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Dissaving by the elderly in Japan: Empirical evidence from survey data

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Dissaving by the elderly in Japan: Empirical evidence from survey data[†]

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Abstract

Using two micro datasets of household surveys, this study empirically examines the (dis)saving behavior of the elderly in Japan. Using the long-run dataset covering 20 years, the findings indicate that, on average, the elderly in Japan dissave, but the pace of dissaving of retired elderly appears to be excessively slow in light of the standard life cycle-permanent income hypothesis. The analysis suggests that one likely factor is the desire to leave a bequest. Both the saving rate and the pace of wealth decumulation show that retired households dissave more slowly if the head plans to leave a bequest. Retired elderly who intend to have savings for precautionary purposes are not found to dissave more slowly 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 codes: D14, E21, D91

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1. 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, one covering households throughout Japan over a long period and the other based on more recent surveys focusing on middle-aged and elderly households. Japan provides a particularly pertinent case study because population aging is progressing much faster than in other countries. Elderly households – i.e., households with a head aged over 60 – now make up more than 40 percent of households in Japan and account for almost 50 percent of household expenditure. In addition, Japan has a compulsory national health insurance scheme, meaning that the burden of medical costs on individuals is limited, mitigating the need to save for unforeseen medical expenses.[2]

Until around 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 in international comparison (e.g., Hayashi 1986). At that time it was found that Japanese aged households do not dissave (Hayashi et al. 1988, Dekle 1990), while Ishikawa (1988) showed that the average saving rate of aged households whose head is retired is substantially lower than that of working aged households.[3] In the late 1980s, with population aging progressing, 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, which showed that the average saving rate of elderly households was positive if the head was employed and negative if the head was retired (i.e., not in work). Horioka (2010), using the semi-aggregate data by employment status from the FIES, showed that the rate of decumulation of financial assets for retired households was slow compared to the rate implied by the simple life-cycle hypothesis.

[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 and thus can receive necessary medical services at a low cost by paying certain insurance premiums and co-payments (10–30 percent). Furthermore, people aged 75 and over are enrolled in the late-stage medical care system for the elderly. According to the author's calculation using microdata from the Family Income and Expenditure Survey, 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 percent and that for households with a head aged 70 or older was 5.8 percent. The ratio is almost the same for all income levels: the average ratio by income quartile, from the lowest to the highest, was 5.4 percent, 6.1 percent, 5.8 percent and 5.9 percent, respectively. The ratio was around 4 percent for younger households with a head aged in their 30s or 40s.

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

While these studies have revealed some important facts about the saving/dissaving behavior of the elderly in Japan, they have not necessarily succeeded in identifying the factors underlying the patterns they observe, probably due to limitations regarding the information available in the datasets used. For instance, the datasets employed in the studies do not contain certain key variables necessary to understand the behavior of the elderly, such as the detailed family structure (in particular, whether a family has a child/children not living in the household), information on the health of household members, and information on intergenerational transfers within the family. Since the desire to leave a bequest and precautionary saving likely are key factors underlying excess saving by the elderly, empirical studies not taking these factors into account provide only an incomplete understanding of the saving behavior of the elderly.

That said, there are two studies that addressed these issues as at least partially. The first of these is the study by Horioka et al. (1996), which examined the saving behavior of aged households using household level data including information on respondents' bequest motives. They calculated the average stocks and flows of saving by household characteristics, namely, (i) the health of the head and (ii) the respondent's bequest motive. They showed that the pace of net worth decumulation was slower for households with a selfish bequest motive than other respondents, but found little difference 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., the share of savings for retirement in their current total savings, the share for precautionary purposes, the share for leaving a bequest, and the share for other purposes) and whether they were dissaving or not, using a survey which contained questions about households' savings for each purpose. They found that saving for precautionary reasons was more important than saving for leaving a bequest in elderly households' saving/dissaving behavior. Thus, the studies by Horioka et al. (1996) and Horioka and Niimi (2017) produce inconclusive results regarding the saving/dissaving behavior of elderly households: the former suggested that the selfish bequest motive was important in the rate of asset decumulation, while the latter suggested that precautionary saving was more important in households' saving/dissaving behavior.[4]

