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**What About Super?
Financial Literacy as a Barrier to Market Entry**

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Warwick-Monash Economics Student Papers

September 2021

No: 2021-02

ISSN 2754-3129 (Online)

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Recommended citation: Boykett, P. (2021). What about super? Financial literacy as a barrier to market entry. *Warwick Monash Economics Student Papers* 2021/02.

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¹ Warwick Economics would like to thank Lory Barile, Gianna Boero, and Caroline Elliott for their contributions towards the selection process.

What About Super?

Financial Literacy as a Barrier to Market Entry

Paul Boykett*

ABSTRACT

A majority of households do not invest their savings and fewer make voluntary contributions to superannuation. This may increase their risk of financial hardship in later life and has raised questions about the role of governments and educators in addressing barriers to market entry. Our probit model framework measures the effect of financial literacy on market participation and contributes new evidence by analysing superannuation and demographical heterogeneity in market barriers. Results indicate that poor financial literacy deters voluntary superannuation contributions and traditional investment, particularly for low-income households. Evidence also suggests that financial advice facilitates market entry while improving financial literacy could shift investor's financial market exposure towards superannuation in later life. These findings enrich our understanding of market barriers and help to guide superannuation policy.

* I owe great thanks to Isaac Gross for his wisdom and patience as my supervisor.
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1. INTRODUCTION

The financial environment for households and individuals continues to increase in complexity. Contrasting this is a growing body of research that highlights a poor understanding of fundamental financial concepts among many adults. This dichotomy poses a problem to households and may prevent them from engaging with markets that play an important role in supporting their financial security. A host of factors have been identified as potential barriers to accessing financial products. Numeracy skills, cognitive ability and risk aversion are commonly cited¹. Studies on welfare costs, inertia and a general mistrust in markets provide less conclusive evidence². This lack of consensus opens the door for a more general interpretation of market barriers. Financial literacy, defined simply as the skillset required to make informed financial decisions, is a particularly useful concept for this analysis. By acting as a proxy for various factors and applying them in the right context, financial literacy offers a broad definition by which we can assess a household's ability or willingness to engage with financial markets.

Research on financial literacy gained popularity around the turn of the 21st century as economists became increasingly interested in the public's financial knowhow. Early papers developed a formal definition and measurement framework for financial literacy, revealing that approximately one third of adults are considered financially illiterate³. These findings were grimmer than expected, shifting focus to the consequences of poor financial literacy in an environment where households are increasingly charged with pecuniary decision making⁴. Wealth accumulation and retirement preparation dominate this space and to a lesser extent, financial market participation. The latter is commonly referred to as the 'stock-holding puzzle'

¹ Almenberg & Widmark (2011); Lusardi (2012); Christelis et al. (2008); Vissing-Jorgenson & Attanasio (2003)

² Calvet et al. (2006); Kezdi & Willis (2003); Guiso et al. (2005)

³ Lusardi & Mitchell (2007); Almenberg & Widmark (2011)

⁴ Almenberg & Widmark (2011); van Rooij et al. (2011); Johnson & Sherraden (2007)

and questions the persistence of households who shy away from investment markets. Despite its status as an educated, high-income country, this issue extends to Australia where only 30% of households invest in financial markets⁵. Governments and regulators are interested in policies that address market barriers while many academics call for better financial education. But less attention has been given to financial advice as a tool for improving market participation⁶. To broaden our discussion, we consider if both financial literacy and financial advice are antidotes for the stock-holding puzzle.

Van Rooij et al. (2011) and Almenberg & Widmark (2011) have shown that financial literacy influences participation in financial and real estate markets. But these papers ignore all investment taking place via superannuation, an important form of market exposure for many households. They also reveal important demographical trends. For example, Figure 1 illustrates how older people and high-income earners are far more likely invest their savings and tend to exhibit better financial literacy. But little is known about heterogeneity in the *effects* of financial literacy. In this paper we hypothesise that (1) financial literacy also influences barriers to entry via superannuation and that (2) the effect of financial literacy on market participation is a factor of demographical heterogeneity. Doing so, we investigate a previously ignored avenue of investment and seek greater detail about the nature of market barriers. The discussion is then enriched by considering whether (3) financial advice is an important determinant of market participation, including superannuation, and (4) if financial literacy influences the effectiveness of advice. Our paper also differs from previous research by focusing on the most financially literate member of each household (referred to as the representative agent), allowing us to gain a new perspective on decision making and market participation.

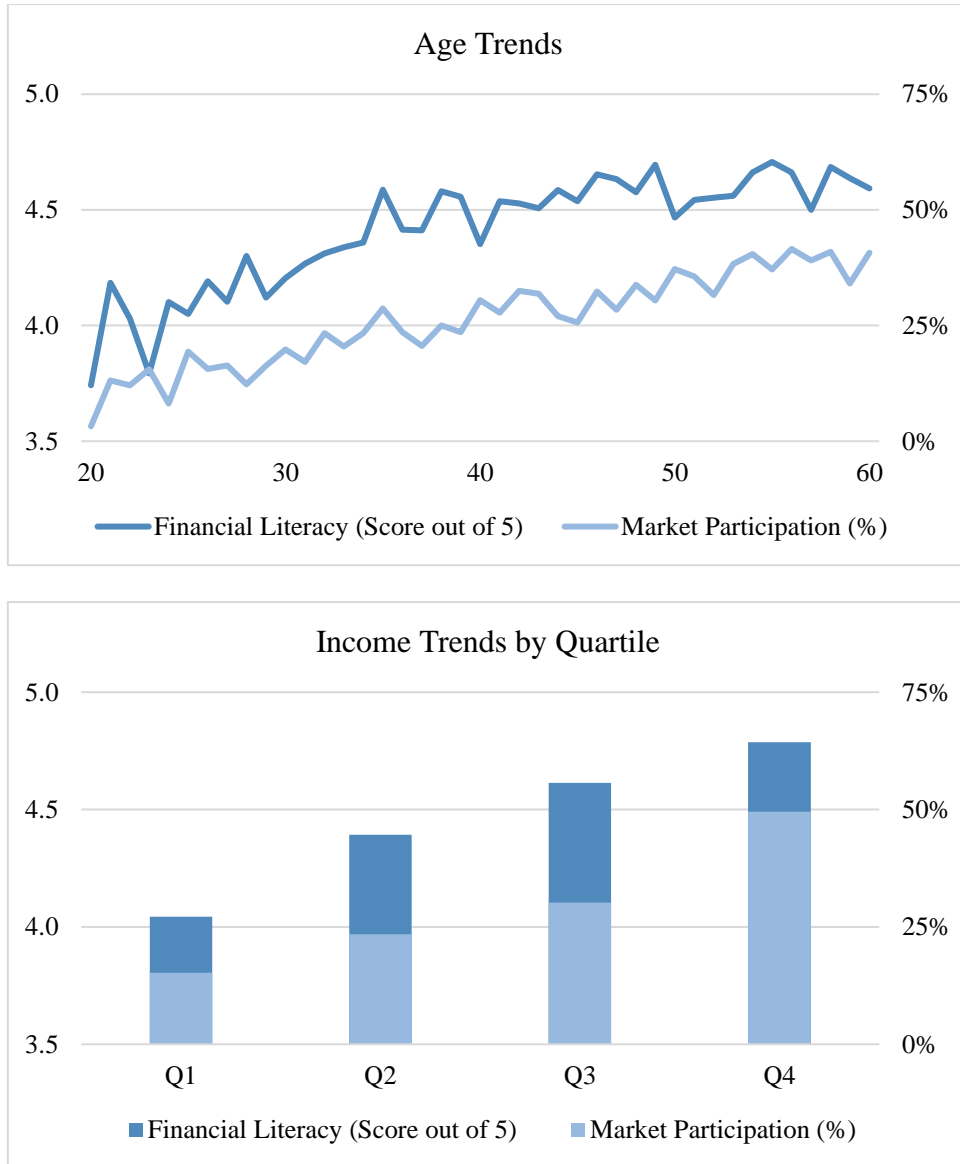
⁵ Australia and New Zealand Banking Group (2014)

⁶ Georgarakos & Inderst (2011) discuss financial advice and stock market participation but not in conjunction with financial literacy

Figure 1

Top: Financial Literacy and Market Participation by Age

Bottom: Financial Literacy and Market Participation by Income Quartiles



To answer these questions, we use micro-level panel data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. Australia is one of the few countries to conduct an annual nationwide survey that assesses financial literacy and an extensive range of other key variables, including the receipt of financial advice and details about superannuation choices. This has allowed us to try new identification techniques and test a novel fixed effects

framework which uses first-differenced data to address endogeneity concerns. We also have a unique opportunity to comment on upcoming changes in Australian superannuation law. To name an example, mandatory employer contributes are currently legislated to increase from 9.5% to 12% by 2025, raising a debate about individual's welfare after increasing their exposure to superannuation⁷. By focusing on recent local trends in financial literacy and superannuation contributions, our results help to inform discussions about these changes and guide future policy which aims to improve welfare outcomes in later life.

