Volume Title: Social Security Programs and Retirement around the World: Micro-Estimation

Volume Author/Editor: Jonathan Gruber and David A. Wise, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-31018-3

Volume URL: http://www.nber.org/books/grub04-1

Publication Date: January 2004

Title: Social Security and Retirement in Japan: An Evaluation Using Micro-Data

Author: Takashi Oshio, Akiko Sato Oishi

URL: http://www.nber.org/chapters/c10705

7

Social Security and Retirement in Japan: An Evaluation Using Micro-Data

Takashi Oshio and Akiko Sato Oishi

7.1 Introduction

The main purpose of this paper is to analyze empirically the impact of social security incentives on retirement decisions of older employees in Japan. It is important because the more elderly people stay in the labor market, the less the demographic pressures social security programs will have to struggle with. Estimation and simulation results in this paper will provide micro-economic foundations for the impact analysis that is crucial to discussions about pension reforms in Japan.

Japan is now facing a very rapid population aging. The share of people aged sixty-five years or above of total population was 16.2 percent in 1998, roughly the Organization for Economic Cooperation and Development (OECD) average. Looking forward, however, the share of elderly people is expected to grow faster than in any other advanced country, reflecting a very low fertility rate, which dropped to 1.34 in 1999. Indeed, the National Institute of Population and Social Security Research (NIPSSR) revised down its population projections in 1997. In its new "middle" projection, the NIPSSR assumes that the fertility rate would return to only 1.61 by 2050—a much more conservative figure than the previously assumed 1.80. The NIPSSR also projects that the share of people aged sixty-five or above would grow to 27.4 percent in 2025 and 32.3 percent in 2050. Many analysts, however, argue that NIPSSR's "pessimistic" scenario, which assumes that the fertility rate would remain as low as 1.38 even in 2050, seems to be

Takashi Oshio is associate professor of economics at Tokyo Gakugei University. Akiko Sato Oishi is a senior researcher in the Department of Theoretical Social Security Research at the National Institute of Population and Social Security Research.

more plausible. If this were the case, the pace of population aging would be more dramatic than is now widely anticipated.

Rapid population is a big challenge to Japan's long-term fiscal strategy. Social security expenditures, including public pensions, health care, and social welfare benefits, amounted to ¥69.4 trillion in 1997, equivalent to 17.8 percent of national income. Public pension benefits were ¥36.4 trillion, covering 52.4 percent of overall social security expenditures. It is likely that social security expenditures will grow substantially over the coming decades. The most recent official projection, released by the Ministry of Health and Welfare in 1998, expects social security expenditures to grow to a level of 33.5 percent of national income by 2025, assuming no change in the current social security programs.

The public pension system is the major determinant of the long-term trend in social security expenditures and fiscal balances beyond 2000. As in other industrialized countries, public pension insolvency is now one of the most serious challenges that an aging society poses to the Japanese economy. The Ministry of Health and Welfare estimates unfunded liabilities to be about ¥490 trillion—almost equivalent to nominal gross domestic product (GDP)—at the end of fiscal year 1999. Also, policy simulations conducted by the Economic Planning Agency (Yashiro et al. 1997) project the public pension fund will be exhausted by 2040 if the current system is not changed. In addition, the newly introduced corporate-accounting system, which became effective as of April 2000, will likely reveal substantial underfunding in corporate pensions and probably also make their reform inevitable.

It is important to understand retirement incentive effects in order to assess the economic impact of pension reforms. The labor force participation rate in Japan is much higher than in other advanced countries: 74.8 percent for men aged sixty to sixty-four and 40.1 percent for women aged sixty to sixty-four in 1998 according to the *Labor Force Survey* (Management and Coordination Agency 1999). However, increasing social security benefits have been reducing labor force participation over the past few decades, even allowing for cyclical swings.[1] Moreover, various cross-sectional studies have found that the existing pension scheme tends to reduce the incentive to work for elderly people (see section 7.3). It is widely recognized that an earnings-tested pension program, called the *Zaishoku pension,* tends to discourage the elderly from working.

Retirement incentive effects will also be potentially critical for Japan's economic growth and the financial position of the public pension, since postwar baby-boomers will become eligible for public pension benefits in

1. The labor participation rate of people aged sixty to sixty-four was 81.5 percent for men and 39.1 percent for women in 1970. The rate for men declined to 71.1 percent in 1988 and then rose to 75.6 percent in 1993, reflecting the economic boom; since then, it has been on a downtrend.

the next few years. With the total labor force diminishing due to a very low fertility rate, Japan's growth potential will depend much more on labor force participation from the elderly. In addition, the sensitivity to social security provisions of the elderly is likely to increase in the long run and reflects two factors. First, the shares of self-employed and agricultural workers who are less sensitive to social security programs are likely to keep declining, reflecting structural change in the Japanese economy. Second, more women will likely enter labor force and become eligible for employees' pension benefits.

The structure of this paper is as follows. Section 7.2 reviews the institutional background, laying out the retirement policy landscape in Japan and setting out the relevant sources of income support for the elderly. Section 7.3 provides the research background with a brief review of previous studies on this topic in Japan; section 7.4 sets out the data on which our estimation and simulation is based; and section 7.5 constructs earnings histories and projections from our data, and section 7.6 sets up incentive measures (benefit accrual, option value, and peak value). Section 7.7 estimates the impact of incentive measures on retirement, and section 7.8 summarizes estimation results. Section 7.9 conducts policy simulations based on the estimated models, and section 7.10 concludes the paper.

7.2 Institutional Background

7.2.1 The Retirement Policy Landscape

This section describes the retirement policy scheme as it existed for the years used in our analysis. Japan's public pensions operate a two-tier system: One pays flat-rate basic pension (*Kiso Nenkin*) benefits to all residents, including the self-employed and unpaid family workers; the other pays earnings-related benefits only for private and public employees.[2] Employees thus receive two forms of pension benefits: basic pension benefits and earning-related benefits. This basic pension, which is mainly for non-employees, has little effect on retirement decisions because its benefits are relatively small and subject to no earnings criterion. The eligibility age of full basic pension benefits is sixty-five years old, with no earnings test. It incorporates a flat-tax and flat-benefit structure, and it is organized on an individual unit basis.[3]

The principal program for private-sector employees is the Kosei Nenkin Hoken (KNH; Private Employees Pension), which covers about 85 percent of all employees. Government employees, private-school teachers, and em-

2. See Takayama (1998) for more detailed and comprehensive information about Japan's pension system. Discussions in this section owe much to chapter two of his book.

3. The flat tax and benefits per month were ¥11,700 and ¥65,000, respectively, in 1995.

ployees in agriculture, forestry, and fishing organizations are covered by special programs provided by Kyosai Kumiai (Public Employees' Pension; 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. In what follows, we provide brief descriptions of the KNH as well as other income-support programs for elderly employees—including Zaishoku Pension, unemployment insurance, and wage subsidy.

Kosei Nenkin Hoken (KNH)

Under the KNH scheme, an individual's benefits are calculated according to the following steps. First, an individual's monthly wage (excluding semi-annual bonus payments) is converted into standard monthly earnings and graded into one of thirty levels. Second, the career-average monthly earnings are calculated over their entire period of coverage (up to age sixty-four) and adjusted by wage income growth and converted into the current earnings level. Finally, benefits are calculated as the career-average monthly earnings × the number of contribution years × 0.0075 (the accrual rate). For instance, forty-year contributors will earn 30 percent of the career-average monthly earnings. In addition, benefits are inflation indexed every year in terms of consumer prices, and adjusted for net wages every five years.

The normal eligibility age for full KNH benefits is currently sixty, with some exceptions,[4] while it is scheduled to increase gradually to sixty-five from 2001. A male KNH recipient currently gets both the full basic pension and earnings-related benefits at age sixty.[5] In addition, his dependent wife (full-time housewife) can get her basic pension benefit with no contribution when she becomes sixty-five. Thus, total benefits that a typical couple receives are two basic pension benefits (for the husband and wife) plus earnings-related benefits (for the husband) that, in total, replace slightly less than 70 percent of average monthly earnings for about 50 percent of average annual wages—including bonus payments—of currently active male workers. Between the ages of sixty and sixty-four, one can get partial pension benefits (Zaishoku Pension, see later discussion) with an earnings test if one chooses to keep working. Beyond sixty-five, one gets full pension benefits without any earnings test but also has the option of delaying the receipt of pension benefits, with some actuarial adjustment. In addition, survivors' benefits are available, but our analysis neglects them for simplicity.

Contributions are based on the employee's monthly standard earnings and are shared equally by the employee and employer. The total contribu-

4. The eligibility age for sailors and miners is fifty-five.

5. The KNH recipients are currently eligible for full basic pension benefits (in addition to the earnings-related component) at age sixty, while the eligibility age of basic pension benefits is sixty-five years for non-KNH recipients. A husband gets some additional spousal benefits (Kakyu Nenkin) until his dependent wife becomes sixty-five years old.

tion rate for KNH and basic pension is currently 17.35 percent, meaning that an employee and employer contribute 8.675 percent each. A female employee pays premiums at the same contribution rate, while a dependent housewife does not need to contribute.

Zaishoku Pension (Earnings-Tested Kosei Nenkin Hoken for Elderly Workers)

The Zaishoku Pension, which is a part of the KNH scheme, is a partial and earnings-tested pension for employees. Upon reaching age sixty and until age sixty-four, a KNH recipient who keeps working can receive reduced KNH benefits subject to an earnings test. This scheme is roughly equivalent to the early retirement system in many other OECD countries. The formula of the Zaishoku Pension is summarized as follows. If an individual earns even a small wage, benefits are reduced by 20 percent. If earnings are above ¥220,000 per month, benefits are reduced by one yen for each additional two yen increment in wages (i.e., the marginal tax rate is 50 percent). If earnings are above ¥340,000, benefits are reduced by the same amount of additional wage earnings (i.e., the marginal tax rate is 100 percent). One of the key elements of the 1994 reform was to make the formula of the Zaishoku Pension more favorable to elderly. Also note that one has to pay KNH contributions as long as they keep working, although they can expect an increase in future pension benefits.

Unemployment Insurance

Unemployment insurance (UI) adds temporary income support to retired employees. In many cases, an individual who reaches age sixty leaves the firm where they have been working and then start to receive KNH benefits. At the same time, it is normal to apply for UI benefits when quitting one's previous job, regardless of any desire to find a new job. The UI benefits for those ages sixty to sixty-four replace 50–80 percent of wage earnings at age sixty for 300 days at most. Thus, there are many cases in which the total replacement rate—adding KNH and UI benefits together—is effectively more than 100 percent of income at the first retirement age, probably reducing the incentive to work. Furthermore, many people tend to stay out of the labor force after receiving UI benefits, meaning that UI is now used in a way very different from its original conception (see Yashiro and Nikami 1996). However, under a new law effective as of April 1998, 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.

Wage Subsidy for Elderly Workers

Another income support that potentially interacts with public pension programs is the wage subsidy to elderly workers (henceforth referred to as "WS"). This program was introduced in 1994 as a part of the public employment insurance scheme to replace the aforementioned UI benefits, which are considered to work ineffectively for elderly workers. The WS equivalent to 25 percent of the current wage is provided to an employee—subject to a certain wage ceiling—on the condition that they are sixty to sixty-four years old and their wage earnings are less than 85 percent of their preretirement wage at age sixty.

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 (ages sixty to sixty-four) and subject to certain earnings criteria. The WS can be treated as a negative premium in calculating social security incentives. The WS equivalent to 25 percent of wage earnings well exceeds the employee's share of KNH contributions (8.675 percent). Thus, the combination of the WS and the pension premium 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.

Disability Pension

The disability pension, unlike in some European countries, is not used as interim income support for elderly workers who are on the path to retirement. The disability pension is strictly for those who are physically unable to work. Benefits are calculated in almost in the same way as those of KNH, while additional benefits of 25 percent are given to those who are categorized as having more serious disabilities.

The eligibility conditions for the disability pension are generally strict: Most disabilities must originate from injuries, which prevents disability pension benefits from being used as a source for financing earlier retirement in Japan. There are about 285,000 recipients of the disability pension, covering only three percent of total old-age pension recipients. Thus, the disability pension will be neglected in our social security incentive calculations.

Employer-Provided Pension

In addition to public pension benefits and other income support, employer-provided pension programs—the Kosei Nenkin Kikin (Employees' Pension Fund) and tax-qualified plans—cover about two-thirds of KNH participants. Employees can choose lump-sum retirement benefits, annuities at retirement, or both. In the case of the KNK, about 40 percent of recipients choose lump-sum benefits, 55 percent choose annuities, and 5 percent choose both in 1996. Benefits of employer-provided pensions are paid on top of public pension benefits, reflecting additional contributions that have been paid in addition to KNH premiums until retirement. In the model case of KNK, benefits from employer-provided pensions are assumed to be equivalent to about 27 percent of KNH benefits for each couple. Lump-sum retirement benefits vary substantially by firm size and tenure, but they are at a level of ¥20–30 million in the case of average employees in large firms.

These employer-provided pension and lump-sum retirement benefits work differently from public pension benefits. Their payments are closely linked to mandatory retirement[6] at age sixty, regardless of an employee's working status after that age. In fact, these benefits add to the incomes of an individual—wages, pension, and others—after the mandatory retirement and increase the disincentive to work through income effects. However, their present discounted value added over a lifetime is basically unchanged even if they continue to work, and they are thus unlikely to affect the timing of retirement for people beyond the age of sixty. Rather, as pointed out by Seike (1993), firms tend to adjust the amount of lump-sum retirement benefits to make their employees retire earlier than the mandatory retirement age. This is because middle-aged workers tend to levy heavy labor costs on firms under Japan's seniority system. Seike argues that the present discount value of retirement benefits peaks in the early fifties and falls thereafter in some industries. Our analysis of social security incentives does not explicitly include the incentive effect of employer-provided pension or lump-sum retirement benefits.

7.2.2 1999 Pension Reform Act

The 1999 Pension Reform Act incorporated measures to lower contributions paid by future generations, making it inevitable that eligibility conditions and benefit systems would become less generous than scheduled in the 1994 Pension Reform Act. In particular, the act proposed (a) a 5 percent reduction in pension benefits, (b) an increase in the eligibility age to sixty-five from sixty, and (c) the abolition of wage indexation for pension benefits. If these proposals are implemented as scheduled, the final contribution rate for KNH will be pushed up to 25.2 percent, from the current 17.35 percent, in contrast to the previously scheduled 34.5 percent. At the same time, the government plans to introduce U.S. 401(k)-style defined-contribution private pensions to supplement the public pension scheme. The combination of these proposals, however, is not expected to solve insolvency problems, and whether or not and when the fertility rate will turn around remains an open question. Further policy measures thus remain to be discussed ahead of the next round of pension reforms.

7.2.3 Labor Market Participation of the Elderly

Figure 7.1 and table 7.1 provide a rough picture of labor market participation and benefit program participation for elderly people in 1996. The

6. "Mandatory retirement" in this paper means the program in which at a certain age (sixty years in most cases) an employee is forced to leave the firm where they have been working full-time for many years. This does not necessarily mean that they must fully retire at that age and become a beneficiary of social security programs. On the contrary, a large proportion of those who have experienced mandatory retirement continue to work in a new firm or even at the same firm with a new status such as a part-time employee.

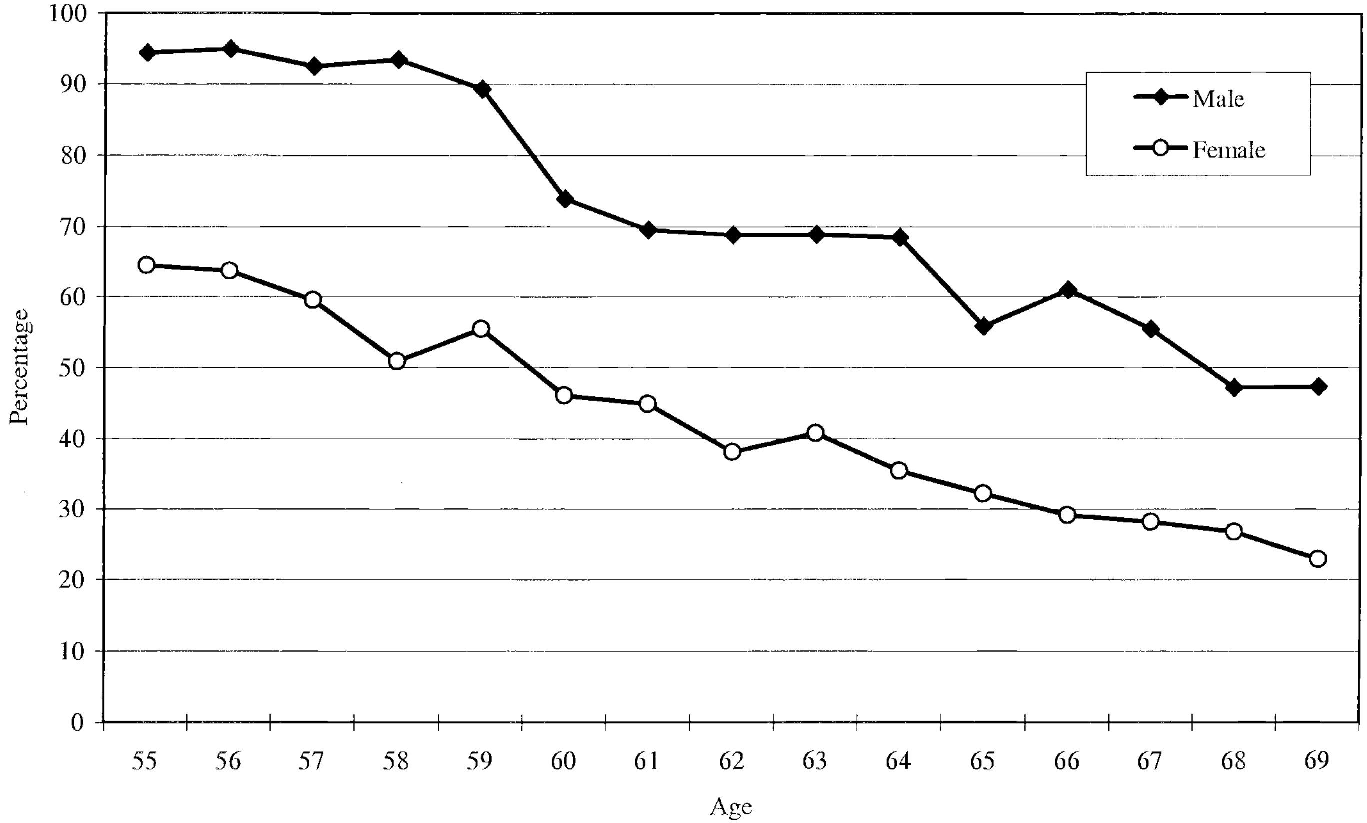

Fig. 7.1 Labor force participation ratio of the Japanese elderly, 1996
Source: Ministry of Labor (MOL; 1996).

Table 7.1 Labor Market and Benefit Program Participation in 1996, by Age and Gender

	Men			Women			Total		
	55–59	60–64	65–69	55–59	60–64	65–69	55–59	60–64	65–69
Labor Market Participation									
Working	92.8	70.1	54.2	59.7	41.9	29.1	75.5	55.8	41.2
Executives	13.1	10.2	6.7	3.1	2.0	1.7	7.9	6.0	4.1
Employed, full time	59.6	29.5	14.2	23.7	9.6	3.8	40.8	19.4	8.8
Employed, part time	2.0	6.8	8.1	11.3	7.5	4.7	6.9	7.2	6.3
Self-employed, etc.	18.1	23.6	25.1	21.6	22.8	18.9	19.9	23.2	21.9
Not working	6.9	29.6	45.6	40.1	57.7	70.8	24.2	43.9	58.7
Unknown	0.3	0.3	0.2	0.2	0.3	0.1	0.3	0.3	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Benefit Program Participation									
KNH[a] (excl. Zaishoku)	1.9	39.8	60.7	6.0	31.3	36.1	4.0	35.4	47.9
Basic pension only[a]	1.0	7.4	20.9	1.6	15.4	46.4	1.4	11.5	34.1
Zaishoku Pension	0.0	5.2	0.0	0.3	1.7	0.0	0.2	3.4	0.0
Kyosai Kumiai[a]	1.5	11.1	11.0	0.9	4.3	5.8	1.2	7.6	8.3
Wage subsidy	0.0	3.5	0.0	0.0	0.9	0.0	0.0	2.2	0.0
Employer-provided pension	0.6	9.4	8.9	0.4	1.9	1.6	0.5	5.6	5.1
UI benefits	1.2	4.4	0.7	1.2	1.6	0.3	1.2	3.0	0.5

Source: Authors' calculations from the Survey on Labor Market Participation of Older Persons (SLM-POP; MOL 1996).

Notes: KNH = Kosei Nenkin Hoken (employees' pension); Zaishoku Pension = Earnings-tested KNH; Kyosai-Kumiai (mutual aid associations): Special programs for national and local government employees, etc.; UI = unemployment insurance.

[a]Includes survivors' benefits.

labor market participation rate is relatively high in Japan among OECD countries, but it drops sharply at age sixty because most employees have mandatory retirement and start receiving public pension benefits, private pension benefits, or both at that age. Also, beyond the age of sixty there are limited chances that they can get a full-time job: After leaving the firm at sixty, most people move to the secondary labor market, become part-time employees with lower wage earnings, or both.

The bottom part of table 7.1 summarizes benefit receipt measures, the pattern of which roughly corresponds to that of labor force withdrawal. Of people aged between sixty and sixty-four, 35.4 percent receive KNH benefits, 7.6 percent receive Kyosai-Kumiai benefits, and 11.5 percent receive Basic Pension benefits only. Recipients of Zaishoku Pension benefits and WS are not a majority in the group of sixty to sixty-four year olds. This suggests that the earnings test for the Zaishoku Pension does not work effectively, especially for part-time workers, and those who continue to work as self-employed after retiring from company jobs can receive full KNH benefits, while they do not need to pay the premium. Also the WS, which was introduced in 1995, seems not to have been widely recognized yet, despite its relatively strong incentives to work.

