Review of Income and Wealth
Series 51, Number 3, September 2005

ANNUITIZED ASSET ADEQUACY IN JAPAN: THE DEMAND FOR INDIVIDUAL PENSIONS

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In this paper, I analyze the impact of social security wealth, retirement payments, and living expenses during retirement on people's retirement savings in general, and on their individual pension holdings in particular, using micro data from a 1996 Japanese household survey. I confirm a replacement effect of social security on saving for all types of households and on individual pensions for self-employed households only. This suggests that the social security assets of self-employed households are less than their optimal level of annuitized assets and that they would increase their demand for individual pensions if social security benefits were to be reduced.

1. Introduction

One of the main sources of income for financing living expenses after retirement is pensions. Although most people think of social security (public pensions) when they hear the word "pensions," there are other important pension systems such as employer-provided pensions (which are provided by one's employer—for example, private companies or the government) and individual pensions (which are provided by insurance companies). There are big differences among the systems: for example, participation in social security and employer-provided pension systems is compulsory and people have little or no choice about the amount of coverage, whereas participation in individual pension systems is voluntary and the individual can choose the amount of coverage. Since the rapid aging of Japan's population will necessitate drastic reforms of her social security system including sizable benefit reductions, individual pensions have begun to play a more important role as a means of providing retirement security (see Section 5.1 for more details). Under such circumstances, it is more important than ever before to pay attention to the relationship between social security and individual pensions.

In this paper, I analyze the impact of social security wealth, retirement payments, and living expenses during retirement on people's retirement savings in

Note: I am greatly indebted to Charles Yuji Horioka for his kind advice, comments, and encouragement throughout the process of writing this paper. I would also like to thank Seki Asano, Daiji Kawaguchi, Colin McKenzie, Fumio Ohtake, Wataru Suzuki, Dariusz Stanko, Ken Tabata, Junmin Wan, Ken Yamada, Yanfei Zhou, members of Professor Horioka's graduate seminar, seminar participants at Osaka Prefecture University, and participants of the Japanese Economic Association meeting of October 2001, and especially two anonymous referees and the managing editors Bart van Ark and Edward N. Wolff for their helpful comments and discussions. This paper was prepared under the supervision of Charles Yuji Horioka, Professor, Institute of Social and Economic Research, Osaka University, and former Special Guest Research Officer, Institute for Posts and Telecommunications Policy. I am grateful to the Institute for Posts and Telecommunications Policy for allowing me to use these data.

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general, and on their individual pension holdings in particular. For this I use micro data from the 1996 "Survey of the Financial Asset Choice of Households (SFACH: in Japanese, Kakei ni okeru Kin'yuu-Shisan-Sentaku ni kansuru Chousa)," which was conducted in November 1996 by the Institute for Posts and Telecommunications Policy (IPTP).

A large number of studies have been conducted on the relationship between social security and life insurance, but few have focused on the relationship between social security and individual pensions in spite of its importance in his seminal study. Bernheim (1991) points out that individuals would purchase individual pensions if their social security assets were less than the optimal level of their annuitized assets (i.e. if they were underannuitized), whereas they would purchase life insurance if their social security assets exceeded the optimal level of their annuitized assets (i.e. if they were overannuitized). He finds that social security benefits have a positive and significant impact on life insurance holdings and concludes that individuals are overannuitized and that the government should decrease social security benefits. By contrast, Brown (1999) finds that there is no relationship between social security benefits and life insurance holdings and concludes that individuals are not seeking to "undo" social security for bequest reasons. Many studies have been conducted on the relationship between social security and life insurance in Japan as well, but there is no agreement on whether or not the individuals are overannuitized. For example, Suzuki (2001) analyzes the relationship between social security and life insurance using the SFACH (the same Japanese survey I use in my analysis) and finds that social security benefits significantly increase life insurance holdings only in the case of elderly individuals who belong to the Employees' Pension, which is consistent with Bernheim's results for all households. Asano (1998, 2001) is the only previous study that analyzes the impact of social security not only on the demand for life insurance but also on the demand for individual pensions using Japanese data.[1] He uses the 1990 and 1994 data from the "Nikkei-Needs RADAR Survey on Financial Behavior (RADAR)," conducted by the Data Bank Bureau of Nihon Keizai Shimbun, Inc., and finds that social security has a negative and significant impact on the demand for individual pensions. This suggests that individuals are overannuitized, whereas the impact of social security on the demand for life insurance differs significantly by respondents' age.

The contributions of this paper are twofold. First, this paper is one of the first to analyze the impact of social security on individual pensions in order to make inferences about the extent to which households are overannuitized. I infer the degree to which households are overannuitized by analyzing the impact of social security on individual pensions for the following two reasons. The first reason is that the rapid aging of Japan's population is putting severe strains on the public pension system and has necessitated reductions in social security benefits. For example, the 1994 reforms stipulated a gradual increase in the age at which the basic pension is paid from 60 to 65 years old. The 1999 reforms stipulated a 5 percent reduction in benefits as well as a gradual increase in the age at which the

[1]Although Bernheim (1991) also analyzed the relationship between social security and the demand for individual pensions using U.S. data, his sample relates to retirement-age individuals, whereas Asano and I use samples of individuals who have not yet retired, meaning that the results are not comparable.

earnings-related component of the benefits of salaried workers is paid from 60 to 65 years old. Most recently, the 2004 reforms stipulated a 0.354 percentage point increase per year in premiums for salaried workers until October 2017 (and constant at 18.3 percent thereafter) and a 280 yen increase per year in premiums for self-employed workers until April 2017 (and constant at 16,900 yen thereafter). Such reduction in social security benefits has increased the likelihood that Japanese households are underannuitized and increased the potential role for individual pensions. The second reason for redirecting our attention from life insurance to pensions is that life insurance is held not only for the purpose of offsetting excess social security benefits but also for protecting the human capital of the primary breadwinner, as Brown (1999) points out. This may cause a spurious relationship between social security and life insurance, and thus it is difficult to make inferences about the degree to which households are overannuitized by looking at the impact of social security on the demand for life insurance. Brown (1999) and Suzuki (2001) restricted the sample to elderly respondents in order to avoid this problem, whereas I avoid this problem by analyzing the impact of social security on individual pension demand because individual pensions are held only for the purpose of covering the deficiency of social security benefits.

Second, this paper analyzes the impact of social security on the demand for individual pensions, shedding light on the difference between salaried workers and self-employed workers. In Japan, for example, self-employed workers, farmers, etc, receive only a flat rate pension whereas salaried workers receive not only a flat rate component but also an earnings-related component, as a result of which the social security benefits of the former are much lower than those of the latter. In addition, retirement payments are paid to the latter but not to the former. Thus, people's behavior, especially their wealth target for retirement and their demand for individual pensions, might be substantially different between the two occupational groups (see Section 5.1 for more details). In this paper, I present separate results for the subsamples of salaried workers and self-employed workers and obtain dramatically different results for the two occupational groups.

To preview my main findings, I find evidence of a replacement effect of social security benefits on retirement saving for all types of households and on individual pensions for self-employed households only but not for salaried worker households. This suggests that the social security assets of self-employed households are less than the optimal level of their annuitized assets, and that they would increase their demand for individual pensions if social security benefits were to be reduced.

The paper is organized as follows. In Section 2, I discuss theoretical considerations; in Section 3, I describe the estimation model; in Section 4, I describe the data source, variable definitions, sample selection, and estimation method; in Section 5, I present some descriptive statistics; in Section 6, I present my estimation results; and Section 7 concludes.

