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Financial literacy and investment choice decisions: Evidence from Australian superannuation fund members

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ABSTRACT

For most Australians, superannuation should be a source of financial security in retirement. However, with the increasing level of choice available in superannuation, financial literacy of the participants needs to be considered. This study assesses the financial literacy of superannuation participants through a survey of 594 fund members. We find superannuation fund members with higher levels of financial literacy, measured both objectively and subjectively, are more likely to exercise investment choice. We also find higher financial risk tolerance is positively associated with financial literacy. The research contributes to the literature on investment choice decisions in the context of the mandatory superannuation system in Australia which has implications for policy-makers and the superannuation industry.

Introduction

There have been considerable changes in the landscape for the management of individual and household wealth in Australia over the past few decades. One of the most noticeable changes is that individuals are increasingly facing complex decisions for securing their own financial wellbeing in retirement. Many individuals are now responsible for selecting their superannuation fund[i] and the investment strategy that will generate enough wealth to support them in retirement.

Industry research indicates that the majority of fund members do not exercise choice and consequently join the default fund nominated by employers and accept the default investment options nominated by fund trustees (Clare, 2007; Ernst & Young, 2008; Fear & Pace, 2008; Sy, 2009). The phenomenon of members being given choice but not exercising their choice motivates this research. This study focuses on superannuation investment choice decisions as they have a strong influence on the growth rate and volatility of the accumulated funds and ultimate retirement benefits.

The superannuation system in Australia is a significant aspect of the economy domestically as well as being unique in global measures. At the micro-economic level it is significant because almost all working Australians have some level of retirement savings, with superannuation becoming the second largest asset of most individuals (Headey *et al*., 2005). At the macro level, superannuation is significant because the value of total superannuation assets, which exceeded $2 trillion in 2015 (APRA, 2015), is continuing to grow. A feature of the Australian superannuation system that distinguishes it from retirement systems in other countries is that superannuation is compulsory and fully outsourced to the private sector (Bateman *et al*., 2001). In addition, the majority of superannuation assets in Australia are in defined contribution funds, rather than defined benefit funds (APRA, 2014). This means that the financial risk of inadequate retirement provisions is further shifted from employer-sponsors and fund trustees to individual fund members (Brown *et al*., 2002). These investors are involuntary investors who may have little or no experience,

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[i] Not all members are able to choose their superannuation fund. Those that are not are excluded from doing so by their industrial agreement or award.

expertise or interest in financial investment and yet are required to make relatively complex investment decisions, which can have significant long-term implications for their retirement.

Literature from personal and pension finance suggests that financial literacy is one of the key requirements for making informed financial decisions (Arnone, 2004). The empirical research to date on financial literacy has predominantly been confined to broad population surveys aimed at measuring very basic financial literacy, such as using and managing money, and is largely based on subjective measures of survey respondents' self-assessment of their ability and attitudes towards money matters.

Further, while there is an increase in research on objective measures of financial literacy and pension financial decisions, to date these studies have mainly been conducted in the UK or US (e.g., Agnew and Szykman, 2005; Dvorak & Hanley, 2010; Kempson *et al.*, 2005; Lusardi & Mitchell, 2006, 2007a, 2007b) which have different retirement savings institutional arrangements than that of Australia. Briefly, while participation in retirement pension plans in the US and UK is voluntary, Australia's mandatory superannuation regime means that nearly all working Australians are 'forced savers'. A number of studies have examined financial literacy and its relationship with voluntary financial decisions, such as participating in the stock market or making portfolio choice (Jappelli & Padula, 2013; van Rooij *et al.*, 2011), but there is little research that investigates financial literacy and investment decisions made by 'involuntary investors'. The current study aims to address this important gap in the literature by examining financial literacy and investment decision-making in the unique setting of the mandatory Australian superannuation system.

