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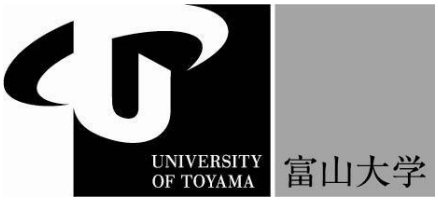

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Housing assets and consumption among the Japanese elderly

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Abstract

A large proportion of the Japanese elderly have accumulated assets in the form of housing wealth. The elderly expect to fund consumption during their retirement by releasing housing equity. This paper estimates a fixed effects model to examine the causal effect of housing assets on consumption, using panel data of Japanese elderly households from 2006 to 2015. Contrary to the above expectation, the results suggest that changes in housing wealth do not significantly increase elderly consumption. The reason behind this result appears to be that the elderly homeowners cannot release part of their housing wealth as cash through the financial sector. Instead, elderly homeowners leave their housing assets to their children, and in exchange, receive cash to fund consumption. The impact on consumption, however, is rather small. Moreover, this mechanism tends to operate only in urban areas where the land values are relatively high. These results imply that housing wealth is available to only a limited proportion of Japanese elderly homeowners.

Keywords: elderly; land values; homeownership; bequest motives; Japan
JEL classification: D12, E21, J14, R21

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1 Introduction

Japan's growth rate for the proportion of elderly in the population is the highest in the world. According to the 2017 Annual Report on the Aging Society, the proportion of the population aged 65 years or over has reached 26.7 percent, which is 9.0 percentage points higher than the average for advanced countries. Accordingly, expenditure on social security is at its highest ever level, and 67.9 percent of that expenditure is on the elderly in the form of public pensions and medical benefits. In an aged society such as Japan, housing assets are expected to be used to maintain the welfare of the elderly. A large proportion of elderly households in Japan have accumulated assets in the form of housing equity. The 2014 National Survey of Family Income and Expenditure (NSFIE) reported that 88.2 percent of the elderly aged 65 years or over own residential property, and this accounts for 67.8 percent of their total wealth. Releasing housing equity, therefore, may smooth consumption through postretirement life and avoid placing a heavy burden on the social security system (Noguchi, 1996; Mitchell and Piggott, 2004).

For example, increases in house prices that increase the available housing equity can thereby stimulate consumption if the elderly sell part or all of their house. The Japanese elderly, however, prefer to stay in their homes and seldom sell them to finance their consumption (Forrest et al., 2003). Reverse mortgages, which allow elderly homeowners to borrow against the value of their homes without selling them, potentially solve this issue. Yet, it is quite difficult to convert housing wealth into cash because the financial sector does not readily provide loans against properties, especially those of low value (Noguchi, 1996; Forrest et al., 2003; Mitchell and Piggott, 2004; Izuhara, 2016). Data indeed demonstrate that the Japanese elderly are less likely to release housing equity, even if they are aged 75 years or over (Murata, 2015). The literature has suggested that elderly homeowners generally leave their housing assets to their children, and consequently, they tend to hold on to their homes until death (Ohtake, 1991; Hirayama, 2010; Ishino, 2011).

The relationship between housing assets and elderly consumption has received increasing attention. Nevertheless, empirical studies are limited in Japan. In this regard, the present paper attempts to empirically identify the causal effect of housing wealth on elderly consumption using

panel data of the Japanese elderly. We find that changes in housing wealth have no significant effects on the consumption of the elderly. The empirical results indicate that elderly borrowing is not associated with housing assets. From a subsample analysis, we find that housing assets have a small but significantly positive impact on the consumption of the elderly who have children. These elderly can increase consumption because they can leave their housing assets to their children in exchange for financial help. However, this mechanism tends to operate only in urban areas where land values are relatively high. Housing wealth appears to be held by only a limited proportion of elderly homeowners in Japan.

2 Background

2.1 Literature review

The life cycle theory provides an insight into the decumulation behavior of elderly homeowners.[1] The theory predicts that households who are assumed to maximize their lifetime utility prefer to maintain a constant level of consumption throughout their lifetime. Therefore, households smooth variations in income by accumulating wealth when income is relatively high and decumulating when income is relatively low. Because elderly households are generally income poor and asset rich, and housing is the main asset held by most households, the life cycle theory suggests that elderly homeowners tend to mainly release their housing wealth by becoming renters (or trading down) to finance postretirement consumption (Artle and Varaiya, 1978). If the elderly sell their residences and become renters, then homeownership rates must decline in older age. However, the decline is generally slow. For example, Venite and Wise (2002; 2004) found no apparent decline in homeownership rates with age in the U.S. Evidence suggested that housing wealth is typically not liquidated to fund consumption after retirement, because the U.S. elderly generally prefer to stay in their homes. The empirical results of Painter and Lee (2009) in the U.S. also demonstrated that the age of elderly homeowners is not related to the likelihood of becoming renters or trading down. Chiuri and Jappelli (2010) found that homeownership rates in 15 OECD countries start falling after age 70, and then experience only a one percentage point decline per year after age 75. Angelini et al. (2014) used data on 13 European countries to study

[1] Modigliani (1986), which summarized his Nobel lectures, provided a detailed review of the life cycle hypothesis.

residential moves beyond the age of 50. They found that moves are rare all over Europe, but particularly so in Mediterranean countries.

The theory also suggests that an unanticipated increase in wealth allows households to increase consumption over their lifetime. In our context, unexpected increases in house prices tend to increase household wealth when homeowners trade down and use the proceeds for consumption. This is called the direct housing wealth channel. Because elderly homeowners have a relatively short expected life horizon, their consumption expenditures are more likely to respond to house wealth gains (Li and Yao, 2006). However, the empirical evidence of Skinner (1996), who used one wave of household-level panel data in the U.S., suggested that housing wealth windfalls for the elderly only affect a small group of people protected against contingencies after retirement. Using cross-section harmonized-wealth micro-data, Sierminsska and Takehtamanova (2012) found that housing wealth has a positive and significant impact on consumption for ages 65–74 in Canada, Finland, Germany, and Italy, but an insignificant impact in the U.S. Moreover, their results suggested that the consumption of the oldest age group (75 years or over) does not significantly respond to housing wealth in all countries.

Alternatively, it is rational for elderly homeowners to use reverse mortgages when housing prices increase. According to the life cycle theory, reverse mortgages increase households' utility if they relax collateral borrowing constraints to allow consumption smoothing over their lifetime. Elderly homeowners therefore have the advantage of the relaxed collateral constraint stemming from the housing price appreciation and can increase their consumption (Davidoff et al., 2017). This is called the housing collateral channel. Using household-level pseudo-panel data for the U.K., Campbell and Cocco (2007) found that the consumption of elderly homeowners responds to a large extent through this channel: a one percent increase in house prices leads to a 1.7 percent increase in consumption. However, using the same data set, but using a different model specification, Attanaio et al. (2009) obtained empirical results that are in sharp contrast with those of Campbell and Cocco (2007): the consumption response estimate was only 0.04 percent and statistically insignificant. The latter result suggests that reverse mortgage demand is low despite the consumption smoothing benefits they can provide to elderly homeowners. Using a

survey of U.S. elderly homeowners, Davidoff et al. (2017) indicated that the low demand for reverse mortgages can be explained by potential borrowers' insufficient knowledge or product-specific literacy.[2]

Recent papers based on rich micro-data sets have found little effect of housing price appreciation on elderly homeowners' consumption. For example, Browning et al. (2013) used a Danish panel data set, which allowed them to control for the possible influence from unobserved household-specific effects, and found no evidence that older homeowners react to house price changes. Unlike previous studies, Atalay et al. (2016) considered the impact of self-reported house values rather than regional house price indices on consumption, using repeated household surveys from Australia and Canada. Self-reported house values may have the advantage of including heterogenous information on each type of housing. The empirical results suggested that a higher housing price level only raises the consumption of the elderly to a small extent. Naoi (2014) provided evidence showing that self-reported house prices have a significantly positive impact on the consumption of elderly homeowners using panel data on Japanese households. However, the impact is small and statistically significant only at the 10 percent level. Hori and Niizeki (2017) used a Japanese micro-data set covering approximately 500,000 households. Instead of using self-reported or regionally averaged housing values, the housing wealth of individual households was estimated by matching the sample with other official statistics. The regression results suggested that housing wealth has a small but significantly positive impact on elderly consumption.

