Dissaving by the Elderly in Japan: Empirical Evidence from Survey Data

Keiko Murata

This study empirically examines the (dis)saving behavior of the elderly in Japan using two micro-datasets of household surveys. The long-run dataset, which covers 20 years, indicates that on average, the elderly in Japan dissave, but the pace of dissaving of retired elderly is excessively slow in light of the standard life cycle/permanent income hypothesis. Analysis results suggest that one likely factor is the desire to leave a bequest. The saving rate and pace of wealth decumulation show that retired households slowly dissave if the head plans to leave a bequest. Retired elderly who intend to have savings for precautionary purposes are unlikely to slowly dissave, except for those who do not plan to leave a bequest to their children.

Keywords: Household saving, Life cycle/permanent income hypothesis, Aging, Bequest, Precautionary saving

JEL Classification: D14, E21, D64, J14

Keiko Murata, Graduate School of Management, Tokyo Metropolitan University, 1-1 Minami-Osawa, Hachioji-city, Tokyo 192-0397, Japan. (Email): keiko-murata@tmu.ac.jp, (Tel): +81-426-77-1111.

This work forms part of our microdata-based research on household consumption in Japan at the Economic and Social Research Institute (ESRI). I am grateful to Yoko Niimi, Charles Yuji Horioka, Jim Bean, and other participants of the 1st Annual Meeting of the Society of Economics of the Household for their valuable comments and Midori Wakabayashi for her discussion at the ESRI seminar. I also would like to thank Fumihira Nishizaki, Masaki Ichikawa, Masatoshi Inouchi, Masahiro Hori, Junya Hamaaki, Koichiro Iwamoto, Daisuke Moriwaki, Takeshi Niizeki, Fumihiko Suga, Kazuhito Higa, and other ESRI colleagues for their comments and support and Ralph Paprzycki for his excellent English editing service. This study was supported by JSPS KAKENHI Grant Number 15K03398. Special thanks go to the Statistics Bureau of Japan for providing us with the microdata from the Family Income and Expenditure Survey (FIES) and the Research Institute of Economy, Trade and

Industry (RIETI), Hitotsubashi University, and the University of Tokyo for the longitudinal dataset from the "Japanese Study of Aging and Retirement (JSTAR)." The views expressed in this work are those of the author and do not represent the institutions that the author belongs to.

[**Seoul Journal of Economics** 2019, Vol. 32, No. 3]

I. Introduction

Many studies on elderly households show that retirees spend their wealth at a slower rate than predicted by the basic life-cycle model. Current explanations for the slow decumulation of wealth include uncertainty about longevity or health expenses (*e.g.*, Love *et al.* 2009; De Nardi *et al.* 2010; Ameriks *et al.* 2015) and the desire to leave a bequest (*e.g.*, De Nardi 2004; Love *et al.* 2009). However, the extant literature has provided mixed results regarding the relative importance of these factors.[1]

This study empirically examines the saving/dissaving behavior of the elderly in Japan using two micro-datasets. The first dataset covers households throughout Japan over a long period, and the second one is based on recent surveys focusing on middle-aged and elderly households. Japan provides a particularly pertinent case study because its population aging is progressing much faster than those in other countries. Elderly households, *i.e.*, those with a head aged over 60 years old, now comprise more than 40% of households in Japan and account for nearly 50% of household expenditure. In addition, Japan possesses a compulsory national health insurance scheme. Specifically, the burden of medical costs on individuals is limited, thereby mitigating the need to save for unforeseen medical expenses.[2]

[1] See De Nardi *et al.* (2015) and Poterba *et al.* (2011, 2013) for recent surveys.

[2] In Japan, people are required to join some form of public insurance system to receive necessary medical services at a low cost by paying certain insurance premiums and co-payments (10%-30%). Furthermore, people aged 75 years old and above are enrolled in the late-stage medical care system for the elderly. The author's calculation using microdata from the Family Income and Expenditure Survey indicated that in 2012, the ratio of out-of-pocket medical expenses to total expenditure for elderly households with a head in their 60s was 5.1%, and that for households with a head aged 70 years old or older was 5.8%. The ratio is almost the same for all income levels: the average ratios by income quartile from the lowest to the highest were 5.4%, 6.1%, 5.8%, and 5.9%. Meanwhile, the ratio

In the 1980s, the saving behavior of the elderly in Japan attracted academics' attention mainly because it might provide a possible reason for the high saving rate of Japanese households (by international comparison) (*e.g.*, Hayashi 1986). During that time, aged Japanese households do not dissave (Hayashi *et al.* 1988; Dekle 1990); however, Ishikawa (1988) showed that the average saving rate of aged households with retired heads was substantially lower than that of working-age households.[3] In the late 1980s, with the progress of population aging, the Family Income and Expenditure Survey (FIES) published by the Statistics Bureau started to provide the average saving rate of elderly households by employment status of the head. This document showed that the average saving rate of elderly households was positive if the head was employed and negative if the head was retired. Horioka (2010) showed that the rate of decumulation of financial assets for retired households was slower compared with that implied by the simple life cycle hypothesis using semi-aggregate data by employment status from the FIES.

Although these studies have revealed some important facts about the saving/dissaving behavior of the elderly in Japan, they were unsuccessful in identifying the factors underlying the patterns they observed probably due to limitations in the information available in the used datasets. For instance, the datasets employed in the studies contain no certain key variables, such as the detailed family structure (*e.g.*, whether a family has a child/children not living in the household) and information on the health of household members and intergenerational transfers within the family, which are necessary to understand the behavior of the elderly. Empirical studies neglecting these factors provide only an insufficient understanding of the saving behavior of the elderly because the desire to leave a bequest and precautionary saving are likely key factors underlying excess saving by the elderly.

Nevertheless, three studies partially address these issues. The first study is that by Horioka *et al.* (1996), which examined the saving behavior of aged households using household-level data, including information on respondents' bequest motives. The average stocks and flows of saving by household characteristics, namely, (i) the health of the head and (ii) the

for younger households with a head aged in their 30s or 40s was approximately 4%.

[3] A survey on the dissaving behavior of the aged in Japan is provided by Horioka (2010).

respondent's bequest motive, were calculated. The result showed that the pace of net worth decumulation was slower for households with a selfish bequest motive than other respondents. However, a slight difference was observed depending on whether the household head was healthy or not. The second study is that by Horioka and Niimi (2017), which analyzed the relationship between elderly households' amount of financial assets for various saving purposes (*i.e.*, share of savings for retirement in their current total savings, share for precautionary purposes, share for leaving a bequest, and share for other purposes) and whether they were dissaving or not using a survey that contained questions about households' savings for each purpose. The result showed that saving for precautionary reasons was more important than that for leaving a bequest in elderly households' saving/dissaving behavior. The third study is that by Hamaaki and Hori (2019), which examined the saving rate of the elderly in Japan. The result showed that the saving rate is higher if individuals plan to leave a bequest to their children. Whether or not the individuals exhibit a precautionary saving motive does not affect their saving rate. Thus, the previous studies produce inconclusive results regarding whether and the extent that the desire to leave a bequest and precautionary saving play roles in the saving/dissaving behavior of elderly households.[4]

By contrast, this study attempts to deepen our understanding of (dis) savings by the elderly using two micro-datasets on Japanese households. Specifically, the (dis)saving behavior of the elderly in Japan is re-examined using the most recent detailed micro-dataset developed from the FIES covering a period of two decades. The analysis result of the issue of employing flow (saving rate) and stock (wealth decumulation) data showed that the average saving rate turns negative for households whose heads are in their early 60s. However, the speed of net worth reduction is particularly slow and even slower the older the household head is. A simple calculation based on the standard life cycle/permanent income hypothesis (LC/PIH) indicates that the pace of dissaving of retired elderly is excessively modest.

The results obtained from the FIES data indicate that the determinants of the saving/dissaving behavior of the aged are examined using another

[4] Some studies on precautionary saving by Japanese households were conducted by several scholars, such as Murata (2003), Zhou (2003), and Abe and Yamada (2005). However, the focus of the aforementioned studies is on young workers or households and not on elderly ones.

micro-based dataset, *i.e.*, the Japanese Study on Ageing and Retirement (JSTAR), on households. JSTAR is a recently launched longitudinal survey on elderly households, and the contents of which are similar to the Health and Retirement Study (HRS) in the United States. Moreover, JSTAR contains valuable information, such as whether householders have children (including children who live separately), health information on household members, and whether they plan to leave a bequest, which are not in the FIES. Regressions that control for heterogeneity in family composition and health of household members are conducted. The result shows that aged households whose heads plan to leave a bequest exhibit a higher saving rate (or a less negative saving rate if it is negative) than those who have no plan of leaving a bequest. Precautionary saving is an unimportant determinant of the saving rate of the elderly. However, this determinant plays a role in the slow pace of asset decumulation in households with retirement-age heads who do not plan to leave a bequest to their children. The finding that households want to leave a bequest do not appear to additionally save for precautionary purposes is in line with Dynan *et al.*'s (2002, 2004) argument that savings simultaneously serve the following two functions: (1) a precautionary life cycle function and (2) a bequest function when things turn out better than they could have been.