We assessed the financial literacy of superannuation participants through a survey of 594 members of a large Australian public sector fund. Results from univariate and multivariate analysis show that fund members with higher levels of financial literacy are also more engaged with financial decisions and therefore more likely to exercise investment choice. Regression analysis also shows that fund members who perceived themselves with higher financial literacy are more likely to actively choose the default option than passively default. This finding suggests that higher confidence in one's financial ability increases the likelihood of making a distinct

financial choice. The next section provides a brief discussion of the institutional background of this study. This is followed by a description of the theoretical framework underpinning the hypotheses. The research method is then detailed, including the regression models developed to test the hypotheses. Results of the analysis are then presented, followed by a summary of key findings and conclusions.

Institutional background

Australia has a compulsory superannuation regime that has been in place since 1992. This legislated system requires employers to contribute a portion of their employees' earnings, currently 9.5 per cent, to an approved superannuation fund. As with many other countries, there has been a significant move away from defined benefit plans to defined contribution, which has shifted the risk of saving for retirement to individual workers. Coupled with this, since 2005 many workers have been able to choose their own superannuation fund[ii]. Again, this places a burden on individuals to understand more about the superannuation system, particularly how to judge performance between funds.

Most superannuation funds offer their members a choice of investment options and strategies to choose from. While some funds only offer a few investment options, others offer many – the average number of options offered by a retail fund[iii] is 265 (APRA, 2014a). Investment options range from predetermined strategies, such as conservative or aggressive, to single asset classes such as cash or international equities, and members can select to use a single investment option, or split their retirement savings between two or more based on percentages. This study focuses on investment choice decisions as they have a strong influence on the growth rate and volatility of the accumulated funds and the ultimate retirement benefits.

As highlighted by Ingles and Fear (2009), the existing superannuation system is built on a "contradictory notion of the way people make financial decisions" (p. 1). By having a mandatory superannuation system, there is an assumption that members are incapable of voluntarily saving sufficient amounts for their own retirement (Fear & Pace, 2008). At the same time the system

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[ii] Employers are still responsible for selecting a default fund.
[iii] A retail fund is one offered by a for profit institution such as an insurance company or a bank.

provides for both Choice of Fund and investment choice, which assumes that members are interested in and capable of making informed decisions about their retirement (Ingles & Fear, 2009). This assumption can be challenged on the basis of the large proportion of superannuation assets that are in default investment options.

There are potentially adverse consequences of not exercising choice and passively accepting the default investment option. These default options vary considerably among superannuation funds in such aspects as asset allocation, risk profile, fees, and performance (Gallery *et al.,* 2010; SelectingSuper, 2013). The cost of such 'non-choice' can amount to significant differences in the retirement wealth that fund members accumulate (Ingles & Fear, 2009). This potential cost has led to the introduction of MySuper, a low cost default investment option deemed necessary by the Cooper Review (Commonwealth of Australia, 2010), as reduced superannuation savings may cause retirees to rely on the age pension to fund their retirement, which will inevitably result in higher government expenditure. Reducing reliance on the age pension is the main objective of superannuation, as proposed in the May 2016 Budget (Minister for Small Business and Assistant Treasurer, 2016)

Theoretical framework and hypotheses

There are a range of potential barriers members face with informed investment choice. Brown *et al.* (2002) proposed a framework of superannuation choice which examined a range of constraints affecting the achievement of informed decisions. They identified endogenous constraints such factors as members' deficiency in financial expertise, unwillingness to become informed, and 'risk transfer costs' such as the cost of becoming informed and the cost of making a wrong choice (Brown *et al.,* 2002). Further, the long planning horizons until retirement may mean the consequences of not choosing well are not known for many years, and possibly too late for correction (Bateman *et al.,* 2010).

When facing considerable options, prior literature suggests that individuals tend not to actively exercise their choices and opt for default options (Choi *et al.,* 2003, 2004; van Rooij & Tappa, 2008). For instance, empirical evidence from pension-related studies shows that individuals are not inclined to actively choose how to invest their retirement savings and thus there is a

widespread acceptance of the default choice (Cronqvist & Thaler, 2004; Gerrans *et al.,* 2008; Madrian & Shea, 2001). This evidence is in line with Australian government data which shows high proportions of superannuation assets are invested in default strategies (APRA, 2014).