Our analysis begins with traditional investment where results indicate that the effect of financial literacy on non-superannuation market participation is positive and convex. The magnitude of this effect is larger for more financially literate households (convex) and for those with higher income but becomes smaller with age. Now focusing on superannuation, an equivalent change in financial literacy is expected to increase the likelihood of participation but to a lesser degree. The effect on superannuation contributions also increases with income and age but is not materially affected by financial literacy levels (not convex). Finally, we assess the effect of financial advice on both forms of market participation. Advice is estimated to increase all forms of participation and both effects are on average stronger for households with lower levels of financial literacy. While precision varies across different versions of these models, our results appear to withstand several robustness checks for alternative specification and estimation techniques.

Compared to Van Rooij et al. (2011) and Almenberg & Widmark (2011), these results provide considerably more detail about heterogeneity in the effects of financial literacy and extends the discussion to include superannuation and financial advice. The age effect of

⁷ The Grattan Institute's 2018 report *Money in Retirement More than Enough* argues that individuals will not benefit from higher employer contributions because employers are likely to pass on the additional expense via lower wages and slower wage growth. However, award rate earners, a high-risk group for financial distress in later life, are more likely to benefit.

financial literacy is opposite for each avenue of market participation, demonstrating that financially literate households may be more likely to shift their investments to superannuation in later life. Interacting financial literacy with income then appears to identify a multiplier effect where low-income earners are even more susceptible to financial literacy market barriers. The increased effect of advice for less financially literate households is intuitive but helps to guide policy makers seeking to address market barriers if they are to consider improving access to financial planners. Our framework used to derive the latter result can also assist future researchers in addressing robustness concerns by removing endogenous fixed effects. More generally, we note that if governments wish to boost savings upon retirement, improving financial literacy may be a valid alternative to increasing employer contributions. By enriching the understanding of financial literacy as a barrier to market entry, our results have meaningful implications for the stock-holding puzzle and help to identify targets areas for retirement preparation policy.

2. BACKGROUND

2.1 Defining & Measuring Financial Literacy

Understanding financial literacy begins with a definition. Or many. Drawing on various sources, Remund (2010) provides a summary of the typical descriptions of financial literacy utilised in relevant literature:

1. Knowledge of financial concepts
2. Ability to communicate about financial concepts
3. Aptitude in managing personal finances
4. Skills in making appropriate decisions
5. Confidence in planning effectively for future financial needs

If we were to condense these further, a common trend among our range of definitions is the acquisition and utilisation of financial information. Clearly the understanding of what financial literacy means is broad and somewhat subjective. In turn, the survey questions and variables employed in empirical studies is equally diverse. In 2002 the United States Federal Reserve Bank asked consumers 28 questions about credit, saving habits (including questions about the stock market and financial instruments), mortgages and their general approach to personal finances⁸. Questions could be self-assessed such as “I manage my finances well” (yes/no or rated on some scale) or objective such as “stocks are typically more volatile than bonds” (true/false). Each category offers different insights into the measurement and understanding of financial literacy given that behaviour may be driven by a subjective understanding of financial concepts.

Lusardi & Mitchell (2006) take a more streamlined approach than The Federal Reserve Bank, developing five simple questions for the United States Health and Retirement Study (HRS) which analyse concepts such as inflation and interest rate compounding. These five questions have since been broadly adopted in literature that assesses basic financial literacy and are the inspiration for questions included in Australia’s HILDA survey (which act as our measurement of financial literacy). Using a relatively consistent framework based on these questions, research in the United States⁹, Europe¹⁰ and Australia¹¹ all identify a general deficiency in financial literacy and concentrations of poorer results in demographics such as women, the young and elderly, and those with lower levels of education. These investigative papers also tend to use regression frameworks to identify key determinants of financial literacy.

⁸ Hilgert & Hogarth (2002)

⁹ Lusardi & Mitchel (2006); Campbell (2006); Campbell & Sodini (2009)

¹⁰ Van Rooij et al. (2011); Almenberg & Widmark (2011)

¹¹ Worthington (2006); ANZ Banking Group (2015); Preston (2020)

This additional step has helped pave the way for causal models that assess decision making or financial outcomes by identifying controls for the effect of financial literacy.

2.2 Financial Decision Making & Market Participation

More recent literature exhibits an overarching interest in wealth accumulation and retirement preparation, helping to emphasise the importance of financial literacy in supporting decisions that have a material effect on welfare in later life. This is no simple task. Berhman et al. (2012) demonstrate the complexity of such an analysis by showing that financial literacy may impact outcomes via several channels including understanding of and interaction with pension systems, inherent differences in risk appetite and in selection of a risk profile that matches one's objectives and investment timeframe. In some cases, financial literacy is difficult to identify separately from other factors and may also be subject to reverse causality by way of exposure (or lack thereof) to financial products. As such, various instruments for literacy are employed which vary between studies but typically include exposure to finance and economics education in school or media preferences such as news and wider reading that may improve literacy. These methods are also used to investigate market participation.

Van Rooij et al. (2011) is successful in identifying a positive relationship between financial literacy and engagement with financial markets, while Almenberg & Widmark (2011) find similar results for real estate markets. As mentioned above, they both ignore superannuation because, historically, market participation via superannuation has been the result of mandated employer contributions. Today, many governments are interested in encouraging households to better prepare themselves for retirement, giving rise to various concessions and advantages for people who make voluntary contributions (tax-deductions, government co-contributions etc.). However, superannuation is arguably more complex than traditional forms of investment due to differences in the taxation environment and investment horizon considerations, among other issues. We expect that financial literacy and financial

advice might help households to understand these complexities, hence playing a significant role in unlocking this avenue of market participation for would-be investors.

2.3 Superannuation in Australia

The establishment of industrial awards and superannuation agreements during Australian's labour movement in the 1980's connected thousands of Australians with financial markets for the first time. Mandatory employer contributions were then legislated under the Keating Labour Government in 1992 and today, 64% of Australian's have a superannuation account¹². Lusardi & Mitchell (2007) raise concerns about current levels of retirement preparedness in the United States but contrary to public discourse, a vast majority of Australians are well placed to retire with sufficient resources¹³. Meanwhile, specific groups such as women, indigenous Australians, low-income earners, and employees of the 'gig economy' face a greater risk of financial hardship in later life¹⁴. We are therefore motivated to address barriers to superannuation investment which may lead to poor outcomes in later life.

At the micro level, households are increasingly responsible for managing their own superannuation and face a tremendous number of investment options. The Australian Prudential Regulation Authority (APRA) currently oversees more than 200 superannuation funds, each with their own choice of underlying asset allocation. It is easy to understand why many people are bewildered by the number of options. Australians also tend to overestimate their knowledge about superannuation, suggesting that many are not positioned to make optimal decisions about their future¹⁵. More recently, there has been a surge in early withdrawals after conditions of release were drastically relaxed as part of Australia's COVID-19 response. Many fear that households do not understand the long-term consequences of

¹² As reported by the Australian Tax Office in October 2019

¹³ The Grattan Institute's 2018 report *Money in Retirement More than Enough* also finds that compulsory contributions, non-super savings, and the Aged Pension are well placed to support future retirees.

¹⁴ Ibid

¹⁵ Chardon (2014)

eating into their retirement savings early, begging to question how wider improvements to financial literacy could negate this risk in the future. While such issues are beyond the scope of this paper, they help to emphasise the complexity of financial risks faced by Australian households and illustrate why some may choose to disengage from financial markets completely.

3. METHODOLOGY

3.1 Representative Agent Selection

A distinguishing feature of this research is that our analysis takes place at the household level. Past research has been conducted at the individual level and by nature, assumes the survey respondent is charged with handling their own financial decisions. Instead, we believe it is realistic to assume that households make collective decisions, driven by the most knowledgeable member. We call this knowledgeable person the representative agent and identify them using the results from our financial literacy questionnaire. In essence, we assume that the person with the best financial literacy is charged with financial decision making. Therefore, we analyse market participation for each household, given the financial literacy and demographical characteristics of a representative agent, plus other controlling variables at the household level such as total combined income.

3.2 Econometric Framework

Inspired by Van Rooij et al. (2011) and Almenberg & Widmark (2011), we use micro-level panel data and probit models to predict market participation rates. Our approach adds several novel elements, namely in the introduction of voluntary superannuation contributions as an alternative outcome variable. We also use interaction terms to identify heterogeneous effects of financial literacy at different ages and income levels. Doing so, we extend the discussion to new forms of market participation and reveal further details about the nature of

barriers to entry. We then investigate how an increase in financial literacy, by way of receiving financial advice, may impact market participation over time. The financial advice models formally address endogeneity concerns by using first-differenced data and help to contextualise a market entry tool that has been largely ignored by previous research.

