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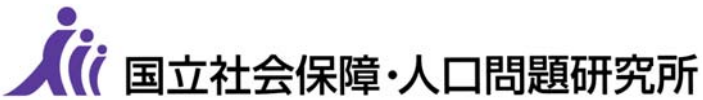

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Abstract

This paper tests the Life-Cycle Hypothesis, based on household-level data, utilizing the change of pension benefits deriving from the 1999 pension reform in Japan. This exogenous change enables substitutability between pension and household assets, which is observed if LCH holds, to be identified separately from the inherent positive correlation between them. In this paper, this phenomenon is found particularly in middle-aged households; moreover, the magnitude is reasonable. Also, the findings reveal that less altruistic households behave more consistently under the LCH than altruistic households, implying that the estimates of substitutability reflect the actual households' responses to the reform.

1 Introduction

Today, in Japan, the sustainability of social security financing in an aging society depends on the balance between the magnitude of the benefits and the choice of base on which social security burdens (taxes and social security contributions) are levied. Future revenues for social security rely on the economic growth of Japan's economy, which is influenced by the effects of changes to social security benefits on household consumption-savings behavior. Hence, it is very important to investigate the effects of social security reform on household asset accumulation. In particular, this paper puts more effort into clarifying the intertemporal saving behavior of households utilizing the effects of social security reform, especially the 1999 public pension reform in Japan.

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With regard to household consumption-savings behavior, many researchers have examined whether households behave consistently according to the Life-Cycle Hypothesis (hereafter referred to as LCH) or the Altruistic Bequest Motive Hypothesis (hereafter referred to as ABMH) since Feldstein's pioneering literature (Feldstein [1974]). In Europe and the United States, a number of studies indicate that households behaved consistently in accordance with LCH (e.g. Feldstein and Pellechio [1979], King and Dicks-Mireaux [1982], Diamond and Hausman [1984], and Gale [1998]). In particular, Attanasio and Brugiavini (2003) and Bottazzi *et al.* (2006) recently examined the extent to which changes in pension wealth are offset by household assets as predicted by LCH, exploiting exogenous changes in pension benefits that resulted from Italian pension reforms in the 1990s. They found evidence indicating a substantial offset between pension and private wealth.

By contrast, Japanese literature has not yet arrived at a clear consensus on this issue although many studies have addressed it. Japanese studies that use household-level data can be divided into three major groups according to viewpoint and strategy of analysis.[1] First, Ando *et al.* (1986), Takayama *et al.* (1990), and Aso and He (2001) estimated a consumption function or an asset demand function to investigate the relationship between consumption (or asset) and pension wealth. Second, Ando *et al.* (1986), Hayashi *et al.* (1988), Takayama *et al.* (1989), Ohtake (1991), and Yashiro and Maeda (1994) considered whether households dissaved in their old age, which is a necessary requirement for LCH. Third, Aso and Kamiya (1998), Horioka *et al.* (1996a, 1996b, 2002) and Horioka (2002) evaluated the degree of coherence of saving purpose with LCH using the results of a household questionnaire survey that includes various questions on savings and bequest motive. Although most studies in the third group concluded that a large proportion of Japanese households had a bequest motive consistent with LCH, the studies in the other groups yielded a range of results that are both consistent with and contradictory to LCH. In the first and second groups, only Takayama *et al.* (1990) and Yashiro and Maeda (1994) found evidence that supports LCH. Many other studies obtained a result that is partially or solely contradictory to LCH. [2]

In particular, Aso and He (2001), which is one of the few studies based on the asset demand equation in Japan, found a significantly positive relationship between net pension benefits and household financial assets, contrary to Attanasio and Brugiavini (2003) and Bottazzi *et al.* (2006). They then suggested that this result might corroborate ABMH. However, their result would merely reflect a spurious positive correlation between pension and private wealth, which is attributable to the positive relation between the benefits of employees' pension and before-retirement earnings. Thus, this spurious correlation has

[1]Recently, Hori and Shimizutani (2007) also tested LCH in another way by examining the reactions of households to anticipated income changes. They suggested that Japanese household behavior is consistent with LCH.

[2]The Annual Report on the Family income and Expenditure Survey shows that elderly people dissave after retirement. This evidence is consistent with LCH. Although this phenomenon should have investigated carefully, several existing studies tested whether or not dissaving was found for older households (including not only retired households but working households).

to be avoided when attempting to estimate the causal relationship between private and pension wealth.

This paper attempts to rigorously estimate this relationship by utilizing the exogenous reduction of pension benefits driven by the 1999 pension reform in Japan. This reform greatly decreased pension benefits in several ways. If Japanese households behaved consistently with LCH, this decrease would be compensated through their asset accumulation. To assess the degree of substitutability between net pension benefits and household assets, I estimate the asset demand function that has net pension benefits as one of the explanatory variables. I use household-level data of NEEDS-RADAR (provided by *Nihon Keizai Shinbun Inc.*) for this estimation, which contains rich data on the assets and characteristics of Japanese households. The estimation results suggest that households offset the decrease in net pension benefits with asset accumulation in a manner that is consistent with LCH. In particular, substitution effects are found for the middle-aged households, and the magnitude is fairly reasonable.

Further, I test whether substitutability differs in terms of significance and magnitude between altruistic and less altruistic households. It is assumed to be likely to find a more significant or larger substitution effect for less altruistic households if the estimates correctly reflect a substantial response by households to the 1999 pension reform rather than other irrelevant factors. This additional estimation gives a more significant substitution effect for less altruistic households, as one would expect. This result indicates that the estimates of substitutability correctly reflect variations in household assets resulting from the pension reform.

The remainder of this paper is organized as follows. Section 2 explains the 1999 pension reform in Japan. Section 3 presents a simple theoretical model that provides a framework to specify and interpret empirical results. Section 4 describes the data set and sample selection criteria employed in this paper. Section 5 reports the baseline estimation results of the household's asset demand equation. Section 6 tests whether substitutability differs between altruistic and less altruistic households in a manner that is consistent with LCH. Section 7 presents the conclusion of this paper.

2 The 1999 pension reform in Japan

This section describes the 1999 pension reform to provide the calculation procedure for net pension benefits in Section 4. Pension benefits were greatly reduced by this pension reform to maintain the sustainability of social security system with an aging population. Pension benefits were reduced in several ways. In what follows, I explain the contents of the pension reform after giving a brief outline of the Japanese employees' pension system. Then, I discuss the timing of the announcement of the pension reform to identify the before- and after-reform periods.

In Japan, salaried workers of private companies have to join the employees' pension system, whose benefit plan consists of the following two parts: (1) old-age basic pension and (2) old-age employees' pension. Workers pay premiums in proportion to their wages,

and they then receive pension benefits after retirement. The old-age basic pension differs in the calculation formula among the elderly aged 60 to 64, for whom the Fixed Amount Part (*Teigaku Bubun* in Japanese) has been provided, and the elderly aged 65 or over, the Basic Pension (*Kiso Nenkin*) has been provided (see Appendix B). Also, the benefits given by the old-age employees' pension are proportional to earnings while in active service; therefore, the old-age employees' pension is called the earnings-related component (*Hoshu Hirei Bubun* in Japanese). The spouses of workers are exempt from paying premiums if their annual income is less than 1.3 million yen.

Next, I explain the reduction of pension benefits. Based on the 1999 pension reform, the national government has implemented a reduction of pension benefits in the following four ways. The first is a five percent reduction in the benefit level of the earnings-related component. This is done by lowering the multiplication number for each household in the calculation formula of pension benefits (e.g. 0.0075 to 0.007125). The second is abolition of the sliding pay scale after 65 years old for the basic pension and employees' pension, with only price indexation remaining after that age.[3] The third is a gradual increase in the starting age for receiving benefits of the earnings-related component from 60 to 65 for men. This is to be conducted during the period from 2013 through 2025.[4] The fourth is introduction of an old-age pension for active employees aged 65 to 70. This paper focuses on the first to third benefits reduction plans, which have a particularly large effect on pension benefits.

Next, I explain the reform of the premium payment system of employees' pension. The 1999 pension reform introduced a total remuneration system, which imposes premium burdens on both monthly wages and annual bonuses at a uniform rate. After introduction in April 2003, pension benefits became proportional to the total amount of wages and bonuses (not only to wages before introduction of that system). At the same time, the national government lowered the premium rate from 17.35% to 13.58% to make the premium burdens on insured persons unchanged before and after 2003. As a result, the upper limit of the effective premium rate hardly changed.

It is necessary to specify the timing with which people are informed about the contents of the 1999 pension reform to identify the before- and after-reform periods. The Pension Council officially started to discuss pension reform in May, 1997. However, the leaven of a drastic pension reform had already been proposed in the early part of 1997, triggered by the newly-released Population Projection (in January 21, 1997 by National Institute of Population and Social Security Research), which revealed the rapid future aging beyond the previous projection. In January 1997, several newspaper articles had already reported the possibility of a drastic pension reform in 1999. In January 28, *Nihon Keizai Shinbun* reported that the Ministry of Health and Welfare started to consider raising premium

[3]The sliding pay scales for the basic pension and the employees' pension are, respectively, called *Seisaku Kaitei* and *Chingin Suraido* in Japanese. This paper does not consider the former indexation due to the difficulty of reflecting it with a simple algorithm. This paper, therefore, considers only *Chingin Suraido* in calculations of present values of benefits in 1996 and 2000. This simplification, however, might not greatly bias the estimation results because *Seisaku Kaitei* was very small in the late 1990s.

[4]An identical policy will also be applied to women five years later than men.

burdens and lowering pension benefits.[5] Hence, people would have expected a decrease of net pension benefits before discussions officially started. The questionnaire survey of the Central Council for Financial Services Information supports this conjecture. Table 1 shows the results of this survey, which tells that the ratio of respondents that save for their retirement gradually increased in the late 1990s. Moreover, the ratio of respondents that felt anxious about their old age largely increased after 1997. A major reason for their anxiety is inadequacy of pension and insurance provisions.

It follows from what has been said thus far that in 1996 people did not know about the implementation of a large pension reform in the near future.[6] Hence, I can regard 1996 and 2000 as before- and after reform years, respectively.

3 Model and empirical specification

3.1 Model

This section describes the theoretical model on which the empirical analysis below is based, following the model of Aso and He (2001). Let me first explain the case of LCH. If households know that a pension reform will be carried out in the near future, the households' budget constraint for their remaining life could be revised. The change to the budget constraint occurring at age x alters the subsequent consumption stream. Then, the relationship between the change of consumption at t years of age (Δc_t, $x \leq t$) and the change of the present value of net pension benefits evaluated at x years of age (ΔNPB_x) can be described as follows:

$$\Delta NPB_x = \sum_{t=x}^{D-1} \frac{\Delta c_t}{(1+r)^{t-x}}, \tag{1}$$

where D denotes the age of death and r is interest rate. If households smooth consumption in a manner that is consistent with LCH, Δc_t becomes Δc, and Δc can be written as follows:

$$\Delta c = \frac{r}{1+r} \cdot \left[1 - \frac{1}{(1+r)^{D-x}}\right]^{-1} \cdot \Delta NPB_x. \tag{2}$$

Thus, the change of household wealth at the beginning of age $t+1$ (ΔA_{t+1}) is given by

$$\Delta A_{t+1} = -\left[\frac{1 - 1/(1+r)^{t-x+1}}{1 - 1/(1+r)^{D-x}}\right] \cdot \Delta NPB_x \cdot (1+r)^{t-x}. \tag{3}$$

[5] In February 20, *Nihon Keizai Shinbun* also reported that the Minister of Health and Welfare announced that a certain decrease of pension benefits was unavoidable.