The results obtained in this study allow the following conclusions: First, the rate of asset decumulation of retired households is slower than predicted by the standard LC/PIH, which is in line with Horioka's (2010) finding. Although Horioka obtained this finding on the basis of financial assets, the results here show that the conclusion is also supported when focusing on households' net worth (including housing wealth). Moreover, the discrepancy between the actual rate of dissaving and that predicted by the standard LC/PIH becomes larger the older the household is. Second, part of the reason that households dissave slower than predicted by the standard LC/PIH is the desire to leave a bequest. Third, precautionary saving does not play a key role in the dissaving behavior of the retired except for those who do not plan to leave a bequest.

The remainder of the study is organized as follows. The next section provides a brief outline of the data. Section III presents a descriptive analysis of age consumption/income profiles and age-wealth profiles using microdata from the FIES. Section IV employs a simple regression to investigate factors affecting the saving behavior of the elderly. Finally,

Section V concludes the study.

II. Data Description

Two Japanese household datasets, namely, FIES and JSTAR, are used to investigate the (dis)saving behavior of the elderly in Japan.

A. FIES

Section III of this study uses FIES data to examine the (dis)saving behavior of the elderly. This FIES is a national representative survey that contains rich information on consumption, income, and wealth. The FIES was employed by Horioka (2010) to investigate the saving rate and net financial assets using time-series data of semi-aggregated published series for the elderly from 1995 to 2008. In this work, the age profile of saving and wealth decumulation of financial assets and net worth are examined using microdata from the FIES. The focus is on recent data from 2008 to 2012, but a dataset for the longer period from 1984 to 2012 is also used to analyze wealth decumulation by cohorts.

The FIES is a monthly survey that provides comprehensive data on the income and expenditure of households. This survey supplies the basic information used for the calculation of the quarterly estimates of GDP and consumer price index. The survey covers approximately 9000 households each month. Each household is surveyed for six months: one-sixth of the households are replaced by new ones every month. The information can be assumed to be accurate and credible because the monthly consumption data are compiled from a diary collected twice a month. The FIES also provides information on households' financial assets and liabilities, family composition, and employment status of each household member living in the household. Until 2001, the survey focused on households with two or more members. Since 2002, one-person households are also included. Among the 9000 surveyed households, 700 are one-person households. Financial asset holdings and liabilities are not surveyed for one-person households.

Although the FIES does not provide information about households' housing wealth, it supplies relevant households' home information, such as whether households own their house, size of residence, year of purchase, type of structure (*e.g.*, a wooden house or an apartment), and addresses. The market value of households' housing wealth can

be calculated using this information by estimating the value of the land on which a property sits and that of the structure and adding the two together. Specifically, the land value is calculated by multiplying the land area reported in the FIES and the price of land at the closest survey location in the "Land Market Value Publication" (Chika-koji) provided by the Ministry of Land, Infrastructure, Transport, and Tourism. The value of the structure is estimated on the basis of the construction material costs reported in the "Annual Report of Building Construction" (1953-2012) and by applying a certain depreciation rate that depends on the type of structure of the dwelling.[5]

B. JSTAR

Section IV of this study uses JSTAR, a recently initiated comprehensive longitudinal survey that covers information on the economic, social, and health statuses of elderly people in Japan. This survey is particularly similar to the Health and Retirement Study (HRS) in the United States, the English Longitudinal Study of Ageing (ELSA) in Britain, and the Survey of Health, Aging and Retirement in Europe (SHARE).[6] JSTAR started collecting data in five municipalities in 2007, with a sample comprising 7723 respondents. The response rate was approximately 60%. In 2009, these respondents were surveyed for a second time while a baseline/first survey was conducted in two newly added municipalities. The JSTAR 2011 survey consisted of the third survey of the original respondents, the second survey of the respondents added in 2009 and a first survey in three new municipalities.[7]

[5] See Hori and Niizeki (2017) and Hamaaki *et al.* (2015) for details of the estimation method. Imputed rent for homeowners is also estimated on the basis of the rental prices from the "Housing and Land Survey" published by the Statistics Bureau, Ministry of Internal Affairs and Communications using information on the floor space, year of construction, construction material, type of building (*e.g.*, detached house or apartment), and locality (prefecture and city size).

[6] See Ichimura *et al.* (2009) for a detailed description of JSTAR.

[7] The five municipalities surveyed in 2007 were Takikawa City in Hokkaido Prefecture, Sendai City in Miyagi Prefecture, Adachi Ward in Tokyo, Kanazawa City in Ishikawa Prefecture, and Shirakawa Town in Gifu Prefecture. Naha City in Okinawa Prefecture and Tosu City in Saga Prefecture were added in 2009, while Chofu City in Tokyo and Hiroshima and Tondabayashi cities in Osaka Prefecture were added in 2011.

The observations in the baseline/first survey are for respondents aged 50-75 years old, who were randomly chosen from the household register after regional stratification in each municipality. Apart from various questions on economic variables, such as income and assets, JSTAR asks respondents whether they have a child/children, including children who live separately. In addition, JSTAR asks the following questions related to leaving a bequest and precautionary saving.

Q1(a). Do you expect to give someone else a gift or leave an inheritance?
1. Yes; 2. No;
3. Have no one to leave anything for;
4. Don't know; 5. Do not want to answer.

Respondents who answered with "yes" are asked to reply to the following additional questions.

Q1(b). Who do you expect to give the gift or inheritance to? (Multiple answers allowed)
1. No one; 2. Spouse; 3. Parent;
4. Parent in law; 5. Sibling;
6. Child/child's spouse/grandchild; 7. Other relatives;
8. Others; 9. Don't know;
10. Do not want to answer.

With regard to precautionary saving, respondents were asked the following questions:

Q2. What are you saving for? Please choose the answers that apply.
1. In preparation for an illness or unforeseen misfortune
2. For children's education
3. For children's wedding
4. To buy or improve a home
5. For old age living expenses
6. To purchase durable goods
7. For travel or leisure
8. For tax payments
9. Want to leave inheritance to children
10. No special purpose, but feel more secure/comfortable with

savings
11. Other (describe)
12. Do not want to answer

In the analysis below, the responses to these questions are used as proxies to examine the link between the desire to leave a bequest and precautionary saving, and the saving rate and wealth decumulation of elderly households. Specifically, respondents who answered Q1(a) with option 1 and Q1(b) with option 6 are defined as individuals planning to leave a bequest. Meanwhile, respondents who answered Q2 with option 1 and/or option 10 are defined as individuals saving for precautionary reasons.

Table 1 presents the basic statistics of the dataset from the FIES and JSTAR. The second set of columns in the table, labeled (b), shows those for households in the FIES whose head is aged 50 years or above, which corresponds to the age group covered by JSTAR. Although JSTAR does not employ probabilistic sampling at the national level, the difference in the average level of disposable income between the FIES and JSTAR is average, and the median values are close. By contrast, the level of consumption is substantially lower in JSTAR even though the average number of household members is the same in both surveys. For the elderly, consumption tends to fall with age because JSTAR respondents on average are considerably older than those in the FIES (65.1 *vs.* 62.4 years of age), but it may also reflect differences in survey methods. In the FIES, survey respondents are asked to record expenditure item by item on a daily basis in a diary, which is collected twice a month. In contrast, JSTAR asks respondents retrospectively about their monthly expenditure on nondurables and services over the past year together with the total amount of durable goods purchases (except for automobiles) over the year. The latter methodology may result in respondents underestimating their expenditures because it relies on respondents' memory. Finally, the average net worth and financial assets are reasonably close in the two surveys.

III. Descriptive Analysis Based on the FIES

A. Age Consumption/Income Profiles

Figure 1 shows the age profiles of the saving rate using the microdata

obtained from the FIES to examine the manner that the elderly decumulate their assets. The figure displays the age-profiles of the average saving rate, average consumption, and average disposable income for the period 2008-2012.[8,9] Households are grouped into age groups in three-year intervals (*e.g.*, those aged 29 to 32 years old, represented in the figure by age 31). Figure 1(a) represents households with two persons or more. The figure shows that the average saving rate is positive until the head reaches 60 years old. Then, such rate sharply declines and becomes negative but then reverses again at the age of 70, thereby forming a "U"-like shape.[10] The "U" shape of the saving rate of elderly households is due to a continuous decline with age in average consumption. Meanwhile, the average income gradually declines and then levels off when the head is 70 years old. Figure 1(b) constrains observations to households consisting of a couple living on its own to exclude possible influences arising from children living in the same household. The average saving rate of elderly couples also follows a "U" shape.

Figure 2 compares the age profiles of consumption and disposable income of aged households by employment status. Evidently, the average consumption of elderly workers' households is lower than their average

[8] The sample used for the analysis in Section III consists of households that meet the following criteria: (i) the household had two or more members; (ii) the household head was not self-employed; and (iii) the household did not include the parents or other relatives of the household head or spouse (other than children of the head). The households whose head was self-employed were excluded because the income of such households is unavailable in the FIES. Similarly, the one-person household was excluded because the FIES contains no information on their financial assets.

[9] Consumption and disposable income for each household are annualized and adjusted for seasonal patterns considering the number of family members, their composition (*e.g.*, age of the youngest child to consider school tuition fees), employment status and occupation of the household head, age of the head, and address of the household (*e.g.*, in the north or south of Japan). The number of observations is adjusted using extraction rates developed from the Population Census (by age of household head, prefecture, and type of house structure) to ensure that households are representative at the national level. See Hamaaki *et al.* (2016) for details.

