# Retirement and Asset Allocation in Australian Households

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**Abstract:**

This paper examines the effect of the retirement decision on the asset allocation of Australian households using data from the Household Income Labour Dynamics of Australia (HILDA) Survey. It investigates the popular financial advice that as individuals reach retirement they should hold lower risky assets. This advice stems from economic foundations informed by the life cycle theory of consumption, saving and portfolio choice. Utilising the panel data nature of HILDA by using data from wave 2 (2002), wave 6 (2006) and wave 10, we estimate three models for single and couple households - a pooled ordinary least squares model, a fixed effects model and a random effect model. In each model, we consider the proportion of risky assets held by each household and the relationship with retirement, retirement intentions, labour income characteristics, and individual and household demographics and characteristics. We find some evidence of retired households decreasing proportion of risky assets held.

## Introduction

The ageing of the population is a global phenomenon, which poses a unique set of challenges to policymakers in dealing with health and aged care, labour market dynamics for older workers and devising systems of social protection. In Australia the population is ageing at a faster rate than the fertility rate and coupled with a growing population, placing pressure on the health system, infrastructure and public finances (Commonwealth of Australia, 2010). In light of these pressures, the government introduced the privately managed retirement income scheme, the Superannuation Guarantee, in 1992 to supplement the public pension system. There is an increased responsibility on individuals to make key decisions regarding their retirement income and wealth such as voluntary contribution rates, asset allocation and timing of retirement. This places emphasis on individual decision-making and accountability by retirees in order to deliver adequate retirement incomes and to ease the burden on government spending.

The general consensus amongst financial advisors regarding asset allocation is that the longer the individual's investment time horizon is, the less risky asset they may want to hold (Ameriks & Zeldes, 2004). Indeed advice regarding asset allocation on websites such as Merrill Edge and Standard & Poor's (Merrill Edge, 2013; S&P, 2013) stresses the importance of time horizon and give examples of those of retirement age reducing the amount of risky assets they hold to protect their investments. Furthermore, there are 'rules of thumb' offered by financial planners such as the proportion of stock held should be 100 less your age (CNN Money; Vanguard, 2010) which reinforces the importance of time horizon. This advice stems from economic foundations in the form of life cycle theory of consumption and portfolio choice and human capital.

This paper examines this type of financial advice in the context of older Australian households. This age group is most likely to be preoccupied with retirement and actively making retirement decisions, therefore their behaviour is of interest to policymakers. The main empirical question being asked in this paper is: for older Australian households, do retired households exhibit behaviour that is consistent with holding a smaller proportion of risky assets compared to working households?

Furthermore, do labour market characteristics affect asset allocation? We utilise the Household Income Labour Dynamics of Australia (HILDA) survey, a household-based longitudinal study commenced in 2001, to examine this empirical question along with other determinants of risky asset holdings using three different statistical models. We investigate the relationship between retirement (and retirement intentions) and the proportion of risky assets held by different types of households. We find that there is some evidence of retired households decreasing proportion of risky assets held and some weak evidence of retirement intention impacting on the proportion of risky financial assets held.

**Literature Review**

The financial advice that one should hold a lower proportion of risky assets in retirement derives from extensions to the life cycle theory of consumption and portfolio choice. The seminal works by Merton (1969), Samuelson (1969) and Mossin (1963) theorise that the long horizon asset allocation decision is the same as the short horizon one. For a portfolio decision between a riskless asset and a risky asset, the optimal portfolio shares are constant over the life cycle, irrespective of age and wealth. However, this result is based on several restrictive assumptions including no labour income or non-tradable assets and the utility function is of the form of constant relative risk aversion. These early papers suggest that an individual near retirement would hold the same portfolio of risky assets as one that is starting out in her career. Since then researchers have sought to relax the restrictive assumptions made by the original authors by incorporating risky labour income (Viceira, 2001; Cocco, Gomes & Maenhout, 2005; Farhi & Panageas, 2007), housing (Cocco 2004), alternative utility functions (Li & Smetters, 2010) and social security (Smetters & Chen, 2010; Maurer, Mitchell & Rogalla, 2010).

The works which build on the seminal works by incorporating labour into the mix include Bodie, Merton and Samuelson (1992) who explore the relationship between portfolio choice and labour supply by solving the individual's lifetime utility subject to budget constraints. They conclude that the individual will tend to invest more conservatively as she nears retirement due to human capital being a safe asset relative to equities and labour flexibility decreases as she ages. Cocco, Gomes and Maenhout

(2005) contribute further to this by using a realistically calibrated life cycle model of consumption and portfolio choice which has non-tradable labour income. They conclude that the presence of labour income increases the demand for stocks, especially early in life, but the proportion of stock holdings decrease with age as the labour income profile is downward sloping.

The empirical evidence on age and household asset allocation is largely found in the diverse literature on factors driving household portfolio choice. The results from U.S. based studies which examine the effect of age on asset allocation are mixed. For example, Agnew, Balduzzi and Sunden (2003) find that investments in equities are higher for males, individuals who are married and those with higher wages and job seniority and lower for those who are older - based on 7000 individual 401(k) plans from 1994 to 1998. However, Ameriks and Zeldes (2004) did not find evidence to support this using pooled cross sectional data from the Surveys of Consumer Finances and panel data from the Teachers Insurance and Annuity Association – College Retirement Equities Fund (TIAA-CREF). They conclude that there is no evidence of a gradual reduction in the share in stocks with age but there is some evidence of older individuals not holding shares altogether around the time of annuitisations and withdrawals.

Other papers examine individual factors influencing asset allocation including individual and labour market characteristics such as income, education and health using international data. Guiso, Jappelli and Terlizzese (1996) use data from an Italian household survey to estimate risky asset holdings as a two-stage decision process. Their results suggest that individuals facing uninsurable income risk reduce their risky asset holdings. Furthermore, there is some evidence of borrowing constraints leading to individuals choosing more safe and liquid forms of wealth. Iwaisako, Mitchell and Piggott (2004), use Japanese micro data from the year 2000 and find that education and income has a positive effect on equity holdings and having a working partner has a negative effect on equity holdings for men. Yamishita (2003) examines the household equity investment decision and its relationship with the ratio of house value to net worth. The author uses data of individual portfolios from the 1989 Survey of Consumer Finances (SCF) dataset and found that there is a strong relationship between the ratio of holdings in stocks and the ratio of housing wealth to net worth.

The demand for housing crowds out stockholdings as households with a higher leveraged home hold relatively less risky assets.

Heaton and Lucas (2000) investigate the influence that entrepreneurial income risk has on portfolio choice using cross sectional data from the SCF and Tax Model. They conclude that households with high and variable proprietary business income tend to hold less wealth in stocks and for non-entrepreneurial households which hold stocks in the firm they work in lead to a reduction of portfolio share in other stocks. Rosen and Wu (2004) examine the relationship between health and household portfolios using data from the Health and Retirement Study (HRS) and find that there is a strong link between the two. Poor health is associated with holding a smaller share of wealth in risky assets and a larger share in safe assets.

The Australian evidence regarding asset allocation decisions are limited due to limited data availability. Gerrans, Clark-Murphy and Speelman (2006) use superannuation fund level data and find that allocations to asset classes differed between age quintiles and support for increasing allocations to conservative asset classes by age quintiles. However, the strength of the relationship is not consistent across all classes of assets or superannuation funds.

An alternative to fund level based data which has been difficult to obtain is the HILDA dataset. Both Cardak and Wilkins (2008) and Stavrunova and Yerokhin (2008) use Wave 2 of the dataset. Cardak and Wilkins (2008) examine the asset allocation decisions of households and the relationship with a range of risks and factors including health, income and liquidity. They find that labour income uncertainty and health risk play important roles along with credit constraints and risky preferences. Homeownership leads to greater risky asset holdings. Stavrunova and Yerokhin (2008) find that education, age, net worth, planning horizon and risk attitudes drive households' exposure to risky assets.

Overall, the theoretical literature on household portfolio choice calls for the holding of less risky assets in retirement and there is some empirical evidence to support the theory. Furthermore, other empirically tested factors that also drive the portfolio decision include labour income risks, risk preferences and health.

## Data

The Household Income Labour Dynamics of Australia (HILDA) Survey is a household based social and economic longitudinal study which commenced in 2001 and is implemented annually (HILDA website). It collects annual information on income, labour market, demographic and personal characteristics of Australian individuals and households and collects information on wealth and retirement in less frequent special modules. There are now 11 waves, comprising both standard questions as well as special topic modules which are repeated in cycles. This paper uses data from the wealth module implemented in Wave 2 (2002), Wave 6 (2006) and Wave 10 (2010) as well as data from the standard questions in those waves.

### *Sample Construction*

We examine the behaviour of households aged 45 and over. The design of the HILDA dataset is such that the information collected in the wealth module is on a household basis, which raises questions regarding the definition of a household we use. For multi-person households, those living in the same dwelling are considered a household when they make provisions for food and other essentials of living (HILDA user guide). The notion of household in this case should not be confused with family. Those living in the same household can include persons both related and unrelated. As a result of this definition, HILDA includes various types of household composition. For the purpose of this study we exclude the non-standard households, as it is not possible to disentangle the wealth components from other members. Standard households are defined by the following categories:

- Lone person
- Single parent with children under 15
- Single parent with dependent student
- Couple only
- Couple with children under 15
- Couple with dependent student

We use an unbalanced panel consisting of approximately 700 single households and 2000 couple households in each of the three waves spanning 8 years. The unbalanced

panel nature of the data means that there are individuals who appear only once or twice or all three times across the three waves.