[6] More precisely, people could already know in 1996 that a fiscal recalculation would be conducted in 1999 because a recalculation had been done at five-year intervals. However, they probably did not expect a large reduction of pension benefits.

where $t+1$ is before-retirement period.[7] On the other hand, if ABMH holds, households do not change their consumption ($\Delta c = 0$) because the change in their benefits can be cancelled out by an increase or decrease of their descendants' social-security burden under the hypothesis. Thus, the coefficient of $\Delta NPB_x \cdot (1+r)^{t-x}$ in Eq. (3) equals zero under ABMH.

In the following empirical analysis, this paper examines a null hypothesis that the coefficient of net pension benefits equals zero. The estimated coefficient is described as follows:

$$\beta(t,x) = -\left[\frac{1-1/(1+r)^{t-x+1}}{1-1/(1+r)^{D-x}}\right]. \tag{4}$$

More concretely, this paper estimates $\beta(x+3,x)$, which denotes the effect of the reduction of net pension benefits announced in 1997 on the amount of household assets in 2000. This value is identified by a pension benefits variation in each age group between before- and after-reform periods. In fact, this paper assumes that households of the same age at two different time points would have the same level of assets if conditions other than the pension reform are identical. However, since this paper compares the household assets of different cohort groups, the cohort effect possibly biases the results. Therefore, this paper adds birth cohort dummies in the estimation equation. The cohorts are classified by the period of birth as follows: [1] 1972 to 1975, [2] 1967 to 1971, [3] 1962-1966, [4] 1957-1961, [5] 1952-1956, [6] 1947-1951, [7] 1942-1946 and [8] 1937-1941. $\beta(x+3,x)$ is estimated to be significantly negative when households accumulate assets in response to the reform.

Figure 1 provides the theoretical values of $\beta(x+3,x)$ for individual ages (x). These values indicate that roughly 18 to 28 percent of a reduction of net pension benefits is offset through a household asset accumulation during the period from 1997 to 2000. The downward sloping curve in Figure 1 reflects the higher speed of asset accumulation by older households to offset the reduction of pension benefits over a shorter period until death. This paper addresses differences in substitutability among age groups by adding interaction terms of net pension benefits and age-group dummies to the asset demand equation.

Nevertheless, there are several factors that lead to a deviation from the values in Figure 1. It is likely that the degree of substitutability can be expected to be lower than the theoretical number for young households because their ability of accumulating assets might be inadequate. In addition, if households distrust the sustainability of the public pension system, the substitution rate might be lower than the values in Figure 1. Because younger households are probably more anxious about sustainability than older ones, the substitution rates for younger households might be smaller than predicted values. Therefore, the estimates of substitutability for younger households are expected to be small both from the viewpoints of theory and practice. Thus, even if younger households

[7] Eq. (3) ignores changes in insurance premiums because the premium burden is hardly altered by the 1999 pension reform.

behave consistently with LCH, it might not be possible to obtain a statistically significant estimate of their substitutability.

This paper estimates the following equation:

$$(PW/DI) = \alpha + \sum_{i=1}^{4}(NPB/DI) \times age_i \times \beta_i + X\gamma + \epsilon, \tag{5}$$

where PW is the amount of private wealth, DI is disposable income, NPB is net pension benefits, age_i is a dummy variable that takes unity if household head (i.e. working man) belongs to age-group i ([1] 25-29 years, [2] 30-39 years, [3] 40-49 years, [4] 50-59 years), and X is a vector of other household characteristics. The equation is estimated by the median-regression model in order to address the outliers of PW, as will be explained in Section 4.4. This paper employs two definitions of PW in the following analysis: (1) total amount of financial and real assets, and (2) amount of financial assets.

3.2 Identification issue

I have to consider a potential bias in the coefficient of net pension benefits (β_i) driven by macroeconomic factors, some of which might lead to a spurious correlation between household assets and pension benefits. For example, the permanent tax reductions of personal income tax and inhabitant tax, determined in the 1999 tax reform, could induce a false negative relationship between household assets and pension benefits. These tax reductions permitted households to subtract 20 percent of personal income tax (the ceiling is 250 thousand yen) and 15 percent of inhabitant tax (the ceiling is 40 thousand yen) from each tax payment after fiscal year 1999. Hence, it might appear that household assets increased during the period from 1996 to 2000 due to those tax reductions even if the households did not react to the 1999 pension reform and accumulated no assets. Also, the amount of tax credits generally increases with age because older households earn more.[8] Thus, the estimates of β_i are likely to be biased downward for older households.

This paper tries to ascertain whether β_i correctly captures the effects of the 1999 pension reform by comparing the magnitude and significance of β_i between altruistic and less altruistic households. If households in fact accumulate assets in response to the pension reform, β_i can be estimated to be more significantly negative for less altruistic households, which are assumed to behave more consistently with LCH, than altruistic households. By contrast, if the spurious negative correlation between net pension benefits and household assets is the primary reason for negative estimates of β_i, substitutability will be found both for altruistic and less altruistic households.

Attanasio and Brugiavini (2003) and Bottazzi *et al.* (2006) identified the effects of pension reforms on the saving behavior of households by employing a natural experiment

[8]Based on RADAR in 2000, the mean values of total tax credit for seven age groups are computed to be 40 thousand yen (for 25-29 years), 48 thousand yen (for 30-34 years), 83 thousand yen (for 35-39 years), 99 thousand yen (for 40-44 years), 117 thousand yen (for 45-49 years), 165 thousand yen (for 50-54 years), and 165 thousand yen. (for 55-59 years).

approach. They exploited the differential effect of the Italian pension reforms on the pension wealth of different groups. They applied the difference-in-difference (DID) method to the estimation of the pension wealth equation in the first-stage regression of the instrumental variable method. However, I cannot apply this approach to my analysis because the 1999 pension reform did not have such a differential effect that can be utilized for DID.[9]

4 Data description

4.1 NEEDS-RADAR

This paper uses Japanese micro-data of NEEDS-RADAR (hereafter referred to as RADAR) for 1996 and 2000, compiled by *Nihon Keizai Shinbun Inc.* This survey randomly chose 5000 (4500 for the year 2000) men and women aged 25 to 69 (25 to 74 for the year 2000) from the Tokyo metropolitan area, which included Tokyo, Saitama prefecture, Chiba prefecture, and Kanagawa prefecture (Ibaraki prefecture was also included in the year 2000). The numbers of effective respondents were 2759 for 1996 and 2510 for 2000. This survey asked a large number of questions on asset holdings and household demographics.

It must be noted that I do not necessarily obtain the same results as this study when using the nationwide survey. Because RADAR covers only the Tokyo metropolitan area, saving behavior could be different from that in other areas. To examine this possibility, I compare the mean values of household income and annual saving in RADAR with those in nationwide surveys. Table 2 provides the mean values of annual income and saving (in nominal terms) of RADAR, Family Saving Survey (hereafter referred to as FSS), Japanese Family Income and Expenditure Survey (hereafter referred to as JFIES), National Survey of Family Income and Expenditure (hereafter referred to as NSFIE), and Public Opinion Survey on Household Savings and Consumption (hereafter referred to as POSHSC).[10] FSS, JFIES, and NSFIE are conducted by Bureau of Statistics, Office of the Prime Minister (formerly Management and Coordination Agency). POSHSC is conducted by the Central Council for Financial Services Information (formerly the Central Council for Savings Information).[11] [12] According to Table 2, the mean values of annual income

[9]Although self-employed workers, who were not affected by the 1999 pension reform, are candidates for a control group, their age bracket and pension system are entirely different from the treatment group (private-sector employees). In addition, the saving behavior of self-employed workers might also differ greatly. Therefore, I do not apply the DID method using them as control group households.

[10]This paper uses NSFIE for 1994 and 1999 instead of 1996 and 2000 because the survey is not conducted every year but is conducted at five-year intervals.

[11]The mean values of FSS, NSFIE and POSHSC are calculated for all households, whereas those of JFIES are calculated for all working households.

[12]Because the 1996 RADAR asked not only the amount of ordinary annual household income but also annual extra income, I present the mean value of total pretax annual household income (7.26 million yen) and annual extra income (0.64 million yen) in the upper row of Table 2. In contrast, the mean value of the 2000 RADAR is calculated only for pretax annual household income because annual extra income is not available. This differential is responsible for the smaller value of income in 2000 than in 1996. The

and saving in RADAR are slightly larger than those of other surveys.[13] Therefore, the sample households in RADAR might have had a somewhat greater ability to accumulate assets, and they could have more strongly responded to the 1999 pension reform than households in other areas.

4.2 Sample selection

This paper uses two types of household in the empirical analysis below: (1) single-income households whose head (aged 59 or younger) works for a private company and (2) double-income households whose head (aged 59 or younger) works for a private company and his spouse works as a part-timer or has a side job. Because the individual annual incomes of husband and wife are not available, I cannot calculate the net pension benefits for double-income households separately. Hence, this paper confines its scope to the sample to households corresponding to (1) and (2) in which only the household head works full-time.

This results in the exclusion of several types of household. First, this paper drops households whose head is aged 60 or over because the estimates of net pension benefits, calculated on the basis of income drawn after the mandatory retirement age of 60, are likely to deviate from the true value of benefits computed from before-retirement income.[14] Second, this paper excludes households whose heads work for public offices. Public employees join either of two different union pension plans depending upon whether they work for the national or local government; however, I cannot identify their plan from RADAR. Third, this paper drops households in which only the household head's spouse or an unmarried single woman works. In most of the former cases, the household head would already have retired; therefore, it is inappropriate to calculate net pension benefits based only on the spouse's annual income. In the latter case, because a portion of female workers are likely to leave full-time employment after marriage[15] and to be the third insured person of an employee's pension, saving behavior would not be continuous before and after marriage. As a result, the numbers of households used in my analysis are 1057 and 846 for the years 1996 and 2000, respectively.

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mean values of FSS, JFIES, and NSFIE also include annual extra income. For POSHSC, I cannot know whether household income includes extra income.

[13]The larger income in RADAR probably reflects regional differences in income level. The above-mentioned nationwide surveys indicate that the mean values of household income in the Kanto district (FSS: 82.8 [77.1], JFIES: 10.7 [10.3], NSFIE: 74.3 [69.1], and POSHSC: 64 [60.1] in the year 1996 [2000]) are larger than the national averages in Table 2.

[14]The elderly aged 60 or over are usually not regular worker in Japan even if they are employed. According to the Annual Report on the Labor Force Survey, conducted by the Statistics Bureau, Ministry of Public Management, Home Affairs, Posts and Telecommunications (formerly Management and Coordination Agency), the rates of regular employees in 1996 and 2000 (defined as a percentage of regular employees [in non-agricultural industries] in the population over 15 years of age) among those aged 50-54, 55-59, 60-64, 65-69, and 70 or over were 77.1% (75.4%), 70.4% (70.9%), 40.0% (37.1%), 22.2% (20.4%), and 8.1% (7.1%), respectively (the values for the year 2000 are in parentheses).

[15]This phenomenon is well known in Japan as the M-shaped employment rate curve.

4.3 Household characteristics

This subsection compares the household characteristics of the 1996- and 2000-year samples to check for similarities. If households have a considerably different distribution of characteristics between these two years, it cannot be identified whether the estimates of β_i reflect the responses of households to the pension reform or merely indicate differences in asset accumulation behavior that come from the differences in the characteristics of households.