Table 7.1 poses an important question, that is, should we define retirement as the status of somebody who has stopped working or that of somebody who has started to claim benefits? Our preferred definition of retirement in Japan is the former—the absence of wage earnings. The receipt of public pension benefits is not an effective criterion for retirement in Japan. This is because pension benefits are given unconditionally to most citizens aged sixty-five years and older, and also because a large portion of pension beneficiaries aged sixty to sixty-four remains in the labor market.

Another question is how we should deal with self-employed workers. There are some cases where one may become self-employed after retiring from a firm. Indeed, the self-employed contribute significantly to the high labor-participation rate of the elderly in Japan. In what follows, we categorize the self-employed (who have been employees) as retired even if they continue to receive self-employed income, because their working behavior seems quite different from that of employees.

That said, there is still a gray zone between working and retirement. The narrowest definition of working should be "being employed full time (and receiving no pension benefits)." However, many people prefer to work part time and receive reduced pension benefits to supplement their wage income. Another question is whether people who say that they cannot find a job should be categorized as retired. We treat them as retired if they receive any pension benefits. Table 7.2 summarizes the combination of working status and public pension benefits for three groups, those aged fifty-five to fifty-nine, sixty to sixty-four, and sixty-five to sixty-nine. The relationship between working status and benefit claiming is so complicated that a clear-cut definition of retirement cannot be established.

So, let us consider the following three tentative definitions of retirement.

Definition I: those who are not employed—in this definition, executives are assumed to be employed

Definition II: those who are categorized as retired according to the Definition I excluding the self-employed and family workers

Definition III: those who are categorized as retired according to the Definition II, excluding job-seekers that are not receiving any public pension benefits

Table 7.3 summarizes the share of the retired according to these three definitions, based on the matrix of table 7.2. The share of retired to the total population is quite sensitive to these definitions, since many working people receive pension benefits. For the group aged sixty to sixty-four, for example, 67.4 percent of the sample is defined as the retired according to the definition I, while the shares of the retired are much lower according to the definitions II and III (44.3 percent and 39.3 percent, respectively). In

Table 7.2 **Working Status and Public Pension Benefits, by Age and Gender**

	55–59			60–64			65–69		
	Receiving Benefits	Not Receiving	Total	Receiving Benefits	Not Receiving	Total	Receiving Benefits	Not Receiving	Total
Males									
Working									
Executives	0.3	12.8	13.1	2.9	7.3	10.2	5.9	0.3	6.7
Employed, full time	1.6	58.2	59.8	15.7	14.0	29.6	12.8	1.5	14.3
Employed, part time	0.3	1.7	2.0	6.0	0.9	6.9	7.8	0.4	8.2
Self-employed, etc.	0.7	17.5	18.2	13.6	10.1	23.7	22.9	2.2	25.2
Subtotal	2.8	90.3	93.1	38.1	32.3	70.4	49.4	4.9	54.3
Not working									
Unable to find a job	0.9	3.7	4.6	15.9	3.0	18.9	16.6	1.1	17.7
Not willing to work	0.7	1.5	2.2	9.5	1.2	10.7	27.0	1.0	28.0
Subtotal	1.6	5.2	6.9	25.4	4.2	29.6	43.6	2.1	45.7
Total	4.5	95.5	100.0	63.5	36.5	100.0	93.0	7.0	100.0
Females									
Working									
Executives	0.1	3.0	3.1	0.6	1.4	2.0	1.5	0.2	1.7
Employed, full time	2.1	21.7	23.7	5.1	4.6	9.7	3.0	0.8	3.8
Employed, part time	1.0	10.3	11.4	3.8	3.7	7.5	4.1	0.6	4.7
Self-employed, etc.	1.0	20.7	21.7	10.9	12.0	22.9	17.0	1.9	19.0
Subtotal	4.2	55.7	59.9	20.5	21.6	42.1	25.7	3.5	29.2
Not working									
Unable to find a job	1.9	13.0	14.9	12.2	6.8	19.0	13.9	2.0	15.9
Not willing to work	2.7	22.6	25.3	20.1	18.7	38.9	49.1	5.8	54.9
Subtotal	4.6	35.5	40.1	32.3	25.6	57.9	63.0	7.8	70.8
Total	8.8	91.2	100.0	52.8	47.2	100.0	88.7	11.3	100.0

Note: Calculations exclude samples whose working status is not known.
Source: Authors' calculations from the SLMPOP (MOL 1996).

Table 7.3 The Share of Retired, by Different Definitions

		55–59	60–64	65–69	Total
Males		100.0	100.0	100.0	100.0
Definition I	Not employed[a]	25.4	53.5	70.9	49.2
Definition II	Def. I (excl. self-employed, etc.)	7.2	29.9	45.8	27.0
Definition III	Def. II (excl. job-seekers not receiving public pension benefits)	3.5	26.9	44.7	24.4
Females		100.0	100.0	100.0	100.0
Definition I	Not employed[a]	61.9	80.9	89.9	77.0
Definition II	Def. I (excl. self-employed, etc.)	40.3	58.1	70.9	55.8
Definition III	Def. II (excl. job-seekers not receiving public pension benefits)	27.4	51.2	69.0	48.4
Total		100.0	100.0	100.0	100.0
Definition I	Not employed[a]	44.5	67.4	80.8	63.6
Definition II	Def. I (excl. self-employed, etc.)	24.5	44.3	58.9	41.9
Definition III	Def. II (excl. job-seekers not receiving public pension benefits)	16.0	39.3	57.3	36.8

[a]Be reminded that, in Definition 1, executives are regarded as employees.

addition, the difference between definitions I and II indicates the importance of the self-employed in assessing the labor force participation of the elderly in Japan. It should also be remembered that Definition I might overstate the actual number of the retired for the younger group, because income from self-employment is likely to be their major source of income.

7.2.4 Pathways to Retirement

For those who have been employed until age sixty, retiree categories are divided into two groups; those receiving public retirement benefits (KNH, other public pension benefits or both) and those receiving public *and* employer-provided retirement benefits. Some become self-employed but are covered by publicly provided benefit programs, employer-provided benefit programs, or both (with no earnings test).

There are a variety of pathways to retirement due to a multiplicity of social security incentives. With a lack of longitudinal data, however, it is nearly impossible to trace all paths that are taken by individuals. So we roughly estimate major options and their probabilities based on the cross-sectional data in the survey (see in section 7.4) and using simple assumptions. We assume an individual had been employed (with no public pension benefits or other public assistance program) until the age of sixty. Then, we trace major paths that they are likely to take through public assistance programs over the following ten years.

For simplicity we divide the period after the age of sixty into two stages, one at sixty to sixty-four and the other at sixty-five to sixty-nine. We then estimate the paths that are taken by an individual who retires in the second stage, based on the observed probabilities of receiving each public benefit in the cross-sectional data. With the lack of data, however, we cannot know how those who are still working in the second stage will behave beyond age seventy. We assume that they will follow the same pattern observed for actual retirees. Thus, it should be remembered that our estimation does not provide a full picture of retirement behavior in Japan. The procedure of our estimation is summarized as follows.

We start with the second stage, ages sixty-five to sixty-nine, in which a retiree has two major options: to receive public pension benefits (referred to as SS hereafter) with *or* without employer-provided pension benefits (referred to as Pension hereafter); SS here includes not only KNH but also *kyosai* benefits, the latter of which are those paid to employees in the public sector and other special occupation groups. In addition, there are two possible forms of retirement: staying out of the labor force *or* becoming self-employed—a retiree receives SS, Pension, or both benefits in either case. There is a very small group of nonbeneficiaries in each type, probably due to eligibility problems.

For the first stage, ages sixty to sixty-four, some people will have already retired (or become self-employed) while others will have continued working. We roughly estimate the working or retirement status of an individual who is retired in the second stage as follows: If one had already been retired in the first stage, they must have started to get SS benefits (with or without Pension benefits); that is, they must have chosen the option of going directly to SS. If one remained employed, they could choose among the following five options.

1. To be employed with no public assistance (that is, going directly to SS)
2. To be employed with SS benefits
3. To be employed with SS and Pension benefits
4. To be employed with SS benefits and WS
5. To be employed with SS and Pension benefits and WS

It should be noted here that the SS in options (2) to (4) include not only Zaishoku Pension, but also (full) KNK benefits, while the choice of being employed with WS only is neglected because of its minority. Full KNH benefits cannot be received when working, and earnings tests should be applied. However, there seem to be many cases in which people do not distinguish Zaishoku and KNH benefits or where earnings tests do not work effectively, especially for part-time jobs. The cases in which one is employed and obtains Pension benefits only, or is employed with Pension benefits and WS, can be ruled out as firms that provide Pension benefits are usually covered by the KNH program.

In addition, as indicated in table 7.1, a significant proportion of retirees receive UI benefits at the first year of retirement. Hence, each option mentioned above has a pair of suboptions: to receive or not to receive UI at the first retirement age, meaning that there are ten (five times two) pathways to retirement in total. Combined with the probabilities of retiree categories in the second stage, we can estimate joint probabilities of pathways to retirement and retiree categories. If one retires in the first stage, they are assumed to remain retired in the second stage (although their retiree category may change). However, some combinations of the first-stage and second-stage options can be ruled out a priori: For instance, if an individual is employed without employer-provided Pension benefits in the first stage, they are unlikely to get them in the second stage. This is because Pension benefits, if applicable, must be paid at the mandatory age of sixty in most cases.

Table 7.4 illustrates the major categories of retirees and their respective pathways to retirement, which are estimated from our cross-sectional data. As shown in this table, the most common pathway to retirement for Japanese employees is going to the SS program and receiving UI benefits (at the first retirement age). About one-third of retirees take this route. Adding the case of receiving no UI benefits—which is slightly less common than the direct path to SS—as well the path to a public pension program with no public or private income assistance until retirement raises the proportion to about 64 percent. Becoming self-employed after having been employed is a minority choice, covering only five percent of total retirees.

Table 7.4 also reveals that about 26 percent of people choose to keep working while receiving SS benefits—which are earnings-tested Zaishoku or even full KNH benefits—before retirement. However, low probabilities for receiving WS confirm that this newly introduced plan has not been widely used so far. Another finding (not shown in the table) is that women depend less on employer-provided benefits than men, probably because women's tenure as a full-time employee is generally shorter than men's.

7.3 Research Background

There have been many empirical analyses of retirement incentives for the elderly in Japan, in spite of the limited availability of longitudinal data. Most of these draw on cross-sectional data from the *National Survey on Family Income and Expenditure,* the *Survey on Labor Market Participation of Older Persons* (Ministry of Labor [MOL] 1996), or both. These analyses can be divided into the following two groups.

The first group, which includes Takayama et al. (1990b), Seike (1993), Abe (1998), Ogawa (1998), and Iwamoto (2000), has estimated how social security benefits raise the probability of retirement. They have all found that, after excluding the sample selection bias, social security benefits create significant retirement incentives for the elderly. Recent research by Abe, Ogawa, and Iwamoto focuses on the negative impact of Zaishoku Pension benefits on labor supply. Each finds that the 1989 Pension Reform Act—which aimed to reduce the marginal tax rate of Zaishoku Pension

Table 7.4 Retiree Categories and Pathways to Retirement

	Retiree Category						
	Retirees (excl. Self-Employed)			Self-Employed			
Pathway	SS Only	SS and Pension	No SS	SS Only	SS and Pension	No SS	Total
Total							
Directly to SS	30.37	3.11	0.22	1.47	0.01	0.15	35.34
UI to SS	33.58	3.44	0.25	0.92	0.01	0.09	38.28
SS (wk) to SS	8.35			1.11			9.46
SS and pension (wk) to SS		2.03			0.18		2.21
SS and WS (wk) to SS	0.84			0.11			0.96
SS, pension, and WS (wk) to SS		0.20			0.02		0.22
UI and SS (wk) to SS	9.24			0.69			9.93
UI, SS, and pension (wk) to SS		2.24			0.12		2.36
UI, SS, and WS (wk) to SS	0.93			0.07			1.00
UI, SS, pension, and WS (wk) to SS		0.23			0.01		0.24
Total	83.31	11.26	0.47	4.37	0.35	0.24	100.0
Men							
Directly to SS	25.00	3.68	0.13	2.73	0.04	0.20	31.78
UI to SS	32.33	4.76	0.17	1.95	0.03	0.14	39.39
SS (wk) to SS	7.20			1.85			9.05
SS and pension (wk) to SS		2.38			0.38		2.76
SS and WS (wk) to SS	0.85			0.22			1.06
SS, pension, and WS (wk) to SS		0.28			0.04		0.32
UI and SS (wk) to SS	9.32			1.32			10.64
UI, SS, and pension (wk) to SS		3.08			0.27		3.35
UI, SS, and WS (wk) to SS	1.09			0.15			1.25
UI, SS, pension, and WS (wk) to SS		0.36			0.03		0.39
Total	75.79	14.54	0.31	8.22	0.80	0.34	100.00
Women							
Directly to SS	39.82	1.93	0.40	0.12	0.00	0.02	42.29
UI to SS	34.32	1.67	0.34	0.06	0.00	0.01	36.40
SS (wk) to SS	9.97			0.11			10.08
SS and pension (wk) to SS		0.75			0.01		0.76
SS and WS (wk) to SS	0.59			0.01			0.59
SS, pension, and WS (wk) to SS		0.04			0.00		0.04
UI and SS (wk) to SS	8.59			0.05			8.64
UI, SS, and pension (wk) to SS		0.65			0.00		0.65
UI, SS, and WS (wk) to SS	0.51			0.00			0.51
UI, SS, pension, and WS (wk) to SS		0.04			0.00		0.04
Total	93.79	5.08	0.74	0.35	0.01	0.03	100.00

Notes: Wk = paid during working; UI = unemployment insurance; pension = employer-provided retirement benefits, which are mostly annuities and do not include lump-sum benefits.

benefits—failed to significantly encourage the elderly to work. These analyses, however, treat social security benefits only on a flow basis, without a dynamic framework that considers how additional work changes benefits and, correspondingly, their wealth.

The second group, which includes Takayama et al. (1990a), Seike (1991), Oshio (1997), and Yashiro and Oshio (1999), has been interested in the magnitude of social security wealth. Takayama et al. discuss how the public pension scheme affects the distribution of human capital through social security wealth. Seike finds that social security accrual turns negative at age sixty, consistent with a sharp drop in labor force participation at that age. Oshio estimates how the 1994 Pension Reform Act affects social security wealth and its accrual pattern. These analyses, however, do not empirically predict how retirement incentives based on social security wealth affect the retirement decisions of the elderly.

One purpose of this paper is to build a bridge between these two groups; we aim to estimate how retirement incentives based on social security wealth affect the probability of retirement, following Oishi and Oshio's (2000) tentative research on the option value model (see section 7.6.1). In addition, policy simulations in this paper provide useful information about how social security reform affects labor force participation for the elderly.

7.4 Data Overview

Our analysis is based on the *Survey on Labor Market Participation of Older Persons* (MOL 1996), which was conducted in October 1996 and published in December 1997 by the MOL. The survey covers men and women of aged fifty-five to sixty-nine who were employees, company executives, self-employed, or not working. Due to data limitations, our analysis centers on those who used to be employees at age fifty-five *and* who had been working until 1995 (see section 7.7.1). The size of the sample we use is 4,088 out of about 22,000 in the survey.

The major problem is that the data from this survey are cross-sectional and 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) they were working for at fifty-five, whether or not and when they would face mandatory retirement, and when they wanted 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: We only know from the survey simply whether or not 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 their 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 about the category and amount of benefits seem at times to be unreliable, probably due to inaccurate knowledge, limited knowledge, or both 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.

7.5 Earnings Histories and Projections

Backward and forward projections of wage earnings are required to analyze the impact of social security incentives on retirement decisions. With little longitudinal information available and uniqueness of the wage curve in Japan, our approach differs from the norm applied to other countries. Our projections of the age-earnings profiles depend largely on the cross-sectional data. Also, we use reported individual characteristics observed in the survey as well as information obtained from the Wage Census. To summarize our methodology, we use (a) current wage earnings as a benchmark, (b) average age and wage profiles obtained from the survey for the ages fifty-five to sixty-nine, and (c) cohort-specific age-earnings profiles in backward projections starting at age fifty-five and below. An additional procedure required in the case of Japan is to estimate the timing of retirement for those who have already retired at the survey year on the basis of limited longitudinal information.

7.5.1 Projections for the ages fifty-five to sixty-nine

In Japan, we observe that earnings for full-time work are likely to decline with age mainly due to the transition from the primary firm with the seniority-based wages to the secondary labor market with market-based wages; thus it is not reasonable to assume zero real growth in earnings into the future. For earnings projections for the ages fifty-five to sixty-nine, we rely on average wage growth rates observed from the survey because cohort-specific information is not available. In addition, the strong sample selection bias for elderly workers in the Wage Census prevents us from applying cohort-specific age and wage profiles for the workers aged fifty-five and above. It should be noted that earnings projections of this type cannot separate age effects from cohort effects and thus are inconsistent with backward projections based on cohort-specific information. We neglect this problem for simplicity.

To calculate average wage growth, we regress the logarithm of monthly earnings (separately for males and females) on an individual's age, experience of mandatory retirement, job categories, firm size at the employee's age of fifty-five, whether or not a private or public employee at fifty-five, and residential area. All independent variables are dummies. We do not apply any linear or parabola form for a wage curve, due to its discontinuity between, before, and after the mandatory retirement age; instead we apply dummies for each age. In addition, we apply Heckman's two-step estimation procedures to deal with the sample selection bias (the first step estimation results are not reported). Estimated parameters are summarized in table 7.5. As clearly seen from this table, wage earnings decrease sharply after age sixty, the age at which many people retire and become eligible for pension benefits.

Based on this regression, we create each sample's earnings profile for the ages fifty-five to sixty-nine using the reported current wage earnings as a benchmark. For those who have already been retired by the survey year, we predict their current wages based on their age and other characteristics and construct their earnings profile for the ages fifty-five to sixty-nine. 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. However, parameters of other dummies show individual fixed effects, which shift the earnings profile up and down for each individual. The timing of mandatory retirement, which is in most cases sixty years old, is important in projecting the earnings profile. In projecting future earnings for an individual younger than sixty, we assume that they will face mandatory retirement at sixty.

7.5.2 Backward Projections

The survey shows only current wage earnings for those who are working, full time or part time, in the survey year. To construct earnings histories before age fifty-five, we rely upon cohort-specific age-earnings profiles. For this purpose, we use wage data from the Wage Census, which is conducted and published every year by the Ministry of Labor.[7] The Wage Census provides average age-wage profiles by industry, firm size, and educational background. We use only information about wage profiles by firm size (categorized into three groups: manufacturing firms with more than 1,000 employees, 999–100, and 99–10) from this Wage Census. This is because (a) wage profiles are determined largely by firm size in Japan, (b) wage data in industries other than manufacturing have problems in terms of continuity and availability, and (c) no information about educational background is available for samples of the survey.

We project wage earnings backwards using estimated earnings at

7. The age classes are divided into five-year increments in the Wage Census. We thus collect data from the census every five years and reconstruct them for each cohort and year with a linear interpolation.

Table 7.5 **Wage Functions**

Independent Variables (Dummies)	Men		Women	
	Coefficient	SE	Coefficient	SE
Age (default: age 55)				
56	–0.020	(0.025)	0.056	(0.050)
57	–0.074	(0.027)	0.150	(0.056)
58	–0.087	(0.028)	0.126	(0.060)
59	–0.099	(0.029)	0.016	(0.059)
60	–0.160	(0.037)	0.073	(0.075)
61	–0.290	(0.043)	–0.099	(0.072)
62	–0.400	(0.045)	0.059	(0.088)
63	–0.457	(0.050)	0.060	(0.084)
64	–0.470	(0.048)	0.007	(0.106)
65	–0.551	(0.061)	0.019	(0.100)
66	–0.579	(0.061)	0.142	(0.123)
67	–0.524	(0.070)	0.053	(0.136)
68	–0.597	(0.073)	–0.185	(0.149)
69	–0.675	(0.086)	–0.075	(0.177)
Mandatory retirement (default: no experience of mandatory retirement)				
55–59	–0.183	(0.035)	–0.291	(0.091)
60–64	–0.214	(0.050)	0.240	(0.119)
65–69	–0.230	(0.066)	0.113	(0.141)
Occupation at age 55 (default: clark)				
Specialists	0.151	(0.043)	0.138	(0.076)
Managers	0.304	(0.037)	0.405	(0.091)
Salespersons	–0.061	(0.044)	–0.297	(0.050)
Service	–0.163	(0.057)	–0.383	(0.051)
Guards	–0.182	(0.068)	–0.261	(0.317)
Farmers	–0.171	(0.063)	–0.581	(0.099)
Trans. & com.	–0.229	(0.041)	–0.304	(0.154)
Blue collar	–0.194	(0.036)	–0.491	(0.043)
Construction	–0.122	(0.042)	–0.283	(0.099)
Firm size at age 55 (default: less than 10)				
10–99	0.069	(0.026)	0.112	(0.040)
100–299	0.082	(0.031)	0.245	(0.043)
300–999	0.054	(0.036)	0.101	(0.060)
1000+	0.181	(0.028)	0.146	(0.053)
Public sector	0.018	(0.036)	0.098	(0.085)
Residential areas (default: Tokyo metropolitan area)				
Hokkaido	–0.180	(0.043)	–0.035	(0.081)
Tohoku	–0.404	(0.034)	–0.070	(0.055)
Kanto2	–0.190	(0.035)	–0.060	(0.054)
Hokuriku	–0.268	(0.045)	0.017	(0.076)
Tokai	–0.151	(0.031)	0.029	(0.046)
Kinki 1	–0.039	(0.028)	–0.018	(0.054)
Kinki 2	–0.225	(0.066)	–0.076	(0.091)
Chugoku	–0.300	(0.043)	–0.053	(0.061)

(*continued*)

Table 7.5 (continued)

	Men		Women	
Independent Variables (Dummies)	Coefficient	SE	Coefficient	SE
Shikoku	–0.443	(0.061)	–0.093	(0.082)
Northern Kyushu	–0.313	(0.038)	0.001	(0.059)
Southern Kyushu	–0.473	(0.047)	–0.085	(0.085)
Constant	3.809	(0.040)	2.765	(0.056)
Inverse Mills' ratio	–0.319	(0.026)	–0.402	(0.080)
Log-likelihood	–7268.9		–4144.4	
No. of observations	6,979		3,710	

Notes: SE = standard error. The dependent variable is the logarithm of monthly earnings. Wage function was estimated by means of the Heckman two-step selection correction. Additional variables that were included in the participation probit were health status, mortgage loans, public pension benefits, private pension benefits, property income, and family members' income.

fifty-five as a benchmark and the cohort-specific wage curve. But how do we know about the earnings history for an individual who has already been retired by the survey year? First, we have to estimate at which age they retired. The survey gives some information about an individual's working status after mandatory retirement if applicable: The survey asks, for instance, whether one has kept working at the same or another firm after mandatory retirement (but the survey does not ask for how long). Based on this information, we make a rough estimation of each sample's retirement age (see section 7.7.1).

