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How Portfolios Evolve After Retirement: Evidence from Australia

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Abstract

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Keywords

Retirement wealth; Life-cycle saving; Public pension; Portfolio choice

JEL Classification

D91, E21, G11

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How Portfolios Evolve After Retirement: Evidence from Australia

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Households in many countries reach retirement with lump sums of financial wealth accumulated in defined contribution retirement plans. Australian households offer a useful case study in how retirees manage wealth from DC accumulations. We study the dynamics of retirement wealth and portfolio allocation using the three wealth waves of the Household Income and Labour Dynamics in Australia panel survey. The average retired household accumulated wealth in 2002-06 and decumulated in 2006-10 consistent with trends in financial asset prices. At older ages, households prefer portfolios with less risk and more liquidity, while maintaining ownership of the family home. The probability of households depleting financial wealth to very low levels increased over the sample, however households who deplete financial wealth do not liquidate their housing wealth at higher rates than other households. In contrast to the U.S., the overall effect of health shocks on the wealth of retired Australian households is minimal.

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1. INTRODUCTION

As defined benefit plans migrate to defined contribution plans in many economies, an increasing proportion of workers are reaching retirement with lump sum wealth rather than lifetime pensions. Consequently, retiring households now confront the critical problem of turning their accumulations into sustainable incomes. Since rates of voluntary life annuity purchase are very low in many countries (Bateman and Piggott, 2010) and health insurance is often expensive or incomplete, households frequently stay exposed to longevity uncertainty, health risks and financial market volatility throughout retirement.

Standard life-cycle theory predicts that households will anticipate their need for both longevity insurance and precautionary liquid savings and adjust their portfolios accordingly (French et al., 2006). So as defined benefit pension support declines, it becomes vital to study not only changes in total wealth but also changes to retirement portfolios. In a detailed study of elderly households from the U.S. Health and Retirement Survey (HRS), Coile and Milligan (2009) find that holdings of risky assets decrease with age, especially following wealth shocks such as the death of a spouse or poor health. Furthermore, Sinai and Souleles (2007) emphasize the difficulty of consuming wealth that is embedded in the family home (typical of the less wealthy), compared with the relatively liquid financial assets of wealthier households.

Here we use panel data on around 900 retired Australian households to study decumulation rates and portfolio management between 2002 and 2010, as financial markets cycled from boom to bust to recovery. Portfolio dynamics of Australian retirees offer a rich case study for policymakers around the world. Since the early 1990s, almost all Australian workers have contributed to a publicly mandated, privately managed, retirement savings system, similar to U.S. 401(k) plans and the U.K.'s Workplace Pensions.[1] Consequently, a large proportion of the panel we study reached retirement with a (typically small) defined contribution accumulation from an immature retirement savings plan, a pattern that is set to be repeated in the U.S. and U.K. in coming decades as auto-enrolment accelerates. Australian retirees carry substantial

[1] The 'Superannuation Guarantee' was established in 1992, originally stipulating that 3% (rising to 9% over several years) of an individual's earnings be placed into a complying superannuation fund until preservation age at 55 years (now increasing to 60 years) (*Superannuation Guarantee (Administration) Act 1992* (Commonwealth)). The mandatory contribution rate will rise to 12% by 2020.

exposure to financial market risk into retirement and purchase longevity insurance at very low rates (Kingston and Thorp, 2005). Further, public retirement income provision for our panel is limited to a modest asset- and income-tested pension (Age Pension).[2] Australia does not have a social security pension linked to earnings history as do many similar developed countries. Around 75% of people over 65 years of age receive a full or part Age Pension, which pays 28% of average male earnings to singles, and 40% to couples. Consequently, the panel members do not enjoy generous public pension provision. On the other hand, the family home is excluded from the Age Pension means tests. Around 80% of elderly own their home most do not run down their housing assets in retirement and our panel has a large stock of illiquid housing wealth (Bradbury, 2008; Cho and Sane, 2011; Bradbury, 2010). Finally, retired Australians are relatively well insured against health shocks, with estimated spending on health at around only 3% of total expenditure (Jones et al. 2008).

Existing empirical studies show that retirement decumulation rates are slower than theoretical predictions and that portfolio allocations change over time. For example, Börsch-Supan (2003) finds little indication that older German households decumulate their wealth in retirement, and Love et al. (2009), using data from the HRS panel, find that comprehensive wealth balances decline much more slowly than remaining life expectancies would suggest. Similarly Hulley et al. (2012), inferring wealth of public pension recipients from Age Pension data, show that wealthier Australian households continued to accumulate in retirement while poorer retirees decumulated.[3]

The composition of asset holdings varies over the lifecycle, with risky asset holdings typically peaking in middle age. Veld-Merkoulova (2011) finds an increasing share of risky financial investments associated with a longer planning horizon in the Netherlands; Poterba and Samwick (2001) and Hurd (2001) find large differences across ages and cohorts in the U.S.

[2] The Age Pension aims to ensure that older Australians have enough funds to maintain a 'sufficient' standard of living during retirement, with payments made fortnightly. The payment is means-tested according to both income received and assets owned, with a maximum payment in 2013 of $733.70 per fortnight for singles and $1106.20 per fortnight for couples, excluding any applicable rental assistance.

[3] Börsch-Supan and Lusardi (2003) demonstrate the importance of panel data for accurate inference about decumulation rates.

Ameriks and Zeldes (2000) estimate a 'hump-shaped' age effect on the fraction of household assets held in equity, peaking in mid-life (late 40s-50s). Similarly, Heaton and Lucas (2000) show a distinct decline in equity share above age 65 for U.S. households, and Guiso, Haliassos, and Jappelli (2001) report risky asset ownership peaks in a person's 50s in Germany, Italy and the U.K.[4] Coile and Milligan (2009), using panel data from the HRS, also show a reduced likelihood of holding risky assets and increased proportions of more liquid assets with increasing age. For Australia, Kohler et al. (2004) report that older households were more likely than young households to hold low-risk bonds and deposits, and are less likely to hold riskier equity investments.

Proposed reasons for the mid-life peak and subsequent decrease in risky asset holdings include declining human capital (Ibbotson 2007), the need for liquid precautionary balances, especially for out-of-pocket medical expenses later in life (French et al. 2006; Frostin et al. 2008), bequest motives (Hubbard et al. 1995), and racial or cultural differences such as having a non-English speaking background (NESB) (Cardak and Wilkins 2009).

Panel data from Australia is a rich source of information on how retired DC plan members manage their lump sums. The contribution of this paper is to measure rates of drawdown, the likelihood of running out of money and the dynamic pattern of portfolio management in retirement by retirees with mostly small DC accumulations. The patterns we record for Australia are a forecast of global trends in wealth management in retirement.

First we measure decumulation between 2002 and 2006, and between 2006 and 2010, the wealth waves in HILDA. We focus mainly on wealth net of debt and housing equity, since most Australian households do not run down their housing assets in retirement. We calculate the rate of decumulation of retired households conditioning on household characteristics and portfolio allocations. Wealthier households tended to hold larger proportions in risky assets and reported larger reductions in wealth after the financial crisis compared with older households with less exposure to investment risk.

[4] Interestingly however, Guiso et al. find an exception to their results to be households in the Netherlands who see a continual increase in risky asset ownership with increasing age.

Since the risk of exhausting wealth before the end of life is higher when accumulations are not annuitized, we also investigate which households are more likely than others to run out of liquid funds, and how that varies from wave to wave. Households pass through critical financial thresholds at increasing rates over the sample period. According to the Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973), the main drivers of these transitions are environmental factors (which could include social changes, changes in regulations or monetary policy, or changes in the investment landscape), rather than changes in households themselves (for example, the death of a spouse). However running out of financial assets does not cause people to draw on housing equity: the households reaching very low liquid assets do not reduce housing assets at higher rates than the better-off.

Thirdly, following Coile and Milligan's (2009) study of the U.S., we describe how portfolio allocations vary with age. Using specifications that separate age, cohort and household effects, estimates show lower holdings of risky assets, such as superannuation and equity, at older ages.

Finally, we investigate the effect of current health status and changes in health on portfolio allocations. Using observations of households who report bad health, expect bad health or have a long-term medical condition, we find that the wealth of retired Australians is not greatly affected by health shocks, in contrast with the U.S. While Australian retired households continue to experience damaging investment shocks, health shocks appear to be less important and are probably better insured than in the U.S., where the elderly bear substantial out-of-pocket health expenses (Fronstin et al. 2008).

2. DATA

The Household and Income Labour Dynamics (HILDA) survey includes socio-demographic characteristics, wealth, health, labor market activity, and a range of other household and personal characteristics.[5] The same households are interviewed in each annual survey

[5] HILDA consumption data is only available for waves 2006 and 2010, and hence our paper focuses on the decumulation of wealth across waves rather than comparing changes in consumption.

('wave'), and in waves 2, 6 and 10 (conducted in 2002, 2006 and 2010 respectively) a special wealth module collected data on households' financial and non-financial assets and liabilities.

HILDA provides data on over 7,000 households (approximately 20,000 non-institutionalized individuals) in each wave. From these we select only single or coupled retired households where the older member of a couple is at least 60 years of age in 2002.[6] All household members must be fully retired from paid work and give answers to questions on nine specified asset classes.[7]

After exclusions for attrition or crucial missing values, the 2002-06 sample includes 885 households and the 2006-10 sample includes 942 households. Of these, 640 appear in all three wealth waves and answer all the relevant questions. Table 1 reports the sample means of household characteristics in different survey waves for the 2002-06 and 2006-10 samples, as well as for the subsample of households that appear in all three waves.

The 2006-10 sample are less educated and in worse health than the 2002-06 sample, but also have higher average wealth (by $200K including housing equity, and by $100K excluding housing equity), probably because the 302 households that joined the panel in 2006 are younger and wealthier than the 245 households who left before 2010 (see columns 7 and 8). The younger cohort may also have accumulated more financial wealth under the mandatory retirement savings system introduced in the early 1990s (the Superannuation Guarantee).

As expected, households appearing in all three wealth waves show, on average, deteriorating health, more singleness, lower rates of risky asset and home ownership over time and increasing rates of financial wealth depletion (lower panel). Further, the average change in wealth between 2002 and 2006 was an *increase* of $88K ($9K excluding net housing equity) compared with an average *decrease* of $73K ($63K excluding net housing equity) between 2006 and 2010.

PLACE TABLE 1 HERE

[6] We do not include any retired couples or singles that are living with other friends or family.

[7] Where available, we make use of HILDA's imputed wealth variables so that we maximize the number of households included in our sample. Refer to Summerfield et al. (2011) (*HILDA User Manual – Release 10*), pp69-73 for more information on imputation methods used.

3. METHOD AND RESULTS

We begin with the question, "Do households decumulate during retirement?", then address the related question of whether they decumulate *too quickly* by tracking the path of the sample through a series of low-wealth thresholds. Next we focus on portfolio dynamics, and the influence of aging and health, comparing the experience of Australian retirees with the U.S. Health and Retirement Survey (HRS).

The HILDA survey reports wealth in nine asset classes: liquid assets; cash investments; superannuation; equity (stocks); principal residence; business; real estate; vehicles; and 'other savings', all of which are described and classified into the five categories below:[8]

1. *Liquid Assets and Cash Investments* – liquid assets such as bank accounts (own and joint) plus cash investments (including government bonds, corporate bonds, debentures[9], certificates of deposit, and mortgage-backed securities).[10]
2. *Superannuation and Equity* – value of superannuation holdings and life insurance (if cash-out before death is available) plus public equity (shares, managed funds (mutual funds), property trusts (real estate investment trusts and children's trust funds[11]).
3. *Principal Residence* – the value of the household's own residence.
4. *Business and Real Estate* – the value of business(es) owned by the household plus investment property (other than principal residence).
5. *Vehicles* – cars, motor homes etc.