While we know most superannuation assets in Australia are held in default strategies, the differentiation between active default, passive default, and automatic default remains unclear. Making an active choice involves the initial selection of an investment option, which can also take the form of a conscious decision to stay in the default investment option for those individuals who have reviewed all the options and choose the default option because it best suits their circumstances (Brown *et al.*, 2002). This is termed 'active default'. In contrast, the literature suggests that some people choose the default option because they believe it to be the implicit advice or endorsement (Banks & Oldfield, 2007; Beshears *et al.,* 2007; Choi *et al.,* 2003, 2004; Madrian & Shea, 2001). This is termed 'passive default'. For those members who did not exercise investment choice, their superannuation savings are automatically invested in the default option nominated by the fund trustee. This is termed 'automatic default'. These different investment behaviours are summarised in Table 1.

Table 1 Types of Default

Type of Default	Description
Active default	Decision made to stay in the default option as it is considered the best for the individual
Passive default	Decision to stay in the default option as it is seen to be endorsed by the fund
Automatic default	No investment choice exercised

Prior research shows that inadequate levels of financial literacy may prevent people from actively engaging and making informed financial choices (Bernheim & Garrett, 2003; Lusardi & Mitchell, 2006). Financial literacy has also been linked to saving behaviour and has been shown to have wide-reaching implications for household wellbeing. For example, Bernheim (1997) identify that for those households which lack basic financial knowledge, their saving behaviours are dominated by heuristics. Additionally, individuals with low financial literacy are found to be less likely to participate in the stock market (Christelis *et al.,* 2010; van Rooij *et al.,* 2011; Yoong, 2011). Dvorak

and Hanley (2010) also indicate that individuals with high levels of financial knowledge are more likely to actively participate in the defined contribution plan by making personal contributions. Together with studies such as those from Alessie *et al.* (2011), Lusardi and Mitchell (2006, 2008, 2009), this growing body of research shows that financial literacy relates to retirement planning which may lead to greater wealth.

The present study seeks to add to this literature by exploring the investment choice decisions of superannuation fund members in Australia. There is an important difference between this cohort of individuals and the investors considered by most previous studies. As outlined earlier, Australia's superannuation regime means that virtually all employees have mandated contributions of earnings made to a fund by their employers. Thus these investors are involuntary investors who may have no experience or interest in financial investment and yet are asked to make relatively complex investment decisions with significant implications for their income and wellbeing in retirement. By contrast, those who participate in the stock market or pension plans such as the US 401(k) plans have chosen to do so and are thus voluntary rather than involuntary investors.

While research on financial literacy and superannuation decisions has grown in recent years in Australia (see for example, Agnew *et al.,* 2013; Bateman *et al.,* 2010, 2012; Clark-Murphy, Gerrans & Speelman, 2009; Croy *et al.,* 2010; Gerrans, Clark-Murphy & Speelman, 2008), the main focus of these streams of research was on asset and portfolio allocation, as well as savings decisions. There appears to be limited research on investigating how financial literacy and other factors impact on fund members' decisions to exercise superannuation investment choice.

Behavioural economics offers a range of possible explanations, including bounded rationality and bounded self-control, for individuals who do not engage with retirement savings decisions. Coupled with the complexity of superannuation matters and choice overload, individuals might procrastinate or withdraw from investment choice decision-making, resulting in their compulsory superannuation savings remaining in the default investment option (Fear & Pace, 2008; Sy, 2011).

Along these lines of reasoning, individuals will be more likely to exercise investment choice if the perceived benefits of doing so are higher than the costs of gathering enough information to

enable them to make an informed choice (Brown *et al.,* 2002). Moreover, changes in rules and regulation about superannuation further add to the information costs in terms of time and effort by fund members to stay updated and informed. This would suggest that individuals with higher financial literacy might be more likely to exercise choice in superannuation decisions, since their information costs are likely to be lower than those with less literacy.