[10] In Japanese firms, a retirement age of 60 is common due to Japanese employment practices. This practice is typically employed in large firms. In small and medium-sized enterprises, the retirement age is relatively more flexible.

income, thereby indicating that they continue to save on average, including households in their late 70s.[11] By contrast, the average consumption of retired households is higher than their average income, thereby suggesting that retired households dissave on average, with the gap between income and consumption shrinking with the age of the household head. This finding indicates that the rate of dissaving decreases with age.

B. Age-wealth Profiles

Given that elderly households dissave on average, the age-wealth profiles were examined to investigate the speed that households spend down their net worth and the type of assets (*i.e.*, financial assets and/or housing wealth) that they decumulate. Figure 3 shows the age-wealth profiles of aged households by cohort using the long-run microdata available from the FIES. Households' net worth is defined as net financial assets + housing assets, while net financial assets are defined as financial assets-liabilities. Households' stock of durable goods is excluded because the FIES does not contain suitable data to calculate this. Given that the age-wealth profiles of different cohorts are inevitably affected by changes in asset prices, such as real estate and stock prices, cohorts of various generations are examined to distill common features of wealth drawdown (dissaving) by the elderly.

Figures 3(a) and 3(b) show that elderly households tend to decumulate their wealth at a particularly moderate pace from their mid-60s regardless of cohort. The average rate of decumulation across all cohorts from the peak of net worth is calculated to be 1.4% (1.2% for elderly couples) using the median value of net worth (Figure 3(a)), which for most cohorts lies between age 63 and 65. The net financial assets (Figure 3(b)) show that the rate of decumulation is 1.4% (1.9% for elderly couples). The rate of net financial asset decumulation is broadly in line with the results reported by Horioka (2010). Horioka found that the

[11] Although information on the employment status of the household head is available, strictly distinguishing in the FIES whether the head is unemployed or retired is unfeasible. The elderly households without occupation are assumed to be retired because the unemployment rate among the elderly is low and stable (for men, it was 4.4% for those aged 55 to 59 years old, 6.1% for those aged 60 to 64 years old, and 3.0% for those aged 65 years old and above during the period 2008-2012, while the rate was much lower for women).

rate of net financial asset decumulation ranged from 1.0% to 2.0% in the period 1995-2008 for retired couples where both spouses were aged 65 years or older and from 1.9% to 2.4% for couples with a husband aged 65 years or older and a wife aged 60 years or older. Figure 3 also indicates that wealth decumulation tends to slow as the household head ages. Although the annual rate of wealth decumulation for those in their 60s (from ages 61-63 to ages 69-71) is 1.8%, this decelerates to 0.5% for those in their 70s (from ages 69-71 to ages 78-80). The corresponding slowdown for elderly couples is from 1.4% to 0.8%.

C. Do the Elderly Consume Particularly Little and Substantially Save During Retirement?

The above-mentioned findings indicate that households may be substantially saving during retirement compared with suggestion of the basic LC/PIH. A simple calculation was employed using information available from the FIES for the period 2008-2012 to examine whether elderly couples spend their resources at an appropriate pace if one takes the standard LC/PIH as a yardstick. Specifically, household i is assumed to live for $(T_i - S_i)$, the average life expectancy for a person at age S_i, and use up the life cycle wealth at the end of period T_i. For simplicity and considering that interest rates and inflation in Japan have been near zero for the past two decades, the interest rate and time preferences are assumed to be zero. Then, the "optimal" consumption level in each year for households i, c_i^*, is equal to the life cycle wealth of household i divided by $(T_i - S_i)$.[12] The obtained c_i^* and actual consumption expenditure indicate that c_i, $\phi_i = c_i / c_i^*$ can be calculated, where ϕ_i represents the discrepancy index between the actual consumption expenditure and "optimal" consumption expenditure. The following assumptions were formulated when calculating life cycle wealth: (i) households continue to receive the same amount as their current pension benefits until they die, (ii) the life expectancy of household i is defined as the average of the life expectancies of the husband and wife, (iii) housing assets (excluding the value of land) depreciate at the rate given in the statistics by type of housing structure, and (iv) the economic situation during 2008-

[12] Here, the standard assumption is employed to ensure that preferences are intertemporally additive, and the instantaneous utility function, $u(c_t)$, is increasing and concave without variation with age.

2012 indicates that households expect no capital gains or losses on their wealth.[13] Life expectancy is taken from the "Life Tables" annually published by the Ministry of Health, Labour, and Welfare, which contain the life expectancy for men and women for each age (from zero to 105 years old).

Figure 4 displays the results. The median of ϕ_i is 0.72 for those in their mid-60s, which is substantially less than one. This finding indicates that households will not use up their life cycle wealth if they die in line with the average life expectancy. Households' consumption level deviates from the optimal level more the older they become, and the median of ϕ_i is 0.39 for those in their late 70s. This finding indicates that the elderly tend to slowly dissave with age. Possible explanations are that households plan to leave a bequest and/or engage in precautionary saving towards risks, such as ill health or longevity.

IV. Determinants of Dissaving by Elderly Households

A. Empirical Methodology

Another objective of this study is to examine the factors the underlie the slow wealth drawdown of the elderly. Although the FIES provides rich information on consumption, income, and assets, it contains no potentially important variables, such as information on the health of household members, households' detailed family structure (*e.g.*, whether householders have children that separately live), information on intergenerational transfers within the family, households' intention to leave a bequest, and precautionary saving, to understand the behavior of the elderly. These factors are likely to play an important role in understanding excess saving of the elderly. However, as mentioned earlier, this information is available in JSTAR. The correlation of saving rate to the intention to leave a bequest and precautionary saving is examined using available data from JSTAR by estimating a median regression in which other characteristics that may be related to the saving rate are controlled for. Specifically, the following simple regression is estimated:

[13] The Topix stood at 859, 908, 899, 729, and 860 points at the end of 2008, 2009, 2010, 2011, and 2012, respectively.

$$SR_i = \alpha_0 + \alpha_1 BequestDummy_i + \alpha_2 PreSavDummy_i + \beta X_i + e_i, \quad (1)$$

where SR_i is the saving rate of respondent i, and $BequestDummy_i$ is a dummy variable that equals one if the respondent answered that they plan to leave a bequest. Similarly, $PreSavDummy_i$ is a dummy that equals one if the respondent answered that they have savings for precautionary reasons. Note that no causal relationship between these dummies and the saving rate is assumed in this regression. The primary purpose here is to examine whether the saving rate is higher for those who either plan to leave a bequest and/or engage in precautionary saving, with other characteristics controlled for, which are observable from the JSTAR dataset. These controls, represented by X_i, include the age of the household head, the square of the age of the household head, the marital status and educational attainment of the household head, a dummy for home owners, dummies for the employment status of the respondent and spouse if the respondent is married, which take one if the person is retired and zero if working, the health condition of the respondent and spouse if the respondent is married, dummies related to family members (*i.e.*, dummies that take one if a respondent has a child/children, has a child/children who are junior high or high school students, has a child/children who are college or university students, and has a child/children who already work), dummies representing if the respondent has received a gift or inheritance in the past and/or expects to do so in the future, and a dummy that takes one if the respondent's or the spouse's parent(s) live(s) with the respondent. Respondents that are neither the household head nor the spouse of the head are dropped from the regressions.

Table 2 shows the basic statistics for the variables used in the regressions. Observations are restricted to respondents who answered the questions used for the analysis, which left 1688 observations from the first survey for ten municipalities and 1260 observations from the second survey for seven municipalities. The average age of the head in the first survey (Wave 1) is 63.7 years, three-quarters of household heads are married, 85% have a child/children, and 76% have a child or children who are already working. The share of respondents whose parents (or parents in law) live with them is 12%. One third of household heads have already retired, and 30% have a spouse who is working. With regard to the household health, respondents were asked to choose among the five categories ranging from 1 (very good) to 5 (very bad). The average

value is slightly above the middle of the range (towards the healthy side). Approximately 37% of respondents answered that they planned to leave a bequest. Moreover, 31% of households replied that they had received a gift or inheritance, while 14% of households expected to obtain such in the future. Households may save less if they received or count on receiving an inheritance, while they may save more if they plan to leave an inheritance for their children. Three-quarters of the respondents said that they had savings to prepare for unforeseen expenses and/or felt more secure with savings. The average saving rate of respondents (or couples, if married) was -4%, with a large standard deviation. The median of the saving rate is positive, which is unsurprising because two-thirds of respondents are working. In addition, imputed rents are excluded in consumption and disposable income due to a lack of necessary information. The right half of Table 2 presents figures from the second survey (Wave 2), which are currently available for seven municipalities. The question we used for precautionary saving was not asked in Wave 2.[14]

B. Regression Results

Table 3 presents the regression results using cross-section data from the first survey for 10 municipalities, which exhibits a large sample size and asked the question on precautionary saving included only in the first survey. Given the large standard deviation in the saving rate, median regression is used. The results for specification (1) indicate that, as expected, the saving rate is lower for retired heads, and this finding is consistent with the LC/PIH.[15] In addition, the rate is higher for married respondents. The health condition of a respondent demonstrates a negative effect on the saving rate, which may be due to higher medical costs and/or lower income caused by illness. The coefficient on the bequest dummy is significant and indicates that households planning to leave a bequest demonstrate a saving rate that is 7% points higher. Meanwhile, the coefficient on the precautionary saving dummy is close

[14] The graphics corresponding to Figures 1 to 4 but using the JSTAR data are presented in Appendix 3.