The sum of all five categories (plus the value of 'other savings'[12]) equals *gross assets* per household. *Net wealth* per household is the sum of gross assets less total debt holdings.[13] We

[8] 'Other savings' (such as collectables and antiques) is not included in any of the five asset categories for our analysis in Section C (*Effecting of Ageing on Asset Holding)* or Section D (*Effects of Health on Asset Holdings*) in order to be comparable with Coile and Milligan's (2009) study. However, 'other savings' is one of the nine asset types that is summed to calculate the value of household wealth which is summarized in Table 1, and analysed in Section A (*Determinants of Wealth and Changes in Wealth)* and Section B (*Prevalence and Determinants of Probabilities Surrounding Low Financial Wealth*). A detailed variable summary can be found in Appendix A.

[9] A debenture is debt instrument that is not secured with collateral.

[10] The HILDA dataset does separately identify corporate bonds. Instead, 'cash investments' include government bonds, corporate bonds, debentures, certificates of deposit, and mortgage-backed securities. Note that the corporate bond market in Australia is very small compared with the U.S.

[11] We would ideally exclude the value of children's trust funds (given retirees cannot draw them down for consumption) but this is not possible due to data limitations.

[12] Other savings includes collectables, antiques, works of art, cemetery plots, or other substantial assets.

also calculate *wealth ex-residence* (financial wealth), the sum of gross assets less total debt holdings, excluding home-owner equity, since most Australian households preserve housing equity through retirement (Cho and Sane, 2011; Bradbury, 2010). We focus mainly on *wealth ex-residence* but include results for net wealth including principal residence where they differ significantly.[14]

A. Determinants of Wealth and Changes in Wealth

We begin by regressing wealth ex-residence in 2002 and 2006 on the household characteristics summarized in Table 1:

$$W_{it} = \beta_0 + \beta_1 age_i + \boldsymbol{\beta_2}' \boldsymbol{Z_{it}} + \varepsilon_{it} \quad (1)$$

here W_{it} is household wealth in period *t* (*t*=2002, 2006), net of debt and housing equity, age_{it} is the age of the head of the household in period *t*, and $\boldsymbol{Z_{it}}$ is a vector of explanatory variables. In the case of couples, we follow convention and treat the adult male as the head of the household and associated values of covariates, but the age of the oldest household member measures household age. (There are no same-sex couples in the sample.) Other explanatory variables include indicators for couple status, Age Pension receiving households, residence in a major city, post-high school education, and home-ownership. We also include indicators for speaking a language other than English, for households who report that they speak English 'poorly' or 'not at all', and for households who indicate particular health conditions.[15] Religious affiliation is classified into indicators for Christianity, Judaism, Islam, 'Other' and 'None'. (Appendix A has further details.) Households are counted as precautionary savers when they answer the question, "Which of the following comes closest to describing your (and your family's) current reason for saving?" with "medical/dental expenses" or "for emergencies/in case of unemployment or illness". If the household head answers the question, "Which of the following comes closest to

[13] Debt not only includes debt attributable to the assets listed above, but also credit card debt, HECS (Higher Education Contribution Scheme), car loans, investment loans, personal loans, hire purchase and overdue bills.
[14] The full results for wealth including housing equity (principal residence) are available from the authors on request.
[15] See Section D. '*Effect of Health on Asset Holdings*' for more details on these three health condition indicator variables.

describing your (and your family's) current reasons for saving?" with "education for children or grandchildren" or "to help children or other relatives" we indicate a bequest intention.

We also incorporate indicator variables for certain types of portfolio holdings:

i. $safe\_50_{it}$, takes the value 1 if household *i* has at least 50% of their wealth invested in liquid or cash investments in time period *t*, or 0 otherwise.
ii. $superequity\_50_{it}$, takes the value 1 if household *i* has at least 50% of their wealth invested in superannuation and/or equity in time period *t*, or 0 otherwise.
iii. $busrealestate\_50_{it}$, takes the value 1 if household *i* has at least 50% of their wealth invested in business and/or real estate in time period *t*, or 0 otherwise.

The reference group for these indicators is 'diversified' households that do not have more than 50% of their total portfolio holding in any one of these three asset classes.

Estimation results in columns 1 and 4 of Table 2 show that those households with more than 50% of wealth invested in superannuation/equity or business/real estate are wealthier than the reference group, as are couples, home-owners, and those with higher education. Those households who report being followers of Judaism have statistically significantly higher wealth in wave 2002, compared with those households who report being either Christian, of another religion, or having no religious affiliation. Households who report being followers of Islam or who receive the Age Pension have comparatively lower wealth across both periods. Having a long-term health condition is associated with lower wealth in 2002, possibly due to the ongoing health care costs or lower accumulations because of limited labor market participation before retirement. These results are robust to the inclusion of housing equity in the net wealth measure, although households residing in a major city report significantly higher wealth in both 2002 and 2006, consistent with higher residential property prices in major cities. Other relationships are substantially unchanged.

PLACE TABLE 2 HERE

To compare decumulation across the two periods, we regress the absolute change in wealth-ex-residence for each household, ΔW_{it}, on the same set of explanatory variables:

$$\Delta W_{it} = \delta_0 + \delta_1 age_{it-1} + \boldsymbol{\delta_3}' \mathbf{Z_{it-1}} + \varepsilon_{it} \quad (2)$$

All controls in model (2) correspond to the beginning of the decumulation period, i.e., to year 2002 for the period 1 sample, and to year 2006 for the period 2 sample.

At the aggregate level, Australian households are exposed to financial risks and diversifying across asset classes offers some protection, but they are also less vulnerable to health shocks. Households with large holdings in one particular asset type (safe, superannuation/equity or business/real estate) experienced a comparatively larger decumulation in the 2006-10 period, when compared to more diversified reference households (Table 2, columns 2 and 5). Rates of decumulation differ also across several other dimensions, though in contrast to US studies (e.g., Poterba, Venti and Wise, 2010, Poterba, Venti and Wise, 2013), we do not find any significant impact of education on changes in wealth. Having a long-term health condition is related to lower wealth in 2002, but there are no other statistically significant effects of health on changes in wealth.

To get a clearer idea of the effect of ageing on decumulation patterns we fix the values of covariates at their medians and compute fitted values of wealth as age increases (Table 3, columns 1 and 3). Confirming Kelly's (2012) finding, the fitted values show an average accumulation of wealth in the period 2002-06 at all ages, and an average decumulation in the period 2006-10 apart from very old ages. The pattern of average accumulation (2002-06) followed by decumulation (2006-10) is also robust to including net value of principal residence in wealth.

PLACE TABLE 3 HERE

We next use results in Table 2 to graph the evolution of expected *wealth ex-residence* over the 2002-06 and 2006-10 periods for various household types, (Figure 1). Households of different ages, on average, experienced a modest wealth increase between 2002-06 and a decumulation in 2006-10. Panel (a) shows that, after the influence of outliers has been removed, average wealth increased by about $1.6K in the first period, and decreased by $54K in the second period. When housing equity is included (not shown here), average wealth increased by 73K in the first period and decreased by 106K in the second period. Panel (b) shows that wealth

decumulation in the second period has been lower for older households. For example, households aged 65 in 2006 experienced an average decline of $100K over the next four year period, while households aged 85 in 2006 experienced almost no decline. This could be partly explained by a lower exposure of older households to risky assets, a finding which will be supported in the next section of this paper. In contrast, there are no significant age differences in the rates of total wealth decumulation including housing equity, so older households experienced falling housing equity in the second period. We show in the next section that the home ownership rate of Australian households declines with age. Panel (d) indicates that households with the highest exposure to equity (50% of the portfolio or more) experienced the largest *fall* in *wealth ex-residence*, with an average decumulation of about $360K over the 2006-2010 period. The results for *net wealth* are similar.

PLACE FIGURE 1 HERE

Finally, we compute the *rate* of decumulation by regressing the difference in log *wealth ex-residence* on the controls and indicators in equation (3):

$$100 \times \log(W_{it}/W_{it-1}) = \vartheta_0 + \vartheta_1 age_{it-1} + \boldsymbol{\vartheta_3' Z_{it-1}} + \varepsilon_{it} \qquad (3)$$

Table 2, columns 3 and 6, report the estimated coefficients. Confirming Bloxham and Betts' (2009) predictions,[16] the coefficients on $superequity\_50$ and $busrealestate\_50$ in the 2006-10 period are negative, statistically significant and larger in absolute value than estimated for 2002-06: households with a high allocation to these categories experienced larger decumulation rates over the crisis and post-crisis compared with those households who did not.[17]

[16] Bloxham and Betts (2009) predict that given higher-wealth households hold larger shares in equity and superannuation, it is likely that the declines in net worth observed in 2008 would have a greater impact on these particular households.

[17] The relatively low R-squared values for these estimations are likely due to the fact that we cannot separately observe returns on wealth (which would ideally be included as explanatory variables in our wealth analysis), and are unable to account for heterogeneity in actual investment returns across our sample. This could help explain why we observe higher R-squared values for *levels* of wealth in any one wave (Table 2, columns 1 and 4) compared to decumulation estimation. Decumulations will be affected by unobservable heterogeneity (including risk preferences and where assets are invested etc.).

(For robustness, we repeat this process excluding the top and bottom 5% of households by decumulation rates across 2002-06 and 2006-10 and the results are similar.)

With this in mind, we compute fitted values for decumulation rates by age in the 2002-06 and the 2006-10 periods, setting covariates to median values (Table 3, columns 2 and 4). The results in Table 3 are conditional averages of absolute changes and rates of changes in wealth ex-residence. In general, average absolute changes and average percentage changes in wealth will not necessarily have the same sign because the modest absolute wealth decumulation of low wealth households can be very large in terms of rates, while large absolute changes in wealth can make up a very small percentage of wealth of high wealth households. For example, over 2002-06, 55% of households decreased their wealth holdings, on average, $109.5K (83%). The remaining 45%, who increased wealth holdings, added on average $152.8K (76%), hence the average absolute change is positive even though a majority of households reduced their total financial wealth, and the average rate of change is negative. Median *wealth ex-residence* actually decreased from $70K in 2002 to $55.4K in 2006. All percentiles up to the 75th decreased wealth, while 90th and higher percentiles increased. Similarly, over 2006-10, 60% of households decreased their *wealth ex-residence*, on average $196.7K (82%) over four years. The remaining 40%, added on average $134.7K (89%), hence the average absolute changes and percentage changes in wealth are negative. Median financial wealth decreased from $77.6K in 2006 to $71.9K in 2010, and all percentiles also decreased. We conclude that the majority of households of different ages decumulated over both periods, consistent with theory. However, wealthier households were able to add to their wealth in the early part of the decade, but not during the turbulence of the 2006-10 period.