2. Theoretical Considerations

In this section, I introduce an optimal retirement portfolio choice model (a two-period overlapping generations model) based on Bernheim's (1991)

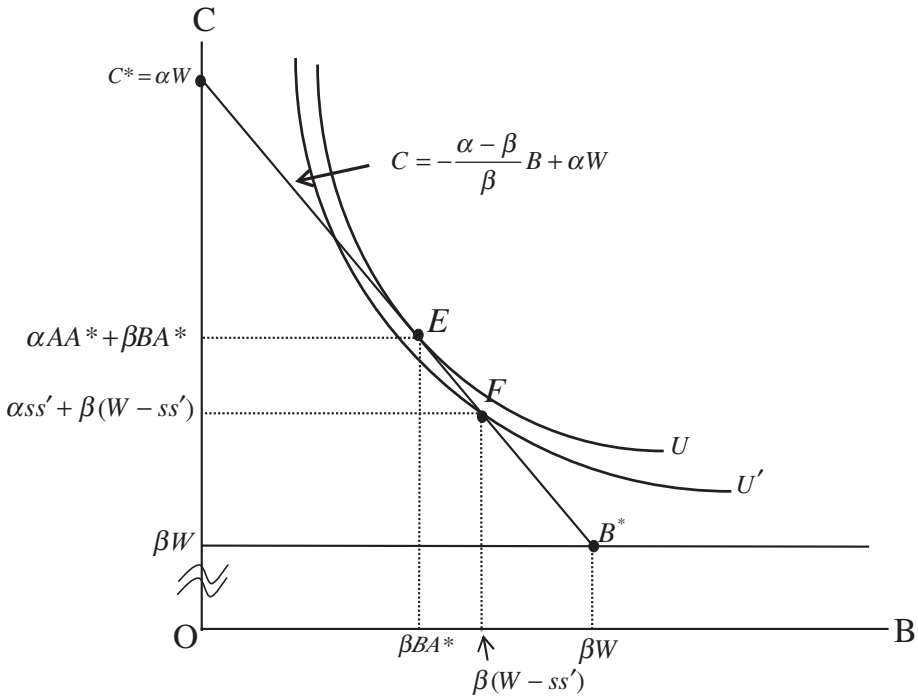

Figure 1. An Optimal Retirement Portfolio Choice Model

model in order to explain the impact of social security on individual pensions theoretically.[2]

Consider an economy in which there are only two types of assets—annuitized assets (AA ≥ 0: such as social security, employer-provided pensions, individual pensions, etc) and bequeathable assets (BA ≥ 0: such as financial assets, real assets, etc). The individual decides how to allocate his/her wealth W between annuitized assets and bequeathable assets in the first period as follows:

$$W = AA + BA$$

One dollar invested in annuitized assets yields a rate of return α (= (1 + α')) only if the individual survives in the second period, whereas bequeathable assets yield a rate of return β (= (1 + β')) whether or not he/she survives. The return on annuitized assets (α') is larger than that on bequeathable assets (β') because the return on annuitized assets includes a mortality premium.

The individual's budget constraint in the second period can be described as follows:

$$\begin{cases} C = \alpha AA + \beta BA & \text{if the individual survives,} \\ B = \beta BA & \text{otherwise.} \end{cases}$$

Figure 1 depicts the bequest-consumption plane in the second period. The horizontal axis (the B-axis) measures the bequest the individual will leave behind if he/she dies, whereas the vertical axis (the C-axis) measures how much the indi-

[2]See Bernheim (1991) for more details.

vidual will consume if he/she survives. If the individual decides to hold all of his/her wealth in bequeathable assets (that is, $AA = 0$, $BA = W$), his/her wealth in the second period will be point B^*, whereas if he/she decides to hold all of his/her wealth in annuitized assets (that is, $AA = W$, $BA = 0$), his/her wealth in the second period will be point C^*. The line $C = -\frac{\alpha - \beta}{\beta} B + \alpha W$, which goes through points B^* and C^*, indicates all feasible combinations of bequests and consumption in the second period. The individual derives utility both from his/her own consumption and from the utility of his/her children (the case in which the individual has a bequest motive). If one assumes that the utility function is quasi-concave, the indifference curves are as shown in Figure 1, and the optimal proportions of annuitized assets and bequeathable assets in the first period will be AA^* and BA^* (but that is, $C = \alpha AA^* + \beta BA^*$ if he/she survives and $B = \beta BA^*$ otherwise in the second period) (E in Figure 1).[3]

Consider the case in which the government operates a compulsory social security program, whereby the government collects ss' in social security contributions (but less than the individual's optimal level of annuitized assets). In this case, the individual's wealth in the second period will be $C = \alpha ss' + \beta(W - ss')$ if he/she survives and $B = \beta(W - ss')$ otherwise (F in Figure 1). If the individual cannot purchase individual pensions, he/she cannot achieve the optimal proportions of annuitized assets and bequeathable assets. However, if the individual has access to individual pensions, he/she will purchase individual pensions in the amount of $W - ss' - BA^*$ in order to cover the deficiency of social security: doing so will allow him/her to attain utility level U in Figure 1 (E in Figure 1).[4] Thus, the individual will purchase individual pensions if the amount of his/her social security assets is less than his/her optimal level of annuitized assets.[5]

3. The Estimation Model

In this section, I describe the estimation model which is based on the theoretical model in Section 2.

[3]We can also consider the case in which the individual has no bequest motive because the idea is basically the same. In this case, the indifference curves are horizontal because the individual derives utility only from his/her own consumption.

[4]In contrast, if the government collects ss'' in social security contributions which is more than the individual's optimal level of annuitized assets, the individual would like to sell individual pensions in the amount of $BA^* - (W - ss'')$. As he/she has no individual pensions to sell, the individual will choose to eliminate the overannuitization of his/her wealth caused by excessively high social security contributions using an alternative method—namely by purchasing life insurance (assuming he/she has access to life insurance), which will also allow him/her to attain utility level U in Figure 1 (E in Figure 1). Thus, the individual purchases life insurance if the amount of social security asset is more than his/her optimal level of annuitized assets.

[5]In the theoretical model, I assume for the sake of simplicity that individuals never hold both individual pensions and life insurance because I assume that life insurance is held only for the purpose of offsetting excess social security benefits. This is an extreme assumption because life insurance is also held for a different purpose, as I explained in the introduction. In the sample I use in the analysis in this paper (421 observations) the percentage of individuals who hold both individual pensions and life insurance is 32.54 percent, that of those who hold only the former 0.48 percent, that of those who hold only the latter 60.33 percent, and that of those who hold neither 6.65 percent. In the full sample, excluding non-response observations (3,233 observations) the percentages are 30.25 percent, 1.36 percent, 54.10 percent, and 14.29 percent, respectively.

3.1. *Wealth Target Equation for Retirement*

In the theoretical model in Section 2, I assumed for the sake of simplicity that the individual's wealth is exogenous. According to the life cycle hypothesis of Modigliani and Brumberg (1954), as extended by Feldstein (1974), people save for life after retirement taking account of their expectations concerning their living expenses during retirement, social security benefits, retirement payments, etc. If individuals behave in accordance with this hypothesis, they will decide their wealth target for retirement (WTR) taking account of living expenses during retirement (RLE), social security wealth (SSW), and retirement payments (RP).

Thus, the estimating equation I used is as follows:

$$\text{WTR} = a_1 \times \text{RLE} + a_2 \times \text{SSW} + a_3 \times \text{RP} + a_5 + u \tag{1}$$

The higher living expenses during retirement are, the higher WTR should be, and thus one should expect that $a_1 > 0$. If social security benefits and retirement payments are substitutes for one's own saving, $a_2 < 0$ and $a_3 < 0$, and if SSW and RP are perfect substitutes for one's own saving, $a_2 = -1$ and $a_3 = -1$.