The bequest motive of elderly homeowners has also been highlighted in the literature.[3] Nakajima and Telyukoba (2012) developed a life cycle model with housing and a bequest motive. A simulation suggested that households who want to accumulate assets in retirement because of the bequest motive prefer to do so in housing. As a result, the bequest motive is more likely to increase the homeownership rate of the elderly. Nakajima and Telyukoba (2017), using simulations of a model that was extended from their previous studies, found that the bequest

[2] Davidoff (2004) found that in the U.S., the elderly reduce their housing equity without selling their home by spending less on routine maintenance to smooth consumption. Moriizumi et al. (2014) provided similar empirical evidence for Japan.

[3] Precautionary saving against future economic emergencies is another reason why the elderly continue to retain housing equity (Skinner, 1996; Yang et al., 2017).

motive dampens the demand for reverse mortgages. Skinner (1996) suggested that altruistic parents who obtain a windfall of housing wealth tend to leave it to their children, who struggle with increases in house prices. Megbolugbe et al. (1997) demonstrated that elderly homeowners are less likely to liquidate housing wealth when their children's income is low in the U.S., suggesting that elderly parents behave consistent with the altruism hypothesis (Barro, 1974). Elderly homeowners cannot obtain cash and thus finance consumption in the altruistic case. Painter and Lee (2009), however, found that living geographically close to one's children lowers the likelihood of becoming a renter or trading down for elderly homeowners in the U.S. They suggested that geographic proximity proxies stronger connections to their children, and parents are therefore more likely to save their housing wealth as a bequest rather than spend it. Using micro-level data from China, Yang et al. (2017) found that changes in housing wealth have no effect on elderly consumption. However, in a subsample analysis, a significantly positive relationship between consumption and house prices was observed among elderly homeowners who live with their children. They explained this result by relying on the fact that co-residence may enable elderly parents to provide childcare for their grandchildren in exchange for receiving financial transfers from their adult children. Empirical evidence from Painter and Lee (2009) and Yang et al. (2017) appears to suggest that elderly parents behave based on self-interested exchange with their children to some degree (Bernheim et al., 1985). In particular, the elderly may choose to insure against longevity risk by making an implicit annuity contract with their children, whereby parents receive an annuity from their children until they die in return for leaving bequests (Kotlikoff and Spivak, 1981). Horioka (2002) suggested that one variant of this type of contract is an intrafamily reverse mortgage, where parents leave bequests in the form of housing assets. Because unanticipated increases in home values tend to encourage children to provide financial support, the elderly can fund consumption through the intrafamily financing channel.

2.2 Housing assets of the Japanese elderly

In Japan, the overall rate of homeownership has been stable at around 60 percent over the past four decades (Housing and Land Survey, HLS). However, it should be emphasized that changes

in the demographic composition of ownership have supported this stability. Figure 1 suggests that the proportion of owner households in the young (aged less than 40 years) and middle-aged (aged 40–59 years) groups has declined substantially since 1980, while that in the elderly (aged 60 years or over) group has remained constant at approximately 80 percent. This implies that the share of elderly among all homeowners increased dramatically. Indeed, the share was 18.6 percent in 1983 and climbed to 30.9 percent in 1993. In 2013, 54.9 percent of homeowners were elderly aged 60 years or over. Figure 2 presents cohort-adjusted homeownership-age profiles for homeowners in their 50s and 60s in our data. The figure shows marked cohort effects where the homeownership–age profiles for homeowners in their 60s are always higher than those for homeowners in their 50s. However, there are no apparent reductions in homeownership rates over time for both cohorts.

On average, the elderly are cash poor but asset rich. The 2014 NSFIE estimated that annual income per elderly aged 65 years or over is 4.0 million yen, which is 1.3 million yen lower than average, while total wealth per elderly aged 65 years or over is 66.7 million yen, which is 15.8 million yen higher than average. Housing assets account for approximately 67.8 percent of the 66.7 million yen in wealth. Yet, Japanese elderly homeowners are less likely to fund consumption by reducing their housing wealth. Thus, as Naoi (2014) and Hori and Niizeki (2017) estimated, changes in housing wealth appear to have limited effects on elderly consumption.

It is noteworthy that in Japan, housing assets are underutilized by the elderly. First, unlike Western countries, residential structures rapidly lose value as they age (Noguchi, 1996; Izuhara, 2016). According to the results of Yoshida (2016), the annual depreciation rate of Japanese homes is approximately 6.5 percent.[4] This implies that structures lose half of their value, on average, some 24.8 years after construction. Yoshida (2016) suggested that buildings tend to be demolished rapidly because they cannot meet earthquake building codes, which are updated regularly. Noguchi (1996) and Izuhara (2016) indicated that the small Japanese resale market for houses may create this phenomenon. Only 14.7 percent of home sales are existing homes in Japan, which is one-sixth of the average for Western countries (Ministry of Land, Infrastructure, Transport and Tourism, MLIT). Homeowners who intend to sell their properties in secondhand

[4] Harding et al. (2007) estimated that the annual rate of housing depreciation is 1.9 percent in the U.S.

markets therefore have less incentive to maintain property quality, which in turn, accelerates depreciation rates.

Second, for the first reason, reverse mortgage schemes allow homeowners to release housing equity based on land value rather than structure value (Noguchi, 1996; Izuhara, 2016). In general, banks only allow outright homeowners aged 65 years or over with assessed land value of over 100 million yen to obtain loans. Additional limitations are: the borrowing period is shorter than 15 years, the maximum borrowing limit is less than 50 percent of the assessed land value, and the consent of all presumptive heirs must be obtained. Institutional innovations appear to lag far behind those in Western countries, and therefore, it is difficult for elderly homeowners to release cash from housing assets using reverse mortgage loans (Noguchi, 1996; Forrest et al., 2003; Mitchell and Piggott, 2004).