The rationale behind the distinction between single and couple households is that in a couple household, it is assumed that wealth and asset allocation decisions are made by the couple jointly and are therefore affected by the characteristics of both parties. However in a single household, the decisions are made solely by the single individual. In the case of the couple households, the male is assumed to be head of the household unless the couple is in a same sex relationship. In the latter event, one person is arbitrarily selected as the household head. The household heads' respective partners are then matched accordingly. As the retirement decision is likely to affect people above a certain age group, in all households, the single person or the household head[1] is at least aged 45 or over in the earliest wave (wave 2).

*Dependent Variable*

In this study we are interested in the portfolio choice behaviour of older Australian households and investigates whether retired households exhibit behaviour that is consistent with holding a smaller proportion of risky assets compared to working households. The dependent variable used to examine the research question is the proportion of gross risky financial assets[2]. Financial assets reported in HILDA include equity holdings, cash, trust funds, bank accounts, life insurance and superannuation. Therefore, the risky financial assets are equity investments[3] and the risky component of superannuation. The data collected does not allow the look through of asset allocation of the individual's superannuation accounts. Given there is a high likelihood of part of the superannuation portfolio being invested in risky assets, each household's superannuation balance are assumed to be held in a balanced fund where 62%, 65% and 65% of the account balance are invested in risky assets in

[1] There are cases of partners being under the age of 45.
[2] We also test whether there are key differences in findings given different definitions of the proportion of risky assets - risky financial assets versus risky assets (which also includes property and business investments). We find that for single households the results are largely the same, while for couple households the household heads tend to reduce the proportion of risky assets held when retired. A likely explanation for this difference is the definition incorporates business and other property investments and individuals tend to exhibit more caution when it comes to buying and selling these investments compared to financial assets such as shares.
[3] Equity investments consist of total shares, managed funds and property trust.

accordance with the annual average asset allocation of the default fund in Australian superannuation funds published by the Australian Prudential Regulation Authority (APRA) for 2002, 2006 and 2008 (APRA, 2010). Therefore, the proportion of gross risky financial assets used in this analysis is measured as risky financial assets as a percentage of total gross financial assets.

*Explanatory Variables*

The explanatory variables can be categorised into four groups relating to: retirement, labour income risks, household characteristics and individual characteristics. The variable of interest is retirement - whereby the individual consider themselves retired and no longer working or looking for employment. Three variables are used to examine the different aspects of retirement. Firstly is the binary variable indicating whether the individual is retired from the labour force completely. This is derived from the retirement question and labour force status. In any of the three waves, if the person is retired, they can elect to return to work in subsequent waves. Therefore, it is possible for the retirement variable to change for a given individual throughout the waves.

For individuals who are not retired completely from the work force, the number of years to their intended retirement age is obtained. This is constructed from the individual's intended retirement age less their actual age in each wave. This variable measures how far away she is to her planned retirement age. We also define a dummy variable for those who have indicated that they never intend to stop working. We hypothesise that retirement leads to a decrease in risky asset holdings and that the closer to retirement, the less risky assets the individual will hold - theorised in lifecycle portfolio choice literature (e.g. Bodie, Merton & Samuelson (1992)).

Consistent with Bodie, Merton and Samuelson (1992) who identify the effect of wage uncertainty on life cycle portfolio allocation, we also consider labour income risks. Firstly, the dichotomous variable of whether the individual is self-employed (or not) is used to represent the background risk arising from uncertain future labour income (Stavrunova & Yerokhin, 2008). Guiso et al (1996) find evidence that uninsurable income leads to individuals reducing the proportion of risky assets held. As a result,

casual employment is also used as a proxy for risky income since those with casual employment are not guaranteed regular hours of work or have entitlements such as sick leave and annual leave compared to full time employment. Milevsky (2003) finds that wages of individuals working in the financial industry is correlated with investments in risky assets through the investments in the stock market. Subsequently, these individuals have risky wages and should reduce the amount of risky assets in their portfolio. The dummy variable of whether the individual works in the financial industry (or not) is used as a proxy for risky wages.

The decision of how much risky assets to hold is also conditional on the household socio-economic characteristics. Household net worth is the difference between household assets and liabilities. It is expected those with higher net worth would be in a better position to invest in risky assets. The number of resident children is used here as a liquidity constraint for households. For the age group examined in this study, it is likely that owning one's own home can free up funds for investment in risky assets. However, the HILDA dataset is not explicit in separating total homeownership from those who still have mortgages on their own homes. Yamashita (2003) finds that households with large home mortgages have proportionally less risky assets. Given the definition of financial assets, investments in home, business and other properties offer a substitute to investment in financial assets and hence are included as covariates.

Individual characteristics include age, education (base – below high school, high school, diploma/certificate or degree), income, self-assessed health (base – poor, fair or good), year of arrival in Australia post 1992 (the year of commencement of the SG scheme), planning horizon (base – short, medium or long), risk averse or no cash to invest and whether they receive the Age Pension. The rationale behind the inclusion of year of arrival in Australia is those who arrived post 1992 would have been in the SG scheme for a shorter time than those arriving before and therefore would have accumulated less superannuation at retirement. As a result they would be looking elsewhere for retirement investment, and perhaps invest more actively outside superannuation.

Planning horizon is indicative of the individual being forward looking in financial planning to manage their own investments: the longer the planning horizon the more likely to increase their risky asset holdings (Cardek & Wilkins, 2008). Two dichotomous variables are created to indicate medium and long planning horizons. Individuals are asked their individual attitude to risk. This is expected to have an effect on risky asset holdings: those who are more willing to take risks will hold more risky assets (Stavrunova & Yerokhin, 2008). A dummy variable for risk aversion is used to indicate this for each individual and a further no cash to invest dummy variable is used for those who does not consider investment due to cash constraints.

Health plays an important factor in household asset allocation composition. Those with worse self-assessed health would be less likely to hold risky assets and possible reasons for this can be due to risk aversion, planning horizon, bequest motives, health insurance and expectations of future income (Rosen & Wu, 2004). A dummy variable is created for each of fair and good health catagories with poor being the base.

Income is expected to have a positive relationship with risky asset holdings (Cardek & Wilkins, 2008). Those with higher income would have more disposable income to invest and would lead to a positive relationship with proportion of risky assets held. The Age Pension can potentially create a safety net when the market is down for those who invest heavily on the stock market using their retirement savings. The use of this variable can potentially test the relationship between Age Pension income and whether the individual invests in any risky assets.

**Descriptive Statistics**

The unbalanced panel consists of 742, 702 and 697 single households and 1,476, 1,194 and 1,104 couple households in 2002, 2004 and 2010 respectively. The descriptive statistics for the panel is displayed in Table 1. It can be seen that the average age in the starting year of 2002 is around 60 for both couple and single household heads while for partners in couple households the average age is 56 in 2002 as partners are predominately women (and men tend to couple with younger women). Overall, couple household heads have higher levels of education compared to partners and singles. This is consistent with households being predominantly male

and single households being approximately 66% female. Around 9% of singles are from non-English speaking backgrounds in all three waves. The percentage is slightly higher for both couple household heads and their partners at around 13%.

In wave 2, 44% of single households consider themselves risk averse and this percentage grows slightly in wave 6 to 51% and to 55% in wave 10. This is likely due to the effect of the cohort ageing, leading to more conservative risk preferences. Furthermore, couple household heads are around 10% less risk averse while partners have similar levels of risk aversion as singles. Single households have a smaller percentage of individuals with long planning horizons compared to couples (both household heads and partners) – with 26% of singles in wave 10 compared to couple household heads with 38% in the same wave. Overall, the percentage declines as the cohorts age.

For both groups of households, the majority of individuals are in good health, although the percentages decrease from wave 2 to wave 10. This is to be expected as individuals age throughout the eight years. A higher percentage of single households receive the Age Pension compared to couple households (both household heads and their partners). For both groups, those receiving the Age Pension increases from wave 2 to wave 10.

*Assets and Liabilities by Net Wealth Deciles*

We examine the key features of the HILDA dataset relating to changes in household assets and liabilities. There are two key aspects of interest here – relating to wealth levels of households and the age of the households head. Consequently, the