In addition, people's behavior during retirement may have an impact on their wealth target for retirement, so I add to this equation the following dummy variables: BEQ (a dummy variable that equals one for those who have a bequest motive and zero otherwise),[6] FS (a dummy variable that equals one for those who plan to receive financial support from their child or children and zero otherwise), NC (a dummy variable that equals one for those who plan to receive nursing care from their child or children and zero otherwise), and COHBT (a dummy variable that equals one for those who plan to live with their child or children and zero otherwise). Also, there may be a relationship between people's health condition and their wealth target for retirement, so I add the dummy variable SICK (a dummy variable that equals one for those who are in poor health and zero otherwise) to this equation.[7]

[6]I use the following question from the survey introduced below in section 4 to analyze the relationship between the wealth target for retirement and bequests: How do you feel about leaving a bequest (including inter vivos transfers) to your children?

(1) I am planning to leave a bequest (including inter vivos transfers) no matter what.
(2) I am planning to leave a bequest (including inter vivos transfers) only if my children provide care during old age.
(3) I am planning to leave a bequest (including inter vivos transfers) only if my children carry on the family business.
(4) I am not planning to make special efforts to leave a bequest but will leave whatever happens to be left over.
(5) It is not necessary to leave a bequest (including inter vivos transfers).

I define the variable BEQ that equals one for those who have a bequest motive (those who choose options 1, 2, or 3) and zero otherwise. I also tried adding BEQ as well as another dummy variable that equals one for those who are planning to make special efforts to leave a bequest but will leave whatever happens to be left over (option 4) and zero otherwise. Finally, I tried adding four dummy variables corresponding to each of the four options. Here I present the results only for BEQ because none of the coefficients of the other dummy variables were significantly different from zero.

[7]The number of respondents in the survey used who have a bequest motive is 103 (34 self-employed households and 69 salaried worker households), that of those who plan to receive financial support from their child or children is 37 (15 self-employed households and 22 salaried worker households), that of those who plan to receive nursing care from their child or children is 20 (11 self-employed households and 9 salaried worker households), that of those who plan to live with their child or children is 81 (18 self-employed households and 63 salaried worker households), and that of those who are in poor health is 32 (10 self-employed households and 22 salaried worker households).

$$\text{WTR} = a_1 \times \text{RLE} + a_2 \times \text{SSW} + a_3 \times \text{RP} + a_4 \times \text{BEQ} + a_5 \times \text{FS} + a_6 \times \text{NC} + a_7 \times \text{COHBT} + a_8 \times \text{SICK} + a_9 + u \quad (2)$$

If individuals have a bequest motive, they need to set aside some wealth for this purpose and therefore may not be able to save up as much for retirement purposes. Thus, one expects that $a_4 < 0$. If individuals plan to receive financial support or nursing care from their children or to live with their children, they will decrease their wealth target for retirement because they require fewer resources of their own during retirement. Thus, one expects that a_5, a_6, $a_7 < 0$. The sign of the coefficient of SICK is ambiguous. If individuals who are in poor health believe that they will die earlier than those who are in good health, they will save less for retirement than healthy individuals ($a_8 < 0$). But if individuals who are in poor health believe that their medical, nursing care, and other expenses during retirement will be higher than those who are in good health, they save will more for retirement than healthy individuals ($a_8 > 0$).

3.2. *The Demand for Individual Pensions*

As discussed in Section 2, if the individual behaves in accordance with the life cycle hypothesis, individuals should convert all of their conventional retirement assets into annuities as long as the marginal annuity pays a rate of return that is equal to or greater than that paid on conventional assets.[8]

Thus, the demand for individual pensions (IP) equals:

$$\text{IP} = b_1 \times \text{WTR} + b_2 + u \quad (3)$$

Theory implies that $b_1 = 1$ and $b_2 = 0$.

3.3. *Reduced Form Equation for Individual Pension Demand*

Next a reduced form equation may be obtained by substituting equation (1) into equation (3). Using this reduced form equation, not only can one analyze the relationship between social security, retirement payments, and individual pensions, but also alleviate the simultaneity between the wealth target for retirement and individual pensions.

As discussed in Section 2, if individuals behave in accordance with optimal portfolio choice theory and if retirement needs exceed the sum of social security wealth and retirement payments, the latter two should have a negative and significant impact on the demand for individual pensions.

[8]When one cancels an individual pension plan, one may get a lump-sum refund called a "cancellation refund," which can be regarded as the saving portion of the individual pension. For example, the amount of the cancellation refund in the case of individual pensions sold by Nippon Life Insurance Company (for those who enroll when they are between 40 and 60 years old) is 669,000 yen per one million yen if the individual cancels just before the expiration date of the contract. Previous studies have argued that one should exclude this cancellation refund from the value of the individual pension and use only the insurance portion. I did not control for this cancellation refund for the following two reasons: first, there is no information on the amount of the cancellation refund in the survey I used in my analysis. Second, if cancellation refunds do not differ significantly among insurance plans and insurance companies, taking account of the cancellation refund would merely entail reducing IP by the same proportionate amount for all respondents, and thus the estimation results would not be significantly affected.

That is,

$$\text{IP} = c_1 \times \text{RLE} + c_2 \times \text{SSW} + c_3 \times \text{RP} + c_4 + u \tag{4}$$

where:

$$c_1 = a_1 \times b_1 > 0, \quad c_2 = a_2 \times b_1 < 0, \quad c_3 = a_3 \times b_1 < 0, \quad c_4 = b_2 + a_4 \times b_1.$$

I also add to this equation the same dummy variables (BEQ, FS, NC, COHBT, SICK) that I used in Section 3.1 and expect the coefficients of all of these dummy variables to be negative:

$$\begin{aligned}\text{IP} = {} & c_1 \times \text{RLE} + c_2 \times \text{SSW} + c_3 \times \text{RP} + c_4 \times \text{BEQ} + c_5 \times \text{FS} + c_6 \times \text{NC} \\ & + c_7 \times \text{COHBT} + c_8 \times \text{SICK} + c_9 + u\end{aligned} \tag{5}$$

4. The Data Source, Variable Definitions, Sample Selection, and Estimation Method

4.1. *The Data Source*

I use micro data from the 1996 "Survey of the Financial Asset Choice of Households (SFACH) (in Japanese, Kakei ni okeru Kin'yuu-Shisan-Sentaku ni kansuru Chousa)" which was conducted in November 1996 by the Institute for Posts and Telecommunications Policy of what was then called the Ministry of Posts and Telecommunications of the Government of Japan. This survey collects detailed information, including information on retirement, individual pensions etc, making it ideal for the purposes of the analysis here.

In this survey, a stratified multistage random sample of 6,000 households with a head of household aged 20 years or older from throughout Japan was surveyed by the drop-off, pick-up method, resulting in 3,695 responses (a response rate of 61.6 percent).

4.2. *Questionnaire*

I use the following questions in order to analyze the estimation model I introduced in Section 3.

(1) "After the household head retires, about how much will your living expenses be per month?" (MRLE: future expected Living Expenses during Retirement per month)

(2) "After the household head retires, what portion of your monthly living expenses do you plan to finance using social security benefits? Indicate as a percentage of monthly living expenses during retirement." (PSS: Social Security Benefits Proportion)

(3) "Are you enrolled in an individual pension? If so, about how much did you pay in premiums last year and what is the cumulative amount of past premiums?" (IPL: Last Year's Premiums; IPC: Cumulative Amount of Past Premiums)

(4) "Are you saving for retirement? If so, about how much is your wealth target (financial assets) for retirement?" (WTR: Wealth Target for Retirement)[9]

[9]Some readers might wonder whether or not this amount (WTR) includes retirement payments, but there is little possibility of this because the survey asks about "current" saving for retirement.

The survey also collects information on the age, annual income, marital status, educational background, planned retirement age, occupation, and firm size of the respondent and his or her spouse.