Indeed, prior research has identified that financial literacy is associated with a range of financial behaviours. For example, in investigating stock market participation in the Netherlands, van Rooij *et al.* (2011) find that individuals who are less financially knowledgeable (that is, do not know about stocks and bonds and are not familiar with the working of financial markets), tend to stay away from investing in the share market. In the study of retirement savings in the Netherlands, van Rooij and Teppa (2008) also find that the higher the degree of financial literacy, the higher the probability for individuals to have additional voluntary pension savings schemes. Similarly, in a US study, Dvorak and Hanley (2010) show that individuals with high levels of financial literacy are more likely to actively participate in their defined contribution plans by making personal contributions.

It can therefore be inferred from these studies that the more financially literate people are, the more likely they are to engage with financial decisions, such as participating in the stock market (van Rooij *et al.,* 2011), having additional pension savings plans (van Rooij & Teppa, 2008) or engaged with their defined contribution plans by making personal contributions (Dvorak & Hanley, 2010). Drawing the inference from these studies, it is expected that more financially literate fund members are likely to be more engaged with their superannuation savings and therefore more likely to be exercising investment choice. Therefore, the following hypothesis is proposed:

H1: Superannuation fund members with higher levels of financial literacy are more likely to exercise investment choice.

In relation to the phenomenon of the high proportion of superannuation assets invested in the default strategies, it is important to distinguish active versus passive default (Gallery *et al.,* 2011). As shown in Table 1, there are three levels of behaviour that all result in staying in the default

investment option. Empirical research shows that for complex decisions such as portfolio choice and retirement savings decisions, a high level of financial knowledge reduces the costs of financial choices and less literate individuals might show a higher aversion to taking these decisions (van Rooij & Teppa, 2008). For instance, Agnew and Szykman (2005) provide experimental evidence of financially illiterate participants being more likely to choose the default options in complex portfolio decisions. van Rooij and Teppa (2008) also find that the attractiveness of the default options is particularly high for less financially literate participants. Accordingly, the following hypothesis is proposed:

H2: Superannuation fund members with higher levels of financial literacy are more likely to make an 'active default and/or active others' choice than passive default.

Methodolgy

We used a survey instrument and partnered with a large public sector superannuation fund for distribution. This fund is for former or current government employees from a broad spectrum of occupations that extend from relatively low-skilled (e.g., cleaners and drivers) to professionals and executives (e.g., teachers, doctors and managers) (QSuper, 2012). While the fund does offer a defined benefit plan, all new members join as defined contribution account holders[iv]. There is a choice of nine investment options with the 'Balanced' option being the default option for members who do not make an investment choice. There were 689 completed surveys, which after excluding defined benefit members, resulted in a final sample size of 594. The sample demographics are shown in Table 2.

Measurement of variables

Financial literacy is comprehensively assessed through subjective and objective measures in this study. The items used in measuring the financial literacy construct and their sources are shown in Table 3. To avoid biases that could arise from simply summing the scores for survey question

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[iv] While DB is now closed to new members, it is possible that some members may have both a DB and DC account.

responses and to discern the underlying structure of the survey instrument (Gallery *et al.,* 2011), factor analysis was undertaken to increase the rigour of the measurement.

Exploratory factoring analysis by principal component analysis of the groups of subjective and objective financial literacy variables resulted in five interpretable latent factors. These factors and the associated variables are summarised in Table 4. Validity of the results from the principal factor analysis was assessed through confirmatory factor analysis (CFA). CFA was conducted to test how well the measured variables represent the constructs (Hair *et al.,* 2006). Using AMOS, the latent factors were assessed and the measured variables were further refined to ensure that there is a good fit between the measurement model and the data.