When housing equity is included (using the *net wealth* measure), fewer households (34%) reported lower wealth over 2002-06, with an average fall of $162.8K (31%) over four years. By contrast, the 66% who increased wealth added an average $214.1K (48%), making a positive average absolute change in wealth for all households. Median wealth including housing rose from $304K in 2002 to $354K in 2006 with all percentiles over the 25th showing a rise. But over 2006-10, 54% report lower wealth when housing is included, falling an average $267.2K (31%) over four years. The remaining 46% of households added on average $158.1K (32%), so the

average absolute change and percentage changes in wealth including housing are negative. Median wealth decreased from $406.6K in 2006 to $404.0K in 2010, and all percentiles also decreased. Overall, residential housing values increased wealth at the median in the first period, but did not prevent declines in the second period.

Unlike results for the U.S., Australian households appear to be more vulnerable to financial shocks than health shocks. Moreover, education is not a significant factor possibly because neither public health insurance nor public pension payments in Australian are dependent on earnings or work history. More complete public health insurance coverage may explain the lower importance of health status. However, the increasing reliance of Australian retirees on defined contribution retirement savings combined with low rates of annuitization may explain why better diversified households preserve their wealth more than less diversified households, as well as the greater vulnerability of wealthier households to financial shocks.

B. Prevalence and Determinants of Probabilities of Low Financial Wealth

Retirement savings systems aim to support consumption at older ages. One measure of success is whether households 'run out of money' before the end of life. A related issue is whether households deplete asset classes in a particular order. In this section we study the evolution of households into very low financial wealth states over an extended time period. We define a series of financial wealth thresholds: either 4, 12, 24 or 48 weeks of equivalent Age Pension payment stored as *wealth ex-residence*, and conditioning on single or couple status.[18,19] A comparable standard for these amounts is the ASFA (2013) 'modest' retirement budget,

[18] The thresholds for couples in 2010 (in $2010) are $2,114, $6,342, $12,684 and $25,368, and for singles the thresholds are $1402, $4,207, $8,413, and $16,826. Age pension payments are calculated as maximum pension payment (excluding rental assistance) as outlined in the 2002, 2006 and 2010 December quarter 'Poverty Lines' publication by the Melbourne Institute of Applied Economic and Social Research, and inflated to 2010 dollars using Reserve Bank of Australia (2012) quarterly inflation figures (which are calculated based on the Consumer Price Index (CPI)). Refer to Appendix B for the equivalent of one week's Age Pension payment (excluding rent assistance) for couples and single households. These figures are multiplied accordingly to calculate each respective threshold of low financial wealth (4, 12, 24 or 48 weeks Age Pension saved, excluding housing equity).

[19] Our thresholds, based on multiples of the weekly Australian Age Pension, are comparable to the Association of Superannuation Funds of Australia Limited's (ASFA) (2013) "modest lifestyle" Retirement Standard, which suggests a yearly budget for retired (home-owning) couples and singles of $32,656 and $22,654 respectively. Our four ascending thresholds, as a proportion of this annual ASFA measure, equal approximately 6%, 19%, 38% and 76% respectively.

compiled from a basket of necessities for retirees, and defined as "better than the Age Pension, but still only able to afford fairly basic activities". For example, the lowest threshold we apply is around 25% less than four weeks' budget under the modest ASFA standard.

We begin by presenting transition matrices showing the frequency with which those 640 households who appear in all three waves fall below each of our thresholds, from either a previously high or low financial wealth state (Tables 4A-D). We observe that the percentage of households below the thresholds is weakly increasing across all three waves.

PLACE TABLES 4A TO 4D HERE

Next we estimate a linear probability model[20] by regressing an indicator for whether household *i* has low financial wealth (Y_i) on explanatory:

$$p_{it} = p(Y_{it} = 1|M_{it}) = \beta_0 + \boldsymbol{\beta_1}'\mathbf{M_{it}} + \varepsilon_{it} \quad (4)$$

where the explanatory variables $\mathbf{M_{it}}$ are the same is in previous estimations.

The transition into low wealth estimated here can reflect both planning failures and/or rational decumulation plans connected with age. We address this identification problem using the Oaxaca-Blinder decomposition technique,[21] decomposing changes in the transition probabilities over time into parts attributable to household characteristics and parts attributable to environmental factors. For example, household characteristics such as an increased likelihood of being widowed and/or decumulation due to aging could both increase a household's probability of falling below a threshold, whereas changes in economic, social or regulatory environments could also have similar effects. The policy implications of each are different.

Estimation results for the linear probability models for households passing through a low financial wealth threshold are reported in Tables 5A-B. A unit increase in the explanatory variable (or switching on an indicator variable), will increase (decrease) the probability of being of low financial wealth given a positive (negative) coefficient sign. In 2002, the likelihood of reaching the lowest wealth threshold is 4.9 percentage points lower for couples than singles, and 8.3 percentage points lower for home-owners than non-homeowners, but higher by

[20] We also estimated logit models, with very similar results.
[21] See Oaxaca (1973) and Blinder (1973).

3.3 percentage points for Age Pensioners. Households who report health problems are not more likely to be below the threshold. Other interesting statistically significant results include the effects of portfolio allocation (low risk portfolios are linked with low wealth), while older households and precautionary savers are less likely to deplete their resources.

PLACE TABLE 5A HERE

Increasing the wealth threshold to 12 weeks of Age Pension (Table 5B), adds having greater than high school education as a significant predictor of not falling below threshold savings.

PLACE TABLE 5B HERE

Estimations for thresholds 3 and 4 (not reported here) show the negative impact of a long-term health condition on wealth in some waves. For threshold 4 we also find that reporting bequest motives (where the household indicates they are saving to help their children/grandchildren)[22] makes falling below the threshold less likely by 10.7 percentage points in 2002. These households may deliberately slow consumption to preserve a bequest.

The final step in this section is to decompose changes in transition probabilities into those changes due to the dynamics of household characteristics, and those changes due to the economic environment. We follow the Oaxaca-Blinder decomposition technique and report average predicted probabilities (Table 6).[23] Starting with threshold one in 2002-06, the probability of having less than four weeks Age Pension saved (i.e., less than $1K in assets outside the family home for a single person) increased by 0.9 percentage points, of which -1.2 percentage points can be attributed to changes in household characteristics and 2.1 percentage points can be attributed to changes in environmental factors.

PLACE TABLE 6 HERE

[22] Includes saving to 'help' their children or grandchildren, or for their education.

[23] We also tested this technique on a number of subsamples (for example, Age Pension recipients and those households with high proportions of wealth held in risky asset types). However, we found that due to our already small sample size this process was largely influenced by noise and hence for reliability we report probabilities for the average across our sample only.

Analyzing the second period (2006-10) gives more evidence that simple ageing is not the main factor in the increased likelihood of falling below the threshold: the decomposition attributes -0.8 percentage points to changes in household characteristics and 1.6 percentage points to changes in environmental factors. This could be due to changes in pension regulations, falling interest rates, increased utility bills, or increased rent, among other influences.

PLACE TABLE 7 HERE

Increasing the threshold to 12, 24 and 48 weeks Age Pension saved (excluding housing equity) produces similar results across both 2002-06 and 2006-10 with most changes attributable to economic/social/regulatory environmental factors (as opposed to changes in household characteristics alone).[24]

Further analysis of changes in home-ownership and housing wealth do not support a clear pattern of sequential depletion of financial assets followed by housing assets. Firstly, households experiencing financial poverty do not reduce homeownership rates or housing equity any more than households who are not poor. This finding fits the general pattern of preservation of housing wealth noted by Bradbury (2008, 2010) and Cho and Sane (2011). We do observe several cases between 2006-10 where households reduce housing equity and increase financial assets, consistent with Fischer and Stamos' (2013) observation that home ownership rates follow the house price cycle, but the reverse also happens in a few instances. When the definition of wealth poverty is based on net wealth including housing, we find that of the 20 households who became wealth poor in 2006, three depleted their housing wealth to zero, and of the 26 households who became wealth poor in 2010 (but were not poor in 2006), eight depleted their housing wealth to zero. Overall, even the poorest households maintain equity in principal residence when financial wealth is running out. The protection for the family home from the Age Pension means tests and the relative vulnerability of renting households, particularly in major cities, makes this an attractive plan for retirees.

[24] Results are available from the authors upon request.

C. Effect of Ageing on Asset Holdings

The goal of this subsection is to analyze the effect of ageing on asset holdings, where we begin with a cross-sectional 'snapshot' of the gross assets of Australian retirees for the most-recent wave, 2010, in Table 8. We include *all* retired couple and single households in the 2010 HILDA survey (not only those who appear in all three surveys).

PLACE TABLE 8 HERE

The top panel shows how ownership rates of different asset types vary with age. Home ownership rates are around 70-80% except for the oldest old, with slowly declining ownership after age 74. Superannuation holdings reflect the relatively recent introduction of the 'Superannuation Guarantee' in 1992, where younger cohorts having longer to contribute. About one third of households' own equities (separate from their superannuation investments) with a slow decrease in ownership rates at older age groups. On the other hand, rates of ownership of liquid assets and cash investments increase with age.

The second panel shows the median value of assets by class, for participating households. Interestingly, the median value of principal residence is almost constant across ages (around $400K), with median equity and superannuation generally declining with age. Median liquid assets (bank accounts) increase with age as predicted, although there is some variation observed in median cash investments[25] across ages. The third panel presents the share of total wealth allocated to each asset category. Shares in equity and principal residence are fairly constant across ages, compared with an increased share observed for liquid assets and the decreased share observed for superannuation, vehicle and real estate holdings.

To control for cohort effects (since households were born during different periods and hence their savings and overall wealth levels are exposed to different market environments across their working life), we consider the panels for periods 1 and 2, and regress gross asset holdings on age and characteristics for household *i* at time *t*:

$$Asset\ holdings_{jit} = \varphi_0 + \varphi_1 age_{it} + \boldsymbol{\varphi_2}'\mathbf{X_{it}} + \gamma_t + \varepsilon_{jit} \qquad (5)$$

[25] Cash investments include government bonds, corporate bonds, debentures, certificates of deposit, and mortgage-backed securities.

where *Asset holdings*$_{jit}$ is the value of asset class *j* held by household *i* at time *t*, age_{it} is the age of the household, $\mathbf{X_{it}}$ is a vector of control variables, γ_t are wave dummies, and ε_{jit} is an independent and identically distributed error. We run this regression seven times: for each of the five asset categories (set out on page 7) plus for superannuation and equity both separately. The control variables include indicators of single or couple status, receipt of Age Pension, residing in a major city, post-high school education, English language proficiency, religious affiliation, expressing precautionary motives, and expressing bequest motives. As in the previous sections, for couple households the personal characteristics of the household head, the adult male, are used as control variables but the age of the oldest household member measures household age.

The dependent variables are binary variables indicating participation (strictly positive holding) in each asset class; and the share of total household assets in each asset class. We use three econometric specifications with robust standard errors:[26] no fixed effects (1); cohort fixed effects (2); and household fixed effects (3).

In estimation (2), cohort dummies, C_k, group households by birth year (where two birth years form one cohort) in the following form:

$$Asset\ holdings_{jit} = \delta_0 + \delta_1 age_{it} + \boldsymbol{\delta_2}'\mathbf{X_{it}} + \gamma_t + C_k + \varepsilon_{jit} \quad (6)$$

Estimation (3) includes household fixed effects, α_i:

$$Asset\ holdings_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}'\mathbf{X_{it}} + \alpha_i + \varepsilon_{jit} \quad (7)$$

but wave dummies cannot be included in this third specification because of the perfectly collinear relationship between age and time (See Wooldridge, 2006, p. 489).

