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Financial Implications of Social Security Reforms in Japan

Akiko S. Oishi and Takashi Oshio

7.1 Introduction

As in other OECD countries, public pension insolvency is now one of the most serious problems that an aging society poses for the Japanese economy. The proportion of people aged 65 and above—19.5 percent in 2004, which is close to the OECD average—is expected to grow faster than in any other advanced country. The latest official population projections, published in December 2006, expect the share of elderly to rise to 30.5 percent in 2025 and 39.6 percent in 2050. These projections assume that the fertility rate will remain low at 1.26 by 2050, expecting no substantial recovery from 1.26 in 2005.

Rapid population aging is a big challenge to the sustainability of the social security system, which relies heavily on future generations. Under strong demographic pressures, the government announced a pension reform plan in 1999, which has been implemented since April 2000. Since Japan's public pension program is basically a pay-as-you-go system, the government must reduce benefits and/or increase contributions in order to keep the programs financially sustainable. To finance pension benefits promised in the 1994 Reform, the contribution rate must eventually increase to 34.5 percent, which seems unacceptable. The 2000 Reform thus incorporates measures to hold down the burden on future generations by making eligibility conditions and benefit schemes less generous than previously scheduled.

Still, the chance that the 2000 reform will fail to solve insolvency problems is very high, since it is still based on seemingly overestimated popu-

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lation growth[1] and rosy macroeconomic forecasts. Indeed, several analysts show that the public pension fund would be exhausted by 2050, even with several changes called for by the 2000 Reform. Net pension liabilities are estimated to be 550 trillion yen, about 108 percent of net GDP, at the end of fiscal year 1999 and will probably keep increasing.

It should be noted, however, that the typical approach to the financial liabilities often ignores the effect of policy changes on the labor supply of elderly people. It is important to understand retirement incentive effects in order to assess the full impact of pension reforms on the financial liabilities of the systems. Those effects will be critical in Japan, since postwar baby-boomers will become eligible for public pension benefits in the next few years. The reform that raise labor supply among the elderly can improve the fiscal position of the social security system and other public sector, but the fiscal implications will depend much on the provisions of the system.

This chapter aims to illustrate how social security reforms affect the financial balance sheet of retirement income systems through a change in retirement decisions by elderly workers. The reforms considered in this chapter are chosen for the purpose of cross-country comparisons and are not proposed as desirable or politically feasible in Japan. It should be also noted that the reforms are being compared to the pre-2000 Reform system, not necessarily to a solvent system. In addition, the incentive measures in this article are calculated based on the social security schemes as of the year 1996 when the data we use were surveyed. However, the basic structure of the social security programs remains the same after the Reform, and main messages and policy implications in this chapter are still relevant.

The structure of the paper is as follows. Section 7.2 provides a brief picture of retirement programs in Japan. Section 7.3 presents the base model used for analysis. Section 7.4 describes the simulation methodology and issues that arise in Japan, section 7.5 presents simulation results and discusses their policy implications, and section 7.6 concludes.

7.2 Institutional Background

7.2.1 Public Pension Plans

The principal program for private sector employees in Japan is the *Kosei-Nenkin-Hoken* (KNH), which covers about 85 percent of all employees. Government employees, private school teachers, and employees in agriculture/forestry/fishing organizations are covered by special programs

1. The 2000 Reform was based on 1998 population projections, which unrealistically expected the fertility rate to smoothly recover to 1.61 by 2050.

provided by *Kyosai-Kumiai* (mutual aid associations), but those programs have almost the same structure as the KNH. Thus, our analysis of public pensions in this paper mainly focuses on the KNH, and treats *Kyosai-Kumiai* members as KNH members.

The KNH operates a two-tier system. One pays flat-rate Basic Pension (*Kiso Nenkin*) benefits, which are applied to all residents: not only employees, but also the self-employed and unpaid family workers. Full Basic Pension benefits paid to those with 40-year contributions are about 67,000 yen per month. The other pays earnings-related benefits, which are only for private and public employees. Those benefits are calculated as the career average monthly earnings × the number of contribution years × the actuarial rate (which differs by birth year). Both benefits are inflation-indexed every year in terms of consumer prices, and adjusted for wage growth every five years.[2]

The normal eligibility age for full KNH benefits—both flat-rate and earnings-related components—had been 65 until 1999, but one could get full benefits at age 60 if he or she retired and stopped working at that age. Since 2001, however, the eligibility age for the flat-rate benefits is raised by one year every three years. And beginning in 2013, the eligibility age for the earnings-related benefits will also be raised by one year every three years. These two steps of increasing the eligibility age have been called for by the 1994 and 2000 Reforms. If they are implemented as scheduled, men who were born in 1961 and later and women who were born in 1966 and later will receive no pension benefits until age 65.

It should be also noted that a KNH recipient, who keeps working during ages 60 and 64, can receive reduced KNH benefits subject to an earnings test. This scheme, which is called the *Zaishoku* Pension, is roughly equivalent to the early retirement system in many other OECD countries. If the total of monthly earnings and KNH benefits exceed 280,000 yen, the marginal tax rate is 50 percent. For high-salaried elderly workers who earn more than 480,000 yen a month, the marginal tax rate is 100 percent. One has to pay KNH contributions as long as he or she keeps working, although he or she can expect an increase in future pension benefits.

Contributions are based on the employee's monthly standard earnings and are shared equally by the employee and employer. The total contribution rate for the KNH Pension—covering both the flat-rate and earnings-related components—is currently 14.642 percent, meaning that an employee and employer contribute 7.321 percent each. A female employee pays premiums at the same contribution rate, while a dependent housewife does not need to contribute.

2. This wage indexation was abolished in the 2000 Reform. The current system has only the price indexation.

7.2.2 Other Income Support

Unemployment insurance (UI) adds temporary income support to retired employees. In many cases, an individual who reaches age 60 leaves the firm where she or he has been working, and starts to receive KNH benefits. At the same time, it is normal to apply for UI benefits when quitting one's previous job, regardless of one's wish to find a new job. Unemployment insurance benefits for those of age 60 to 64 replace 45 to 80 percent of wage earnings at age 60, for 240 days at most. There had been many cases where the total replacement rate—adding KNH and UI benefits together—was effectively more than 100 percent of income at the first retirement age, probably reducing the incentive to work. Under a new law, effective April of 1998, however, an individual cannot receive UI and KNH benefits at the same time; as long as one is receiving UI benefits, one has to postpone receipt of KNH benefits.

Another income support that potentially interacts with public pension programs is the wage subsidy (WS) to elderly workers. This program was introduced in 1994 as a part of the public employment insurance scheme to replace the aforementioned UI benefits. The WS, which is equivalent to 15 percent of the current wage, is provided to an employee—subject to a certain wage ceiling—on condition that he or she is 60 to 64 years old and his or her wage earnings are less than 75 percent lower than his or her preretirement wage at age 60.

This WS program is independent from the public pension scheme, but its economic implications are similar to those of the *Zaishoku* Pension. Both programs are applicable to the same age group (60–64) and subject to certain earnings criteria. The WS can be treated as a negative premium in calculating social security incentives. The WS equivalent to 15 percent of wage earnings can exceed the employee's share of KNH contributions (7.321 percent). The combination of the WS and pension premium thus would add to an individual's net pension wealth, although it may not be enough to offset the negative effect from postponing receipt of pension benefits.

7.2.3 2000 Pension Reform

The 2000 Reform incorporated measures to lower contributions paid by future generations, making it inevitable that the eligibility conditions and benefit system would become less generous than scheduled in the 1994 Pension Reform. In particular, the 2000 Reform called for:

- a 5 percent reduction in earnings-related benefits
- a gradual increase in the eligible age of the earnings-related benefits to 65, from 60 since 2013 (in addition to the already-scheduled increase of the eligibility age to 65, from 60 during 2000 and 2013, called for by the 1995 Pension Reform)

- abolishing the wage indexation for pension benefits
- applying an earnings test for KNH benefits to high-salaried workers who are 65 years old and above
- a rise in the ratio of the subsidy from the central government to one-half, from the current one-third of Basic Pension benefits (without referring to any specific tax reform).

If these proposals are implemented as scheduled, the final contribution rate for KNH will be eventually pushed up to 25 percent, in contrast to the previously scheduled 34.5 percent. And the pension fund, which amounts to 144 trillion yen at the end of fiscal 1999, will not be exhausted over the next fifty years and more.