Initial analysis from CFA and evaluation of the diagnostic measures suggest that a number of variables should be deleted from the latent factors due to their standardised loadings falling below either the 0.7 cut-off, or the less conservative 0.5 threshold (Hair *et al.,* 2006). As a result, four variables were omitted from the model[v]. In the new model, two of the four remaining measured variables from the General Financial Literacy construct had standardised loadings slightly below the less conservative threshold of 0.5[vi]. However, as these items have been widely tested in prior studies (e.g., Bateman *et al.,* 2012; Lusardi & Mitchell, 2006, 2007a, 2009; van Rooij *et al.,* 2011), it was deemed appropriate that these two items should be retained in the measurement model due to their theoretical significance.

To further improve the goodness-of-fit indices of the re-specified model, it was decided that the Superannuation Financial Literacy construct should be removed from the model due to the remaining two items in this construct both falling below the acceptable criteria[vii] (Hair *et al.,* 2006). The effects of the Superannuation Financial Literacy construct on the subsequent multivariate regressions are assessed through robustness tests.

To assess whether the underlying dimensions that made up each factor are internally consistent *Cronbach's alpha* tests of reliability were conducted and the results are presented in Table 4. The

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[v] The standardised regression weights of FLS1, FLO1, FLO9 and FLO12 are 0.596, 0.388, 0.305 and 0.350 respectively.
[vi] The standardised regression weights for FLO2 and FLO6 are 0.445 and 0.485.
[vii] The standardised regression weights for FLO10 and FLO11 are 0.439 and 0.424.

results indicate that the underlying dimensions that made up Factors 1 and 4 (Subjective Financial Literacy and Complex Investment Options Literacy) are reliable as the coefficients exceeded the minimum threshold of 0.8 (Bryman & Cramer, 2009). Whereas the items that made up Factors 2 and 3 (General Financial Literacy and Simple Investment Options Literacy) exhibited lower levels of internal consistency (0.548 and 0.704 respectively). The exploratory nature of this study may partly explain these lower levels of internal reliability of the measured variables to the latent financial literacy factors. Fit indices relating to the CFA are displayed in Table 6 and indicate a reasonable fit of the model to the data with parameters mostly equivalent or slightly less optimal than the lower-bound criteria for acceptance identified by Hu and Bentler (1998).

This result supports the theoretical underpinning for analysing superannuation fund members' financial literacy in terms of Subjective Financial Literacy, General Financial Literacy, Simple Investment Options Literacy and Complex Investment Options Literacy. Standardised estimates and squared multiple correlations of these four factors are reported in Table 7.

In keeping with the financial literacy indices developed in Gallery *et al.* (2011) and conceptually speaking, the three indices derived from the factor analysis of the objective measures are indicators of the level of sophistication in financial literacy. While the first two indices (General Financial Literacy and Simple Investment Options Literacy) are regarded as more basic knowledge and skills, the third index (Complex Investment Options Literacy) reflects higher levels of knowledge and understanding of more complex investment products.

For each of the four financial literacy latent factors (FSSUB, FSGEN, FSSIM, FSCOM), respondents are assigned to high or low financial literacy quantiles based on the factor scores derived from the factor analysis. Four dummy variables (FLSUB, FLGEN, FLSIM, FLCOM) representing the high (1) or low (0) financial literacy groups are created using quantile grouping procedure.

In our study, *CHOICE* is the dependent variable to test hypothesis H1. Respondents who indicated that they had exercised choice, *CHOICE* is coded as one, and coded as zero for those who automatically defaulted. For respondents who had exercised investment choice, their investment choice outcome is further analysed. There are two investment choice outcomes for respondents who had exercised choice: (1) 'Passive Default' represents respondents who chose the default

option because they viewed it as an implicit recommendation by the fund trustees; (2) 'Active Default and/or Active Others' represents those who had reviewed all the investment options and selected the default option as it best suits their circumstances and those who chose other option(s)[viii]. The investment choice outcomes are captured by a dummy variable called *ACTIVE* which is coded one for 'Active Default and Active Others', and zero for Passive Default. *ACTIVE* is the dependent variable used in tests of hypothesis H2 and represents whether respondents had actively chosen the default option and/or other option(s), or passively defaulted to the default investment option.