7.6 Incentive Variable Calculation

This section describes the construction of incentive measures and provides tabulations that illustrate them by age. These incentive measures are used to capture the impact of social security programs on retirement decisions in the next section.

7.6.1 Definitions and Methodology

We construct three incentive measures: benefit accrual, option value, and peak value, each of which assesses the impact of social security programs upon retirement decisions. The key concept from which these three measures are derived is social security wealth (SSW), which is the present discounted value of lifetime social security benefits. Social security wealth is gross of wage taxation, but net of income taxation. It should be noted here that the income tax system is very generous to pensioners and other elderly people (especially those aged sixty-five and above); income tax levied on them is in most cases negligible due to lower tax rates and various tax exemptions.

The three incentive measures, the latter two of which are of forward-looking type, are defined as follows.

1. *Benefit accrual* is the change in SSW at each age resulting from the postponement of retirement for one additional year. If the accrual is positive, an individual may want to postpone retirement since working for an additional year will raise SSW. If it is negative, social security will provide a disincentive to work. One problem with the accrual is that it does not take into account potential large accruals in the future.

2. The *option value* is the (expected) gain from postponing retirement to the age when an individual's life-cycle utility is maximized (see Stock and Wise 1990). If one retires at age r, the discount utility at the current age t is given by

$$V_t(r) = \sum_{s=t}^{r-1} \beta^{s-t} Y_s^{\gamma} + \sum_{s=r}^{S} \beta^{s-t} [kB_s(r)]^g,$$

where S is the maximum age, Y_s is wage earnings at age s, $B_s(r)$ is SS benefits at age s (if retired at age r), and β is the discount factor. Let $r^*(> r)$ denote the future retirement age yielding the highest value of utility; then the option value is given by

$$G_t(r^*) = V_t(r^*) - V_t(t).$$

The individual retires if $G \leq 0$; otherwise he postpones retirement. We assume that β is equal to 0.97 (a three percent discount rate), γ is equal to 0.75, and k is equal to 1.5, rather than structurally estimating them.

3. The *peak value* is defined as the difference between SSW today and SSW at its peak; that is, the sum of all accruals from today to the year when SSW is at its maximum. This is a simpler, less structural, alternative to the option value, with utility from wage earnings neglected. After the peak point, the peak value is equal to the annual accrual.

Calculations of these incentive measures have to incorporate the multiple policies reviewed in section 7.2.3. Our construction of weighted average incentive measures neglects employer-provided pension (and lump-sum retirement) benefits. The possibility that these benefits affect people's retirement decisions cannot be ruled out, but in most cases they are paid by firms at the mandatory retirement age of sixty regardless of the employee's working or retirement status thereafter. On the other hand, there are some cases in which employer-provided pension benefits make it profitable to retire earlier than sixty with a reduction in the discount value of benefits. This effect, however, will not be explicitly analyzed, due to limited data.

Hence, weighted average incentive measures reflect the following four programs: (a) KNH benefits, (b) Zaishoku Pension benefits, (c) WS, and (d) UI benefits. A KNH participant is eligible for KNH benefits at age sixty, but they can choose to keep working with earnings-tested Zaishoku Pension benefits. The WS is paid for those who keep working between sixty and sixty-four. Beyond the age of sixty-five, only KNH benefits apply. The construction of weighted average of incentive measures is based on the actual probability of receiving each measure at each age observed from the sample. Three points should be mentioned here in estimating social security incentives.

First, for those aged sixty to sixty-four, UI benefits are 50–80 percent of the wage earnings at age sixty unless current wage earnings exceed them. This means that UI benefits are usually fixed for those aged sixty to sixty-four regardless of retirement age, because wage earnings tend to decline sharply after sixty. For those aged fifty-nine or younger, however, UI benefits usually replace 60 percent of the current-age earnings and thus postponing retirement will affect the amount of UI benefits as well as SSW and its accrual. On the other hand, one cannot apply for UI benefits at age sixty-five and after. Hence, people tend to stop working between the ages of sixty and sixty-four and receive UI benefits.

Second, there appear to be many cases in which workers receive full KNH benefits, probably due to an ineffective earnings test. Also, it is unclear whether or not the samples in the survey know their own type of pension benefits; some of those who respond that they are KNH beneficiaries might actually get Zaishoku (that is, earnings-tested KNH) benefits instead. In calculating social security incentives, we assume that public pension benefits that an individual gets while employed during the ages of sixty through sixty-four are earnings-tested Zaishoku rather than full KNH. While this assumption is loyal to the law, our calculations might more or less overestimate disincentives.

Third, WS is treated as a negative premium to social security, while it does not affect SSW in gross terms.

7.6.2 Summary of Incentive Measures

Based on the aforementioned methodology, we obtain tables 7.6 and 7.7 which illustrate weighted average incentive measures. The results set out in table 7.6 summarize SSW, its accrual, standard deviation, and the tax or subsidy rate by age for the median, tenth, and ninetieth percentiles, compared with a previous study by Yashiro and Oshio (1999). Table 7.7 provides similar calculations for the forward-looking incentive measures: peak and option values. Tables 7.6 and 7.7 include results for men and women. Among other things, the following results are most noteworthy.

First, SSW peaks at age fifty-nine. This is consistent with the fact that the eligibility age for social security benefits is sixty and that most employees exit the labor force at that age. Accrual is positive until fifty-nine and negative after that. Almost flat SSW and zero accrual beyond age sixty-five in most cases reflect the KNH formula, which allows full benefits with no

Table 7.6 Summary of Incentive Measures (in 1998 US$)

		Accrual				Tax or Subsidy Rate	
Age	SSW Median	Median	10th Percentile	90th Percentile	SD	Median	Yashiro and Oshio (1999)[a]
Men							
54	224,314	—	—	—	—	—	—
55	235,188	7,333	5,087	12,729	2,708	–0.235	–0.195
56	248,940	10,275	7,236	14,569	3,102	–0.328	–0.202
57	258,654	6,624	4,581	11,124	2,635	–0.232	–0.105
58	268,532	8,675	6,077	12,637	2,935	–0.299	–0.112
59	280,562	11,548	7,676	15,368	3,400	–0.424	–0.138
60	267,989	–13,351	–19,605	–7,148	4,669	0.602	0.338
61	257,437	–10,839	–15,381	–5,344	3,829	0.552	0.340
62	245,849	–11,504	–16,066	–6,164	3,863	0.670	0.342
63	234,591	–11,021	–17,823	–5,720	4,544	0.668	0.340
64	217,702	–16,400	–20,250	–10,878	4,043	0.921	0.204
65	216,390	0	–5,975	709	3,290	0	0
66	215,686	0	–6,295	6	2,765	0	0
67	215,273	0	–5,820	6	2,708	0	0
68	214,753	0	–4,948	0	1,980	0	0
69	214,739	0	–6	0	1,986	0	0
Women							
54	176,821	—	—	—	—	—	—
55	184,538	5,331	–6,992	13,917	7,303	–0.326	—
56	195,111	6,583	–7,208	16,036	8,037	–0.369	—
57	201,221	4,847	–8,630	12,935	7,979	–0.265	—
58	208,762	5,402	–8,981	12,542	8,351	–0.328	—
59	214,137	6,375	–7,318	10,651	7,362	–0.313	—
60	206,211	–5,656	–19,489	–4,948	6,920	0.501	—
61	197,989	–4,997	–17,246	–3,930	6,182	0.523	—
62	189,860	–6,164	–15,476	–5,486	4,287	0.550	—
63	184,065	–6,379	–12,085	–5,692	4,624	0.405	—
64	182,874	–7,702	–14,681	–5,576	4,319	0.655	—
65	182,571	0	–86	0	4,544	0	—
66	180,962	0	0	0	1,827	0	—
67	180,962	0	0	0	0	0	—
68	180,962	0	0	0	0	0	—
69	180,962	0	0	0	0	0	—

Note: SD = standard deviation. Dashes indicate that data is not relevant.
[a]Data in this column is from Yashiro and Oshio (1999).

earnings test beyond that age. For males in the tenth percentile, small negative accruals beyond that age probably reflect negative accruals for spouses who are under sixty-five.

Hence, we can conclude that social security generally works as an incentive to work until the age of fifty-nine, but turns into a disincentive at sixty, and becomes neutral beyond sixty-five. Our previous study, Yashiro

Table 7.7 Summary of Forward-Looking Incentive Measures (in 1998 US$)

	Option Value				Peak Value			
Age	Median	10th Percentile	90th Percentile	SD	Median	10th Percentile	90th Percentile	SD
Men								
55	98,159	58,659	174,423	50,837	34,527	23,883	51,475	12,074
56	85,850	54,364	162,567	40,166	29,025	21,275	48,437	10,186
57	70,414	38,429	127,216	33,609	21,129	14,808	33,855	7,365
58	59,819	30,435	102,082	29,047	14,951	11,073	23,593	5,521
59	36,815	14,881	80,452	26,847	11,548	7,676	15,368	3,400
60	34,991	9,769	73,357	26,817	–13,351	–19,605	–7,148	4,669
61	34,160	8,019	66,012	22,320	–10,839	–15,381	–5,344	3,968
62	32,158	6,688	63,352	20,685	–11,504	–16,066	–6,164	3,863
63	33,786	10,787	66,021	20,873	–11,021	–17,823	–5,720	4,544
64	34,165	11,635	65,569	20,765	–16,400	–20,250	–10,515	5,170
65	37,283	21,610	62,258	17,004	0	–5,975	709	4,691
66	29,757	15,268	49,844	14,770	0	–6,295	6	2,767
67	21,821	10,162	38,727	12,594	0	–5,820	6	3,531
68	15,262	7,109	26,446	7,942	0	–4,948	5	2,190
69	7,169	2,462	16,191	5,710	0	–6	0	1,986
Women								
55	97,410	57,318	175,919	48,550	25,274	–6,992	47,980	18,850
56	89,592	49,213	169,527	45,357	20,100	–5,833	37,130	16,100
57	81,684	42,410	136,370	41,965	14,821	–8,247	30,816	14,377
58	69,357	35,179	122,228	44,534	10,420	–8,981	20,705	11,770
59	60,662	27,029	110,406	34,426	6,375	–7,318	10,651	7,389
60	38,592	16,679	90,373	31,509	–5,645	–19,489	–4,948	6,923
61	36,448	16,013	86,467	28,853	–4,997	–17,246	–3,930	6,218
62	29,199	13,705	78,554	27,158	–6,164	–15,476	–5,486	4,327
63	42,238	17,204	80,978	28,416	–6,379	–12,085	–5,692	4,624
64	31,242	12,581	70,477	25,036	–7,702	–14,681	–5,576	4,319
65	39,971	19,841	71,221	28,657	0	–86	0	4,948
66	24,595	14,802	60,220	18,043	0	0	0	1,899
67	11,090	2,303	36,714	11,076	0	0	0	0
68	12,403	7,468	24,307	9,402	0	0	0	0
69	4,709	3,377	11,448	4,836	0	0	0	0

Note: SD = standard deviation.

and Oshio (1999), which assumed that all (male) employees get Zaishoku benefits if they keep working, neglects UI benefits and assumed no wage growth. In the current paper, we take into account the case of receiving no Zaishoku benefits and going directly onto SS, include UI benefits, and reflect a projected reduction in wage earnings based on the cross-sectional data. As a result, the implied tax rate during the ages of sixty through sixty-four is larger than found in our previous study.

Turning to forward-looking incentive measures, the option value declines by age, suggesting that a disincentive to work tends to increase by age. This probably can be attributed to both declining SSW and an increasing risk of lower wage earnings when postponing retirement. The option value continues to fall even beyond age sixty-five, in contrast with SS accrual which is flat beyond sixty-five; this is because SS accrual does not reflect a reduction in wage earnings beyond that age.

The pattern of a change in the peak value by age is also consistent with that of benefit accrual; it is positive until age fifty-nine and then turns negative. In addition, tables 7.6 and 7.7 confirm that the peak value is simply annual SS accrual after the year when SSW is at its maximum, consistent with its definition.

7.7 Empirical Framework for Regression Analysis

In this section, we describe the empirical framework for regression analysis on the impact of social security on retirement. However, we first have to estimate each sample's previous working or retirement status, since our survey tells us only whether or not each sample is retired or working 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.

7.7.1 Estimation of Retirement Age and Changes in Working Status

To estimate models for incentive measures we select from the survey the individuals who are expected to have kept working until 1995, one year before the survey year, and we apply the probit model to them to explain their retirement decisions (whether or not to keep working or to retire) in 1996.[8] 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 working in 1995 too. 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.

Table 7.8 summarizes an estimated change in working or retirement status for those who are estimated to have been working in 1995. Out of the total sample, 2,629 men are estimated to have been working in 1995, and 2,296 of them kept working and 333 retired in 1996. As for women, 1,204 of 1,459 kept working and 295 retired. For men the hazard rate is very high for those aged sixty or sixty-one in 1995, roughly consistent with the actual trend of labor force participation.

8. It might be possible to take individuals who were working in 1996 out of the sample and see whether or not they will retire in 1997, since we can construct a forward-looking panel using the reported answers as to when they wish to retire. We do not do this, however, because such answers do not appear reliable enough to use for estimating retirement age.

Table 7.8 Changes in Working Status of Employees (1995–1996)

	Males				Females			
		Working Status in 1996				Working Status in 1996		
Age in 1995	*N*	Employed	Retired (Def. I)	%	*N*	Employed	Retired (Def. I)	%
54	103	102	1	1.0	167	158	9	5.4
55	150	141	9	6.0	200	180	20	10.0
56	159	151	8	5.0	168	146	22	13.1
57	237	232	5	2.1	157	126	31	19.7
58	253	238	15	5.9	144	120	24	16.7
59	293	209	84	28.7	144	94	50	34.7
60	292	199	93	31.8	114	75	39	34.2
61	193	176	17	8.8	88	63	25	28.4
62	201	172	29	14.4	73	65	8	11.0
63	177	158	19	10.7	70	61	9	12.9
64	149	124	25	16.8	44	36	8	18.2
65	135	123	12	8.9	34	31	3	8.8
66	112	102	9	8.0	25	22	3	12.0
67	103	100	3	2.9	16	15	1	6.3
68	72	68	4	5.6	15	12	3	20.0
Total	2,629	2,296	333	12.7	1,459	1,204	255	17.5

Source: Authors' calculations from the SLMPOP (MOL 1996).
Notes: *N* = number of observations. "Employed" includes executives.

7.7.2 Model Specification

The dependent variable is a dummy for whether or not an individual (who is expected to have been working in 1995) retired in 1996, with retirement defined according to Definition I, which is described in section 7.2.3. We choose Definition I, the broadest definition of retirement, largely because most of the self-employed probably have been retired from the firms and their income seem to at least partly rely on public pension benefits. Then, we estimate the retirement models by probit for three incentive measures: accrual, peak value, and option value. The central issue is which controls to include in the retirement models. In particular, age itself may be very important in Japan: Most people are effectively *forced* to leave firms at age sixty. Meanwhile, our preliminary regressions indicate that there is relatively little value added by showing the variation in results when demographic and earnings controls are and are not incorporates in the models.

Here we estimate two models: one model (M1) has all controls for earnings, demographics, sectors, and a linear age term; the other model (M2) has all these controls but replaces the linear age terms with age dummies. We estimate these two models for each incentive measure: accrual, peak

Table 7.9 **Summary Statistics**

	Males		Females	
	Mean	SD	Mean	SD
Retired (Def. I)	0.127	0.333	0.175	0.380
SSW (US$ 10,000)	27.444	9.292	22.462	11.857
SSA (US$ 10,000)	–0.270	1.111	–0.053	0.915
Peak value (US$ 10,000)	0.134	1.721	0.499	1.675
Option value (US$ 10,000)	5.166	4.044	7.253	5.099
Property income (US$ 1,000)	0.160	1.057	0.069	0.306
Health condition: not well	0.151	0.358	0.154	0.361
Health condition: bad or sick	0.035	0.183	0.028	0.165
PE (US$ 1,000)	2.424	1.548	1.391	0.843
ALE (US$ 1,000)	2.792	1.821	1.467	0.964
Square of PE	8.272	11.858	2.645	4.641
Square of ALE	11.109	17.430	3.082	6.580
Age in 1995	60.324	3.660	58.352	3.422
Sample *N*	2,629		1,459	

Notes: All dollar values are in 1998 US$ ($1 = ¥131.02). SD = standard deviation; PE = projected earnings; ALE = average lifetime earnings; *N* = number of observations.

value, and option value for men and women, separately. Each model includes SSW. 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, nine occupational dummies, dummies for four categories of firm size at age fifty-five, and eight dummies for residential area.

7.8 Estimation Results

Table 7.9 shows the summary statistics for the sample, and tables 7.10 and 7.11 summarize estimation results for men and women, respectively. In tables 7.10 and 7.11, each incentive measure has two columns for M1 (with a linear age term) and M2 (with age dummies), with coefficients for controls other than earnings omitted to save space. The coefficient on each incentive measures is expected to be negative, since they should reduce the probability of retirement. The following four findings are noteworthy in assessing the impact of each incentive measure.

First, coefficients on incentive measures are all negative and statistically significant for men, except for the M2 option value model. In the peak value M1 model, for example, one thousand dollar increase in the peak value would raise the hazard rate by 0.62 percent points. For women, only the M1 accrual and M1 peak value models show negative and significant coefficients on incentive measures. Men are more sensitive to incentive measures than women, probably because men's labor participation is much

Table 7.10 **Retirement Probits (male sample)**

	Accrual Model		Peak Value Model		Option Value Model	
	Linear Age	Age Dummies	Linear Age	Age Dummies	Linear Age	Age Dummies
SSW	0.001	–0.006	–0.002	–0.005	0.008	–0.007
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
$10,000 change	0.02	–0.10	–0.03	–0.09	0.15	–0.11
Incentive measure	–0.399	–0.228	–0.367	–0.204	–0.035	0.019
	(0.048)	(0.109)	(0.039)	(0.081)	(0.015)	(0.017)
$1,000 change	–0.68	–0.37	–0.62	–0.33	–0.06	0.03
Property income	0.102	0.103	0.101	0.103	0.097	0.102
	(0.050)	(0.049)	(0.048)	(0.049)	(0.050)	(0.049)
Health condition: not well	0.265	0.292	0.265	0.290	0.255	0.283
	(0.089)	(0.093)	(0.090)	(0.093)	(0.088)	(0.093)
Health condition: bad or sick	0.929	1.011	0.958	1.012	0.886	1.015
	(0.157)	(0.155)	(0.160)	(0.156)	(0.153)	(0.154)
PE	0.054	–1.447	0.282	–1.479	–2.533	–1.365
	(0.945)	(1.091)	(0.998)	(1.091)	(0.854)	(1.106)
ALE	0.477	1.817	0.343	1.851	2.591	1.756
	(0.783)	(0.929)	(0.837)	(0.931)	(0.718)	(0.939)
Square of PE	0.059	0.297	0.130	0.318	0.205	0.252
	(0.128)	(0.139)	(0.141)	(0.140)	(0.118)	(0.140)
Square of ALE	–0.187	–0.368	–0.246	–0.384	–0.277	–0.336
	(0.093)	(0.110)	(0.105)	(0.112)	(0.089)	(0.111)
Age	–0.032		–0.045		–0.084	
	(0.020)		(0.020)		(0.020)	
55		0.912		0.790		0.858
		(0.445)		(0.446)		(0.445)
56		0.703		0.483		0.761
		(0.445)		(0.452)		(0.453)
57		0.383		0.020		0.399
		(0.473)		(0.499)		(0.491)
58		1.047		0.541		1.038
		(0.466)		(0.494)		(0.498)
59		1.421		0.979		1.957
		(0.513)		(0.578)		(0.498)
60		1.527		1.086		2.002
		(0.522)		(0.583)		(0.516)
61		0.604		0.169		1.099
		(0.549)		(0.606)		(0.541)
62		0.914		0.479		1.405
		(0.554)		(0.611)		(0.545)
63		0.539		0.120		1.143
		(0.588)		(0.643)		(0.561)
64		1.272		0.816		1.522
		(0.504)		(0.550)		(0.523)
65		0.864		0.402		1.147
		(0.520)		(0.564)		(0.544)

Table 7.10 (continued)

	Accrual Model		Peak Value Model		Option Value Model	
	Linear Age	Age Dummies	Linear Age	Age Dummies	Linear Age	Age Dummies
66		0.689		0.235		0.969
		(0.559)		(0.604)		(0.588)
67		0.302		–0.159		0.587
		(0.605)		(0.646)		(0.633)
68		0.479		0.017		0.772
		(0.639)		(0.678)		(0.676)
Pseudo R^2	0.172	0.225	0.185	0.226	0.137	0.233
Other controls	Yes	Yes	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. Figures in parentheses show robust standard errors. PE = projected earnings; ALE = average lifetime earnings.