4.3. *Variable Definitions: Conversion of Flow Data to Stock Data*

As I discussed in Section 3, the estimation model I use in my analysis requires stock data, whereas the survey collects almost entirely flow data. I converted the flow data to stock data as follows.

- *Future expected Living Expenses during Retirement (RLE)*. I calculate the total amount of future expected living expenses during retirement (RLE: a stock) from monthly future expected living expenses during retirement (MRLE (question 1): a flow) as follows:

$$\text{RLE} = \text{MRLE} \times \text{RETSPAN}, \text{ where RETSPAN} = \text{retirement span (in months).}$$[10]

- *Social Security Wealth (SSW)*. I calculate social security wealth (SSW: a stock) from the monthly future expected living expenses during retirement (MRLE (question 1) : a flow) and the expected social security benefit proportion (PSS: question 2) as follows:

$$\text{SSW} = \text{MRLE} \times \text{PSS} \times \text{RETSPAN}.$$

- *Holdings of Individual Pensions (IP)*. I calculate holdings of individual pensions (IP: a stock) from last year's premium (IPL (question 3), a flow) and the cumulative amount of past premiums (IPC (question 3)), as follows:

$$\text{IP} = \text{IPL} \times \text{WRKSPAN} + \text{IPC}, \text{ where WRKSPAN} = \text{working span (number of years from now until retirement)}$$

- *The Estimation of Retirement Payments*. There is no information on the expected amount of retirement payments in the survey, so I use Wakabayashi's (2001) method (based on that of Dicks-Mireaux and King, 1984) in order to estimate retirement payments. In the present paper, I use information not only on the firm size of respondents' employers but also on respondents' educational attainment. Wakabayashi (2001) used only information on the former.

4.4. *Sample Selection*

The sample I used in my analysis is as follows. First, I dropped observations for which the respondent's gender is not known. Second, I used only the subsam-

[10] I use Horioka and Okui's (1999) method for estimating the retirement span. They defined retirement span (RETSPAN) as follows: RETSPAN = max [the household head's expected age at death—his planned retirement age, the spouse's expected age at death + (the household head's age – the spouse's age)—the household head's planned retirement age]. Note that the unit of analysis in the theoretical analysis in Section 2 is the individual whereas the unit of analysis in the empirical analysis is the household. The survey I use does not collect any information on the expected age at death so I use data on life expectancy at retirement from the "18th Life Tables" (Statistics and Information Department of the Minister's Secretariat of the Ministry of Health and Welfare) and add to it the respondent's planned retirement age.

ple of married respondents because I do not know whether or not single respondents will marry in the future. Moreover, in the questions pertaining to saving for retirement, expected social security benefits, etc, single respondents are asked to put down the amount for themselves only whereas married couples are asked to put down the total amount for the household head and spouse combined, meaning that the amounts are not comparable. Third, as I am only interested in how individuals prepare for their future retirement, I confine the sample to households that have not yet retired.[11] Finally, I dropped all observations for which all of the necessary information is not available. Restricting the sample to respondents who report their gender reduces the number of observations from 3,695 to 3,666. Restricting the sample to respondents who are married reduces the number of observations further to 2,694. Restricting the sample to respondents who are not yet retired reduces the number of observations further to 2,416, of which 575 are self-employed households (a household whose head is a farmer or self-employed worker), 1,792 are salaried worker households (a household whose head is a salaried worker working for a private company or for the government), and 49 are other households (a household whose household head is a part-time worker, is not working, or does not report his/her household head's occupation). Restricting the sample to respondents for whom all of the necessary information is available reduces the number of observations further to 421, of which 134 are self-employed households and 287 are salaried worker households.

4.5. *The Estimation Method*

I use a Tobit model because there are 211 respondents (about 50 percent) who do not have a wealth target for retirement and 282 respondents (about 67 percent) who are not enrolled in an individual pension.[12] Equations (1), (2), (4) and (5) include RP (retirement payments). Retirement payments are paid only to salaried workers working for a private company or for the government and are not paid to self-employed workers. However, as I include both salaried worker households and self-employed households in the sample in order to avoid sample selection bias, I set the retirement payments of self-employed workers equal to zero.

5. Descriptive Statistics

5.1. *Occupational Differences*

In this section, I present the main descriptive statistics broken down by the occupation of the household head (see Table 1 for more details).

Looking first at the average length of the retirement span (RETSPAN), the average length is 23.0 years for self-employed households and 25.6 years for

[11]I defined a household that has not yet retired as a household in which all of the following three conditions apply. First, the respondent's current age is equal to or smaller than his/her retirement age. Second, neither the respondent nor his or her spouse is receiving social security benefits. Third, the respondent answers questions directed at those who are before retirement.

[12]"Zero respondents" do not include respondents who did not indicate whether or not they have a wealth target for retirement or whether or not they are enrolled in an individual pension because I limit my sample to observations for which all of the necessary information is available.

salaried worker households, and thus the length for self-employed households is 2.6 years shorter than that of salaried worker households. Presumably, this is because there is a mandatory retirement age system for salaried workers in most companies in Japan, whereas there is no such system for self-employed workers.

Next I compare the average amount of current living expenses per month (CLE) and future expected living expenses during retirement per month (MRLE). The average MRLE is about 285,000 yen for all categories of households and hardly differs by occupation of the household head, whereas the average CLE is much higher for self-employed households than it is for salaried workers (340,200 yen vs. 305,100 yen). The average CLE in my survey is much lower than that in other data sources. For example, according to the Family Saving Survey, which is conducted by the Statistics Bureau, Ministry of Internal Affairs and Communications, it was 356,000 yen in 1996. One possible explanation is that the definition of living expenses is different. For example, the CLE used in my analysis does not include imputed rent on owner-occupied housing, as a result of which it is downward biased.

Concerning, the main source of income after retirement, the survey asks the following question: "After the household head retires, with what kinds of income do you expect to finance your living expenses? Check all that apply." The answers show 79.1 percent expect to rely on social security, 30.7 percent on retirement payments and company pensions, 38.3 percent on insurance and private pensions, 45.2 percent on dissaving, and 40.2 percent on employment income during retirement. Social security is clearly the most important source of income after retirement. In Japan, self-employed workers, farmers, those not working, and students are required to enroll in the National Pension system (in Japanese, Kokumin Nenkin), pay a flat rate contribution, and receive a flat rate pension. Salaried workers working for a private company belong to the Employees' Pension system (in Japanese, Kousei Nenkin) and salaried workers working for the government belong to the Mutual Aid Pension system (in Japanese, Kyousai Nenkin). The latter pay a certain proportion of their wages in social security contributions and receive a flat rate pension—the Basic Pension (in Japanese, Kiso Nenkin)—as well as an earnings-related component. Thus, both the level of social security contributions as well as the level of social security benefits of self-employed workers are much lower than those of salaried workers. Moreover, the spouses of salaried workers are exempt from paying monthly contributions if their annual income is below a certain level whereas this is not the case for the spouses of self-employed workers.[13] As can be seen from Table 1, the average amount of SS (future expected social security benefits: see Section 4.2) for the household head and spouse combined is, as expected, 40,000 yen lower for self-employed households than it is for salaried worker households (103,500 yen vs. 144,000 yen). The amount of future expected benefits from the survey is much lower than the amount of present benefits from the Summary of the Social Security System, which is conducted by the Social Insurance Agency. The amount in 1996 was 149,000 yen per month per person for those who are enrolled in the National Pension system and 171,000 yen per month per person for those who are enrolled in the Employees' Pension system.

[13]See Horioka (2001) for more details.

This difference is probably due to the following two reasons: first, social security benefits have been reduced in recent years and will be reduced further in the future and thus future benefits are sure to be lower than present benefits. Second, it is quite possible that people have lowered their expectations regarding future social security benefits because there is so much uncertainty about the future finances of the social security system and about future benefit levels.