There are three key factors found to be associated with financial literacy in prior research. These factors include individuals' financial risk tolerance (Benjamin *et al.,* 2013; Clark & Strauss, 2008; Dohmen *et al.,* 2010; van Rooij *et al.,* 2007, 2011), sources of advice and information (Bucher-Koenen & Koenen, 2011; Gallery *et al.,*2011; van Rooij *et al.,* 2011), and their socio-demographic characteristics, such as age, gender, education, wealth, working status, home ownership and investment holding (Coronado & Dynan, 2012; Gerran, 2012; Gallery *et al.,* 2011; Hung *et al.,* 2009; Lusardi, Mitchell, 2009; Lusardi, Mitchell & Curto, 2010; van Rooij *et al.,* 2011).

Financial risk tolerance was measured by five items and subsequently captured by two independent variables RISK*sub* and *RISK* representing subjective and objective financial risk tolerance respectively. A positive and highly significant correlation was found between these two measures of financial risk tolerance (r = 0.744, p < 0.01). The high correlation indicates that the survey respondents were able to accurately assess their financial risk tolerance. Because of the high correlation between these two risk tolerance variables, only objective risk tolerance[ix] (*RISK*) is used.

The variables are summarised in Table 8. The groupings for age, household income and superannuation account balance follow the categories used in ANZ (2011). Other variables include: home ownership (DWELL), the individual's working status (WORK), whether an individual

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[viii] Which may or may not include some investment allocated to the default (Balanced) option.
[ix] Subsequent analysis shows that regression results are essentially the same when subjective risk tolerance variable was used.

holds other investments in the form of cash products (OI*cash*), property (OI*prop*) or shares (OI*share*) separate from their superannuation fund (Gallery *et al.,* 2011)[x].

Regression models

Following prior studies in financial literacy and financial decisions (Lusardi *et al.,* 2009; van Rooij *et al.,* 2011), a two-stage multivariate regression analysis is utilised to jointly test the hypotheses in this study. In stage one, Regression Model 1 examines the associations between a range of explanatory variables and financial literacy. In stage two of the multivariate data analysis, the residuals of the financial literacy variables derived from Regression Model 1 become the independent variables measuring financial literacy, together with the other explanatory variables to predict investment choice in Regression Model 2.

The first stage of the regression involves assessing the levels of financial literacy of superannuation fund members by exploring a range of background characteristics, including financial risk tolerance, sources of advice and information, and socio-demographics factors. Hence, the logistic regression model to test the combined effects of these independent variables that are expected to be associated with high or low financial literacy, is:

$$\text{FL}X_i = a + \beta_1 \text{RISK}_i + \beta_2 \text{ADV}acct_i + \beta_3 \text{ADV}fp_i + \beta_4 \text{INFO}_i + \beta_5 \text{AGE}_i + \beta_6 \text{GEND}_i + \beta_7 \text{EDU}_i +$$
$$\beta_8 \text{HHINC}_i + \beta_9 \text{SUPBAL}_i + \beta_{10} \text{DWELL}_i + \beta_{11} \text{WORK}_i + \beta_{12} \text{OI}cash_i + \beta_{13} \text{OI}prop_i + \beta_{14} \text{OI}share_i + \xi_i$$

<div align="right">(Model 1)</div>

where FL*X*1 = Subjective Financial Literacy (FLSUB)
FL*X*2 = General Financial Literacy (FLGEN)
FL*X*3 = Simple Investment Options Literacy (FLSIM)
FL*X*4 = Complex Investment Options Literacy (FLCOM)

In the second stage of the regression, investment choice decision is the dependent variable, predicted to be associated with the independent variables of financial literacy and other

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[x]Three variables found to be non-significant in regression results in Gallery *et al.* (2011), including household situation, in terms of whether a person is living as couple with, or without children, and whether the individual lives in the city or a regional area, were also examined in this study and found to be non-significant in preliminary testing. As a result, these variables are excluded from the regression model in the current study.

explanatory variables (financial risk tolerance, sources of advice and information, and socio-demographic factors). Because these explanatory variables are expected to be associated with both financial literacy and investment choice, there is the potential issue of endogeneity between these variables. To partial out the effect of these explanatory variables on financial literacy, the standardised logit residuals from the regression model above (Model 1) are saved as new financial literacy variables (termed RFLSUB, RFLGEN, RFLSIM and RFLCOM) before entering the investment choice model in the second-stage regression.