Table 7.11 **Retirement Probits (female sample)**

	Accrual Model		Peak Value Model		Option Value Model	
	Linear Age	Age Dummies	Linear Age	Age Dummies	Linear Age	Age Dummies
SSW	0.007	0.010	0.006	0.011	0.012	0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)
\$10,000 change	0.14	0.21	0.14	0.00	0.26	0.03
Incentive measure	–0.150	0.024	–0.101	0.040	–0.008	0.041
	(0.058)	(0.069)	(0.039)	(0.046)	(0.019)	(0.019)
\$1,000 change	–0.32	0.05	–0.08	–0.14	–0.02	0.08
Property income	0.804	0.783	0.807	0.781	0.805	0.779
	(0.155)	(0.149)	(0.156)	(0.149)	(0.155)	(0.148)
Health condition: not well	0.124	0.144	0.127	0.143	0.122	0.148
	(0.115)	(0.120)	(0.115)	(0.120)	(0.114)	(0.121)
Health condition: bad or sick	1.025	1.088	1.015	1.090	0.999	1.101
	(0.219)	(0.227)	(0.220)	(0.226)	(0.220)	(0.226)
PE	–0.141	0.680	–0.310	0.763	–0.660	0.752
	(1.797)	(2.033)	(1.812)	(2.022)	(1.753)	(2.039)
ALE	1.842	1.087	1.976	1.024	2.340	0.965
	(1.518)	(1.754)	(1.530)	(1.745)	(1.490)	(1.762)
Square of PE	–0.522	–0.681	–0.468	–0.712	–0.442	–0.769
	(0.524)	(0.555)	(0.531)	(0.548)	(0.514)	(0.555)
Square of ALE	–0.402	–0.260	–0.437	–0.241	–0.482	–0.195
	(0.393)	(0.424)	(0.398)	(0.420)	(0.387)	(0.426)

(*continued*)

Table 7.11 (continued)

	Accrual Model		Peak Value Model		Option Value Model	
	Linear Age	Age Dummies	Linear Age	Age Dummies	Linear Age	Age Dummies
Age	0.015		0.007		0.018	
	(0.016)		(0.017)		(0.021)	
55		0.251		0.276		0.318
		(0.217)		(0.219)		(0.221)
56		0.511		0.548		0.641
		(0.216)		(0.225)		(0.230)
57		0.724		0.778		0.896
		(0.208)		(0.222)		(0.234)
58		0.524		0.594		0.744
		(0.215)		(0.232)		(0.248)
59		1.218		1.307		1.466
		(0.255)		(0.252)		(0.260)
60		1.092		1.178		1.336
		(0.234)		(0.260)		(0.266)
61		0.977		1.065		0.128
		(0.259)		(0.283)		(0.289)
62		0.359		0.445		0.627
		(0.314)		(0.331)		(0.343)
63		0.416		0.502		0.701
		(0.298)		(0.319)		(0.327)
64		0.768		0.840		1.089
		(0.300)		(0.316)		(0.350)
65		0.365		0.435		0.747
		(0.383)		(0.395)		(0.430)
66		0.305		0.382		0.686
		(0.419)		(0.431)		(0.461)
67		0.065		0.142		0.469
		(0.551)		(0.559)		(0.585)
68		0.761		0.836		1.160
		(0.485)		(0.496)		(0.528)
Pseudo R^2	0.161	0.200	0.161	0.201	0.155	0.204
Other controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: See table 7.10.

higher and their retirement decisions are much more linked with pension benefits.

Second, compared to M1 models, coefficients on incentive measures are either smaller and less significant, have wrong signs, or both in M2 models. This result suggests that M2 specification "overfits" the data, in that age dummies absorb much of retirement incentives. Indeed, figure 7.2 illustrates, for men and women respectively, how the hazard rate at each age would rise when each age dummy is raised from zero to one, compared with the actual hazard rates. These figures show that for all cases of accrual,

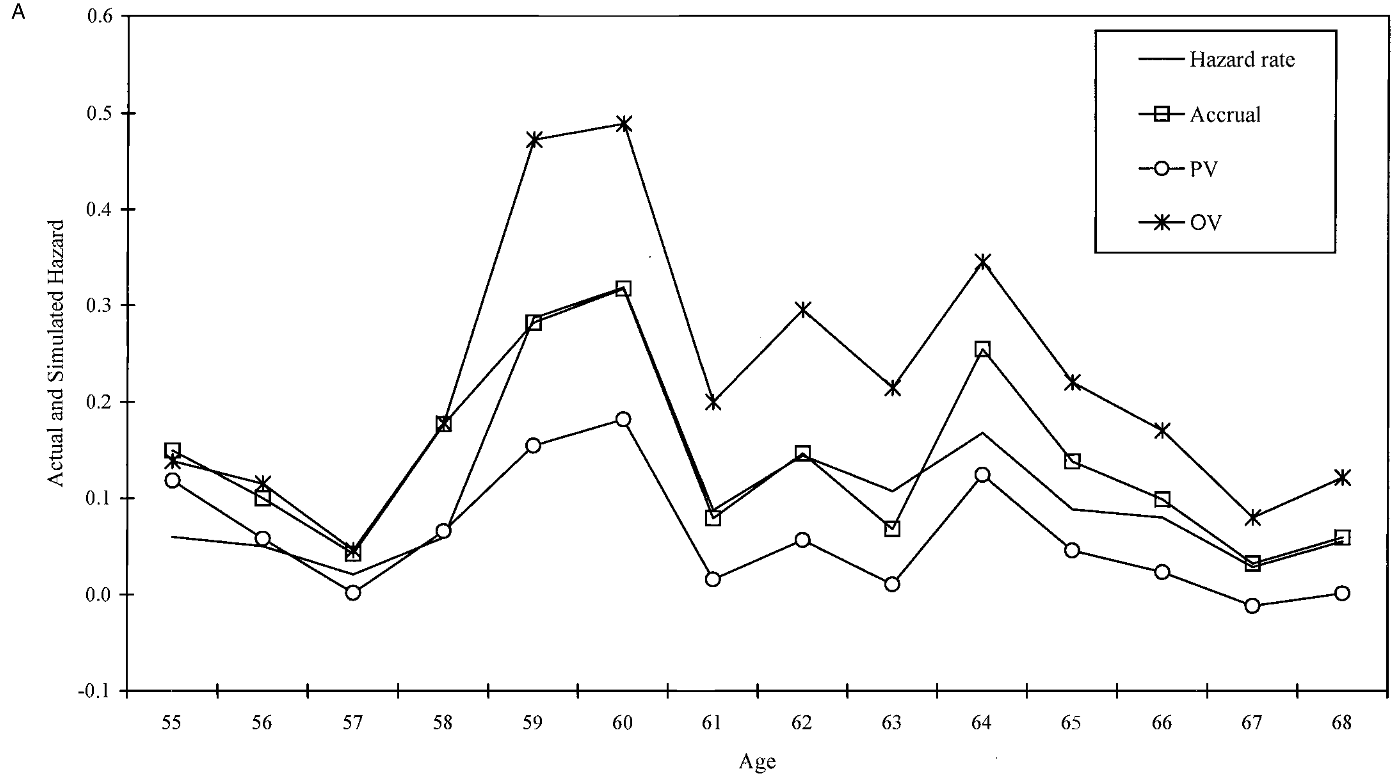

Fig. 7.2 The retirement hazard and age dummies: *A*, Males; *B*, Females

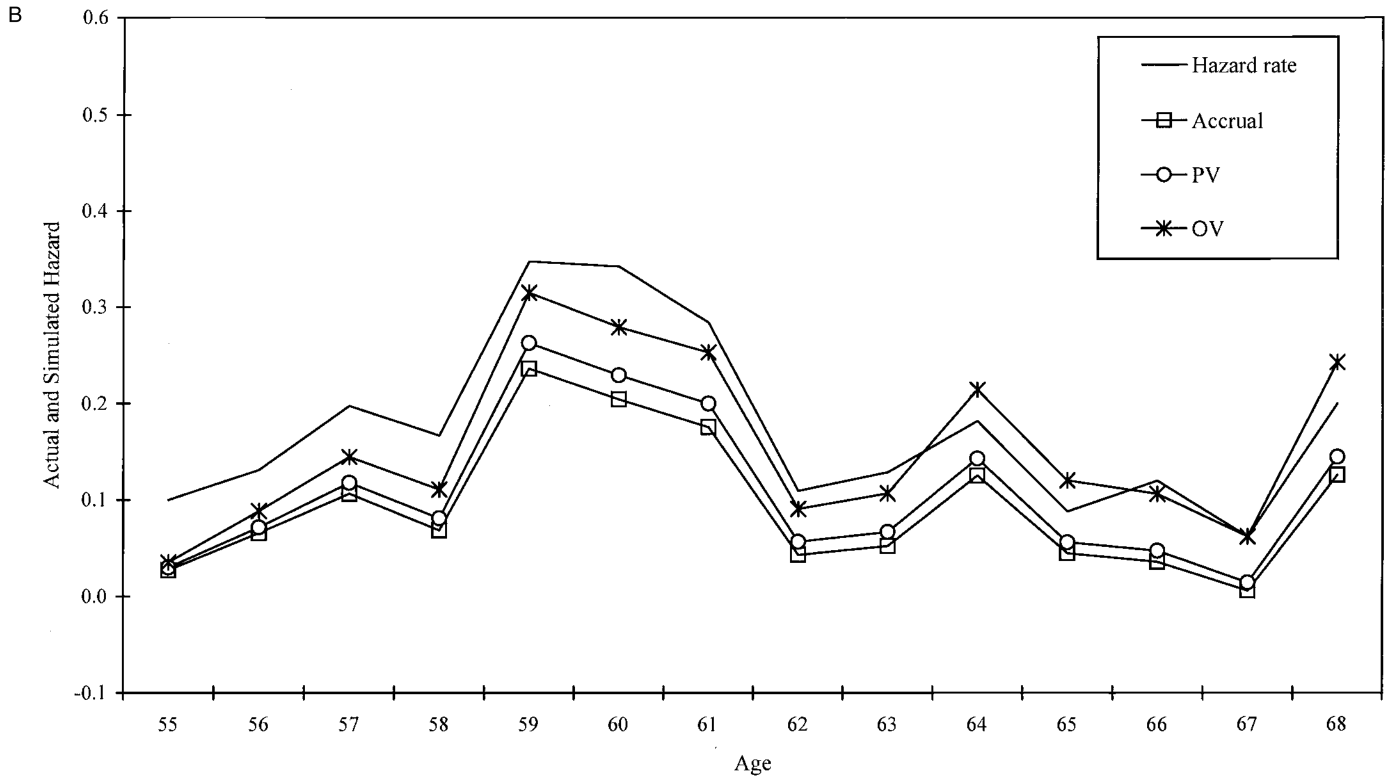

Fig. 7.2 (cont.) The retirement hazard and age dummies: *A*, Males; *B*, Females

peak value, and option value models age dummies trace well the actual age pattern of hazard rates.

Third, in terms of explanatory power, the peak value models look better than other models for men, while there is no big difference for women. While the fit is better in M2 models than in M1 models, coefficients on incentive measures tend to be either smaller and less significant, have wrong signs, or both in M2 as mentioned above. The explanatory power of the option value model looks relatively weak. This result seems plausible, judging by the fact that the option value monotonically declines as one gets older (as shown in table 7.7)—which is not consistent with the age pattern of hazard rates.

Finally, turning to other variables, SSW itself does not seem to be important in retirement decisions; its coefficient is not significant, especially in the case of men. The incentive effect of social security benefits works largely through dynamic incentive measures rather than SSW, and the wealth effect does not seem to be large. Also, supporting intuition about income and substitution effects, average lifetime earnings tend to increase disincentive to work, while projected earnings tend to decrease it. However, the value and significance differs substantially depending on model specifications.

All in all, the estimation results confirm that all dynamic incentive measures at least partially affect retirement decisions of the elderly, while the option value models show poorer performance than the others. The true impact of incentive measures is very difficult to assess, since their significance varies greatly when age dummies are in and out of the models. Thus, we should present a range of predictions based on a variety of models, instead of searching for the single best model, to predict the impact of policy changes.

7.9 Policy Simulations

In this section of policy simulations, we quantitatively assess the responsiveness of retirement decisions to social security reform. We propose two simulations for reform plans, which are described in the following sections.

7.9.1 Two Reform Plans

The first reform plan—referred to as the plus-three-years reform—is to raise both the early and normal eligibility age for the social security program by three years. In Japan, those ages correspond to sixty and sixty-five years, respectively. (More specifically, age sixty is the eligibility age for full benefits, but benefits are earnings-tested if one remains employed; at the age of sixty-five and over, one can get full benefits with no earnings test.) The simulation raises these threshold ages to sixty-three and sixty-eight, respectively. The eligibility ages for Zaishoku Pension benefits and WS and the age pattern of receiving UI benefits also are also raised by three years. For this reform plan, we consider three different scenarios.

- Simulation 1 (S1): increments the incentive and SSW measures and UI eligibility probabilities according to the policy changes from the model without age dummies (M1).
- Simulation 2 (S2): increments the incentive and SSW measures and UI eligibility probabilities from the model with age dummies (M2), with age dummies unchanged.
- Simulation 3 (S3): increments the incentive and SSW measures, UI eligibility probabilities, *and* age dummies from the model with age dummies (M2).

It seems likely that simulations S2 and S3 will bound true responses to policy changes, with simulation S1 lying somewhere in between.

The second reform plan is to implement the common reform, which has the following features:

1. An early eligibility age of sixty;
2. A normal retirement age of sixty-five;
3. A replacement rate of 60 percent (of earnings at the age of fifty-nine) at age sixty-five;
4. A six percent per-year actuarial reduction for retirement before sixty-five and six percent actuarial increase for retirement after sixty-five; and
5. No other pathways to retirement.

While this simulation allows us to compare the impact on the common reform across countries, some comments should be made regarding each component of this reform plan in Japan's case:

1. No change is necessary because the early eligibility age is currently sixty;
2. No change is necessary because the normal eligibility age is currently sixty-five;
3. The tax rate at age sixty-five is 92 percent for men and 66 percent for women as indicated in table 7.6, suggesting that a replacement rate of 60 percent will lower the tax rate and disincentives to work at that age;
4. The net effect of this actuarial adjustment is uncertain, since existing Zaishoku benefits are to be abolished; and
5. "No other pathways to retirement" means the abolishment of Zaishoku, WS, and UI benefits.

For this reform plan, we consider three different scenarios.

- S1: calculates incentive and SSW measures according to the new policy from the model without age dummies (M1).

- S2: calculates incentive and SSW measures according to the new policy from the model with age dummies (M2), with age dummies unchanged.
- S3: calculates incentive and SSW measures according to the new policy from the model with age dummies (M2), and change the age dummies. The goal of this simulation would be to maintain the portion of an age dummy that reflects increasing desire for leisure as one ages, and to discard the component that reflects the effect of retirement programs (not captured by the incentive measures), with the exception of effects due to early retirement and to normal retirement eligibility.

We perform these simulations by taking the estimated retirement model, plugging in new incentive measures and possibly new retirement ages in place of the existing ones and estimating for each individual a new probability of retirement. Then, we average the estimated probabilities at each age to the new age-specific retirement rates. Also, we estimate the cumulative hazard rate at each age as well as average retirement ages.

7.9.2 Simulation Results

Figures 7.3 to 7.11 summarize the simulation results for men. Each figure has two graphs: The first graph compares the baseline hazard rate and hazard rate under each of the two policies for each simulation and incentive combination; the second graph shows cumulative hazard rates for the baseline and each of the two policies for the same combination.

The following findings should be mentioned. First, in the case of the plus-three-years reform, S1 and S3 shift the spike of the hazard rate to age sixty-three to sixty-four from age sixty to sixty-one for the accrual and peak value models. By contrast, S2 does not show any clear shift in the spike, although it somewhat reduces the hazard rates. The policy impact in S3 is thus most probably due to a change in the age dummies, and S1 lies between the two extremes of S2 and S3. This result is also in line with the fact that the coefficient on the incentive measure is smaller if age dummies are included.

Second, the common reform moderates the hazard rates across ages. This is probably because the abolishment of Zaishoku, WS, and UI benefits—together with actuarial adjustment of pension benefits—moderates the age pattern of incentive measures. At the same time, this reform fails to postpone retirement substantially; in many cases, the hazard rate becomes higher until age sixty. This is because the common reform makes social security benefits less linked to the number of contribution years and reduces both the accrual and peak value below age sixty, while the reform raises them during ages sixty and sixty-four.

Third, as shown in figures 7.9 and 7.10 the option value model tends to be insensitive to policy reform (with no change in age dummies). This is

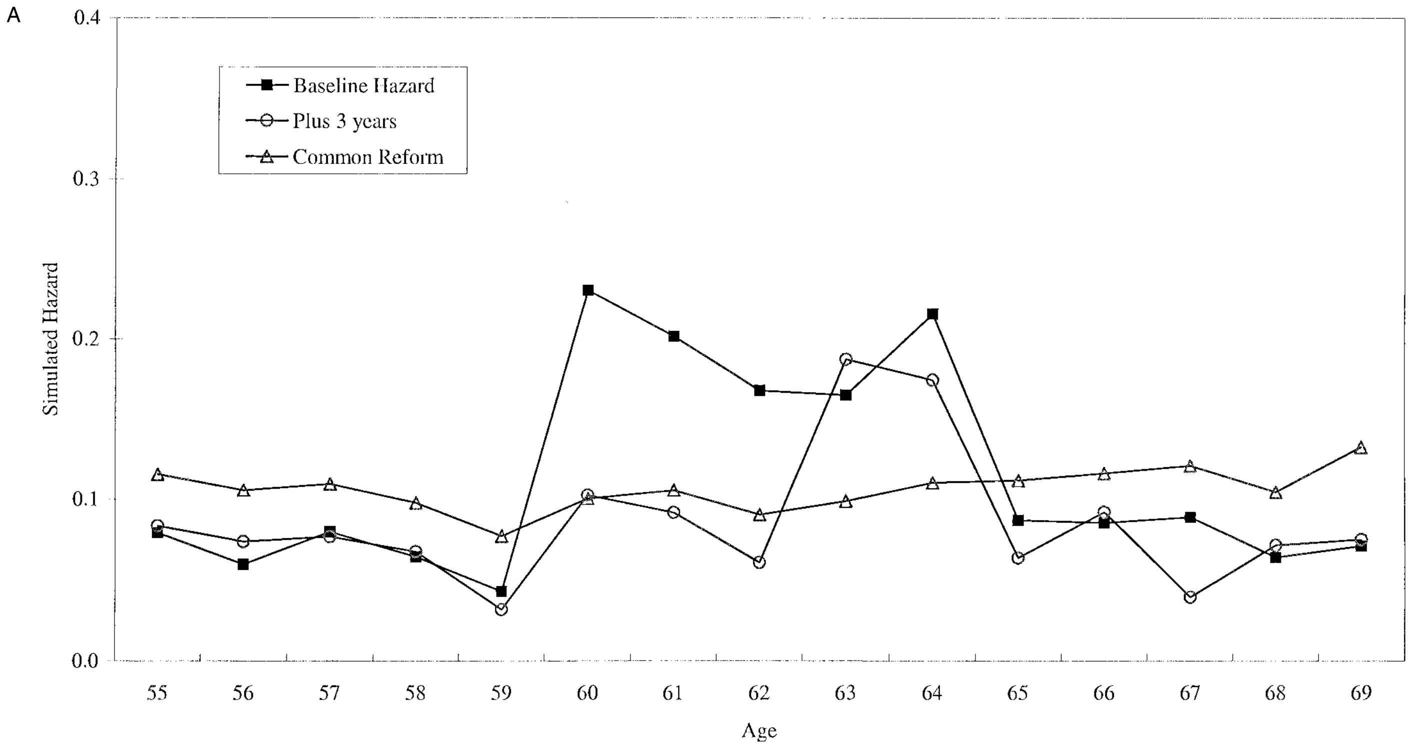

Fig. 7.3 Simulation S1 on males using accrual estimates: *A*, Simulated hazard; *B*, Cumulative probability

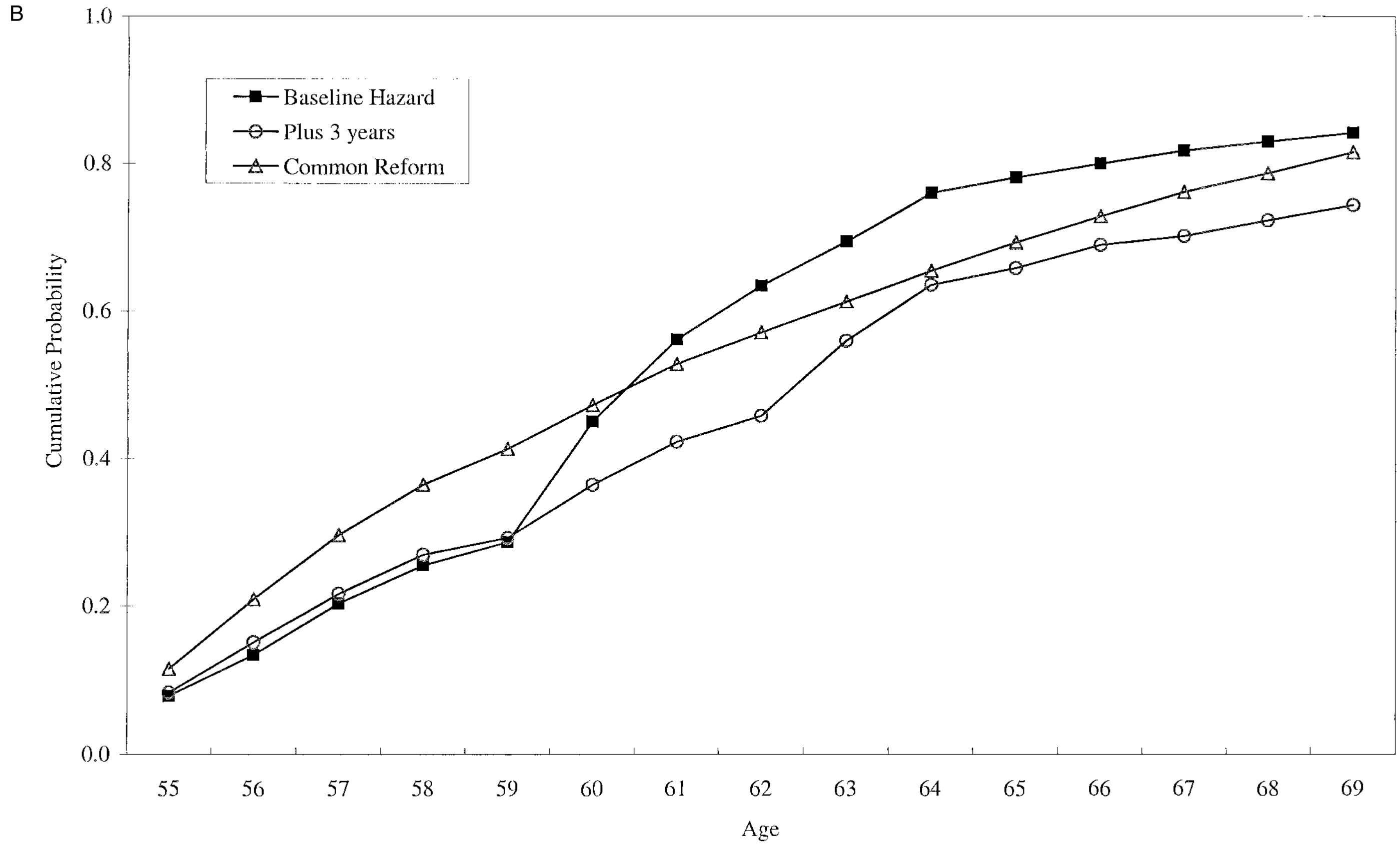
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.3 (cont.)