Third, the housing assets of the Japanese elderly used to go to their children, especially the eldest son, because patriarchy has been a common practice (Izuhara, 2004). In addition, Japanese inheritance taxes gave preferential treatment to real estate assets as opposed to financial assets (Ito, 1994; Kanemoto, 1997; Hirayama, 2010). The assessed property value for inheritance taxes varies from 50 to 70 percent of the market value, while the rate for financial assets is almost 100 percent. According to the National Tax Agency, housing assets account for approximately 50 percent of inherited wealth. In exchange, children who inherit the parental home tend to subsidize the consumption needs of their parents (Ohtake, 1991; Mitchell and Piggott, 2004). However, waiving inherited housing is becoming more common in Japan, particularly when it is in an unattractive location. In practice, the population decline in Japan is leading to a surplus of houses. For example, the average ratio of vacant dwellings outside the three major metropolitan areas has already reached 14.8 percent (the 2013 HLS).[5] In such locations, it may also be difficult to sell or rent the parental home. Therefore, successors can avoid paying the local tax on real estate by rejecting the inheritance (Hirayama, 2010).

[5]The three major metropolitan areas are: Tokyo metropolitan area (Saitama, Chiba, Tokyo, Kanagawa); Chukyo metropolitan area (Gifu, Aichi, Mie); and Osaka metropolitan area (Kyoto, Osaka, Hyogo, Nara).

3 Empirical analysis

3.1 Econometric model

Assuming a linear specification, the consumption function in this paper is written as:

$$c_{ijt} = \beta_0 + \beta_1 w_{ijt} + \boldsymbol{x}_{ijt}\boldsymbol{\beta} + \nu_i + \phi_j + \psi_t + \varepsilon_{ijt},$$

where c_{ijt} is the consumption expenditure of individual household i in region j at time t, w_{ijt} is housing wealth, $\boldsymbol{x}_{ijt}$ is a set of other control variables, ν_i is household fixed effects, ϕ_j is regional fixed effects, ψ_t is time effects, β_0, β_1 and $\boldsymbol{\beta}$ are coefficients, and ε_{ijt} is the error term with the usual properties.

We must address several econometric issues when estimating this model. First, there could be confounding factors that drive both consumption expenditure and housing wealth increases (Attanasio and Weber, 1994; Atalay et al., 2016). For example, local economic conditions are often responsible for house price changes in the same region. They are also closely associated with future income prospects that influence consumption expenditure. To deal with a potential common causal channel, we specify the fixed effects by prefecture (ϕ_j) and for survey year (ψ_t).

Second, household fixed effects (ν_i) such as risk preference and financial literacy tend to impact consumption substantially, but are generally unobservable. To consider this issue, we average this equation over time for each i as follows:

$$\overline{c}_{ij} = \beta_0 + \beta_1 \overline{w}_{ij} + \overline{\boldsymbol{x}}_{ij}\boldsymbol{\beta} + \nu_i + \phi_j + \overline{\psi} + \overline{\varepsilon}_{ij},$$

where $\overline{c}_{ij}$, $\overline{w}_{ij}$, $\overline{\boldsymbol{x}}_{ij}$, $\overline{\psi}$ and $\overline{\varepsilon}_{ij}$ are the mean of c_{ijt}, w_{ijt}, $\boldsymbol{x}_{ijt}$, ψ_t and ε_{ijt}, respectively. Subtracting the averages from the original equation, household (and regional) unobserved components can be removed by applying the within transformation:

$$c_{ijt} - \overline{c}_{ij} = \beta_1(w_{ijt} - \overline{w}_{ij}) + (\boldsymbol{x}_{ijt} - \overline{\boldsymbol{x}}_{ij})\boldsymbol{\beta} + (\psi_t - \overline{\psi}) + (\varepsilon_{ijt} - \overline{\varepsilon}_{ij}). \tag{1}$$

The coefficients can be estimated using the fixed effects model.

Third, one could be skeptical about the use of self-reported house values as a proxy for market values in that the owner's valuation could be inaccurate and include systematic bias

toward more optimistic valuations. In fact, Kiel and Zabel (1999) showed that the average owner overstates their own house value by 5.1 percent. Using self-reported house values can pose a problem in our application if the measurement errors in an owner's valuation are correlated with consumption expenditure. This is possible if there are some omitted variables in our model that are also correlated with self-reported house values. However, Kiel and Zabel (1999) showed that valuation errors are uncorrelated with individual owner's characteristics, as well as house and neighborhood attributes. Furthermore, because our housing wealth measure is expressed in terms of deviations from the means of self-reported values, as shown in Eq. (1), problems arising from systematic overvaluation, which is constant over time, can be largely mitigated.[6]

Fourth, house values are expected to change when households move to a different house or make any additions and/or repairs to their house, even when market prices are stable (Naoi, 2014). We thus only consider the survey period since the most recent move or improvement for each household. This lowers the possibility of simultaneous determination of housing asset values and elderly consumption. Moreover, we examine consumption excluding housing related expenditure (maintenance costs) because there may be a reverse causal link between asset values and consumption (Yang et al., 2017).[7]

3.2 Empirical strategies

In the following sections, we use the same data set as Naoi (2014). In his empirical analysis, he applied the first-difference approach by dividing the sample into three age groups, i.e., household heads aged younger than 40 years (young), 40–59 (middle-aged) and 60 or over (elderly). Comparing the size of the coefficients β_1 in Eq. (1) by age groups tells us which channel dominates among direct wealth, housing collateral, and the common causal channels discussed in the literature (Campbell and Cocco, 2007; Attanaio et al., 2009; Sierminsska and Takehtamanova, 2012; Browning et al., 2013; Atalay et al., 2016; Hori and Niizeki, 2017). Naoi (2014) found that the coefficient for the elderly has the largest and only significant impact, indicating the presence

[6] The Japan Real Estate Institute (JREI) calculates and publishes the JREI Home Price Index based on price changes for repeat sales of secondhand condominiums in the Tokyo metropolitan area. We check that the annual percentage changes in self-reported values of our data in the Tokyo metropolitan area closely align with the annual percentage changes in the JREI Home Price Index.

[7] Including housing-related expenditure in consumption does not fundamentally change our empirical results.

of the direct wealth effect, as the elderly are more likely to downsize their housing asset than are the young and middle-aged. However, the impact is rather small and only significant at the 10 percent level. As a benchmark, we conduct an empirical analysis similar to that of Naoi (2014).

Real estate is property consisting of land and buildings. In the literature, housing wealth is defined as the combined value of land and buildings. In Japan, however, land and buildings are valued separately. In this paper, housing wealth is disaggregated into residential land wealth and home building wealth. Thus, secondly, we estimate Eq. (1) for the elderly by replacing housing wealth with alternative measures such as land or building value.

Homeowners cannot raise cash and finance consumption unless they sell or trade down their housing. However, our sample selection means that we cannot directly examine this effect, because our sample periods commence following the most recent move or improvement for each household. Moreover, we found that Japanese elderly homeowners are less likely to sell their housing. In this regard, any consumption responses would presumably be smaller if housing wealth influenced homeowners' decisions through only the direct wealth channel (Naoi, 2014). However, the elderly can increase their borrowings to finance their consumption needs through the housing collateral channel . To check whether the elderly chose this option, we thirdly attempt to estimate Eq. (1) by replacing the dependent variable $c_{ijt} - \overline{c}_{ij}$ with $b_{ijt} - \overline{b}_{ij}$, where b is the amount of borrowing (Mian and Sufi, 2011; Brown et al., 2015).

Alternatively, the elderly may increase consumption through the intrafamily financing channel by retaining their housing asset and obtaining financial support from their children. To examine whether the elderly choose this option, we fourthly attempt to estimate Eq. (1) by dividing the elderly sample into households with and without children.