The age-evolution of portfolios is the main interest, so in Table 9 we omit other controls and report only estimated coefficients on age for each of the three specifications.[27] Results in column 2 of panel 1 of Table 9 shows each year of age lowers the probability of participation in superannuation and/or equity assets by 0.67 percentage points. Including cohort dummies (column 2) weakens the size but not the sign of this effect.

PLACE TABLE 9 HERE

[26] We use OLS estimation with robust standard errors for the first two specifications.

[27] Full estimation results are available from the authors. Bold italic typeface show cases where a quadratic in age was significant for some ages (see Appendix C for detailed results on the quadratic specification).

The third column of Table 9 incorporates household fixed effects and uses the panel structure to identify age coefficients. However, since it is not possible to separately estimate both time and age effects in this specification, the coefficient on age may include both the influence of ageing and exogenous changes in the external environment (or in the waves of the survey) not captured by other controls, and we interpret results with caution. Results show a decreased likelihood of participation in vehicle ownership, superannuation, equity, and business/real estate at older ages. The coefficient on holdings in cash and liquid assets is insignificantly different from zero, probably because high and relatively constant rates of participation in this class are captured by the household fixed effects. Interestingly, if quadratic terms in age are included, rates of ownership of principal residence peak at age 81.

The effect of age on the *share* of each asset class in portfolios is presented in panel 2 of Table 9. Using equation (5) without cohort or household fixed effects, we see a decrease in the share of superannuation/equity and vehicles (of 0.41 and 0.39 percentage points respectively), and an increase in the proportion of principal residence and liquid/cash investments (of 6.56 and 0.61 percentage points respectively) with each additional year of age. Specifications (6) and (7), which control for cohort and household fixed effects, largely confirm that as households age they hold increasing proportions in liquid/cash investments and decreasing proportions in more risky asset types such as superannuation and equity.

Figures 2 and 3 graph the effects of age on asset class participation rates and portfolio share by age, setting other control values at medians.[28] Coile and Milligan (2009) suggested that the shift towards cash and liquid assets could be due to 'transitory' proceeds from the sale of principal residence (for example) on their way to other asset types, older households having greater loss aversion due to their exhausted human capital (and inability to make up for potential investment losses), and reduced mental capacity. A critical difference between the U.S. and Australian settings is the effect of the means-tested Age Pension on portfolio decisions, since the

[28] The median household in our sample is single, Christian, living in a major city, homeowner with a long-term health condition and a diversified financial portfolio.

test excludes the value of the family home.[29] Consequently, the households in the sample studied here have a strong incentive to keep their principal residence (Cho and Sane, 2011).

PLACE FIGURES 2 AND 3 HERE

D. Effect of Health on Asset Holdings

Finally, we look at how current health status and changes in health affect the asset holdings of Australian retirees. Specifically, following Coile and Milligan (2009), we investigate households where either member reports poor health, expected poor health or having a long-term health condition. We conduct a static analysis[30] by incorporating the three health status indicators into the household fixed effects specification (equation (7) above) to control for unobservable household heterogeneity:

$$Asset\ holdings_{jit} = \beta_0 + \beta_1 badhealth_{it-1} + \beta_2 expectedbadhealth_{it-1} + \beta_3 longtermhealthcondition_{it-1} + \beta_4 age_{it} + \boldsymbol{\beta_5}'\mathbf{Q_{it}} + \alpha_i + \varepsilon_{jit} \quad (8)$$

where $badhealth_{it}$ equals 1 if household *i* reports being of 'poor' health in period *t* and zero otherwise, $expectedbadhealth_{it}$ equals 1 if household *i* answers 'definitely true' in period *t* to the statement "I expect my health to get worse", and $longtermhealthcondition_{it}$ equals 1 if household *i* reports having a long-term health condition, impairment or disability in period *t*.[31] This enables us to compare household observations before and after a change in reported status, as well as comparing with households who never report bad health. The estimation uses lagged values of the health statues indicators, i.e., how current asset holdings relate to health reports from the previous wave (Table 10).[32] $\mathbf{Q_{it}}$ is a vector of control variables, α_i represents household fixed effects, and ε_{jit} is an independent and identically distributed error.

[29] See http://www.humanservices.gov.au/customer/enablers/assets for further details regarding those assets included and excluded from the Age Pension assets test.

[30] Coile and Milligan (2009, p239) investigate how health shocks impact asset holdings over time via a dynamic analysis by incorporating dummies for household-wave observations corresponding to the wave immediately after/before the health 'shock'. However, the data here have only three observation points and we are limited to a static pre- and post-shock analysis.

[31] This indicator equals 1 if respondent answers yes to the question "Do you have any long-term health condition, impairment or disability…that restricts you in your everyday activities, and has lasted or is likely to last, for 6 months or more?"

[32] Our reported coefficients are for each health dummy variable using a linear age variable though it is worth noting that we observed the same sign coefficients of very similar magnitude under the version tested using quadratic age.

Households that expect bad health may need to shift towards liquid assets to fund increased healthcare and hospital costs (French et al. 2006). However estimates in the first column and second panel of Table 10 show a negative coefficient on the share held in liquid assets when households reported bad health in the previous wave. These households may be running down liquid assets but not yet liquidating property or investments. On the other hand, households which reported an *expectation* of bad health in the future increased the share of liquid assets, possibly anticipating future expenses. Further, estimates of risky asset shares for households reporting long term health conditions are generally negative, though not statistically significant. These households may be less risk tolerant because of their reduced physical capacity.

The striking feature of these results is how few significant relationships there are. Out-of-pocket medical expenses for older Australian households are estimated to average only 3% of total household expenditure (Jones et al., 2008), or about $524 per year for households with no private health insurance (and hence fully reliant on public insurance cover provided by 'Medicare'[33]) and increasing from $469 per year for 60-64 year olds to $753 per year for those aged 80 and above (Johar and Savage, 2012). By contrast, U.S. households must manage a series of caps on public coverage for medical and pharmaceutical benefits: Fronstin et al. (2008, figure 2, p.8) estimate that for median drug expenses and additional insurance premia alone, men retiring in 2008 at age 65 need around $80K US dollar savings and women around $108K. Very serious and long-term treatments may cost much more. It follows that the effects of bad health on portfolio structure in Australia will be less than in U.S. studies.

PLACE TABLE 10 HERE

4. CONCLUSIONS

Australian retirees' decumulation patterns are an especially interesting case study for comparison with other developed countries. Unlike workers in many European and North

[33] All recipients of the Age Pension are eligible for a "Pensioner Concession Card" which provides heavily subsidised prescription medicine (or fully subsidised for those who fill a large number of scripts per year), fee-free doctor's visits and full coverage for a range of in-hospital treatments.

American economies, Australians do not contribute to an earnings-linked social security system. Instead, around 75% of retirees aged over 65 receive a modest, means-tested public pension payment unconnected to work history. Further, Australia was an early adopter of defined contribution retirement savings plans under the mandatory Superannuation Guarantee, which requires 9.25% of earnings for almost all workers to be paid into an accumulation plan. Very little superannuation is annuitized and consequently retirees carry exposure to financial market risk into and throughout retirement. Finally, medical provision for Australian retirees is largely free and un-capped, so that out-of-pocket expenses are modest by international standards, particularly for Age Pensioners. The results reported here illustrate the ongoing exposure to investment risk, modest public pension provision and limited exposure to health costs of the retired cohorts interviewed for the 2002, 2006 and 2010 HILDA wealth waves.

Consistent with existing Australian and international evidence, wealthier retired households hold a higher proportion of their wealth as risky financial assets (superannuation, equity, business or real estate). Both the average household accumulated wealth between 2002-06 as financial asset prices trended up, and decumulated wealth between 2006-10 (both including and excluding housing equity). Analysis of absolute and percentage changes in wealth also shows the wide variation in decumulation both in the cross-section and over time. Households with more diversified portfolios reduced wealth less in the second period. Other aspects of estimation highlight how household attitudes to savings, cultural characteristics and portfolio choices are related to decumulation patterns.

The fact that there are periods in which almost half the retired households in the sample add to their wealth can be at odds with retirement income products and policy settings. In Australia, for example, the most popular form of retirement income stream product is a phased withdrawal account, typically invested in a balanced portfolio, called an 'allocated pension'. The regulations surrounding this account stipulate that once an account is set up, more money cannot be added to it, and that a minimum percentage of the balance must be drawn as income each year. These minimum percentages increase with age from 4% under age 65 to 14% at 95 years or older. The rules aim to stop the tax concessions tied to retirement accumulations being applied to other funds, or passed on to estate beneficiaries. Even so, for a substantial number of

households in this sample, these rules would be binding constraints, as shown by the pressure successfully applied to regulators that led to them temporarily halving the minimum drawdown rates during the Global Financial Crisis and its aftermath. Flexibility is valuable to people who cannot go back to work to managed unexpectedly severe shocks and regulated drawdown rates from phased withdrawal products should accommodate precautionary savings. Finally, Age Pension means tests favor both risky asset holdings and the family home, creating biases in portfolios. These rules should be re-evaluated with a view to helping retirees better manage investment risk and maintain liquidity.

Given the low rates of voluntary annuitization in Australia and other countries, do we find evidence of retirees spending too quickly and running out of money? A close examination of the number of retired households depleting financial assets confirms an increasing, but, not necessarily alarming, trend. The most vulnerable households are single, non-home-owners and pensioners. Long-term health conditions also have an impact. A decomposition using the Oaxaca Blinder method points to external factors (possibly regulatory changes, low interest rates, higher utility bills etc.) as more important than household characteristics (such as ageing) in explaining the probabilities of running out of money. Estimates show that households experiencing financial poverty do not reduce home ownership more than other households. There are several reasons why Australian retired households do not liquidate housing wealth, including transaction costs, bequest motives, insurance against long-term care expenses, and the inadequacy of Age Pension rental allowances. There is scope for a complete review and harmonization of the rules around housing before and during retirement to enable more liquidity while meeting other goals.

Poterba and Samwick (2001) and Coile and Milligan (2009) study the evolution of retirement wealth and portfolio structure in the U.S. Like the U.S., in Australia we see declining rates of ownership of, and lower portfolio shares in, risky assets (including superannuation, equity, and business/real estate) at older ages, and a compensating increase in liquid/cash investments. In contrast to Coile and Milligan, we find investment in principal residence peaks around age 81 before dropping off very slowly.

The starkest contrast between Australia and U.S. retired households is in the effects of poor health. Although reporting bad health or expected bad health can influence liquid asset holdings

of retired households, and chronic conditions are linked to more cautious portfolio weighting, poor health and changes in health seem to explain little about portfolio choices in the HILDA sample. Australian retirees, especially Age Pensioners are well covered for most medical expenses and do not have to pay additional premiums or large co-payments as in the U.S. Unsurprisingly, the key issues for retired Australians are financial market and longevity risks rather than health risks.

Continuing study of Australian retirees can give insight into international trends in retirement behavior. As more countries around the globe adopt defined contribution pension plans, the need to understand the way individuals manage lump sum wealth in retirement becomes critical. The analysis presented here indicates that retired DC plan members face a serious challenge in the form of market risk. Exposure to investment markets continues into retirement thus creating a wide array of decumulation patterns as retirees manage financial shocks to their capital. Creating retirement income stream products that allowing for flexible drawdown rates, for precautionary savings after the retirement dates, and that encourage diversification must be a goal for industry and regulators.