However, the risk that this 2000 Reform fails to raise sustainability of the overall social security scheme is high, because the reform depends on the seemingly optimistic estimations of population growth and rosy macroeconomic forecasts. Indeed, several simulations conducted by private think tanks and researchers show that the pension fund is likely to turn into a deficit by 2050, with more realistic assumptions about fertility rates, interest rates, and inflation rates.

7.3 Base Model

7.3.1 Data Source

Our analysis is based on the *Survey on Labor Market Participation of Older Persons* (*Konenreisha Shugyo Jittai Chosa*), which was conducted in October 1996 and published in December 1997 by the Ministry of Labor. The survey covers men and women aged 55 to 69 who were employees, company executives, self-employed, or not working. Our analysis centers on those who were employed at age 55 and had been working until 1996. The size of the sample we use for analysis is 4,141, out of 21,219 in the survey.

A major problem is that the data from this survey are cross-sectional, not longitudinal. What we know from the survey is an individual's age, current working status, wage income, pension benefits, and so on at the survey date. The survey asks each individual what kind of firm (industry and size) he or she was working for at age 55, whether and when he or she would face mandatory retirement, and when he or she wants to retire (if working at the time of the survey). However, any other longitudinal information, including wage profiles and the actual date of retirement, is not available: what we know from the survey is just whether an individual was retired or still working in the survey year of 1996. Moreover, data on an individual's background, such as education and family situation, are limited.

The most important quantitative information available from the survey

relates to an individual's current wage earnings and his or her social security and other benefits, on which our incentive calculations are based. It is, however, difficult to capture the diversity of incentives in employer-based pension policies, and information about lump-sum retirement benefits is not available. Moreover, answers regarding the category and amount of benefits seem at times to be unreliable, probably due to inaccurate and/or limited knowledge among respondents about social security programs. We estimate the theoretical value of social security benefits based on projected wage profiles, and make some adjustment if the discrepancy between theoretical and actual figures is too large to be ignored.

7.3.2 Cohorts in Focus

To estimate the impact of pension reforms on retirement decisions and assess its financial implications, we limit our sample to those who were working at age 55. We use multiple birth cohorts: that is, fifteen birth cohorts of ages 55 to 69 in the survey year 1996. This is because the sample size of a single birth cohort is very small (around 400). Individuals who are older than age 55 in 1996 are de-aged back to age 55 by being given the projected earnings history (which is discussed in the next section) and other characteristics they had at age 55 (which are known from the survey).

Two things should be mentioned about spousal issues. The first is how to obtain spousal information, which is needed to calculate family social security wealth (SSW) and other incentives to retire. Matching can be completely made if a spouse is 55 to 69 years old, since she or he is included in the sample and her or his information is available from the survey.[3] If a spouse's age is below 55 or above 69, however, we cannot know anything about her or him. We exclude the latter type of individual—whose age tends to be close to 55 or 69 in most cases—from the sample. We believe that this adjustment has no substantial impact on the results, because we de-age the observations aged 56 years and over back to age 55; the average age difference between husbands and wives is in accordance with the national average.

The second issue is how to avoid spousal double counting. If both a husband and his wife are included in the sample cohort, we would have their SSW twice in the sum. We solve this problem by including only men and single women in the analysis and incorporating all benefits received by married women (both from their own work and their husbands) in the cal-

3. The question sheets of the survey are sent to randomly selected households that have at least one household member aged between 55 and 69; everyone aged 55 to 69 in the surveyed households is requested to fill in the sheet and send it back to the office. Thus, for example, in the case of a couple with a husband aged 65 and wife 63, both are included in the survey, whereas in the case of a husband 55 and wife 53, only the husband is included. We exclude the latter type of couples from the sample.

culations for the husbands.[4] The sample, after adjustment, consists of 8,101 people—3,489 couples, 548 single male workers, and 575 single female workers.

7.3.3 Earnings Projections

Backward and forward projections of wage earnings are required to analyze the impact of social security incentives on retirement decisions. With limited longitudinal information, our projections of the age-earnings profiles depend largely on the cross-sectional data. Also, we use information from the Wage Census (*Chingin Sensasu*) to complement reported individual characteristics observed in the survey. To summarize our methodology, we use: (1) current wage earnings as a benchmark, (2) average age-wage profiles obtained from the survey for the ages 55 to 69, and (3) cohort-specific age-earnings profiles in backward projections, starting at age 55 and below, obtained from the Wage Census.

For earnings projections for ages 55 to 69, we rely on average wage growth rates observed from the survey, because cohort-specific information is not available. To calculate average wage growth, we regress the logarithm of monthly earnings (for males and females, separately) on an individual's age, experience of mandatory retirement, job categories, firm size at the employee's age of 55, whether a private or public employee at 55, and residential areas. All independent variables are dummies.

Based on this regression, we create each sample's earnings profile for the ages 55 to 69, using the reported current wage earnings as a benchmark. The wage growth rate is thus set to be the same for each individual: it is calculated by taking the difference in parameters on the two subsequent age dummies. The timing of mandatory retirement, which in most cases is 60 years old, is important in projecting the earnings profile. We assume that one will face mandatory retirement at 60, regardless of her or his desire to go to secondary labor markets.

To construct earnings histories before age 55, we use age-earnings data from the Wage Census, which is conducted and published every year by the Ministry of Health, Labor, and Welfare. The Wage Census provides average age-wage profiles by industry, firm size, and educational background. We project wage earnings backward, using estimated earnings at 55 as a benchmark and also using the cohort-specific wage curve.

Based on those earnings projections, we compute SSW (Social Security Wealth) and two kinds of incentive measures: PV (Peak Value) and OV (Option Value) at each age for each individual.[5] The technical problem

4. We also exclude women whose husbands are assumed to be deceased.

5. See Stock and Wise (1990) and Coile and Gruber (2000a) for the definition and implications of the option value, and see Coile and Gruber (2000a, 2000b) and Gruber and Wise (2003) for those of the peak value.

here is how to deal with multiple retirement income programs: KNH, UI, and *Zaishoku* benefits. In the previous study (Oshio and Oishi 2004), we captured the role of multiple retirement programs by creating weighted average incentive measures that incorporated all possible pathways to retirement. We cannot allocate workers across multiple programs based on these weights, since benefits are linked to their wage profiles. Instead, we use the weights to compute the weighted average of each program's benefits.

7.3.4 Model Estimates

In this section, we describe the empirical framework for regression analysis on the impact of social security on retirement. We first have to estimate each sample's previous working/retirement status, since our survey tells us only whether each sample is retired in the survey year of 1996. Hence, we first explain how to build up the quasi-longitudinal data; then we address the reduced-form models of retirement decisions.

To estimate models for incentive measures we select from the survey the individuals who were working at age 55 *and* are expected to have kept working until 1995, one year before the survey year. We apply the probit models to them to explain their retirement decisions in 1996: whether to keep working or to retire. The main problem of our analysis is that we cannot exactly identify those who were working in 1995, due to a lack of longitudinal information. Hence, we first assume that those who were working in 1996 were also working in 1995. And for those who were already retired, we only use those whose age of retirement can be identified from their reported answers about mandatory retirement and subsequent job experience. Thus, 2,629 men and 1,075 women out of the total sample are estimated to have been working in 1995—whose statistical characteristics are summarized in table 7.1.

For baseline simulations, we compute the projected work and retirement trajectory for our cohorts under the pre-2000 Reform scheme, using the two models with PV and OV. We use models that have controls for earnings, demographics, and sectors. Each model includes SSW. For ages, we have two types of methodologies: one with linear ages, the other with age dummies. Earnings controls consist of projected earnings for next year, average lifetime earnings, and the squares of each. Other controls include property income, dummies for health conditions, new occupational dummies, dummies for four categories of firm size at age 55, and eight dummies of residential areas.