Thus, the logistic regression model to test the combined effects of the financial literacy variable and the independent variables that are expected to be associated with investment choice, is:

$$\text{CHOICE}_i = a + \beta_1\text{RFL}X_i + \beta_2\text{RISK}_i + \beta_3\text{ADV}acct_i + \beta_4\text{ADV}fp_i + +\beta_5\text{PDS}_i + \beta_6\text{ICG}_i + \beta_7\text{AGE}_i + \beta_8\text{GEND}_i + \beta_9\text{EDU}_i +$$
$$\beta_{10}\text{HHINC}_i + \beta_{11}\text{SUPBAL}_i + \beta_{12}\text{DWELL}_i + \beta_{13}\text{WORK}_i + \beta_{14}\text{OI}cash_i + \beta_{15}\text{OI}prop_i + \beta_{16}\text{OI}share_i + \xi_i$$

(Model 2)

where   RFLX1 = Subjective Financial Literacy – Residual (RFLSUB)
        RFLX2 = General Financial Literacy – Residual (RFLGEN)
        RFLX3 = Simple Investment Options Literacy – Residual (RFLSIM)
        RFLX4 = Complex Investment Options Literacy – Residual (RFLCOM)

Logistic Regression Model 3 uses the sub-sample of respondents who had exercised choice to test for differences between respondents in the 'Active Default & Active Others' and 'Passive Default' groupings. Similar to the procedure for Model 2, the residual of the financial literacy variable from Model 1 becomes an independent variable in Model 3. The logistic regression model to test the combined effects of the financial literacy variable and the independent variables that are expected to be associated with active/passive default choice, is:

$$\text{ACTIVE}_i = a + \beta_1\text{RFL}X_i + \beta_2\text{RISK}_i + \beta_3\text{ADV}acct_i + \beta_4\text{ADV}fp_i + +\beta_5\text{PDS}_i + \beta_6\text{ICG}_i + \beta_7\text{AGE}_i + \beta_8\text{GEND}_i + \beta_9\text{EDU}_i +$$
$$\beta_{10}\text{HHINC}_i + \beta_{11}\text{SUPBAL}_i + \beta_{12}\text{DWELL}_i + \beta_{13}\text{WORK}_i + \beta_{14}\text{OI}cash_i + \beta_{15}\text{OI}prop_i + \beta_{16}\text{OI}share_i + \xi_i$$

(Model 3)

where   RFLX1 = Subjective Financial Literacy – Residual (RFLSUB)
        RFLX2 = General Financial Literacy – Residual (RFLGEN)
        RFLX3 = Simple Investment Options Literacy – Residual (RFLSIM)
        RFLX4 = Complex Investment Options Literacy – Residual (RFLCOM)

Results

Descriptive statistics for the sample of 594 respondents are presented in Table 9. Panel A shows the breakdown of respondents categorised into high or low financial literacy groups according to the factor scores of the four financial literacy indices. Panel A also shows that the majority of the respondents had exercised investment choice (76.1 percent) and for those who had exercised choice, 75.9 percent indicated that they had actively chosen the default and/or other options.

Panel B presents the frequencies of dichotomous independent variables. In terms of sources of advice and information, most respondents had consulted with accountants with their financial decision-making (84 percent) while consulting with financial planners was comparatively less popular (52.9 percent). Using the key documents in relation to superannuation investment decisions was quite widespread among the survey respondents, with three-quarters of them having used the sampled fund's Product Disclosure Statement (PDS) and 63 percent having used the Investment Choice Guide (ICG).