Data from the next wealth survey in the HILDA series will show how retirees have adjusted portfolios in the recovery from the 2007-09 financial crisis. Moreover, additional consumption data is needed to see whether and to what extent retirees smooth consumption over these (possibly unexpected) events. Finally, by that time, more of the survey sample will have participated in the mandatory retirement savings system for the majority of their working lives, bringing richer data on how people manage retirement accumulations.

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APPENDICES

Appendix A. HILDA Variables Used

Note: where we use an underscore '_' in the variable name, there is an appropriate letter for each wave, namely 'b' for wave 2, 'f' for wave 6, and 'j for wave 10.

Variable	Description	Variable	Description
_hgage	person's age	_edhigh	Highest education level achieved
_hhtype	Household type, single or couple	_hstenr	Home owner
_hgeab, _iopeng	English language difficulties	_fisedch, _fishlpc	Bequest motives
_hgsex	gender	_hhmsr	Geographical location/region
_rtcomp, _rtcompn, _nlmact	Retirement	_hglote, _iopeng, _anengfn	Language other than English
_gh1	Bad health	_bncap	Age pension recipient (yes/no)
_gh11c	Expected health	_religb	Religion variable
_helth	Long term health	_fismed, _fisemr	Precautionary motives
_hwobani	*Liquid assets*, own bank account	_hwhmvai	*Real estate*, own home value
_hwjbani	*Liquid assets*, joint bank account	_hwhmdti	*Real estate*, own home debt
_hwcaini	*Cash investments* (bonds etc.)	_hwopvai	*Real estate*, other property value
_hwvech	*Vehicles*	_hwopdti	*Real estate*, other property debt
_hqsupei	*Superannuation*	_hwbusvi	*Business*, value
_hwinsui	*Superannuation*, life insurance	_hwbusdi	*Business*, debt
_hwcolli	*Other savings*, collectables and other assets	_pwhecdi	*Other debt*, Higher Education Contribution Scheme (HECS) debt
_hwtrusi	*Other savings*, trust funds	_pwoccdi	*Other debt*, own credit card debt
_hweqini	*Equity*, equity investments	_pwjccdi	*Other debt*, joint credit card debt
		_pwothdi	*Other debt*, car loans etc.

Appendix B. Age Pension payments, weekly, excluding rent assistance

These figures are multiplied accordingly to calculate each respective threshold of low financial wealth (i.e. 4, 12, 24 or 48 weeks Age Pension saved, excluding housing equity).

Weekly Age Pension per household (2010 dollars)

	2002	2006	2010
Couple	439.97	479.02	528.50
Single	262.41	286.77	350.55

Source: Melbourne Institute of Applied Economic and Social Research, *Poverty Lines*, December quarter 2002, 2006 and 2010

Appendix C. Predicted ownership rates and share of total assets by age

We report the estimated ownership rates and share of total assets according to age in Table A1 below for all asset types. For those assets where a quadratic age relationship was shown to exist, we report in Table A2 the extent of statistically significant marginal effects across different ages on these asset types.

TABLE A1

Predicted Ownership Rates and Share of Total Assets According to Age

We estimate two measures of *asset holding* using coefficient output from the household fixed effects specification in Table III, and take the median value across the sample for control variables:

Linear Age Specification: $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Quadratic Age Specification: $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \boldsymbol{\beta_3}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Where $'\boldsymbol{Xit}$ are set to median values of sample such that *majorcity* =1, *relig_christ* =1, *longtermhealthcondition* =1 and *homeowner* =1

Asset Type	With Household Fixed Effects								
	Model	Significance Level (Age)	Age						
			60	65	70	75	80	85	90
Predicted share of housholds with positive asset holdings									
Liquid/cash investments	Linear Age		1.00	1.00	0.99	0.99	0.98	0.98	0.98
Superannation/equity	Linear Age	***	0.59	0.53	0.48	0.42	0.36	0.30	0.24
Business/real estate	Linear Age	***	0.12	0.11	0.09	0.07	0.05	0.03	0.01
Principal residence	Linear Age	***	0.79	0.76	0.72	0.69	0.65	0.62	0.58
Vehicle	Linear Age	***	0.83	0.78	0.72	0.67	0.62	0.57	0.52
Superannation	Linear Age	***	0.34	0.31	0.28	0.25	0.22	0.19	0.17
Equity	Linear Age	***	0.46	0.41	0.36	0.30	0.25	0.20	0.14
Predicted share of holdings in a given asset type									
Liquid/cash investments	Linear Age	***	0.15	0.19	0.23	0.26	0.30	0.34	0.38
Superannation/equity	Linear Age	***	0.25	0.21	0.18	0.14	0.11	0.07	0.04
Business/real estate	Linear Age		0.04	0.04	0.04	0.04	0.03	0.03	0.03
Principal residence	Quadratic Age	*	0.42	0.48	0.52	0.54	0.54	0.52	0.49
Vehicle	Linear Age	***	0.08	0.07	0.06	0.04	0.03	0.02	0.00
Superannation	Linear Age	***	0.12	0.11	0.09	0.07	0.06	0.04	0.02
Equity	Linear Age	***	0.12	0.11	0.09	0.07	0.05	0.03	0.02

Notes

(1) Our sample includes 1187 households that appear in either waves 2002 and 2006, or in waves 2006 and 2010.

(2) Statistical significance on the linear age coefficient reported at the 10%, 5%, and 1% levels is indicated by one, two, or three asterisks respectively

TABLE A2

Predicted Ownership Rates and Share of Total Assets According to Age

For those assets where a quadratic age relationship was shown to exist, we estimate *asset holding* using coefficient output from the household fixed effects specification in Table 9, and take the median value across the sample for control variables according to equations: $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

$\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \boldsymbol{\beta_3}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Where ***'Xit*** are set to median values of sample such that *majorcity* =1, *relig_christ* =1, *longtermhealthcondition* =1 and *homeowner* =1

Asset Type	**Age**						
	60	65	70	75	80	85	90
Predicted share of holdings in a given asset type							
Principal Residence	0.42 ***	0.48 ***	0.52 ***	0.54 **	0.54	0.52	0.49

Notes

(1) Our sample includes 1187 households that appear in either waves 2002 and 2006, or in waves 2006 and 2010.

(2) We report predictions and significance level of marginal effect of age across a number of ages

(3) Statistical significance on the linear age coefficient reported at the 10%, 5%, and 1% level is indicated by one, two, or three asterisks respectively

(4) We report coefficients for our household fixed effects specification only

TABLE 1
Sample Means of Household Characteristics

Sample	Period 1 households, 2002	Period 1 households, 2006	Period 2 households, 2006	Period 2 households, 2010	Households appearing in periods 1 and 2, 2002	Households appearing in periods 1 and 2, 2006	Households appearing in periods 1 and 2, 2010	Households appearing in period 1 only, 2002	Households appearing in period 2 only, 2006
Characteristic	1	2	3	4	5	6		7	8
Age	71.528	75.528	72.194	76.194	70.273	74.273	78.273	74.804	67.788
Couple household	0.435	0.386	0.430	0.389	0.450	0.406	0.355	0.396	0.480
Greater than highschool education	0.369	0.369	0.260	0.260	0.378	0.378	0.378	0.347	0.010
Language other than English	0.090	0.090	0.066	0.066	0.091	0.091	0.091	0.090	0.013
Language difficulty	0.055	0.055	0.036	0.036	0.053	0.053	0.053	0.061	0.000
Major city	0.527	0.516	0.513	0.515	0.545	0.533	0.536	0.478	0.470
Religion: None	0.440	0.440	0.245	0.245	0.234	0.234	0.234	0.976	0.268
Religion: Christian	0.539	0.539	0.721	0.721	0.736	0.736	0.736	0.024	0.689
Religion: Islam	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.000	0.000
Religion: Judaism	0.002	0.002	0.004	0.004	0.003	0.003	0.003	0.000	0.007
Religion: Other	0.018	0.018	0.029	0.029	0.025	0.025	0.025	0.000	0.036
Received Age Pension	0.626	0.706	0.626	0.727	0.616	0.698	0.775	0.653	0.474
Reports bad health	0.095	0.148	0.117	0.160	0.078	0.122	0.164	0.139	0.106
Reports expected bad health	0.113	0.171	0.133	0.194	0.102	0.152	0.208	0.143	0.093
Reports a long-term health condition	0.551	0.757	0.677	0.781	0.509	0.713	0.802	0.661	0.603
Has at least 50% of wealth in liquid assets	0.131	0.137	0.102	0.165	0.116	0.122	0.197	0.171	0.060
Has at least 50% of wealth in superannuation or equity	0.125	0.104	0.132	0.099	0.130	0.116	0.081	0.114	0.166
Has at least in 50% of wealth in business or real estate	0.016	0.021	0.018	0.015	0.014	0.014	0.013	0.020	0.026
Home owner	0.779	0.745	0.776	0.739	0.788	0.755	0.717	0.755	0.821
Bequest motives	0.120	0.099	0.118	0.118	0.123	0.113	0.113	0.110	0.129
Precautionary motives	0.272	0.299	0.325	0.325	0.272	0.323	0.323	0.273	0.328
Wealth, $2010	$474,164	$561,956	$678,303	$605,799	$502,170	$522,841	$584,827	$401,006	$876,398
Wealth, excluding housing, $2010	$238,394	$247,402	$333,101	$270,100	$254,053	$256,936	$212,684	$197,489	$494,513
Below wealth (excl. housing) threshold 1[(ii)]	0.063	0.079	0.063	0.072	0.055	0.064	0.077	0.086	0.060
Below wealth (excl. housing) threshold 2[(ii)]	0.124	0.134	0.108	0.122	0.117	0.117	0.128	0.143	0.089
Below wealth (excl. housing) threshold 3[(ii)]	0.171	0.203	0.174	0.183	0.156	0.188	0.194	0.208	0.146
Below wealth (excl. housing) threshold 4[(ii)]	0.249	0.297	0.253	0.279	0.236	0.286	0.292	0.282	0.182
Number of households	885	885	942	942	640	640	640	245	302

Notes:

(i) Period 1 corresponds to 2002 and 2006 waves of HILDA. Period 2 corresponds to 2006 and 2010 waves of HILDA. Period 1 households appear in waves 2002 and 2006 with non-missing wealth information. Period 2 households appear in waves 2006 and 2010 with non-missing wealth information.

(ii) Wealth thresholds are indicators of whether a household has less than a particular amount stored as wealth. For threshold 1 this is having less than $2114 for a couple, or $5280 for a single. Wealth thresholds 2, 3 and 4 are defined similarly: threshold 2 is $5280 for couples and $3149 for singles; threshold 3 is $10559 for couples and $6298 for singles; and threshold 4 is $21119 for couples and $12596 for singles.