[15] If households can freely decide on their retirement age, the savings rate and retirement age will be decided simultaneously (Ishikawa 1988). An estimation using two-stage least squares is conducted to obtain consistent estimates for considering this notion. The results are presented in Appendix Table 1 and show that the coefficient on the bequest dummy is still significant.

to zero and statistically insignificant. The coefficients on the child dummies are non-statistically significant, except for the dummy for children that are already working, which is significant at the 10% level. No significant link is present between whether the (spouse's) parents live in the respondent's household and the saving rate. With regard to the dummies representing whether a household has received an inheritance or expects to receive an inheritance, the results indicate that having received or expecting to receive an inheritance are irrelevant to the saving rate. In specifications (2) and (3), the dummy representing precautionary saving and the one depicting the desire to leave a bequest are first excluded to check the robustness of the results. The coefficient on the bequest dummy remains significantly positive and essentially unchanged. Meanwhile, the coefficient on the precautionary saving dummy turns positive but remains close to zero and insignificant.

Table 4 presents the regression results based on the unbalanced panel data from Waves 1 and 2. The dummy for precautionary saving is omitted because the question was excluded in Wave 2. The results are essentially the same as those in Table 3. The Breusch-Pagan and Hausman tests support the random effect model. This finding suggests that if a respondent expects to leave a bequest, then the household exhibits a saving rate that is 10% points higher than would otherwise be the case.

C. Discussion

The results in Tables 3 and 4 indicate that the saving rate of the elderly is considerably high for the desire to leave an inheritance but not by precautionary saving. These results are consistent with those obtained by Hamaaki and Hori (2019) but differ from those obtained by Horioka and Niimi (2017), who highlighted the relative importance of precautionary saving. Discrete choice regressions following their approach were employed by replacing the dependent variable in Equation (1) with a dummy variable that takes one if the saving rate is negative and zero otherwise (columns (1) to (3) in Appendix Table 2) to examine the possible reasons that the results here differ from those obtained by Horioka and Niimi (2017). However, the finding that precautionary saving exhibits no effect on the saving rate of the elderly remains constant. Furthermore, the saving rate-to-wealth ratio is used as an alternative dependent variable to consider the possibility that the saving rate regression may suffer from extreme outliers, such as households with a very low income. However,

the coefficient on precautionary saving is insignificant (column (4) in Appendix Table 2).[16]

Precautionary saving is insignificant due to two possible reasons: First, if individuals perceive uncertainties, such as with regard to their income, health, or other eventualities, during their retirement to be smaller than during their working life, then they may feel less need to additionally save for precautionary purposes because they have already accumulated savings for future contingencies during retirement. Abe and Yamada (2005) pointed out that if the retired elderly in Japan are assumed to face less income uncertainty than when they were working, then they do not need to suppress consumption for precautionary purposes (*i.e.*, they could consume more) because they face less income risk. Second, Dynan *et al.* (2002, 2004) suggested that respondents that plan to leave a bequest and save for uncertainty in the future may not generally distinguish between assets when saving for these purposes. The model of the aforementioned authors assumes that people save for life cycle and precautionary purposes and bequeath wealth to their offspring when precautionary savings are unused by contingencies.

The following additional analysis is conducted to further examine the second possible explanation: First, the ratio of households' consumption level to their expected life cycle wealth, $\phi_{i,}$ which was introduced in Section III, *C* (Figure 4), is examined using available data from JSTAR. The sample size becomes much smaller than in the case of the saving rate regression because calculating this ratio means that data on household assets are needed. Nevertheless, using the ratio makes it possible to investigate households' dissaving behavior considering lifetime wealth. Table 5 and Table 6 compares ϕ_i — the ratio of households' consumption level to their expected life cycle wealth introduced in Section III, *C* — on the basis of whether individuals were planning to leave a bequest and/or were engage in precautionary saving. Given that JSTAR asks respondents about the

[16] Another possible reason is that the dataset used here differs from that used in Horioka and Niimi (2017). The advantages of the JSTAR compared with the data used by the aforementioned authors are the larger observations and longitudinal survey. The sample size of Horioka and Niimi's (2017) main regression was 210 and 1680 in this analysis. The saving rate equation was regressed by adding a dummy variable for those who plan to leave a bequest to their spouse, brother, sister, and/or other relatives. I am grateful to an anonymous referee for this suggestion. The coefficient on precautionary saving remains insignificant.

pension benefits, such as the amount that they expect to receive and the age at which they expect to receive in the future, such information is also used to calculate expected lifetime wealth.[17] The results in Table 5 show that the median of ϕ_i for retired couples whose heads are in their early 60s is 0.56, which is substantially less than one. This value marginally decreases to 0.55 for couples whose heads are in their late 60s and then declines to 0.45 for couples whose heads are in their early 70s. Although the dataset used in the additional analysis here is different from that used to obtain Figure 4, the results are highly similar because the median of ϕ_i is smaller than one and decreases with age.

In Table 6, observations are divided by whether a respondent plans to leave a bequest and/or saves for precautionary reasons. The first row shows that the median of ϕ_i is 0.45 for respondents who plan to leave a bequest, which is lower than 0.58 for those that have no plan of leaving a bequest. The second and third rows show that the finding that the median of ϕ_i is smaller for respondents who plan to leave a bequest remains constant even if the observations are further divided into whether or not they have savings for precautionary reasons (*i.e.*, 0.45 *vs.* 0.53 and 0.47 *vs.* 0.72). However, the comparison result of the two rows shows that the difference is much larger for those that are not saving for precautionary reasons. The first column shows that among respondents who plan to leave a bequest, a slight difference is observed depending on whether respondents engage in precautionary saving or not (*i.e.*, 0.45 *vs.* 0.47). Meanwhile, the second column indicates that a substantial difference is observed for those that do not plan to leave a bequest (*i.e.*, 0.53 *vs.* 0.72). This result suggests that respondents who plan to leave a bequest build up savings to be used for both purposes, *i.e.*, to leave a bequest if events occur according to plan and use it for

[17] JSTAR includes a question that asks respondents about their expected lifespan. Moreover, JSTAR also asks about (i) the pension benefits that a respondent was currently receiving and (ii) other pension benefits that the respondent expected to receive in the future (amount and starting age). Information from these questions is used to calculate respondents' lifetime wealth. Specifically, the present discounted value of expected future disposable income is calculated as

$$\sum_{s}^{T} \left\{ (Penbnfts_{i,s} * pratio_{k}) / (1+r)^{t-s} \right\},$$

themselves if otherwise.

Table 6 suggests that dissaving differs depending on whether households were planning to leave a bequest. By contrast, whether respondents were saving for precautionary purposes differs only between those that have no plan of leaving a bequest. The following regression is estimated to further examine this result:

$$\ln(W_i / C_i) = \alpha_0 + \alpha_1 BequestDummy_i + \alpha_2 PreSavDummy_i + \beta X_i + u_i, \quad (2)$$

where (W_i/C_i) is the expected lifetime wealth-to-consumption ratio of respondent i, which equals the inverse of φ_i, and the other variables are the same as those in Equation (1). The observations are restricted to those whose information necessary for the regression is available (295 observations). The results are shown in columns (1) and (2) of Table 7 and indicate that the coefficient on the bequest dummy is positive and statistically significant. In specifications (1) and (3), the coefficient on precautionary saving is positive but non-statistically significant. Specifications (4) and (5) present the regression results when the observations are divided by whether respondents are planning to leave a bequest or not. The coefficient on precautionary saving is positive but insignificant for those planning to leave a bequest but positive and significant for those not planning to leave a bequest. The results indicate that with other things being equal, the level of consumption of retired elderly who plan to leave a bequest is 18% lower (for the rest of their lives) than that of retired elderly who are not planning to leave a bequest. Among those not planning to leave a bequest, with other things being equal, retired elderly saving for precautionary reasons consume 24% less than those not saving for precautionary reasons.[18]

where *Pratio* is an adjustment factor that is the average ratio of disposable income to pension benefits of retired elderly obtained from FIES, and r is the real interest rate in the year that the survey was conducted (*i.e.*, 0.015, 0.0128, and 0.0098 in 2007, 2009, and 2011, respectively). For respondents with a spouse, the pension benefit after the spouse has died is assumed to be 44% lower. This assumption is based on comparable figures from the FIES. As for consumption, an age-related taste shifter is incorporated to ensure that consumption falls by 1.4% with each additional year of age. For respondents whose spouse passed away, consumption falls by 42% (also estimated using comparable figures from the FIES).

[18] One potentially important factor neglected here is the possible effect of asset

V. Concluding Remarks and Remaining Issues

In view of the rapid population aging in Japan, this study investigated the behavior of elderly households in the country utilizing two different micro-datasets, which have only recently become available, to contribute to the literature on the dissaving behavior of the elderly. The results obtained in this study can be summarized as follows.

The (dis)saving behavior of the elderly in Japan is broadly consistent with the life cycle hypothesis in the sense that elderly households dissave after retirement. However, the speed of net worth reduction (dissaving) is slow. Such speed becomes slower the older the household head is. A key factor underlying dissaving at a pace slower than that predicted by the standard LC/PIH is the desire to leave a bequest. By contrast, precautionary saving may not play a significant role in the slow pace of dissaving by retired elderly except for those who do not expect to leave a bequest.