Against this background, this study attempts to deepen our understanding of (dis)savings by the elderly using two micro datasets on Japanese households. Specifically, using the most recent detailed micro dataset constructed from the FIES covering a period of two decades, the (dis)saving behavior of the elderly in Japan is re-examined. Analyzing the issue employing both flow data (saving rate) and stock data (wealth decumulation), it is found that the average saving rate turns negative for households with heads in their early 60s, but the speed of

[4] There are some studies on precautionary saving by Japanese households such as Murata (2003), Zhou (2003) and Abe and Yamada (2005); however, their focus is on young workers or households and not on elderly households.

net worth reduction is very slow and is 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.

Next, based on the results obtained from the FIES data, the determinants of the saving/dissaving behavior of the aged are examined using another micro-based dataset on households, the Japanese Study on Ageing and Retirement (JSTAR). JSTAR is a recently launched longitudinal survey on elderly households, the contents of which are similar to the Health and Retirement Study (HRS) in the United States. JSTAR contains valuable information that is unavailable in the FIES, such as whether householders have children (including children that live separately), health information on household members, and whether they plan to leave a bequest. Running regressions that control for heterogeneity in family composition and the health of household members, it is found that aged households whose heads plan to leave a bequest have a higher saving rate (or a less negative saving rate if it is negative) than those not planning to leave a bequest. Precautionary saving is not found to be an important determinant of the saving rate of the elderly; however, it does appear to play a role in the slow pace of asset decumulation in households with a retirement age head that do not plan to leave a bequest to their children. The finding that households that 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 two functions: (1) a precautionary life-cycle function, and (2) a bequest function when things turn out better than could have been.

The results obtained in this study allow the following conclusions. First, in line with Horioka's (2010) finding, it is found that the rate of asset decumulation of retired households is slower than predicted by the standard LC/PIH. While Horioka obtained this finding based on 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 why households dissave slower than predicted by the standard LC/PIH appears to be 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 3 presents a descriptive analysis of age consumption/income profiles and age-wealth profiles using microdata from the FIES. Section 4 employs a simple regression to investigate factors affecting the saving behavior of the elderly. Finally, Section 5 concludes.

2. Data description

To investigate the (dis)saving behavior of the elderly in Japan, two Japanese household datasets, the Family Income Expenditure Survey (FIES) and the Japanese Study of Aging and Retirement (JSTAR), are used.

2.1 Family Income and Expenditure Survey (FIES)

Section 3 of this study uses the FIES to examine the (dis)saving behavior of the elderly, since it is a national representative survey which contains rich information on consumption, income and wealth. The FIES is employed by Horioka (2010), for example, 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 paper, using microdata from the FIES, the age profile of saving and wealth decumulation of financial assets as well as net worth are examined. The focus is on recent data for 2008-2012, 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. It supplies the basic information used for the calculation of the Quarterly Estimates of GDP and the Consumer Price Index. The survey covers around 9,000 households each month, and each household is surveyed for six months: one-sixth of the households are replaced by new households every month. As the monthly consumption data are compiled from a diary collected twice a month, the information can be assumed to be accurate and credible. The FIES also provides information on households' financial assets and liabilities, the family composition, and the employment status of each household member living in the household. Until 2001, the survey focused on households with two or more members, and since 2002 one-person households are also included. Among the 9,000 households surveyed, around 700 households are one-person households. Financial asset holdings and liabilities are not surveyed for one-person household.

While the FIES does not provide information on households' housing wealth, it does provide relevant information on households' home, such as whether households own their house, the size of the residence, the year of purchase, the type of structure (e.g., a wooden house or an apartment), and the area where the home is located. Using this information, it is possible to calculate the market value of households' housing wealth by estimating the value of the land on which a property sits and the value of the structure and adding the two together. More precisely, 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 (MLIT). The value of the structure is estimated based on the construction material costs reported in the "Annual

Report of Building Construction" (1953–2012) and applying a certain depreciation rate that depends on the type of structure of the dwelling.[5]

2.2 Japanese Study of Aging and Retirement (JSTAR)

Section 4 of this study uses JSTAR, a recently started comprehensive longitudinal survey which covers information on the economic, social, and health status of elderly people in Japan. It is very 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 a total of 7,723 respondents; the response rate was nearly 60 percent. 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 together with the second survey of the respondents added in 2009, and additionally conducted a first survey in three new municipalities.[7]

The observations in the baseline/first survey are for respondents aged 50 to 75 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 whether respondents have a child/children, including children that 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 question:

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 relative 8. Other 9. Don't know 10. Do not want to answer.