Table 3 presents descriptive statistics of household characteristics. In this table, "Part-timer" is a dummy variable that takes unity if the wife works as a part-timer or has a side job. "Plan a housing loan" is a dummy variable that takes unity if a household plans to purchase a home by getting a housing loan from a bank or public financial institution or their workplace. "Expect a retirement allowance" is a dummy variable that takes unity if a respondent or his/her spouse expects to receive a retirement allowance in the future. "Private life annuity" is a dummy variable that takes unity if a respondent or his/her spouse joins a private pension plan, and it provides whole-life benefits.

Table 3 suggests that mean value and standard deviation of most household characteristics do not differ greatly between 1996 and 2000, thus household characteristics are distributed similarly in these two years. Hence, households in 1996 and 2000 could be homogeneous and their asset accumulation behavior could also be similar.

4.4 Household asset holdings

This subsection explains a calculation of the household assets and provides a summary of asset-holding status. The following products are included in financial and real assets.

Financial assets:
Ordinary bank deposits, postal savings, fixed-amount postal savings, time deposits, large time deposits, saving deposits, trust deposits, bonds,[16] stocks, MMF, MRF, midterm government bond funds, investment trusts, in-house savings deposits, worker's asset-building savings, mortgage securities, commodity funds, gold savings, amount of money received at maturity date of single premium endowment life insurance policy, and amount returned at maturity of accident insurance policy

Real assets:
Residential land, other land (land for second house, apartment, condominium, building, etc.), other real assets (studio apartment, co-owned real estate, gold, golf course membership, and resort club membership)

The products that are contained in the data of 1996 and 2000 years should be the same. To achieve this, I exclude foreign currency deposits from financial assets because

[16]Bonds include discount bank debentures, interest-bearing bank debentures, government bonds, convertible bonds, warrant bonds, corporate bonds, and housing bonds.

the 1996 RADAR did not collect information on the amount of such assets.[17] In addition, life insurance policies are eliminated because the 2000 RADAR did not ask about them.[18] Thus, the amounts of financial assets in 1996 and 2000 do not differ due to differentials in asset type included.

When equalizing the types of real assets between these two years, I have to pay attention to differences among questions. The 1996 RADAR asked the market value of three real assets: (1) residential land, (2) land for second house, apartment, condominium, building, etc., and (3) other real assets, including studio apartment, co-owned real estate, gold, golf course membership, and resort club membership. Hence, real assets for this year do not include residential housing. Thus, the amount of net real assets can be obtained by deducting the amount of housing loan only for residential land from the total amount of real assets (amount of gross real assets).[19] [20]

On the other hand, the 2000 RADAR asked about the amount of real assets in the slightly different form from the 1996 RADAR. Real assets are divided into three groups: (1) residential land, (2) "apartment, condominium, and building," "second house," "land for parking lot," "farmland," and "other land," and (3) other real assets, including the same assets as in the 1996 RADAR. Because the 2000 RADAR asked about the amount represented by "apartment, condominium, and building" in (2), households that own condominium and live in it probably reported those assets as a component of (2).[21] Due to the absence of a question on residential housing in the 1996 RADAR, the amount of real assets in 2000 could be larger than that in 1996 by the amount of condominiums. This differential in the questionnaire might downwardly bias the estimate of β_i. To avoid this bias, I exclude 83 households that have "apartment, condominium, or building" and "live in their own condominium" from the sample households of year 2000.[22] This sample exclusion makes the types of real assets included in the sample of year 2000 equivalent to that of 1996. Also, this paper eliminates households that report a larger amount of

[17]According to POSHSC, the amount of foreign currency deposits dramatically increased from 0.12 million yen to 1.32 million yen during the period from 1998 to 2000 (0.78 million yen in 1999, and the values for 1996 and 1997 are not available). Hence, the exclusion of foreign currency deposits does not negatively bias the estimate of β_i, implying that exclusion is unfavorable to a rejection of ABMH.

[18]National Survey of Life Insurance, conducted at three-year intervals by Japan Institute of Life Insurance, shows a slight decrease (from 5.0 to 4.6 in the period between 1994 and 1999) in the average number of life insurance policies held. Therefore, in contrast to the foreign currency deposits, the exclusion of life insurance policies might bias β_i downward.

[19]Appendix A explains the way of estimating the amount of housing loan for residential land separately from that for residence.

[20]Some households might purchase a studio apartment (for rent) using a housing loan; however, I do not deduct the loan for it because the amount of the housing loan for this asset is not available. Moreover, because only about 10 households own a studio apartment in each year, the estimation results are hardly biased even if the loan for this asset is not deducted.

[21]It was possible that the questionnaire-maker wanted respondents to answer not the "building price" of "apartment, condominium, and building" but rather the "land price," as did the 1996 RADAR. The respondents, however, might answer with the "building price" because the wording of the questionnaire was confusing.

[22]This paper keeps households that have a condominium but do not live in it (20 households) because the 1996 RADAR might also include households that have a condominium for rent.

annual repayments than annual income when calculating the amount of net total assets. Due to this elimination, the numbers of observations for net total assets in Tables 7, 12 and 13 are slightly smaller than that for gross total assets.

Tables 4-1 and 4-2 provide quartiles of the amount of financial and real assets, respectively. Net financial assets are calculated by subtracting loan on deed, which is used for an education loan, car loan, and free loan, from gross financial assets. Net real assets are obtained by subtracting housing loans for residential land from gross real assets. Tables 4-1 and 4-2 show that the median values of financial and real assets do not differ greatly between 1996 and 2000 although they slightly decrease during my sample period. The decreasing trends in real and financial assets are also found in NSFIE.[23] In contrast to the median values, a substantial difference is found between the mean values of financial assets. The mean values are 88.7 and 76.0 hundred thousand yen in 1996 and 2000, respectively. This difference is probably because several outliers are included in my sample. Hence, I estimate Eq. (5) by the median-regression method.

In Table 4-2, the real assets of the youngest age group greatly increased from 1996 to 2000 though such a trend is not found for other age groups. Since only a few households own the real assets in this group, I may happen to have more households that own a large amount of real assets in 2000 than 1996. Another possibility is an acceleration of home purchases in the late 1990s due to low mortgage rates and several preferential tax treatment policies. Table 5 reports the ownership rate of detached houses, and it indicates that the ownership rate for the youngest age group rises significantly from 34.4% to 45.0%.[24] In fact, however, few households of the youngest age group in this paper repaid a housing loan. Hence, I cannot ascribe the large amount of real assets in this age group to a low mortgage rate and preferential tax treatments. Nevertheless, the increase of the house ownership rate might be one of the reasons. When estimating Eq. (5), the youngest age group is excluded to avoid a downward bias to β caused by the increase of real assets that might be unrelated to the pension reform. This constraint can also be justified by the reason that unmarried young respondents who lived with their parents over-reported the amount of real assets because they might include the parents' house among their real assets.[25]

[23] NSFIE shows that the mean value of real assets in the Kanto district decreased from 44.8 million yen in 1994 to 34.2 million yen in 1999. Net financial assets in the Kanto district also decreased in NSFIE. However, the amount of gross financial assets did increase in the late 1990s, contrary to the trend in Table 4-1.

[24] An increasing trend of the house ownership rate is found in FSS as well. FSS shows that the house ownership rate of the age group of 25 to 29 rises from 9.0% in 1996 to 21.7% in 2000. Moreover, the house ownership rate in the Kanto district rises from 61.9% to 68.4%. Thus, the increase in house ownership rate in the late 1990s is not specific to the sample households in this paper.

The house ownership rate of the youngest age group is larger than that of the second-youngest group. This is probably because many unmarried respondents lived in their parents' house.

[25] Although the households of other age groups would also include parents' assets, the deviation from the true asset amount can be large, particularly for young unmarried households.

4.5 Net pension benefits

This subsection describes the change of net pension benefits between before and after the 1999 pension reform.[26] Table 6 presents the discounted present values of net pension benefits (pension benefits minus insurance premiums) and its normalized values (by disposable income). The calculation of pension benefits and insurance premiums is summarized as follows.[27] As the first step in obtaining pension benefits, this paper calculates the initial-year benefits of individual households based on the mean value of monthly remuneration over the whole working life (the average monthly standard remuneration). Next, the pension benefits paid after the first entitlement are computed by multiplying the initial-year benefits with the expected inflation rate and appreciation of remuneration. Meanwhile, the insurance premiums of each age are obtained by multiplying the annual income with the employee's contribution rate. Then, multiplying the benefits and premiums with the survival rate of each age yields the expected values of them. Finally, this paper discounts the expected values by interest rate in order to obtain the present value.

In Table 6, the amount of net pension benefits decreases considerably after the reform by approximately 1.5 million yen to 6 million yen.[28] Further, the amount of net pension benefits is smaller in the younger age group, and it has a negative value for the age group of 40-44 years or younger in 2000.

Figure 2 shows the ratio of benefits to insurance premiums according to household head's age. This ratio falls after the pension reform for all ages.[29] In the next section, I estimate the effect of this reduction on household asset accumulation.

However, the variability of net pension benefits is not only derived from a dynamic variation before and after the pension reform but also from a cross-sectional variation between high and low income households, which mainly results from variations in the earnings-related component of pension benefits. If the estimate of β_i reflects the latter

[26] In reality, the factor in affecting household asset accumulation would not be the objectively-estimated amount of net pension benefits but each person's subjective valuation of that. This paper cannot use the subjective valuations because RADAR does not provide such information. However, Horioka and Okui (1999) used people's expectations of social security benefits, which were collected by the Institute for Posts and Telecommunications Policy, in order to consider the importance of retirement saving and of the determinants thereof.

[27] Appendix B explains in more detail how to estimate the amount of net pension benefits.

[28] The changes of net pension benefits are also attributed to variations between 1996 and 2000 of inflation rate, wage growth rate, and investment yield, which are used for calculating the discounted present values of benefits.

[29] The ratios of benefits to contributions in Figure 2 are larger than in other studies on Japan (e.g. Hatta and Oguchi, 1999; Wakazono, 2002) because this paper considers only (nominal or statutory) employee contributions as the perceived burden of households. If an employer's burden were to be transferred to the employees in the form of a wage reduction and employees recognize that, an employer's contributions should be included in the employee's own burden. However, as shown in Iwamoto and Hamaaki (2006), an employer's contributions might not be completely shifted back on to wages in Japan. Furthermore, it seems that most people do not regard an employer's contribution as their own burden because the concept of payroll-tax incidence is unknown to ordinary people. Consequently, the household budget constraint might not include the employer's contributions. Thus, this paper assumes that only employee contributions are the perceived burdens of households.

variation, it would be underestimated due to a positive correlation between household assets and net pension benefits, which is also controversial among previous studies. To avoid this, net pension benefits and household assets are normalized by disposable income. The positive correlation, however, might remain even after this manipulation. Nevertheless, the underestimation does not support LCH falsely, but instead favors ABMH. Hence, one can conclude that households behave consistently with LCH if β_i is significantly negative. At the same time, acceptance of ABMH needs careful consideration.

5 Baseline empirical results

This section discusses the estimation results (of Eq. [5]) for all sample households chosen in Section 3.2. In the estimations below, I do not use the variables on educational status and firm size of household head as explanatory variables because they may absorb the effects of net pension benefits.[30]

Table 7 presents the estimation results of Eq. (5) using the total amount of financial and real assets as PW. Columns (A) and (B) report the result of gross and net total assets, respectively. Column (A) provides insignificant coefficients of net pension benefits (NPB/DI) for all age groups. On the other hand, column (B) shows that the coefficients of net pension benefits are significantly negative for two older age groups. These negative coefficients are corroborated with LCH though they are rather smaller than the theoretically predicted values in Figure 1.