Given our focus on dichotomous outcome variables, we probit models for our framework but briefly discuss the effects of estimation with logit models after presenting our results. Outcomes therefore represent the response probability of market participation. The interpretation of coefficients produced by probit models is however a well-known limitation. We can calculate the marginal effect of financial literacy at each questionnaire score (0 – 5) as well as the average marginal effect for all households. Results become less clear after the addition of interaction terms but provide clear directional trends for our heterogeneity analysis. Overall, the framework is simple, flexible, and well suited to our analysis.

3.3 Endogeneity Issues

We now offer an extensive discussion of internal validity and our identification strategy because this analysis exposes us to several forms of endogeneity. Our primary concern is the direction of causality between financial literacy and market participation because respondents who participate in financial markets may have superior knowledge to those who do not, simply by way of exposure. We would ideally test this hypothesis by investigating financial literacy before and after entering the stock market, but the questionnaire has not been repeated in our data set yet and this project's time constraints do not permit deferral until that occurs¹⁶. Omitted variables are of considerable concern too. Van Rooij et al. (2011) provides a comprehensive discussion about sources of financial information and the influence of peers; variables for which we do not have observations. More generally, a long and inconclusive history of

¹⁶ We expect that the financial literacy survey will appear again in Wave 20 of HILDA, providing an opportunity to investigate this issue in future research.

empirical research indicates there is no clear understanding of what determines financial literacy. Finally, one may criticize our financial literacy index given that the underlying survey is a short sequence of multiple-choice questions. Correctly guessing one answer therefore leads to a 20% spike in measured financial literacy of that individual. Since the survey determines both representative agent selection and the value of our key variable, we acknowledge our exposure to positive bias in the underlying measurement of financial literacy.

Van Rooij et al. (2011) designed an instrument for their financial literacy index by targeting ‘pre-existing financial literacy’ (degree of exposure to economics education in high school, presumed to have taken place prior to engaging with the stock market) and find that two-stage estimation results in higher coefficients for their financial literacy index. In other words, their model understates the effect of financial literacy. We attempted to replicate this approach using variables in HILDA which specify if someone has completed higher education relating to (1) business or (2) social sciences (which includes economics). But these approaches failed Hausman tests for endogeneity and exclude those who did not go to university. Hence, we do not use instrumental variable estimation and our financial literacy models are presumed to be biased. However, we argue that because the specifications of our models were closely informed by Van Rooij et al. (2011), we can assume that the direction of endogeneity bias is negative too. Also bear in mind that our survey only contains one question directly relating to financial products, potentially reducing our exposure to the counter-directional influence of market participation. If these assumptions hold, coefficients for our financial literacy index can be interpreted as a minimum effect.

When analysing financial advice, we exploit our access to panel data and pioneer a fixed effects probit model. Specifically, we evaluate how the receipt of advice impacts market participation in a subsequent period. This model addresses several endogeneity threats by (1) drawing on a sequence of observations that establishes a clear direction of causality and (2)

using first-differenced panel data that removes endogenous fixed effects such as the stock market experience of one's peers. Therefore, we are confident that the results can be interpreted as causal without the need for further assumptions.

3.4 Financial Literacy Models

Model (1) is a basic probit model of market participation as a function of financial literacy. Controls are included for significantly correlated variables, as highlighted in the ANZ Survey of Adult Financial Literacy in Australia (2015) and of general consistency with previous applications of this framework. To assess heterogeneity, we then interact financial literacy with age and income in our extended probit models (2) – (4). This helps us to better understand the relationship between regressors and nuances our discussion of the results. This is particularly true when we investigate superannuation because age and income levels affect the benefit of making contributions (but these benefits may not be understood by financially illiterate persons, hence we expect to find a significant interaction effect). These models take the following form:

$$(1) \quad Y_i = \Phi[\alpha_i + \beta_1 FL_i + \beta_2 \mathbf{X}_i + \varepsilon_i]$$

$$(2) \quad Y_i = \Phi[\alpha_i + \beta_1 FL_i + \beta_2 (FL_i \times Age_i) + \beta_3 \mathbf{X}_i + \varepsilon_i]$$

$$(3) \quad Y_i = \Phi[\alpha_i + \beta_1 FL_i + \beta_2 (FL_i \times Income_i) + \beta_3 \mathbf{X}_i + \varepsilon_i]$$

$$(4) \quad Y_i = \Phi[\alpha_i + \beta_1 FL_i + \beta_2 (FL_i \times Age_i) + \beta_3 (FL_i \times Income_i) + \beta_4 \mathbf{X}_i + \varepsilon_i]$$

Y_i is the market participation outcome (household owns financial assets outside superannuation or voluntarily contributes to superannuation) and FL_i is the financial literacy index for each representative agent. \mathbf{X}_i is a vector of control variables for the representative agent. Age_i is specified nominally while $Income_i$ is added after taking the natural logarithm of total household income. α_i and ε_i are the intercept and error term, respectively.

3.5 Financial Advice Models

We now use a fixed effects framework to model the change in market participation outcomes over time after the receipt of financial advice (5). Financial advice is interacted with financial literacy to assess whether the impact of advice is heterogenous (6). We also interacted financial advice with other variables of interest but found no meaningful results (see Table A.2 in the appendix for further details). These models take the following form:

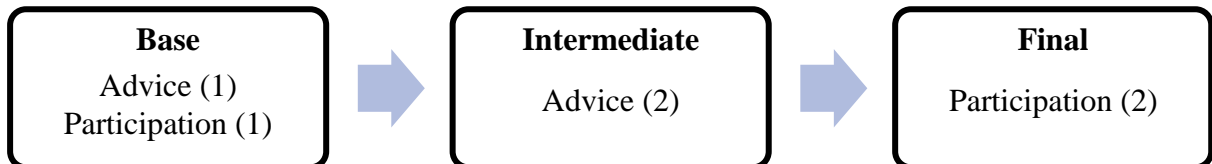
$$(5) \quad Y_{i,t} = \Phi[\beta_1 FA_{i,t} + \beta_2 \mathbf{X}_{i,t} + h_i + u_{i,t}]$$

$$(6) \quad Y_{i,t} = \Phi[\beta_1 FA_{i,t} + \beta_2 (FA_{i,t} \times FL_i) + \beta_3 \mathbf{X}_{i,t} + h_i + u_{i,t}]$$

$Y_{i,t}$ now represents a change in the market participation outcome, taking the possible values of 1 (market entrant) or 0 (no change from period 1). A small number of divestors (-1) were ignored to allow for probit estimation. $FA_{i,t}$ is a dummy variable which takes the value of 1 if a household received financial advice between observation periods. Figure 2 demonstrates the sequence of observations for advice and market participation which establish a clear direction of causality. FL_i is the agent's financial literacy score¹⁷. \mathbf{X}_i is a vector of time variant controls for the representative agent. h_i and $u_{i,t}$ respectively are the heterogenous effects and time variant error, otherwise interpreted together as the idiosyncratic error term.

Figure 2

Sequence of Observations for Financial Advice and Market Participation



¹⁷ Note that we interact financial literacy after taking the first difference of advice because we only have access to a single observation of the questionnaire. Hence, there is no time subscript for this variable.

4. DATA

4.1 HILDA Survey & Time Periods

HILDA (Household, Income and Labour Dynamics in Australia) is a longitudinal survey conducted by The Melbourne Institute since 2001. Since its inception, the number of people interviewed each year has grown to over 20,000. Subject areas broadly include questions regarding labour force participation, financial decision making, education and other key demographic variables. Some questions are asked every year whereas others are repeated at regular intervals. Questions have also been progressively added and removed throughout the lifetime of the survey.

Our financial literacy models use data from ‘Wave 18’ (2018) and ‘Wave 16’ (2016). Wave 18 since it is the most recently released and Wave 16 since it includes some variables not observed in Wave 18, including our financial literacy survey. The fixed effects financial advice models use two observation periods for each variable and rely on older waves where our key variables align with one another. Period 1 is drawn from Waves 6 and 7 and period 2 is drawn from Waves 10 and 11 (corresponding to a 4-year interval for each variable).

4.2 Market Participation

The dependent variables of our models are different classifications of market participation, captured at the household level. This distinction between avenues of investment is a definitive characteristic of this paper and sets it apart from previous research. The first outcome option is traditional financial market participation, defined as ownership of financial assets (excluding superannuation). The second option is our main contribution to the literature; market participation via superannuation. The latter is defined by making *voluntary* contributions to superannuation since we intend to analyse the effect of financial literacy on cognisant decision making rather than trends in mandatory employer contributions.