**Table 1 – Descriptive Statistics: All**

| | Single Households | | | | | | Couple Households | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 (n=742) | | 2006 (n=702) | | 2010 (n=697) | | 2002 (n=1476) | | 2006 (n=1194) | | 2010 (n=1104) | |
| | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median |
| **Household Head Retired** | 55% | | 61.3% | | 67.3% | | 37.4% | | 43.8% | | 50% | |
| **Partner Retired** | | | | | | | 47.4% | | 51.1% | | 54.1% | |
| **Individual Characteristics – Household Heads** | | | | | | | | | | | | |
| **Age** | 61.8 | 60.5 | 65.3 | 64 | 69.1 | 68 | 59.4 | 58 | 62.5 | 61 | 65.6 | 64 |
| **Male** | 32.2% | | 32.8% | | 33.3% | | | | | | | |
| **Divorced** | 47.7% | | 44.4% | | 45.5% | | | | | | | |
| **Widowed** | 35.3% | | 37.5% | | 37.2% | | | | | | | |
| **Income** | $27,530.07 | $17.364.50 | $31,728 | $20,187 | $34,391.14 | $22,248 | $40,405.91 | $28,989 | $48,290.86 | $32,950.50 | $51,222.42 | $33,734 |
| **High School** | 6.7% | | 6.8% | | 6.7% | | 7.7% | | 7% | | 7.2% | |
| **Diploma or Certificate** | 27.4% | | 29.5% | | 28.4% | | 39.4% | | 41.7% | | 41.3% | |
| **Higher Degree** | 15.9% | | 16.7% | | 17.8% | | 21.1% | | 22% | | 23% | |
| **NESB** | 10.4% | | 8.8% | | 9% | | 14.8% | | 13.1% | | 12.8% | |
| **Risk Averse** | 43.8% | | 50.9% | | 55.2% | | 35.1% | | 36.1% | | 36.7% | |
| **No Cash** | 24.1% | | 22.8% | | 17.1% | | 12.3% | | 11.1% | | 9.4% | |
| **Medium Planning Horizon** | 19.9% | | 17.8% | | 17.6% | | 20.9% | | 18.8% | | 19.1% | |
| **Long Planning Horizon** | 33.4% | | 35.8% | | 26.1% | | 44.6% | | 46.4% | | 38.1% | |
| **Fair Health** | 20.6% | | 23.4% | | 27.7% | | 18.2% | | 18% | | 20.7% | |
| **Good Health** | 70.6% | | 67% | | 62.8% | | 74.5% | | 73.7% | | 73.7% | |
| **Age Pension** | 31.8% | | 38.2% | | 46.5% | | 20.3% | | 26.5% | | 33.4% | |
| **Overseas Pension** | 3.8% | | 4.1% | | 4% | | 4.3% | | 4.2% | | 4.6% | |
| **Arriving Post 1992** | 0.5% | | 0.4% | | 0.6% | | 2.2% | | 1.7% | | 2.1% | |
| **Individual Characteristics – Partners** | | | | | | | | | | | | |
| **Age** | | | | | | | 55.8 | 55 | 59 | 59 | 62.1 | 62 |
| **Income** | | | | | | | $22,428.11 | $14,079 | $27,554.58 | $18,343.50 | $32,584.92 | $19,855 |
| **High School** | | | | | | | 11.7% | | 11.4% | | 9.6% | |
| **Diploma or Certificate** | | | | | | | 20.8% | | 24.3% | | 25.9% | |
| **Higher Degree** | | | | | | | 17% | | 18.8% | | 20% | |
| **NESB** | | | | | | | 13.7% | | 13% | | 12.9% | |
| **Risk Averse** | | | | | | | 45.1% | | 47.6% | | 49.9% | |
| **No Cash** | | | | | | | 14.8% | | 12.3% | | 10.5% | |
| **Medium Planning Horizon** | | | | | | | 22.4% | | 20.8% | | 21% | |
| **Long Planning Horizon** | | | | | | | 44.5% | | 46.2% | | 37.3% | |
| **Fair Health** | | | | | | | 14.9% | | 15.4% | | 18.2% | |
| **Good Health** | | | | | | | 80% | | 76.5% | | 77.1% | |
| **Age Pension** | | | | | | | 20.5% | | 23.9% | | 30.3% | |
| **Overseas Pension** | | | | | | | 3.7% | | 3.3% | | 4.1% | |
| **Arriving Post 1992** | | | | | | | 3.3% | | 3.3% | | 3.3% | |
| **Household Characteristics** | | | | | | | | | | | | |
| **Number of Resident Children** | 1 | 0 | 1 | 0 | | | 1 | 0 | 1 | 0 | 1 | 0 |
| **Net worth** | $351,544 | $187,225 | $480,233.5 | $300,787 | | | $686,155.70 | $451,992.50 | $1,145,841 | $707,192.50 | $1,244,419 | $845,805 |
| **Business Equity** | $29,512.34 | 0 | $24,649.81 | 0 | | | $68,137.57 | 0 | $73,941.43 | 0 | $64,958.84 | 0 |
| **Home Equity** | $161,631 | $110,000 | $234,068.30 | $200,000 | | | $253,223.30 | $200,000 | $425,235.70 | $340,500 | $503,708 | 430,000 |
| **Property Equity** | $30,080.55 | 0 | $54,042.99 | 0 | | | $64,643.19 | 0 | $194,460 | 0 | $177,253.10 | 0 |

differences in the composition of asset and liability classes for both types of households are examined by net wealth deciles and age groups over the three relevant waves: wave 2 (2002), wave 6 (2006) and wave 10 (2010).

As categorised by HILDA, the types of assets held by households are cash, equity investments, bank accounts, home, other properties, business, trust funds, vehicles, life insurance, superannuation and other. For households over the age of 45, the main types of assets held are home, superannuation and bank accounts.

Comparing asset class composition by net deciles, Figures 1 and 2, shows the average amount of assets by classes for each net wealth decile (for both single and couple households) in each of the relevant waves. Home is by far the largest asset class for all net asset deciles, followed by superannuation and bank account balances. The poorer single households (those in lower deciles) barely hold any assets with the main (or sometimes only) asset being their own home. By comparison, poorer couple households hold a slightly greater variety of assets and as expected more in total compared to single households since their wealth is jointly held. Richer single households (those in the 8th, 9th and 10th deciles), hold a large variety of asset classes with more equity and business holdings compared to all other deciles. Similarly, for couple households, those in the upper deciles have larger mix of asset classes and furthermore, this mix is greater compared to single households. Overall, total assets have grown throughout the waves for both types of households.

The types of liabilities held by households in the HILDA dataset are debts on own home, other properties and business; credit cards; the Higher Education Contribution Scheme (HECS) and other debts. The HECS debt arises due to dependents being counted in both single and couple household wealth. For the older household considered in the sample, the main types of liabilities held are mortgages on property – both own home or investment properties.

Figures 3 and 4 compare the classes of liabilities held by both single and couple households by net wealth deciles for the three relevant waves. It can be seen that the largest class of debt for households is mortgage on properties (all types). Single households hold significantly less total debt compared to couple households given the latter is joint wealth. For single households in the 9th and 10th deciles, the amount of total debt is higher compared to those