[5] See Hori and Niizeki (2017) and Hamaaki et al. (2015) for details of the estimation method. Imputed rent for homeowners is also estimated based on 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 City and Tondabayashi City in Osaka prefecture were added in 2011

In relation to precautionary saving, respondents were asked the following question:

Q2. What are you saving for? Please choose all 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 on the one hand and the saving rate and wealth decumulation of elderly households on the other. More precisely, respondents who answered Q1(a) with option 1 and Q1(b) with option 6 are defined as individuals planning to leave a bequest, while 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 or over, 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 not very large, and the median values are even closer. On the other hand, the level of consumption is substantially lower in JSTAR, even though the average number of household members is the same in both surveys. Given that for the elderly consumption tends to fall with age, this is partly 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, which relies on respondents' memory, may result in respondents underestimating their expenditures. Finally, the average net worth as well as financial assets are reasonably close in the two surveys.

3. Descriptive analysis based on the FIES

3.1 Age consumption/income profiles

To start examining how the elderly decumulate their assets, Figure 1 shows age-profiles of the saving rate using the micro data obtained from the FIES. 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, 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 is around 60 years old. After that, it sharply declines and becomes negative, but then reverses again around the age of 70, forming a U-shape.[10] The U-shape of the saving rate of elderly households is due to a continuous decline with age in average consumption, while average income gradually declines and then levels off when the head is around 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.

Next, Figure 2 compares the age profiles of consumption and disposable income of aged households by employment status. It shows that the average consumption of elderly workers' households is lower than their average income, meaning that they continue to save on average, including households in their late 70s.[11] In contrast, the average consumption of retired households is higher than their average income, meaning that retired households dissave on average, with the gap between income and consumption shrinking as the household head gets older, indicating that the rate of dissaving decreases with age.

3.2. Age-wealth profiles

[8] The sample used for the analysis in Section 3 consists of households that meet the following criteria: (i) the household had two or more members; (ii) the household head was not self-employed; (iii) the household did not include the parents or other relatives of the household head or spouse (other than children of the head). The reason for excluding households whose head was self-employed is that the income of such households is not available in the FIES. Similarly, the reason for excluding one-person households is that the FIES does not contain information on their financial assets.

[9] Both consumption and disposable income for each household are annualized, adjusting for seasonal patterns and taking into account the number of family members, their composition (e.g., the age of the youngest child to consider school tuition fees), the employment status and occupation of the household head, the age of the head, and where the household lives (e.g., in the north or the south of Japan). The number of observations is adjusted using extraction rates constructed from the *Population Census* (by age of household head, prefecture, and type of house structure) so 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. The practice is typically employed in large firms. In small and medium-sized enterprises, the retirement age is relatively more flexible.

[11] While information on the employment status of the household head is available, it is not possible to strictly distinguish in the FIES whether the head is unemployed or retired. Since the unemployment rate among the elderly is low and stable (for men, it was 4.4 percent for those aged 55 to 59, 6.1 percent for those aged 60 to 64, and 3.0 percent for those aged 65 and over during the period 2008-2012, while the rate was much lower for women), it is assumed here that elderly households without occupation are retired.