Lump-sum retirement payments and company pensions from one's employer are one of the mechanisms used by Japanese employers to encourage their workers to stay with them for a long time. This system is available only to salaried workers working for a private company or for the government and not to self-employed workers. According to data from the Survey on Retirement Allowance System and Payments, which is conducted by the Policy Planning and Research Department, Minister's Secretariat, Ministry of Labor of the Government of Japan, the average amount of retirement payments in 1997 was about 19,260,000 yen. As can be seen from Table 1, the average amount of RP in the data set I use in my analysis is 16,800,000 yen in the case of salaried worker households whose household head is working for a private company or for the government (household head and wife combined), which is broadly consistent with the figure from the other data source.[14] Self-employed households receive much less retirement income than salaried worker households, and their way of preparing for retirement might differ significantly from that of salaried worker households.

The most important feature of individual pensions (insurance-type individual pensions, annuitized type individual pensions) which are provided by insurance companies and publicly controlled Postal Life Insurance Service (in Japanese, *Kampo*) is that participation in individual pension systems is voluntary.[15] The reason why people purchase individual pensions is to cover the deficiency in annuitized assets. Nowadays, although defined contribution private pension plans (DC plans, in which contributions are predetermined and benefits depend on the behavior of the underlying investments) have become popular throughout the world, most individual pensions in Japan are still defined benefit plans (DB plans, in which benefit levels are determined in advance).[16] As Purcal and Pigott (2003) point out, the individual pension market in Japan is still thin but continues to grow in spite of people's distrust of banks and life insurance companies. For example, according to the "Survey of Life Security (SLS) (in Japanese, *Seikatsu Hoshou ni Kansuru Chousa*)," which was conducted by the Japan Institute of Life Insurance (in Japanese, *Seimei Hoken Bunka Sentaa*), the enrollment rate of individual pensions in Japan has increased from 11.1 percent in 1991 to 22.5 percent in 2001. According to the Life Insurance Association in Japan, the individual pension premium income of life insurance companies has increased from 2.2 trillion yen in 2000 to 4.5 trillion yen in 2003 (2000 prices) whereas life

[14]The reason why the average amount of RP for self-employed households is not zero is that the retirement payments of spouses who work for a private company or for the government are included.

[15]There is another type of individual pension, called the saving-type individual pension (non-annuitized pension), which is offered by banks and securities companies, but in Japan, most individuals enroll in insurance-type individual pensions.

[16]In Japan, many companies have introduced DC company pension plans which are based on the 401(k) plans in the U.S.

TABLE 1

DESCRIPTIVE STATISTICS (MEANS AND STANDARD DEVIATIONS)

	All Households	Self-employed Households	Salaried Worker Households
Number of observations	421	134	287
Husband's age	45.029 (8.927)	45.873 (9.446)	44.634 (8.663)
Spouse's age	42.586 (8.693)	43.632 (9.161)	42.101 (8.439)
Number of homeowners	281	87	194
Variables			
RETSPAN[a] retirement span	24.737 (5.304)	22.962 (6.483)	25.566 (4.427)
CLE[b] current living expenses per month	31.600 (10.748)	34.023 (13.234)	30.507 (9.237)
RLE[b] living expenses during retirement (stock)	8,451.405 (3,214.325)	7,937.927 (3,634.463)	8,691.147 (2,974.675)
MRLE[b] living expenses during retirement per month	28.413 (8.760)	28.522 (9.112)	28.362 (8.606)
SSW[b] social security wealth (stock)	3,935.553 (2,338.424)	2,891.318 (2,074.819)	4,423.106 (2,297.588)
SS[b] social security benefits per month	13.111 (7.145)	10.345 (6.260)	14.402 (7.175)
PSS proportion of the SS on MRLE	0.471 (0.219)	0.372 (0.197)	0.517 (0.214)
RP[b] retirement payments	1,153.444 (1,090.435)	32.806 (132.793)	1,676.669 (935.328)
Husband's RP[b]	969.414 (863.088)	0.000 (0.000)	1,422.032 (669.366)
Spouse's RP[b]	184.030 (442.009)	32.806 (132.793)	254.637 (512.828)
Number of respondents who are setting up *WTR* Ownership ratio	210 0.499	66 0.492	144 0.502
WTR[b] wealth target for retirement	808.470 (1,585.520)	1,043.134 (2,145.257)	698.906 (1,230.328)
Number of respondents who are holding *IP* Ownership ratio	139 0.330	46 0.343	93 0.324
IP[b] individual pension (stock)	247.067 (1,442.002)	412.090 (2,476.946)	170.017 (426.371)
last year's premium of IP[b]	14.297 (72.128)	25.858 (122.438)	8.899 (24.617)
conventional total amount of IP[b]	70.430 (172.891)	112.515 (247.547)	50.780 (119.087)

Source: The 1996 "Survey on the Financial Asset Choice of Households (SFACH)."
All variables refer to couples (except where indicated). Standard deviations are in parentheses.
[a]number of years; [b]ten thousands of yen.

insurance premium income has decreased from 16.2 trillion yen in 2000 to 15.4 trillion yen in 2003 (2000 prices).[17]

The enrollment rate for individual pensions in the survey I use was about 30 percent for all categories of households, although according to the SLS it was 25.4 percent in 1996, which is about 5 percentage points lower. In my analysis, I did not consider the possibility that there are some respondents who are currently not enrolled in individual pensions but who plan to enroll in the future. I calculated the enrollment rate for individual pensions for ten-year age groups and found that the difference among age groups is not very large.[18] This suggests that there are relatively few people who enroll in an individual pension for the first time late in life. Looking next at the average amount of IP, the average IP is 4,120,000 yen for self-employed households and 1,700,000 yen for salaried worker households, and thus the average IP for self-employed households is 2.5 times higher than that for salaried worker households.

Finally, the average wealth target for retirement (WTR) is about 10,400,000 yen for self-employed households and 7,000,000 yen for salaried worker households. The figure for self-employed households is much higher than that for salaried worker households for the following two reasons: first, the social security benefits of self-employed workers are much lower than those of salaried workers; and second, retirement payments are paid only to salaried workers and not to self-employed workers, as pointed out earlier.

In conclusion, both individual pensions and wealth targets for retirement are much higher for self-employed households than for salaried worker households. This is presumably because the magnitude of the deficiency in the annuitized assets of self-employed households is much larger than in the case of salaried workers.

5.2. *Enrollment Differences*

In this section, I present descriptive statistics on the variables, broken down by whether or not the household head is enrolled in an individual pension (IP), in addition to the occupation of the household head. In this way, it can be observed whether the values of these variables (for example, future expected living expenses during retirement) differ significantly by whether or not the individual is enrolled in an individual pension (see Table 2 for more details).

Looking first at current living expenses (CLE) and future expected living expenses during retirement (MRLE), two interesting patterns emerge: first, the average MRLE of self-employed households is about 288,000 yen and hardly differs according to whether or not they are enrolled in an IP, whereas the average

[17]Although this growth in individual pensions might be due partly to supply factors (for example, greater marketing efforts by life insurance companies induce people to enroll in individual pensions), I think that it is primarily due to demand factors—namely, a desire by individuals to make up for the increased shortfall in their annuitized assets. For example, according to the SLS, the percentage of individuals who do not expect to finance their living expenses by social security increased from 61.5 percent in 1991 to 75.8 percent in 2001.

[18]The enrollment rates of those aged 20–29, 30–39, 40–49, and 50–59 are 29.17 percent, 29.47 percent, 33.12 percent, and 35.81 percent, respectively, in the sample I use in our analysis (421 observations), whereas they are 16.2 percent, 33.0 percent, 32.4 percent, and 31.9 percent, respectively, for the full sample (3695 observations).