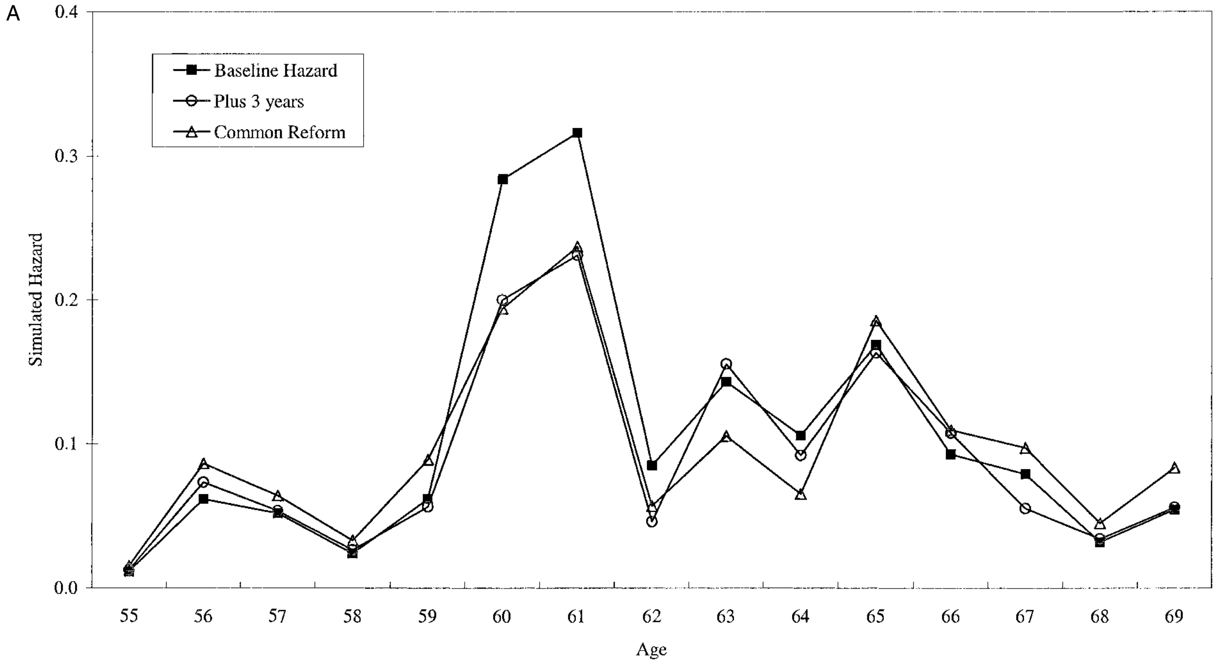

Fig. 7.4 Simulation S2 on males using accrual estimates: *A,* Simulated hazard; *B,* Cumulative probability

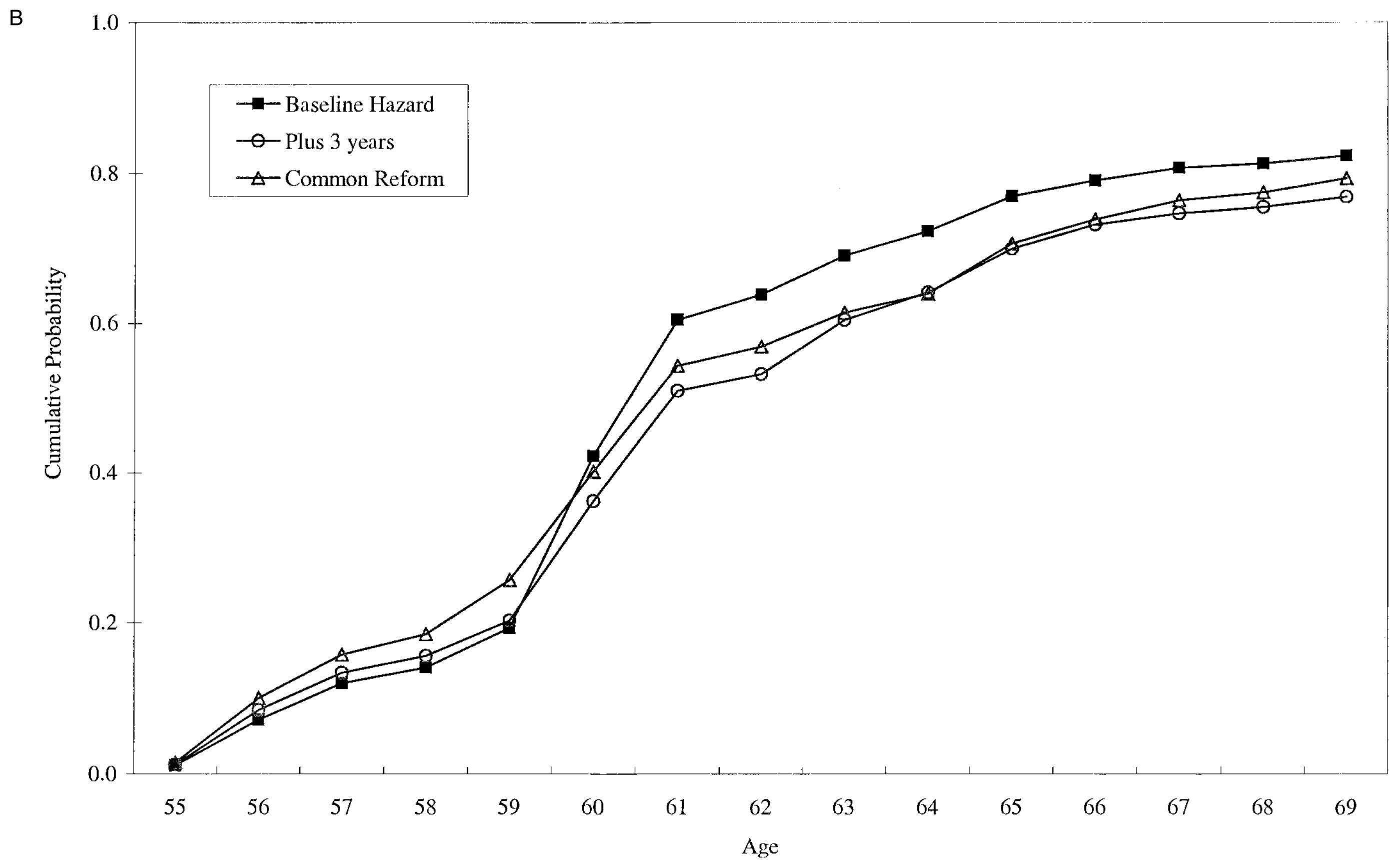
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.4 (cont.)

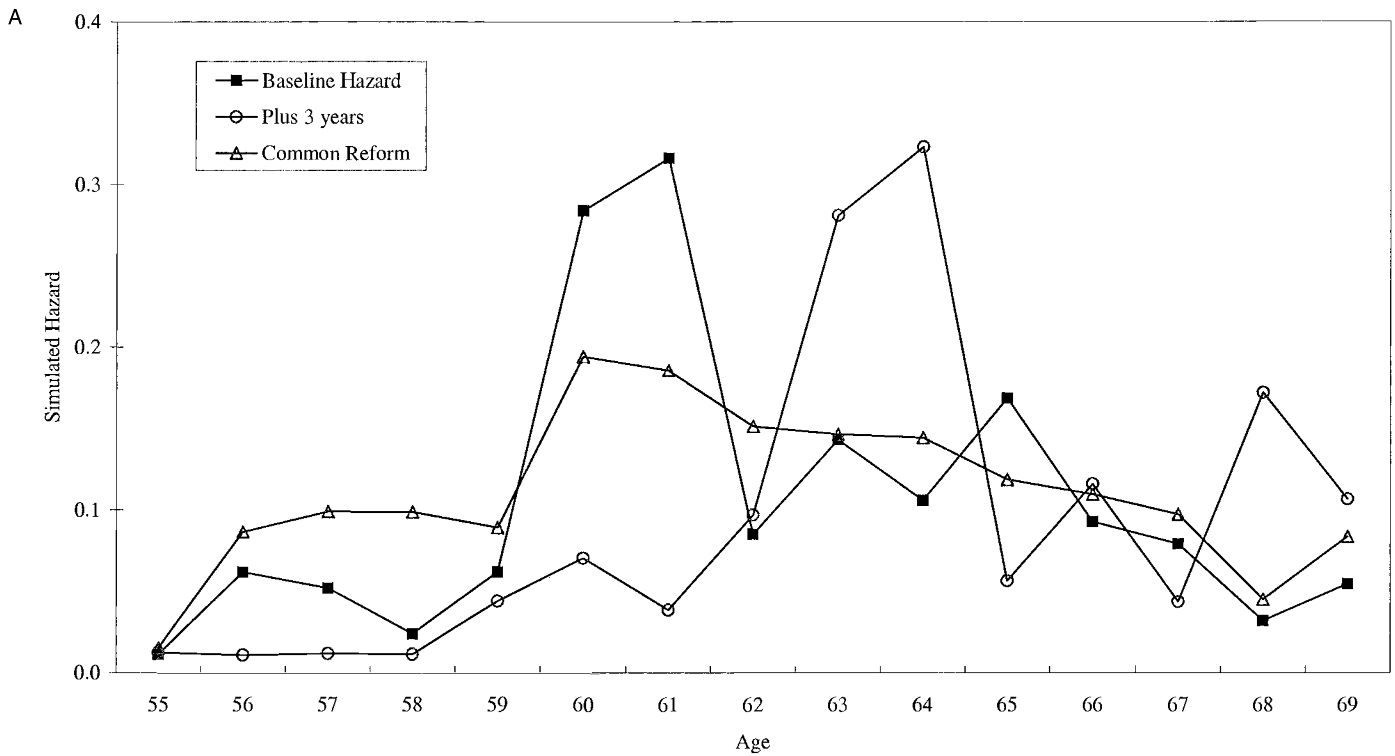

Fig. 7.5 Simulation S3 on males using accrual estimates: ***A*, Simulated hazard; *B*, Cumulative probability**

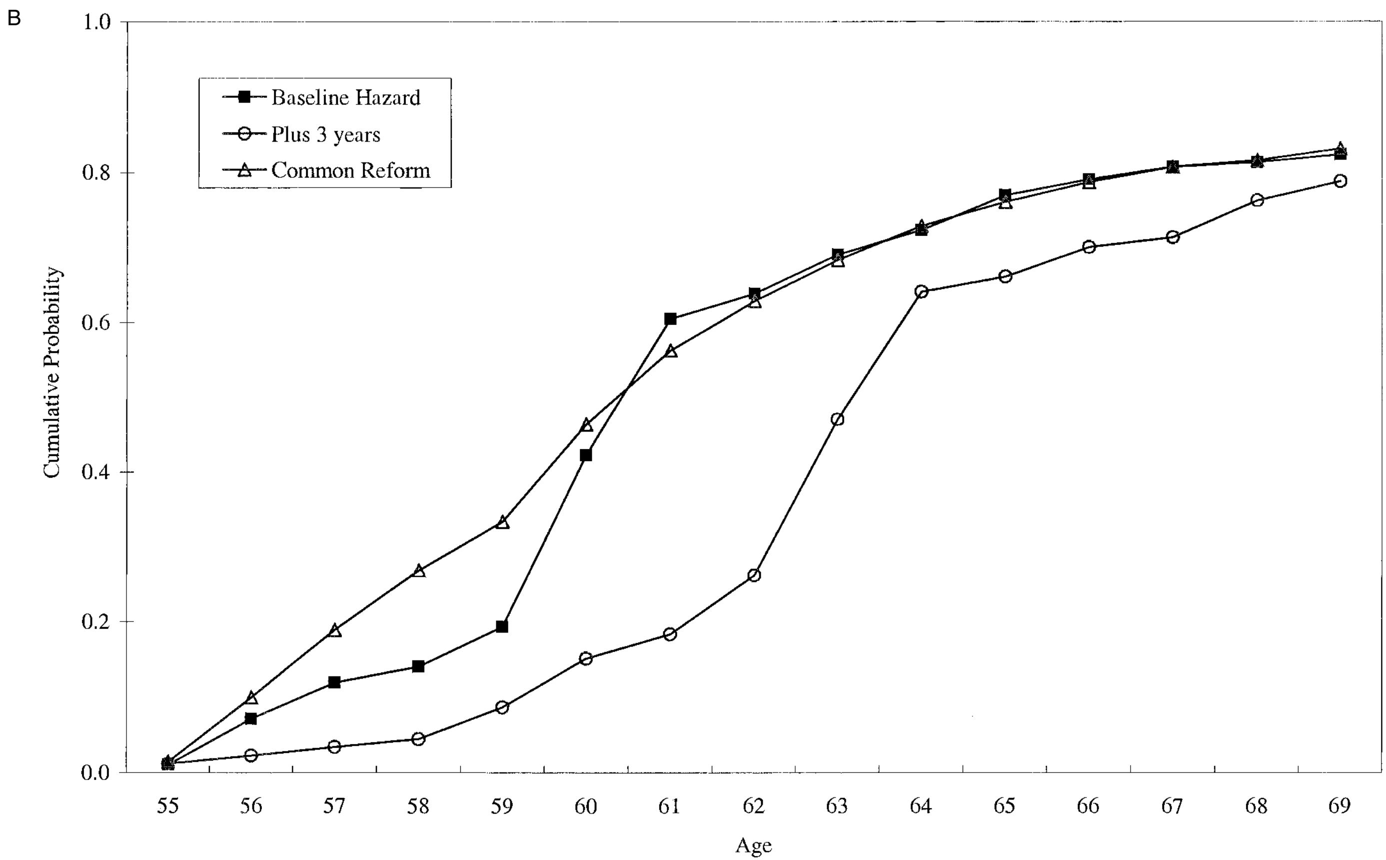
B
1.0
0.8
0.6
0.4
0.2
0.0
Cumulative Probability
Baseline Hazard
Plus 3 years
Common Reform
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.5 (cont.)

A

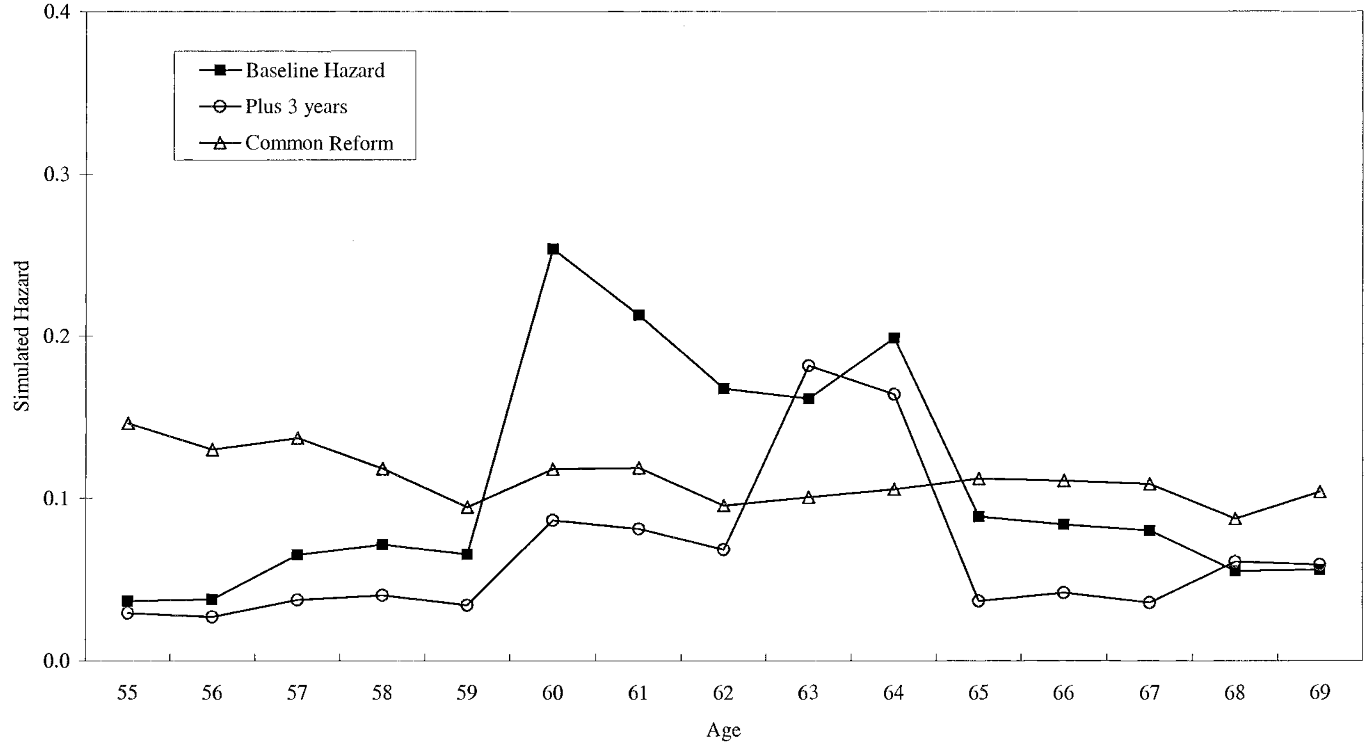

Fig. 7.6 Simulation S1 on males using peak value estimates: *A,* Simulated hazard; *B,* Cumulative probability

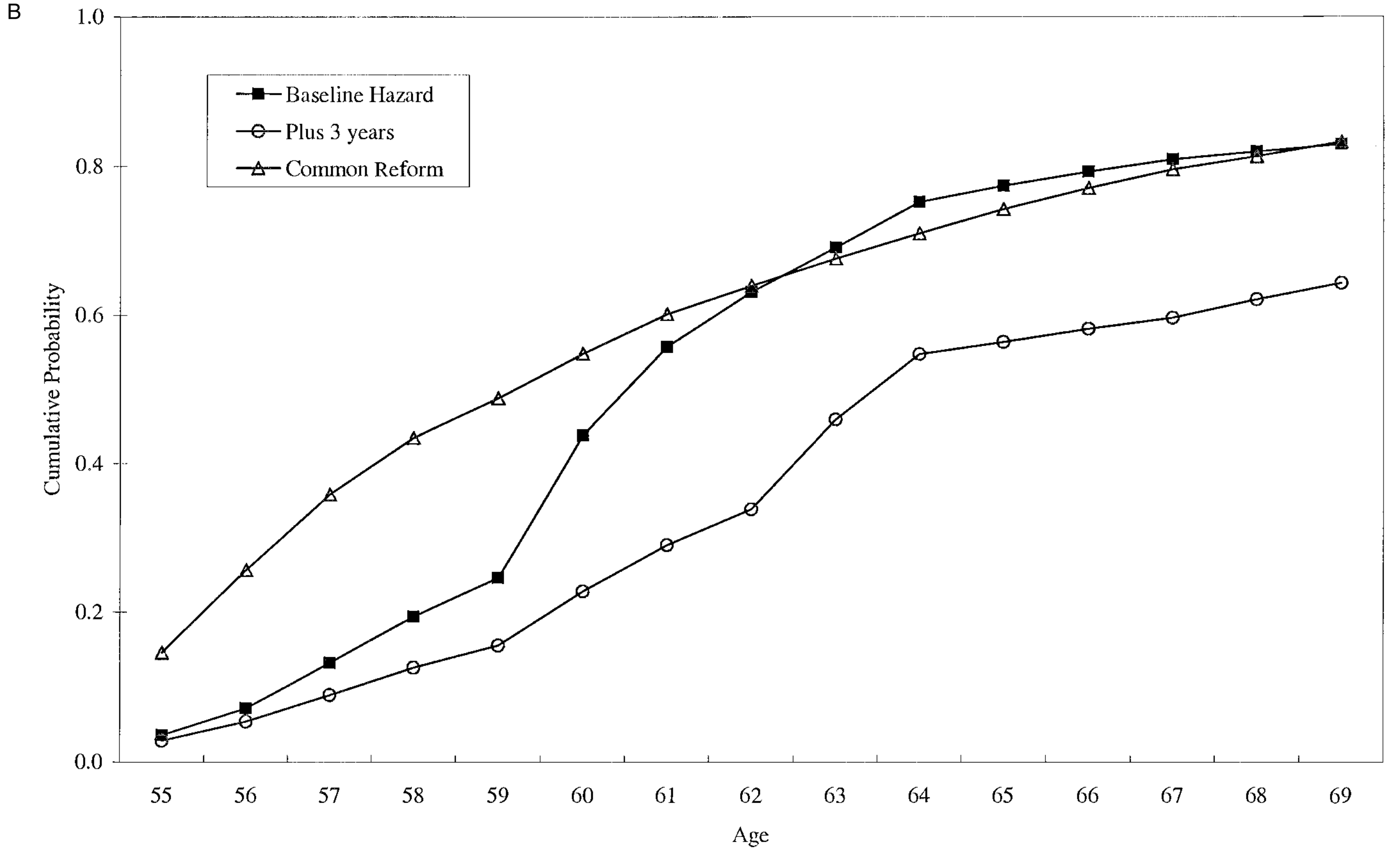
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.6 (cont.)