Japan's elderly population will continue to increase over the next quarter of a century. Moreover, the ratio of the elderly to the total population will continue to increase for an even longer time, *i.e.*, the next 50 years or so, because the total population will decline. This finding indicates that utilizing the resources of the elderly is highly important from a policy perspective. The results obtained in this study suggest that policies, such as a reduction in taxes on inter vivo gifts or inheritances, may be effective and desirable to boost consumption by younger generations, especially younger households that are liquidity constrained. In addition, policies that reduce financial uncertainly for the aged through pension and healthcare measures could be effective in spurring consumption by the elderly, especially those that have no plan of leaving a bequest.

This study has shed some light on the factors underlying the slow

price shocks on the lifetime wealth of retired elderly in the future. I am grateful to an anonymous referee for pointing out this possibility. Although share prices follow a random walk, changes in land prices in the future may vary depending on where individuals live, and part of these changes in land prices may be predictable. I re-estimated the model by excluding observations in three and five areas where land price fluctuations are relatively high to investigate whether the regression results of Equation (2) were affected by asset price shocks. The number of observations declined to 180 and 166. However, the results remained qualitatively constant.

wealth decumulation (dissaving) of the elderly in Japan, thereby indicating that the importance of precautionary saving may differ depending on whether they plan to leave a bequest or not. Access to subsequent waves of JSTAR might allow us to conduct highly detailed analyses using substantial observations, especially on assets, including changes in assets of elderly households, in the near future. In addition, another avenue would be to consider mortality risk and relative risk aversion of individual households, which can be also addressed with JSTAR. These issues are left for future research.

(*Received 7 July 2018; Revised 5 March 2019; Accepted 8 April 2019*)

References

Abe, N. and T. Yamada. "Structural Estimation of Consumption Function: An Empirical Analysis on Precautionary Saving in a Buffer Stock Saving Model." *Keizai Kenkyu* 56 (No. 3 2005): 248-265. (in Japanese)

Ameriks, J., J. Briggs, A. Caplin, M.D. Shapiro, and C. Tonetti. Long-Term Care Utility and Late-in-Life Saving. NBER Working Paper 20973, 2015.

Dekle, R. "Do the Japanese Elderly Reduce Their Total Wealth? A New Look with Different Data." *Journal of the Japanese and International Economies* 4 (1990): 309-317.

Dynan, K., J. Skinner, and S. Zeldes. "The Importance of Bequests and Life-Cycle Saving in Capital Accumulation: A New Answer." *American Economic Review* 92 (No. 2 2002): 274-278.

_____. "Do the Rich Save More?" *Journal of Political Economy* 112 (No. 2 2004): 397-444.

De Nardi, M. "Wealth Inequality and Intergenerational Links." *Review of Economic Studies* 71 (2004): 743-768.

De Nardi, M., E. French, and J. Jones. "Why Do the Elderly Save? The Role of Medical Expenses." *Journal of Political Economy* 118 (No. 1 2010): 39-75.

_____. Saving after Retirement: A Survey. NBER Working Paper 21268, 2015.

Hamaaki, J., M. Hori, K. Iwamoto, S. Maeda, K. Murata, and T. Niizeki. "Estimation of Real Assets Holdings by Japanese Households Based on the Microdata from the Family Income and

Expenditure Survey: Estimation Methods and Illustrative Tables and Figures." *Keizai Bunseki (Economic Analysis)* 189 (2015): 63-95. (in Japanese)

Hamaaki, J., M. Hori, K. Iwamoto, K. Murata, T. Niizeki, and F. Suga. "Estimation of Annual Consumption Expenditures by Japanese Households Based on the Microdata from the Family Income and Expenditure Survey: Estimation Methods and Illustrative Tables and Figures." *Keizai Bunseki (Economic Analysis)* 190 (2016): 95-128. (in Japanese)

Hamaaki, J. and M. Hori. "The Bequest Motive and Saving Behavior of the Elderly: Evidence from Japanese Microdata." *Keizai Bunseki (Economic Analysis)*, forthcoming, 2019. (in Japanese)

Hayashi, F. "Why is Japan's Saving Rate so Apparently High?" in F. Stanley (ed.), *NBER Macroeconomics Annual*, Vol 1, Cambridge, MA: MIT Press, pp. 147-210, 1986.

Hayashi F., A. Ando, and R. Ferris. "Life Cycle and Bequest Savings: A Study of Japanese and US Households Based on Data from the 1984 NSFIE and the 1983 Survey of Consumer Finances." *Journal of the Japanese and International Economies* 2 (No. 4 1988): 450-491.

Hori, M. and T. Niizeki. Housing Wealth Effects in Japan: Evidence Based on Household Micro Data. ESRI Discussion Paper Series No. 339, 2017.

Horioka C. Y., N. Kasuga, K. Yamazaki, and W. Watanabe. "Do the Aged Dissave in Japan? Evidence from Micro Data." *Journal of the Japanese and International Economies* 10 (No. 3 1996): 295-311.

Horioka, C. Y. "The (Dis)saving Behavior of the Aged in Japan." *Japan and the World Economy* 22 (No. 3 2010): 151-158.

Horioka, C. Y. and Y. Niimi. "An Empirical Analysis of the Saving Behavior of Elderly Households in Japan." *Keizai Bunseki (Economic Analysis)* 196 (2017): 29-47. (in Japanese)

Ichimura, H., S. Shimizutani, and H. Hashimoto. JSTAR First Result 2009 Report. RIETI Discussion Paper Series 09-E-047, 2009.

Ishikawa, T. "Saving and Labor Supply Behavior of Aged Households in Japan." *Journal of the Japanese and International Economies* 2 (No. 4 1988): 417-449.

Love, D. A., M. G. Palumbo, and P. A. Smith. "The Trajectory of Wealth in Retirement." *Journal of Public Economics* 93 (Nos. 1-2 2009): 191-208.

Murata, K. "Precautionary Saving and Income Uncertainty: Evidence from Japanese Micro Data." *Monetary and Economic Studies* 21 (No. 3 2003): 21-52.

Poterba, J. M., S. F. Venti, and D. A. Wise. "Family Status Transitions, Latent Health, and the Post-Retirement Evolution of Assets." in D. A. Wise (ed.), *Explorations in the Economics of Aging*, National Bureau of Economic Research, 2011.

Poterba, J. M., S. F. Venti, and D. A. Wise. Health, Education, and the Post-Retirement Evolution of Household Assets. NBER Working Paper 18695, 2013.

Zhou, Y. "Precautionary Saving and Earnings Uncertainty in Japan: A Household-Level Analysis." *Journal of the Japanese and International Economies* 17 (No. 2 2003): 192-212.

TABLE 1 SAMPLE STATISTICS

Basic statistics of the Family Income and Expenditure Survey and comparison with JSTAR

	Family Income and Expenditure Survey						JSTAR		
	(a)			(b)			(c)		
	All households			Households with head aged 50 or over			Households used in the analysis		
Variable	Mean	Std. dev.	Median	Mean	Std. dev.	Median	Mean	Std. dev.	Median
Income and consumption									
Disposable income	4,537	2,510	4,141	4,142	2,665	3,527	4,487	6,226	3,500
Disposable income (including imputed rent)	5,157	2,669	4,734	4,841	2,792	4,235		-	
Consumption	3,540	1,978	3,145	3,580	2,166	3,106		-	
Consumption (including imputed rent)	4,161	2,126	3,783	4,280	2,295	3,842		-	
Consumption (excluding automobile purchases)	3,465	1,844	3,126	3,510	2,044	3,086	2,508	1,325	2,400
Age of household head and family attributes									
Age of household head	51.2	14.2	51	62.4	8.7	61	65.1	7.4	65
Number of household members	3.0	1.3	3	2.6	1.2	2	2.6	1.2	2
Dummy for household head not in work	0.19	0.39	0.00	0.34	0.48	0	0.38	0.49	0
Number of observations		48,034			25,365			3,362	
Wealth									
Net worth	25,164	30,197	17,389	35,558	33,473	28,170	35,549	33,020	28,000
Net financial assets	8,457	22,307	4,600	16,170	24,180	10,300	15,231	27,264	9,000
Housing wealth	15,930	18,769	12,983	18,274	19,419	14,260	20,318	19,097	15,000
Number of bservations		35,389			18,256			798	

Notes:

1) Income, consumption, and assets are in thousand yen. The table shows figures for households whose disposable income and consumption are available for the period 2008-2012 from the FIES, and from the first JSTAR surveys, which were conducted in 2007–2011. Income and consumption are in 2012 prices.
2) Income and consumption are annualized.
3) Housing wealth is unavailable from the FIES and is estimated using related variables as explained in Section 2. Net worth and net financial assets from the FIES exclude one-person households.
4) In JSTAR, some households provided their answers on income, consumption, and assets in the form of bracket questions rather than exact figures. For those households, the variables are imputed. See Appendix 1 for details.