Financial asset ownership is identified using a single question where households can nominate if they invest outside of superannuation. This includes ASX listed investments, bonds, managed funds and various other instruments. Respondents are specifically instructed to ignore superannuation resources when answering this question. As identified in Table 1, 29% of households said they owned financial assets in 2018. Financial asset owners are nearly twice as likely to contribute to superannuation than non-participants, indicating that market participation between both avenues is highly correlated. These market participants are also comparatively more financially literate, have a higher chance of using financial advice, and come from older and wealthier households.

HILDA asks various questions about superannuation contributions. We have used the response to 4 questions which identify if a respondent makes voluntary contributions. Wording is not consistent across all questions and does not specify the regularity of these contributions in all cases, so we have simply defined a contributing household as one providing a positive response to any of these questions. The full survey can be found in the appendix (Figure A.1). Compared to 29% of households who own investments outside of superannuation, 21% make voluntary contribution to superannuation. This is clearly a less favoured avenue of market participation but begs to question whether this lower figure may be improved by increasing a household's financial literacy. The average level of financial literacy among contributors to superannuation is slightly lower than other investors but compared with non-market participants, investors inside and outside of superannuation exhibit much better financial knowledge. Households contributing to superannuation are on average significantly older and wealthier but are expected to have slightly lower income than other investors. This is likely a reflection of older people engaging more with superannuation as they transition to retirement. Both investor groups are equally more likely to have received financial advice than non-market participants.

Table 1*Summary Statistics for Market Participants*

Variable of Interest	HILDA (Total Sample)	Financial Asset Owners	Contributors to Superannuation
Owns Financial Assets	0.29 (0.45)	1.00 (0.00)	0.47 (0.50)
Contributes to Superannuation	0.21 (0.41)	0.41 (0.49)	1.00 (0.00)
Financial Literacy Score	3.90 (1.29)	4.75 (0.57)	4.71 (0.65)
Received Financial Advice	0.41 (0.49)	0.56 (0.50)	0.56 (0.50)
Age	37.93 (23.36)	50.12 (13.60)	53.95 (11.93)
Income	112,760 (71,445)	141,698 (76,186)	131,760 (71,584)
Wealth	800,411 (1,149,018)	1,241,353 (1,338,204)	1,128,870 (1,315,718)

Note: Mean given for each variable with standard deviation in the parenthesis

4.3 Financial Literacy & Financial Advice

Financial literacy questions were first included in Wave 16 (2016) of HILDA and are yet to be subsequently observed. The survey includes five objective questions that assess basic financial literacy and are consistent with those originally developed by Lusardi & Mitchell (2006) for the United States HRS. The questions cover a range of topics and have been widely adopted in similar literature. Some examples of the questions are shown below while the full survey can be found in the appendix (Figure A.2).

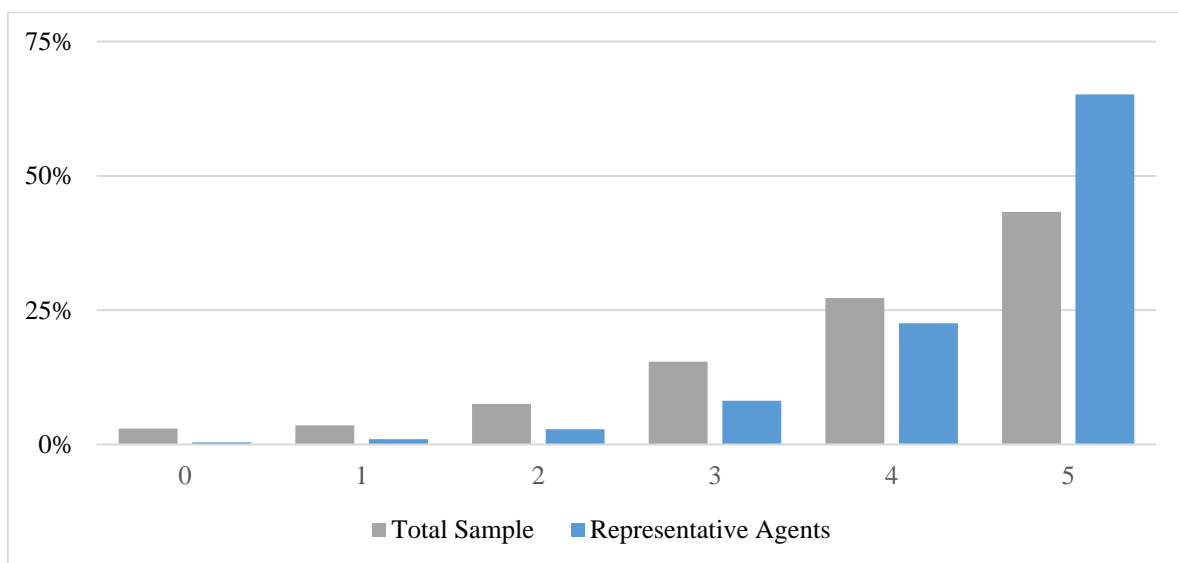
“Buying shares in a single company usually provides a safer return than buying shares in a number of different companies.” (True or false?)

“Suppose that by the year 2020 your income has doubled, but the prices of all of the things you buy have also doubled. In 2020, will you be able to buy more than today, exactly the same as today, or less than today with your income?”

Survey responses for each person are used to construct a score out of five where one point is awarded for each correct answer. We define a financially literate person (or agent) as one who scores at least 4 points. With our representative agent sample, we can distinguish between observations for an average Australian with those who are more likely to be charged with financial decision making. Results for the questionnaire are presented in Figure 2.

Figure 2

Distribution of Financial Literacy Scores



In the total sample, it is pleasing to see that frequencies increase with the financial literacy score. However, there is a clear deficiency in financial literacy for a material portion of the total population. Although 43.3% of respondents received a full score, 38.5% are considered financially illiterate. After considering our exposure to positive bias in the questionnaire, these results reflect a best-case scenario for Australia’s financial literacy status. The distribution for our representative agents is obviously skewed further right given that the sample is restricted to the maximum score for each household. Notably, we see a 50.3% increase in the number of maximum scores and only 12.4% of households are without a financially literate representative agent. When we shift the analysis from individuals to households, the picture of financial literacy in Australia becomes a lot more optimistic.

HILDA is however yet to include questions that assess more advanced financial literacy. Van Rooij et al. (2011) and Almenberg & Widmark (2011) both constructed an advanced financial literacy index which included more demanding calculations and specific questions about financial instruments. Almenberg & Gerdes (2012) also demonstrate that people with the highest levels of financial literacy are most likely to make accurate estimations about exponential growth over long time horizons, suggesting that advanced financial literacy would be particularly useful in our superannuation models. Ideally, we would have an index for both levels of financial literacy and note this as an opportunity for future research.

We also consider how financial advice may impact market participation. Conceptually, this is similar to financial literacy and may be interpreted as an increase in financial literacy. As part of HILDA, prospective retirees are asked “have you sought any advice or information to help plan for your retirement?”. Unlike the financial literacy questionnaire, this question has been repeated in four-year intervals, providing the basis for our fixed effects model which uses first-differenced data to remove unobserved heterogeneity. This variable allows us to address endogeneity issues faced by previous studies although our sample becomes limited to agents aged 45 or older. Thus, the nature of this variable presents its own trade-off but offers an interesting opportunity to identify how the exchange of financial information might influence market participation.

4.4 Representative Agent Characteristics

Our representative agent selection process and choice of control variables impose several observation restrictions at the household and individual level but offer key insights into the demographical heterogeneity of financial literacy in Australia. In this section we identify any manipulations of the sample’s characteristics, compared to the broader HILDA survey results, and consider their implications. These results are then discussed in relation to financial literacy since it forms the basis for agent selection.

The response rate for household level questions was 97.8% (all were compulsory). However, the compilation of individual level questions for our representative agents requires many demographical variables, as identified by similar literature as key personal attributes relating to market participation¹⁸. Filtering out missing observations for these variables was particularly restrictive in some cases, leading to a loss of approximately 30% of observations. But the sheer size of the HILDA sample works to our advantage, leaving us with over 6,000 observations for our first data set (financial literacy models). A second data set is prepared for the financial advice models because it is skewed towards older agents and reduces the sample size further, but we focus our discussion on the financial literacy data set where a majority of the restrictions are imposed.

Table 2 compares our representative agent sample with the full HILDA sample. By definition, agents are the most literate within each household and are expected to score 15% higher on our survey than the average Australian. While one may argue that this contributes to positive bias in our sample, recall that we believe households may make collective decisions about their finances, driven by the most literate member. Therefore, the presence of a literate agent in each household should increase their overall likelihood of market participation and this effect should not be materially influenced by the presence of less literate individuals. The well documented age and gender gaps in Australian financial literacy¹⁹ is evident in our sample, where agents are on average nearly 8 years older and 6% less likely to be female. Our agent selection process appears to hide the gender gap in market participation once we model our results (the coefficient for *Female_i* is not statistically significant) but age remains an important determinant when interacted with financial literacy. The former indicates that gender is more likely to influence market participation via its effect on financial literacy. We do not discuss

¹⁸ ANZ Banking Group (2015); Van Rooij et al. (2011); Almenberg & Widmark (2011)

¹⁹ Preston (2020); Coates (2016)

extensively discuss the role of gender in market participation, but this initial result could be useful for policy makers intending to address market barriers for women. As expected, labour force participation rates, education levels, and cognitive ability are also higher for agents. Admittedly, our proxy for cognitive ability, a literacy skills test, is a crude measure of aptitude and does not include a quantitative component²⁰. However, our results show a strong and precise effect of this variable on market participation and may also include the ability to consume financial information. The labour force variables do not imply an exclusion of unemployed persons, only that agents are more likely to be employed.

