0.027	0.038
Psychiatric disorder	0.018	0.026	0.021	0.027	0.028
Cancer	0.028	0.023	0.036	0.037	0.029
Hypertension	0.154	0.195	0.266	0.348	0.420
Arthritis	0.057	0.057	0.058	0.082	0.105
Diabetes	0.031	0.050	0.072	0.088	0.104
Illness:missing	0.424	0.270	0.188	0.143	0.114
Underweight	0.083	0.074	0.078	0.069	0.049
Overweight	0.207	0.203	0.235	0.260	0.265
Obese	0.062	0.045	0.038	0.047	0.063
Weight: missing	0.026	0.016	0.018	0.012	0.025
Former smoker	0.089	0.082	0.081	0.071	0.065
Current smoker	0.153	0.116	0.088	0.049	0.046
Smoker: missing	0.059	0.073	0.064	0.077	0.080
Below high school	0.078	0.116	0.223	0.359	0.451
High school	0.418	0.451	0.470	0.411	0.342
Some college	0.299	0.256	0.169	0.118	0.100
College	0.150	0.088	0.044	0.034	0.020
Education: missing	0.055	0.089	0.093	0.079	0.088
Married	0.769	0.738	0.712	0.712	0.631
Marital status: missing	0.059	0.086	0.104	0.081	0.097
Blue collar	0.106	0.081	0.100	0.136	0.162
Low-skilled services	0.085	0.063	0.042	0.050	0.066
Covered by a pension	0.816	0.698	0.667	0.286	0.238
# Obs	615	1120	1289	1283	1356