TABLE 2

DESCRIPTIVE STATISTICS (MEANS AND STANDARD DEVIATIONS)[a]

	Self-employed Households		Salaried Worker Households	
	Holding IP	Not holding IP	Holding IP	Not holding IP
Number of observations	46	88	93	194
Husband's age	48.478 (8.469)	44.51136 9.687051	44.323 (8.799)	44.784 (8.616)
Spouse's age	46.565 (8.416)	42.080 (9.203)	42.065 (8.565)	42.119 (8.401)
Number of homeowners	36	51	66	128
Variables (years)				
RETSPAN[(a)] retirement span	22.704 (6.209)	23.09727 (6.653)	25.394 (3.991)	25.649 (4.629)
CLE[(b)] current living expenses per month	36.178 (14.648)	32.855 (12.337)	31.707 (9.518)	29.932 (9.069)
RLE[(b)] living expenses during retirement (stock)	7,856.580 (3,251.602)	7,980.449 (3,836.598)	9,151.281 (3,102.739)	8,470.567 (2,893.546)
MRLE[(b)] living expenses during retirement per month	28.826 (9.086)	28.364 (9.174)	30.129 (9.167)	27.515 (8.215)
SSW[(b)] social security wealth (stock)	2,547.365 (1,609.747)	3,071.112 (2,268.357)	4,836.956 (2,227.992)	4,224.713 (2,309.611)
SS[(b)] social security benefits per month	9.580 (5.824)	10.744 (6.472)	15.910 (6.863)	13.680 (7.226)
PSS proportion of the SS on the MRLE	0.339 (0.178)	0.390 (0.205)	0.542 (0.204)	0.504 (0.218)
RP[(b)] retirement payments	26.224 (104.934)	36.246 (145.697)	1,919.412 (1,058.221)	1,560.303 (8,48.870)
Husband's RP[(b)]	0.000 (0.000)	0.000 (0.000)	1,558.352 (717.890)	1,356.683 (636.425)
Spouse's RP[(b)]	26.224 (104.934)	36.246 (145.697)	361.060 (617.751)	203.620 (446.917)
Number of respondents who are setting up WTR Ownership ratio	32 0.696	34 0.386	60 0.645	84 0.433
WTR[(b)] wealth target for retirement	1,862.609 (3,155.433)	614.773 (1,159.621)	1,039.097 (1,624.621)	535.825 (949.976)
IP[(b)] individual pension (stock)	1,200.435 (4,143.154)	0.000 (0.000)	524.677 (614.029)	0.000 (0.000)
last year's premium of IP[(b)]	75.32609 (201.241)	0.000 (0.000)	27.462 (35.746)	0.000 (0.000)
conventional total amount of IP[(b)]	327.761 (330.149)	0.000 (0.000)	156.710 (165.245)	0.000 (0.000)

Source: The 1996 "Survey on the Financial Asset Choice of Households (SFACH)."
All variables refer to couples (except where indicated). Standard deviations are in parentheses.
[(a)]number of years; [(b)]ten thousands of yen.

MRLE of salaried worker households who are enrolled in an IP is about 301,000 yen, which is 26,000 yen higher than that of those who are not enrolled in an IP. Second, comparing the ratio of MRLE to CLE depending on whether or not the household is enrolled in an IP, the impact of IP on this ratio differs by the occupation of the household head. In the case of self-employed households, the ratio is about 80 percent (= 288,300/361,800) for those who are enrolled in an IP, which is about 7 percentage points lower than that of those who are not enrolled in an IP (= 283,600/328,600). In the case of salaried worker households, the ratio of MRLE to CLE is about 95 percent (= 301,300/317,100) for those who are enrolled in an IP, which is 3 percentage points higher than that of those who are not enrolled in an IP (= 275,200/299,300). These findings suggest that self-employed households enroll in individual pensions in order to make up for the shortfall in their retirement income, whereas salaried worker households purchase individual pensions in order to achieve a higher standard of living during retirement.

Looking next at social security, the level of benefits differs by the occupation of the household head. In the case of self-employed households, the average SS of those who are enrolled in an IP is 95,800 yen, which is 11,600 yen lower than that of those who are not enrolled in an IP. For salaried worker households, the average SS is 159,100 yen for those who are enrolled in an IP, which is 22,300 yen higher than for those who are not enrolled in an IP. Similar patterns can be observed in the case of retirement payments. These results suggest that the deficiency in future expected living expenses during retirement of self-employed households is caused by the deficiency in their annuitized assets (social security and retirement payments).

Finally, the wealth target for retirement, the average WTR, is much higher for those who are enrolled in an IP than for those who are not for all types of households. For example, the average WTR of self-employed households who are enrolled in an IP is 18,600,000 yen, which is about three times as high as that of those who are not enrolled in an IP. This is because respondents who are saving for retirement are more likely to enroll in an individual pension.

To summarize my findings based on the descriptive statistics, I found that the reason why respondents enroll in individual pensions differs by the occupation of the household head. Salaried worker households enroll in individual pensions in order to gain a higher standard of living during retirement. Self-employed households enroll in individual pensions in order to make up for the shortfall in their annuitized assets (social security and retirement payments).

6. Estimation Results

6.1. *Wealth Target Equation for Retirement*

In this section, I present my estimation results concerning the determinants of the wealth target for retirement (WTR). As discussed in Section 3.1, if people behave in accordance with the life cycle hypothesis, they should decide on their wealth target for retirement taking account of living expenses during retirement, social security wealth, retirement payments, etc.

Table 3 presents the results from estimating equations (1) and (2) using a Tobit model. Looking first at the results concerning the impact of future expected

TABLE 3

WEALTH TARGET EQUATION FOR RETIREMENT; DEPENDENT VARIABLE *WTR*
(WEALTH TARGET FOR RETIREMENT)

	Self-employed Households		Salaried Worker Households	
Explanatory Variables				
RLE living expenses during retirement	0.29*** (0.11)	0.28** (0.11)	0.083* (0.05)	0.079 (0.05)
SSW social security wealth	–0.48** (0.20)	–0.51** (0.20)	–0.063* (0.03)	–0.063* (0.03)
RP retirement payments	–4.18 (3.00)	–4.32 (3.11)	0.58*** (0.14)	0.59*** (0.14)
BEQ bequest motive dummy		351.92 (756.29)		–87.29 (302.18)
FS financial support dummy		–2,486.17 (1,547.40)		875.67 (708.93)
NC nursing care dummy		780.07 (1,081.92)		721.76 (450.84)
COHBT cohabitation dummy		373.84 (970.60)		–615.68* (316.82)
SICK sick dummy		534.97 (1,215.80)		–326.95 (481.62)
intercept	–1,235.50 (803.76)	–1,128.31 (909.53)	–1,533.49*** (429.66)	–1,423.70*** (442.97)
Log likelihood	–671.27	–669.36	–1,385.10	–1,380.49
Number of observations	134	134	287	287
Number of zero observations	68	68	143	143

Regression model $WTR = a_1RLE + a_2SSW + a_3RP + a_4 + u$ (1)

$WTR = a_1RLE + a_2SSW + a_3RP + a_4BEQ + a_5FS + a_6NC + a_7COHBT + a_8SICK + a_9 + u$ (2)

The log likelihood ratio is 44.40 and 52.38, respectively, in equations (1) and (2).
The level of significance at 1% is ***, 5% is **, and 10% is *.
Standard errors are in parentheses.

living expenses during retirement (RLE) on WTR, the coefficient of RLE is positive and significant in most cases. I also calculated the marginal effect of RLE $\left(\frac{\partial E(WTR|RLE, SSW, RP)}{\partial RLE}\right)$ and found it to be about 0.10 for self-employed households and 0.03 for salaried worker households.[19] This implies that the higher one's future expected living expenses are during retirement, the higher is one's WTR, as expected. However, the marginal effect of RLE is significantly less than expected (less than one) for all types of households.