Table 7.2 summarizes estimation results for men and women, respectively. For men, the coefficients on PV and OV are negative and significant in both S1 models, while in S3 models we find negative and insignificant impact of incentive measures on retirement. For women, the coefficient on PV is negative and significant in both cases of S1 and S3, while it is insignificant in OV models. For both men and women (supporting intuitive

Table 7.1 Summary statistics for the estimation sample

	Mean	Standard deviation	Min.	Max.
Males (sample size = 2,629)				
Retired	0.132	0.339	0.000	1.000
SSW (billion yen)	32.748	9.412	6.100	74.558
SSA (billion yen)	–0.050	2.476	–7.212	6.130
Peak value (billion yen)	1.844	3.761	–7.212	13.319
Option value (billion yen)	63.417	43.952	1.125	396.407
Property income (10 thousand yen)	2.099	13.850	0.000	500.000
Health condition: not well	0.151	0.358	0.000	1.000
Health condition: bad or sick	0.035	0.183	0.000	1.000
Projected earnings (billion yen)	3.393	2.264	0.100	14.417
Average lifetime earnings (billion yen)	3.486	1.792	0.799	7.080
Square of PE	16.635	25.715	0.010	207.860
Square of ALE	15.359	14.765	0.639	50.126
Age	61.324	3.660	55.000	69.000
Lives with spouse	0.858	0.349	0.000	1.000
Females (sample size = 1,075)				
Retired	0.186	0.389	0.000	1.000
SSW (billion yen)	33.633	14.838	9.057	80.908
SSA (billion yen)	0.239	1.626	–6.512	6.185
Peak value (billion yen)	1.909	3.003	–6.512	12.761
Option value (billion yen)	106.208	66.216	1.218	442.930
Property income (10 thousand yen)	0.804	3.836	0.000	66.000
Health condition: not well	0.148	0.355	0.000	1.000
Health condition: bad or sick	0.032	0.175	0.000	1.000
Projected earnings (billion yen)	1.957	1.270	0.120	12.000
Average lifetime earnings (billion yen)	1.985	1.163	0.799	7.080
Square of PE	5.440	10.762	0.014	144.000
Square of ALE	5.292	7.928	0.639	50.126
Age	59.309	3.378	55.000	69.000
Lives with spouse	0.735	0.442	0.000	1.000

explanations of income and substitution effects) average lifetime earnings tend to increase disincentives to work, while projected earnings tend to decrease them. The coefficient on SSW is positive in all cases, although insignificant in some, suggesting the existence of the wealth effect of SSW on retirement; a reduced SSW is expected to encourage people to keep working.

7.3.5 Predicted Probabilities of Retirement and Pension Reform

We can predict a probability of retirement at each age beyond 55, based on the previously-mentioned models and projected earnings. We first compute baseline hazard rates, assuming no policy change from the pre-2000 Reform schemes. Then we consider the following four policy changes, the last of which is specific to Japan:

Table 7.2 Retirement probits

Model	PV—S1	PV—S3	OP—S1	OP—S3
	A. Male sample (N = 2,623)			
SSW	0.000	0.001	0.031	0.004
	(0.006)	(0.006)	(0.006)	(0.009)
Incentive measure	–0.119	–0.071	–0.006	–0.001
	(0.013)	(0.042)	(0.002)	(0.002)
Property income	0.007	0.007	0.007	0.007
	(0.004)	(0.004)	(0.004)	(0.004)
Health condition: not well	0.287	0.299	0.278	0.303
	(0.088)	(0.090)	(0.087)	(0.091)
Health condition: bad or sick	1.075	1.133	1.084	1.158
	(0.154)	(0.167)	(0.150)	(0.152)
Projected earnings	–0.240	–0.227	–0.990	–0.274
	(0.406)	(0.485)	(0.399)	(0.494)
Average lifetime earnings	0.781	0.793	1.374	0.847
	(0.381)	(0.447)	(0.397)	(0.458)
Square of PE	0.009	0.009	0.048	0.011
	(0.021)	(0.025)	(0.020)	(0.025)
Square of ALE	–0.097	–0.099	–0.127	–0.102
	(0.024)	(0.027)	(0.025)	(0.027)
Age	–0.038		–0.068	
	(0.019)		(0.021)	
Age 55		0.509		0.524
		(0.364)		(0.358)
Age 56		0.207		0.420
		(0.385)		(0.369)
Age 57		–0.247		–0.099
		(0.416)		(0.404)
Age 58		0.225		0.429
		(0.392)		(0.397)
Age 59		0.537		1.336
		(0.609)		(0.398)
Age 60		0.871		1.406
		(0.496)		(0.396)
Age 61		0.023		0.545
		(0.512)		(0.427)
Age 62		0.312		0.839
		(0.516)		(0.431)
Age 63		0.128		0.651
		(0.529)		(0.454)
Age 64		0.606		1.029
		(0.471)		(0.428)
Age 65		0.174		0.576
		(0.479)		(0.449)
Age 66		0.099		0.507
		(0.521)		(0.491)
Age 67		–0.247		0.156
		(0.545)		(0.487)
Age 68		–0.077		0.322
		(0.548)		(0.543)
Pseudo R^2	0.175	0.208	0.135	0.207
Other controls	Yes	Yes	Yes	Yes

Table 7.2 (continued)

Model	PV—S1	PV—S3	OP—S1	OP—S3
	B. Female sample (N = 1,075)			
SSW	0.010	0.010	0.014	0.007
	(0.004)	(0.004)	(0.006)	(0.006)
Incentive measure	–0.137	–0.163	–0.001	0.001
	(0.026)	(0.067)	(0.002)	(0.002)
Property income	0.056	0.056	0.058	0.057
	(0.017)	(0.017)	(0.018)	(0.017)
Health condition: not well	0.138	0.194	0.152	0.209
	(0.132)	(0.134)	(0.130)	(0.135)
Health condition: bad or sick	1.230	1.242	1.129	1.255
	(0.231)	(0.238)	(0.229)	(0.238)
Projected earnings	–0.288	–0.535	–0.794	–0.664
	(0.461)	(0.485)	(0.440)	(0.482)
Average lifetime earnings	0.330	0.626	0.766	0.618
	(0.536)	(0.539)	(0.536)	(0.540)
Square of PE	0.043	0.061	0.068	0.065
	(0.033)	(0.033)	(0.033)	(0.033)
Square of ALE	–0.095	–0.121	–0.118	–0.110
	(0.071)	(0.065)	(0.072)	(0.066)
Age	–0.029		0.036	
	(0.022)		(0.024)	
Age 55		0.321		0.432
		(0.238)		(0.234)
Age 56		0.067		0.554
		(0.309)		(0.252)
Age 57		0.418		0.843
		(0.286)		(0.247)
Age 58		0.060		0.607
		(0.324)		(0.271)
Age 59		–0.142		1.253
		(0.601)		(0.279)
Age 60		0.225		1.270
		(0.469)		(0.284)
Age 61		0.044		1.117
		(0.490)		(0.317)
Age 62		–0.433		0.656
		(0.515)		(0.365)
Age 63		–0.675		0.454
		(0.521)		(0.380)
Age 64		0.275		1.314
		(0.494)		(0.391)
Age 65		–0.216		0.795
		(0.542)		(0.454)
Age 66		–0.276		0.759
		(0.607)		(0.759)
Age 67		–0.981		0.182
		(0.544)		(0.418)
Age 68		–0.283		0.699
		(0.725)		(0.616)
Pseudo R^2	0.151	0.172	0.125	0.168
Other controls	Yes	Yes	Yes	Yes

Notes: Other control variables are 9 occupational dummies, dummies for 4 categories of establishment size, and 8 regional dummies. The estimated parameters on these variables are not reported. Numbers in parentheses show robust standard errors.

- The Three-Year Reform calls for a three-year increase in the ages of early and normal retirement age (ERA and NRA hereafter). In Japan, this means shifting the ERA to 63 from 60 and the NRA to 68 from 65. In this reform, we assume that the spouse retires at the original ERA, both before and after the reform.
- The Actuarial Reform implements a 6 percent annual actuarial adjustment per year away from the NRA, without changing the ERA, NRA, or replacement rate. In this reform, we assume that benefits become available at the existing ERA level and keep benefits at the NRA the same as in the current system.
- The Common Reform calls for a common system, with (1) the ERA of 60, the NRA of 65, (2) a benefit equal to 60 percent of the lesser of average indexed lifetime earnings and the 90th percentile of the wage distribution for men, (3) a 6 percent per year actuarial adjustment, and (4) a survivor benefit equal to 100 percent of her or his spouse's benefit.[6] We assume that if a person retires before age 60 she or he still receives benefits starting at age 60, and that taxation of benefits is the same as in the base case.
- The JP 2000 Reform calls for an NRA of 65, with no ERA, and a 5 percent reduction in earning-related benefits, reflecting the final stage implied by the Pension Reform.