Finally, we examine region heterogeneity (inside/outside the three major metropolitan areas), focusing on the elderly who have children. In a low-demand area, children tend to wave their inheritance, and consequently, parents are less likely to receive financial transfers from their children.

3.3 Data and variables

Our empirical analysis draws on the Japan Household Panel Survey (JHPS) to examine the relationship between housing wealth and the consumption decisions of elderly homeowners. The JHPS, sponsored by the Japan Society for the Promotion of Science, is a nationally representative, large-scale longitudinal survey of Japanese households, with the survey conducted annually in January. The JHPS comprises two sets of population surveys: one commenced in 2004 (originally called the Keio Household Panel Survey, KHPS), and the other in 2009 (the initial JHPS sample), both of which had an initial sample of approximately 4,000 households.[8] The KHPS was integrated into the current JHPS in 2014. In the following analysis, we use the 10 yearly waves of the JHPS from 2006 to 2015. The JHPS is particularly suited to addressing the research questions in this paper because it contains detailed information on household consumption, the tenure mode of housing, housing wealth, and it includes a rich set of family background characteristics.

The JHPS asks respondents to report their consumption expenditures in the previous month. This value is then annualized by simply multiplying by 12. The JHPS also provides information on the value of the home if owned. Our housing wealth measure is constructed based on self-reported information in the survey ("*How much do you think the house and lot would sell for in today's market?*"). Using this information, we define housing wealth as the sum of land and building values. We hypothesize that households would change monthly consumption expenditure, and accordingly change annual consumption expenditure, when they perceive their current housing values as having deviated from the average.

In addition to these variables, we gather a number of important economic and demographic characteristics from the JHPS, including financial wealth, household income, respondent age, the number of households, and so on. Household income is measured as the total annual income of all household members. Therefore, our income variables measure temporary rather than permanent income.[9] The dummy variables for the survey year serve as controls in all of our

[8] In addition, there were random refreshment samples of approximately 1,400 and 1,000 new respondents in 2007 and 2012, respectively.

[9] According to the life cycle theory, changes in temporary income do not affect consumption. We only include household income to minimize a potential omitted-variable bias. For example, temporary income may affect

estimations. All monetary variables are converted to 2005 prices using the consumer price index.

The number of observations is 54,790 (9,731 households). As we examine consumption of homeowner households in our empirical analysis, we exclude renter households, resulting in 43,730 observations. In the JHPS, the housing wealth of single detached, owner-occupied housing units is broken down into land and dwelling wealth. We only examine households that own a single detached house, because homeowners who own a condominium do not report land values. This reduced the sample to 38,688 observations. We also focus on households with a land value of one million yen or above, because extremely low values may have less impact on consumption, resulting in 24,751 remaining observations. As mentioned, our survey periods commence since the most recent move or improvement for each household. This reduced the number of observations further to 21,384. Finally, restricting the sample to those for which all necessary information was available, our estimation is based on a total of 18,571 observations (4,356 households).

Among the 18,571 observations, 3,019 observations have household heads aged younger than 40 years, 7,780 observations have household heads aged between 40–59, and 7,772 observations have household heads aged 60 or over.

Table 1 provides descriptive statistics for our variables. On average, annual consumption of the elderly is approximately 3.5 million yen, which is approximately \$31,818 (\$1 = 110 yen). Household income of the elderly is the lowest among the three generations, while both housing and financial wealth are the highest, suggesting that the elderly are relatively asset rich, but income poor. As mentioned, buildings lose their value rapidly in Japan. Reflecting this fact, the building values decrease with household age, as older households are more likely to have purchased their houses long ago. Approximately 71.1 percent of the elderly's housing assets consist of land assets. Half of the elderly are not employed, as many have reached retirement age.

consumption when households cannot borrow funds because of incomplete capital markets.

3.4 Empirical results

To understand whether the Japanese elderly behave differently from other age groups, we first estimate the fixed effects model by dividing the sample into age groups. Table 2 presents the empirical results.[10] Similar to Naoi (2014), the results in columns [1] and [2] show that the coefficients of housing asset prices are not significant for the young and middle-aged. Column [3] also demonstrates that the coefficient of housing wealth is not significant at the 10 percent level for the elderly, indicating that elderly consumption does not respond to their housing value.[11] Our results are inconsistent with those of Naoi (2014), possibly because we apply a different econometric model with different sample selection. In the Appendix, we report the results of additional specifications of housing wealth to assess the robustness of our finding in column [3].

Because our primary interest relates to elderly consumption, we only consider the elderly households below. In terms of the other explanatory variables, column [3] of Table 2 indicates the following. Economic factors such as annual income and financial wealth have a significantly positive effect on consumption.[12] The elderly may extract money from financial wealth to fund consumption. We note, however, that the financial wealth elasticity of consumption is relatively small: only 0.039 (not reported). The coefficients of nonworker have a significant negative sign. The elderly tend to decrease consumption because they appear to reduce work-related expenses after retirement (Wakabayashi, 2008). The demographic attributes of household size also matter, being significantly and positively associated with consumption. Namely, consumption expenditure decreases when family size declines.

[10] The JHPS categorizes a respondent's location of residence across 47 regions and three city sizes (20 major cities, other smaller cities, and towns/villages). Because we restricted our sample to nonmover households, the regional fixed factors are removed from the estimation equation. However, the fixed effect with respect to city size, which does not appear in Eq. (1), remains in the estimation equation because municipal mergers during the survey period have changed city sizes.

[11] We estimate the fixed effects model without any other explanatory variables except housing wealth. The coefficient is larger than that in Table 2, i.e., 4.456, but insignificant.

[12] Consumption expenditures of elderly households with low income may be associated with housing wealth because they are more likely to face liquidity constraints. We thus estimate Eq. (1) incorporating a cross-term between housing wealth and a dummy variable indicating whether household incomes are in the 25th percentile or below. The coefficient, however, is insignificant. Rather, a coefficient of an interaction between housing wealth and a dummy variable indicating whether household incomes are above the 75th percentile is positive and significant. These results are consistent with results for China (Yang et al., 2017).

We expect that land wealth tends to have a larger impact on consumption than does building wealth, as the Japanese attach more weight to the former than to the latter. To examine this, in Table 3, we present regression results using land or building wealth, instead of housing wealth, in column [3] of Table 2. As expected, the coefficient of land wealth in column [1] has a relatively larger value. However, again the coefficient of land is not significant at the 10 percent level.

Our sample selection lowers the possibility of consumption increases through the direct wealth channel.[13] Another option to increase elderly consumption is through the housing collateral channel. When the elderly choose this option, their borrowings from the financial sector should increase. However, because elderly consumption is not associated with all wealth measures, the elderly may not increase their consumption. Table 4 presents the estimation results of elderly borrowing. As expected, column [1] demonstrates that borrowing is unaffected by increases in housing wealth. The insignificant coefficient suggests that housing equity withdrawal through reverse mortgages tends to be underutilized, as previously mentioned.[14] This tendency does not change, even when we use the alternative specification for the housing wealth measure, as in columns [2] and [3].