TABLE 2 BASIC STATISTICS FOR REGRESSION (DATA FROM JSTAR)

	Wave 1 (10 municipalities)				Wave 2 (7 municipalities)			
	No. of obs.	Mean	Std. dev.	Median	No. of obs.	Mean	Std. dev.	Median
Age of head	1,688	63.7	7.18	64	1,260	67.2	7.3	68
Education of head								
Junior high school	1,688	0.18	0.38	0	1,260	0.07	0.08	0
High school	1,688	0.45	0.50	0	1,260	0.43	0.49	0
Junior college	1,688	0.09	0.29	0	1,260	0.09	0.29	0
Four-year university or higher	1,688	0.29	0.45	0	1,260	0.18	0.38	0
Family attributes								
Married	1,688	0.76	0.42	1	1,260	0.76	0.43	1
Have a child/children	1,688	0.85	0.36	1	1,260	0.90	0.30	1
Have a child/children (junior high or high school student)	1,688	0.01	0.12	1	1,260	0.01	0.08	1
Have a child/children (college or university student)	1,688	0.05	0.22	0	1,260	0.04	0.20	0
Have a child/children (with job)	1,688	0.76	0.43	0	1,260	0.83	0.38	0
Living with parent(s)	1,688	0.12	0.32	0	1,260	0.10	0.30	0
Employment status								
Retired head	1,688	0.33	0.47	0	1,260	0.46	0.50	0
Spouse working	1,688	0.32	0.47	0	1,260	0.30	0.46	0
Health status								
Bad health	1,688	2.36	1.09	2	1,260	2.52	1.03	3
Spouse bad health	1,688	2.42	0.97	2.5	1,260	1.48	0.73	1
Bequests								
Planning to leave bequest	1,688	0.37	0.48	0	1,260	0.26	0.44	0
Received bequest	1,688	0.31	0.46	0	1,260	0.31	0.46	0
Expecting to receive bequest	1,688	0.14	0.35	0	1,260	0.07	0.25	0
Precautionary saving	1,688	0.76	0.43	1			-	
Income, consumption, and saving rate								
Saving rate	1,688	-0.04	2.38	0.37	1,260	0.03	1.08	0.28
Consumption (million yen)	1,688	2.65	1.47	2.46	1,260	2.33	1.10	2.19
Disposable income (million yen)	1,688	5.05	6.60	4.00	1,260	3.70	3.12	3.07
Home ownership	1,688	0.82	0.38	1	1,260	0.83	0.38	1

Note: "Planning to leave bequest" represents respondents who plan to leave a bequest and/or give inter vivo transfers to their children. Spouse bad health is assumed to take an average value for a single respondent.

Table 3 Determinants of Saving Rate of Elderly Households (Median regressions)

	(1)			(2)			(3)		
	Coef.		Std. err.	Coef.		Std. err.	Coef.		Std. err.
Planning to leave bequest	0.068	**	(0.030)	0.069	**	(0.030)			
Precautionary saving	-0.008		(0.033)				0.003		(0.033)
Bad health	-0.036	***	(0.013)	-0.036	***	(0.013)	-0.028	***	(0.013)
Spouse bad health	-0.010		(0.015)	-0.010		(0.015)	-0.014		(0.015)
Received bequest	0.027		(0.031)	0.027		(0.031)	0.024		(0.030)
Expecting to receive bequest	-0.007		(0.041)	-0.007		(0.041)	0.001		(0.041)
Dummy for retired head	-0.160	***	(0.035)	-0.160	***	(0.036)	-0.168	***	(0.036)
Married	0.137	***	(0.040)	0.141	***	(0.041)	0.136	***	(0.041)
Spouse working	0.051		(0.033)	0.049		(0.034)	0.074	**	(0.034)
Have a child/children	-0.024		(0.063)	-0.027		(0.064)	-0.003		(0.063)
Have a child/children (junior high or high school student)	0.077		(0.120)	0.085		(0.122)	0.100		(0.122)
Have a child/children (college or university student)	0.046		(0.067)	0.049		(0.068)	0.035		(0.068)
Have a child/children (with job)	0.096	*	(0.054)	0.100	*	(0.054)	0.071		(0.055)
Living with parent(s)	0.041		(0.048)	0.039		(0.048)	0.028		(0.048)
Pseudo R2	0.053			0.053			0.052		
Number of observations	1,688			1,688			1,688		

Notes: The dependent variable is the saving rate. Age and age squared of the household head, year dummies, city dummies, a dummy for home owners, dummies for the educational attainment of the household head (high school, college, or university or higher), and number of household members are included in the regressions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 4 Determinants of Saving Rate for Elderly Households (Panel regressions)

	Pooled (Between effect)			Fixed effect			Random effect		
	Coef.		Std. err.	Coef.		Std. err.	Coef.		Std. err.
Planning to leave bequest	0.096	**	(0.046)	0.476	**	(0.206)	0.103	**	(0.044)
Bad health	-0.062	***	(0.019)	-0.085		(0.067)	-0.062	***	(0.018)
Spouse bad health	-0.015		(0.024)	-0.079		(0.068)	-0.026		(0.023)
Received bequest	0.017		(0.044)	0.045		(0.360)	0.023		(0.043)
Expecting to receive bequest	0.008		(0.066)	0.102		(0.258)	0.006		(0.064)
Dummy for retired head	-0.237	***	(0.051)	-0.252		(0.261)	-0.256	***	(0.049)
Married	0.162	***	(0.059)	-0.286		(0.658)	0.168	***	(0.057)
Spouse working	0.084	*	(0.049)	-0.032		(0.254)	0.083	*	(0.048)
Have a child/children	-0.164	*	(0.094)		-		-0.129		(0.091)
Have a child/children (junior high or high school student)	-0.067		(0.198)	-0.075		(0.893)	-0.050		(0.188)
Have a child/children (college or university student)	0.048		(0.103)	-0.422		(0.441)	0.052		(0.098)
Have a child/children (with job)	0.170	***	(0.080)	-0.000		(0.306)	0.136	*	(0.077)
Living with parent(s)	-0.002		(0.070)	-0.232		(0.406)	0.014		(0.068)
Within R2	0.02			0.06			0.03		
Between R2	0.08			0.00			0.08		
Overall R2	0.07			0.00			0.07		
F-test that all u_i=0 (p-value)		–			0.328			–	
Breusch-Pagan test (p-value)		–			–			0.142	
Hausman prob. chi2 (p-value)		–			–			0.946	
Number of observations					2,938 (2,612)				

Notes: The dependent variable is the saving rate. Age and age squared of the household head, year dummies, city dummies, a dummy for home owners, dummies for the educational attainment of the household head (high school, college, or university or higher, and number of household members are included in the regressions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Observations whose saving rate was either higher than the top 1% or lower than the bottom 1% were omitted from the regressions.

TABLE 5 CONSUMPTION LEVEL OF RETIRED ELDERLY (MEDIAN OF ϕ_i)

	All	Age of the head			
		Aged 60-64	Aged 65-69	Aged 70-74	Aged 75-79
ϕ	0.51	0.56	0.55	0.45	0.49
No. of observations	355	55	104	120	64

Note: Retired households from JSTAR.

TABLE 6 CONSUMPTION LEVEL OF RETIRED ELDERLY:
By Planning to Leave a Bequest and Precautionary Saving (Median of ϕ_i)

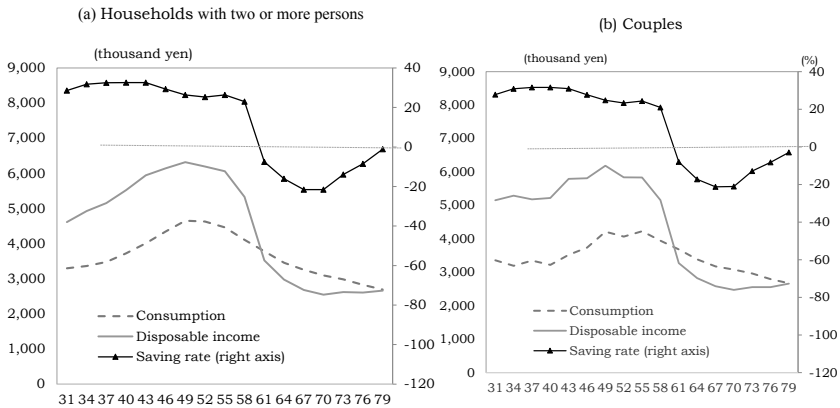
		Plan to leave bequest		
		Yes	No	
		0.45	0.58	
		(124)	(197)	
Precautionary saving	Yes	0.45	0.53	0.49
		(103)	(151)	(254)
	No	0.47	0.72	0.59
		(21)	(46)	(67)

Notes: Retired households from JSTAR. The number of observations is shown in parentheses. "Planning to leave bequest" indicates that respondents answered that they planned to leave a bequest to their child/children.