For all of these four reforms, we consider three methodologies regarding ages to check the sensitivity of the results to the treatment of ages in the estimated models: S1, based on the models with linear ages; S2, based on the models with age dummies, leaving them unchanged; and S3, based on and incrementing the models with age dummies. We perform these simulations by taking the estimated retirement model, plugging in new incentive measures and possibly new retirement ages, and estimating for each individual a new probability of retirement. Also, it should be remembered that the Japanese system already has an ERA of 60 and an NRA of 65, and that the JP 2000 Reform calls for no benefit at all before age 65.[7]

7.4 Simulation Methodology

7.4.1 Methodology

The goal of our simulation is to estimate the impact of pension reforms on older workers' net fiscal contributions to retirement income finances.

6. In Japan, a widow can receive the maximum of (a) three-fourths of her husband's worker benefit, (b) the full amount of her own benefit, and (c) half of her husband's worker benefit and half of her own worker benefit, in addition to her Basic Pension benefit. The first option is chosen in most cases, since womens' wage income is much lower than mens', and women work shorter years than men. A widower cannot receive the survivor benefit.

7. Disability pension benefits are available, but they are strictly targeted to accidentally handicapped people, not used for transitory income support until the normal eligibility age.

Such reforms will have two effects: (1) an automatic effect on fiscal contributions, by changing contributions and benefits for a given work history, and (2) an additional effect, through labor supply responses to the reform. We will estimate the fiscal implications of both, using the retirement model. It should be noted, however, that the result is an estimate of the steady-state impact of the reforms, with the transitory path neglected for simplicity.

The steps that we take are summarized in what follows. First, we project each worker's wage earnings forward (based on the predicted wage earnings) and backward (based on the Wage Census), as well as his or her SSW and incentive measures at each age.

Second, we obtain his or her estimated probability of exit at each age by multiplying incentive measures (and other time-independent variables augmented for the current age and year) by the estimated coefficients in the probit functions and plug through the normal distribution. We also explicitly account for the probability of dying at each age from the official mortality tables—to know whether he or she remains in the labor force, retires, or dies.

Third, we calculate net SSW at each age for those exiting the labor force to retirement and those exiting it to death, corresponding to the social security system that is applied to them. For couples, we calculate the SSW values, assuming that the spouse retires at the ERA. Net SSW is calculated for the entire family's SS payroll taxes and other taxes at each age, paid by both spouses.

Fourth, we get the expected net SSW of those exiting the labor force at each age, by multiplying the probabilities of entering retirement and of death by the net SSW associated with these states.

Fifth, we add the expected net SSW across all potential states, to calculate the average SSW that the individual is expected to receive under a given social security scheme. From the government's viewpoint, this average SSW is the net payment to the individual who leaves the labor force. The difference of the level between the baseline case and alternative reform scenarios quantitatively shows the financial implications of the reforms.

Finally, we separate out the fiscal effects of the reforms that automatically arise due to changes in program rules and those that arise due to labor supply responses. We call the former the *mechanical* effect and the latter the *behavioral* effect. We compute the mechanical effect by simulating the paths of taxes and benefits without assuming any change in retirement behavior: that is, taking the baseline path of exiting the labor market and applying this path to the new taxes/benefits structure. We then obtain the fiscal implications of the behavioral effect as the difference between the total effect and the mechanical effect.

7.4.2 Issues That Arise in Japan

The methodology discussed in the previous section is largely applicable to Japan, but there are some minor issues that more particularly arise for Japan. First, we have to ignore the survivor pension benefit for dependent children, for simplicity. We have little information about an individual's family members, and survivor pension benefits for dependent children are generally strict, especially if they are older than 18. We also ignore the possibility of divorce after age 55.

Second, in calculating taxes, we include all payroll taxes (SS contributions paid by both employees and employers), personal income taxes, and consumption taxes (VAT), to assess the magnitude of a change in tax revenues at both the SS budget and total government budget. The consumption tax rate is currently 5 percent in Japan, and we roughly estimate consumption tax revenues by multiplying personal disposable income by the consumption-tax factor, which is calculated so that for the economy as a whole VAT revenues = consumption tax factor × personal disposable income in the national accounts.[8]

Third, there is a risk that we may overestimate the impact on older workers' labor supply in Japan, since there are limited chances to get a full-time job after age 60. We cannot rule out the case that a substantial part of policy incentives to stimulate working will be induced to firms rather than older workers through a reduction in wage. Our methodology assumes that additional labor supply, which is stimulated by pension reforms, can be smoothly realized without a reduction in wage.

7.5 Simulation Results

7.5.1 Main Results

Table 7.3 shows the present discounted values of gross and net SS benefits for the four reforms—the Three-Year, Actuarial, Common, and JP 2000 Reforms—in comparison with the base case. For each, the effect of the reform on tax revenues is broken down into payroll taxes (SS contributions), income taxes, and consumption taxes. The calculations are based on PV and OV models and methodologies S1, S2, and S3—that is, six types of combination. The numbers are reported in euros per worker.[9]

This table indicates that the financial implications depend on the type of

8. The tax rate was 3 percent in the survey year 1996, but we use the current 5 percent to assess the impact of the reforms on consumption tax revenues. The consumption tax factor is assumed to be equal to 0.0397, which is implicitly calculated from national accounts and tax statistics.

9. We use the CPI to put values in 2001 yen, and translate them to euros using the December 31, 2001, euro/yen exchange rate (117.32).

Table 7.3 **Total fiscal impact of reform**

	Present discounted value (in euros)					Total change relative to base (%)			
	Base	Three-Year Increment	Actuarial	Common	JP2000	Three-Year Increment	Actuarial	Common	JP2000
				Peak value—S1					
Benefits	249,744	219,839	206,612	240,321	194,463	–12.0	–17.3	–3.8	–22.1
After-tax income	208,521	214,765	211,485	180,744	213,511	3.0	1.4	–13.3	2.4
Taxes									
Payroll	37,478	44,432	37,760	34,630	38,458	18.6	0.8	–7.6	2.6
Income	10,621	10,740	10,635	9,102	10,703	1.1	0.1	–14.3	0.8
Consumption	8,269	8,516	8,386	7,167	8,467	3.0	1.4	–13.3	2.4
Total	56,369	63,689	56,781	50,899	57,628	13.0	0.7	–9.7	2.2
Net change (in euros)						–37,225	–43,544	–3,954	–56,541
Change as % of base benefits						–14.9	–17.4	–1.6	–22.6
				Peak value—S2					
Benefits	243,678	215,322	200,309	234,580	190,789	–11.6	–17.8	–3.7	–21.7
After-tax income	201,983	206,443	203,914	188,694	205,897	2.2	1.0	–6.6	1.9
Taxes									
Payroll	36,509	43,082	36,496	34,898	37,041	18.0	0.0	–4.4	1.5
Income	10,336	10,401	10,330	9,525	10,396	0.6	–0.1	–7.8	0.6
Consumption	8,010	8,186	8,086	7,483	8,165	2.2	1.0	–6.6	1.9
Total	54,854	61,670	54,912	51,905	55,602	12.4	0.1	–5.4	1.4
Net change (in euros)						–35,172	–43,426	–6,149	–53,637
Change as % of base benefits						–14.1	–17.4	–2.5	–21.5

(*continued*)

Table 7.3 (continued)

	Present discounted value (in euros)					Total change relative to base (%)			
	Base	Three-Year increment	Actuarial	Common	JP2000	Three-Year Increment	Actuarial	Common	JP2000
				Peak value—S3					
Benefits	243,678	219,182	200,309	234,580	188,208	–10.1	–17.8	–3.7	–22.8
After-tax income	201,983	242,905	203,914	188,694	236,078	20.3	1.0	–6.6	16.9
Taxes									
Payroll	36,509	47,529	36,496	34,898	41,038	30.2	0.0	–4.4	12.4
Income	10,336	11,915	10,330	9,525	11,569	15.3	–0.1	–7.8	11.9
Consumption	8,010	9,632	8,086	7,483	9,362	20.3	1.0	–6.6	16.9
Total	54,854	69,077	54,912	51,905	61,968	25.9	0.1	–5.4	13.0
Net change (in euros)						–38,719	–43,426	–6,149	–62,584
Change as % of base benefits						–15.5	–17.4	–2.5	–25.1
				Option value—S1					
Benefits	250,012	220,642	203,991	245,195	187,853	–11.7	–18.4	–1.9	–24.9
After-tax income	209,029	224,215	207,124	205,310	221,921	7.3	–0.9	–1.8	6.2
Taxes									
Payroll	38,108	46,623	37,695	37,631	39,444	22.3	–1.1	–1.3	3.5
Income	10,583	11,121	10,379	10,291	10,940	5.1	–1.9	–2.8	3.4
Consumption	8,289	8,891	8,213	8,142	8,800	7.3	–0.9	–1.8	6.2
Total	56,980	66,635	56,288	56,064	59,185	16.9	–1.2	–1.6	3.9
Net change (in euros)						–39,025	–45,329	–3,901	–64,363
Change as % of base benefits						–15.6	–18.2	–1.6	–25.8