**Figure 1 - Singles - Assets by Wealth Deciles**

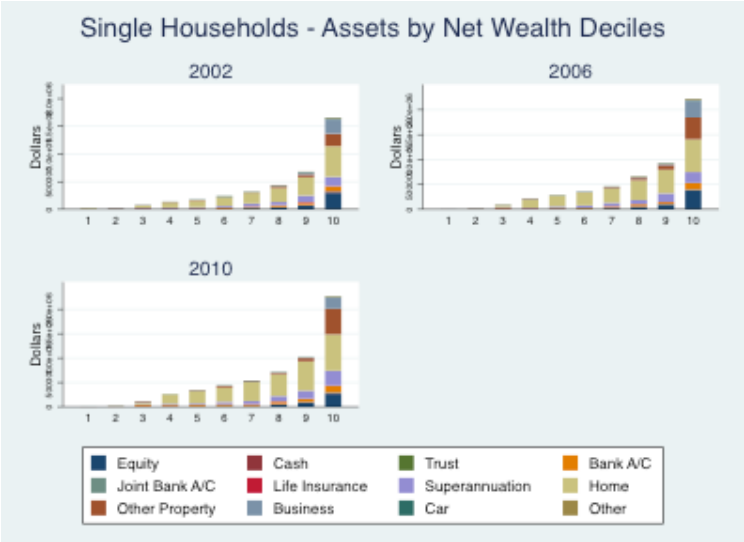



**Figure 2 - Couples: Assets by Wealth Deciles**

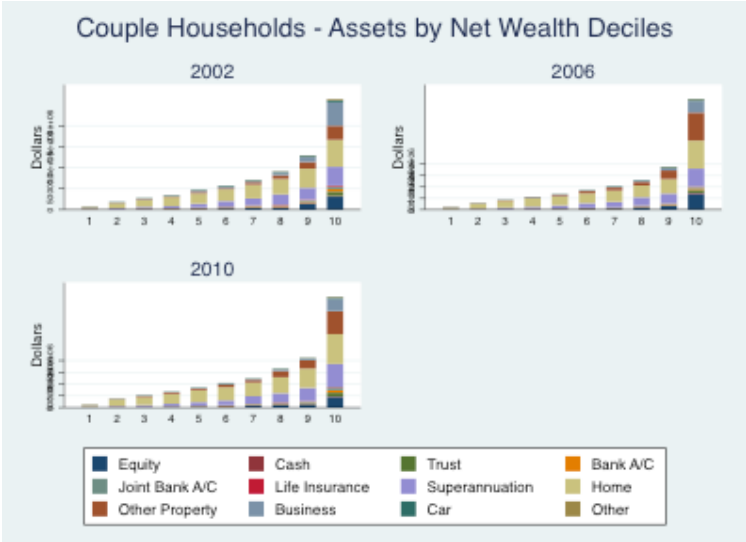



**Figure 3 - Singles: Liabilities by Wealth Deciles**

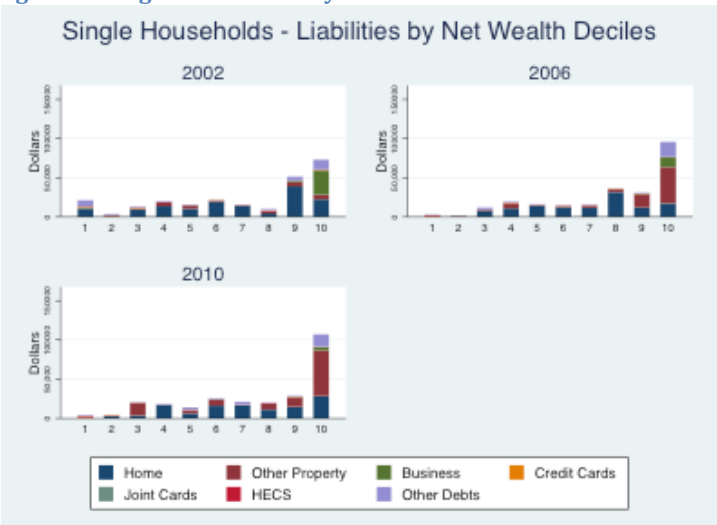



**Figure 4 - Couples: Liabilities by Wealth Deciles**

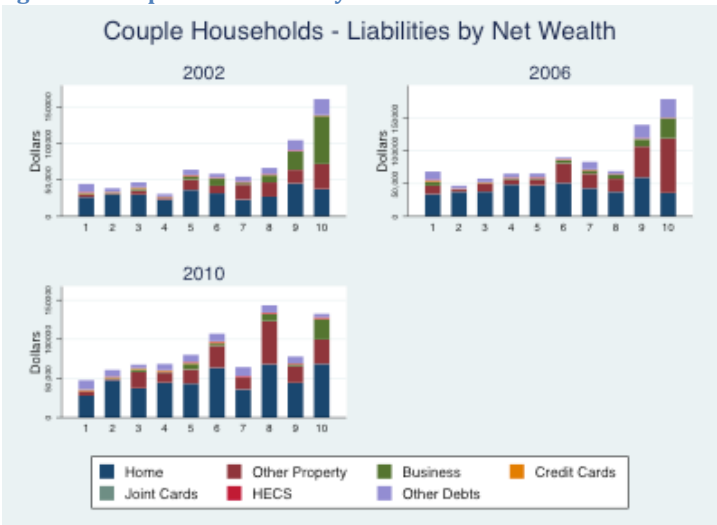


**Figure 5 – Singles: Assets by Age Deciles**

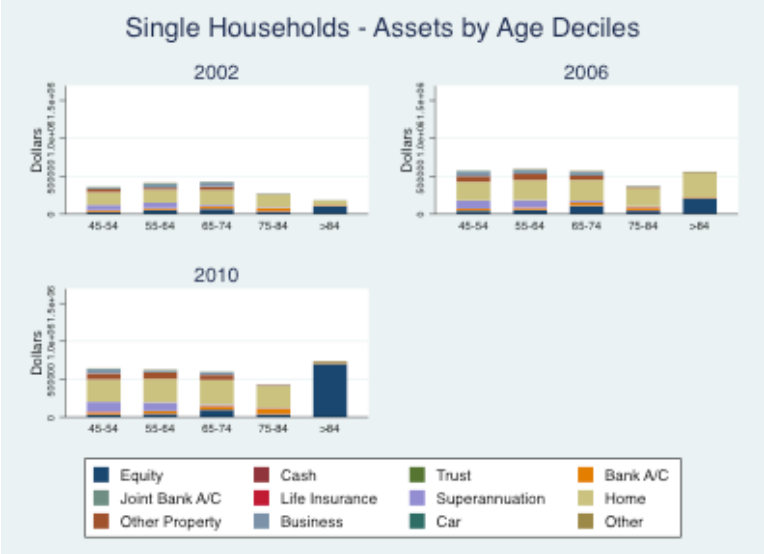



**Figure 6- Couples: Assets by Age Deciles**

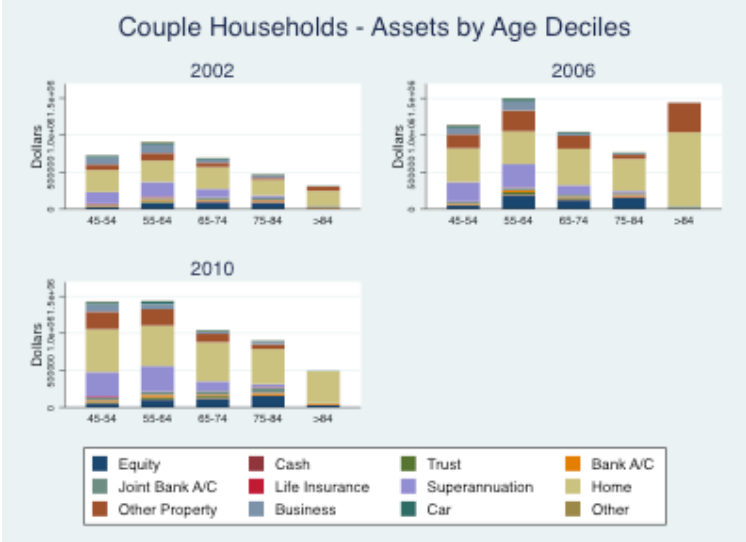



**Figure 7 - Singles: Liabilities by Age Deciles**

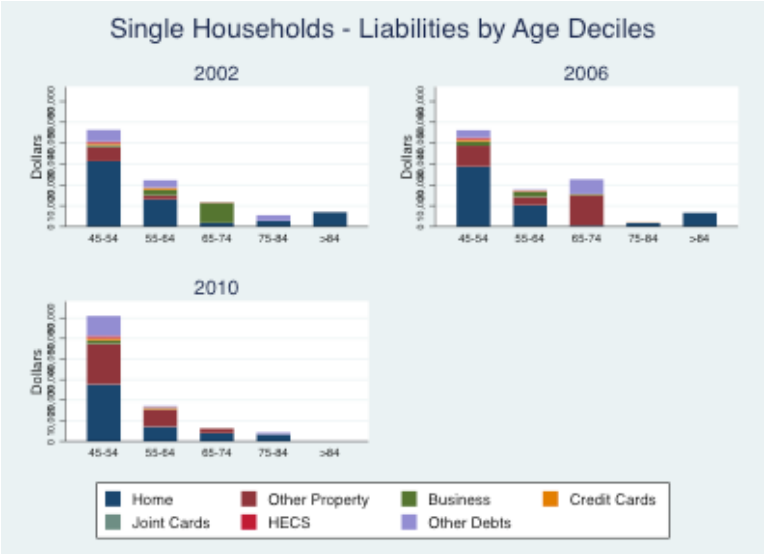
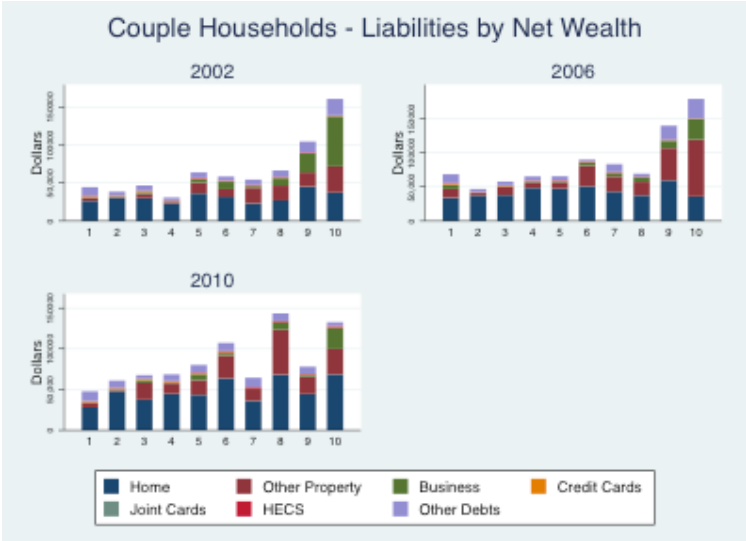



**Figure 6 - Couples: Liabilities by Age Deciles**



in lower deciles and there is more variety of debt types including other property and business which poorer households, those in the first and second deciles, do not have.

Couples tend to have not only higher levels of debt but also a mixture of debt types compared to singles in all deciles. Those households in higher deciles tend to have more other properties and business debt. Couple households with higher net wealth deciles have slightly higher debts, although this effect is not consistent for all richer households. There are very small amounts of HECS debt appearing in liabilities of these older households. This is due to households with dependents being counted in the sample which may university students.

The overall level of debt does not appear to reduce for all deciles in both single and couple households, and seems to fluctuate throughout the waves. This is similar for mortgages associated with own home and other properties.

*Assets and Liabilities by Age Deciles*

The relationship between risky asset holdings and retirement is related to age. Consequently, we examine the composition of the asset and liability classes for both single and couple households by the age of the household head in 2002. The ages are split into five groups: 45 to 54, 55 to 64, 65 to 74, greater than 84 years of age. Figures 5 and 6 show the assets for single and couple households by these age groups.

For all age groups and in all types of households, own home is the largest asset class. Interestingly, for the younger cohorts of single households, age groups 45 to 54 and 55 to 64, their superannuation balances increase as the cohort age. Furthermore, the older age groups do not have a large amount of superannuation by comparison. This is because the younger households are working for longer and thus accumulating more superannuation under the relatively new SG, which was only implemented ten years earlier, compared to the older generations. This also holds true in couple households with the younger age groups 45 to 54, 55 to 64 and also 65 to 74 holding more superannuation balances than older households.

In all three waves, the younger households tend to have more assets than older households and in particular the age group 55 to 64 has the highest level of assets in all waves for all types of households (except singles in wave 10). The younger households also tend to have a mixture of assets which not only include home and superannuation but also business and other properties. Similarly to assets by net decile, couple households have more total assets compared to single households. Overall, it can be seen that total assets are increasing as the cohorts age for all households. This is more evident in couple households.

Interestingly, all age groups hold some equities with couple households holding more by comparison. For both types of households, this amount of equity investments do not seem to decrease as the cohort ages - which contradicts age phasing of risky assets. This is further supported by the observation that those in older age groups, 75 to 84, still hold a significant amount of equities. This is more evident in couple households, although it can be partially explained by the fact that the partners of these older household heads can be significantly younger and therefore have some propensity to hold more equities.

Figures 7 and 8 show different types of liabilities by age groups for single and couple households in the relevant waves. The largest debt class for both household types is mortgage on home. However, the amount of debt is significantly less for older age groups, i.e. comparing 45 to 54 year olds to other older groups. Furthermore, for the younger cohorts in both household types, 45 to 54 and 55 to 64 age groups, home is the biggest liability relative to other liability classes. They also tend to have a mix of different types of debt including other property and debts.