A

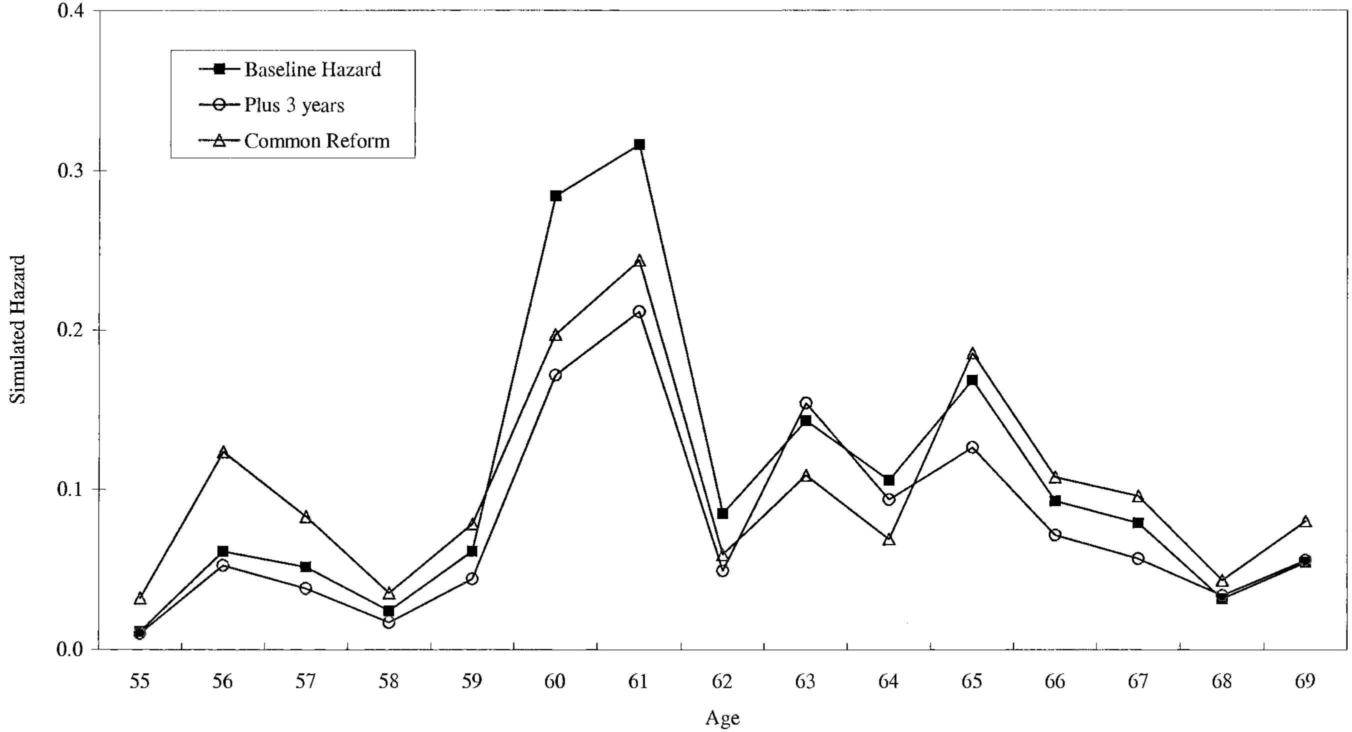

Fig. 7.7 Simulation S2 on males using peak value estimates: *A*, Simulated hazard; *B*, Cumulative probability

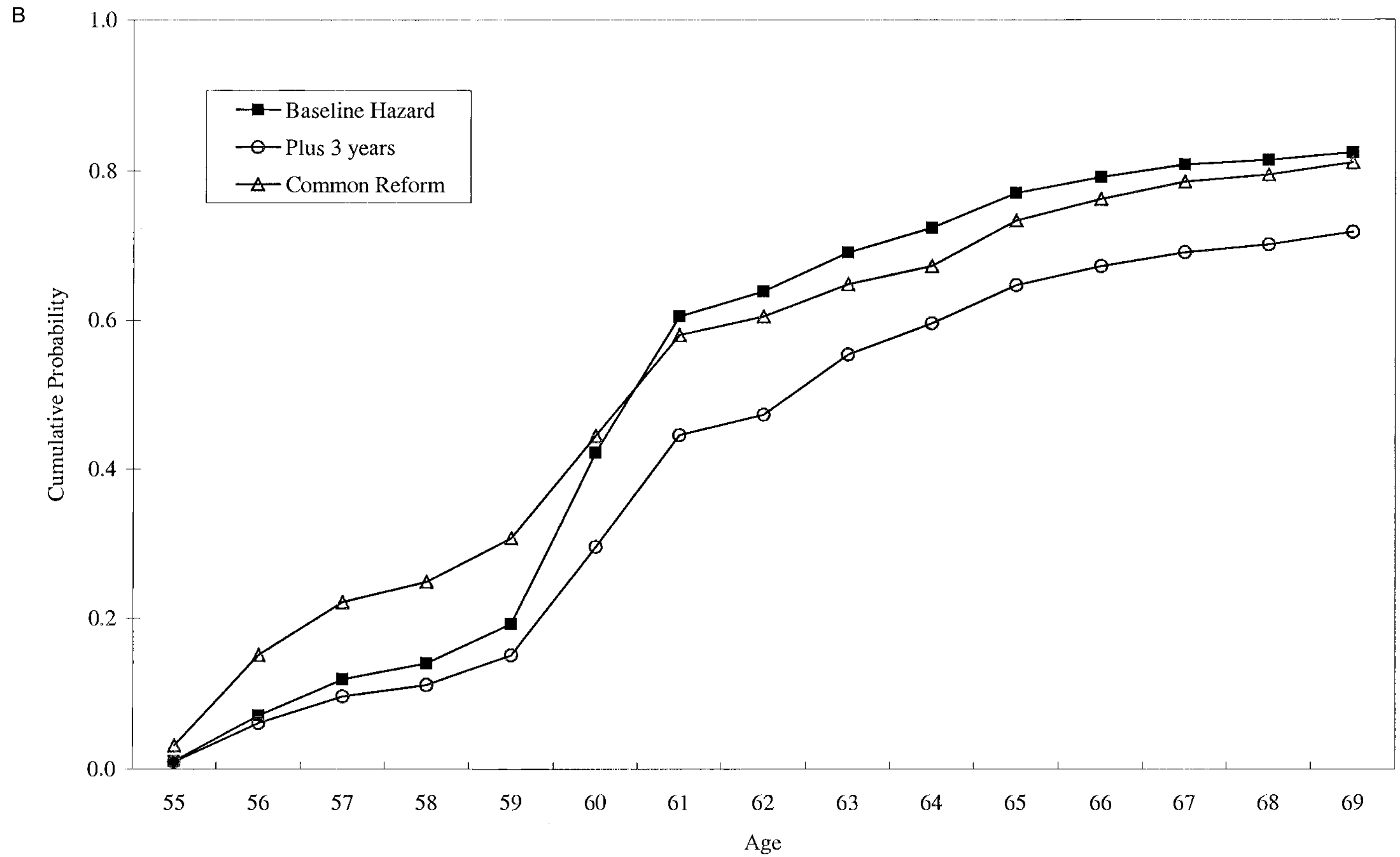
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.7 (cont.)

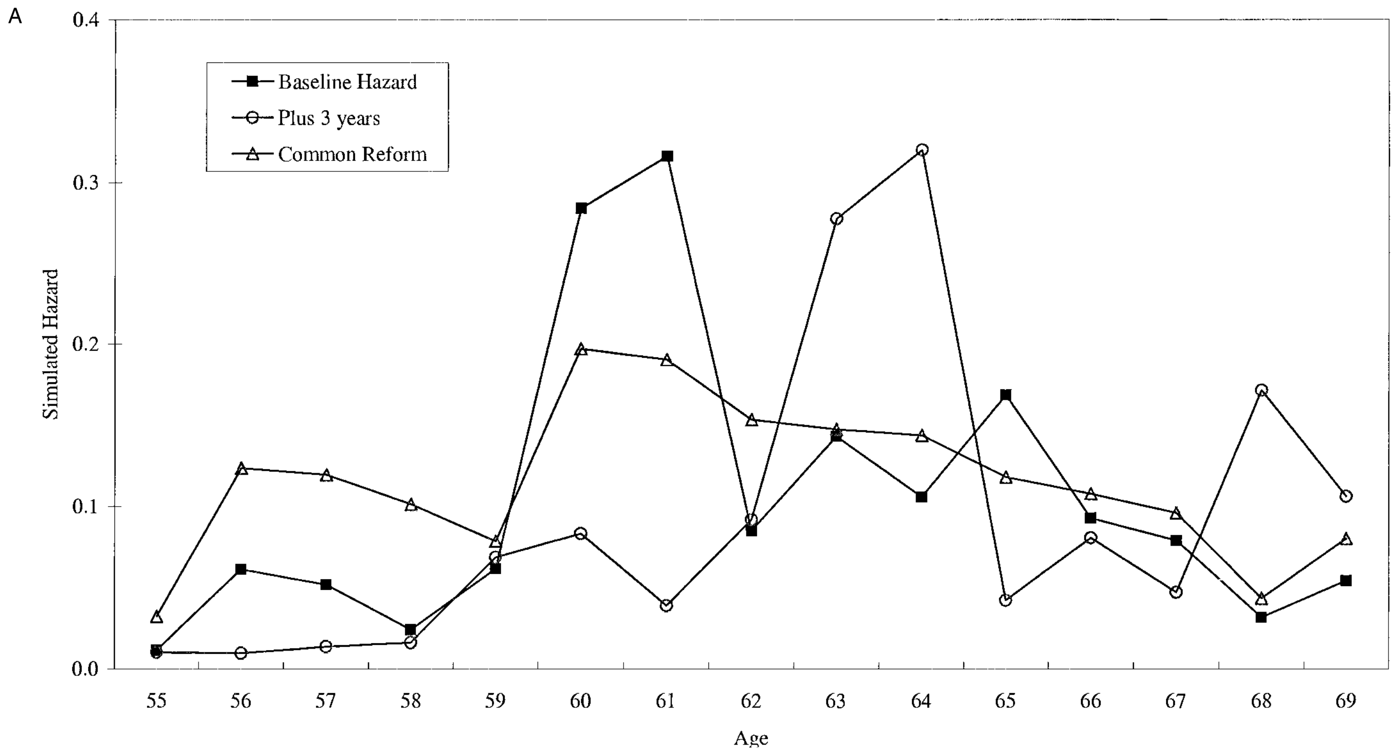

Fig. 7.8 Simulation S3 on males using peak value estimates: *A*, Simulated hazard; *B*, Cumulative probability

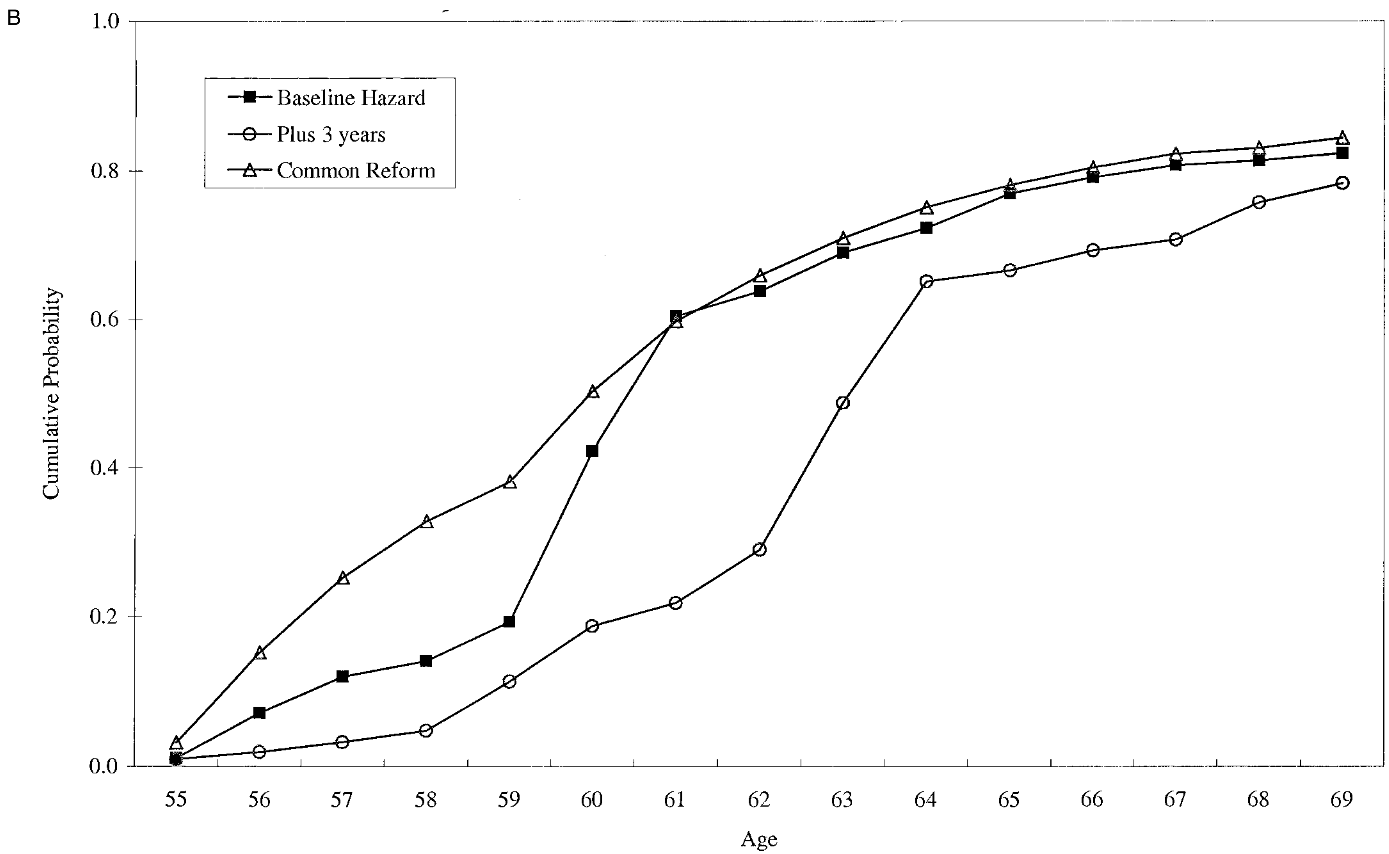
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.8 (cont.)

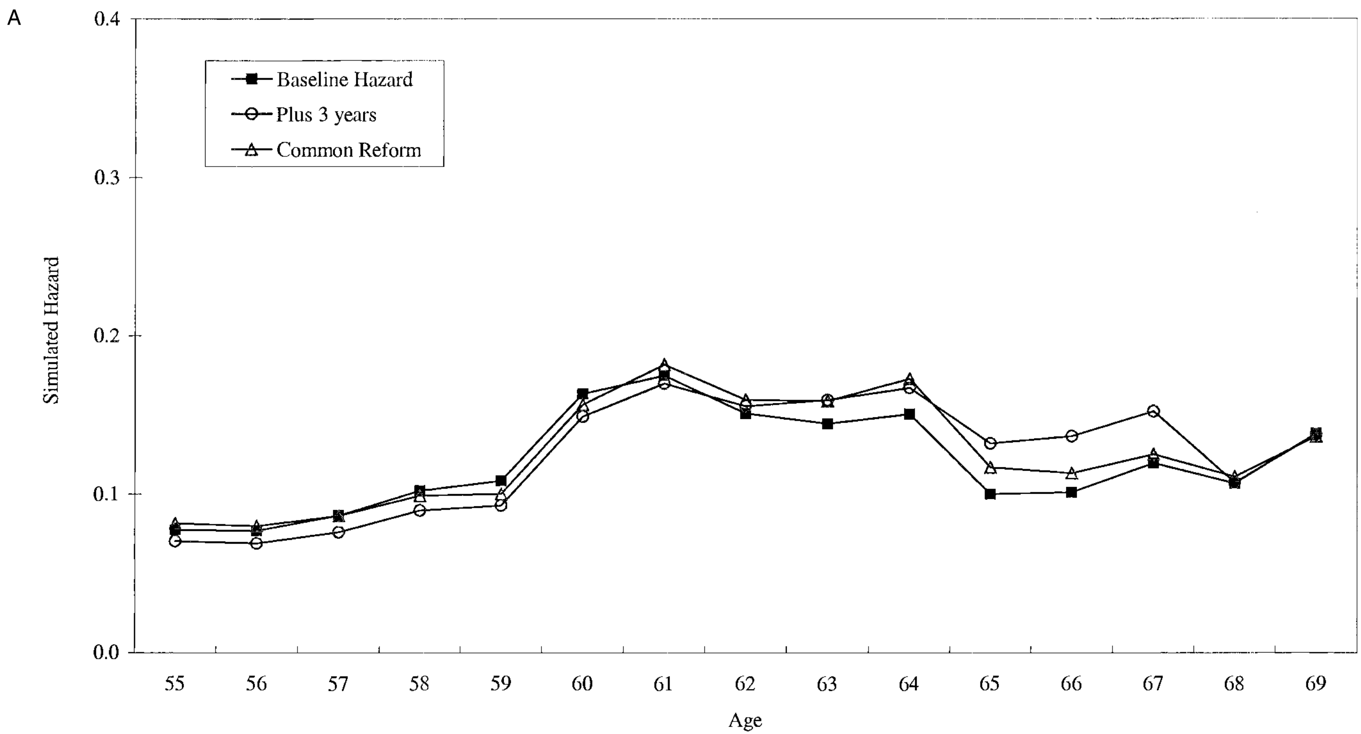

Fig. 7.9 Simulation S1 on males using option value estimates: *A*, Simulated hazard; *B*, Cumulative probability

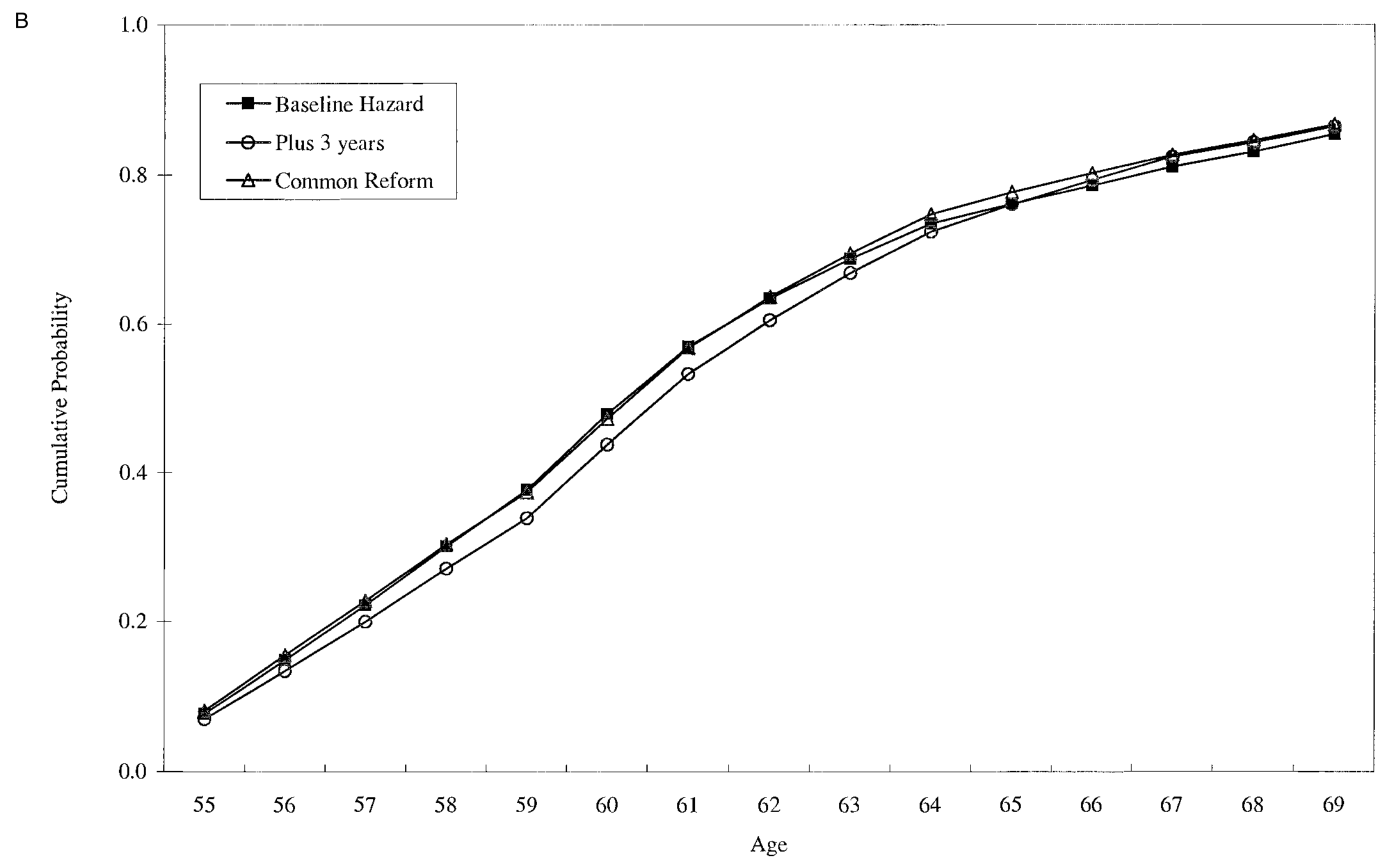
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.9 (cont.)