				Option value—S2					
Benefits	243,651	217,996	200,372	236,168	192,243	–10.5	–17.8	–3.1	–21.1
After-tax income	202,114	206,151	204,245	202,965	205,020	2.0	1.1	0.4	1.4
Taxes									
Payroll	36,519	43,463	36,526	36,414	36,916	19.0	0.0	–0.3	1.1
Income	10,342	10,438	10,345	10,299	10,415	0.9	0.0	–0.4	0.7
Consumption	8,015	8,175	8,099	8,049	8,130	2.0	1.1	0.4	1.4
Total	54,876	62,076	54,970	54,761	55,461	13.1	0.2	–0.2	1.1
Net change (in euros)						–32,855	–43,374	–7,368	–51,993
Change as % of base benefits						–13.2	–17.4	–3.0	–20.8
				Option value—S3					
Benefits	243,651	213,762	200,372	236,168	182,237	–12.3	–17.8	–3.1	–25.2
After-tax income	202,114	254,556	204,245	202,965	254,697	25.9	1.1	0.4	26.0
Taxes									
Payroll	36,519	48,335	36,526	36,414	43,271	32.4	0.0	–0.3	18.5
Income	10,342	12,322	10,345	10,299	12,180	19.2	0.0	–0.4	17.8
Consumption	8,015	12,322	8,099	8,049	10,100	53.7	1.1	0.4	26.0
Total	54,876	72,979	54,970	54,761	65,550	33.0	0.2	–0.2	19.5
Net change (in euros)						–47,993	–43,374	–7,368	–72,089
Change as % of base benefits						–19.2	–17.4	–3.0	–28.9

reform, and that their extent relies heavily on the combination of models and methodologies. We find that net benefits decline in all cases, although the magnitude of reduction relies much on the type of reform and the combination of models and methodologies. First, the Three-Year Reform saves net benefits by 13.2 percent to 19.2 percent, with S3 reducing them more than S1 and S2. The Actuarial Reform turns to be somewhat more effective than the Three-Year Reform in saving the benefits, suggesting that the current system is more generous than actuarially fair. In sharp contrast to these two reforms, the Common Reform fails to significantly reduce net benefits. To be sure, the proposed actuarial adjustment incorporated in this reform should reduce the benefits, as suggested in the case of the Actuarial Reform. This effect seems to be, however, mostly offset by the proposed benefit at 65 (equal to 60 percent of the average indexed lifetime earnings) and the survivor benefit (equal to 100 percent of her or his spouse's benefit)—both of which are more generous than in the current system. Actually, we find little change in gross benefits from the base case. Finally, the JP 2000 Reform, which reduces net benefits by 20.8 percent to 28.9 percent, is more effective than the other three reforms, mainly because it pays no pension benefits until age 65 and incorporates a 5 percent reduction of earnings-related benefits.

In addition, dividing the impact into the changes in gross benefits and taxes, we find that reforms other than the Common Reform succeed in reducing gross benefits, with the Three-Year Reform raising tax revenues most. This result suggests that the Three-Year Reform is more effective in postponing exit from labor force (see the following).

Table 7.4 divides the impact into the mechanical effect and the fiscal implications of the behavioral effect. In all cases, most of the financial effect can be attributed to the mechanical effect; the fiscal implications of the behavioral effect are relatively small, even positive in some models. This probably reflects two factors: (1) limited responsiveness of retirement to incentive measures, which is implied by small coefficients on them, as reported in tables 7.2, panels A and B, and (2) the actuarial adjustment already incorporated in the current scheme (especially for the earnings-related component).[10] The effects of the proposed reforms thus center on the eligibility conditions and benefit payment scheme, rather than changes in the working/retirement behavior of the elderly.

The results in tables 7.4, 7.5, and 7.6 also depend greatly on the model specifications and estimation methodologies. We find that OV tends to produce a greater reduction in net benefits than PV, while S3 tends to produce a larger reduction than S1 and S2. The estimated impact is the biggest for the combination of OV and S3 and is the smallest for the combination of PV and S2, with some exceptions.

10. In addition, older workers receive WS, which is a subsidy equivalent to 15 percent of wage income, although this scheme has not been widely used to date.

Table 7.4 **Decomposition of the total effect of reform (in euros)**

	Change in present discounted value											
	Three-Year Increment			Actuarial			Common			JP2000		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
						Peak value—S1						
Benefits	–27,049	–2,857	–29,905	–44,676	1,544	–43,131	–8,836	–587	–9,423	–52,669	–2,612	–55,281
After-tax income	1,938	4,306	6,244	2,182	782	2,964	1,687	–29,464	–27,777	743	4,247	4,990
Taxes												
Payroll	7,002	–48	6,954	0	281	281	0	–2,848	–2,848	429	551	980
Income	0	119	119	0	13	13	0	–1,519	–1,519	0	82	82
Consumption	77	171	248	87	31	118	67	–1,168	–1,101	29	168	198
Total	7,079	242	7,320	87	326	412	67	–5,536	–5,469	458	802	1,260
Net change	–34,127	–3,098	–37,225	–44,762	1,219	–43,544	–8,903	4,949	–3,954	–53,127	–3,414	–56,541
Change as % of base benefits	–13.7	–1.2	–14.9	–17.9	0.5	–17.4	–3.6	2.0	–1.6	–21.3	–1.4	–22.6
						Peak value—S2						
Benefits	–26,130	–2,226	–28,356	–43,328	–41	–43,369	–7,066	–2,032	–9,098	–50,847	–2,043	–52,890
After-tax income	1,843	2,617	4,460	2,065	–134	1,931	1,601	–14,890	–13,289	852	3,062	3,914
Taxes												
Payroll	6,666	–93	6,573	0	–14	–14	0	–1,612	–1,611	190	343	532
Income	0	65	65	0	–6	–6	0	–811	–811	0	60	60
Consumption	73	104	177	82	–5	77	63	–590	–527	34	121	155
Total	6,739	76	6,815	82	–24	57	64	–3,013	–2,949	224	524	748
Net change	–32,869	–2,302	–35,172	–43,409	–17	–43,426	–7,130	981	–6,149	–51,070	–2,567	–53,637
Change as % of base benefits	–13.5	–0.9	–14.4	–17.8	0.0	–17.8	–2.9	0.4	–2.5	–21.0	–1.1	–22.0

(*continued*)

Table 7.4 (continued)

	Change in present discounted value											
	Three-Year Increment			Actuarial			Common			JP2000		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
						Peak value—S3						
Benefits	–26,130	1,633	–24,496	–43,328	–41	–43,369	–7,066	–2,032	–9,098	–50,847	–4,623	–55,470
After-tax income	1,843	39,079	40,922	2,065	–134	1,931	1,601	–14,890	–13,289	852	33,244	34,096
Taxes												
Payroll	6,666	4,354	11,020	0	–14	–14	0	–1,612	–1,611	190	4,339	4,529
Income	0	1,579	1,579	0	–6	–6	0	–811	–811	0	1,233	1,233
Consumption	73	1,550	1,623	82	–5	77	63	–590	–527	34	1,318	1,352
Total	6,739	7,483	14,222	82	–24	57	64	–3,013	–2,949	224	6,890	7,114
Net change	–32,869	–5,850	–38,719	–43,409	–17	–43,426	–7,130	981	–6,149	–51,070	–11,513	–62,584
Change as % of base benefits	–13.5	–2.4	–15.9	–17.8	0.0	–17.8	–2.9	0.4	–2.5	–21.0	–4.7	–25.7
						Option value—S1						
Benefits	–28,749	–621	–29,370	–44,874	–1,147	–46,021	–4,510	–306	–4,817	–53,751	–8,408	–62,159
After-tax income	2,087	13,099	15,186	2,379	–4,284	–1,905	1,792	–5,511	–3,719	654	12,238	12,892
Taxes												
Payroll	7,333	1,182	8,515	0	–413	–413	0	–477	–477	685	651	1,336
Income	0	538	538	0	–204	–204	0	–292	–292	0	357	357
Consumption	83	519	602	94	–170	–76	71	–219	–147	26	485	511
Total	7,416	2,239	9,655	94	–786	–692	71	–987	–916	711	1,494	2,205
Net change	–36,165	–2,860	–39,025	–44,968	–361	–45,329	–4,581	681	–3,901	–54,462	–9,901	–64,363
Change as % of base benefits	–14.5	–1.1	–15.6	–18.0	–0.1	–18.1	–1.8	0.3	–1.6	–21.8	–4.0	–25.7