TABLE 2
Wealth Level and Wealth Growth (Ex-Residence) ($2010)

Sample	Period 1 households			Period 2 households		
Dependent Variable	Wealth level, 2002	Wealth growth, level, 2002-2006	Wealth growth, %, 2002-2006	Wealth level, 2006	Wealth growth, level, 2006-2010	Wealth growth, %, 2006-2010
Variable	1	2	3	4	5	6
age	-1248.6	-376.7	0.0865	-3827.2 *	2483.3 **	1.06 *
	(1209.30)	(867.60)	(0.54)	(1645.40)	(918.90)	(0.52)
couple	108388.4 ***	-33260.4 *	-5.836	154612.2 ***	-8685.5	-9.107
	(17524.90)	(14637.10)	(7.20)	(27279.00)	(15769.80)	(7.23)
highschool_more	107247.1 ***	6039.3	4.54	57388.8	-21756.3	-10.78
	(18897.00)	(14871.60)	(7.34)	(29316.20)	(18506.00)	(7.81)
language_other	-73862.8 *	1424.9	3.091	-78644.3	-21075.6	-12.72
	(29440.50)	(42330.20)	(16.50)	(51454.10)	(41041.90)	(17.12)
language_diff	-69818.5 *	50819.2	9.662	-20072.3	9366.1	60.76 *
	(34287.10)	(59606.90)	(25.52)	(82543.30)	(62221.80)	(28.62)
majorcity	24505.3	-4876.7	-9.14	48945.8 *	-7578.7	-12.55
	(17973.10)	(13633.40)	(7.29)	(23538.50)	(14232.10)	(6.98)
Relig_christ	-24241.4	8866.8	-0.841	-17159.6	-5241.1	-0.362
	(17048.00)	(13388.40)	(7.62)	(30326.70)	(17229.00)	(8.09)
Relig_islam	-226235.8 ***	-63658.9	-126.9 ***	-63725.3	46266.3	61.55 *
	(40247.20)	(40037.10)	(25.06)	(63112.70)	(38600.20)	(25.71)
Relig_judaism	263519.7 ***	259866 **	69.89 **	353021.9	-246777.9 *	-110.0 ***
	(44755.10)	(87642.20)	(24.98)	(228087.10)	(98482.90)	(32.63)
Relig_other	-16090	-5437.3	15.88	-32976.1	6742.7	-3.618
	(83298.30)	(30256.60)	(21.74)	(76188.80)	(27859.40)	(19.47)
pension	-159331.9 ***	-28378.2	-0.525	-306359.4 ***	22938.8	-16.09 *
	(20016.90)	(15223.10)	(7.95)	(31823.60)	(17554.40)	(7.71)
bad health	-39077	14881.3	20.07	-140492.9 ***	25462.9	-17.93
	(29283.20)	(24572.70)	(14.23)	(30892.60)	(21242.10)	(11.15)
expected bad health	50893.4	-2223.5	10.42	5771.4	5303.4	11.1
	(33354.80)	(24062.00)	(12.21)	(36085.70)	(23953.00)	(10.13)
long term health condition	-61444.1 **	-16046.9	-11.12	-65938 *	-1152.8	-8.237
	(18726.40)	(13539.40)	(7.36)	(29682.60)	(16729.00)	(7.55)
safe_50	110352.6 ***	-15134.8	6.515	150715.9 ***	-119209.5 ***	-11.3
	(27548.40)	(20648.70)	(15.52)	(39192.40)	(23006.10)	(18.45)
superequity_50	455635 ***	-73560.1 *	-21.46 *	591040.5 ***	-298057.1 ***	-72.56 ***
	(46798.70)	(34447.70)	(9.56)	(61480.00)	(35758.70)	(9.71)
busrealestate_50	1369088.2 ***	110418.8 *	25.95	470464 ***	-254869.5 *	-101.6 **
	(353152.60)	(51784.50)	(19.01)	(80169.90)	(123469.30)	(32.13)
home owner	178952.9 ***	8106.5	9.592	248792.2 ***	-117072.7 ***	-15.19
	(28616.30)	(21185.20)	(10.69)	(36092.70)	(21470.90)	(13.06)
bequest	23998	-8368.9	-1.736	26796.6	2959	11.69
	(32901.80)	(23797.40)	(10.19)	(46411.70)	(30735.50)	(11.00)
precautionary	-12378.3	33789.9	8.675	59430.2 *	-6486.8	-7.063
	(22862.10)	(17888.60)	(7.88)	(29093.10)	(16056.80)	(7.57)
constant	133132.3	55698.5	-14.85	416027.7 ***	-86836.3	-33.8
	(88010.60)	(62823.30)	(39.39)	(117276.20)	(67065.20)	(39.63)
Number of observations	867	867	836	922	922	883
Adjusted R-squared	0.5	0.022	-0.003	0.437	0.203	0.07

Notes:

(1) Statistical significance at the 10%, 5% and 1% levels is indicated by one, two, or three asterisks respectively. Robust standard errors are in parentheses.

(2) Safe_50 is a dummy = 1 if a household has at least 50% of their wealth invested in liquid or cash investments in time period t, 0 otherwise; superequity_50 is a dummy = 1 if a household has at least 50% of their wealth invested in superannuation or equity in time period t, 0 otherwise; and busrealestate_50 is a dummy = 1 if a household has at least 50% of their wealth invested in business or real estate in time period t, 0 otherwise.

(3) To minimize the influence of outliers, observations in the top and bottom 1% of the distribution of the dependent variables were not included in the estimation sample.

TABLE 3

Estimated Change in Wealth (Ex-Residence) Across Time, According to Age

Age	2002-2006, level, $2010	2002-2006, %	2006-2010, level, $2010	2006-2010, %
	1	2	3	4
64	18,771	-20.0	-53,710	-2.0
68	17,264	-19.6	-43,776	2.3
72	15,757	-19.3	-33,843	6.5
76	14,250	-18.9	-23,910	10.8
80	12,743	-18.6	-13,977	15.0
84	11,237	-18.2	-4,044	19.2
88	9,730	-17.9	5,890	23.5
92	8,223	-17.6	15,823	27.7
96	6,716	-17.2	25,756	31.9

Note:

These predictions are obtained using coefficients from the specification in Table 2, columns 2, 3, 5 and 6. Covariates other than age are set to their sample median values.

TABLE 4A

Threshold 1: Percentage of Households with less than 4 weeks Age Pension saved*

Low Wealth 2006

Low Wealth 2002	Yes	No	
Yes	3.1	2.3	5.5
No	**3.3**	91.3	94.5
	6.4	93.6	

Low Wealth 2010

Low Wealth 2006	Yes	No	
Yes	4.8	1.6	6.4
No	**2.8**	90.8	93.6
	7.7	92.3	

Low Wealth 2010

Low Wealth 2002	Yes	No	
Yes	3.4	2.0	5.5
No	4.2	90.3	94.5
	7.7	92.3	

TABLE 4B

Threshold 2: Percentage of Households with less than 12 weeks Age Pension saved*

Low Wealth 2006

Low Wealth 2002	Yes	No	
Yes	7.7	4.1	11.7
No	**4.1**	84.2	88.3
	11.7	88.3	

Low Wealth 2010

Low Wealth 2006	Yes	No	
Yes	7.8	3.9	11.7
No	**5.0**	83.3	88.3
	12.8	87.2	

Low Wealth 2010

Low Wealth 2002	Yes	No	
Yes	6.7	5.0	11.7
No	6.1	82.2	88.3
	12.8	87.2	

TABLE 4C

Threshold 3: Percentage of Households with less than 24 weeks Age Pension saved*

Low Wealth 2006

Low Wealth 2002	Yes	No	
Yes	11.1	4.5	15.6
No	**7.7**	76.7	84.4
	18.8	81.3	

Low Wealth 2010

Low Wealth 2006	Yes	No	
Yes	13.1	5.6	18.8
No	**6.3**	75.0	81.3
	19.4	80.6	

Low Wealth 2010

Low Wealth 2002	Yes	No	
Yes	10.3	5.3	15.6
No	9.1	75.3	84.4
	19.4	80.6	

TABLE 4D

Threshold 4: Percentage of Households with less than 48 weeks Age Pension saved*

Low Wealth 2006

Low Wealth 2002	Yes	No	
Yes	20.0	3.6	23.6
No	**8.6**	67.8	76.4
	28.6	71.4	

Low Wealth 2010

Low Wealth 2006	Yes	No	
Yes	21.4	7.2	28.6
No	**7.8**	63.6	71.4
	29.2	70.8	

Low Wealth 2010

Low Wealth 2002	Yes	No	
Yes	17.7	5.9	23.6
No	11.6	64.8	76.4
	29.2	70.8	

Notes

*Excluding housing equity

(1) Balanced sample size across all three waves of 640 households

(2) Reported values are for percentage of total households that have total wealth (excluding housing equity) less than each respective threshold of low wealth.

(3) Grey shaded boxes highlight the percentage of *new* low financial wealth households in 2006 or 2010 (i.e. fall below a particular threshold in period 2)

(4) Threshold 1 is an indicator of a household having less than $2114 for a couple, or $5280 for a single, stored as wealth, excluding housing equity. Wealth thresholds 2, 3 and 4 are defined similarly: threshold 2 is $5280 for couples and $3149 for singles; threshold 3 is $10559 for couples and $6298 for singles; and threshold 4 is $21119 for couples and $12596 for singles.

TABLE 5A

Coefficients from Linear Probability Models

Threshold 1: Probability of having less than 4 weeks Age Pension saved (ex-residence)

Sample	Wave		
	2002	2006	2010
age	-0.005 ***	-0.005 ***	-0.004 *
	(0.0013)	(0.0016)	(0.0018)
couple	-0.049 ***	-0.062 ***	-0.070 ***
	(0.0135)	(0.0134)	(0.0162)
greater than high school education	-0.021	-0.019	-0.033 *
	(0.0140)	(0.0160)	(0.0187)
speaks a language other than English at home	0.029	-0.017	0.018
	(0.0378)	(0.0334)	(0.0408)
reports English language difficulties	0.076	0.092	0.039
	(0.0626)	(0.0599)	(0.0645)
majorcity	-0.011	0.023	0.007
	(0.0175)	(0.0187)	(0.0198)
Relig_christ	0.004	-0.002	-0.040
	(0.0226)	(0.0234)	(0.0275)
Relig_islam	-0.172 **	0.892 ***	-0.110
	(0.0706)	(0.0634)	(0.0684)
Relig_judaism	0.016	-0.047	-0.061
	(0.0835)	(0.0810)	(0.1050)
Relig_other	-0.002	-0.090 **	-0.138 ***
	(0.0516)	(0.0375)	(0.0383)
age pension recipient	0.033 *	0.023	0.032
	(0.0175)	(0.0190)	(0.0210)
reports bad health	0.071	-0.033	-0.005
	(0.0481)	(0.0281)	(0.0329)
reports expected bad health	0.026	-0.003	0.027
	(0.0320)	(0.0283)	(0.0294)
reports a long-term health condition	-0.017	-0.008	-0.008
	(0.0171)	(0.0211)	(0.0271)
safe_50	0.128 **	0.026	0.006
	(0.0515)	(0.0621)	(0.0569)
superequity_50	-0.042 ***	-0.083 ***	-0.076 ***
	(0.0153)	(0.0235)	(0.0274)
businessrealestate_50	-0.045	-0.058 *	-0.081
	(0.0357)	(0.0334)	(0.0505)
home owner	-0.083 ***	-0.143 ***	-0.122 **
	(0.0320)	(0.0435)	(0.0478)
bequest motives	-0.008	0.017	-0.016
	(0.0159)	(0.0125)	(0.0125)
precautionary motives	-0.035 ***	-0.032 **	-0.024
	(0.0128)	(0.0150)	(0.0189)
constant	0.484 ***	0.600 ***	0.498 ***
	(0.1150)	(0.1400)	(0.1470)
Number of observations	640	640	640
Adjusted R-squared	0.158	0.159	0.093

Notes

(1) Robust standard errors appear in parentheses and statistical significance at the 10%, 5% and 1% level is indicated by one, two, or three asterisks respectively