Couple households also tend to have more mixed debt including business debts compared to single households. Younger age groups of couple households, 45 to 54 and 55 to 64, tend to have more debt than their counterparts in single households, but older couple households, 65 to 74 and 75 to 84, have less debt than single households in the same age groups.

Overall, total liabilities are falling when compared between age groups and across cohorts. Given the relatively small group of households over the age of 84, the observations are rather skewed.

**Methodology**

The research question central to this paper is how retirement affects the proportion of risky assets held by older Australian households. A complimentary question is how retirement intentions impact on risky asset holdings. The HILDA dataset offers a three year longitudinal data with the relevant waves being wave 2 (2002), wave 6 (2006) and wave 10 (2010). The nature of the data can allow us to measure the individual's decision to retire from the work force and the impact on risky asset holdings through time. As a result, we employ three different panel data methods. Firstly we use a pooled cross section ordinary least squares model (pooled OLS) to estimate a relationship between retirement and risky asset holdings. However, due to the dynamic nature of the dataset such a model is likely to suffer from omitted variable problems. Consequently, we use a fixed effects model (FE model) and the random effects model (RE model) to address any shortcomings as a result of the longitudinal nature of the dataset used.

*Pooled Generalised Least Squares Model*

With the three years of relevant data, we use a pooled cross section ordinary least square model to utilise the information contained in all relevant time periods. To measure the effect of retirement on the proportion of risky assets of households, the following pooled regression model is estimated:

$$RA_{it} = \beta_0 + \beta_1 Retired_{it} + \beta_2 x_{it2} + \ \dots + \beta_k x_{itk} + \delta_0 Wave6_i + \delta_1 Wave10_i + \nu_{it} \quad (1)$$

where $RA_{it}$ is a measure of the percentage of risky assets for each household $i$ at time $t$, where time $t$ is either wave 2, 6 or 10. $Retired_{it}$ is a dummy variable equal to 1 if the individual belonging to household $i$ at time $t$ is retired and zero otherwise. $\beta_2 x_{it}$ , …, $\beta_k x_{itk}$ are explanatory variables including individual and household

characteristics. Dummy variables $Wave6_i$ and $Wave10_i$ are time dummies where $Wave6_i = 1$ when observations are from wave 6 and $Wave10_i = 1$ when observations are from wave 10. $\beta_0$, $\beta_1$, …, $\beta_k$, $\delta_0$ and $\delta_1$ are parameters and $v_{it}$ is an independently and identically distributed error term.

However, it is highly likely that there are time invariant unobserved factors or effects, $a_i$, which are not captured in the above model. We can rewrite the error term, $v_{it}$ as a composite error term to take into account the unobserved effects, $a_i$: $v_{it} = a_i + u_{it}$ (Woolridge, 2003). Therefore, Equation 1 can be written as:

$$RA_{it} = \beta_0 + \beta_1 Retired_{it} + \beta_2 x_{it2} + \ ... + \beta_k x_{itk} + \delta_0 Wave6_i + \delta_1 Wave10_i + a_i + u_{it} \quad (2)$$

An example of possible $a_i$ in this case can be inherent ability, which maybe correlated with education. Not capturing these unobserved effects in the model can lead to inconsistent estimators. In order for OLS to produce consistent estimators, it is assumed that the unobserved effects $a_i$ are uncorrelated with the covariates (Wooldridge, 2003). Otherwise, omitted variable bias occurs and the pooled OLS model is not designed to account for this.

*Fixed Effects Model*

To account for the possible omitted variable bias by not capturing the time constant unobserved effect ai, a fixed effects model is estimated. In a fixed effects (FE) model, the covariates are transformed in order to remove the unobserved effect $a_i$. Given Equation (3.2), for each $i$ the equation is averaged over time:

$$\overline{RA}_i = \beta_0 + \beta_1 \overline{Retired}_i + \beta_2 \bar{x}_{i2} + \ ... + \beta_k \bar{x}_{ik} + \delta_0 \widetilde{Wave}6_\iota + \delta_1 \widetilde{Wave}10_\iota + a_i + \bar{u}_i$$

(3.3)

where $\overline{RA}_t = T^{-1} \sum_{t=1}^{T} RA_{it}$ and so on. Then for each period of $t$, Equation (3.3) is subtracted from Equation (3.2) and given $a_i$ is time invariant it is differenced out and the model becomes:

$$\widetilde{RA}_{it} = \beta_0 + \beta_1 \widetilde{Retired}_{it} + \beta_2 \tilde{x}_{it2} + \ ... + \beta_k \tilde{x}_{itk} + a_i + \tilde{u}_{it} \quad (3.4)$$

where $\widetilde{RA}_{it} = RA_{it} - \overline{RA}_i$ and so on. Estimating this model, there is no omitted variable bias caused by the unobserved heterogeneity, thus the estimators obtained will be consistent. However, one drawback of this model is that other explanatory

variables that are fixed with time, such as gender, will also be differenced out from the model and their effects cannot be measured. Furthermore, explanatory variables that hardly change in time will also suffer from lack of statistical significance.

*Random Effects Model*

The assumption made by the fixed effect model is that the unobserved effects, ai, may be correlated with one or more explanatory variables and differencing it out solves the resulting bias. However, the drawback is that the model is not able to measure the effects of time invariant explanatory variables. If $a_i$ is uncorrelated with the explanatory variables in all three periods, then using a pooled OLS model (equation 2) will produce consistent estimators. However, given the composite error term $v_{it} = a_i + u_{it}$, $a_i$ is now present in each time period leading to serial correlation (Wooldridge, 2003). Thus, the correlation between the composite errors in two periods is as follow:

$$Corr(v_{it}, v_{is}) = \frac{\sigma_a^2}{(\sigma_a^2 + \sigma_u^2)}$$

Where $t \neq s$, $\sigma_a^2$ is the variance of $a_i$ and $\sigma_u^2$ is the variance of $u_{it}$. Not accounting for this auto-correlation in the pooled OLS estimations will lead to incorrect test statistics. In order to solve this, we can use Generalised Least Squares transformation to eliminate the serial correlation problem in the OLS, resulting in a random effects (RE) model. Here we define a parameter, $\lambda$:

$$\lambda = 1 - \left[\frac{\sigma_a^2}{(\sigma_a^2 + \sigma_u^2)}\right]^{\frac{1}{2}}$$

Where $\lambda$ is between 0 and 1. We can use this parameter to transform Equation 3.2:

$$RA_{it} - \lambda\overline{RA}_i = \beta_0(1-\lambda) + \beta_1(Retired_{it} - \lambda\overline{Retired}_i) + \beta_2(x_{it2} - \lambda\bar{x}_{i2}) + \ldots + \beta_k(x_{itk} - \lambda\bar{x}_{itk}) + (v_i - \lambda\bar{v}_i)$$

The overbar denotes time averages same as in the fixed effects model. The parameter $\lambda$ cannot be calculated but an estimation, $\hat{\lambda}$, can be obtained by using the residuals from pooled OLS or FE models:

$$\hat{\lambda} = 1 - \left[\frac{1}{1 + T\left(\frac{\hat{\sigma}_a^2}{\hat{\sigma}_u^2}\right)}\right]^{\frac{1}{2}}$$

Where $\hat{\sigma}_a^2$ and $\hat{\sigma}_u^2$ are consistent estimators of $\sigma_a^2$ and $\sigma_u^2$. Comparing the FE and RE models, the RE estimator takes a fraction, $\hat{\lambda}$, of the time average of the variable and subtracts it from the corresponding variable. Thus, in a pooled OLS model, $\hat{\lambda} = 0$ and in a FE model $\hat{\lambda} = 1$. The RE model allows variables that do not vary across time to be estimated unlike the FE model.

## Empirical Results

The research question is for older Australians do retired households exhibit behaviour that is consistent with holding a smaller proportion of risky assets compared to working households? We employ three different types of statistical models to investigate this – a pooled OLS model, a fixed effects model and a random effects model. We also use two different samples: the complete sample consisting of both working and retired individuals over the age of 45 and then the employed households only (in the case of couple households, if the household head is employed).

### *Retirement and Risky Assets Holdings*

Table 1 presents the results for all three models – pooled OLS, fixed effects and random effects. For single households, the results are reported for all, which consists of both males and females. For couple households both the household head and their partner's characteristics are reported side by side (unless the variables are household characteristics).

The relationship central to this exploration is that between retirement and proportion of gross risky assets held. The OLS results for singles show that single retired households tend to reduce the proportion of risky asset holdings by 14%. This result is in contrast to those from couple households. For those semi-retired couple households, that is if either the household head or their partner are retired but their other half is not, the effect on the proportion of risky assets held are positive. When the head of the household is retired the proportion of risky assets held by the household increases by 2% (although this relationship is not precisely estimated) and when the partner is retired it increases by 4%. However, when the couple household is

considered retired, that is if both people in the household are retired, the proportion of risky assets held falls by 5%. It shows that in a couple household, financial decisions are likely to be joint – as one spouse remains in the labour market, their income provides a safety net for the household to invest in riskier assets compared to those households where both parties are retired. These results are statistically significant.

The fixed effects model tells a similar story. For single households the effect is negative, a 5% increase proportion of risky assets when the household is retired. For couple households either head of the house or their partner is retired will lead to a 3% increase in the proportion of risky assets held by the household. If the household is completely retired, the proportion of risky assets falls by 2%. However, the results are not statistically significant in the FE model. This is also confirmed by the random effects model results. Where for single households, the fall in proportion of risky financial assets is 11% for retired households compared to non-retired ones. Furthermore, the completely retired couple households has a 4% fall in the proportion of risky asset holdings.