						Option value—S2						
Benefits	–26,096	441	–25,655	–43,294	15	–43,279	–7,077	–406	–7,483	–50,810	–597	–51,408
After-tax income	1,846	2,191	4,037	2,067	63	2,130	1,603	–752	851	854	2,052	2,906
Taxes												
Payroll	6,661	283	6,944	0	7	7	0	–105	–105	190	207	397
Income	0	96	96	0	3	3	0	–43	–43	0	73	73
Consumption	73	87	160	82	3	84	64	–30	34	34	81	115
Total	6,734	466	7,201	82	12	94	64	–178	–115	224	362	586
Net change	–32,830	–26	–32,855	–43,376	2	–43,374	–7,141	–227	–7,368	–51,034	–960	–51,993
Change as % of base benefits	–13.5	0.0	–13.5	–17.8	0.0	–17.8	–2.9	–0.1	–3.0	–20.9	–0.4	–21.3
						Option value—S3						
Benefits	–26,096	–3,794	–29,889	–43,294	15	–43,279	–7,077	–406	–7,483	–50,810	–10,604	–61,414
After-tax income	1,846	50,596	52,441	2,067	63	2,130	1,603	–752	851	854	51,729	52,583
Taxes												
Payroll	6,661	5,154	11,815	0	7	7	0	–105	–105	190	6,562	6,752
Income	0	1,980	1,980	0	3	3	0	–43	–43	0	1,838	1,838
Consumption	73	2,006	2,080	82	3	84	64	–30	34	34	2,051	2,085
Total	6,734	9,141	15,875	82	12	94	64	–178	–115	224	10,451	10,675
Net change	–32,830	–12,935	–45,965	–43,376	2	–43,374	–7,141	–227	–7,368	–51,034	–21,055	–72,089
Change as % of base benefits	–13.5	–5.3	–18.8	–17.8	0.0	–17.8	–2.9	–0.1	–3.0	–20.9	–8.6	–29.6

Table 7.5 **Distributional analysis (OV—S1)**

	Present discounted value					Change relative to base			
	Base	Three-Year Increment	Actuarial	Common	JP2000	Three-Year Increment	Actuarial	Common	JP2000
				Quintile 1 (highest)					
Benefits	335,041	295,519	269,756	402,395	249,898	–39,522	–65,285	67,354	–85,142
After-tax income	394,134	411,898	383,865	385,330	406,366	17,763	–10,269	–8,804	12,232
Taxes									
Payroll	54,945	65,575	54,239	54,047	58,587	10,630	–706	–898	3,643
Income	29,648	31,073	29,081	28,823	30,490	1,425	–567	–825	841
Consumption	15,629	16,334	15,222	15,280	16,114	704	–407	–349	485
Total	100,222	112,981	98,542	98,150	105,191	12,759	–1,680	–2,072	4,969
Net change						–52,281	–63,604	69,426	–90,112
Change as % of base benefits						–15.6	–19.0	20.7	–26.9
				Quintile 2					
Benefits	277,682	245,859	224,759	279,766	207,877	–31,823	–52,923	2,084	–69,805
After-tax income	241,606	252,157	235,207	236,206	248,904	10,550	–6,400	–5,401	7,298
Taxes									
Payroll	44,233	53,179	43,689	43,531	46,002	8,947	–544	–702	1,769
Income	9,455	9,967	9,271	9,199	9,847	512	–184	–256	392
Consumption	9,581	9,999	9,327	9,367	9,870	418	–254	–214	289
Total	63,269	73,146	62,287	62,097	65,720	9,877	–981	–1,171	2,451
Net change						–41,700	–51,941	3,255	–72,256
Change as % of base benefits						–15.0	–18.7	1.2	–26.0

				Quintile 3					
Benefits	245,695	216,424	199,933	232,467	184,085	–29,272	–45,763	–13,119	–61,610
After-tax income	189,163	197,954	184,389	184,890	195,569	8,791	–4,773	–4,273	6,406
Taxes									
Payroll	36,671	44,900	36,272	36,208	37,928	8,229	–399	–463	1,257
Income	6,662	7,033	6,532	6,481	6,948	372	–130	–181	286
Consumption	7,501	7,850	7,312	7,332	7,755	349	–189	–169	254
Total	50,834	59,783	50,116	50,020	52,631	8,949	–718	–813	1,797
Net change						–38,221	–45,045	–12,415	–63,407
Change as % of base benefits						–15.6	–18.3	–5.1	–25.8
				Quintile 4					
Benefits	214,549	188,910	177,186	187,450	162,407	–25,640	–37,364	–27,099	–52,142
After-tax income	145,567	152,758	142,168	142,157	151,008	7,190	–3,400	–3,410	5,441
Taxes									
Payroll	31,217	38,835	30,930	30,935	31,860	7,619	–287	–281	643
Income	4,903	5,169	4,807	4,768	5,095	266	–96	–135	192
Consumption	5,772	6,058	5,638	5,637	5,988	285	–135	–135	216
Total	41,892	50,062	41,375	41,340	42,943	8,170	–517	–552	1,051
Net change						–33,810	–36,846	–26,548	–53,193
Change as % of base benefits						–15.8	–17.2	–12.4	–24.8
				Quintile 5					
Benefits	177,224	156,616	148,423	124,121	135,095	–20,608	–28,801	–53,103	–42,130
After-tax income	84,445	88,790	82,956	82,407	88,106	4,345	–1,488	–2,037	3,662
Taxes									
Payroll	23,502	30,654	23,373	23,461	22,873	7,152	–129	–41	–629
Income	2,261	2,376	2,218	2,198	2,336	115	–43	–63	75
Consumption	3,349	3,521	3,290	3,268	3,494	172	–59	–81	145
Total	29,111	36,550	28,881	28,927	28,703	7,439	–231	–184	–408
Net change						–28,048	–28,570	–52,919	–41,722
Change as % of base benefits						–15.8	–16.1	–29.9	–23.5

Table 7.6 **Distributional analysis (OV—S3)**

		Present discounted value				Change relative to base			
	Base	Three-Year Increment	Actuarial	Common	JP2000	Three-Year Increment	Actuarial	Common	JP2000
				Quintile 1 (highest)					
Benefits	326,889	286,895	265,548	388,612	243,460	–39,993	–61,340	61,723	–83,428
After-tax income	381,113	465,541	379,436	380,855	463,858	84,429	–1,677	–258	82,745
Taxes									
Payroll	53,095	70,200	53,107	52,933	65,864	17,105	12	–163	12,769
Income	29,011	34,203	29,019	28,887	33,671	5,192	8	–124	4,660
Consumption	15,113	18,461	15,046	15,103	18,394	3,348	–66	–10	3,281
Total	97,219	122,864	97,172	96,922	117,929	25,645	–47	–297	20,710
Net change						–65,638	–61,294	62,020	–104,139
Change as % of base benefits						–20.1	–18.8	19.0	–31.9
				Quintile 2					
Benefits	271,160	238,228	221,418	270,109	201,620	–32,932	–49,743	–1,052	–69,541
After-tax income	233,746	284,924	232,622	233,565	284,033	51,178	–1,124	–181	50,286
Taxes									
Payroll	42,735	55,653	42,744	42,599	50,660	12,918	9	–136	7,925
Income	9,213	11,133	9,216	9,176	11,076	1,920	3	–37	1,863
Consumption	9,269	11,299	9,225	9,262	11,263	2,029	–45	–7	1,994
Total	61,218	78,084	61,185	61,038	72,999	16,867	–33	–180	11,782
Net change						–49,799	–49,710	–872	–81,322
Change as % of base benefits						–18.4	–18.3	–0.3	–30.0