(2) We report coefficients on each explanatory variable, where in the case for dummies we interpret the coefficient such that if dummy = 1 then the probability of being of low financial wealth increases (decreases) if the coefficient is positive (negative). E.g. coefficient = -0.015 reduces probability by 1.5 percentage points given dummy = 1, and a coefficient = 0.057 increases probability by 5.7 percentage points given dummy = 1

TABLE 5B

Coefficients from Linear Probability Models

Threshold 2: Probability of having less than 12 weeks Age Pension saved (ex-residence)

Sample	Wave		
	2002	2006	2010
age	-0.005 **	-0.007 ***	-0.007 ***
	(0.0019)	(0.0018)	(0.0021)
couple	-0.032	-0.076 ***	-0.090 ***
	(0.0237)	(0.0215)	(0.0221)
greater than high school education	-0.049 **	-0.050 **	-0.046 **
	(0.0229)	(0.0217)	(0.0233)
speaks a language other than English at home	0.034	0.023	-0.022
	(0.0446)	(0.0499)	(0.0418)
reports English language difficulties	0.128	0.182 **	0.113
	(0.0778)	(0.0828)	(0.0765)
majorcity	-0.025	0.028	0.037
	(0.0240)	(0.0227)	(0.0245)
Relig_christ	0.018	0.010	-0.058 *
	(0.0307)	(0.0296)	(0.0322)
Relig_islam	-0.321 ***	0.721 ***	0.751 ***
	(0.0930)	(0.0912)	(0.0892)
Relig_judaism	-0.034	-0.085	-0.091
	(0.1640)	(0.1200)	(0.1740)
Relig_other	0.074	-0.093	-0.167 **
	(0.0816)	(0.0648)	(0.0694)
age pension recipient	0.024	0.007	0.042
	(0.0254)	(0.0253)	(0.0258)
reports bad health	0.105	0.010	0.014
	(0.0641)	(0.0390)	(0.0411)
reports expected bad health	0.022	0.024	0.006
	(0.0455)	(0.0373)	(0.0352)
reports a long-term health condition	0.027	0.002	0.021
	(0.0242)	(0.0251)	(0.0307)
safe_50	0.036	0.011	-0.043
	(0.0603)	(0.0691)	(0.0635)
superequity_50	-0.120 ***	-0.160 ***	-0.153 ***
	(0.0224)	(0.0294)	(0.0355)
businessrealestate_50	-0.171 ***	-0.132 ***	-0.155 **
	(0.0577)	(0.0509)	(0.0726)
home owner	-0.208 ***	-0.246 ***	-0.237 ***
	(0.0464)	(0.0502)	(0.0542)
bequest motives	-0.036	0.025	-0.018
	(0.0245)	(0.0224)	(0.0211)
precautionary motives	-0.051 **	-0.021	-0.038 *
	(0.0242)	(0.0219)	(0.0228)
constant	0.633 ***	0.867 ***	0.886 ***
	(0.1480)	(0.1510)	(0.1750)
Number of observations	640	640	640
Adjusted R-squared	0.166	0.215	0.177

Notes

(1) Robust standard errors appear in parentheses and statistical significance at the 10%, 5% and 1% level is indicated by one, two, or three asterisks respectively

(2) We report coefficients on each explanatory variable, where in the case for dummies we interpret the coefficient such that if dummy = 1 then the probability of being of low financial wealth increases (decreases) if the coefficient is positive (negative). E.g. coefficient = -0.015 reduces probability by 1.5 percentage points given dummy = 1, and a coefficient = 0.057 increases probability by 5.7 percentage points given dummy = 1

TABLE 6
Estimated Probability of Low Financial Wealth (2002 vs 2006)
Linear Probability Model

Threshold 1: Probability of having less than 4 weeks Age Pension saved*	
N=640	
Probability in 2002 using 2002 parameters	5.50%
Probability in 2006 using 2002 parameters	4.30%
Probability in 2006 using 2006 parameters	6.40%
Total Change in Estimated Probability (2002-06):	0.90%
Δ due to Δ household characteristics:	-1.20%
Δ due to Δ environmental factors:	2.10%

Notes
*Excluding housing equity
(1) 'Probability in *j* using *i* parameters' means that the probability was computed using linear probability model parameters (coefficients) estimated from data in wave *j* and sample covariates (control variables) from wave *i*
(2) We report average sample predicted probabilities

TABLE 7
Estimated Probability of Low Financial Wealth (2006 vs 2010)
Linear Probability Model

Threshold 1: Probability of having less than 4 weeks Age Pension saved*	
N=640	
Probability in 2006 using 2006 parameters	6.40%
Probability in 2010 using 2006 parameters	5.60%
Probability in 2010 using 2010 parameters	7.20%
Total Change in Estimated Probability (2006-10):	0.80%
Δ due to Δ household characteristics:	-0.80%
Δ due to Δ environmental factors:	1.60%

Notes
*Excluding housing equity
(1) 'Probability in *j* using *i* parameters' means that the probability was computed using linear probability model parameters (coefficients) estimated from data in wave *j* and sample covariates (control variables) from wave *i*
(2) We report average sample predicted probabilities

TABLE 8
Household Assets by Age, 2010 HILDA

Asset Type	Age						
	60-64	65-69	70-74	75-79	80-84	85-89	90+
% with positive asset holdings							
Principal Residence	72.9	79.7	80.5	73.9	73.0	70.1	52.5
Vehicle	86.0	89.8	87.8	79.8	76.5	52.8	30.0
Superanuation	46.5	51.7	41.5	30.7	17.8	15.0	2.5
Equity	32.6	46.6	41.1	37.0	30.4	34.6	25.0
Liquid Assets	98.4	97.5	99.2	99.2	98.3	96.1	97.5
Cash Investments	2.3	1.7	2.0	2.9	3.0	8.7	7.5
Business	0.0	0.4	1.2	0.0	0.0	1.6	0.0
Real Estate	17.1	14.0	9.8	6.7	6.1	7.1	2.5
Other Savings	16.3	19.9	17.5	13.9	17.8	13.4	17.5
Median value, conditional on positive asset holding ('000s of $2010)							
Principal Residence	400	450	400	400	395	380	347
Vehicle	17	15	10	9	5	5	4
Superanuation	206	247	170	76	50	70	152
Equity	37	49	83	74	59	47	24
Liquid Assets	10	12	19	18	22	26	28
Cash Investments	30	24	180	100	100	50	40
Business	0	152	149	0	1,000	1,029	0
Real Estate	0	350	320	328	360	385	4,872
Other Savings	15	20	17	8	5	5	1
Total Assets	464	549	456	394	392	365	270
% mean share of total assets							
Principal Residence	47.5	51.3	54.7	53.6	56.5	53.8	41.4
Vehicle	13.3	10.7	6.6	7.7	3.6	2.0	0.4
Superanuation	12.9	14.9	10.4	5.6	4.0	1.8	0.4
Equity	3.7	6.0	7.2	6.9	5.7	7.0	6.4
Liquid Assets	14.2	11.0	15.4	22.5	25.7	31.2	41.2
Cash Investments	0.1	0.4	0.3	0.7	0.4	0.8	2.3
Business	0.0	0.0	0.3	0.0	0.0	0.3	0.0
Real Estate	5.7	3.8	3.5	2.7	2.6	2.6	2.6
Other Savings	2.5	1.9	1.6	0.4	1.5	0.7	5.4
No. observations (2010)	129	236	246	238	230	127	40

Notes

(1) We include 1246 retired households who are present for the 2010 HILDA survey

(2) The age of couple households is set equal to the age of the oldest member of the couple

(3) Liquid assets include own or joint bank accounts; cash investments include government bonds, corporate bonds, debentures, certificates of deposit, and mortgage-backed securities; real estate is property owned by the household excluding their own home (principal residence); and other savings includes trust funds, collectables, antiques, works of art, cemetery plots, or other substantial assets

TABLE 9

Effect of Age on Asset Holdings

We regress *asset holdings* (two measures: the number of households with a positive holding in a particular asset class; and the share of total assets in a particular asset type) on *age* (age of oldest household member), control variables X, and wave dummies γ. Our control variables include *couple* (dummy=1 if couple household), *high school* (dummy=1 if household head has education level higher than high school), *major city* (dummy=1 if household lives in Sydney, Melbourne, Brisbane, Adelaide or Perth), *language other than English* (dummy=1 if household speaks a language other than English at home) and *English difficulty* (dummy=1 if household speaks English not well/not at all)

With Wave Dummies: $Asset\ holdings_{jit} = \varphi_0 + \varphi_1 age_{it} + \boldsymbol{\varphi_2}'\mathbf{X_{it}} + \gamma_t + \varepsilon_{jit}$

With Wave and Cohort Dummies: $Asset\ holdings_{jit} = \delta_0 + \delta_1 age_{it} + \boldsymbol{\delta_2}'\mathbf{X_{it}} + \gamma_t + C_k + \varepsilon_{jit}$

With HH Fixed Effects: $Asset\ holdings_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}'\mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Asset Type	Mean	With Wave Dummies	With Wave and Cohort Dummies	With Household Fixed Effects
Proportion of households with positive asset holdings				
Liquid/Cash Investments	0.9796	***0.0002***	***0.0009***	-0.0008
		(0.0005)	(0.0008)	(0.0008)
Superannation/Equity	0.4951	-0.0067 ***	***-0.0007***	-0.0119 ***
		(0.0016)	(0.0032)	(0.0018)
Business/Real Estate	0.0889	-0.0017 *	0.0004	-0.0039 ***
		(0.0009)	(0.0023)	(0.0012)
Principal Residence	0.7530	***-0.0012***	***0.0034***	-0.0070 ***
		(0.0015)	(0.0030)	(0.0015)
Vehicle	0.7777	-0.0110 ***	***-0.0030***	-0.0101 ***
		(0.0014)	(0.0028)	(0.0015)
Superannuation	0.3014	-0.0149 ***	-0.0115 ***	-0.0056 ***
		(0.0013)	(0.0028)	(0.0017)
Equity	0.3959	-0.0007	0.0089 ***	-0.0107 ***
		(0.0015)	(0.0032)	(0.0020)
Share of holdings in asset type				
Liquid/Cash Investments	0.2036	0.0061 ***	***0.0022***	0.0075 ***
		(0.0008)	(0.0020)	(0.0013)
Superannation/Equity	0.1565	-0.0041 ***	***-0.0006***	-0.0070 ***
		(0.0012)	(0.0016)	(0.0009)
Business/Real Estate	0.0289	-0.0003	***0.0002***	-0.0005
		(0.0004)	(0.0008)	(0.0005)
Principal Residence	0.5230	0.0656 **	0.0035	***0.0027*** *
		(0.0013)	(0.0026)	(0.0014)
Vehicle	0.0714	-0.0039 ***	-0.0042 ***	-0.0027 ***
		(0.0007)	(0.0014)	(0.0007)
Superannuation	0.0786	-0.0054 ***	-0.0047 ***	-0.0029 ***
		(0.0005)	(0.0011)	(0.0007)
Equity	0.0779	0.0012 **	0.0041 ***	-0.0036 ***
		(0.0006)	(0.0010)	(0.0008)

Notes

(1) Our sample includes 1187 households that appear in either waves 2002 and 2006, or in waves 2006 and 2010.

(2) Coefficient reported is for linear age. Those coefficients reported in ***bold italics*** are also for linear age, but indicate those asset types for which the marginal effect on quadratic age was reported to be statistically significant for some ages.