Table 2

Summary Statistics by Sample

Variable of Interest	HILDA (Total Sample)	Representative Agents
Financial Literacy Score	3.90 (1.29)	4.47 (0.88)
Age	37.93 (23.36)	45.52 (14.31)
Female	0.50 (0.50)	0.47 (0.50)
Employed	0.64 (0.48)	0.79 (0.41)
Self-Employed	0.06 (0.23)	0.08 (0.27)
Retired	0.21 (0.41)	0.08 (0.26)
High School	0.55 (0.50)	0.61 (0.59)
Vocational	0.08 (0.27)	0.10 (0.30)
University	0.14 (0.35)	0.18 (0.39)
Cognitive Ability	13.83 (5.35)	14.56 (5.12)

Note: Mean given for each variable with standard deviation in the parenthesis

²⁰ HILDA's numeracy aptitude test asks respondents to recite a sequence of numbers but does not involve any calculations. We do not believe that this is a suitable measure of numeracy skills, in the context of financial literacy, and rely on the quantitative component of the financial literacy questionnaire where respondents are asked to calculate an interest payment.

5. RESULTS

This section presents our regression analysis, beginning with the financial literacy models for financial asset ownership. We then discuss the results after substituting the outcome for voluntary superannuation contributions. Thirdly, we present our financial advice models and discuss both avenues of market participation. We conclude this section with several robustness checks of the results. To foreshadow our headline results, we present some selected coefficient estimates below. In Table 3, the positive coefficients for the financial literacy index and its interaction with income identify a market barrier and income multiplier, respectively. The opposing signs for the age interaction terms identify what we call the Ageing Asset Allocation (AAA): financially literate households are more likely to shift their resources to superannuation in later life. Our summary for financial advice shows that advice appears to address market barriers (positive coefficients), but with varying levels of precision. A negative sign for the interaction between advice and financial literacy indicates that, on average, advice may be more effective for households with lower levels of financial literacy although this result is not statistically significant in either case.

Table 3

Selected Coefficient Estimates

	Financial Assets	Superannuation
Financial Literacy Models		
Financial Literacy	0.167*** (0.029)	0.069* (0.029)
Financial Literacy x Age	-0.004* (0.002)	0.007*** (0.002)
Financial Literacy x Income	0.073* (0.029)	0.085* (0.029)
Financial Advice Models		
Financial Advice	0.387* (0.148)	0.192 (0.150)
Financial Advice x Financial Literacy	-0.243 (0.294)	-0.446 (0.251)

* $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

5.1 Financial Asset Ownership

Table 4 presents (1) a bivariate estimation of financial assets on financial literacy, (2) the basic model for financial assets using key controls and (3) – (5) extended models which interact financial literacy with age and income. As expected, the bivariate model highlights a strong positive relationship between financial literacy and asset ownership. The effect of financial literacy then evolves as we experiment with various controls and interaction terms. Consistent with existing literature, household finances, education, labour market status and family demographics are also key determinants of market participation. This is first identified in our basic model where the strength of financial literacy becomes substantially weaker after adding controls for these variables. However, the coefficient for our financial literacy index still predicts a sizeable effect on market participation with great precision. The results appear to reflect those delivered by Van Rooij et al. (2011), providing evidence in favour of our negative bias assumption which relies on similarities with their model.

Due to our use of probit models, the marginal effect of financial literacy is non-linear and relies on the values of other regressors. To interpret the basic model's coefficient, we have calculated the average marginal effect and the nominal marginal effect at each interval of the index (0 - 5). Increases in financial literacy are least influential on market participation at low levels of the index but become increasingly influential as financial literacy improves. This effect is slightly convex and improves in precision at higher levels of literacy, as illustrated in Figure 3. The exact marginal effects at each level of literacy are presented in Table 5. On average, a one unit increase in the index (equivalent to financial literacy improving by 20%) is expected to increase the probability of market participation outside superannuation by 5%-points. With a sample mean participation rate of 29% (see Table 1), this result is certainly sizeable (increase of 17.2%). Recall that our assumption about negative bias appears to hold, meaning that we can interpret these results as a minimum effect.

Table 4*Regressions of Financial Asset Ownership on Financial Literacy*

	(1) Bivariate	(2) Basic	(3) Extended 1	(4) Extended 2	(5) Extended 3
(Intercept)	-2.388*** (0.120)	-5.617*** (0.388)	-6.400*** (0.543)	-1.987 (1.509)	-2.984 (1.729)
Financial Literacy					
Financial Literacy	0.408*** (0.026)	0.167*** (0.029)	0.338*** (0.087)	-0.644* (0.328)	-0.424 (0.376)
Financial Literacy x Age			-0.004* (0.002)		-0.003 (0.002)
Financial Literacy x Income				0.073* (0.029)	0.064* (0.031)
Household Finances					
Wealth (Log)		0.093*** (0.010)	0.093*** (0.010)	0.092*** (0.010)	0.092*** (0.010)
Income (Log)		0.181*** (0.034)	0.183*** (0.035)	-0.140 (0.134)	-0.101 (0.142)
Labour Market Status					
Employed		0.174* (0.067)	0.175** (0.068)	0.173* (0.067)	0.174** (0.067)
Self-Employed		-0.021 (0.068)	-0.019 (0.068)	-0.021 (0.068)	-0.020 (0.068)
Retired		0.097 (0.096)	0.102 (0.096)	0.106 (0.096)	0.108 (0.096)
Demographics					
Age		0.005 (0.009)	0.022 (0.012)	0.004 (0.009)	0.016 (0.012)
Female		-0.060 (0.038)	-0.062 (0.038)	-0.060 (0.038)	-0.060 (0.038)
Children		-0.104*** (0.016)	-0.105*** (0.016)	-0.105*** (0.016)	-0.105*** (0.016)
Married		0.128** (0.043)	0.132** (0.043)	0.123** (0.043)	0.126** (0.043)
Education and Skills					
High School		0.208*** (0.044)	0.208*** (0.044)	0.207*** (0.044)	0.207*** (0.044)
Vocational		-0.144* (0.067)	-0.140* (0.067)	-0.138* (0.067)	-0.136* (0.067)
University		0.095 (0.050)	0.092 (0.050)	0.093 (0.050)	0.091 (0.050)
Cognitive Ability		0.022*** (0.004)	0.022*** (0.004)	0.021*** (0.004)	0.022*** (0.004)
N	6004	6004	6004	6004	6004
Controls	No	Yes	Yes	Yes	Yes
χ^2	310.092***	1045.089***	1049.464***	1052.970***	1055.289***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

Figure 3

Basic Financial Assets Model:

Plot of Predicted Market Participation Rates with 95% Confidence Interval

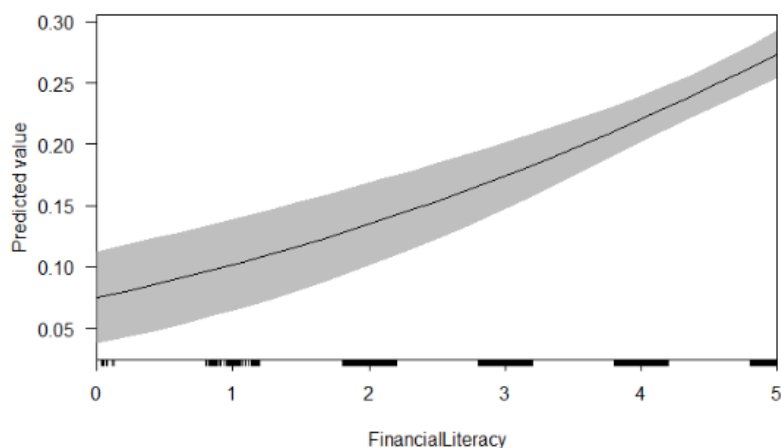


Table 5

Marginal Effects (M.E.) of Financial Literacy on Financial Market Participation

Financial Literacy Score	M.E. (%-points)	M.E. (%)
0	2.9	9.9%
1	3.4	11.6%
2	3.9	13.4%
3	4.4	15.1%
4	4.8	16.7%
5	5.2	18.0%
Average	5.0	17.2%

Note: M.E. (%) calculation based on an average participation rate of 29%

Interacting financial literacy with age in our first extended model (3) yields a negative coefficient. This implies that while financially literate people are still more likely to hold assets outside of superannuation, this trend deteriorates over time as the representative agent becomes older. This may reflect a shift in asset allocation as financially literate households take advantage of a more retirement-friendly superannuation environment in later life. Model (4) finds a positive interaction between financial literacy and income, suggesting a multiplier effect for households with greater literacy and income. Hence, being equipped with both financial knowledge and financial means is expected to further improve the likelihood of market

participation. Simultaneously interacting financial literacy with age and income in our third extended model (5) does not provide any further context to our heterogeneity analysis.