				Quintile 3					
Benefits	239,460	209,542	196,413	223,739	178,455	–29,918	–43,047	–15,721	–61,005
After-tax income	182,653	224,279	181,987	182,449	224,012	41,625	–666	–205	41,359
Taxes									
Payroll	35,138	46,390	35,145	35,036	41,564	11,252	7	–102	6,426
Income	6,494	7,884	6,495	6,467	7,842	1,391	2	–26	1,348
Consumption	7,243	8,894	7,217	7,235	8,883	1,651	–26	–8	1,640
Total	48,874	63,168	48,857	48,738	58,289	14,294	–18	–136	9,414
Net change						–44,212	–43,029	–15,585	–70,420
Change as % of base benefits						–18.5	–18.0	–6.5	–29.4
				Quintile 4					
Benefits	208,950	182,833	173,779	179,976	157,288	–26,117	–35,171	–28,974	–51,662
After-tax income	140,347	173,185	140,081	140,093	173,213	32,838	–266	–254	32,866
Taxes									
Payroll	29,656	39,435	29,661	29,578	34,528	9,779	5	–78	4,872
Income	4,786	5,772	4,788	4,767	5,726	985	1	–20	940
Consumption	5,565	6,868	5,555	5,555	6,869	1,302	–11	–10	1,303
Total	40,008	52,074	40,004	39,900	47,122	12,066	–4	–108	7,115
Net change						–38,184	–35,167	–28,866	–58,776
Change as % of base benefits						–18.3	–16.8	–13.8	–28.1
				Quintile 5					
Benefits	171,928	151,424	144,803	118,621	130,458	–20,503	–27,125	–53,307	–41,470
After-tax income	81,287	100,762	81,565	81,089	101,369	19,475	278	–198	20,082
Taxes									
Payroll	21,999	30,029	22,001	21,951	23,775	8,030	3	–48	1,776
Income	2,217	2,635	2,218	2,208	2,600	417	1	–9	382
Consumption	3,223	3,996	3,234	3,216	4,020	772	11	–8	796
Total	27,439	36,659	27,454	27,375	30,394	9,220	14	–65	2,955
Net change						–29,723	–27,139	–53,242	–44,425
Change as % of base benefits						–17.3	–15.8	–31.0	–25.8

7.5.2 Interpreting the Results

Figures 7.1 to 7.7 are useful in interpreting the simulation results discussed in the previous section. We focus on the Three-Year Reform, based on the OV model, to save space.

Figure 7.1 indicates how the reform changes gross SSW by age of retirement from the base case. The reform reduces gross SSW at each age, probably encouraging people to work via the negative wealth effect, while the gap with the base case becomes the narrowest at age 65, which is the NRA. By contrast, the reform raises taxes from the base case at each age, as indicated in figure 7.2. This is mainly because increased eligibility ages make people pay more taxes (mostly payroll taxes) while working, as indicated in table 7.4.

Figure 7.3 shows how the distribution of the retirement age changes from the base case. The reform does not change the spike at age 60, and it raises the probability of labor-force exit for people aged 62 and above and lowers it for younger people, suggesting a rise in the average retirement age. People aged 68 and above show little response to the reform. These results point to relatively small behavioral effect, which is again consistent with the results in table 7.4.

Figure 7.4 depicts the distribution of the total effect of the reform in terms of gross and net SSW. This figure shows that the reform succeeds in reducing SSW substantially for people aged 62 and younger but raises SSW between ages 63 and 67, in line with a change in the distribution of the retirement age, shown in figure 7.3. In addition, we observe no substantial impact beyond age 68, which is the new NRA.

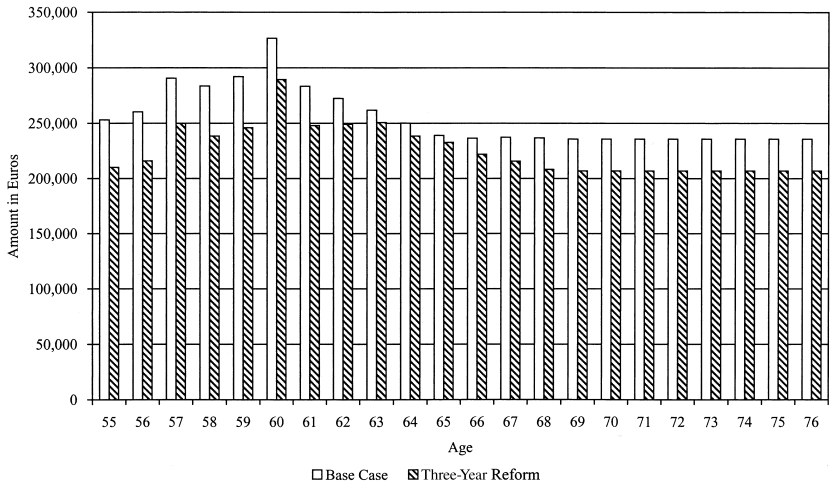

Fig. 7.1 SSW by age of labor force exit

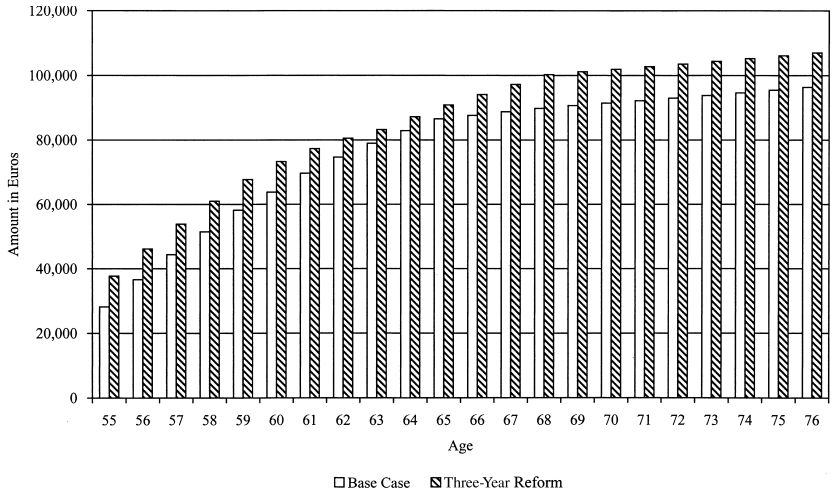

Fig. 7.2 Taxes by age of labor force exit

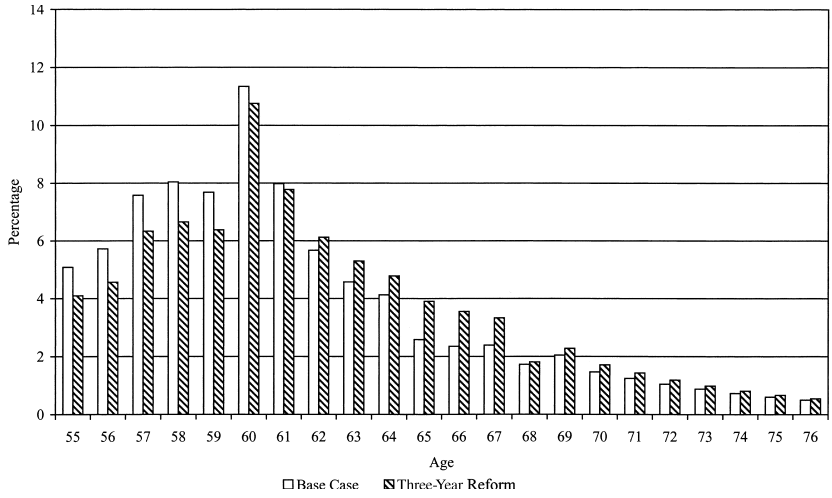

Fig. 7.3 Distribution of age of labor force exit (OV-S1 Model)

Figures 7.5 and 7.6 show how the previously-mentioned results change if we use the S3 model instead of the S1 model. Figure 7.5 shows a clear rightward shift in the spike of retirement age, probably reflecting a rise in age dummies incorporated in S3. Correspondingly, the total effect shows a sharp contrast at old and new spikes of labor-force exit: both gross and net SSW decline sharply at ages 60 and 61, while they jump at 63 and 64, reflecting an increase in the early retirement age.