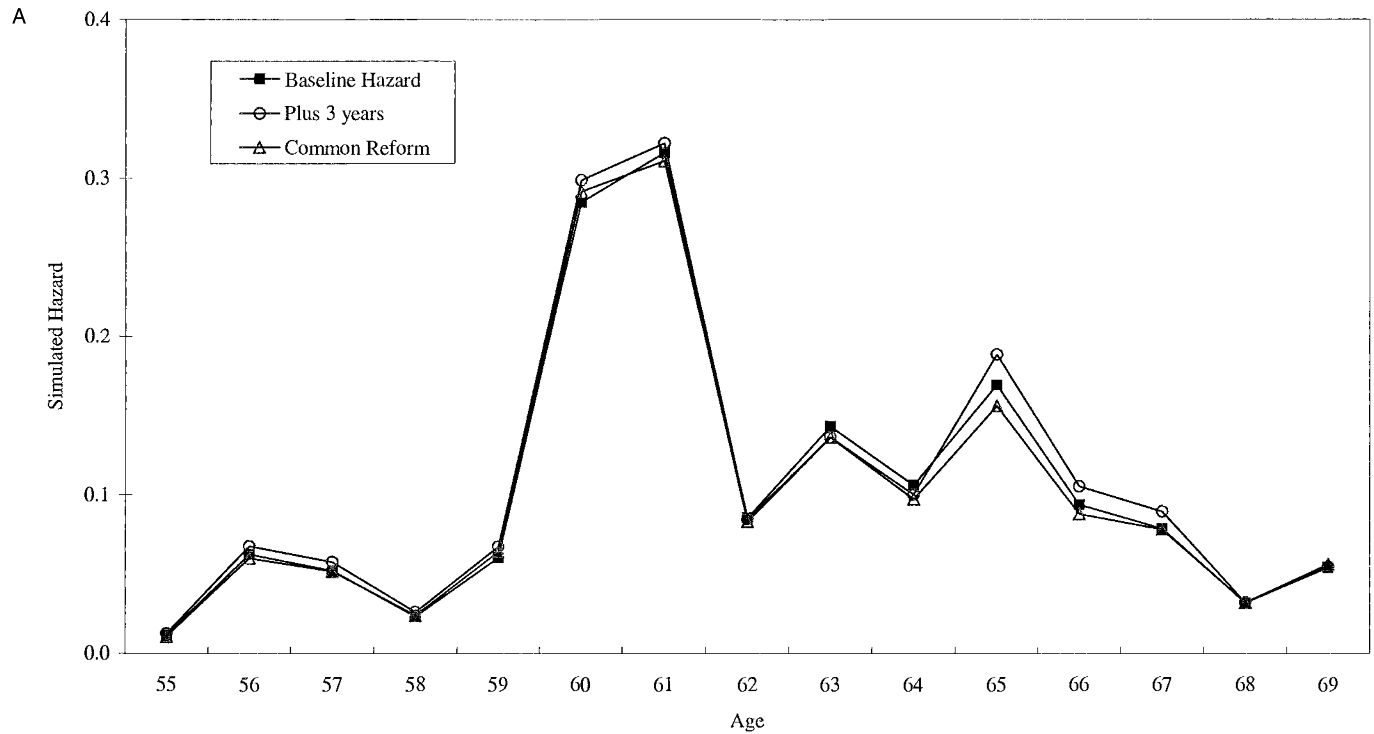

Fig. 7.10 Simulation S2 on males using option value estimates: *A,* Simulated hazard; *B,* Cumulative probability

B

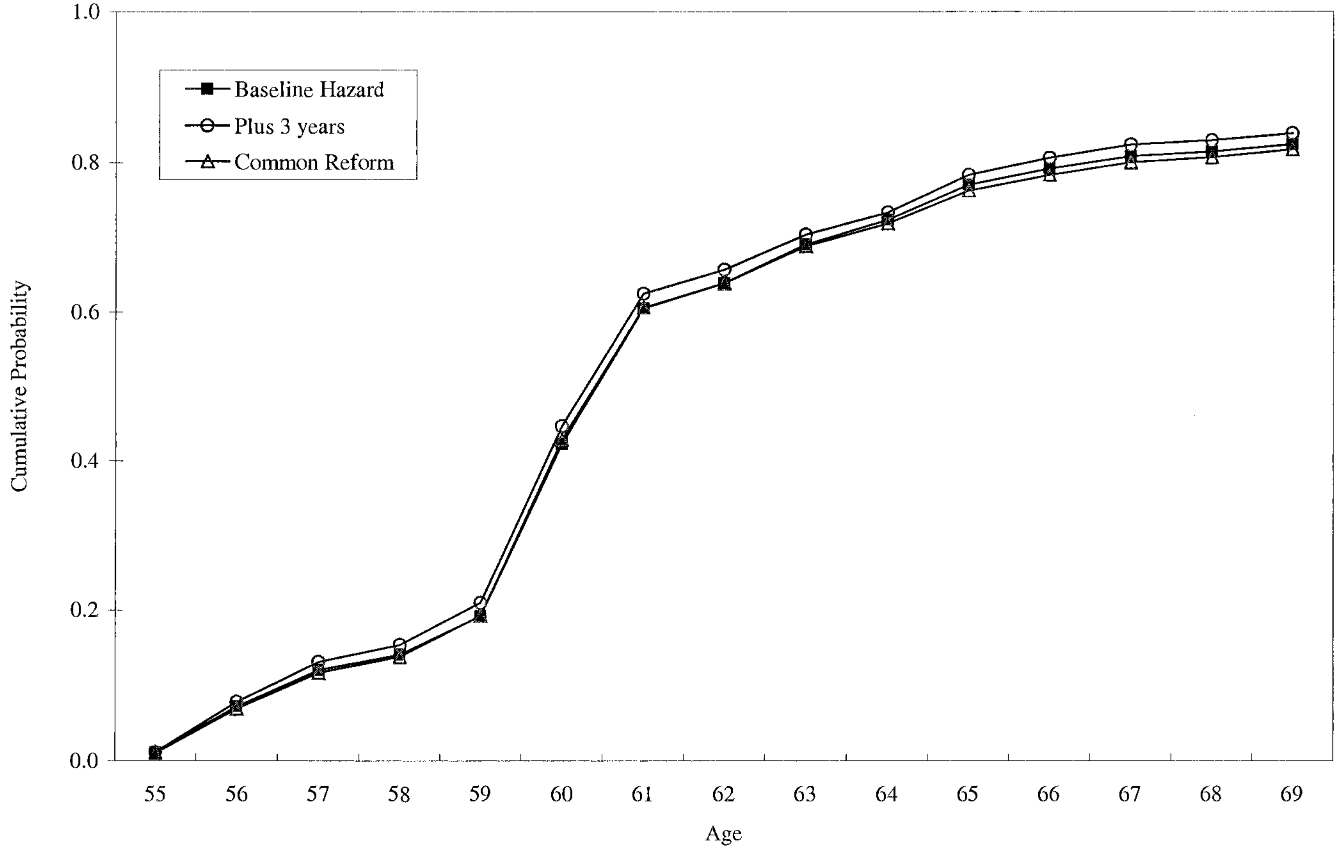

Fig. 7.10 (cont.)

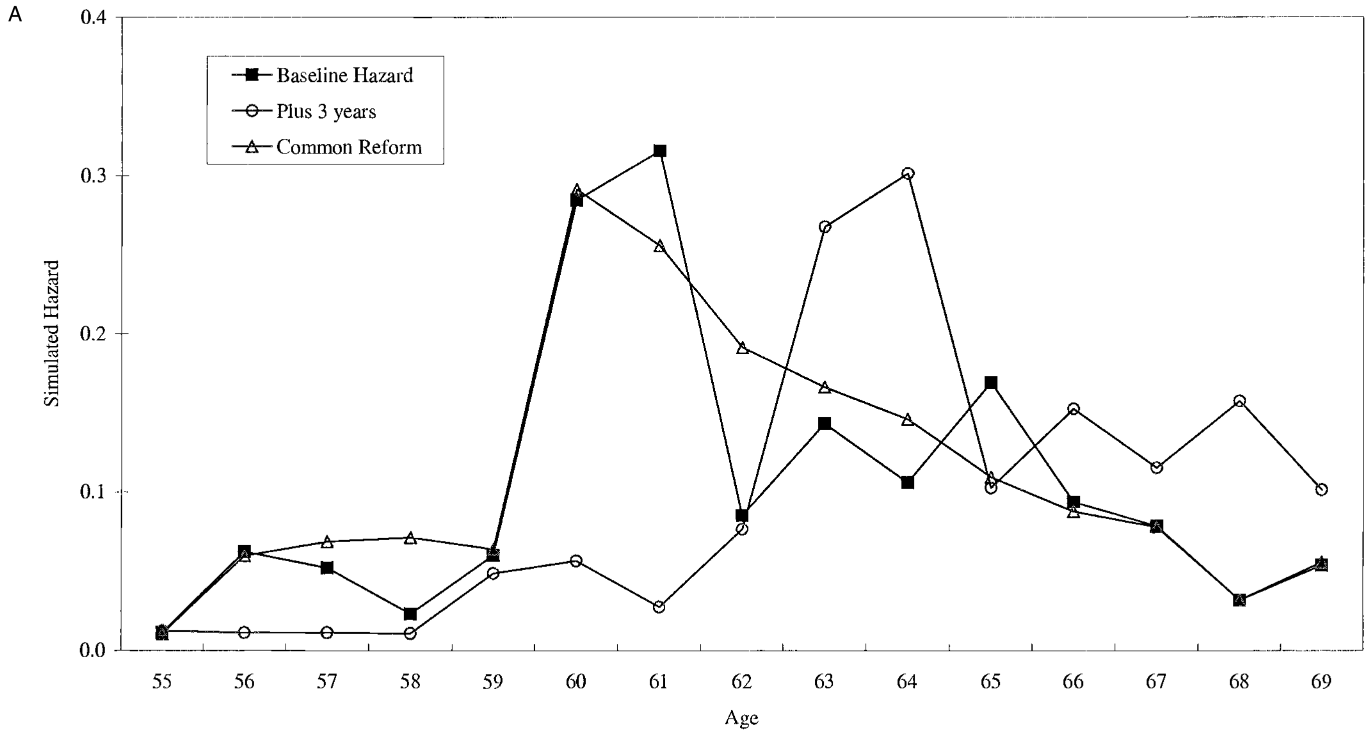

Fig. 7.11 Simulation S3 on males using option value estimates: *A*, Simulated hazard; *B*, Cumulative probability

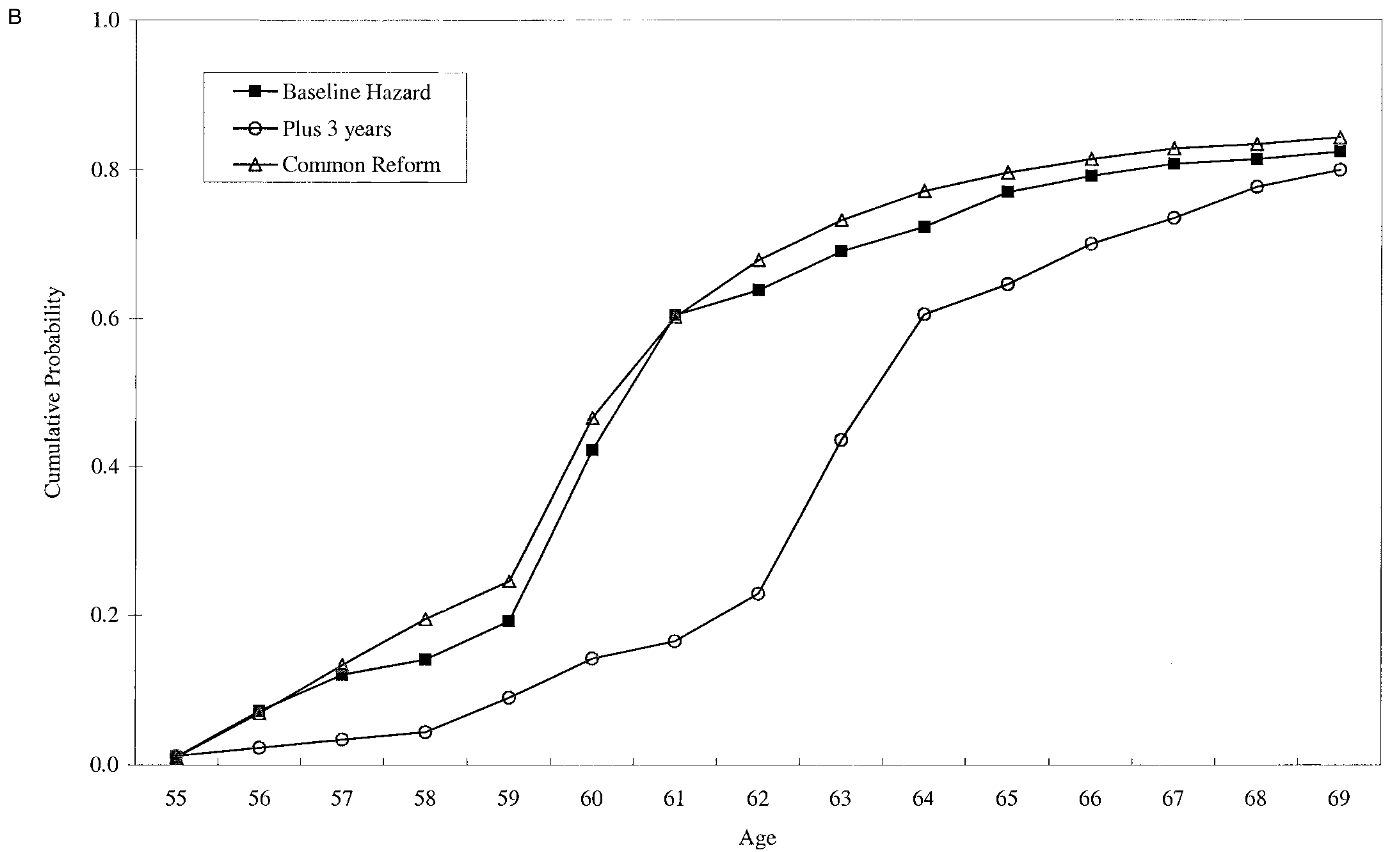
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.11 (cont.)

because the coefficient on the option value is all quite small, as reported in table 7.10. The option value model, which fails to trace the age pattern of retirement, is not good at assessing the impact on retirement from policy changes.

Table 7.12 shows what the model predicts will happen to average retirement ages. The current average retirement age is 60.8 for men. The plus-three-years reform increases the average retirement age to 61.8 on average. By contrast, the common reform slightly *reduces* the average retirement age to 60.4, largely reflecting an increase in the hazard rate before the early retirement age of sixty. Hence, the plus-three-years reform is more effective than the common reform in Japan. In particular, this kind of reform, assuming the combination of the peak value and S3, would be most efficient in postponing retirement—with the average retirement age raised by 2.4 years to 63.2.

Table 7.12 Average Retirement Ages in Simulations

	Plus-Three-Years Reform	Common Reform
	Males	
Actual	60.8	60.8
Accrual		
S1	61.0	60.5
S2	61.0	60.9
S3	63.0	60.4
Average	61.7	60.6
Peak value		
S1	62.1	59.8
S2	61.4	60.4
S3	62.8	60.0
Average	62.1	60.1
Option value		
S1	61.0	60.7
S2	60.7	60.8
S3	63.2	60.5
Average	61.6	60.7
S1 average	61.4	60.3
S2 average	61.0	60.7
S3 average	63.0	60.3
Average	61.8	60.4
	Females	
Actual	59.3	59.3
Peak value		
S1	59.9	59.2
S2	59.3	59.4
S3	60.8	59.6
Average	60.0	59.4

Note: The average retirement age is the actual retirement age plus the estimated change from the baseline in each case.

The same kind of policy simulations can be conducted for women. The bottom part of table 7.12 and figures 7.12–7.14 summarize the results of the peak value model, which seems to work best for Japanese women in terms of significance and signs of coefficients on incentive measures. The plus-three-years reform turns out to postpone retirement, but not as much as for men. This reform shifts the spike of the hazard rate by three years in the case of S3 (see figure 7.14, panel A), but it seems to be mostly due to a change in age dummies. The common reform shows no significant impact.

7.10 Concluding Remarks

This paper analyzes the economic impact of social security incentives on retirement decisions, based on the micro-data from the *Survey on Labor Market Participation of Older Persons* (SLMPOP; MOL 1996). Our estimations confirm that the incentive measures—such as benefit accrual, the peak value, and option value—at least partially affect retirement decisions, although their impact is not easy to identify. In particular, individuals aged sixty to sixty-five face substantial disincentives to work due to public income support programs, including public pension and UI benefits.

In the face of a rapidly aging population, labor force participation of elderly people is crucial for growth potential and the fiscal position of the public pension scheme. Our policy simulations quantitatively capture the potential impact of pension reforms on retirement decisions through incentive measures. For example, an increase in the early and normal eligibility ages is most likely to reduce a disincentive to work for elderly people. A three-year increment of those eligibility ages is expected to raise the average retirement age by about one year for men, while the impact varies greatly due to a choice of incentive measures and model specifications.

We also find that the proposed common reform fails to postpone retirement. This is probably because the early and normal retirement ages are already sixty and sixty-five, respectively, in Japan and proposed actuarial adjustment fail to offset the impact of eliminating the existing incentives to work. The 1999 Pension Reform Act may be more *aggressive* than the proposed common reform, in that the act aims to completely raise the eligibility age to sixty-five and to reduce total pension benefits for employees.