In conjunction with the variable of interest, other household level and individual level characteristics are also included in three models. The household characteristics considered include number of resident children, net worth, business equity, home equity and property (other than own home) equity. These are proxies for the financial status of the household.

The number of children living in the household can impose a financial burden on the household budget. For single households, the results from all three models indicate a negative relationship between the number of resident children and the proportion of risky assets held. The pooled OLS model predicts that if the single household increase the number of children by one child, the proportion of risky assets would decrease by 0.3%. Similarly, the fixed effects and the random effects models indicate a 2% and 1% decrease respectively. For the couple households, there is also negative relationship in all three models. However, the results are not statistically significant for both singles and couples. One possible reason is that for the age group examined, there are not many children still residing in the households.

The coefficient is positive for net worth and negative for net worth squared. Both results are statistically significant. This holds true across all models for both types of households. As predicted, an initial increase in net worth leads to an increase in the proportion of risky financial assets held by both single and couple households. For net worth squared the coefficient is negative. This is in contrast with the results presented in Cardak & Wilkins (2008) where both coefficients on net worth are positive. However, it can be noted that the coefficient values from all three models are of small magnitudes – all less than 1% indicating a very small negative effect as net worth gets larger.

Since business investments and property investments (including own home) are considered substitutes to owning risky financial assets, an increase in home equity or business equity leads to a decrease in the proportion of risky assets held by single households. These results are statistically significant in all models for the single households but only in the OLS and RE models for couple households. For equity associated with property investments other than own home, the coefficients are negative for OLS and RE models but positive for the FE models across both samples. However, the FE results are not statistically significant and the coefficients are of small magnitudes.

Individual characteristics such as education, individual preferences, health status and government pensions also play a possible role in risky asset allocation. There is some evidence of age effects, although it is weak. The coefficients for age and age squared are only statistically significant for household heads in the OLS and RE models with the coefficient being positive for the former and negative for the latter. This is consistent with a priori expectations as the proportion of risky assets increase as age increases initially. However, when reaching a turning point, the household decreases risky asset holdings as they age. The partner age coefficients are not statistically significant and of the opposite signs. The single household coefficients are also positive in age and negative in age squared, although the age effect is not statistically significant for the sample.

**Table 2: Retirement and Risky Financial Assets – Single Households and Couple Households**

| Independent Variable | Single Households | | | Couple Households | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Household Head | | | Partner | | |
| | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects |
| | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | |
| | | | | | ***Retirement*** | | | | |
| **Retired** | -0.1429*** | -0.0458* | -0.1068*** | 0.0167 | 0.0331 | 0.0119 | 0.0390*** | 0.0283 | 0.0343** |
| | (0.023) | (0.027) | (0.022) | (0.021) | (0.027) | (0.021) | (0.015) | (0.019) | (0.014) |
| **Both Retired** | | | | -0.0521** | -0.0241 | -0.0392* | | | |
| | | | | (0.022) | (0.026) | (0.021) | | | |
| | | | | | ***Household Characteristics*** | | | | |
| **No. of Resident Children** | -0.0026 | -0.019 | -0.0105 | -0.0037 | -0.0128 | -0.0052 | | | |
| | (0.012) | (0.020) | (0.013) | (0.005) | (0.010) | (0.005) | | | |
| **Net Worth** | 0.0366*** | 0.0134*** | 0.0316*** | 0.0069*** | 0.0036** | 0.0066*** | | | |
| | (0.004) | (0.005) | (0.004) | (0.001) | (0.001) | (0.001) | | | |
| **Net Worth Squared** | -0.0004*** | -0.00005 | -0.0003*** | -0.00004*** | -0.00002* | -0.00004*** | | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | | |
| **Business Equity** | -0.0161*** | -0.0143*** | -0.0159*** | -0.0070*** | -0.001 | -0.0053*** | | | |
| | (0.004) | (0.005) | (0.004) | (0.001) | (0.001) | (0.001) | | | |
| **Home Equity** | -0.0252*** | -0.0124** | -0.0203*** | -0.0028** | -0.002 | -0.0028** | | | |
| | (0.004) | (0.006) | (0.004) | (0.001) | (0.002) | (0.001) | | | |
| **Property Equity** | -0.0207*** | 0.0001 | -0.0128*** | -0.0030*** | 0.0002 | -0.0016** | | | |
| | (0.004) | (0.005) | (0.004) | (0.001) | (0.001) | (0.001) | | | |
| | | | | | ***Individual Characteristics*** | | | | |
| **Age** | 0.0051 | 0.0412 | 0.0048 | 0.0120* | -0.0094 | 0.0178*** | -0.0082* | -0.0104 | -0.0089* |
| | (0.007) | (0.034) | (0.007) | (0.006) | (0.045) | (0.007) | (0.005) | (0.016) | (0.005) |
| **Age Squared** | -0.0069 | -0.0113* | -0.0068 | -0.0112** | -0.0168 | -0.0165*** | 0.0057 | -0.0023 | 0.0059 |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.011) | (0.005) | (0.004) | (0.010) | (0.005) |
| **Male** | -0.0289** | | -0.0151 | | | | | | |
| | (0.013) | | (0.018) | | | | | | |
| **Divorced** | 0.0182 | -0.0522 | 0.0127 | | | | | | |
| | (0.016) | (0.038) | (0.022) | | | | | | |
| **Widowed** | -0.0094 | | 0.0046 | | | | | | |
| | (0.019) | | (0.025) | | | | | | |
| **Income** | -0.0007 | -0.0292 | -0.0024 | -0.0068 | -0.0411** | -0.0121 | 0.0454** | 0.0486* | 0.0459** |
| | (0.034) | (0.038) | (0.031) | (0.015) | (0.021) | (0.015) | (0.022) | (0.025) | (0.020) |
| **Income Squared** | -0.0141 | -0.0053 | -0.0084 | -0.0021 | 0.0053* | -0.0004 | -0.0026 | 0.0052 | -0.0029 |
| | (0.009) | (0.010) | (0.008) | (0.002) | (0.003) | (0.002) | (0.004) | (0.007) | (0.004) |
| **NESB** | -0.0420** | | -0.0459* | -0.0017 | | -0.0117 | -0.0591*** | -0.0774 | -0.0603*** |
| | (0.020) | | (0.026) | (0.014) | | (0.017) | (0.015) | (0.242) | (0.018) |
| **High School** | 0.0454* | -0.0713 | 0.0626** | 0.0579*** | 0.1062 | 0.0561*** | -0.002 | 0.1820** | 0.0035 |
| | (0.023) | (0.138) | (0.031) | (0.016) | (0.132) | (0.020) | (0.013) | (0.086) | (0.017) |

**Table 2: Retirement and Risky Financial Assets – Single Households and Couple Households (Continued)**

| Independent Variable | Single Households | | | Couple Households | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Household Head | | | Partner | | |
| | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects |
| | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | |
| | | | | | *Individual Characteristics* | | | | |
| **Diploma or Certificate** | 0.0451*** | -0.0039 | 0.0572*** | 0.0618*** | 0.113 | 0.0647*** | 0.0136 | 0.0546 | 0.0104 |
| | (0.014) | (0.063) | (0.018) | (0.010) | (0.088) | (0.012) | (0.010) | (0.042) | (0.012) |
| **Higher Degree** | 0.0611*** | -0.0772 | 0.0839*** | 0.0742*** | 0.0707 | 0.0862*** | -0.0064 | 0.0756 | 0.0006 |
| | (0.018) | (0.132) | (0.024) | (0.013) | (0.186) | (0.016) | (0.012) | (0.119) | (0.015) |
| **Risk Averse** | -0.0966*** | -0.0195 | -0.0685*** | -0.0784*** | -0.0069 | -0.0531*** | -0.0412*** | -0.0108 | -0.0313*** |
| | (0.015) | (0.016) | (0.014) | (0.010) | (0.012) | (0.009) | (0.010) | (0.012) | (0.009) |
| **No Cash** | -0.1534*** | -0.0359* | -0.1084*** | -0.0832*** | 0.0026 | -0.0597*** | -0.0353** | -0.0004 | -0.0293** |
| | (0.019) | (0.021) | (0.018) | (0.015) | (0.019) | (0.014) | (0.015) | (0.018) | (0.014) |
| **Med. Planning Horizon** | 0.0213 | -0.0298* | -0.0058 | -0.0097 | -0.0141 | -0.007 | -0.0017 | -0.0251** | -0.0096 |
| | (0.016) | (0.015) | (0.014) | (0.011) | (0.013) | (0.010) | (0.011) | (0.012) | (0.010) |
| **Long Planning Horizon** | -0.0124 | -0.0455*** | -0.0254** | -0.016 | -0.017 | -0.0102 | 0.009 | -0.0143 | 0.0036 |
| | (0.014) | (0.015) | (0.013) | (0.010) | (0.012) | (0.010) | (0.010) | (0.012) | (0.010) |
| **Fair Health** | 0.0624** | 0.0324 | 0.0590*** | 0.0379* | -0.0371 | 0.0169 | 0.0208 | -0.0051 | 0.0116 |
| | (0.025) | (0.026) | (0.022) | (0.020) | (0.027) | (0.019) | (0.024) | (0.029) | (0.022) |
| **Good Health** | 0.0918*** | 0.0226 | 0.0813*** | 0.0551*** | -0.0413 | 0.0322* | 0.0461** | -0.0102 | 0.0254 |
| | (0.024) | (0.029) | (0.023) | (0.019) | (0.029) | (0.019) | (0.022) | (0.029) | (0.022) |
| **Age Pension** | -0.0033 | -0.0363 | -0.0213 | -0.0043 | -0.0513** | -0.0302 | -0.0122 | 0.0145 | 0.0011 |
| | (0.019) | (0.025) | (0.019) | (0.021) | (0.024) | (0.019) | (0.021) | (0.023) | (0.019) |
| **Overseas Pension** | -0.0305 | -0.0413 | -0.0349 | -0.0467* | 0.0630* | -0.0158 | 0.0258 | 0.0084 | 0.0183 |
| | (0.029) | (0.046) | (0.032) | (0.026) | (0.035) | (0.026) | (0.028) | (0.037) | (0.028) |
| **Arriving Post 1992** | -0.0905 | | -0.0341 | -0.0267 | | -0.0394 | -0.0025 | | -0.0066 |
| | (0.079) | | (0.098) | (0.035) | | (0.043) | (0.029) | | (0.037) |
| **Wave 6** | 0.0126 | -0.1037 | 0.0122 | 0.0388*** | 0.1757 | 0.0323*** | | | |
| | (0.014) | (0.123) | (0.011) | (0.010) | (0.167) | (0.008) | | | |
| **Wave 10** | -0.019 | -0.2566 | -0.0197 | 0.0042 | 0.2939 | 0.0002 | | | |
| | (0.015) | (0.245) | (0.013) | (0.011) | (0.334) | (0.009) | | | |
| **Retired*Income** | 0.1980*** | -0.0196 | 0.1069** | 0.0841*** | 0.0021 | 0.0583** | -0.0387 | -0.0784** | -0.0500* |
| | (0.049) | (0.056) | (0.046) | (0.031) | (0.035) | (0.028) | (0.033) | (0.037) | (0.030) |