The replacement effect of social security wealth (SSW) has a negative and significant impact on WTR, as expected, in every case. However, the coefficient of retirement payments (RP) is insignificant in the case of self-employed households and positive and significant in the case of salaried worker

[19]The marginal effect of x_j on $E(y|x, y > 0)$ is calculated as follows:

$$\frac{\partial E(y|x, y>0)}{\partial x_j} = \beta_j\left\{1 - \lambda\left(\frac{X\beta}{\sigma}\right)\left(\frac{X\beta}{\sigma} + \lambda\left(\frac{X\beta}{\sigma}\right)\right)\right\}, \quad \text{and the value of } 1 - \lambda\left(\frac{X\beta}{\sigma}\right)\left(\frac{X\beta}{\sigma} + \lambda\left(\frac{X\beta}{\sigma}\right)\right)$$

in equation (1) is 0.336.

households, which is contrary to expectation (see the conclusion for a discussion of possible reasons). As for the magnitude of the marginal effects of SSW $\left(\frac{\partial E(WTR|RLE, SSW, RP)}{\partial SSW}\right)$, the estimated value is about –0.15 for self-employed households and about –0.02 for salaried worker households. This is significantly less than one in absolute value for all types of households, which implies that the extent to which increases in social security benefits are offset by declines in household saving is far from complete. A likelihood ratio test suggests that the coefficients differ significantly by the occupation of the household head (the log likelihood ratio is 44 and 52 in equations (1) and (2), respectively). The coefficients of the aforementioned variables are not sensitive to the inclusion of dummy variables (see also Section 6.3).

Finally, I included several dummy variables in the model (BEQ, FS, NC, COHBT, and SICK). The SFACH survey collects direct information on whether or not respondents have a bequest motive (BEQ) and whether or not they plan to receive financial support (FS) or nursing care (NC) from their child or children or plan to live with them (COHBT). Previous studies (e.g. Hurd, 1989; Asano, 1998, 2001) use a child dummy (that equals one if the respondent has one or more children and zero otherwise) as a proxy thereof because they have no direct information on bequest motives or support from one's children. Although the coefficients of most of the dummy variables are not significantly different from zero, the coefficient of COHBT (a dummy variable that equals one for those who plan to live with their child or children and zero otherwise) is negative and significant. This is as expected in the case of salaried worker households because those who plan to live with their child/children require fewer resources of their own during retirement. In addition, the coefficient of FS (a dummy variable that equals one for those who plan to receive financial support from their child or children and zero otherwise) is negative and marginally significant (its p-value is 0.111), as expected, in the case of self-employed households.

6.2. *The Demand for Individual Pensions*

In this section, I present the results concerning the demand for individual pensions. Individuals should convert all of their retirement assets into annuities as long as the marginal annuity pays a rate of return that is equal to or greater than that paid on conventional assets.

Table 4 presents the estimation results. The coefficient of WTR (the wealth target for retirement) is positive and significant, as expected, in all cases. I also calculate the magnitude of the marginal effect of WTR $\left(\frac{\partial E(IP|WTR)}{\partial WTR}\right)$ and would have expected it to be one, but the estimated value thereof is only about 0.12 for self-employed households, and 0.05 for salaried worker households.[20] This suggests that people do not convert all of their conventional retirement assets into annuities but only a portion thereof. There are at least three reasons for this. First,

[20]The value of $1-\lambda\left(\frac{X\beta}{\sigma}\right)\left(\frac{X\beta}{\sigma}+\lambda\left(\frac{X\beta}{\sigma}\right)\right)$ in equation (3) is 0.248.

TABLE 4

THE DEMAND FOR INDIVIDUAL PENSIONS; DEPENDENT VARIABLE *IP* (INDIVIDUAL PENSIONS)

	Self-employed Households		Salaried Worker Households	
Explanatory Variables				
WTR wealth target for retirement	0.49** (0.20)	0.50** (0.20)	0.20*** (0.05)	0.21*** (0.05)
SICK sick dummy		1,094.32 (1,732.29)		131.47 (238.81)
intercept	–3,408.94*** (696.87)	–3,515.03*** (725.90)	–597.14*** (98.27)	–609.03*** (101.32)
Log likelihood	–488.40	–490.40	–856.29	–856.14
Number of observations	134	134	287	287
Number of zero observations	88	88	194	194

Regression model $IP = b_1 WTR + b_2 + u$ (3)

The log likelihood ratio is 136.37 in equations (3).

The level of significance at 1% is ***, 5% is **, and 10% is *.

Standard errors are in parentheses.

it could be that there are market imperfections (adverse selection) in private pension markets.[21] Since insurance companies do not have information on the life expectancy of insurees, they have no choice but to set uniform rates for all insurees. Thus there is the possibility that only healthy people get a good deal from enrolling in individual pensions and that individual pensions are less than actuarially fair for the less healthy people.[22] Second, it could be that people do not convert all of their conventional retirement assets into annuities because it reduces the usefulness of their assets (for example, it can no longer be used as precautionary saving for unforeseen contingencies). Third, it could be that individuals behave irrationally. For example, some individuals might be myopic, or they might believe that the current balance of their conventional retirement assets is larger than the present value of future annuities (which is called "money illusion").

Lastly, I speculate about the reason why the coefficient of WTR is higher for self-employed households than it is for salaried worker households. Annuitized assets are much more likely to be deficient for self-employed households than for salaried worker households because the social security benefits of the former are much lower (there is no earnings-related component in the case of self-employed workers—see Section 5.1). Moreover, retirement payments are paid only to salaried workers and not to self-employed workers. In addition, the intercept in Table 4 is generally negative and significant, contrary to expectation. A likelihood

[21]McCarthy and Mitchell (2003) evaluate the extent of adverse selection in life insurance and annuities in international markets, focusing on the U.S., the U.K., and Japan, and find that, in Japan, among males, insurance purchasers appear to have higher mortality than voluntary annuity holders, while among females, mortality is roughly equal.

[22]I have added the dummy variable SICK (a dummy variable that equals one for those who are in poor health and zero otherwise) to equation (3) to check whether or not the healthy people convert more assets into annuities than people who are in poor health, but its impact was not statistically significant.

ratio test shows that the coefficients differ significantly by the occupation of the household head (the log likelihood ratio is 136 in equation (3)).

6.3. *Reduced Form Equation for Individual Pension Demand*

This section presents the estimates of the reduced form equation, which is obtained by substituting equation (1) into equation (3), and tests for the replacement effect of SSW (social security wealth) and RP (retirement payments) on IP (individual pensions) using this reduced form equation. As discussed in Section 2, if people's annuitized assets (social security and retirement payments) are insufficient, they should purchase individual pensions in order to make up for the deficiency in their annuitized assets; that is, social security wealth and retirement payments should have a negative and significant impact on the demand for individual pensions.

Table 5 presents the results from estimating equations (4) and (5) using a Tobit model. The coefficient concerning the impact of future expected living expenses during retirement (RLE) on IP is not significant in any case. The coefficient of SSW is negative and significant, as expected, only in the case of self-employed households and is not significant in the case of salaried worker households. I also calculate the magnitude of the marginal effect of SSW $\left(\frac{\partial E(IP|RLE, SSW, RP)}{\partial SSW}\right)$ in the case of self-employed households and find the estimated value to be only about –0.16.[23] This implies that a 10 percent increase (decrease) in social security benefits is offset by a decline (increase) of 1.6 percent in individual pensions.[24] The magnitude of the coefficient is much smaller than expected, and suggests that changes in individual pensions do not fully offset changes in social security wealth. However, this result may be reasonable for at least three possible reasons. First, we already found from the estimation of equation (3) that Japanese households do not convert all of their conventional retirement assets to individual pensions. Hence changes in social security wealth will be offset partly by changes in individual pensions and partly by changes in conventional retirement assets. Second, there is presumably considerable measurement error in social security wealth because it is calculated from a number of variables instead of being obtained directly from the respondent. This may cause a downward bias in the coefficient of this variable. Third, individual pensions have some drawbacks: for example, they are provided by private insurance companies that might go bankrupt, whereas social security is provided by the government that will never go bankrupt.[25] The coefficient of RP is insignificant in the case of self-employed households and positive and significant in the case of salaried-worker households, contrary to expectation (see the concluding section for a discussion of possible reasons). The coefficients of the dummy variables are not significantly different from zero.