Next, I estimate Eq. (5) using financial assets as PW. Because households can buy and sell these assets at a lower transaction cost than real assets, they might have accumulated financial assets (in the short run at least) to offset a decrease in net pension benefits. If this inference is true, one can obtain significantly negative estimates of β_i using only financial assets. Table 8 reports the results of this estimation and shows that β_i is significantly negative only for the 40s. The negative estimates are fairly reasonable in magnitude compared to the theoretically predicted values. Thus, this result implies that households were likely to accumulate financial assets in response to the pension reform. At the same time, however, β_i is insignificant for other age groups. Further, the pattern of β_i that is largest in absolute value in the 40s is not corroborated with theory but with Attanasio and Brugiavini's (2003) "somewhat puzzling U-shaped age pattern" though the reason for this pattern remains unclear in this paper.

A compositional change in household portfolio could lead to a significantly negative estimate of β_i in Table 8. If sample households sold real assets and purchased financial assets to offset losses of real assets in the late 1990s, the use of financial assets as a dependent variable can generate negative estimates even in case assets were not accumulated. However, the ratio of real assets to total household assets hardly declines between 1996

[30]The pension benefits and insurance premiums are calculated based on individual wage profiles, which are prepared according to educational status and firm size. Hence, net pension benefits are correlated with those characteristics.

and 2000 in my sample.[31] Furthermore, a significant increase in the ownership rate of detached houses, shown in Table 5, also indicates that middle-aged households did not sell real assets, but rather purchased them.

Finally, I summarize the results of other independent variables in Tables 7 and 8. Higher age households are likely to own a larger amount of financial assets. Also, the older cohorts have more assets. Then, the positive coefficients of marital status indicate that marriage entails the acquisition of residential housing in many cases. The coefficients of the part-timer dummy might well be significantly negative because dual-income households do not have to prepare a large amount of assets to buffer their income fluctuations. Further, home ownership increases the total amount of real and financial assets. Meanwhile, a housing loan and loan on deed both decrease financial assets. This might imply that the burden of loan repayment has a negative effect on accumulating financial assets. Moreover, planning to have a housing loan increases assets probably because households have to make a down-payment before taking out a loan. In addition, planning to receive a retirement allowance reduces the total amount of assets. The positive coefficients of "private life annuity" might spuriously reflect the positive relationship between the probability of holding a private annuity and the amount of assets.

6 Altruistic bequest motive and household saving behavior

In this section, Eq. (5) is estimated using split samples obtained by dividing households on the basis of the degree of altruistic bequest motive. Because less altruistic households are assumed to behave more consistently with LCH, I can expect that ABMH is rejected more significantly with this group. If this pattern can be seen in split-sample estimations, I can ascertain that the response of households to the 1999 pension reform is the main source of the negative estimates of β_i in Tables 7 and 8. In other words, their negative sign does not merely reflect an increase in household assets caused by a change in other irrelevant factors (e.g. macroeconomic conditions).

6.1 The proxies for altruistic bequest motive

This paper utilizes the following two proxies for the degree of altruistic bequest motive. First, households are divided on the basis of the degree of desire to leave assets to children. The 1996 RADAR asked the question: "Do you want to leave financial assets to your children?" with the five-grade evaluation of "1. Yes, 2. Yes if anything, 3. Yes and no, 4. No if anything, and 5. No." On the other hand, the 2000 RADAR asked the question: "Do you want to use your assets to enrich your retired life rather than to leave assets to your children?" with the five-grade evaluation of "1. Yes, 2. Yes if anything, 3. Yes and no, 4. No if anything, and 5. No." I classify as altruistic the households that replied

[31] The ratio of real assets is 35.2% in 1996 and 34.7% in 2000. Also, the ratio of the 40s is 43.0% and 42.8% for those years, respectively.

"Yes" or "Yes if anything" to the question in 1996 and "No if anything" or "No" to the question in 2000, while other households are regarded as less altruistic.[32] [33]

The second criterion is whether households have children because households with no children are assumed to have a very weak or no altruistic motive in relation to their children while households with children have some altruistic motive. I classify the following two types of household as the altruistic group: (1) households that have dependent children and (2) households that have no dependent children, but whose stage in life is after "3. Birth of first child." On the other hand, households that have no dependent children and whose stage in life is "1. Single" or "2. Getting married" are classified as no-child household.[34] [35]

Before the split-sample estimation, let me consider the criteria in more detail using a cross tabulation of Table 9.[36] First, I can point out that the small number of the households having strong bequest motive supports LCH. Secondly, I can list the four groups ("Strong bequest motive," "Weak bequest motive," "With children" and "No children") in order of the degree of altruistic bequest motive. Since the group of "No children" is dominated by households with the weak bequest motive, this group is expected to be more consistent with LCH than the one of the weak bequest motive, which includes a certain number of households in the group of "With children." Similarly, the group of "Strong bequest motive" is supposed to be less consistent with LCH than the one of "With children." As a result, the most altruistic group can be "No children," and next comes "Weak bequest motive." The third group is "With children," and finally "Strong bequest motive" comes.[37] Finally, I discuss the points to keep in mind when interpreting results of "With children" and "No children." Since three quarters of the households in the group of "With children" do not want to leave assets to their children, I may have a result that those households are corroborated with LCH as well as the group of "No children." Ideally, I would focus the difference of the coefficient of net pension benefits

[32]Even if households answer that they want to leave assets to their children, some of them may not have an altruistic bequest motive but have the one that is consistent with other selfish motives (e.g. strategic bequest motive). Therefore, LCH may be applicable to the altruistic households of this paper.

[33]The wording of the questions about bequest is substantially different between 1996 and 2000, though the contents are almost the same. The difference may prejudice the estimation result. This remains an issue.

[34]Dependent children in RADAR are defined as those whose annual income is less than 1 million yen and whose living expenses are fully supported by the respondent or his/her spouse.

[35]The RADAR asks at which stage in life each household is. A life is divided into the following ten stages: (1) Single, (2) Getting married, (3) Birth of first child, (4) Entry of first child into elementary school, (5) Entry of first child into junior high school, (6) Entry of first child into high school, (7) Entry of first child into college, (8) First child entering employment or getting married, (9) Youngest child entering employment or getting married, and (10) Birth of grandchild.

[36]In performing a cross-tabulation analysis, I use only the households that give an answer to both questions about the desire to leave assets and the presence of children. Since I exclude the households that reply either one of the two questions, the number of households is smaller than those of the estimations below.

[37]I cannot confine the sample households to the upper left cell ("With children" and "Strong bequest motive") or the lower right cell ("No children" and "Weak bequest motive") in Table 9 because sample size becomes too small.

between these two groups in order to consider the difference of consistency with LCH that is related to the presence of children.[38]

Moreover, I examine whether the above-mentioned criteria are appropriate for the purpose of the sample division in this paper. For example, if households with children have a lower ability to accumulate assets due to their educational expenditure, the offset through household asset accumulation can be observed regardless of the strength of the altruistic bequest motive. Tables 10 and 11 provide descriptive statistics of the amount of savings, and each table does not show a significant difference in the amount of savings between the two groups.[39] Hence, the sample divisions based on the above-mentioned criteria might be appropriate for this paper and are likely not to produce a false conclusion.

6.2 Results of split-sample analysis

This section discusses the results of split-sample estimations. First, samples are divided on the basis of the strength of their desire to leave assets. Table 12 reports the results of this estimation, and it reports significantly negative coefficients of net pension benefits only for less altruistic households.[40] On the other hand, no coefficient of net pension benefits is significantly negative for altruistic households. Overall, the findings in Table 12 reveal that the saving behavior of less altruistic households is more consistent with LCH than that of altruistic ones.

Second, I divide households based on whether they have children or not. Table 13 provides estimation results using this criterion. The contrast between the groups of "No children" and "With children" is apparent. In columns (B) and (D), the coefficients of net pension benefits for the group of "No children" are estimated to be significantly negative for two older age groups although those magnitudes are too large in absolute value compared to the theoretical prediction. Those large coefficients may be partly due to a lack of sample households, which can make the estimation result unstable. In columns (E) to (H), several coefficients of net pension benefits are also significantly negative for the group of "No children," contrary to those of "With children."[41] The differentials in the coefficient between those two groups may express the degree of substitutability that is derived from the presence of children. Judging from Table 13, less altruistic households behave more consistently with LCH than altruistic ones. Furthermore, as expected in the

[38] If I use the DID method, the difference between the household groups could be identified. This is an issue in the future.

[39] The question "How much do you save money from the income during the past one year?" provides the amounts of savings shown in Tables 10 and 11. Because this question has more missing values than the others, the number of observations is smaller than in other tables.

[40] The total number of observations in Table 12 is slightly smaller than those in Tables 6 and 7. This is due to missing values in the following question: "Do you want to leave financial assets to your children?" The observations in Table 13 also have decreased because of missing values of the stage in life and dependent children.

[41] Table 13 shows that several coefficients of net pension benefits are significantly positive for the 30s. Moreover, Tables 7, 8 and 12 also report positive (but insignificant) coefficients for them; however, the reason for this result have yet to be determined.

previous subsection, the estimate of β_i is the largest for "No children" among the four groups. Thus, Tables 12 and 13 suggest that the negative estimates of β_i in Tables 7 and 8 is attributable to the response of households to the pension reform.

7 Conclusion

Japanese literature has not arrived yet at a clear consensus on whether LCH or ABMH seems more plausible, while a number of studies on western countries confirm the validity of LCH. The latter literature contains studies in which estimations of the asset demand equation are performed to compute the degree of substitutability between net pension benefits and household assets. This paper also tries to estimate substitutability by exploiting the exogenous reduction in pension benefits caused by the 1999 pension reform in Japan. This exogenous variation allows identification of substitutability separately from an inherent positive correlation between pension and private wealth. The substitution effect is found mainly for middle-aged households, and its value is corroborated by theoretical predictions. In addition, this paper tests whether the magnitude and significance of substitutability differ between altruistic and less altruistic households in a manner that is consistent with LCH. If LCH is more reasonable for less altruistic households, it can be ascertained that the estimates in this paper capture the substantial effect of the pension reform. Consequently, this test indicates that the substitution effect is more significant for less altruistic households. Thus, the estimates of substitutability are probably given by the increase of household assets in response to the 1999 pension reform.

However, this paper has several limitations. First, it ignores life insurance due to a lack of information despite a feature of Japanese saving behavior being a higher participation rate in life insurance. This exclusion might bias the estimation results favorably towards LCH (as discussed in Section 4.4). Second, this paper does not consider the potential change in retirement age that can be induced by a reduction in pension benefits. If most households reacted to the reduction by extending their retirement age, it is natural to consider the substitution effect obtained in this paper as being overestimated. Finally, although this paper regards only LCH and ABMH as possible hypotheses of household saving behavior, other possibility might exist. For example, a combination of them might be the true hypothesis. Further research is required to resolve these issues.