Having seen that elderly households dissave on average, let us examine age-wealth profiles to investigate how quickly households spend down their net worth and what type of assets (i.e., financial assets and/or housing wealth) they decumulate. Utilizing the long-run microdata available from the FIES, Figure 3 shows the age-wealth profiles of aged households by cohort. 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 not included, since the FIES does not contain suitable data to calculate this. Given that the age-wealth profiles of different cohorts inevitably are 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, regardless of the cohort, elderly households tend to decumulate their wealth at a very moderate pace from their mid-60s. Using the median value of net worth (Figure 3(a)), the average rate of decumulation across all cohorts from the peak of net worth, which for most cohorts lies between age 63 and 65, is 1.4 percent (1.2 percent for elderly couples). Looking at net financial assets (Figure 3(b)), the rate of decumulation is 1.4 percent (1.9 percent for elderly couples). The rate of net financial asset decumulation is broadly in line with the results reported by Horioka (2010), who, focusing on the period 1995-2008, found that the rate of net financial asset decumulation ranged from 1.0 to 2.0 percent for retired couples where both spouses were aged 65 or older (and from 1.9 to 2.4 percent for couples with a husband aged 65 or older and a wife aged 60 or older). Figure 3 also indicates that wealth decumulation tends to slow as the household head ages. Specifically, while the annual rate of wealth decumulation for those in their 60s (from age 61-63 to age 69-71) is 1.8 percent, this decelerates to 0.5 percent for those in their 70s (from age 69-71 to age 78-80). The corresponding slowdown for elderly couples is from 1.4 percent to 0.8 percent.

3.3 Do the elderly consume too little and save too much during retirement?

The above findings indicate that households may be saving too much during retirement compared to what the basic LC/PIH suggests. To examine whether elderly couples spend their resources at an appropriate pace if one takes the standard LC/PIH as a yardstick, let us employ a simple calculation using information available from the FIES for the period 2008-2012. 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 taking into account that interest rates and inflation in Japan have been near zero for the past two decades, both 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] Based on the obtained c_i^* and the actual consumption expenditure, c_i, $\phi_i = c_i / c_i^*$ can be calculated, where ϕ_i represents the discrepancy index between actual consumption expenditure and "optimal" consumption expenditure. In calculating life-cycle wealth, it is further assumed that (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 the wife, (iii) housing assets (excluding the value of land) depreciate at the rate given in the statistics by type of housing structure, and (iv) based on the economic situation during 2008-2012, households expect no capital gains or losses on their wealth.[13] Life expectancy is taken from the "Life Tables" published annually 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 1, implying 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 get and the median of ϕ_i is 0.39 for those in their late 70s, implying the elderly tend to dissave even more slowly 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.

4. Determinants of dissaving by elderly households

4.1 Empirical methodology

The next objective of this study is to examine what factors underlie the slow wealth drawdown of the elderly. Although the FIES provides rich information on consumption, income, and assets, it does not contain potentially important variables to understand the behavior of the elderly, such as information on the health of household members, households' detailed family structure (e.g., whether householders have children that live separately), information on intergenerational transfers within the family, households' intention to leave a bequest, and precautionary saving, which are factors that are likely to play an important role in understanding excess saving of the elderly. However, as mentioned earlier, this information is available in JSTAR. Utilizing available data from JSTAR, it is examined how the saving rate is related to the intention to leave a bequest and precautionary saving by estimating a median regression in which other characteristics that may be related to the saving rate are controlled for. Specifically, the

[12] Here, the standard assumption is employed that preferences are intertemporally additive and the instantaneous utility function, $u(c_t)$, is increasing and concave without variation with age.
[13] The Topix stood at 859 points at the end of 2008, 908 points at the end of 2009, 899 points at the end of 2010, 729 points at the end of 2011, and 860 points at the end of 2012.

following simple regression is estimated:

$$SR_i = \alpha_0 + \alpha_1 BequestDummy_i + \alpha_2 PreSavDummy_i + \beta X_i + e_i \qquad [1]$$

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 (observable from the JSTAR dataset) controlled for. 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 the 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 the spouse if the respondent is married, dummies related to family members (i.e., dummies which 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 which 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 all the questions used for the analysis, which left 1,688 observations from the first survey for ten municipalities and 1,260 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 percent have a child/children, and 76 percent have a child or children who are already working. The share of respondents whose parents (or parents in law) live with them is 12 percent. One third of household heads have already retired, and 30 percent have a spouse who is working. Regarding their health, respondents were asked to choose among 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). 37 percent of respondents answered that they planned to leave a bequest. 31 percent of households replied that they had received a gift or inheritance, while 14 percent of households expected to do so 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 respondents said that they had savings to prepare for unforeseen expenses and/or that they felt more secure with savings. The average saving rate of respondents (or couples, if married) was minus 4 percent, with a large standard deviation. The median of the saving rate is positive, which is not surprising, since two-thirds of respondents are not retired. In addition, imputed rents are not included, both 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 use for precautionary saving was not asked in Wave 2.