The other option for the elderly to increase their consumption is to use the intrafamily financing channel, whereby parents receive financial support from their children in exchange for leaving property. Table 5 presents summary statistics of annual financial transfers from adult children to their parents from the JHPS. On average, adult children who expect to inherit the parental home provide a larger amount of financial support than those who do not. The proportion of adult children who provide a positive transfer to parents is also higher for those who expect to inherit the parental home than for those who do not. This may compliment the above assumption. Table 6 presents the estimation results for the subsample with and without children. The JHPS asks respondents to list family members regardless of living status (living

[13] The JHPS asks respondents whether they plan to move from their present home, build a new home, or purchase a home. We create a dummy variable that takes the value of one if households have a plan and zero if they have no plan for the time being, and estimate a linear probability fixed effects model. The estimation results suggest that changes in housing wealth have no statistical impact on future living plans.

[14] The 2016 JHPS asks all respondents ($N = 4993$) to report their intention to use a reverse mortgage based on the following question: "*How likely is it that you will use a reverse mortgage?*" 1 = have used; 2 = very likely; 3 = likely; 4 = unlikely; 5 = very unlikely; 6 = do not know. On average, approximately 1.4 percent and 10.3 percent of respondents choose 2 and 3, respectively. However, less than 0.1 percent of them choose 1.

together or separately). The elderly with children are defined as those who list at least one child as a family member. Column [1] shows that a significantly positive effect of housing wealth on consumption exists among the elderly who have children. However, the evidence suggests a weak effect in magnitude; the elasticity, which is calculated at the mean, is just 0.08.[15] Namely, a one percent increase in house price leads to a 0.08 percent increase in consumption. This is considerably smaller than the estimates of Yang et al. (2017), who reported that a one percent increase in housing wealth leads to a 3.0 percent increase in consumption among Chinese elderly who live with their children. The small impact can be explained as follows. As mentioned, in low-demand areas, children tend to waive inherited housing so that parents are less likely to receive financial help from their children. Selfish elderly parents who have children with limited resources cannot increase consumption because although those children are more likely to give parents nonmonetary help, they cannot afford to offer monetary help (Taniguchi and Kaufman, 2017). Alternatively, some elderly parents are altruistic or have no bequest motive; therefore, they leave housing assets without receiving financial help from their children. Column [2] shows that increases in housing wealth have a negative and significant impact on consumption when the elderly have no children, which runs contrary to our expectation. Housing prices may be positively correlated with nursing home fees. Therefore, some elderly people who want to move into a nursing home tend to refrain from consumption expenditures. The absolute value of the elasticity, however, is smaller than that in column [1]. The results in columns [3] and [4] using land wealth yield qualitatively similar findings. Increases in building wealth, however, have no impact on elderly consumption, even when the elderly have children (not reported).

Finally, Table 7 presents the estimation results that consider regional heterogeneity. Children are less likely to utilize inherited housing when it is located in a low-demand area. Column [3] suggests that only the land wealth in metropolitan areas has positive and significant impacts on elderly consumption. However, although we attempt to control for regional differences, the elasticity is still inelastic, as a one percent increase in land price is associated with a 0.1 percent increase in consumption. Overall, the empirical findings suggest that housing assets are only

[15] The elasticity tends to decrease when we measure it at the lower percentile of housing wealth. For example, when we calculate the elasticity at the 75 percentile of housing wealth, it rises to 0.10, while at the 25 percentile of housing wealth, it falls to 0.04 and becomes statistically insignificant.

available to a small proportion of the elderly.

4 Conclusion

This paper used panel data of the JHPS to examine the role of housing wealth in the consumption decisions of the Japanese elderly. After considering both common and reverse causality between nonhousing consumption and self-reported house values, we first estimated a fixed effects model for all elderly households as a benchmark. Our results indicate that changes in housing wealth do not have a significant impact on elderly consumption. We then disaggregated housing wealth into land and dwelling wealth, because the depreciation rates of residential structures are extremely high in Japan. However, again, neither of these had a significant effect on elderly consumption. The reason underlying these relationships appears to be that elderly homeowners cannot release any of their housing wealth through the financial sector. To confirm this, we estimated a fixed effects model by changing the dependent variable from elderly consumption to their borrowings. Indeed, our estimation results demonstrated that elderly borrowing is not associated with changes in housing wealth. Instead, elderly homeowners may leave housing assets to their children, and in exchange, receive cash to fund consumption. The observations were therefore divided into subgroups: those who have children and those who do not. We only found a small significant positive coefficient for the elderly who have children. We then conducted a subsample analysis that categorized the elderly who have children into two groups: housing located in metropolitan or other areas. We found that the positive impact tends to operate only in metropolitan areas where the land values are relatively high. This appears to imply that housing wealth is only available to a limited proportion of elderly homeowners in Japan.

The role of housing wealth in the consumption decisions of the elderly has attracted considerable attention from researchers and policy makers in Japan, because releasing housing equity may prevent not only financial hardship among the elderly, but also financial difficulty in the social security system. Yet, the contribution of this paper is to empirically confirm that the Japanese elderly are less likely to use their housing assets to fund consumption after retirement.

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Conflict of interest

The authors declare that they have no conflict of interest.

Appendix

In this Appendix, we estimate alternative models in addition to our benchmark model in column [3] of Table 2 for robustness checks, and summarize the results in Tables 8 and 10. Households may anticipate that residential structures lose value as they age. In column [1] of Table 8, we construct housing wealth where building values depreciate at a fixed rate of 6.5 percent (Yoshida, 2016). However, housing wealth, which considers the annual depreciation rate, has no significant impact on elderly consumption.

The JHPS asks respondents to report the assessed property value for property taxes. This value has a moderate positive correlation with housing wealth. Therefore, in column [2] of Table 8, we use this variable in place of self-reported house values. The empirical results suggest that the assessed value for property taxes does not matter for the elderly.

Although the long-term official data on house prices are not prepared well in Japan, the Survey on Land Prices issued by the MLIT reports the data on the price per square meter of residential land. Hori and Niizeki (2017) used these data to estimate the value of residential land assets. In column [3] of Table 8, we use the city-level land price instead of self-reported house values. The empirical results again indicate that land price has no significant impact on elderly consumption.

To obtain regional house prices, we average self-reported house values in every city for each year. The empirical results are similar to the benchmark model in column [3] of Table 2: the coefficient of average housing wealth in column [4] of Table 8 is statistically insignificant.

Similar to Begley (2017), we also calculate housing price at the city-level using homeowner's self-reported house values in an AR3 process and presented in Table 9. However, note that Begley (2017) used the market repeat-sales indices rather than self-reported values. We then obtain the fitted self-reported values at the city level. This value is more likely to capture regional trends in housing prices. The main finding, however, is unchanged: the fitted self-reported house values are statistically insignificant, as in column [1] of Table 10.

In practice, Begley (2017) estimated the unanticipated component of housing price (growth) by calculating the difference between actual (growth in) housing prices and predicted (growth in) house prices. Following this, we calculated the difference between the actual and fitted self-reported values at the city level. This variable appears to mitigate problems arising from overvaluation. We thus empirically examine the relationship between the difference and elderly consumption. Contrary to our expectations, column [2] of Table 10 suggests that the difference is negative, but still statistically insignificant.

References

Angelini, V., Brugiavini, A. & Weber, G. (2014). The dynamics of homeownership among the 50+ in Europe. *Journal of Population Economics*, 27(3), 797–823.

Artle, R. & Varaiya, P. (1978). Life cycle consumption and homeownership. *Journal of Economic Theory*, 18(1), 38–58.