5.2 Superannuation Contributions

Table 6 presents estimations in the same fashion as above, now showing market participation by way of superannuation contributions. The financial literacy coefficients in the (1) bivariate and (2) basic models are comparatively lower for superannuation, indicating that financial literacy has a weaker relationship with superannuation than with financial assets. Although the results for our basic model are less precise, they remain significant at the 5% level and predict an average marginal effect of 1.9%-points. Recall that the mean for participation via superannuation is 21% (see Table 1), thus our marginal effect represents an 8.8% increase in the likelihood of participation via superannuation.

Figure 4 shows a similar trend in the effect of financial literacy on market participation via superannuation, but without the convexity seen for non-superannuation investment. Table 7 provides the marginal effects at each level of the index. The linearity of our chart suggests that marginal changes in market participation via superannuation are on average less sensitive to the original level of financial literacy. In other words, financial education should have a more consistent effect on superannuation contributions for households of all levels of financial literacy. This contrasts with assets outside superannuation, where marginal increases in financial literacy are more influential for more knowledgeable households. There is however a wider confidence interval at lower levels of financial literacy where observations are fewer.

Also in contrast to our financial assets models, the first extended superannuation model (3) shows that the effect of financial literacy on market participation via superannuation *increases* with age. Note also that the ageing effect of financial literacy on superannuation is comparatively stronger and more precise than for financial assets. This provides evidence in

Table 6*Regressions of Voluntary Superannuation Contributions on Financial Literacy*

	(1) Bivariate	(2) Basic	(3) Extended 1	(4) Extended 2	(5) Extended 3
(Intercept)	-2.017*** (0.114)	-7.559*** (0.436)	-6.261*** (0.559)	-4.739** (1.660)	-1.796 (1.602)
Financial Literacy					
Financial Literacy	0.303*** (0.024)	0.069* (0.029)	-0.233** (0.089)	-0.553 (0.354)	-1.226*** (0.351)
Financial Literacy x Age			0.006*** (0.002)		0.007*** (0.002)
Financial Literacy x Income				0.056 (0.032)	0.085** (0.029)
Household Finances					
Wealth (Log)		0.038*** (0.009)	0.038*** (0.009)	0.038*** (0.009)	0.039*** (0.009)
Income (Log)		0.261*** (0.037)	0.260*** (0.037)	0.009 (0.148)	-0.123 (0.135)
Labour Market Status					
Employed		0.441*** (0.077)	0.447*** (0.078)	0.445*** (0.077)	0.454*** (0.077)
Self-Employed		0.177** (0.068)	0.174* (0.068)	0.179** (0.068)	0.177** (0.068)
Retired		0.443*** (0.100)	0.449*** (0.101)	0.448*** (0.100)	0.459*** (0.100)
Demographics					
Age		0.074*** (0.010)	0.049*** (0.013)	0.073*** (0.010)	0.044*** (0.012)
Female		-0.011 (0.039)	-0.010 (0.039)	-0.012 (0.039)	-0.010 (0.039)
Children		-0.087*** (0.016)	-0.086*** (0.016)	-0.088*** (0.016)	-0.087*** (0.016)
Married		0.042 (0.045)	0.035 (0.045)	0.038 (0.045)	0.027 (0.045)
Education and Skills					
High School		0.098* (0.045)	0.098* (0.045)	0.096* (0.045)	0.095* (0.045)
Vocational		0.103 (0.068)	0.095 (0.068)	0.108 (0.068)	0.102 (0.068)
University		0.113* (0.053)	0.120* (0.054)	0.112* (0.053)	0.119* (0.054)
Cognitive Ability		0.004 (0.004)	0.004 (0.004)	0.004 (0.004)	0.003 (0.004)
N	6004	6004	6004	6004	6004
Controls	No	Yes	Yes	Yes	Yes
χ^2	180.149***	1210.497***	1223.384***	1213.250***	1230.247***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

Figure 4

Basic Superannuation Contributions Model:

Plot of Predicted Market Participation Rates with 95% Confidence Interval

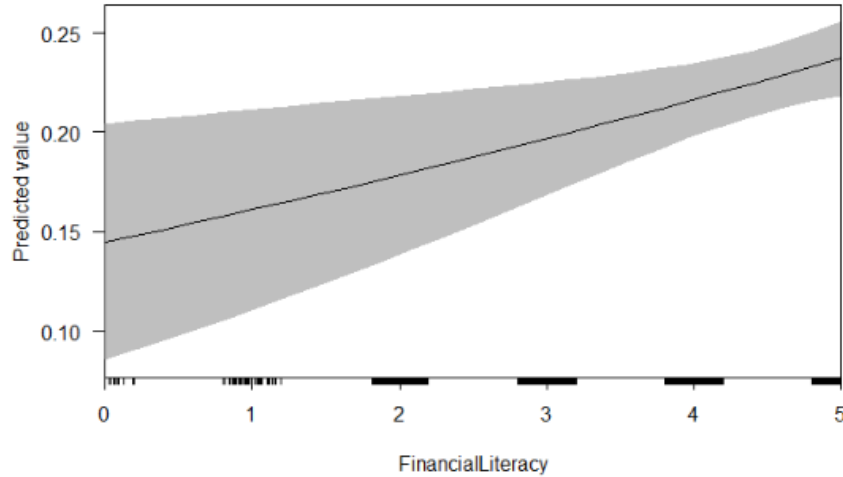


Table 7

Marginal Effects (M.E.) of Financial Literacy on Superannuation Contributions

Financial Literacy Score	M.E. (%-points)	M.E. (%)
0	1.54	7.3%
1	1.61	7.7%
2	1.69	8.0%
3	1.76	8.4%
4	1.82	8.7%
5	1.89	9.0%
Average	1.85	8.8%

Note: M.E. (%) calculation based on an average contribution rate of 21%

favour of our heterogeneity hypothesis, suggesting that financially literate market participants are more likely to reallocate their resources to superannuation as they become older. Above, we identified this as the Ageing Asset Allocation (AAA) effect. Interestingly, financial literacy and income do not exhibit a multiplier effect when considered alone in the second extended model (4) but do so in the third extended model (5) where literacy is also interacted with age. These results show that the effect of financial literacy on superannuation contributions is magnified by age and income but is somewhat sensitive to the choice of specification.

The effects of other socioeconomic traits are not a key focus of this paper, but they highlight some interesting trends and are yet to be evaluated by market participation literature. As one might expect, wealth is positively correlated with superannuation contributions but to a lesser degree than non-superannuation assets. Income also exhibits a positive coefficient but is more influential on superannuation contributions than other investment. We believe this reflects the incentives provided by superannuation where households can reduce their taxable income after making personal contributions. Participation rates via superannuation for high school and university graduates are 12.5% and 6.4% higher, respectively. Both are statistically significant at the 5% level while our estimation for recipients of vocational education were inconclusive. This contrasts with our financial assets models where university was an inconclusive predictor of market participation and vocational graduates were 14.8% less likely to participate outside superannuation. These results are relatively intuitive in that basic and advanced levels of education might contribute to the cognitive requirements for market participation. The lower likelihood of vocational education to focus on financial concepts could explain the opposing results for other forms of study.

Labour market characteristics are also key factors of superannuation contributions where coefficients are comparatively stronger than the financial assets models. Our basic model suggests the employed and retired are more likely to make voluntary contributions (24.6% and 13.8%, respectively) and self-employed agents are slightly less likely to contribute (-0.2%). Employed persons typically have a regular stream of income, some of which could be set aside for superannuation. Self-employed persons are an interesting case because they cannot rely on mandatory employer contributions and must contribute themselves if they wish to build their superannuation balance. However, they are subject to higher risk in the labour market and may be more cautious about locking away their savings²¹. Our evidence suggests that these effects

²¹ Heaton & Lucas (2000) discuss the effects of increased labour market risk on investment behaviour

offset each other. Retired persons may be more likely to contribute given that they can or will soon be able to access their funds, therefore being subject to a far lower level of liquidity risk.