4.2 Regression results

Table 3 presents the regression results using cross-section data from the first survey for 10 municipalities, which has a large sample size and asked the question on precautionary saving, which was 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 if the head is retired, which is consistent with the LC/PIH.[14] In addition, the rate is higher if a respondent is married. The health condition of a respondent has a negative impact 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 have a 7 percentage point higher saving rate, while the coefficient on the precautionary saving dummy is close to zero and statistically insignificant. The coefficients on the child dummies are not statistically significant, except for the dummy for children that are already working, which is significant at the 10 percent level. There is no significant link between whether the (spouse's) parents live in the respondent's household and the saving rate. Turning 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 not relevant to the saving rate. In specifications (2) and (3), to check the robustness of the results, first the dummy representing precautionary saving and then the one representing the desire to leave a bequest are excluded. The coefficient on the bequest dummy remains significantly positive and essentially unchanged, while that on the precautionary saving dummy turns positive, but remains close to zero and insignificant.

Next, Table 4 presents the regression results based on the unbalanced panel data from Waves 1 and 2. The dummy for precautionary saving is omitted, since the question was not

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

included 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, which suggests that if a respondent expects to leave a bequest, the household has a saving rate that is 10 percentage points higher than would otherwise be the case.

4.3 Discussion

The results in Tables 3 and 4 indicate that the saving rate of the elderly is considerably pushed up by the desire to leave an inheritance, but not by precautionary saving, which differs from the results obtained by Horioka and Niimi (2017), who highlighted the relative importance of precautionary saving. To examine possible reasons for the different results, a probit regression following their approach was employing by replacing the dependent variable in equation [1] with a dummy variable which takes one if the saving rate is negative and zero otherwise (Columns (1) and (2) in Appendix Table 2). However, the finding that precautionary saving did not affect the saving rate of the elderly remains unchanged. Further, to take into account the possibility that the saving rate regression may suffer from extreme outliers, such as households with a very low income, the saving rate-to-wealth ratio is used as an alternative dependent variable. Yet, again the coefficient on precautionary saving is not significant (Column (3) in Appendix Table 2).

Two possible explanations why precautionary saving so far is found to be insignificant suggest themselves. First, if individuals perceive uncertainties during their retirement (such as with regard to their income, their health, or other eventualities) to be smaller than during their working life, they may feel less of a need to save additionally for precautionary purposes, since they have already accumulated savings for future contingencies during retirement. As pointed out by Abe and Yamada (2005), if it is assumed that the retired elderly in Japan face less income uncertainty than when they were working, they do not need to suppress consumption for precautionary purposes (i.e., they could consume more), because they face less income risk. Second, as suggested by Dynan et al. (2002, 2004), respondents that plan to leave a bequest and also save for uncertainty in the future may not generally distinguish between assets when saving for these purposes. Their model assumes that people save for life-cycle and precautionary purposes, and bequeath wealth to their offspring when precautionary savings are not used up by contingencies.

To examine the second possible explanation further, the following additional analysis is conducted. First, the ratio of households' consumption level to their expected life-cycle wealth, $\phi_{i,}$ which was introduced in Section 3.3 (Figure 4), is examined using available data from JSTAR. Since calculating this ratio means that data on household assets are needed, the sample size becomes much smaller than in the case of the saving rate regression. Nevertheless,

using the ratio makes it possible to investigate households' dissaving behavior taking life-time wealth into account. Table 5 compares ϕ_i – the ratio of households' consumption level to their expected life-cycle wealth introduced in Section 3.3 – based on whether individuals were planning to leave a bequest and/or were engage in precautionary saving. Since JSTAR asks respondents about the pension benefits they and their spouse expected to receive in the future (such as the amount they expect to receive and the age at which they expect to receive them) such information is also used to calculate expected life-time wealth.[15] The results in Table 5(a) show that the median of ϕ_i for retired couples with a head aged in their early 60s is 0.51, which is substantially less than 1. It goes up slightly to 0.55 for couples with a head in their late 60s and then declines to 0.45 for couples with a head in their 70s. Thus, although the dataset used in the additional analysis here is different from that used to obtain Figure 4, the results are very similar in that the median of ϕ_i is smaller than one and decreases with age.