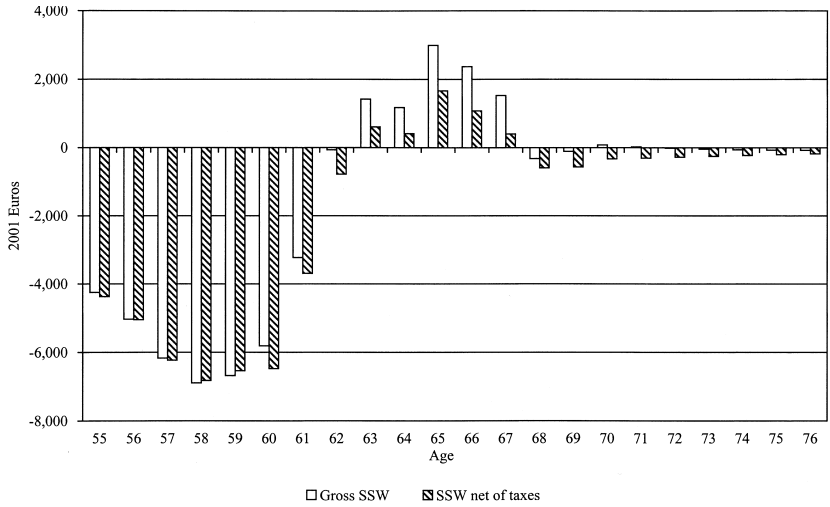

Fig. 7.4 Total effect by age of retirement (OV-S1 Model)

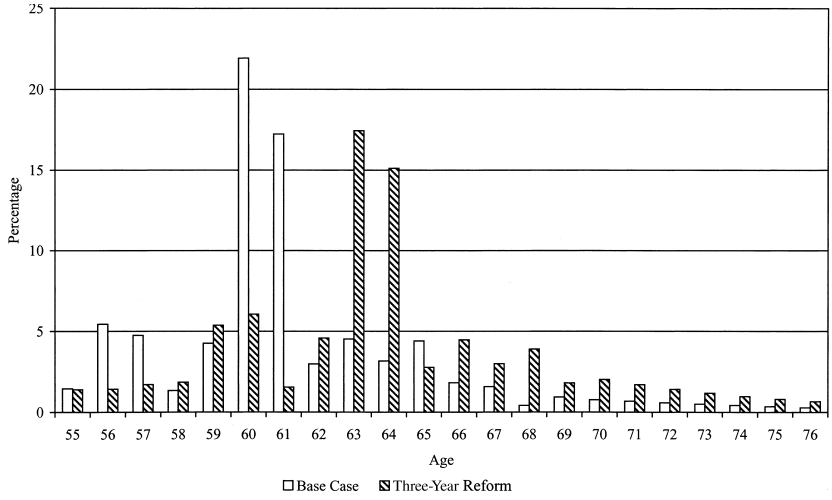

Fig. 7.5 Distribution of age of labor force exit (OV-S3 Model)

Finally, figure 7.7 summarizes the fiscal implications of the Three-Year Reform under the combinations of PV/OV and S1/S2/S3. This figure shows the results in terms of a share of nominal GDP to assess the magnitude of the impact for the whole economy and enable comparisons across countries. Our sample consists of only private-sector employees, who are mostly KNH members. Public-sector employees are covered by *Kyosai-Kumiai,* which has almost the same structure as KNH but is independent. Also,

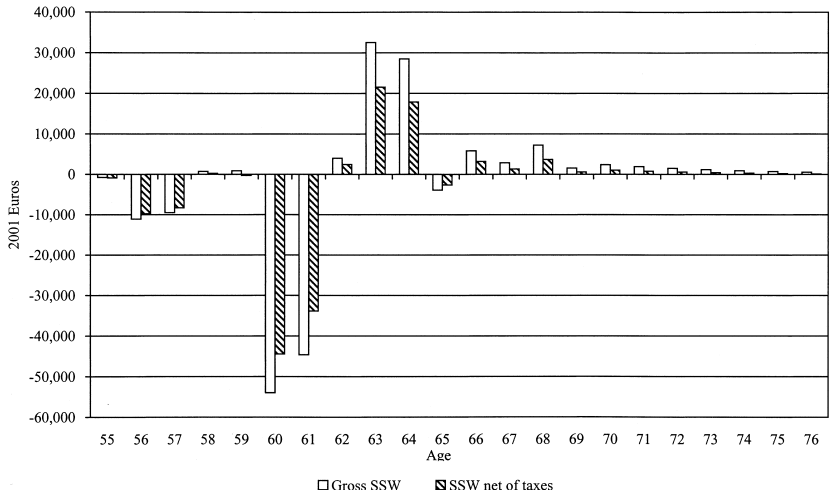

Fig. 7.6 Total effect by age of retirement (OV-S3 Model)

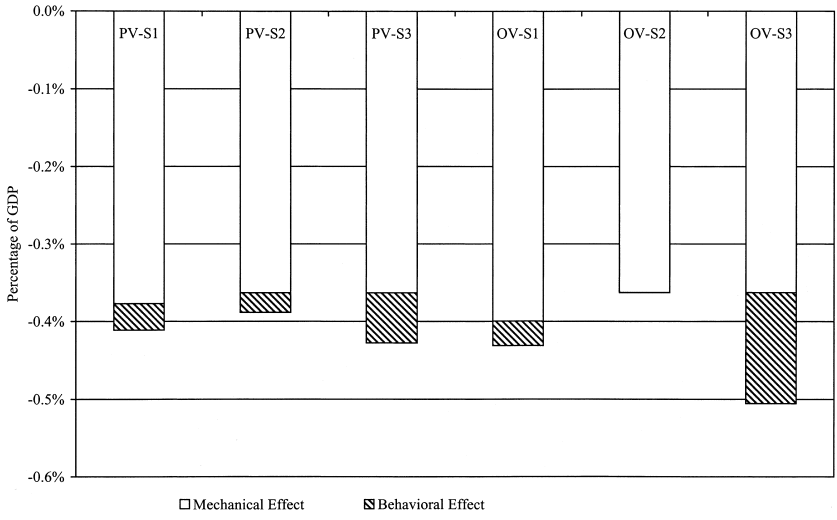

Fig. 7.7 Fiscal implications of reform as a percent of GDP

self-employed workers receive only Basic Pension benefits and pay the flat-rate contributions. Thus, we scale up the results for private-sector employees, estimating what percentage of people aged 55 are covered by KNH.

Two things should be noted about this figure. First, the size of the total impact of reforms is around 0.4 percent of nominal GDP, which is not substantial, but cannot be neglected, especially given the lower growth poten-

tial in Japan. Second, and more interestingly, the mechanical effect dominates fiscal implications of the behavioral effect in all cases, as is already suggested by a change in the distributions of the retirement age and of the total effect.

7.5.3 Distributional Issues

The proposed pension reforms seem to have different effects on different income groups. For considering distributional issues, we divide the sample into quintiles according to real family average lifetime earnings, and show how a change in net benefit is distributed by lifetime income group.

The results are summarized in table 7.5, panels A and B, for the combinations of OV-S1 and OV-S3, respectively. Table 7.5, panel A shows that: (1) the Three-Year Reform affects each quintile almost equally, (2) the Actuarial and JP 2000 Reforms are more favorable for people with lower income than people with higher income, reducing net benefits somewhat more for people with higher income, and (3) the Common Reform increases net benefits for people with higher income and reduces them for those with a lower income. The regressive feature of the Common Reform can be explained by its increase in the survivor benefit, which is favorable for rich couples.

However, the progressiveness of other reforms is also limited, reflecting the doubledecker feature of the KNH, which has the flat-rate basic benefit as well as the earnings-related benefit. The proposed increase in the eligibility age is biased toward a reduction in the basic benefit component over one's lifetime, which is relatively harmful to poor workers. To richer workers, on the other hand, the longer period of contributions incorporated by the reforms adds to earnings-related benefits, which partly (or more) offset a reduction in the basic benefit.

7.6 Conclusions

Our analysis has several limitations. First, it is an analysis about the steady-state impacts on some specific cohorts, not about the transition to the new steady state. And the proposed pension reforms cannot be implemented immediately; they have to incorporate many adjustments for cohorts in transition. Second, it does not incorporate any general equilibrium effects that might occur. Third, we neglect how firms will respond to an increase in labor supply of the elderly; they might reduce wage and absorb some of the impact from reforms.

However, our policy simulations show that the proposed pension reforms can mitigate strong pressures on social security finances from aging. We find, especially, that postponing eligibility ages can significantly reduce net SS payments, mainly through the mechanical effect that arises automatically due to changes in program rules. The fiscal implications of be-

havioral effects are relatively small, because of limited responsiveness of retirement to incentive measures and the actuarial adjustment already incorporated in the current scheme. Simulation results heavily depend on model specifications and estimation methodologies, but they clearly suggest that encouraging work in older age should be an effective way to help mitigate aging-related pressures on the government budget.

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