(3) Standard errors appear in parentheses and statistical significance at the 10%, 5% and 1% levels is indicated by one, two, or three asterisks respectively.

TABLE 10

Simple Effects of Health on Asset Holdings

We incorporate three health status dummies into the household fixed effects specification in Table 9, and report coefficients on each (indicating the given health status change was suffered in a previous period), where: *Bad Health* = 1 if household reports having 'poor' health, 0 otherwise; *Expected Bad Health* = 1 if household answers 'definitely true' to question "Do you expect your health to get worse?", 0 otherwise; and *Long-term Health Condition* = 1 if household reports having a long-term health condition, impairment or disability that has lasted or is likely to last for 6 months or more

$$Asset\ holdings_{jit} = \beta_0 + \beta_1 badhealth_{it-1} + \beta_2 expectedbadhealth_{it-1} + \beta_3 longtermhealthcondition_{it-1} + \beta_4 age_{it} + \boldsymbol{\beta_5}'\mathbf{Q_{it}} + \alpha_i + \varepsilon_{jit}$$

Asset Type	Mean	Median	With Household Fixed Effects		
			Bad Health	Expected Bad Health	Long-Term Health Condtion
(N = 630)					
% with positive asset holdings					
Liquid/Cash Investments	0.9857	-	-0.0068	-0.0295	-0.0058
			(0.0175)	(0.0179)	(0.0094)
Superannation/Equity	0.4709	-	0.0186	0.0086	-0.0152
			(0.0361)	(0.0314)	(0.0210)
Business/Real Estate	0.0730	-	-0.0056	-0.0013	-0.0016
			(0.0236)	(0.0258)	(0.0149)
Principal Residence	0.7624	-	-0.0236	-0.0197	-0.0187
			(0.0278)	(0.0281)	(0.0142)
Vehicle	0.7767	-	-0.0180	-0.0158	0.0152
			(0.0314)	(0.0293)	(0.0140)
Superannation	0.2704	-	-0.0324	-0.0196	-0.0353
			(0.0323)	(0.0346)	(0.0172)
Equity	0.3852	-	0.0324	0.0007	0.0062
			(0.0348)	(0.0352)	(0.0223)
Share of holdings in asset class					
Liquid/Cash Investments	0.2118	0.0632	-0.0464 *	0.0452 *	0.0196
			(0.0266)	(0.0247)	(0.0133)
Superannation/Equity	0.1459	0.0000	0.0084	0.0040	-0.0082
			(0.0123)	(0.0193)	(0.0099)
Business/Real Estate	0.0236	0.0000	0.0098	0.0053	0.0083
			(0.0125)	(0.0132)	(0.0073)
Principal Residence	0.5387	0.6447	0.0198	-0.0385	-0.0221
			(0.0267)	(0.0257)	(0.0151)
Vehicle	0.0620	0.0167	-0.0076	0.0149	-0.0003
			(0.0116)	(0.0129)	(0.0079)
Superannation	0.0679	0.0000	0.0040	0.0013	-0.0110
			(0.0109)	(0.0169)	(0.0072)
Equity	0.0780	0.0000	0.0044	0.0026	0.0028
			(0.0114)	(0.0135)	(0.0077)

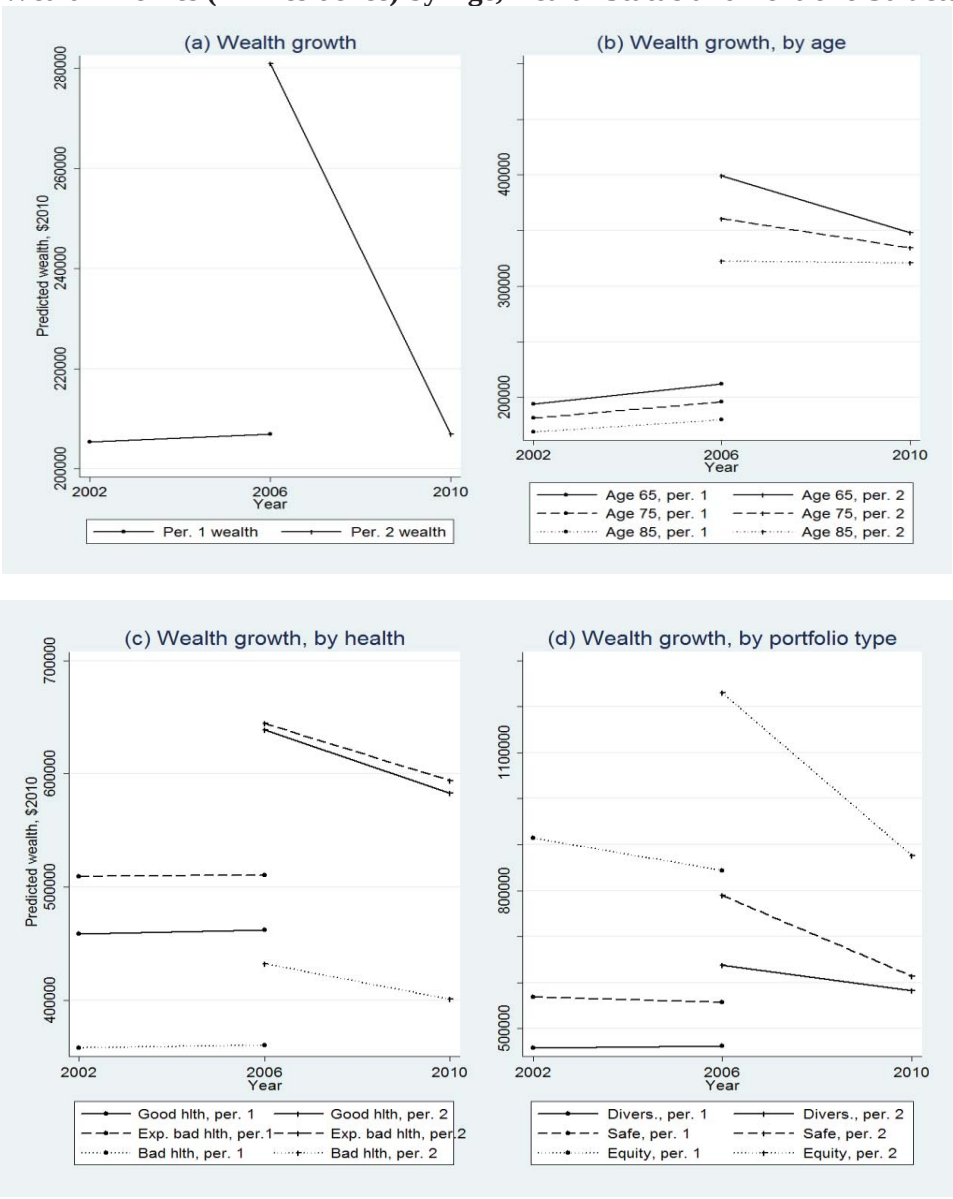
Notes

(1) Our sample includes 1187 households who appear in either waves 2002 and 2006, or in 2006 and 2010.

(2) We report the coefficient on the three health dummy variables which indicate that a particular health condition was reported in a previous period

(3) Standard errors appear in parentheses and statistical significance at the 10%, 5% and 1% level is indicated by one, two, or three asterisks respectively.

FIGURE 1
Financial Wealth Profiles (Ex-Residence) by Age, Health Status and Portfolio Structure, $2010



Notes:

(1) Period 1 profiles are estimated from the sample of households present in waves 2002 and 2006. Period 2 profiles are estimated from the sample of households present in waves 2006 and 2010.

(2) Panel (a) is constructed using sample averages of financial wealth after removing top and bottom 1% of observations. Panels (b)-(d) are constructed using estimates in Table 2.

(3) The profiles correspond to a median household, i.e. a single, Christian, living in a major city, homeowner with a long-term health condition and a diversified financial portfolio.

FIGURE 2

Predicted Ownership Rates According to Age

We estimate *asset holding* using coefficient output from the household fixed effects specification in Table 9, and take the median value across the sample for control variables, which takes the form:

Linear Age $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Quadratic Age Specification: $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \boldsymbol{\beta_3}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Where $'\boldsymbol{X}_{it}$ are set to median values of sample such that *majorcity* =1, *relig_christ* =1, *longtermhealthcondition* =1 and *home owner* =1

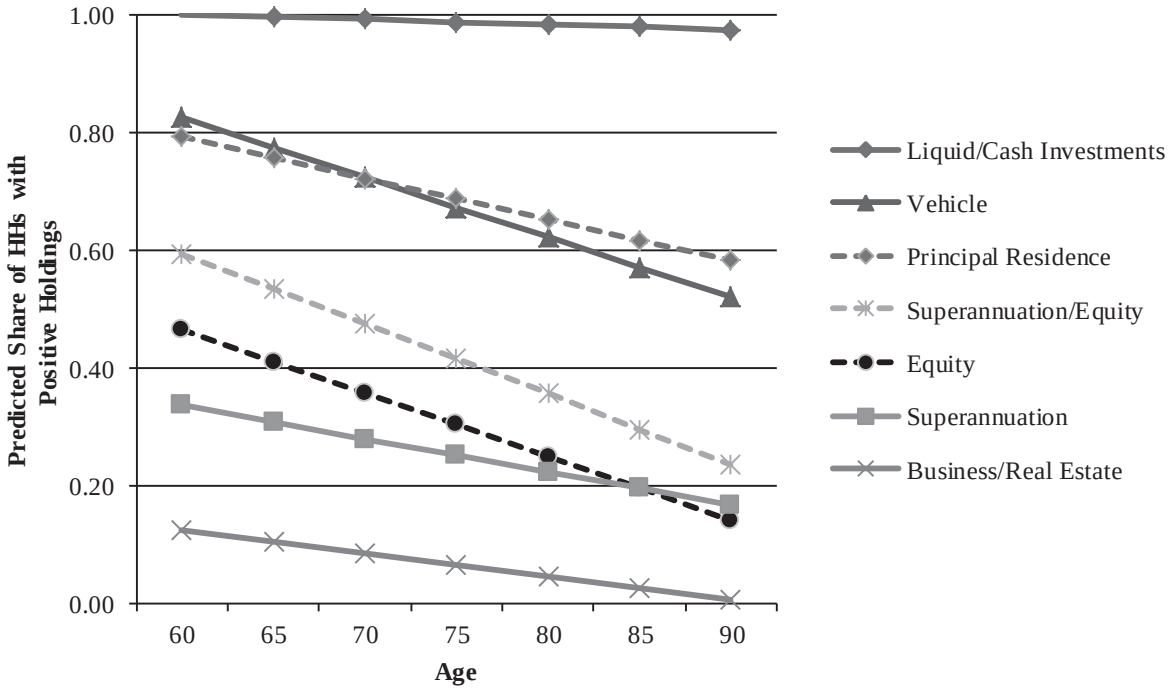


FIGURE 3

Predicted Share of Total Assets According to Age

We estimate *asset holding* using coefficient output from the household fixed effects specification in Table 9, and take the median value across the sample for control variables, which takes the form:

Linear Age $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \boldsymbol{\beta_2}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Quadratic Age Specification: $\widehat{Asset\ holdings}_{jit} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \boldsymbol{\beta_3}' \mathbf{X_{it}} + \alpha_i + \varepsilon_{jit}$

Where $'\boldsymbol{X}_{it}$ are set to median values of sample such that *majorcity* =1, *relig_christ* =1, *longtermhealthcondition* =1 and *home owner* =1