Next, in Table 5(b) 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 the 0.58 for those that do not plan to leave 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 does not change even if the observations are further divided into whether or not they have savings for precautionary reasons. However, comparing the two rows shows that the difference is much larger for those that are not saving for precautionary reasons. Focusing on the columns, the first column shows that among respondents who plan to leave a bequest, there is little difference depending on whether respondents engage in precautionary saving or not, while the second column indicates that there is a substantial difference for those that do not plan to leave a bequest. This result suggests that respondents who plan to leave a bequest build up savings to be used for both purposes, that is, to leave a bequest if all goes well and use it for themselves if it does not.

Table 5(b) suggests that dissaving differs depending on whether households were planning to leave a bequest. On the other hand, whether respondents were saving for precautionary purposes differs only between those not planning to leave a bequest. To examine

[15] JSTAR includes a question asking how long respondents expected to live. Moreover, it also asks about (i) the pension benefits a respondent was currently receiving and (ii) other pension benefits that the respondent expected to receive in the future (amount and the 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 $\sum_{s}^{T}\left\{(Penbnfts_{i,s} * Pratio_k\right\}/(1+r)^{t-s}$, 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* the real interest rate in the year that the survey was conducted (i.e. 0.015 in 2007, 0.0128 in 2009, and 0.0098 in 2011). For respondents with a spouse, the pension benefit after the spouse has died is assumed to be 44 percent lower. (The assumption is based on comparable figures from the FIES). As for consumption, an age-related taste shifter is incorporated such that consumption falls by 1.4 percent with each additional year of age, and for respondents whose spouse passes away consumption falls by 42 percent (also estimated using comparable figures from the FIES).

this further, the following regression is estimated:

$$\ln(W_i / C_i) = \alpha_0 + \alpha_1 BequestDummy_i + \alpha_2 PreSavDummy_i + \beta X_i + u_i \qquad [2]$$

where (W_i/C_i) is the expected life-time 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 6 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 not 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, while it is positive and significant for those not planning to leave a bequest. The results indicate that, other things being equal, the level of consumption of retired elderly who plan to leave a bequest (for the rest of their lives) is 18 percent lower than that of those not planning to leave a bequest. Among those not planning to leave a bequest, other things being equal, retired elderly saving for precautionary reasons consume 24 percent less than those not saving for precautionary reasons.

5. Concluding remarks and remaining issues

In view of the rapid population aging in Japan, and to contribute to the literature on the dissaving behavior of the elderly, this study investigated the behavior of elderly households in Japan utilizing two different microdatasets which have only recently become available. 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. It 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 appears to be the desire to leave a bequest. On the other hand, 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, since the total population will decline, the ratio of the elderly to the total population will continue to increase for an even longer time – the next 50 years or so. This means that, from a policy perspective, it is increasingly important to utilize the resources of the elderly. The results obtained in this study suggest that policies such as a reduction in taxes on inter vivos

gifts or inheritances may be an effective and desirable step 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 are not planning to leave a bequest.

This study has shed some light on the factors underlying the slow wealth decumulation (dissaving) of the elderly in Japan, highlighting in particular 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 , hopefully in the near future, should allow us to conduct more detailed analyses using more observations especially on assets, including changes in assets of elderly households. In addition, another avenue would be to consider mortality risk and the relative risk aversion of individual households, which can also be addressed with JSTAR. These issues are left for future research.