Atalay, K., Whelan, S. & Yates, J. (2016). House prices, wealth and consumption: New evidence from Australia and Canada. *Review of Income and Wealth*, 62(1), 69–91.

Attanasio, O. P., Blow, L., Hamilton, R. & Leicester, A. (2009). Booms and busts: Consumption, house prices and expectations. *Economica*, 76(301), 20–50.

Attanasio, O. P. & Weber, G. (1994). The UK consumption boom of the late 1980s: Aggregate implications of microeconomic evidence. *Economic Journal*, 104(427), 1269–1302.

Barro, R. J. (1974). Are government bonds net wealth? *Journal of Political Economy*, 82(6), 1095–1117.

Begley, J. (2017). Legacies of homeownership: Housing wealth and bequests. *Journal of Housing Economics*, 35, 37–50.

Bernheim, B. D., Shleifer, A. & Summers, L. H. (1985). The strategic bequest motive. *Journal of Political Economy*, 93(6), 1045–1076.

Brown, M., Stein, S. & Zafar, B. (2015). The impact of housing markets on consumer debt: Credit report evidence from 1999 to 2012. *Journal of Money, Credit and Banking*, 47(1), 175–213.

Browning, M., Gotz, M. & Leth-Petersen, S. (2013). Housing wealth and consumption: A micro panel study. *Economic Journal*, 123(568), 401–428.

Campbell, J. Y. & Cocco, J. F. (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics*, 54(3), 591–621.

Chiuri, M. C. & Jappelli, T. (2010). Do the elderly reduce housing equity? An international comparison. *Journal of Population Economics*, 23(2), 643–663.

Davidoff, T. (2004). Maintenance and the home equity of the elderly. Fisher Center for Real Estate and Urban Economics Paper No. 03-288, doi: 10.2139/ssrn.509294.

Davidoff, T., Gerhard, P. & Post, T. (2017). Reverse mortgages: What homeowners (don't) know and how it matters. *Journal of Economic Behavior and Organization*, 133, 151–171.

Forrest, R., Kennett, P. & Izuhara, M. (2003). Home ownership and economic change in Japan. *Housing Studies*, 18(3), 277–293.

Harding, J. P., Rosenthal, S. S. & Sirmans, C. F. (2007). Depreciation of housing capital, maintenance, and house price inflation: Estimates from a repeat sales model. *Journal of Urban Economics*, 61(2), 193–217.

Hirayama, Y. (2010). The role of home ownership in Japan's aged society. *Journal of Housing and the Built Environment*, 25(2), 175–191.

Hori, M. & Niizeki T. (2017). Housing wealth effects in Japan: Evidence based on household microdata. Unpublished papers.

Horioka, C. Y. (2002). Are the Japanese selfish, altruistic or dynastic? *Japanese Economic Review*, 53(1), 26–54.

Ishino, T. (2011). Real-estate holdings and bequests among Japanese elderly (Koreisha no fudosan hoyu to isan doki). *Japanese Journal of Real Estate Sciences* (*Nihon Fudosan Gakkai Shi*), 24(4), 124–133. [in Japanese].

Ito, T. (1994). Public policy and housing in Japan. In Noguchi, Y. & Poterba, J. M. (Eds.), *Housing Markets in the United States and Japan* (pp. 215–238), University of Chicago Press, Chicago.

Izuhara, M. (2004). Negotiating family support? The 'generational contract' between long-term care and inheritance. *Journal of Social Policy*, 33(4), 649–665.

Izuhara, M. (2016). Reconsidering the housing asset-based welfare approach: Reflection from East Asian experiences. *Social Policy and Society*, 15(2), 177–188.

Kanemoto, Y. (1997). The housing question in Japan. *Regional Science and Urban Economics*, 27(6), 613–641.

Kiel, K. A. & Zabel, J. E. (1999). The accuracy of owner-provided house values: The 1978–1991 American Housing Survey. *Real Estate Economics*, 27(2), 263–298.

Kotlikoff, L. J. & Spivak, A. (1981). The family as an incomplete annuities market. *Journal of Political Economy*, 89(2), 372–391.

Li, W. & Yao, R. (2007). The life-cycle effects of house price changes. *Journal of Money, Credit and Banking*, 39(6), 1375–1409.

Megbolugbe, I. F., Sa-Aadu, J. & Shilling, J. D. (1997). Oh, yes, the elderly will reduce housing equity under the right circumstances. *Journal of Housing Research*, 8(1), 53–74.

Mian, A. & Sufi, A. (2011). House prices, home equity-based borrowing, and the US household leverage crisis. *American Economic Review*, 101(5), 2132–2156.

Mitchell, O. S. & Piggott, J. (2004). Unlocking housing equity in Japan. *Journal of the Japanese and International Economies*, 18(4), 466–505.

Modigliani, F. (1986). Life-cycle, individual thrift, and the wealth of nations. *American Economic Review*, 76(3), 297–313.

Moriizumi, Y., Tiwari, P. & Yukutake, N. (2014). Smoothing consumption fluctuations through household decisions on home improvement expenditure in Japan. *International Journal of Housing Markets and Analysis*, 7(1), 76–97.

Murata, K. (2015). The elderly do not release their assets: Promoting the liquidity of the housing and land assets (Shisan torikuzusanai koreisha: Jutaku tochi nado no ryudokasaku wo). In *Report of the Large City Research Group* (*Dai Toshi Kenkyu Kai Hokoku*) (pp. 91–102), Japan Economic Research Center, Tokyo. [in Japanese].

Nakajima, M. & Telyukova, I. A. (2012). Home equity in retirement. doi: 10.2139/ssrn.1898330.

Nakajima, M. & Telyukova, I. A. (2017). Reverse mortgage loans: A quantitative analysis. *Journal of Finance*, 72(2), 911–950.

Naoi, M. (2014). Housing wealth and household consumption behavior (Jutaku shisan to kakei no shohi kodo). In Sumita, K., Naoi, M. & Okumura, Y. (Eds.), *Economic Analysis of Cities, Regions and Real Estate Markets* (*Toshi, Chiiki, Fudosan no Keizai Bunseki*) (pp. 3–25). Keio University Press, Tokyo. [in Japanese].

Noguchi, Y. (1996). Improvement of after-retirement income by home equity conversion mortgages: Possibility and problems in Japan. In Hurd M. D. & Yashiro, N. (Eds.), *The Economic Effects of Aging in the United States and Japan* (pp. 195–213), University of Chicago Press, Chicago.

Ohtake, F. (1991). Bequest motives of aged households in Japan. *Ricerche Economiche*, 45(2–3), 283–306.

Painter, G. & Lee, K. (2009). Housing tenure transitions of older households: Life cycle, demographic, and familial factors. *Regional Science and Urban Economics*, 39(6), 749–760.

Sierminska, E. & Takhtamanova, Y. (2012). Financial and housing wealth and consumption spending: Cross-country and age group comparisons. *Housing Studies*, 27(5), 685–719.

Skinner, J. S. (1996). Is housing wealth a sideshow? In Wise, D. A. (Ed.), *Advances in the Economics of Aging* (pp. 241–272). University of Chicago Press, Chicago.

Taniguchi, H. & Kaufman, G. (2017). Filial norms, co-residence, and intergenerational exchange in Japan. *Social Science Quarterly*, doi:10.1111/ssqu.12365.