5.3 Receiving Financial Advice

Results for our financial advice models are presented in Table 8. Here we show the change in both forms of market participation over time, after receiving financial advice. For each outcome, we present a bivariate model, a basic model with key controls for time variant determinants of market participation and finally an extended model where the financial advice dummy is interacted with our measurement of financial literacy. Financial advice always has a positive effect on market participation but does not remain statistically significant in every case and is generally weaker for the superannuation models. This reveals some evidence in favour of our financial advice hypothesis, but the results are clearly sensitive to specification choices. The interaction between advice and financial literacy provides some support for our hypothesis about heterogeneity in the effectiveness of advice but is never statistically significant.

The bivariate model for financial assets in column (1) compliments our financial literacy models, identifying a strong positive effect of financial advice on market participation. Controlling for time variant determinants in column (2) has little effect on the magnitude or precision of our results, showing that receiving financial advice increases the probability of market participation through traditional pathways (outside superannuation) by 16.2%. Changes in household finances, labour market status and family demographics do not predict any conclusive change in participation within the basic model, although we note that within our four year window of observations there were few instances of material change in these variables. The extended model for financial assets in column (3) provides less convincing evidence toward our effectiveness-of-advice hypothesis. Results indicate that, on average, financial advice has a larger positive effect on non-superannuation market participation when

delivered to a household with lower financial literacy. However, the results are not statistically significant and would be expected to vary greatly from household to household.

Table 8
Regressions of Market Participation on Financial Advice

	Financial Assets			Superannuation		
	(1) Bivariate	(2) Basic	(3) Extended	(4) Bivariate	(5) Basic	(6) Extended
(Intercept)	-1.590*** (0.062)	-0.429 (4.928)	-3.085 (7.221)	-1.404*** (0.056)	-10.061 (7.363)	-15.708 (9.980)
Financial Advice						
Financial Advice	0.380** (0.145)	0.387** (0.148)	1.521 (1.388)	0.161 (0.144)	0.192 (0.150)	2.435* (1.163)
Financial Literacy			0.289* (0.142)			0.065 (0.087)
Financial Advice x Financial Literacy			-0.243 (0.294)			-0.446 (0.251)
Household Finances						
Wealth ('000)		0.031 (0.040)	0.029 (0.047)		-0.084* (0.038)	-0.084* (0.043)
Income ('000)		0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)
Labour Market Status						
Employed		0.267 (0.180)	0.317 (0.232)		-0.055 (0.165)	-0.160 (0.201)
Self-Employed		0.223 (0.219)	0.398 (0.285)		0.491* (0.213)	0.530 (0.270)
Retired		0.299 (0.206)	0.519 (0.267)		-0.529* (0.226)	-0.555 (0.289)
Demographics						
Age (At Period 2)		-0.050 (0.159)	-0.003 (0.234)		0.317 (0.247)	0.495 (0.335)
Age ² (At Period 2)		0.001 (0.001)	0.000 (0.002)		-0.003 (0.002)	-0.004 (0.003)
Children		0.351 (0.212)	0.649* (0.307)		0.391* (0.197)	-0.066 (0.232)
Married		0.177 (0.279)	0.145 (0.337)		0.175 (0.245)	0.133 (0.294)
N	1232	1232	821	1232	1232	821
Controls	No	Yes	Yes	No	Yes	Yes
χ^2	6.512*	15.429	20.811	1.214	36.463***	30.584**

* $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

The results are less clear for our superannuation models. The basic model in column (5) predicts an increase in superannuation contributions of 13.2% although this is not statistically significant. On the other hand, the extended model in column (6) generates a marginal effect of 25.3% which is statistically significant at the 5% level. Therefore, there is some evidence to suggest that financial advice increases superannuation contributions although the recurring sensitivity to specifications raises concerns about consistency. The inconsistent significance in our results is surprising, given our expectation that the complexities of superannuation would make contributions more sensitive to financial knowledge. This may owe to the restrictions imposed on our sample size after adding the financial advice variable, thus contributing to higher levels of variance. The extended model also offers some insight into the heterogenous effects of advice, much like the financial assets model where we observe a negative coefficient for the interaction term. The effect is statistically insignificant. However, it is substantially larger in magnitude than that observed for owning financial assets. This may indicate that households with lower financial literacy are more likely to be given advice regarding superannuation.

5.4 Robustness Checks

A notable omission from our models is any measure of the representative agent's risk preference. This is a well-documented variable in related literature given that volatility in financial markets is likely to deter more risk averse persons. Financial literacy is also expected to be correlated with risk preference because it contributes to considerations such as investment horizons and portfolio asset allocation²². While our financial literacy index may capture some degree of an agent's risk aversion, our headline results may still be exposed to omitted variable bias. HILDA gathers information about attitudes towards financial risks but 42% of our agents selected the response: "*Never has any spare cash*", hence providing no indication of their risk

²² Heaton & Lucas (2000)

aversion if they did have the means to invest. Excluding these households substantially reduces the sample size and ignores the considerations of lower income households, ultimately prompting us to exclude this measure from our headline results. Results for our basic models after including the measures of risk preference are present in the appendix (Table A.3). As expected, an appetite for higher risk is positively and precisely correlated with owning financial assets. The superannuation models exhibit a similar trend but only for risk averse, not risk seeking households. In the basic financial assets model, our financial literacy index remains robust to the inclusion of risk dummies. But the variance of our index coefficient in the superannuation model increases to the extent that results are only statistically significant at the 10% level. Plus, the marginal effect is slightly reduced. This negative bias may be offset by other bias introduced when the sample is restricted or the existing endogeneity (recall we assume our results are a minimum effect). Clearly there is some sensitivity to omitted variables, but it is difficult to discern the exact impact on our headline results.

The choice between probit and logit estimation is usually immaterial. However, results may be sensitive to the distribution of underlying variables and we know that, for example, our financial literacy index is heavily skewed rightward. To reflect on our choice of probit models, we re-estimate our financial literacy models on a logistic distribution instead. The results are presented in the appendix (Tables A.4 and A.5). The basic logit model for financial assets predicts financial literacy's average marginal effect to be essentially the same at 4.99%-points (the result under probit estimation was 4.98%-points). Pleasingly, this means that our financial literacy results appear robust to the choice of estimation method. The marginal for superannuation is 2.11% points (14% higher when compared to 1.98% under probit estimation). This suggests the potential for a more conservative negative bias in the superannuation model which could offset the potential for positive bias when we exclude measures of risk preference.

6. CONCLUSION

This paper began by investigating the role of financial literacy in market participation, where the outcome is extended to include both superannuation and other investment options. We are the first to identify that low financial literacy may act as a market barrier to investment via superannuation. We also uncovered demographical heterogeneity when financial literacy is increased: a multiplier effect for high income households and a larger shift of resources towards superannuation in later life. While we are limited by the availability of instruments for financial literacy, our assumption about the direction of endogeneity bias (as identified in previous literature and supported by our results) provides that our predicted values for market participation rates are likely a conservative estimate. Therefore, based on our hypotheses about financial literacy, policy makers should be aware that financial education programs also have the capacity to address barriers to engagement with superannuation. This is particularly important for young and low-income households who are most at risk.

Given that the legislated increases to employer contributions risk distorting welfare outcomes (through slower wage growth and a shift in aggregate resources towards superannuation in earlier life²³), financial literacy programs may provide a safer alternative by empowering households to make informed decisions about their finances. Therefore, any future changes to superannuation laws might be complimented by efforts to improve financial literacy. Extensions to these models would be wise to seek a measure of advanced financial literacy. Our expectation is that the additional complexities of superannuation would be better predicted by an advanced index which measures some understanding about taxation and compounding returns. Knowledge about relevant policies such as concessional contributions and government co-contributions could also be incorporated to strengthen the results.

²³ Coates et al. (2018)

In a separate analysis, we use a novel fixed effects model to assess how financial advice influences market participation over time. According to this framework, financial advice significantly increases market participation outside superannuation, although the results for voluntary contributions are less consistent. In both cases, advice is expected to be more effective for households with lower financial literacy. The convexity of financial literacy's effect on traditional market participation (as identified in the previous section) indicates that it may be more difficult to address market barriers for low literacy households. But our financial advice hypotheses appear to hold for the average household, suggesting that this heterogeneity may be offset by access to retirement planning resources. Efforts to improve market participation and outcomes in retirement may therefore be more effective when education programs are complimented by formal advice.

Of equal importance, the underlying financial advice model shows great potential for upcoming research that faces similar sources of endogeneity. Future applications of this framework may be able to achieve more robust results with a tighter clustering of observation periods (ours spans a total of 5 years). We were also prevented from directly applying this model to measures of financial literacy, due to the singular observation of our questionnaire in 2016. The release of HILDA's 20th Wave will hopefully present the opportunity to do so.