TABLE 7 DETERMINANTS OF THE RATIO OF EXPECTED LIFE-TIME WEALTH TO EXPENDITURES OF RETIRED ELDERLY (Median regressions)

	(1)		(2)		(3)		(4)		(5)	
							Plan to leave bequests		No bequest motive	
	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
Planning to leave bequest	0.169 *	(0.087)	0.185 **	(0.090)						
Precautionary saving	0.200	(0.104)			0.142	(0.090)	0.085	(0.133)	0.237 **	(0.114)
Bad health	-0.052	(0.039)	-0.074 *	(0.040)	-0.063 *	(0.033)	0.010	(0.044)	-0.127 ***	(0.048)
Spouse bad health	0.028	(0.043)	0.058	(0.045)	0.012	(0.037)	-0.014		0.053	(0.052)
Received bequest	0.239 **	(0.096)	0.248 **	(0.099)	0.220 ***	(0.082)	0.335 ***	(0.104)	0.245 **	(0.120)
Expecting to receive bequest	0.091	(0.173)	0.138	(0.179)	0.150	(0.150)	-0.158	(0.175)	0.250	(0.241)
Married	-0.166	(0.158)	-0.201	(0.164)	-0.207	(0.135)	-0.509	(0.155)	-0.044	(0.239)
Have a child/children	-0.213	(0.207)	-0.099	(0.213)	-0.093	(0.177)	1.336	(0.454)	0.062	(0.247)
Have a child/children (with job)	0.231	(0.177)	0.101	(0.182)	0.169	(0.153)	0.197	(0.185)	-0.007	(0.228)
Living with parent(s)	-0.045	(0.216)	0.008	(0.224)	0.049	(0.188)	-0.042	(0.232)	0.208	(0.291)
Pseudo R2	0.151		0.142		0.151		0.290		0.171	
Number of observations	295		295		295		114		181	

Notes: Age and age squared of the household head, year dummies, city dummies, dummies for the educational attainment of the household head (high school, college, or university or higher), and number of household members are included in the regressions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.



Notes: Author's calculations based on FIES data. Consumption and disposable income are deflated using the consumer price index.

FIGURE 1

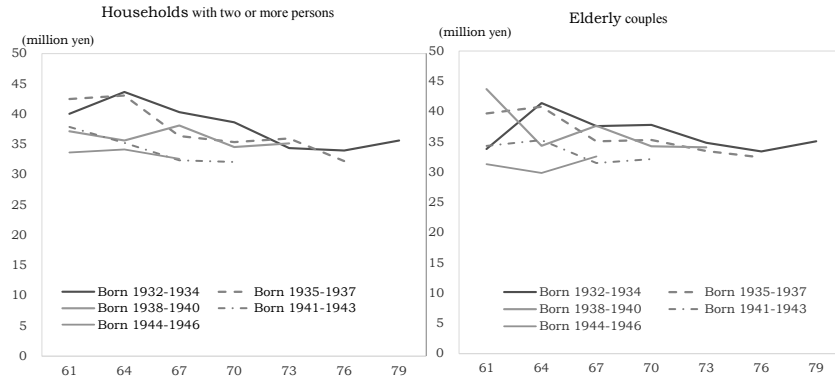
AGE PROFILES OF THE SAVING RATE, INCOME AND CONSUMPTION (AVERAGE FIGURES, 2008-2012)

Notes: See notes for Figure 1.

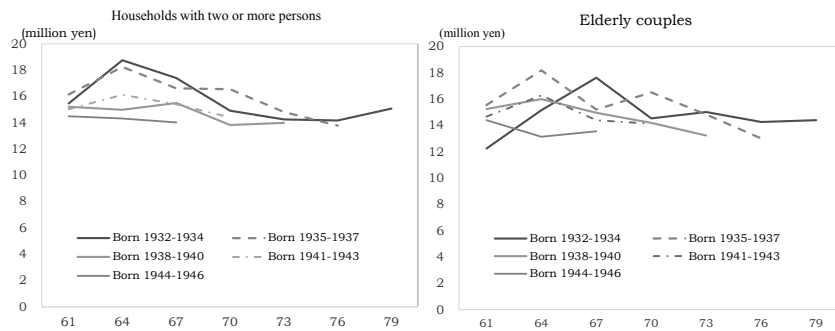
FIGURE 2

INCOME AND CONSUMPTION OF AGED HOUSEHOLDS BY EMPLOYMENT STATUS (AVERAGE FIGURES, 2008-2012)

(a) Net worth



(b) Net financial assets

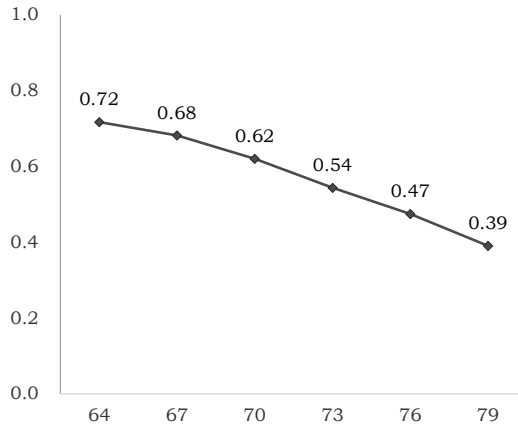


Notes: Cohort series are calculated using cross-section data grouping householdd into agegroups in three-year intervals starting in 1985 up to 2012. The figures are deflated using the consumer price index

Source: Author's calculations based on FIES data

FIGURE 3

AGE–WEALTH PROFILES BY COHORT (MEDIAN VALUES))



Note: Aged couples that are not working.
Source: Author's calculations based on FIES data.

Figure 4
Elderly households' consumption level (median of ϕ_i)

Appendix 1. JSTAR data and missing-data imputation

JSTAR asks respondents to fill in their disposable income and amount of financial assets (*e.g.*, deposits, bonds, and shares) in the self-reporting questionnaire to measure income and financial assets. Then, in the interview that comes after the self-reporting questionnaire, the interviewer asks the respondent whether those items were indeed filled in or not. If the items were not filled in, the interviewer asks about the value of those items. If a respondent is willing to answer but provide no exact numbers, he/she is asked a sequence of unfolding bracket questions ("Was the income higher/lower than a certain threshold?") using up to three thresholds. These answers place the income/assets in a certain range. With regard to consumption, housing wealth, and debt, no such questions were included in the self-reporting questionnaire. The interviewer asked the respondent for the value, followed by bracket questions when required.

For respondents whose income is reported in terms of range, the figures are imputed by taking the average if a respondent provided upper and lower brackets. In cases where respondents provided

only one, the median value of the group a respondent belongs to is given. With regard to income, the groups are categorized by year and employment status (in work, on leave, and no longer work). Meanwhile, with regard to wealth, debt, and consumption, the groups are categorized by year and five-year age intervals for the household head. Out of the 1688 observations used in Table 3, respondents who provide an income value make up 89.6% (1513 observations); 4.0% provided upper and lower brackets, 5.5% upper bracket only, and 0.8% lower bracket only.

Appendix 2. Regression results using other specifications

Appendix Table 1 shows the results for the specifications in Table 3 when considering possible endogeneity of the saving rate and retirement decision. A dummy indicating whether the household head has reached the age of eligibility for the public pension is used as instrument for the retirement dummy because the age of eligibility in Japan for the public pension depends on the birth year and sex. The rationale is that becoming eligible for public pension benefits should greatly affect the retirement decision but is uncorrelated with the error term of the saving rate equation. The regression is conducted using two-stage least squares. The signs of the coefficients on the dummies for children remain the same, but the coefficients are statistically insignificant. The coefficients on the bequest dummy are positive and significant.

As explained in the main text, in Appendix Table 2, specifications (1), (2), and (3) show the results when the saving rate is replaced by a dummy variable following Horioka and Niimi (2017). In specification (4), the saving rate is replaced by the ratio of saving to net worth. As explained in the main text, the reason for focusing on the saving rate in the regressions in Section Ⅳ is because the sample size is substantially reduced if wealth variables are included in the regressions. Appendix Table 2 shows that in all specifications, the coefficient on the dummy for planning to leave a bequest is positive and significant at the 10% level, while the coefficient on the precautionary saving dummy is close to zero and insignificant.

Appendix Table 1 Determinants of the Saving Rate of Elderly Households (Two-stage least squares)

	(1)			(2)			(3)		
	Coef.		Std. err.	Coef.		Std. err.	Coef.		Std. err.
Saving rate									
Planning to leave bequest	0.131	**	(0.054)	0.132	**	(0.053)			
Precautionary saving	0.015		(0.060)				0.021		(0.060)
Bad health	-0.057		(0.035)	-0.057		(0.035)	-0.055		(0.035)
Spouse bad health	-0.038		(0.027)	-0.038		(0.027)	-0.038		(0.027)
Received bequest	0.000		(0.060)	0.001		(0.060)	0.031		(0.056)
Expecting to receive bequest	0.046		(0.067)	0.047		(0.069)	0.072		(0.068)
Dummy for retired head	-1.053		(0.694)	-1.061		(0.702)	-1.090		(0.704)
Married	0.184	**	(0.081)	0.184	**	(0.081)	0.177	**	(0.081)
Spouse working	-0.106		(0.123)	-0.108		(0.124)	-0.111		(0.124)
Have a child/children	-0.147		(0.131)	-0.147		(0.131)	-0.108		(0.132)
Have a child/children (junior high or high school student)	0.181		(0.157)	0.181		(0.158)	0.170		(0.160)
Have a child/children (college or university student)	0.021		(0.133)	0.020		(0.134)	0.008		(0.134)
Have a child/children (with job)	0.114		(0.106)	0.114		(0.106)	0.110		(0.106)
Living with parent(s)	-0.006		(0.074)	-0.007		(0.074)	-0.012		(0.074)
Decision of the head to retire (first-stage regression)									
Dummy indicated whether head has reached age of eligibility for basic pension benefits	0.129	***	(0.039)	0.127	***	(0.039)	0.129	***	(0.039)
Underidentification tests									
Kleibergen-Paap rk LM stat.	11.13	***	(0.000)	10.95	***	(0.001)	11.03	***	(0.000)
Kleibergen-Paap rk Wald stat.	11.10	***	(0.000)	10.92	***	(0.001)	10.99	***	(0.000)
Weak identification test (Kleibergen-Paap Wald rk F stat.)	10.90			10.73			10.79		
Weak-instrument-robust inference									
Anderson-Rubin Wald F test		2.54(0.111)			2.54(0.111)			2.69(0.101)	
Anderson-Rubin Wald chi-sq. test		2.59(0.108)			2.59(0.108)			2.74(0.098)	
Endogeneity chi-sq. test		2.58(0.108)			2.58(0.108)			2.73(0.099)	
Shea partial R2	0.009	***	(0.000)	0.009	***	(0.001)	0.009	***	(0.001)
Centered R2 of 2nd stage	0.017			0.015			0.005		
Number of observations	1,656			1,656			1,656		