Gender does not seem to play a role in the proportion of risky assets held as this is tested using the singles sample. The coefficients for being male in both OLS and RE models are negative, although only the OLS result is statistically significant. With respect to the indicators for marriage status, divorced and widowed have positive effects in the proportion of risky assets held (only the OLS coefficient for widowed is negative) although only the OLS and RE coefficients are statistically significant. The positive results are likely due to an increase in assets after divorce or with the death of a partner.

Interestingly, income and income squared does not seem to have an effect on the proportion of risky assets held by single households. The coefficients are negative for both covariates and not of statistical significance. For couple households, only the household head's coefficients from the FE model are statistically significant and negative in age and positive in age squared. This is baffling as the a priori expectation is for negative and positive for the coefficients respectively.

The results from all three models indicate individuals from a non-English speaking background in both single and couple households decrease their risky financial assets holdings. The results for education levels are mixed. The coefficients from the FE models are largely statistically insignificant. While those from OLS and RE are mainly positive and statistically significant indicating that those with higher levels of education tend to increase the amount of risky asset holdings. This is in line with expectations. Those with higher education would have more financial literacy and the more confidence to invest in risky financial assets.

Individual preferences in terms of risk aversion and planning horizon have been included in the models. As expected, those individuals in both types of households who are risk averse would hold less risky financial assets. Furthermore, individuals who indicate that they have no cash for investments would hold less proportion of risky financial asset holdings in both the OLS model and RE model which are both statistically significant. However, for the FE result, only the no cash coefficient is statistically significant for the single households. Those individuals with medium and long planning horizons in both types of households tend to hold less proportion of

risky financial asset holdings. This is most evident in the single households and those with long planning horizons who exhibit more conservative behaviour regarding risky financial asset holdings. This is in direct contrast with the finding from Cardek & Wilkins (2008) who found a longer planning horizon led to the individual being less likely to hold risky assets.

Fair and good health statuses generally have a positive influence on the proportion of risky financial assets held. This is to be expected as those with a worse health status are less likely to hold risky assets due to bequest motives or high health costs. Whether or not the individual is receiving the Age Pension in Australia or an overseas pension does not seem to have an effect on risky financial asset holdings. This is due to only the coefficients for the household head in the OLS and FE models being statistically significant. This indicates some evidence of those receiving the Age Pension decreasing the proportion of risky financial assets in the FE model and also those receiving the overseas pension increasing the proportion of risky financial assets held. This result seems to support the theory that some couple households are using the overseas pension to invest in the stock market which is not so for those receiving Australian pensions. The results also show that those who arrived in Australia after 1992 tend to decrease the proportion of risky financial assets held although none of the coefficients are statistically significant.

*Retirement Intentions and Risky Assets Holdings*

Next we turn to older Australian households in HILDA that are considered employed, in order to examine this group's retirement intentions and labour income risks. The HILDA data contains information on retirement intentions of those over the age of 45 and not retired. Given this information, we consider the effect of retirement intention on risky asset holdings of the employed single and couple household samples. We constructed a variable that indicates how many years the individual is from her intended retirement age and also used an indicator for those who do not intend to retire. The results are in Table 3.

The coefficient on the variable of interest, the difference between actual age and the intended retirement age, is positive for individuals in single households and

**Table 3: Retirement Intention and Risky Financial Assets – Single Households and Couple Households**

| Independent Variable | Single Households | | | Couple Households | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Household Head | | | Partner | | |
| | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects |
| | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | |
| | | | | | *Retirement Intention* | | | | |
| **Intended Retirement Age** | 0.0001 | 0.0007** | 0.0003 | 0.0004** | 0.0001 | 0.0002 | -0.0003** | -0.0002 | -0.0003* |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Not Retiring** | -0.0205 | -0.0576* | -0.0306 | -0.0177 | -0.0065 | -0.0187 | -0.0227 | -0.0255 | -0.0177 |
| | (0.029) | (0.034) | (0.027) | (0.016) | (0.020) | (0.015) | (0.019) | (0.024) | (0.019) |
| | | | | | *Labour Income Characteristics* | | | | |
| **Self Employed** | -0.0894*** | -0.0404 | -0.0629** | -0.0723*** | -0.0286* | -0.0606*** | -0.0376** | 0.0209 | -0.0165 |
| | (0.028) | (0.045) | (0.030) | (0.011) | (0.017) | (0.011) | (0.015) | (0.021) | (0.015) |
| **Casual Employment** | -0.0069 | 0.0223 | 0.0038 | -0.0355*** | 0.0322* | -0.0077 | -0.0064 | -0.0044 | -0.0078 |
| | (0.022) | (0.028) | (0.022) | (0.013) | (0.018) | (0.013) | (0.012) | (0.016) | (0.012) |
| **Finance Industry** | -0.0089 | -0.1141 | -0.0295 | 0.0375 | 0.0378 | 0.0508* | 0.0349 | 0.0026 | 0.0285 |
| | (0.067) | (0.109) | (0.071) | (0.027) | (0.054) | (0.030) | (0.026) | (0.049) | (0.029) |
| | | | | | *Household Characteristics* | | | | |
| **No. of Resident Children** | -0.0279** | -0.0399 | -0.0268* | -0.0066 | -0.0091 | -0.007 | | | |
| | (0.013) | (0.027) | (0.015) | (0.004) | (0.010) | (0.005) | | | |
| **Net Worth** | 0.0179*** | -0.0032 | 0.0142*** | 0.0035*** | 0 | 0.0027*** | | | |
| | (0.005) | (0.007) | (0.005) | (0.001) | (0.001) | (0.001) | | | |
| **Net Worth Squared** | -0.0002 | 0.0002 | -0.0001 | -0.0000*** | 0 | -0.0000** | | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | | |
| **Business Equity** | -0.0078 | -0.0103* | -0.0104** | -0.0046*** | 0.0004 | -0.0031*** | | | |
| | (0.005) | (0.006) | (0.004) | (0.001) | (0.001) | (0.001) | | | |
| **Home Equity** | -0.0133*** | -0.0067 | -0.0107** | -0.0012 | -0.001 | -0.0012 | | | |
| | (0.005) | (0.008) | (0.005) | (0.001) | (0.002) | (0.001) | | | |
| **Property Equity** | -0.0112** | 0.0021 | -0.0061 | -0.0012* | 0.0004 | -0.0008 | | | |
| | (0.005) | (0.007) | (0.005) | (0.001) | (0.001) | (0.001) | | | |
| | | | | | *Individual Characteristics* | | | | |
| **Age** | 0.0007 | -0.0402* | -0.0084 | 0.0320*** | 0.0569*** | 0.0292*** | -0.008 | -0.0258 | -0.0051 |
| | (0.014) | (0.021) | (0.014) | (0.010) | (0.021) | (0.011) | (0.007) | (0.017) | (0.007) |
| **Age$^2$** | -0.0024 | 0.0370** | 0.0051 | -0.0284*** | -0.0368** | -0.0254*** | 0.0067 | 0.0095 | 0.0032 |
| | (0.011) | (0.018) | (0.012) | (0.009) | (0.016) | (0.010) | (0.007) | (0.013) | (0.007) |
| **Male** | -0.025 | | -0.0067 | | | | | | |
| | (0.019) | | (0.024) | | | | | | |
| **Divorced** | 0.0708*** | 0.0196 | 0.0579** | | | | | | |
| | (0.021) | (0.088) | (0.028) | | | | | | |