[23]The value of $1-\lambda\left(\frac{X\beta}{\sigma}\right)\left(\frac{X\beta}{\sigma}+\lambda\left(\frac{X\beta}{\sigma}\right)\right)$ in equation (5) is 0.248.

[24]Strictly speaking, people's responses to negative wealth shocks and positive wealth shocks are not necessarily symmetric.

[25]This explanation applies only when social security benefits are increased. Individuals will reduce their individual pensions by less than the increase in social security benefits because individual pensions are imperfect substitutes for public pensions.

TABLE 5

REDUCED FORM EQUATION FOR INDIVIDUAL PENSION DEMAND; DEPENDENT VARIABLE *IP* (INDIVIDUAL PENSION HOLDINGS)

	Self-employed Households		Salaried Worker Households	
Explanatory Variables				
RLE living expenses during retirement	0.23 (0.17)	0.20 (0.18)	0.03 (0.03)	0.03 (0.03)
SSW social security wealth	–0.63* (0.33)	–0.68* (0.35)	0.00 (0.03)	0.01 (0.03)
RP retirement payments	–0.91 (4.24)	–0.22 (4.32)	0.22*** (0.07)	0.20*** (0.07)
BEQ bequest motive dummy		671.37 (1,148.10)		–233.73 (163.95)
FS financial support dummy		–4,074.90 (2,785.53)		
NC nursing care dummy		–519.97 (1,785.96)		263.64 (235.05)
COHBT cohabitation dummy		818.31 (1,485.16)		127.96 (156.74)
SICK sick dummy		1,223.30 (1,777.90)		91.03 (250.28)
intercept	–2,828.00** (1,283.98)	–2,586.77* (1,451.13)	–1,096.37*** (234.39)	–1,063.22*** (244.23)
Log likelihood	–491.57	–489.49	–857.85	–853.25
Number of observations	134	134	287	287
Number of zero observations	88	88	194	194

Regression model $IP = c_1RLE + c_2SSW + c_3RP + c_4 + u$ (4)

$IP = c_1RLE + c_2SSW + c_3RP + c_4BEQ + c_5FS + c_6NC + c_7COHBT + c_8SICK + c_9 + u$ (5)

The log likelihood ratio is 149.10 and 154.95, respectively, in equations (4) and (5).

The level of significance at 1% is ***, 5% is **, and 10% is *.

Standard errors are in parentheses. I could not calculate the standard errors of FS in the case of salaried worker households because all salaried worker households who are enrolled in individual pensions do not plan to receive financial support from their child or children.

A likelihood ratio test suggests that the coefficients differ significantly by the occupation of the household head (the log likelihood ratio is 149 and 155 in equations (4) and (5), respectively). This suggests the possibility that only self-employed households purchase individual pensions in order to make up for the deficiency in their annuitized assets and that salaried worker households are not deficient in their annuitized assets. It might even be the case that salaried worker households are overannuitized.

Finally, I analyzed the impact of bequest motives and of financial support and/or care from children during retirement on the wealth target for retirement and individual pensions. I could not infer the motives for such intergenerational transfers. Horioka (2002) analyzes data for the U.S. and Japan and finds that both parents and children are selfish life cyclers in both countries and that bequests are either unintended or a quid pro quo for financial support and/or care during old age.

7. Conclusion

In this paper, I analyzed the impact of social security wealth, retirement payments, and living expenses during retirement on people's retirement savings in general and on their individual pension holdings in particular using micro data from the 1996 "Survey of the Financial Asset Choice of Households" (SFACH), which was conducted in November 1996 by the Institute for Posts and Telecommunications Policy.

I analyzed this relationship using a two-stage model: I assume that people decide their wealth target for retirement in the first stage taking account of living expenses during retirement, social security wealth, and retirement payments. I found that the results for retirement payments are often contrary to expectation, but that the results for social security are highly significant and confirm the existence of a replacement effect of social security on saving for retirement for all types of households. For the second stage, I assumed that people decide how much of their retirement assets to convert into individual pensions, I found that people convert only a portion of their retirement assets into annuities. Finally, I analyzed the replacement effect of social security wealth and retirement payments on individual pensions using a reduced form equation which was derived from the first and second stages. It was found that the results for social security are highly significant in the case of self-employed households but insignificant in the case of salaried worker households.

I found evidence of a replacement effect of social security on individual pensions only in the case of self-employed households. This suggests that the social security assets of self-employed households are less than their optimal level of annuitized assets and that they would increase their demand for individual pensions if social security benefits were to be reduced. Conversely, a replacement effect does not exist in the case of salaried worker households, which suggests that the annuitized assets of salaried worker households are not deficient and that such households may even be overannuitized. The descriptive statistics also supports these results. Suzuki (2000) found evidence of a replacement effect of social security on life insurance only in the case of salaried worker households, which is consistent with my results because it suggests that only salaried worker households are overannuitized.

Finally, it should be stressed that some individuals in Japan, especially self-employed workers, farmers, those not working, and students (called "first insured persons"), who feel uneasy about their future social security benefits, refuse to enroll in public pensions (called "pension hollowing"), and enroll instead in individual pensions.[26] According to the Social Insurance Agency, the percentage of first insured persons who refuse to enroll in public pensions was about 5 percent and the percentage of first insured persons who refuse to pay premiums was about 27 percent in 2000. In addition, according to the 1998 Summary of the Social Security System, the percentage of first insured persons not enrolled in public pensions and who enroll in individual pensions instead is 16.8 percent. This is not as large as the proportion of first insured persons who are enrolled in public pensions and

[26]In Japan, it is impossible for salaried workers (called "second insured persons") to refuse to enroll in public pensions because premiums are withheld from their monthly paychecks.

also enroll in individual pensions (22.4 percent), but in Japan, the former percentage has increased year by year.[27] In 2002, the Ministry of Health, Labor and Welfare, which was concerned about this problem, proposed that people who refuse to enroll in public pensions and enroll in individual pensions instead should not be allowed to claim the tax deduction for individual pension contributions. Given the existence of this "pension hollowing" problem, further research on the relationship between social security and individual pensions is needed (see Suzuki and Zhou (2000) for more details).

There are several other directions for further research. In my analysis, I used only information on respondents' firm size and educational attainment when estimating retirement payments, even though retirement payments also depend on seniority, ability, etc. With respect to seniority, no information is available in the data set and a different data source is required. Ignoring ability may cause measurement error (ability bias) in retirement payments because ability and educational attainment are positively correlated, and ability and retirement payments are also positively correlated. This problem could be solved if good instrumental variables are found. These two problems might explain why I could not find a replacement effect of retirement payments on retirement saving and individual pensions.

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[27]The survey also asks the first insured persons: "Why you do not enroll in public pensions?". The answers are as follows: "I forgot to enroll in public pensions," 15.9 percent; "I do not enroll in public pensions due to financial difficulties," 15.6 percent; and "I do not enroll in public pensions due to the future uncertainty of public pension systems," 15.5 percent. According to the 1999 Survey of Insured Persons under National Pension, which is conducted by the Social Insurance Agency, the income distribution of individuals who do not enroll in public pensions is not different from that of individuals who enroll in public pensions.

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