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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 observations	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 not available 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, there are some households that 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 college 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 have a plan to leave 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)
No. of observations	1,688		1,688		1,688	
Pseudo R-sq.	0.053		0.053		0.052	

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. *, **, *** indicate significance at the 10, 5, and 1 percent level, 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 R-sq.	0.02		0.06		0.03	
Between R-sq.	0.08		0.00		0.08	
Overall R-sq.	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	
No. 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 the number of household members are included in the regressions. *, **, *** indicate significance at the 10, 5, and 1 percent level, respectively. Observations whose saving rate was either higher than the top 1 percent or lower than the bottom 1 percent were omitted from the regressions.

Table 5(a). 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	0.51	0.55	0.45	0.45
No. of observations	(355)	(72)	(106)	(125)	(35)

Table 5(b). 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)

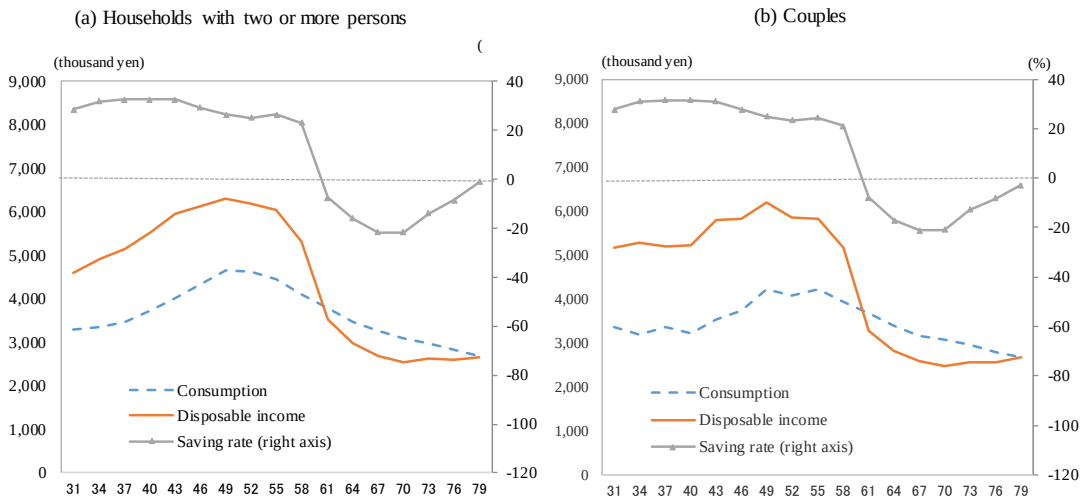
Notes: Retired households from JSTAR. The number of observations is shown in parentheses.
"Planning to leave bequest" indicates that respondents answered that they planned to leave a bequest to their child/children.

Table 6. 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)
No. of observations	295		295		295		114		181	
Pseudo R-sq.	0.151		0.142		0.151		0.290		0.171	

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 the number of household members are included in the regressions. *, **, *** indicate significance at the 10, 5, and 1 percent level, respectively.

Figure 1. Age profiles of the saving rate, income, and consumption (Average figures, 2008-2012)



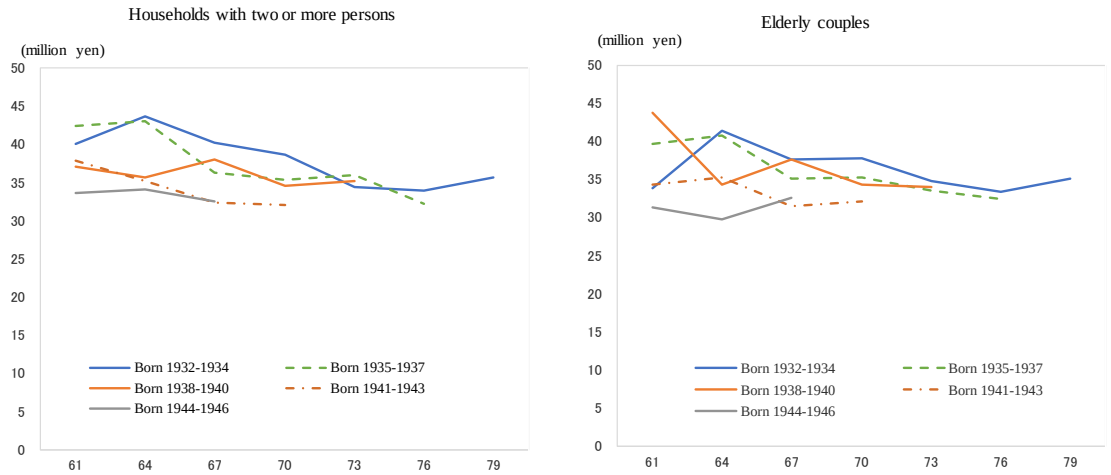
Notes: Author's calculations based on FIES data. Consumption and disposable income are deflated using the consumer price index.