Appendix A. Method of calculating the amount of housing loans for residential land

This section describes the procedures for calculating the amount of housing loans for residential land separately from that for residences. Because the 2000 RADAR provides the present value of total housing loans in 2000, I have to calculate the amount only for 1996. The procedure consists of two steps: (1) calculating the present value of total housing loans, and (2) dividing this present value into housing loans for residential land

and for residences. The amount of annual payments and the remaining payment period are available from the 1996 RADAR; therefore, the present value of total housing loans can be calculated by summing the present values of annual payments for each year. To get the present values, this paper uses the discount rate of the pension investment yield (4%) postulated in the 1994 fiscal recalculation. Next, the amount of housing loans is computed for residential land separately from that for residences. The total amount of housing loans is split into these two parts by multiplying the average ratio (in the real economy) of housing loans for residential land to that of total housing loans. This ratio comes from the Survey of Private Residential Construction Funds (conducted by Housing Bureau, Ministry of Construction), which provides the total amount of housing loans and the amount of housing loans for land purchases for purchasers of own house and land. Consequently, the average ratio of housing loans for land purchases in South Kanto (Tokyo, Saitama, Chiba, and Kanagawa) for the period from 1986 to 2000 is calculated to be 0.339. Appendix tables A-1 and A-2 report estimates of the amount of housing loans for residential land in 1996 and 2000, respectively. Because the magnitude and age pattern of these two tables are similar, the projection of the present value of total housing loans for 1996 probably performs well.

Appendix B. Method of calculating the amount of net pension benefits

B.1 Calculating the amount of pension benefits

The amount of pension benefits is calculated according to the following 10 steps, which virtually replicate the actual calculation procedure for pension benefits.

1. Annual household income (other than bonus) and annual bonus
Before-tax annual household income in RADAR is divided into two components: (1) annual household income excluding bonus and (2) annual bonus, using the ratio of annual bonus and special cash earnings to the sum of contractual cash earnings $\times 12$ and annual bonus and special cash earnings, which are given by the Basic Survey on Wage Structure.

2. Stream of annual household income
Next, the streams of annual household income (other than bonus) for individual households during the period from entering the job market to mandatory retirement (at 60 years old) are calculated. First, multiplying annual household income of the data collection year (1996 or 2000) by a nominal wage profile yields the streams of nominal household income from entering the job market to the data collection year. The nominal wage profiles, calculated on the basis of the Basic Survey on Wage Structure, are prepared for each household head's age (25 to 59 years), educational background (junior high graduate, high school graduate, junior college graduate, college graduate), and company size of household head (more than 1000 employees, between 200 and 999 employees, between 50 and 199

employees, between 10 to 49 employees). Secondly, to obtain the income streams from the data collection year to retirement the annual household income of the data collection year is multiplied by the expected rate of increase in nominal wage. This expected rate is 4.0% per annum and 2.5% per annum for 1996 and 2000, respectively, both of which are postulated in the fiscal recalculation in 1994 and 1999.

3. Monthly standard remuneration

Dividing the annual household income of each year (obtained in step 2) by 12 yields monthly household income. Then, this monthly income is converted into monthly standard remuneration following the grade table of standard remuneration. When converting future monthly income, the grade table used is that updated by multiplying the grade table of data collection year by the expected increase rate of nominal wage.

4. Average monthly standard remuneration

The average monthly standard remuneration is eventually obtained by averaging the reevaluated monthly standard remuneration. I can convert the monthly standard remuneration (obtained in step 3) into the reevaluated monthly standard remuneration using reassessment rates. The reassessment rate adjusts the past increase in real wages (i.e. productivity growth). In the calculation, the observed rates are applied for household heads retiring by 2004. Meanwhile, for household heads retiring after 2005, values updated by expected increase rates of real wage are used. This expected rate is 2.0% per annum for the 1996-year sample and 1.0% per annum for the 2000-year sample, which are postulated in fiscal recalculations.

5. Annual standard bonus and the annual bonus

Next, the streams of annual standard bonus and annual bonus are calculated. The annual standard bonus is used for calculating the earnings-related component for the period after the introducing the total remuneration system. On the other hand, the annual bonus is employed for calculating the amount of special premiums on bonuses, which was introduced in the 1994 fiscal recalculation.

One can calculate the stream of annual bonus, in a similar way to step 2, using the annual bonus amount of the data collection year obtained in step 1. Because a bonus up to 1.5 million yen for each payment is regarded as the standard bonus under the total remuneration system, a bonus up to 3 million yen is considered to be the annual standard bonus, assuming that a bonus is paid two times a year.

6. Benefits of old-age basic pension before age 65 (*Teigaku Bubun*)

The following steps (from 6 to 8) now calculate the pension benefits using the components obtained so far. Step 6 explains the procedure for computing the benefits of the old-age basic pension before 65 years of age. The first-year benefits are represented as a product of unit price, total number of enrollment months, and accumulated inflation rate up to the first entitlement year. Unit prices are the actual values in 1996 and 2000. This paper also assumes that all household heads participated in the employees' pension for 444

months (37 years), which is the upper limit of the enrollment period determined by law (for people born after April 2, 1934). Further, the accumulated inflation rate is calculated using actual price indexation rates before the data collection year and the expected inflation rates after that (2.0% and 1.5% per annum for 1996 and 2000, respectively). The expected rates are derived from the postulated values of the fiscal recalculations in 1994 and 1999. Finally, the pension benefits for each year are computed by multiplying the first-year benefits with the inflation rate.

7. Benefits of old-age basic pension after age 65 (*Kiso Nenkin*)

Step 7 describes the calculation of benefits provided by the old-age basic pension after 65 years of age. The first-year benefits are represented as a product of 780000 (804200 for 2000 data), price indexation rate for 1996 or 2000, and accumulated inflation rate from the next year of 1996 or 2000 to the first entitlement. Here, the price indexation rates of 1996 and 2000 are 1.007 and 0, respectively.[42] The accumulated inflation rate is calculated on the basis of expected inflation rates, as in step 6. Also, the assumption of full-term participation in the pension system is the same as in step 6. The benefits of each year are obtained by multiplying the first-year benefits by the inflation rate.

8. Benefits of earnings-related component

Step 8 illustrates how to obtain the benefits of the earnings-related component. The benefits are calculated to be a product of average monthly standard remuneration, multiplying number, total number of enrollment months, and accumulated inflation rate up to the time of entitlement. The multiplying numbers for 1996 and 2000 data come from fiscal recalculations in 1994 and 1999, respectively. Because this number was reduced by five percent in the 1999 pension reform as noted in Section 3, these two years have different values. The number of enrollment months and inflation rate are the same as those used in step 6. Also, because the 1999 pension reform raised the starting age for receiving the earnings-related component from 60 years old, the age for the first entitlement differs between 1996 and 2000.

For the 1996 year sample, the annual benefits after the first entitlement are computed by multiplying the first-year benefits of the earnings-related component by the expected appreciation rate of average monthly standard remuneration (i.e. 4.0%), which was postulated in the 1994 fiscal recalculation.[43] On the other hand, for the 2000 year sample, the annual benefits are computed by multiplying the first-year benefits by the expected appreciation rate of disposable income (i.e. 2.3%, which was postulated in the 1999 fiscal recalculation) to obtain the benefits until 64 years old, thereafter multiplying only by the

[42]The zero value for 2000 is due to a moratorium on price indexation, which resulted from price decreases (-0.3%) in 1999.

[43]It might be more appropriate to use the expected appreciation rate of disposable income rather than that of average monthly standard remuneration because the sliding pay scale of disposable income has been applied since the 1994 pension reform. However, the expected appreciation rate of disposable income was not disclosed in the 1994 pension reform. Hence, the expected appreciation rate of average monthly standard remuneration is used here instead. Because the differential between these two values is very small, this substitution hardly affects the results.

price indexation rate.

Finally, I explain the calculation of benefits for households that have an insured period ranging from before to after the introduction of the total remuneration system. For these, the benefits are the sum of the before- and after-period benefits. The before-period benefits are computed following the above-mentioned formula in this step. The after-period benefits are computed using the average standard remuneration, which is (monthly standard remuneration and annual standard bonus)/ number of enrollment months.

9. Expected values of benefits
The expected values of benefits can be obtained by multiplying the benefits at each age by individual survival rate after 60 years conditional on living at the data collection year. The survival rate comes from the Abridged life tables for Japan, compiled by the Ministry of Health, Labor and Welfare. This calculation gives the expected values of benefits from first entitlement to 100 years old.

10. Discounted present values of expected benefits
Discounting the expected benefits for each age provides the discounted present values of pension benefits. The discount rates are 4.0% and 5.5% for the calculations of 1996 and 2000, respectively, which were assumed in the 1994 and 1999 fiscal recalculations. Then, these discounted present values are summed.

B.2 Calculating amount of insurance premiums

The amount of insurance premiums is calculated according to the following three steps.

1. Expected values of insurance premiums for 1996 data
In this step, the amount of insurance premiums collected separately from standard remuneration and bonuses is calculated. The annual amount of premiums from standard remuneration is computed by multiplying the standard remuneration in each year (monthly standard remuneration$\times$12) by the employee's premium rate. Here, the actual values of the employee's premium rate as for the period until 1996 are used, and the expected premium rates, postulated in the 1994 fiscal recalculation, for the subsequent period are used. On the other hand, the special premiums levied on bonuses are calculated by multiplying bonuses by the special premium rate of 0.5%. Finally, the expected insurance premiums at each age are computed using the Abridged life tables, as in step 9 of the previous subsection.

2. Expected values of insurance premiums for 2000 data
For 2000 data, the insurance premiums are calculated separately for the periods before and after the introduction of the total remuneration system because the procedure for calculating the premium differs between these periods. For the before-introduction period, the calculation is the same as that described in step 1 of this subsection. Meanwhile, for the after-introduction period, the premiums are computed by multiplying the total

amount of standard remuneration and bonuses in each year by the premium rates newly determined with the introduction of the total remuneration system. The actual premium rates are used for the calculation of the period until 2000, and the expected rates, postulated in the 1999 fiscal recalculation, are calculated for the period after 2000. Lastly, the expected premiums are computed using the life table.

3. Discounted present values of insurance premiums

The insurance premiums can be divided into two components: (1) insurance premiums that were already paid until the data collection year, and (2) insurance premiums that would be paid after the data collection year. To obtain the discounted present value of premiums, the former component is multiplied by past investment yields of the reserve fund of employees ' pension. On the other hand, the latter is discounted at the rate of the expected pension investment yields assumed in the 1994 and 1999 fiscal recalculations.

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Table 1. The change in motivation for saving and thoughts on retirement

	What is a motivation for saving?	Are you concerned about retirement?		Reasons for anxiety about retirement
Year	For living expenses after retirement	Not concerned	Concerned	Inadequacy of pension and insurance provisions
1992	48.2	33.6	63.7	55.5
1993	50.1	35.6	62.0	59.5
1994	51.6	28.2	69.9	59.1
1995	52.9	27.2	71.6	56.9
1996	53.9	27.8	71.3	59.0
1997	53.2	20.4	78.8	63.1
1998	55.3	14.3	85.5	67.1
1999	56.7	15.8	84.1	66.9
2000	55.9	15.0	84.7	68.1
2001	58.6	15.3	84.3	66.5
2002	56.9	12.6	86.6	66.7
2003	60.4	11.3	87.9	72.2
2004	57.4	13.4	86.1	N.A.
2005	58.7	13.8	84.4	N.A.
2006	56.6	12.9	86.2	N.A.
2007	60.9	12.0	86.9	N.A.

Note: All figures are expressed in percentage. The figures are from the Survey of Household Finances for 2007, conducted by the Central Council for Financial Services Information. The respondents of this table are the households whose number of persons are more than one and whose head is aged less than 60 years old.