Our analysis centers on the supply side of the labor market for the elderly, estimating the impact on their retirement decisions of social security reform. However, the demand side matters, too. In Japan, it is not easy for employees to find a full-time job after the mandatory retirement at age sixty. If demand for elderly workers remains subdued due to institutional and other reasons, any social security reform that aims to increase incentives to work could just lower wage income for elderly workers. Future research should be directed at more comprehensively assessing impact on the

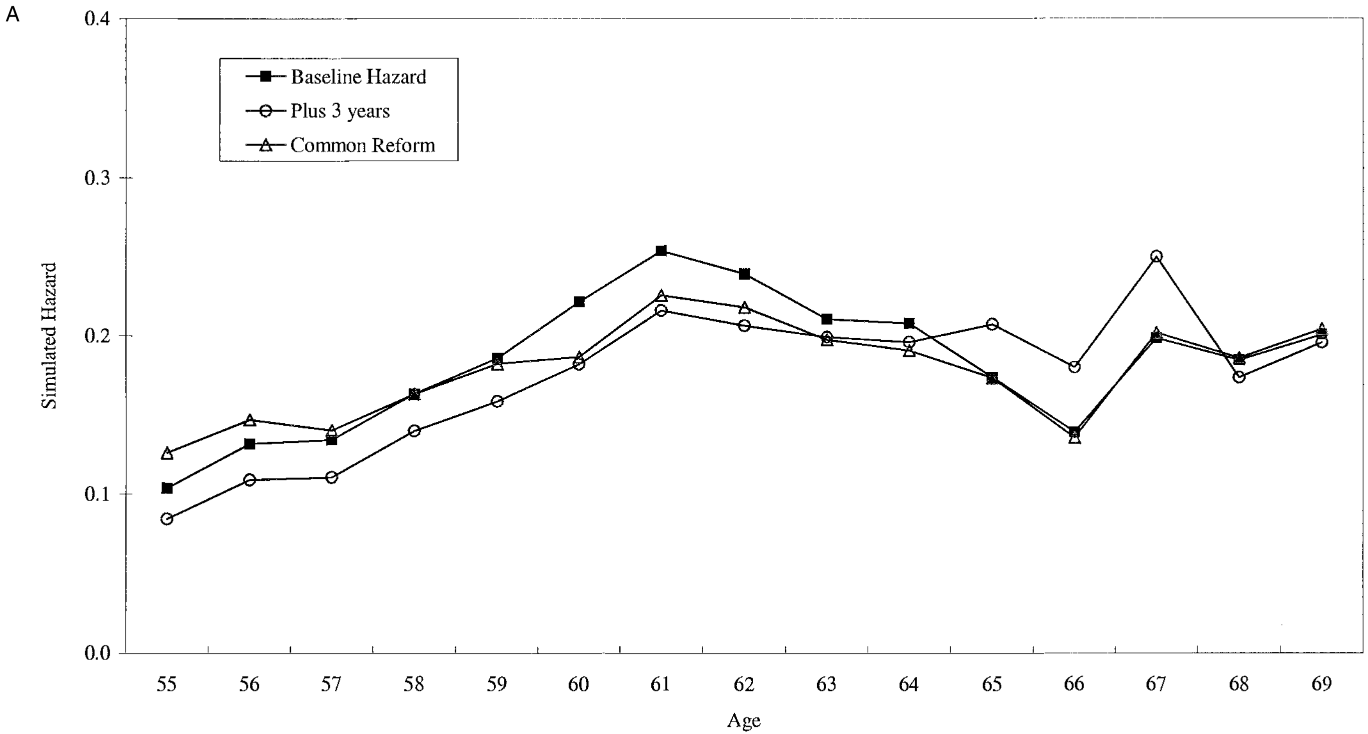

Fig. 7.12 Simulation S1 on females using peak value estimates: *A*, Simulated hazard; *B*, Cumulative probability

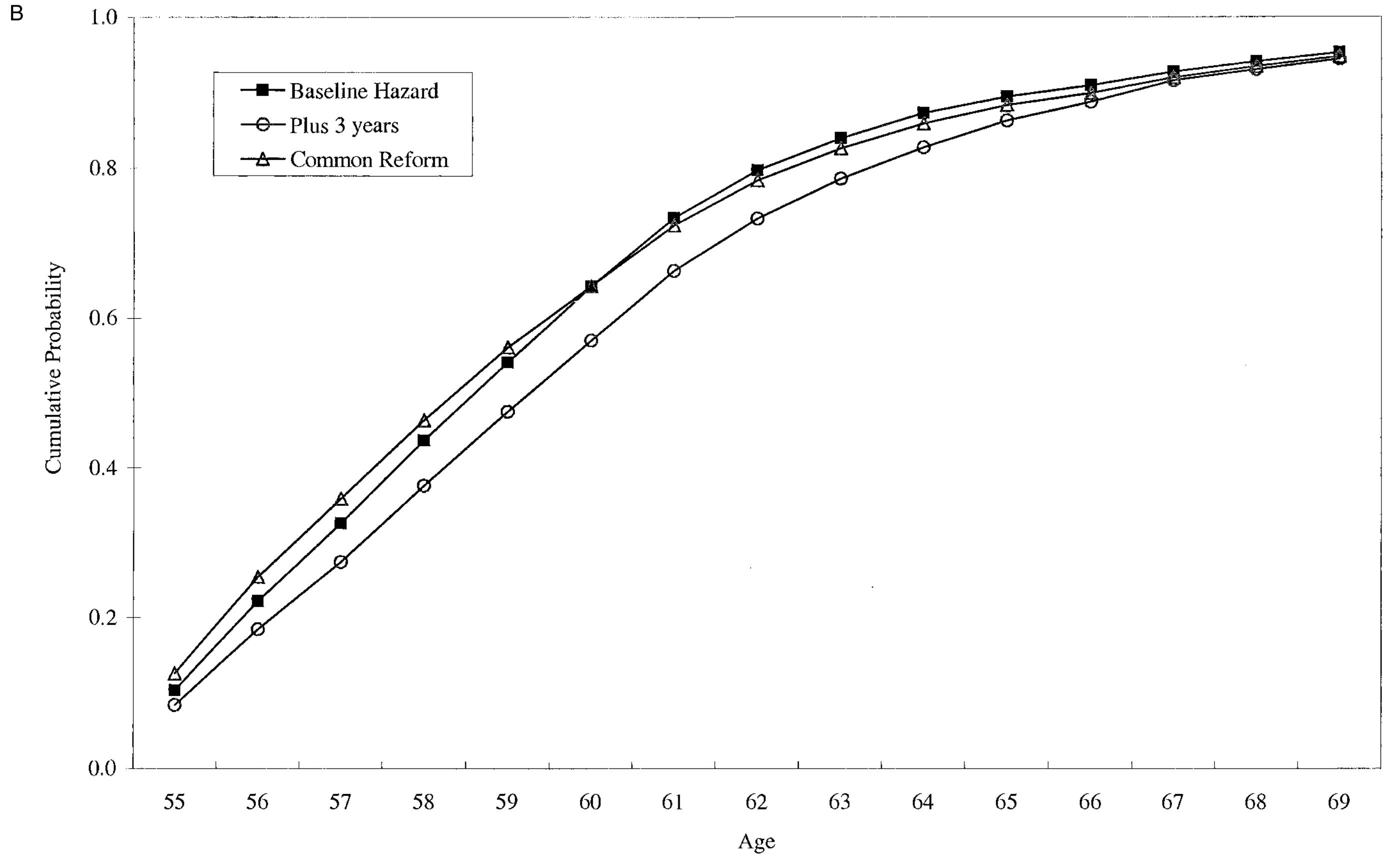
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.12 (cont.)

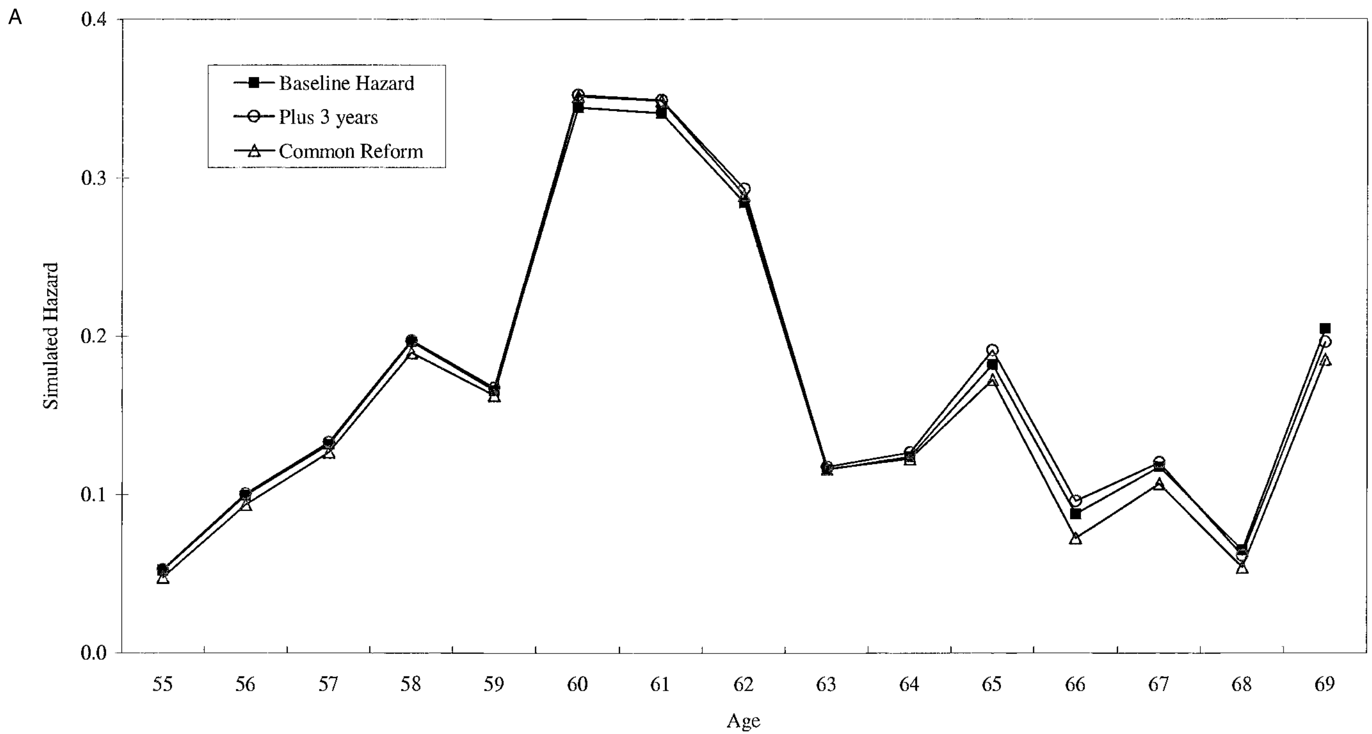

Fig. 7.13 Simulation S2 on females using peak value estimates: *A*, Simulated hazard; *B*, Cumulative probability

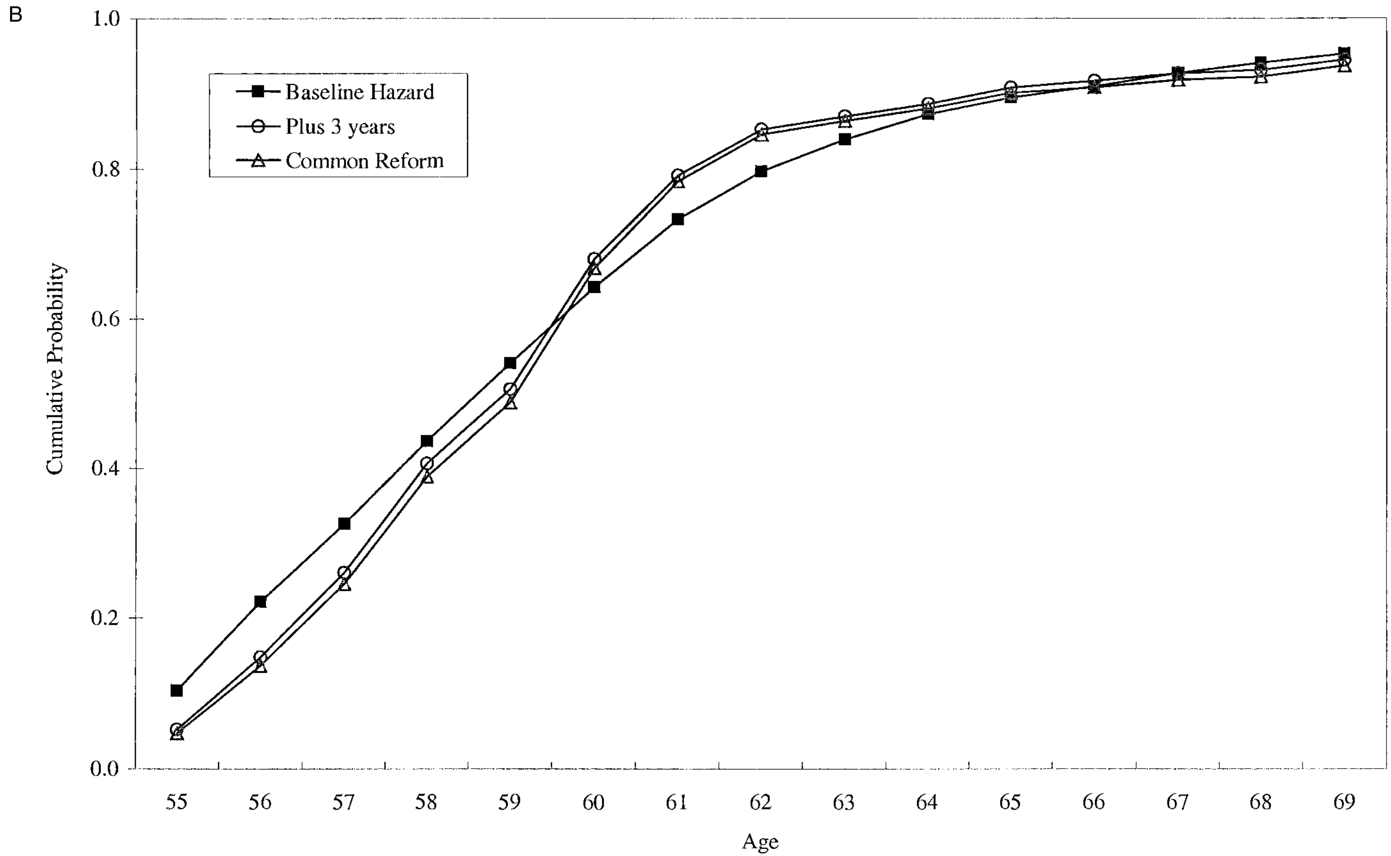
B
Baseline Hazard
Plus 3 years
Common Reform
Cumulative Probability
1.0
0.8
0.6
0.4
0.2
0.0
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
Age

Fig. 7.13 (cont.)

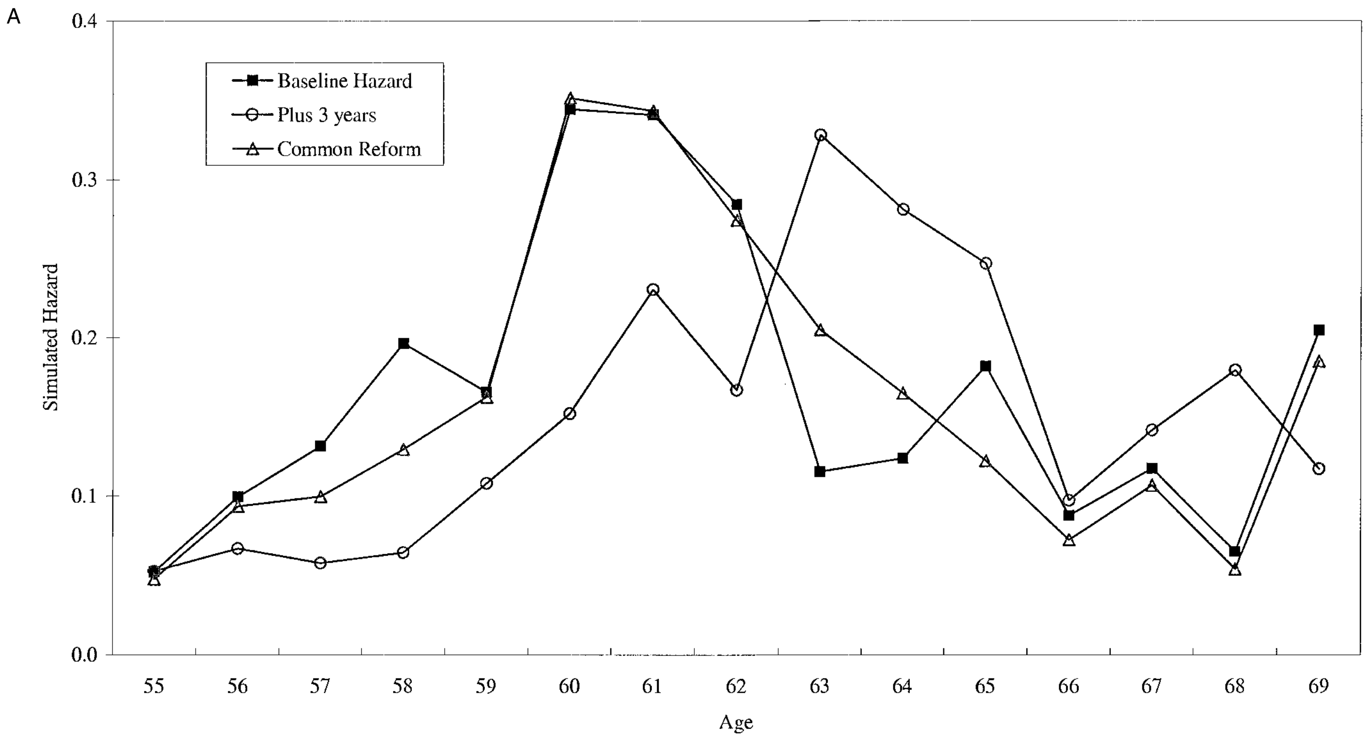

Fig. 7.14 Simulation S3 on females using peak value estimates: *A*, Simulated hazard; *B*, Cumulative probability

B

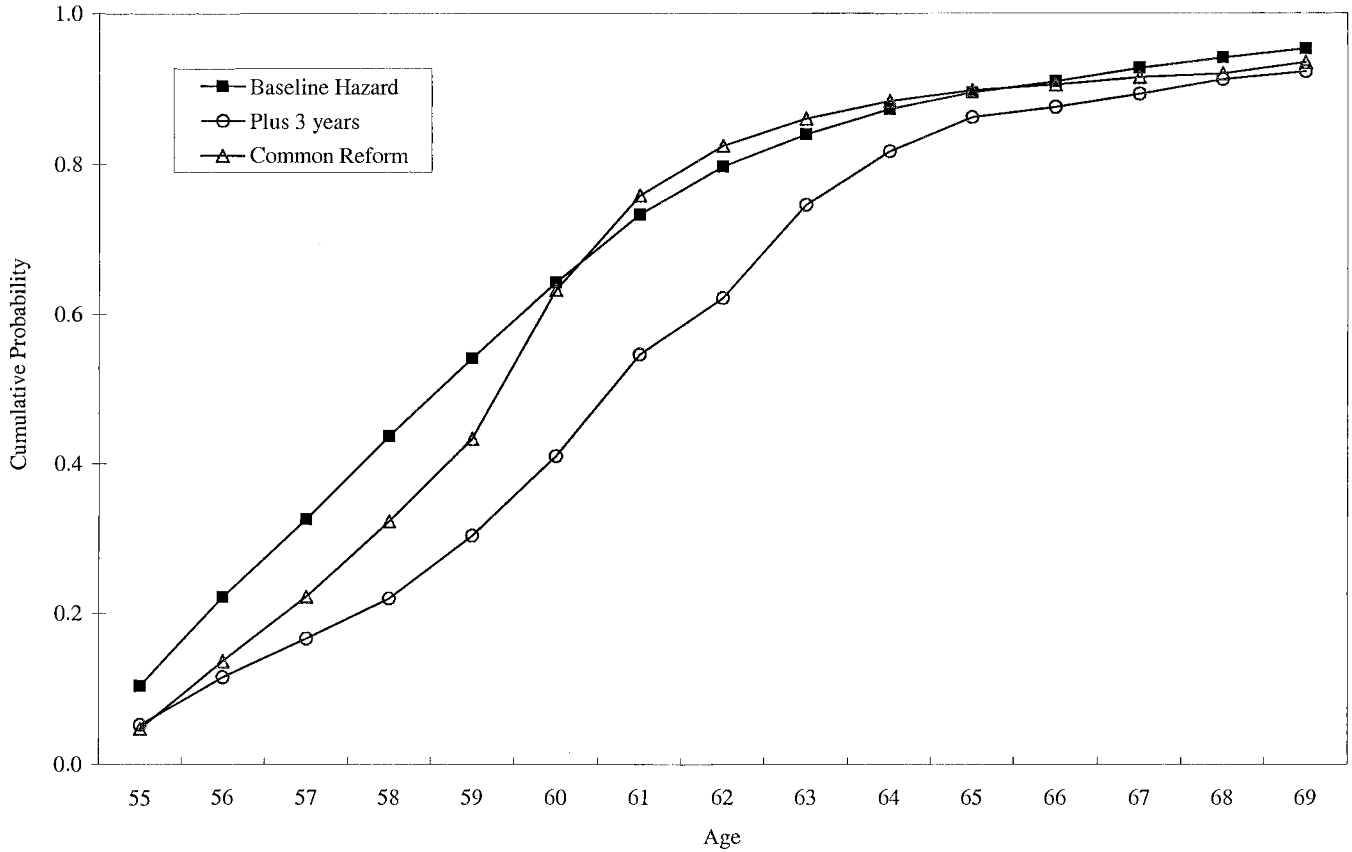

Fig. 7.14 (cont.)

labor market for the elderly of policy changes, taking into account potential changes in firms' behaviors under the effects of population aging and policy measures to stimulate demand for elderly workers.

References

Abe, Y. 1998. Labor supply of the elderly male and the earnings-tested pension in the 1980s and 1990s (in Japanese). *JCER Economic Journal* 36:50–82.

Iwamoto, Y. 2000. The social security earnings test and labor supply of the elderly (in Japanese). *The Quarterly of Social Security Research* 35 (4): 364–76.

Management and Coordination Agency. 1999. *Labor force survey 1998.* Tokyo: Management and Coordination Agency.

Ministry of Labor (MOL). 1996. *Survey of labor market participation of older persons (SLMPOP).* Tokyo: MOL.

Ogawa, H. 1998. On the impact of the public pension on labor supply of the elderly (in Japanese). *The Economic Review* 49 (3): 245–58.

Oishi, A., and T. Oshio. 2000. Social security wealth and retirement decisions (in Japanese). *The Quarterly of Social Security Research* 35 (4): 405–19.

Oshio, T. 1997. Pension and employment insurance reforms and pension wealth (in Japanese). *The Quarterly of Social Security Research* 33 (3): 286–97.

Seike, A. 1991. Lifetime pension wealth and retirement (in Japanese). *The Economic Review* 42 (1): 12–20.

———. 1993. *The labor market in the aging society* (in Japanese). Tokyo: Toyo-Keizai Simposha.

Stock, J. H., and D. A. Wise. 1990. Pensions, the option value of work, and retirement. *Econometrica* 58 (5): 1151–80.

Takayama, N. 1998. *The morning after in Japan: Its declining population, too generous pensions and a weakened economy.* Tokyo: Maruzen Co., Ltd.

Takayama, N., F. Funaoka, F. Ohtake, M. Sekiguchi, T. Shibuya, F. Ueno, and K. Kubo. 1990a. Estimation of human capital and income redistributional effect of the public pension (in Japanese). *Economic Analysis* 118.

———. 1990b. The public pension and labor supply of the elderly male (in Japanese). *Economic Analysis* 121.

Yashiro, N., and K. Nikami. 1996. Employment insurance reform and its implications on the employment of older persons (in Japanese). *JCER Economic Journal* 33:177–203.

Yashiro, N., and T. Oshio. 1999. Social security and retirement in Japan. In *Social security and retirement around the world,* ed. J. Gruber and D. A. Wise, 239–67. Chicago: University of Chicago Press.

Yashiro, N., T. Oshio, N. Li, M. Matsuya, Y. Terasaki, M. Yamagishi, M. Miyamoto, and Y. Igarashi. 1997. The economics of aging (in Japanese). *Economic Analysis* 151.