**Table 3: Retirement Intention and Risky Financial Assets – Single Households and Couple Households (Continued)**

| Independent Variable | Single Households | | | Couple Households | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Household Head | | | Partner | | |
| | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects | Pooled OLS | Fixed Effects | Random Effects |
| | Coefficient (Standard Error) | | | Coefficient (Standard Error) | | | Coefficient (Standard Error) | | |
| | | | | *Individual Characteristics* | | | | | |
| **Widowed** | 0.0316 | | 0.0257 | | | | | | |
| | (0.030) | | (0.038) | | | | | | |
| **Income** | 0.0359 | -0.0242 | 0.0241 | -0.0083 | -0.0297 | -0.0085 | 0.0458*** | 0.0258 | 0.0372** |
| | (0.040) | (0.040) | (0.035) | (0.013) | (0.018) | (0.013) | (0.017) | (0.020) | (0.016) |
| **Income^2** | 0.0065 | 0.0009 | -0.0043 | -0.001 | 0.0032 | -0.0003 | -0.0031 | 0.006 | -0.0015 |
| | (0.019) | (0.018) | (0.016) | (0.002) | (0.003) | (0.002) | (0.003) | (0.005) | (0.003) |
| **NESB** | -0.0509* | | -0.0501 | -0.0219 | | -0.0283 | -0.0031 | | -0.0044 |
| | (0.029) | | (0.038) | (0.014) | | (0.018) | (0.015) | | (0.018) |
| **High School** | 0.0334 | -0.0414 | 0.0453 | 0.0351** | -0.0294 | 0.021 | -0.0084 | 0.1338* | 0.0037 |
| | (0.033) | (0.128) | (0.043) | (0.016) | (0.131) | (0.020) | (0.013) | (0.078) | (0.017) |
| **Diploma or Certificate** | 0.0327 | -0.0257 | 0.041 | 0.0410*** | 0.0111 | 0.0450*** | 0.0099 | 0.0692* | 0.0102 |
| | (0.021) | (0.066) | (0.025) | (0.011) | (0.087) | (0.013) | (0.011) | (0.041) | (0.013) |
| **Higher Degree** | 0.0463** | -0.0601 | 0.0636** | 0.0550*** | -0.0722 | 0.0597*** | -0.0077 | 0.0229 | 0.0019 |
| | (0.023) | (0.126) | (0.029) | (0.013) | (0.192) | (0.016) | (0.012) | (0.099) | (0.015) |
| **Risk Averse** | -0.0546*** | -0.0194 | -0.0451** | -0.0463*** | -0.0230* | -0.0385*** | -0.0230** | 0.0041 | -0.0143 |
| | (0.020) | (0.024) | (0.019) | (0.010) | (0.014) | (0.010) | (0.009) | (0.013) | (0.009) |
| **No Cash** | -0.0774*** | -0.0254 | -0.0698*** | -0.0360** | 0.0278 | -0.0197 | 0.0061 | 0.0228 | 0.0055 |
| | (0.027) | (0.033) | (0.026) | (0.016) | (0.022) | (0.016) | (0.015) | (0.020) | (0.014) |
| **Med. Planning Horizon** | 0.0299 | 0.033 | 0.0285 | 0.0046 | 0.0095 | 0.0076 | -0.0329*** | -0.024 | -0.0280** |
| | (0.024) | (0.025) | (0.021) | (0.012) | (0.015) | (0.012) | (0.012) | (0.015) | (0.011) |
| **Long Planning Horizon** | 0.0053 | -0.021 | -0.0088 | -0.0294*** | -0.008 | -0.0205** | -0.0188* | -0.0061 | -0.0125 |
| | (0.020) | (0.023) | (0.019) | (0.010) | (0.014) | (0.010) | (0.010) | (0.014) | (0.010) |
| **Fair Health** | 0.1483*** | -0.059 | 0.0858** | -0.017 | -0.0238 | -0.0131 | 0.0328 | 0.0557 | 0.0437 |
| | (0.044) | (0.058) | (0.042) | (0.042) | (0.055) | (0.039) | (0.029) | (0.038) | (0.029) |
| **Good Health** | 0.1567*** | -0.1212** | 0.0726* | 0.0013 | -0.0316 | -0.002 | 0.0398 | 0.0369 | 0.0463* |
| | (0.042) | (0.058) | (0.041) | (0.041) | (0.057) | (0.039) | (0.028) | (0.037) | (0.027) |
| **Age Pension** | -0.0937** | -0.1226** | -0.0968** | -0.0341 | -0.0852* | -0.0628* | 0.0306 | 0.0793* | 0.0524* |
| | (0.044) | (0.062) | (0.044) | (0.034) | (0.047) | (0.033) | (0.031) | (0.045) | (0.031) |
| **Overseas Pension** | 0.0856 | -0.0707 | 0.0262 | -0.0108 | 0.0839 | 0.0135 | 0.1275*** | 0.1631** | 0.1268** |
| | (0.117) | (0.109) | (0.099) | (0.049) | (0.083) | (0.053) | (0.049) | (0.081) | (0.052) |
| **Arriving Post 1992** | -0.2081* | | -0.1869 | -0.0149 | | -0.0129 | -0.025 | | -0.0367 |
| | (0.106) | | (0.134) | (0.032) | | (0.040) | (0.027) | | (0.035) |
| **Wave 6** | 0.0359* | 0.0497*** | 0.0418** | 0.0351** | -0.0294 | 0.021 | 0.0397*** | 0.0343*** | 0.0384*** |
| | (0.020) | (0.014) | (0.017) | (0.016) | (0.131) | (0.020) | (0.010) | (0.008) | (0.009) |
| **Wave 10** | -0.0013 | 1.6913*** | 0.0026 | 0.0410*** | 0.0111 | 0.0450*** | 0.0048 | | 0.0049 |
| | (0.024) | (0.586) | (0.022) | (0.011) | (0.087) | (0.013) | (0.012) | | (0.011) |

household heads in couple households across all three models. It is statistically significant for the fixed effects model. A positive coefficient indicates that an one year increase in the difference between actual age and retirement age, i.e. the individual is retiring later, leads to an increase in the proportion of risky assets held. However, the coefficient on the difference is negative for partners, which is not expected. A possible explanation for this is given the financial assets are held jointly, the interaction between couples retirement intentions may not be captured. More interestingly, those individuals who indicated that they do not intend to retire tend to hold a smaller proportion of risky financial assets. This may be a result of possible bequest motives or other factors at play.

For this employed sample, labour income risks are also taken into consideration. Whether an individual is self-employed is an indicator for risky labour income, as those under self-employment would have more uncertain income. The results from all three models show that there is a negative relationship between self-employment and the proportion of risky financial assets held by a household (both single and couple). The coefficients are statistically significant in most models and for singles and household heads. Casual work is used as proxy for risky human capital. In this case, the results are mixed. The results are only statistically significant for household heads in the OLS and FE models. The coefficients are not of the same sign. We would expect the coefficient to be negative as being in casual employment has an element of risk attached and it is only the case in the OLS model.

Individuals working in the financial services industry is a proxy for risky human capital. For single households there is a negative relationship while for couple households the relationship is generally positive. Only the fixed effects estimate for household heads is statistically significant. One possibility that may partially explain the positive relationship is that many working in the financial services industry are encouraged to buy shares in their company and may not realise their double exposure. Overall, there is little evidence to support a relationship between being in the financial services industry and the proportion of risky financial assets held.

Comparing the household and individual characteristics' coefficients with those from the full sample, i.e. both retired and employed households are included, the conclusions are similar.

**Discussion**

The central question being examined in this paper is the relationship between retirement and the proportion of risky assets held. In particular, we consider the older Australian population, those over the age of 45, as they would likely to make decisions relating to retirement and retirement finances.

Firstly we consider single and couple households and the relationship between retirement and risky financial asset holdings. We find some evidence of decrease in proportion of risky assets for retired single households. However, for couple households, if either the household head or their partner is retired, the relationship is positive but if both are retired then they tend to hold a lower proportion of risky financial assets. This indicates the financial decision is made jointly by the household and as one party remains in the job market, it offers a safety net for the household to invest in riskier financial assets compared to those households where the couple is completely retired from the job market.

Next we examine the relationship between retirement intentions and the proportion of risky financial assets. Here we assume that the individual is forward looking when it comes to investment and retirement, i.e. how far away they are from their planned retirement age plays a role in their investment choices. Taking the sample of single and couple households still employed, we find some weak evidence of retirement intentions impacting on the proportion of risky financial assets held – an increase in the difference between the individual actual age and their intended retirement age leads to an increase in the proportion of risky assets held. However this result is not statistically significant for all models and is negative for partners in couple households.

The evidence of some support for the hypothesis is of interest to policymakers as their objective is to ensure the elderly have adequate and secure income for retirement and are not overly reliant on government transfers. Evidence in support of the hypothesis

is not overwhelming. This may be partially due to the fact that many Australians of the age 45 and above have few assets outside of their superannuation account and own home, and many have poor financial skills. Policymakers should ensure older Australians choose (or be directed to) safer asset allocations for their superannuation accounts in order to safeguard their retirement savings. In 2011, the total risky asset allocation of default investment strategy for Australian funds is 63% (Australian Prudential Regulation Authority, 2012), which could be considered risky for those who are retired and have depleted their human capital. Both policymakers and superannuation funds should consider developing investment strategies specific to individuals reaching retirement and in the post retirement phase. These could include life cycle and target date funds, where the asset allocation in the portfolio changes as the person ages or approaches specific target dates.

Another important question for policymakers is whether the means tested Age Pension acts as an incentive to engage in risky investment behaviour. From the preliminary results, this does not seem to be the case – for both single and couple households, receiving an Age Pension is associated with a reduction in the holdings of risky assets. This could be due to pensioners not having the financial capacity to invest outside superannuation.

An avenue for further study is the use of an instrumental variable in the estimation of data with possible endogeneity. A possible instrumental variable candidate is the change in women's Age Pension eligibility age as since 1995 there has been steps taken by the government to shift women's pension eligibility age to be in line with men's. This is a viable instrumental variable as it is correlated with the decision of retirement but not correlated with the proportion of risky assets held by the household. Therefore, using change in the policy as an instrumental variable can potentially lead to consistently estimate parameters given unobserved effects. This will be investigated in further work.

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