Table 2. A comparison of RADAR and other nationwide surveys

	RADAR	FSS	JFIES	NSFIE	POSHSC
		1996			
Before-tax annual income	79.0	75.5	69.5	69.2	59.3
Annual saving	15.0	11.0	10.8	–	9.0
		2000			
Before-tax annual income	70.6	72.1	67.3	64.9	55.7
Annual saving	17.0	–	10.7	–	7.9

Note: All figures are measured in hundred thousand yen. The annual income of POSHSC is after-tax annual income.

Table 3. Descriptive statistics

Year	1996		2000	
Variable	Mean	S. D.	Mean	S. D.
Head's age	42.0	9.5	42.3	9.3
Real disposable income	69.7	28.6	70.0	27.0
Married	0.850	0.358	0.871	0.335
Part-timer	0.301	0.459	0.287	0.453
Education dummy				
Junior high school	0.045	0.208	0.038	0.191
High school	0.374	0.484	0.301	0.459
Short college	0.088	0.283	0.100	0.301
College or above	0.493	0.500	0.560	0.497
Firm size dummy (Number of employees)				
10-49	0.161	0.368	0.169	0.375
50-199	0.181	0.385	0.171	0.377
200-999	0.212	0.409	0.252	0.434
1000-4999	0.203	0.403	0.202	0.402
over 5000	0.243	0.429	0.206	0.404
House status				
Detached house	0.516	0.500	0.547	0.498
Cluster housing	0.101	0.302	0.143	0.350
Dwelling with shop	0.010	0.102	0.012	0.108
Repaying loan on deed	0.156	0.363	0.139	0.347
Repaying housing loan	0.351	0.478	0.396	0.489
Plan a housing loan	0.362	0.481	0.285	0.452
Expect a retirement allowance	0.753	0.431	0.696	0.460
Private life annuity	0.155	0.362	0.109	0.312
Number of observations	1057		846	

Note: Real disposable income is measured in hundred thousand yen, and this variable is deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent).

Table 4-1. The quartiles of financial assets

Year		1996					
		Gross financial assets			Net financial assets		
Age group	Obs	Median	1st quartile	3rd quartile	Median	1st quartile	3rd quartile
25-29	128	13.0	5.0	33.5	12.5	2.0	33.0
30-34	152	31.5	13.0	69.5	29.5	9.0	68.5
35-39	150	49.0	18.0	88.0	48.0	14.0	88.0
40-44	161	55.0	26.0	108.0	55.0	23.0	108.0
45-49	196	60.0	21.0	137.0	59.5	17.0	132.5
50-54	152	73.0	31.0	162.5	69.5	28.5	162.5
55-59	118	111.5	55.0	191.0	110.0	53.0	185.0
All	1057	51.0	17.0	108.0	49.0	15.0	106.0

Year		2000					
		Gross financial assets			Net financial assets		
Age group	Obs	Median	1st quartile	3rd quartile	Median	1st quartile	3rd quartile
25-29	81	14.9	6.0	31.8	14.9	5.0	31.8
30-34	120	27.9	11.9	54.2	26.4	9.0	48.3
35-39	142	36.8	15.9	87.6	36.8	14.9	87.6
40-44	145	46.8	15.9	77.6	45.8	15.9	77.6
45-49	139	59.7	26.9	129.4	59.7	19.9	125.4
50-54	121	65.7	28.9	137.3	63.7	24.9	124.4
55-59	98	91.1	54.7	176.1	90.6	46.8	176.1
All	846	45.8	15.9	94.5	42.8	14.9	91.6

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent). Net financial assets are obtained by subtracting loan on deed from gross financial assets.

Table 4-2. The quartiles of real assets

Year			1996					
			Gross real assets			Net real assets		
Age group	Obs	Ownership rate	Median	1st quartile	3rd quartile	Median	1st quartile	3rd quartile
25-29	128	3.9%	100.0	20.0	300.0	32.2	20.0	300.0
30-34	152	20.4%	300.0	150.0	400.0	300.0	150.0	400.0
35-39	150	36.7%	300.0	240.0	500.0	284.7	182.2	460.5
40-44	161	54.0%	300.0	200.0	500.0	300.0	117.1	421.7
45-49	196	55.6%	300.0	200.0	600.0	294.9	154.7	500.0
50-54	152	67.1%	360.0	200.0	500.0	350.0	200.0	500.0
55-59	118	78.8%	450.0	250.0	800.0	439.7	222.6	800.0
All	1057	45.6%	335.0	200.0	500.0	300.0	182.8	500.0

Year			2000					
			Gross real assets			Net real assets		
Age group	Obs	Ownership rate	Median	1st quartile	3rd quartile	Median	1st quartile	3rd quartile
25-29	80	7.5%	298.5	139.3	447.8	298.5	69.7	447.8
30-34	110	16.4%	199.0	199.0	348.3	153.1	102.0	263.1
35-39	125	29.6%	278.6	199.0	398.1	199.0	139.3	386.2
40-44	129	51.9%	268.7	199.0	348.3	199.0	130.7	298.5
45-49	120	59.2%	298.5	199.0	457.8	248.8	129.0	399.7
50-54	111	68.5%	298.5	199.0	437.9	281.7	164.4	414.1
55-59	88	80.7%	348.3	199.0	497.6	298.5	192.3	490.8
All	763	45.3%	298.5	199.0	418.0	234.9	147.7	398.1

Note: The quartiles are calculated using the households that own real assets. All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent). Net real assets are obtained by subtracting housing loan for residential land from gross real assets. The households that have a larger amount of annual payment than annual income are excluded from the sample. In addition, 83 households that have "apartment, condominium, or building" and "live in their own condominium" are also excluded from the observations in 2000.

Table 5. The ownership rate of detached houses

Year	1996		2000		Welch test	
Age group	Obs	Mean	Obs	Mean	p-value	
25-29	128	34.4%	80	45.0%	0.066	*
30-34	152	26.3%	110	33.6%	0.103	
35-39	150	32.7%	125	34.4%	0.382	
40-44	161	54.7%	129	68.2%	0.009	***
45-49	196	59.2%	120	73.3%	0.004	***
50-54	152	77.6%	111	87.4%	0.018	**
55-59	118	76.3%	88	84.1%	0.080	*
All	1057	51.6%	763	60.7%	0.000	***

Note: Null hypothesis in the Welch test is that ownership rates in 1996 and 2000 are equivalent. Alternative hypothesis is that ownership rate in 2000 is larger than that in 1996. The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels.

Table 6. The discounted present values of net pension benefits

Year		1996							
		Net pension benefits (NPB)				NPB/Disposable income			
Age group	Obs	Mean	S. D.	Min	Max	Mean	S. D.	Min	Max
25–29	128	20.4	8.0	1.6	37.1	0.547	0.241	0.027	1.255
30–34	152	22.8	9.7	−3.6	37.7	0.467	0.229	−0.069	1.235
35–39	150	27.6	11.1	−13.0	67.6	0.453	0.250	−0.247	1.807
40–44	161	38.2	10.6	3.2	61.0	0.548	0.237	0.040	2.075
45–49	196	58.6	12.3	34.6	88.0	0.788	0.259	0.230	1.950
50–54	152	102.6	21.9	68.4	162.3	1.369	0.502	0.585	3.924
55–59	118	185.6	33.0	119.3	266.3	2.433	0.777	0.963	4.725
All	1057	61.8	53.9	−13.0	266.3	0.896	0.730	−0.247	4.725

Year		2000							
		Net pension benefits (NPB)				NPB/Disposable income			
Age group	Obs	Mean	S. D.	Min	Max	Mean	S. D.	Min	Max
25–29	81	−22.7	16.4	−64.4	5.7	−0.506	0.276	−0.989	0.213
30–34	120	−33.0	17.1	−64.3	1.2	−0.586	0.227	−0.902	0.044
35–39	142	−34.0	16.7	−63.3	12.7	−0.479	0.189	−0.817	0.386
40–44	145	−2.8	18.8	−45.9	43.0	0.020	0.368	−0.460	2.391
45–49	139	43.9	19.9	3.2	71.0	0.652	0.416	0.027	2.252
50–54	121	84.7	17.4	59.5	133.4	1.036	0.415	0.412	3.195
55–59	98	152.6	26.0	98.3	208.7	2.071	0.892	0.839	5.192
All	846	24.0	65.0	−64.4	208.7	0.287	0.969	−0.989	5.192

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent).

Table 7. Estimation results of asset demand function

Dependent variable	Gross total assets/DI			Net total assets/DI		
	(A)			(B)		
	Coef.	Std. Err.		Coef.	Std. Err.	
(NPB/DI)*(Age30-39)	0.155	0.378		0.137	0.377	
(NPB/DI)*(Age40-49)	-0.488	0.325		-0.724	0.319	**
(NPB/DI)*(Age50-59)	-0.099	0.177		-0.473	0.175	***
Age35-39	0.244	0.447		0.102	0.441	
Age40-44	0.008	0.647		-0.162	0.642	
Age45-49	0.374	0.719		0.118	0.713	
Age50-54	0.153	0.845		0.182	0.835	
Age55-59	1.080	0.937		1.365	0.927	
Cohort3 (1962-1966)	-0.099	0.494		-0.069	0.491	
Cohort4 (1957-1961)	-0.028	0.841		0.132	0.837	
Cohort5 (1952-1956)	0.495	0.916		0.910	0.911	
Cohort6 (1947-1951)	0.531	0.988		1.166	0.980	
Cohort7 (1942-1946)	1.199	1.039		2.017	1.030	**
Cohort8 (1937-1941)	1.919	1.114	*	2.785	1.103	**
Married	0.402	0.238	*	0.325	0.235	
Part-timer	-0.324	0.137	**	-0.377	0.135	***
Detached house	1.784	0.170	***	1.411	0.167	***
Cluster housing	0.675	0.258	***	0.907	0.252	***
Dwelling with shop	0.737	0.570		0.197	0.573	
Repaying loan on deed	-0.607	0.173	***	-0.939	0.171	***
Repaying housing loan	1.299	0.154	***	0.672	0.152	***
Plan a housing loan	0.325	0.139	**	0.412	0.137	***
Expect a retirement allowance	-0.086	0.145		-0.028	0.143	
Private life annuity	0.300	0.174	*	0.361	0.172	**
Constant	0.417	0.387		0.404	0.384	
Obs.	1612			1601		
Pseudo R^2.	0.17			0.14		

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross total assets is a total amount of real and financial assets. The amount of net total assets is obtained by deducting the amount of housing loan for residential land from the total amount of real and financial assets. DI denotes disposable income. The estimations use only the households whose head age is over 30 years old.