Notes: The dependent variable is the saving rate. Age and age squared of the household head, year dummies, city dummies, a dummy for home owners, dummies for the educational attainment of the household head (high school, college, or university or higher), and number of household members are included in the regressions. All exogenous variables in the saving regression are also included in the first-stage regression. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Appendix Table 2 Determinants of the saving behavior of elderly households

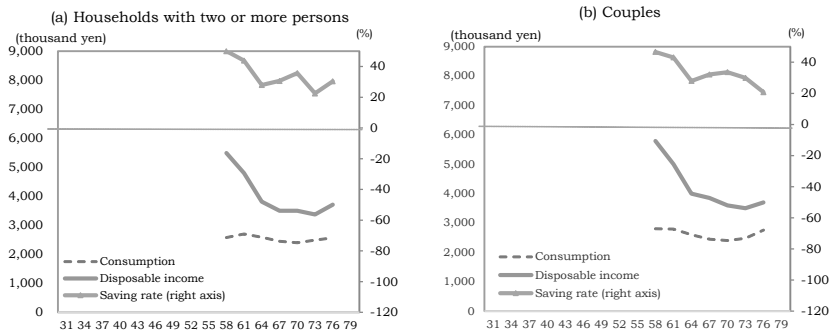
Discrete choice models (logit and probit models) and median regression of the saving-to-assets ratio

	(1)			(2)			(3)			(4)		
	Logit model (1 for $SR_i > 0$, 0 for $SR_i <= 0$)			Probit model (1 for $SR_i > 0$, 0 for $SR_i <= 0$)			Marginal effects (Probit model)			Saving/NW (Median regression)		
	Coef.		Std. err.	Coef.		Std. err.	Coef.		Std. err.	Coef.		Std. err.
Planning to leave bequest	0.274	*	(0.145)	0.151	*	(0.083)	0.043	*	(0.023)	0.018	*	(0.011)
Precautionary saving	-0.004		(0.153)	-0.002		(0.088)	-0.001		(0.025)	0.002		(0.013)
Bad health	-0.177	***	(0.059)	-0.098	***	(0.034)	-0.028	***	(0.010)	-0.010	**	(0.005)
Spouse bad health	-0.029		(0.071)	-0.022		(0.040)	-0.006		(0.012)	0.002		(0.006)
Received bequest	0.131		(0.146)	0.070		(0.084)	0.020		(0.024)	0.006		(0.011)
Expecting to receive bequest	0.006		(0.207)	0.010		(0.116)	0.003		(0.033)	-0.009		(0.015)
Dummy for retired head	-0.718	***	(0.159)	-0.415	***	(0.092)	-0.125	***	(0.029)	-0.034	***	(0.013)
Married	1.098	***	(0.176)	0.654	***	(0.103)	0.211	***	(0.036)	0.048	***	(0.016)
Spouse working	0.129		(0.168)	0.077		(0.094)	0.022		(0.026)	0.027	**	(0.013)
Have a child/children	-0.335		(0.291)	-0.181		(0.168)	-0.049		(0.043)	0.001		(0.025)
Have a child/children (junior high or high school student)	-0.153		(0.612)	-0.058		(0.354)	-0.017		(0.106)	-0.050		(0.045)
Have a child/children (college or university student)	0.677	*	(0.400)	0.360		(0.214)	0.090	*	(0.045)	0.071	***	(0.025)
Have a child/children (with job)	0.324		(0.253)	0.181		(0.146)	0.054		(0.045)	0.014		(0.021)
Living with parent(s)	0.324		(0.235)	0.192		(0.133)	0.052		(0.034)	-0.004		(0.019)
Pseudo R^2	0.124			0.126			0.126			0.093		
Number of observations	1,688			1,688			1,688			860		

Notes: In specification (4), the dependent variable is the ratio of saving to net worth. Age and age squared of the household head, year dummies, city dummies, a dummy for home owners, dummies for the educational attainment of the household head (high school, college, or university or higher) and number of household members are included. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Appendix 3. Corresponding figures using the JSTAR dataset

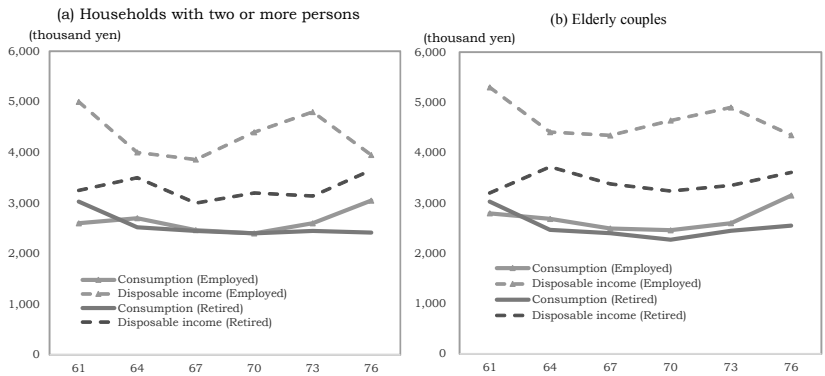
The following figures show the corresponding graphics for Figures 1 to 4 using the JSTAR surveys instead. Figures 1 and 2 show median values because the sample size of the JSTAR dataset is substantially smaller than that of the FIES data. Figure 3 shows the wealth level by age not by cohort because the JSTAR currently provides data for up to six years (three waves) only. As explained in Section Ⅱ, B, the consumption level is lower in the JSTAR, thereby probably reflecting differences in survey methods. The key characteristics found in each figure are similar to those in the corresponding graphics based on the FIES data. The figures based on the JSTAR data show some fluctuations due to the small number of observations.



Note: Author's calculations based on the first wave (Wave 1) of JSTAR data.

APPENDIX FIGURE 1

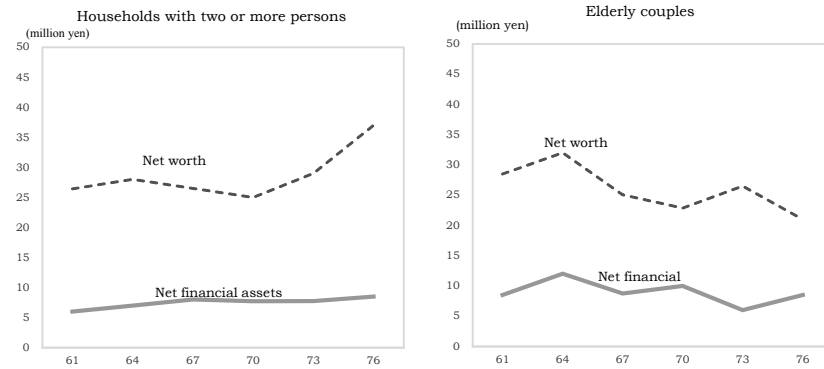
AGE PROFILES OF THE SAVING RATE, INCOME, AND CONSUMPTION (MEDIAN VALUES)



Note: See the note for Appendix Figure 1.

APPENDIX FIGURE 2

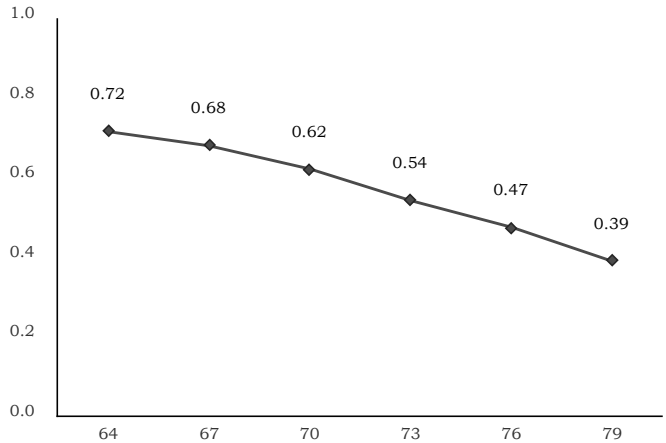
INCOME AND CONSUMPTION OF AGED HOUSEHOLDS BY EMPLOYMENT STATUS (MEDIAN VALUES)



Notes: Author's calculations based on the first wave (Wave 1) of JSTAR data.

APPENDIX FIGURE 3

AGE–WEALTH PROFILES



Note: Aged couples that are not working.
Source: Author's calculations based on JSTAR data.

APPENDIX FIGURE 4

CONSUMPTION LEVEL OF THE ELDERLY (MEDIAN OF ϕ_i)