Figure 2. Income and consumption of aged households by employment status (Average figures, 2008-2012)

Note: See notes for Figure 1.

Figure 3. Age-wealth profiles by cohort (Median values)

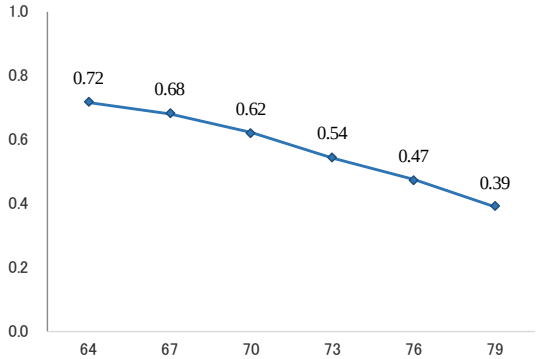
(a) Net worth



(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 4. Elderly households' consumption level (Median of ϕ_i)



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

Appendix 1. JSTAR data and missing-data imputation

To measure income and financial assets, JSTAR asks respondents to fill in their disposable income and amount of financial assets (e.g., deposits, bonds and shares, etc.) in the self-reporting questionnaire. Then, in the interview which 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 does not provide exact numbers, he/she is asked a sequence of unfolding bracket questions ("Was the income higher/lower than a certain threshold?" Etc.) using up to three thresholds. These answers place the income/assets in a certain range. Regarding consumption, housing wealth, and debt, there are no such questions in the self-reporting questionnaire. The interviewer asked the respondent for the value, followed by bracket questions when required.

In this study, for respondents whose income is reported in terms of a range, the figures are imputed by taking the average if a respondent provided both an upper and a lower bracket. In cases where respondents provided only one of them, 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, not in work), while with regard to wealth, debt, and consumption, the groups are categorized by year and 5-year age intervals for the household head. Out of the 1,688 observations used in Table 3, respondents who provide an income value make up 89.6 percent (1,513 observations); 4.0 percent provided both an upper and a lower bracket, 5.5 percent the upper bracket only, and 0.8 percent the lower bracket only.

Appendix 2. Regression results using other specifications

Appendix Table 1 shows the results for the specifications in Table 3 when taking possible endogeneity of the saving rate and the retirement decision into account. Given that in Japan the age of eligibility for the public pension depends on the year of birth and sex, a dummy indicating whether the household head has reached the age of eligibility for the public pension is used to instrument for the retirement dummy. The rationale is that becoming eligible for public pension benefits should greatly affect the retirement decision but is not correlated 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 found to be positive and significant.

Next, 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 4 is that 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 percent level, while the coefficient on the precautionary saving dummy is close to zero and not significant.

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 R-sq.	0.009 ***	(0.000)	0.009 ***	(0.001)	0.009 ***	(0.001)
No. of observations	1,656		1,656		1,656	
Centered R-sq. of 2nd stage	0.017		0.015		0.005	

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 the number of household members are included in the regressions. All exogenous variables in the saving regression are also included in the first-stage regression. *, **, *** indicate significance at the 10, 5, and 1 percent level, 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) Logit model (1 for SR_i>0, 0 for SR_i<=0)		(2) Probit model (1 for SR_i>0, 0 for SR_i<=0)		(3) Marginal effects (Probit model)		(4) 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)
No. of observations	1,688		1,688		1,688		860	
Pseudo R-sq.	0.124		0.126		0.126		0.093	

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 the number of household members are included. *, **, *** indicate significance at the 10, 5, and 1 percent level, respectively.