Table 8. Estimation results of asset demand function of financial assets

Dependent variable	Gross total assets/DI			Net total assets/DI		
	(A)			(B)		
	Coef.	Std. Err.		Coef.	Std. Err.	
(NPB/DI)*(Age25-29)	0.153	0.149		0.154	0.177	
(NPB/DI)*(Age30-39)	0.149	0.123		0.153	0.145	
(NPB/DI)*(Age40-49)	-0.262	0.107	**	-0.226	0.125	*
(NPB/DI)*(Age50-59)	0.009	0.060		-0.032	0.070	
Age30-34	0.318	0.143	**	0.339	0.170	**
Age35-39	0.387	0.242		0.462	0.285	
Age40-44	0.473	0.297		0.516	0.349	
Age45-49	0.539	0.313	*	0.539	0.369	
Age50-54	0.496	0.345		0.502	0.406	
Age55-59	0.772	0.371	**	0.910	0.436	**
Cohort2 (1967-1971)	-0.056	0.190		-0.116	0.228	
Cohort3 (1962-1966)	-0.129	0.252		-0.220	0.300	
Cohort4 (1957-1961)	-0.102	0.336		-0.237	0.398	
Cohort5 (1952-1956)	0.032	0.357		-0.040	0.423	
Cohort6 (1947-1951)	0.125	0.377		0.108	0.445	
Cohort7 (1942-1946)	0.174	0.391		0.141	0.462	
Cohort8 (1937-1941)	0.076	0.413		-0.009	0.487	
Married	0.088	0.068		0.045	0.080	
Part-timer	-0.098	0.045	**	-0.098	0.052	*
Detached house	0.113	0.052	**	0.077	0.062	
Cluster housing	0.161	0.074	**	0.132	0.087	
Dwelling with shop	0.244	0.181		0.277	0.211	
Repaying loan on deed	-0.385	0.054	***	-0.633	0.063	***
Repaying housing loan	-0.363	0.050	***	-0.309	0.059	***
Plan a housing loan	0.183	0.043	***	0.185	0.051	***
Expect a retirement allowance	0.018	0.045		0.084	0.052	
Private life annuity	0.112	0.056	**	0.112	0.065	*
Constant	0.354	0.140	**	0.389	0.166	**
Obs.	1903			1903		
Pseudo R^2.	0.08			0.10		

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross total assets is a total amount of real and financial assets. The amount of net total assets is obtained by deducting the amount of housing loan for residential land from the total amount of real and financial assets. DI denotes disposable income.

Table 9. Cross tabulation of two criteria for the degree of altruistic bequest motive

	With children	No children
Strong bequest motive	309	59
Weak bequest motive	924	284

Note: The cross-tabulation uses only the households that give an answer to both questions about the desire to leave assets and the presence of children. Also, the households whose head is aged 25 or over is used.

Table 10. The amount of annual saving by strength of bequest motive

	Strong bequest motive			Weak bequest motive		
Age group	Obs	Mean	S. D.	Obs	Mean	S. D.
25–29	39 (5)	6.5	5.6	127 (8)	7.2	7.0
30–34	68 (4)	8.2	8.3	129 (6)	7.8	7.8
35–39	57 (2)	8.6	8.6	138 (8)	11.2	28.4
40–44	49 (1)	11.2	13.7	168 (12)	8.0	7.3
45–49	54 (2)	10.0	9.5	192 (14)	10.2	12.1
50–54	36 (4)	15.2	33.9	170 (15)	15.7	35.8
55–59	23 (0)	23.9	50.3	137 (11)	23.0	48.2
All	326 (18)	10.7	19.7	1061 (74)	11.9	26.1

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent). Numbers in parentheses are the number of the no-saving households.

Table 11. Amount of annual saving by presence of children

	With children			No children		
Age group	Obs	Mean	S. D.	Obs	Mean	S. D.
25–29	40 (6)	5.5	4.7	129 (8)	7.4	7.2
30–34	147 (7)	7.3	7.3	86 (3)	8.6	8.3
35–39	201 (8)	10.6	22.5	41 (2)	13.7	26.1
40–44	227 (14)	8.9	9.7	21 (0)	8.3	6.7
45–49	252 (21)	9.9	11.1	25 (2)	10.4	15.0
50–54	204 (19)	16.5	36.4	13 (1)	22.2	47.6
55–59	168 (11)	22.1	47.0	11 (1)	31.6	58.0
All	1239 (86)	12.1	25.9	326 (17)	10.2	18.9

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent). Numbers in parentheses are the number of the no-saving households.

Table 12. Estimation results of asset demand function by strength of bequest motive

Dependent variable	Gross total assets/DI				Net total assets/DI			
	(A) Strong bequest motive		(B) Weak bequest motive		(C) Strong bequest motive		(D) Weak bequest motive	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
(NPB/DI)*(Age30-39)	0.131	0.905	0.117	0.466	-0.156	0.977	-0.156	0.610
(NPB/DI)*(Age40-49)	-0.272	0.889	-0.698	0.404 *	-0.529	0.971	-0.582	0.528
(NPB/DI)*(Age50-59)	-0.223	0.476	-0.718	0.204 ***	-0.272	0.532	-0.906	0.262 ***
Age35-39	-0.653	1.239	0.310	0.576	-1.265	1.329	-0.044	0.751
Age40-44	-1.557	1.704	0.377	0.820	-2.363	1.867	-0.217	1.074
Age45-49	-0.689	1.996	1.170	0.901	-1.585	2.186	0.427	1.181
Age50-54	-1.371	2.446	1.230	1.048	-3.192	2.668	1.043	1.369
Age55-59	2.956	2.747	1.951	1.143 *	1.613	3.005	1.762	1.491
Cohort3 (1962-1966)	0.217	1.174	0.099	0.656	0.558	1.234	0.277	0.856
Cohort4 (1957-1961)	0.632	2.111	0.372	1.081	1.433	2.264	0.880	1.419
Cohort5 (1952-1956)	1.984	2.325	0.568	1.180	3.205	2.504	1.219	1.547
Cohort6 (1947-1951)	0.688	2.581	0.480	1.264	1.969	2.783	1.265	1.655
Cohort7 (1942-1946)	2.414	2.838	1.609	1.318	4.898	3.064	2.581	1.726
Cohort8 (1937-1941)	-0.298	3.114	2.949	1.396 **	1.355	3.368	3.762	1.825 **
Married	0.540	0.502	0.029	0.281	0.549	0.537	0.010	0.365
Part-timer	-0.577	0.298 *	-0.398	0.163 **	-0.585	0.330 *	-0.352	0.211 *
Detached house	2.467	0.361 ***	1.562	0.211 ***	2.421	0.393 ***	1.293	0.272 ***
Cluster housing	1.787	0.592 ***	0.496	0.299 *	2.812	0.661 ***	0.640	0.385 *
Dwelling with shop	26.072	1.310 ***	-0.083	0.667	26.512	1.427 ***	0.099	0.848
Repaying loan on deed	-0.479	0.359	-0.692	0.212 ***	-0.817	0.390 **	-1.051	0.275 ***
Repaying housing loan	1.482	0.351 ***	1.023	0.187 ***	0.469	0.385	0.502	0.242 **
Plan a housing loan	-0.042	0.277	0.259	0.175	0.040	0.305	0.454	0.228 **
Expect a retirement allowance	-0.189	0.330	-0.089	0.175	-0.313	0.363	-0.050	0.226
Private life annuity	0.738	0.350 **	0.387	0.216 *	0.824	0.385 **	0.439	0.281
Constant	0.613	0.921	0.527	0.494	0.491	0.971	0.331	0.639
Obs.	333		1055		331		1047	
Pseudo R^2.	0.23		0.18		0.19		0.16	

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross total assets is a total amount of real and financial assets. The amount of net total assets is obtained by deducting the amount of housing loan for residential land from the total amount of real and financial assets. DI denotes disposable income. The estimations use only the households whose head age is over 30 years old.

Table 12 *Continued*

Dependent variable	Gross financial assets/DI				Net financial assets/DI			
	(E) Strong bequest motive		(F) Weak bequest motive		(G) Strong bequest motive		(H) Weak bequest motive	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
(NPB/DI)*(Age25-29)	-0.159	0.289	-0.055	0.206	-0.034	0.302	0.077	0.226
(NPB/DI)*(Age30-39)	0.160	0.292	0.239	0.167	0.168	0.305	0.196	0.177
(NPB/DI)*(Age40-49)	-0.164	0.269	-0.276	0.150 *	0.292	0.288	-0.219	0.162
(NPB/DI)*(Age50-59)	0.290	0.159 *	-0.154	0.073 **	0.229	0.165	-0.179	0.079 **
Age30-34	-0.116	0.304	0.119	0.208	-0.098	0.312	0.290	0.224
Age35-39	0.130	0.605	0.276	0.339	0.032	0.625	0.525	0.363
Age40-44	0.524	0.751	0.318	0.416	0.473	0.777	0.481	0.446
Age45-49	1.371	0.818 *	0.525	0.436	1.329	0.845	0.527	0.468
Age50-54	0.956	0.937	0.562	0.478	1.291	0.966	0.550	0.513
Age55-59	1.183	1.020	1.049	0.506 **	1.490	1.052	1.066	0.544 **
Cohort2 (1967-1971)	0.465	0.431	0.110	0.245	0.246	0.476	-0.084	0.266
Cohort3 (1962-1966)	0.605	0.564	0.058	0.342	0.392	0.605	-0.246	0.369
Cohort4 (1957-1961)	0.362	0.806	0.076	0.461	0.313	0.853	-0.217	0.496
Cohort5 (1952-1956)	0.480	0.868	0.227	0.492	0.057	0.914	0.027	0.529
Cohort6 (1947-1951)	-0.327	0.937	0.176	0.520	-0.933	0.984	0.126	0.560
Cohort7 (1942-1946)	-0.349	1.011	0.381	0.536	-0.739	1.058	0.326	0.577
Cohort8 (1937-1941)	-0.403	1.092	0.131	0.560	-0.543	1.139	0.095	0.603
Married	0.139	0.138	0.108	0.086	0.069	0.151	0.051	0.094
Part-timer	-0.309	0.092 ***	-0.056	0.057	-0.196	0.096 **	-0.068	0.062
Detached house	0.104	0.104	0.198	0.069 ***	-0.014	0.109	0.194	0.074 ***
Cluster housing	0.526	0.184 ***	0.171	0.093 *	0.350	0.189 *	0.186	0.101 *
Dwelling with shop	0.165	0.382	0.262	0.221	-0.045	0.396	0.295	0.238
Repaying loan on deed	-0.369	0.105 ***	-0.391	0.071 ***	-0.600	0.106 ***	-0.678	0.077 ***
Repaying housing loan	-0.493	0.107 ***	-0.409	0.065 ***	-0.324	0.112 ***	-0.372	0.070 ***
Plan a housing loan	0.104	0.084	0.193	0.058 ***	0.053	0.088	0.176	0.063 ***
Expect a retirement allowance	0.090	0.096	0.026	0.058	0.092	0.100	0.095	0.063
Private life annuity	0.140	0.107	0.040	0.074	0.129	0.109	0.014	0.080
Constant	0.011	0.322	0.283	0.170 *	0.229	0.369	0.357	0.185 *
Obs.	387		1255		387		1255	
Pseudo R^2.	0.13		0.09		0.14		0.10	

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross financial assets is a total amount of financial assets. The amount of net financial assets is obtained by deducting the amount of loan on deed from the amount of gross financial assets. DI denotes disposable income. All age groups are used for estimations.