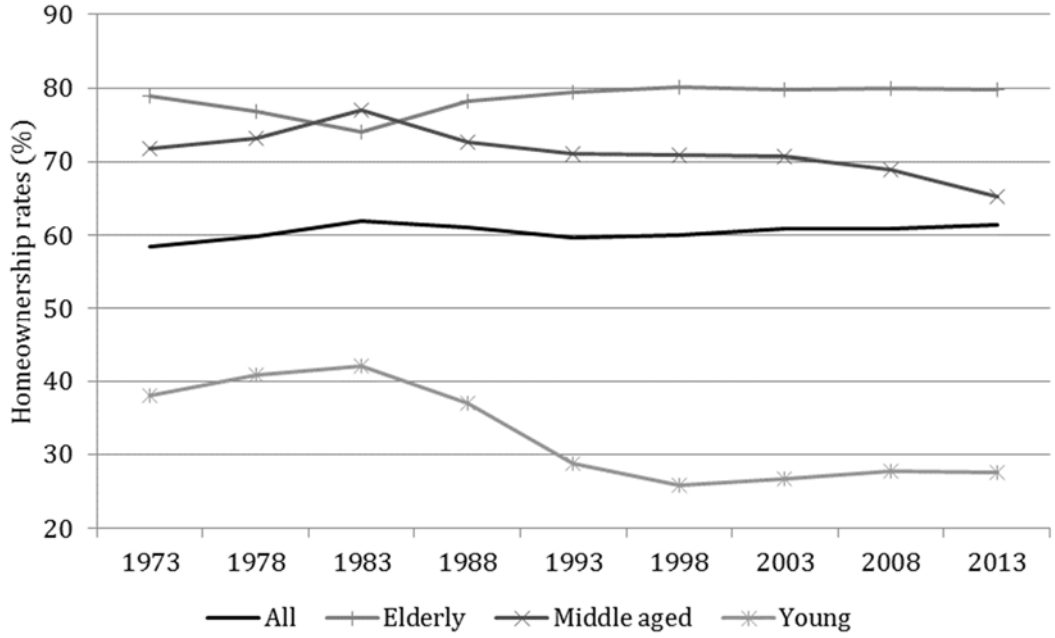
Venti, S. F. & Wise, D. A. (2002). Aging and housing equity. In Mitchell, O. S., Bodie, Z., Hammond, P. B. & Zeldes, S. (Eds.), *Innovations in Retirement Financing* (pp. 254–281). University of Pennsylvania Press, Philadelphia.

Venti, S. F. & Wise, D. A. (2004). Aging and housing equity: Another look. In Wise, D. A. (Ed.), *Perspectives on the Economics of Aging* (pp. 127–180). University of Chicago Press, Chicago.

Wakabayashi, M. (2008). The retirement consumption puzzle in Japan. *Journal of Population Economics*, 21(4), 983–1005.

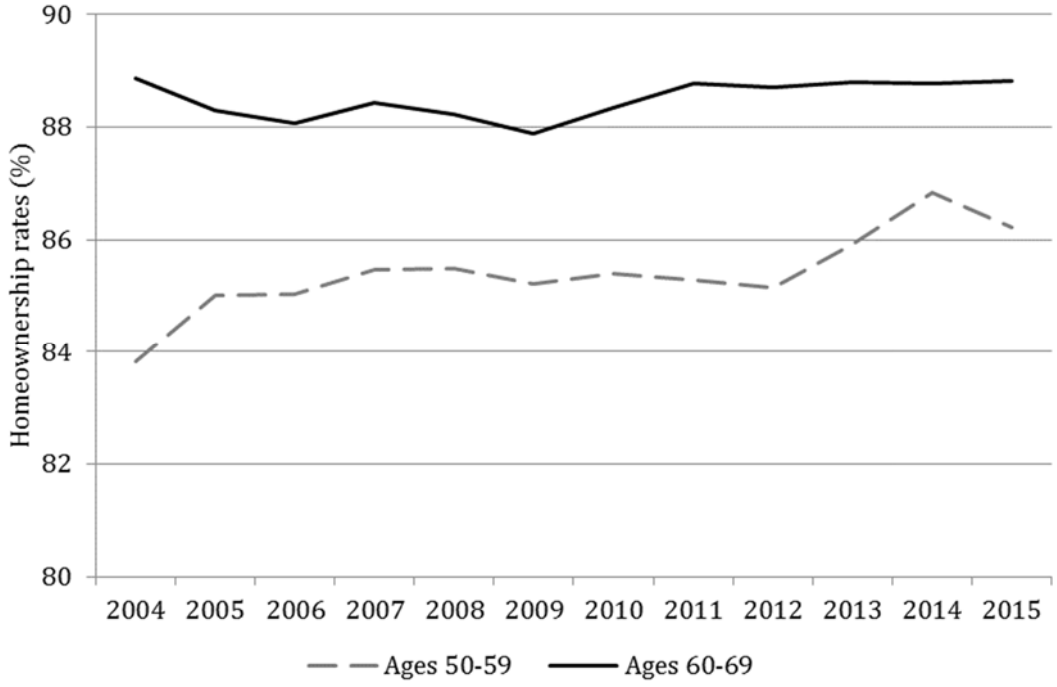
Yang, Z., Fan, Y. & Cheung, C. H. Y. (2017). Housing assets to the elderly in urban China: To fund or to hedge? *Housing Studies*, 32(5), 638–658.

Yoshida, J. (2016). Depreciation rates of Japanese real estate assets (Fudosan no keinen genka ritsu). *Quarterly Journal of Housing and Land Economics* (*Kikan Jutaku Tochi Keizai*), 99, 20–27. [in Japanese].



Source: Housing and Land Survey

Figure 1. Homeownership-age profiles over time.



Source: Japan Household Panel Survey

Figure. 2. Cohort-adjusted homeownership-age profiles over time.

Table 1. Summary statistics of main variables

Variables	Young		Middle-aged		Elderly	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Consumption (thousand yen)	3478.40	2341.68	4094.55	3047.05	3476.30	2595.07
Housing wealth (million yen)	26.99	35.16	25.40	22.72	27.15	27.29
Land wealth (million yen)	17.27	25.27	16.86	18.21	19.30	22.79
Building wealth (million yen)	9.72	14.70	8.54	9.07	7.84	9.59
Financial wealth (million yen)	5.41	12.21	9.10	15.39	20.71	26.99
Income (million yen)	7.35	5.15	8.56	4.94	6.23	5.20
Nonworker (dummy)	0.05	0.22	0.03	0.17	0.51	0.50
Household size (#)	3.98	1.25	3.74	1.33	2.77	1.29
Observations	3019		7780		7772	

Table 2. Empirical results of consumption by age groups

Variables	[1] Young	[2] Middle-aged	[3] Elderly
Housing wealth	2.010	4.815	2.768
	(2.408)	(5.224)	(4.135)
Financial wealth	10.500	5.378	6.502**
	(9.024)	(4.999)	(2.540)
Income	33.229***	53.433***	47.657***
	(11.224)	(17.806)	(15.253)
Nonworker	−325.496	−218.213	−234.879**
	(271.903)	(263.560)	(110.197)
Household size	81.739	28.942	241.749***
	(74.725)	(86.760)	(55.761)
City size	Yes	Yes	Yes
Year	Yes	Yes	Yes
Elasticity	0.016	0.030	0.022
	[0.019]	[0.032]	[0.032]
Observations	3019	7780	7772

Notes: Robust standard errors clustered by household in parentheses and standard errors calculated by the Delta method in brackets.
Elasticity measures how much consumption responds to a change in housing wealth, calculated at average values.
*** and ** indicate significance at the 0.01 and 0.05 levels, respectively.