Both sets of results have broader implications about asymmetries of information that put households at a disadvantage. A lack of understanding about financial markets poses two threats: barriers which may deter entry and the risk of suboptimal decision making if market entry prevails. We address the former under the premise that financial markets are an important tool for wealth accumulation and hence, welfare in later life. But we hope that financial literacy and advice also equip households with the ability to make better decisions once engaged with markets. Such a result would restore the traditional assumption of voluntary and informed transactions between rational agents. That being said, we are unable to assess the extent to

which financial literacy must be increased before households can make ‘good’ investment decisions. Similarly, depending on the circumstances and objectives of a household, ‘good’ financial advice may not recommend entering the market and households with lower financial literacy may have a poorer capacity to appreciate or understand financial advice. Therefore, our objective of increasing market participation should be issued with a caveat: reducing barriers to market entry are not guaranteed to improve wellbeing and financial returns.

Limitations implied by mere increases in market participation could be addressed by appropriate policy. Pleasingly, Australia’s 2020 Federal Budget pledged to improve transparency about superannuation fund’s performance and fees. Another consideration could be to review how default investment options within superannuation are treated. Younger Australians, who as we have seen are expected to exhibit poorer financial literacy, may benefit from additional information and guidance regarding their investment options. For example, younger persons are inherently more likely to have a long investment horizon (which may suit a riskier growth profile) but may be unable or unaware of how to act on this advantage. Hence, a combination of financial education and superannuation policy reform could help to improve welfare outcomes for younger people.

HILDA’s longitudinal data set is promising for future financial literacy research, if we are able to follow market participants over time and assess whether increases in financial literacy actually lead to better outcomes. A similar approach may be applied to the decision between voluntary superannuation contributions and other investment (or both). We identified that financially literate households are more likely to shift their assets towards superannuation in later life. But it would be valuable to know if this ‘smarter’ decision materially improves outcomes. Both analyses would be informative for policy makers while providing further context to our results and findings in other market participation literature.

7. APPENDIX

Table A.1

Summary Statistics for all Variables by Subsample

Variable of Interest	HILDA (Total Sample)	Representative Agents	Financial Asset Owners	Contributors to Superannuation
Owens Financial Assets	0.29 (0.45)	0.30 (0.46)	1.00 (0.00)	0.47 (0.50)
Contributes to Superannuation	0.21 (0.41)	0.26 (0.44)	0.41 (0.49)	1.00 (0.00)
Financial Literacy Score	3.90 (1.29)	4.47 (0.88)	4.75 (0.57)	4.71 (0.65)
Received Financial Advice	0.41 (0.49)	0.43 (0.49)	0.56 (0.50)	0.56 (0.50)
Wealth	800,411 (1,149,018)	765,792 (1,096,805)	1,241,353 (1,338,204)	1,128,870 (1,315,718)
Income	112,760 (71,445)	111,515 (69,842)	141,698 (76,186)	131,760 (71,584)
Employed	0.64 (0.48)	0.79 (0.41)	0.84 (0.37)	0.83 (0.38)
Self-Employed	0.06 (0.23)	0.08 (0.27)	0.09 (0.29)	0.12 (0.32)
Retired	0.21 (0.41)	0.08 (0.26)	0.10 (0.30)	0.13 (0.33)
Age	37.93 (23.36)	45.52 (14.31)	50.12 (13.60)	53.95 (11.93)
Female	0.50 (0.50)	0.47 (0.50)	0.43 (0.50)	0.44 (0.50)
Children	1.63 (1.49)	1.62 (1.40)	1.64 (1.30)	1.80 (1.28)
Married	0.44 (0.50)	0.45 (0.50)	0.59 (0.49)	0.58 (0.49)
High School	0.55 (0.50)	0.61 (0.59)	0.69 (0.46)	0.61 (0.49)
Vocational	0.08 (0.27)	0.10 (0.30)	0.08 (0.27)	0.09 (0.29)
University	0.14 (0.35)	0.18 (0.39)	0.21 (0.41)	0.19 (0.39)
Cognitive Ability	13.83 (5.35)	14.56 (5.12)	16.12 (4.67)	15.76 (5.04)

Note: Mean given for each variable with standard deviation in the parenthesis

Figure A.1

Superannuation Contributions Questions (As Seen in HILDA's Marked Up Questionnaire)

J43. Do you currently make any contributions into [a / any other] superannuation fund?

- Yes [1] [rsapcps]
- No [2]
- Refused [8]
- Don't know [9]

J39. Many superannuation funds allow employees to make personal contributions in addition to those made by their employer. Do you make contributions to your superannuation fund above what your employer is required to put in?

- Yes – make regular additional contributions [1] [rsapc]
- Yes – occasional lump sum contributions [2]
- No – only receive employer contributions [3]
- Refused [8]
- Don't know [9]

J44. Now I'd like to ask about superannuation. Do you currently make contributions into a superannuation fund? That is, a fund set up for your own superannuation.

- Yes [1] [rsapcs]
- No [2]
- Refused [8]
- Don't know [9]

J48. Does your partner make any contributions to any of **your superannuation funds?**

- Yes [1] [rsaspc]
- No [2]
- Respondent has NO super funds AT ALL [3]
- Refused [8]
- Don't know [9]

Figure A.2

Financial Literacy Questions (As Seen in HILDA's Marked Up Questionnaire)

N18. Finally we have five questions about money. If you don't know the answer to any question, just say so.

Please tell me whether you think the following statement is true or false? "An investment with a high return is likely to be high risk." (True or false?)

- True [1] [pfl1hir]
- False [2]
- Don't know/ Don't understand the question [9]
- Refused [8]

N19. Again, please tell me whether you think the following statement is true or false? "Buying shares in a single company usually provides a safer return than buying shares in a number of different companies." (True or false?)

- True [1] [pfl1sh]
- False [2]
- Don't know/ Don't understand the question [9]
- Refused [8]

N20. Suppose you put \$100 into a no-fee savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?

- Record number [1] [pfl2pc]
- Irrelevant answer [2]
- Don't know/ Don't understand the question [9]
- Refused [8]

N21. Imagine now that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, would you be able to buy **more than today, exactly the **same** as today, or **less** than today with the money in this account?**

- More than today [1] [pfl1pc]
- Exactly the same as today [2]
- Less than today [3]
- Don't know/ Don't understand the question [9]
- Refused [8]

N22. Suppose that by the year 2020 your income has doubled, but the prices of all of the things you buy have also doubled. In 2020, will you be able to buy **more than today, exactly the **same** as today, or **less** than today with your income?**

- More than today [1] [pfl1dou]
- Exactly the same as today [2]
- Less than today [3]
- Don't know/ Don't understand the question [9]
- Refused [8]

Table A.2*Regression Results for Alternative Extended Financial Advice Models*

	Financial Assets		Superannuation	
	(1)	(2)	(3)	(4)
	Extended 2	Extended 3	Extended 2	Extended 3
Financial Planning	1.548 (1.889)	0.369* (0.147)	0.578 (1.815)	0.176 (0.141)
Financial Planning x Age	-0.020 (0.032)		-0.007 (0.031)	
Financial Planning x Income ('000)		-0.002 (0.002)		-0.001 (0.002)
N	1045	1380	1380	1380
Controls	Yes	Yes	Yes	Yes
χ^2	12.170	14.415	38.902***	39.168***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

Table A.3*Regression Results for Basic Financial Literacy Models with Measures of Risk Aversion*

	(1)	(2)
	Financial Assets	Superannuation
Financial Literacy	0.136*** (0.033)	0.059 (0.033)
Risk Averse	-0.533*** (0.045)	-0.220*** (0.047)
Risk Seeking	0.257*** (0.065)	0.006 (0.069)
N	4898	4898
Controls	Yes	Yes
χ^2	904.543***	999.881***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

Table A.4*Regression Results for Financial Assets Models Using Logit Estimation*

	(1) Bivariate	(2) Basic	(3) Extended 1	(4) Extended 2	(5) Extended 3
Financial Literacy	0.720*** (0.047)	0.284*** (0.052)	0.638*** (0.160)	-1.335* (0.620)	-0.738 (0.763)
Financial Literacy x Age			-0.008* (0.003)		-0.006 (0.003)
Financial Literacy x Income				0.144** (0.055)	0.114 (0.062)
N	6004	6004	6004	6004	6004
Controls	No	Yes	Yes	Yes	Yes
χ^2	312.858***	1070.033***	1075.696***	1075.453***	1078.568***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

Table A.5*Regression Results for Superannuation Models Using Logit Estimation*

	(1) Bivariate	(2) Basic	(3) Extended 1	(4) Extended 2	(5) Extended 3
Financial Literacy	0.550*** (0.046)	0.135** (0.052)	-0.358* (0.174)	-0.412 (0.726)	-1.226*** (0.351)
Financial Literacy x Age			0.010** (0.003)		0.007*** (0.002)
Financial Literacy x Income				0.049 (0.065)	0.085** (0.029)
N	6004	6004	6004	6004	6004
Controls	No	Yes	Yes	Yes	Yes
χ^2	184.065***	1244.524***	1252.856***	1245.079***	1230.247***

* p ≤ 0.05 ** p ≤ 0.01 *** p ≤ 0.001

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