Table 13. Estimation results of asset demand function by presence of children

Dependent variable	Gross total assets/DI				Net total assets/DI			
	(A) With children		(B) No children		(C) With children		(D) No children	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
(NPB/DI)*(Age30-39)	0.236	0.487	0.823	0.751	0.113	0.564	0.766	0.442 *
(NPB/DI)*(Age40-49)	-0.612	0.392	-1.201	0.567 **	-0.723	0.458	-1.359	0.331 ***
(NPB/DI)*(Age50-59)	-0.017	0.203	-1.744	0.504 ***	-0.099	0.238	-1.594	0.292 ***
Age35-39	0.109	0.541	1.386	0.954	-0.061	0.629	1.285	0.553 **
Age40-44	-0.362	0.766	3.271	1.559 **	-0.564	0.892	3.291	0.924 ***
Age45-49	-0.100	0.836	1.820	1.913	-0.379	0.973	1.820	1.127
Age50-54	-0.501	0.975	5.636	2.295 **	-0.881	1.137	5.240	1.325 ***
Age55-59	0.602	1.068	3.962	2.521	0.277	1.242	2.959	1.488 **
Cohort3 (1962-1966)	0.054	0.610	-1.282	1.002	0.119	0.708	-1.252	0.585 **
Cohort4 (1957-1961)	0.292	1.032	-2.306	1.808	0.568	1.197	-2.087	1.070 *
Cohort5 (1952-1956)	0.970	1.106	-1.988	2.074	1.377	1.284	-1.763	1.214
Cohort6 (1947-1951)	1.200	1.177	-1.459	2.325	1.744	1.368	-1.217	1.360
Cohort7 (1942-1946)	1.760	1.228	-1.936	2.686	2.536	1.428 *	-1.215	1.600
Cohort8 (1937-1941)	2.035	1.301	3.912	3.080	2.930	1.514 *	4.301	1.826 **
Married	0.545	0.726	0.220	0.424	0.603	0.798	0.424	0.245 *
Part-timer	-0.201	0.151	-0.551	0.507	-0.321	0.175 *	-0.713	0.290 **
Detached house	2.030	0.199 ***	0.369	0.417	1.728	0.231 ***	0.510	0.237 **
Cluster housing	0.696	0.287 **	0.924	0.797	1.014	0.334 ***	1.140	0.468 **
Dwelling with shop	0.740	0.640	-0.117	1.252	0.840	0.761	0.058	0.725
Repaying loan on deed	-0.590	0.194 ***	-0.685	0.482	-0.928	0.225 ***	-0.944	0.284 ***
Repaying housing loan	1.073	0.170 ***	2.795	0.592 ***	0.386	0.197 *	2.982	0.363 ***
Plan a housing loan	0.306	0.156 **	0.382	0.366	0.354	0.182 *	0.424	0.215 **
Expect a retirement allowance	-0.002	0.166	-0.256	0.365	-0.014	0.192	-0.309	0.212
Private life annuity	0.319	0.195	0.338	0.517	0.301	0.225	0.344	0.303
Constant	0.103	0.854	1.584	0.723 **	-0.009	0.954	1.474	0.433 ***
Obs.	1337		212		1330		208	
Pseudo R^2.	0.17		0.19		0.14		0.17	

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross total assets is a total amount of real and financial assets. The amount of net total assets is obtained by deducting the amount of housing loan for residential land from the total amount of real and financial assets. DI denotes disposable income. The estimations use only the households whose head age is over 30 years old.

Table 13 *Continued*

Dependent variable	Gross financial assets/DI				Net financial assets/DI			
	(E) With children		(F) No children		(G) With children		(H) No children	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
(NPB/DI)*(Age25-29)	0.345	0.311	0.040	0.153	0.282	0.265	0.111	0.149
(NPB/DI)*(Age30-39)	-0.072	0.179	0.689	0.191 ***	-0.134	0.159	0.460	0.190 **
(NPB/DI)*(Age40-49)	-0.240	0.149	-0.260	0.133 *	-0.163	0.134	-0.217	0.131 *
(NPB/DI)*(Age50-59)	0.104	0.079	-0.487	0.089 ***	0.114	0.070	-0.490	0.117 ***
Age30-34	0.209	0.230	0.846	0.197 ***	0.019	0.204	0.927	0.192 ***
Age35-39	0.127	0.356	1.837	0.372 ***	-0.086	0.316	1.732	0.367 ***
Age40-44	0.147	0.424	2.007	0.503 ***	-0.101	0.377	1.659	0.500 ***
Age45-49	0.208	0.441	2.037	0.568 ***	-0.057	0.392	1.668	0.560 ***
Age50-54	0.051	0.481	3.878	0.650 ***	-0.171	0.428	3.562	0.644 ***
Age55-59	0.372	0.509	3.756	0.692 ***	0.135	0.453	3.392	0.682 ***
Cohort2 (1967-1971)	-0.163	0.405	0.049	0.192	0.075	0.352	-0.066	0.186
Cohort3 (1962-1966)	-0.077	0.464	-0.800	0.322 **	0.216	0.405	-0.861	0.316 ***
Cohort4 (1957-1961)	0.136	0.554	-1.705	0.502 ***	0.452	0.487	-1.579	0.498 ***
Cohort5 (1952-1956)	0.273	0.576	-1.528	0.557 ***	0.601	0.508	-1.258	0.547 **
Cohort6 (1947-1951)	0.388	0.596	-1.569	0.616 **	0.735	0.526	-1.286	0.606 **
Cohort7 (1942-1946)	0.356	0.611	-2.269	0.712 ***	0.687	0.538	-1.938	0.703 ***
Cohort8 (1937-1941)	0.255	0.632	-1.441	0.806 *	0.546	0.558	-1.065	0.800
Married	-0.346	0.275	0.064	0.091	-0.461	0.243 *	0.114	0.090
Part-timer	-0.068	0.057	-0.294	0.112 ***	-0.086	0.051 *	-0.340	0.111 ***
Detached house	0.122	0.075	0.029	0.077	0.076	0.067	0.070	0.076
Cluster housing	0.118	0.100	0.386	0.150 ***	0.106	0.089	0.486	0.150 ***
Dwelling with shop	0.278	0.237	-0.376	0.268	0.388	0.210 *	-0.210	0.266
Repaying loan on deed	-0.401	0.072 ***	-0.404	0.097 ***	-0.627	0.063 ***	-0.686	0.095 ***
Repaying housing loan	-0.359	0.065 ***	-0.318	0.134 **	-0.345	0.057 ***	-0.354	0.132 ***
Plan a housing loan	0.190	0.059 ***	0.175	0.070 **	0.156	0.052 ***	0.247	0.069 ***
Expect a retirement allowance	0.051	0.062	0.001	0.071	0.091	0.055 *	-0.013	0.070
Private life annuity	0.073	0.073	0.033	0.106	0.099	0.065	0.020	0.104
Constant	0.847	0.421 **	0.358	0.133 ***	0.853	0.369 **	0.355	0.131 ***
Obs.	1460		373		1460		373	
Pseudo R^2.	0.08		0.11		0.10		0.14	

Note: The asterisks indicate statistical significance at the 1 % (*), 5 % (**), and 10 % (***) significance levels. The amount of gross financial assets is a total amount of financial assets. The amount of net financial assets is obtained by deducting the amount of loan on deed from the amount of gross financial assets. DI denotes disposable income. All age groups are used for estimations.

Appendix table A-1. The amount of housing loans for residential land (for the households that have housing loans)

Year	1996					2000				
Age group	Obs	Mean	S. D.	Min	Max	Obs	Mean	S. D.	Min	Max
25-29	2	80.8	18.4	67.8	93.8	1	108.0	–	–	–
30-34	13	84.2	51.4	15.1	224.7	15	74.4	34.3	27.0	141.7
35-39	31	81.9	42.3	4.6	237.2	22	91.4	39.9	16.9	185.5
40-44	48	80.6	47.0	9.1	244.9	50	78.4	36.5	16.9	168.7
45-49	67	58.7	47.2	1.3	230.4	41	66.9	47.9	3.4	168.7
50-54	61	44.6	36.3	1.9	158.0	48	44.5	39.6	3.4	185.5
55-59	36	40.0	39.0	1.3	137.3	30	46.3	42.3	3.4	178.8
All	258	61.1	45.9	1.3	244.9	207	64.8	43.5	3.4	185.5

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent).

Appendix table A-2. The amount of housing loans for residential land (for all households)

Year	1996					2000				
Age group	Obs	Mean	S. D.	Min	Max	Obs	Mean	S. D.	Min	Max
25-29	128	1.3	10.2	0	93.8	80	1.3	12.1	0	108.0
30-34	152	7.2	27.7	0	224.7	110	10.2	28.5	0	141.7
35-39	149	17.0	38.4	0	237.2	125	16.1	38.6	0	185.5
40-44	160	24.2	45.0	0	244.9	126	31.1	44.8	0	168.7
45-49	195	20.2	39.2	0	230.4	119	23.0	42.4	0	168.7
50-54	151	18.0	31.8	0	158.0	110	19.4	34.1	0	185.5
55-59	118	12.2	28.2	0	137.3	86	16.2	33.2	0	178.8
All	1053	15.0	34.7	0	244.9	756	17.8	36.8	0	185.5

Note: All figures (except for Obs) are measured in hundred thousand yen, and they are deflated by Consumer Price Index for Ku-area of Tokyo (General, excluding imputed rent).

Figure 1 Theoretical figure of substitution rate

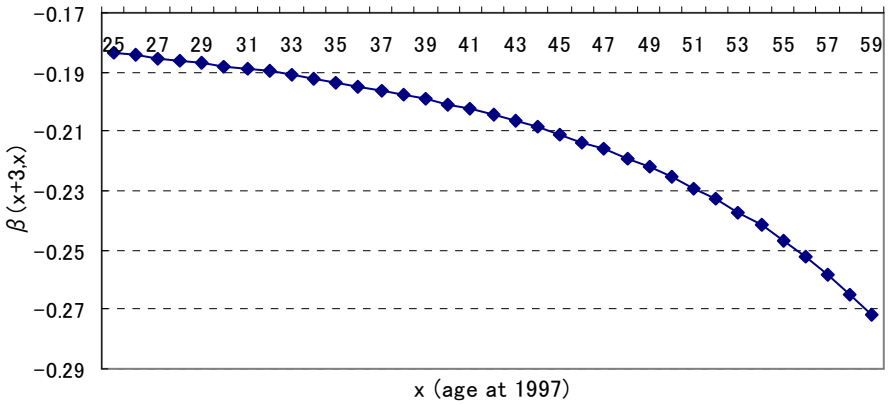
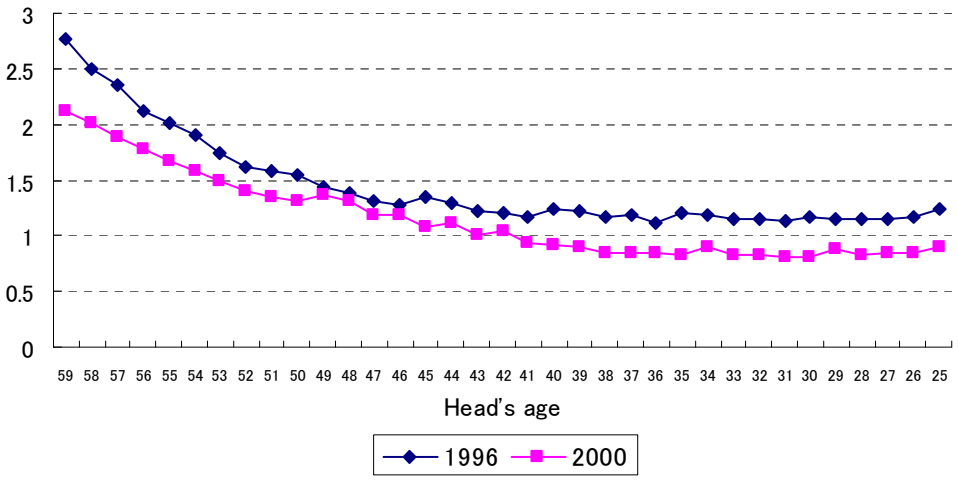


Figure 2 Ratio of benefits to insurance premiums



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