Table 3. Empirical results of elderly consumption using disaggregated housing wealth

Variables	[1] Land wealth	[2] Building wealth
Land wealth	4.419	
	(4.493)	
Building wealth		−1.289
		(6.822)
Financial wealth	6.499**	6.522**
	(2.536)	(2.545)
Income	47.888***	47.568***
	(15.314)	(15.137)
Nonworker	−234.562**	−234.724**
	(110.257)	(110.306)
Household size	241.555***	242.853***
	(55.833)	(55.859)
City size	Yes	Yes
Year	Yes	Yes
Elasticity	0.025	−0.003
	[0.025]	[0.015]
Observations	7772	7772

Notes: Robust standard errors clustered by household in parentheses and standard errors calculated by the Delta method in brackets.
Elasticity measures how much consumption responds to a change in land/building wealth, calculated at average values.
*** and ** indicate significance at the 0.01 and 0.05 levels, respectively.

Table 4. Empirical results of elderly borrowing

Variables	[1] Housing wealth	[2] Land wealth	[3] Building wealth
Housing wealth	−0.019		
	(0.026)		
Land wealth		−0.011	
		(0.027)	
Building wealth			−0.051
			(0.042)
Financial wealth	0.027*	0.027*	0.027*
	(0.015)	(0.015)	(0.015)
Income	0.098	0.098	0.101
	(0.062)	(0.062)	(0.063)
Nonworker	−0.148	−0.149	−0.146
	(0.372)	(0.372)	(0.373)
Household size	0.182	0.177	0.179
	(0.133)	(0.133)	(0.134)
City size	Yes	Yes	Yes
Year	Yes	Yes	Yes
Elasticity	−0.193	−0.075	−0.148
	[0.264]	[0.190]	[0.120]
Observations	7733	7733	7733

Notes: Robust standard errors clustered by household in parentheses and standard errors calculated by the Delta method in brackets.
Elasticity measures how much borrowing responds to a change in housing wealth, calculated at average values.
* indicates significance at the 0.10 level.

Table 5. Annual transfers from adult children to parents

	With heritability	Without heritability
Mean (thousand yen)	127.46	78.21
	(65.23)	(62.89)
Ratio of positive transfers (%)	21.27	16.11
Observations	11718	18514

Note: Std. dev. in parentheses.

Table 6. Subsample analysis of elderly consumption: with and without children

Variables	[1] With children	[2] Without children	[3] With children	[4] Without children
Housing wealth	11.181*	−7.759*		
	(6.527)	(4.269)		
Land wealth			12.529*	−5.635
			(6.864)	(5.106)
Financial wealth	8.505*	8.547*	8.616*	8.463*
	(5.108)	(4.544)	(5.109)	(4.527)
Income	68.385***	28.398*	68.921***	28.236*
	(22.654)	(15.324)	(22.855)	(15.357)
Nonworker	−211.125	−116.478	−208.204	−118.678
	(145.919)	(188.742)	(146.209)	(188.203)
Household size	223.138***	−67.026	222.244***	−66.668
	(67.772)	(234.137)	(68.165)	(233.872)
City size	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Elasticity	0.084*	−0.064*	0.066*	−0.033
	[0.049]	[0.035]	[0.036]	[0.030]
Observations	4164	3608	4164	3608

Notes: Robust standard errors clustered by household in parentheses and standard errors calculated by the Delta method in brackets.
Elasticity measures how much consumption responds to a change in housing/land wealth, calculated at average values.
*** and * indicate significance at the 0.01 and 0.10 levels, respectively.

Table 7. Subsample analysis of elderly consumption with children: metropolitan areas and other areas

Variables	[1] With children/ Metropolitan areas	[2] With children/ Other areas	[3] With children/ Metropolitan areas	[4] With children/ Other areas
Housing wealth	13.646	4.222		
	(8.525)	(6.186)		
Land wealth			14.552*	4.456
			(8.767)	(6.455)
Financial wealth	4.790	13.478	4.972	13.494
	(5.795)	(9.785)	(5.719)	(9.856)
Income	108.854***	21.538	109.059***	21.808
	(35.864)	(17.762)	(36.221)	(17.629)
Nonworker	−262.393	−181.022	−250.979	−183.152
	(240.869)	(156.808)	(242.369)	(156.661)
Household size	270.187**	162.539*	268.145**	162.609*
	(105.609)	(91.195)	(106.910)	(91.161)
City size	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Elasticity	0.120	0.025	0.096*	0.017
	[0.075]	[0.037]	[0.058]	[0.025]
Observations	2093	2071	2093	2071

Notes: Robust standard errors clustered by household in parentheses and standard errors calculated by the Delta method in brackets.
Elasticity measures how much consumption responds to a change in housing/land wealth, calculated at average values.
***, **, and * indicate significance at the 0.01, 005, and 0.10 levels, respectively.

Table 8. Empirical results of elderly consumption using the alternative specification for the housing wealth measure

Variables	[1] Depreciated	[2] Property value	[3] Land price	[4] Average
Housing wealth	−0.150	−6.985	−0.001	4.211
	(2.981)	(4.541)	(0.003)	(4.474)
Financial wealth	5.558**	3.506	6.491**	6.505**
	(2.725)	(3.638)	(2.543)	(2.539)
Income	27.758**	54.244**	45.625***	47.3375***
	(10.937)	(23.174)	(15.254)	(15.190)
Nonworker	−327.251**	−235.954	−240.904**	−232.466**
	(110.592)	(149.895)	(111.481)	(109.897)
Household size	236.426***	306.321***	250.447***	241.885***
	(62.828)	(84.239)	(56.585)	(55.698)
City size	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Observations	6507	4649	7616	7772

Notes: Robust standard errors clustered by household in parentheses.
*** and ** indicate significance at the 0.01 and 005 levels, respectively.

Table 9. AR3 estimate for housing wealth

Variables	Housing wealth
$t-1$	0.186***
	(0.032)
$t-2$	0.008
	(0.022)
$t-3$	0.035
	(0.022)
Constant	19.439***
	(1.548)
Year	Yes
Observations	2370

Notes: Robust standard errors in parentheses.
Model estimated using Arellano−Bond dynamic panel GMM estimator.
*** indicates significance at the 0.01 level.

Table 10. Empirical results using fitted housing wealth value

Variables	[1] Fitted-value	[2] Difference
Housing wealth	23.418	−1.0914
	(45.783)	(3.118)
Financial wealth	7.796**	7.754**
	(3.460)	(3.477)
Income	33.843***	33.884***
	(11.705)	(11.725)
Nonworker	−258.035*	−255.735*
	(137.407)	(136.978)
Household size	227.389***	230.238***
	(64.852)	(65.012)
City size	Yes	Yes
Year	Yes	Yes
Observations	6644	6644

Notes: Bootstrap standard errors in parentheses (500 replications by household).
*** and * indicate significance at the 0.01 and 0.10 levels, respectively.