In terms of socio-demographics, Panels B and C of Table 9 show the majority of respondents had a TAFE/Trade Certificate or above qualification and more than half of them were working full-time. The sample was also over-represented by members with higher annual household income, averaging above $160,000. While about a quarter of the respondents had invested outside of superannuation in property, nearly half of them had investments in Australian and/or international shares, which may reflect the high proportion of members with high financial literacy.

To check for indications of multicollinearity, bivariate correlations and variance inflation factors (VIF) were reviewed. None of the bivariate correlations is greater than 0.7 and the highest VIF is 2.52. Multicollinearity is not considered to be present.

Model 1 - Predicting financial literacy

Hypothesis 1 predicts that superannuation fund members with higher levels of financial literacy are more likely to exercise investment choice. This hypothesis is supported by univariate analysis

of T-tests, which showed mean factor scores for members who exercised choice are significantly higher than those not making a choice in each of the financial literacy indices: subjective financial literacy (FLSUB t = 9.548, p < 0.01); general financial literacy (FLGEN t = 6.201, p < 0.01); simple investment options literacy (FLSIM t = 6.51, p < 0.01); and complex investment options literacy (FLCOM t = 2.548, p < 0.05). Chi-square tests show that for all the financial literacy indices, respondents with higher levels of financial literacy are more likely to exercise investment choice. However, these differences are less pronounced for FLCOM with relatively high proportions of both groups exercising investment choice. This result suggests that understanding complex investment options is not as strongly associated with choice as the other measures of financial literacy.

Results of the tests of Research Model 1 are presented in Table 10. The model for predicting subjective financial literacy has the highest pseudo R-square at 23.06%. The explanatory power is lower for predicting the three objective measures of financial literacy, with adjusted R-squares of 14.4 percent, 12 percent and 5.4 percent respectively.

The coefficients for financial risk tolerance are significant at conventional levels for all the four financial literacy indices. Consistent with the van Rooij *et al.* (2007) finding that risk tolerance is highly correlated with self-assessed financial literacy in their study of pension plan participants in the Netherlands, the results here show that fund members with higher risk tolerance are more likely to have higher levels of subjective financial literacy (FLSUB z = 2.47, p < 0.05). The additional finding that risk tolerance is also associated with all three objective measures of financial literacy (FLGEN z = 2.26, p < 0.05; FLSIM z = 2.34, p < 0.05; FLCOM z = 2.57, p< 0.01) suggests a stable relationship between financial literacy and risk tolerance.

Interestingly, with regard to sources of advice, consultation with different types of financial experts is found to have differing associations with financial literacy. Consultation with accountants (ADV*acct*) is a significant predictor for higher financial literacy for both measures of investment options literacy (FLSIM z = 3.54, p < 0.01; FLCOM z = 2.22, p < 0.05). However, consulting with financial planners (ADV*fp*) is (marginally) significant for complex investment options literacy (FLCOM z = 1.83, p< 0.1) only. In other words, those with higher levels of financial

literacy on both simple and complex investment options are more likely to consult an accountant to assist with their financial decision-making, but only those who are more literate in complex investment options are more likely to consult a financial planner. While prior literature has generally found that individuals with higher financial literacy are more likely to solicit financial advice (ANZ, 2011; Bucher-Koenen & Koenen, 2011), consistent with Gallery *et al.* (2011), this study more specifically finds that those who are more literate in investment matters are more likely to consult financial professionals.

Results of the logistic regression analysis show that members who used more sources of financial information (INFO) are likely to have higher levels of literacy across all four financial literacy indices (FLSUB $z=3.98$, $p < 0.01$; FLGEN $z = 4.15$, $p < 0.01$; FLSIM $z = 4.45$, $p < 0.01$; FLCOM $z = 2.41$, $p < 0.05$). These statistically highly significant result confirm findings reported in prior studies (e.g., Dvorak & Hanley, 2010; Gallery *et al.,* 2011; van Rooij *et al.,* 2011) that individuals who become informed by using more sources of financial information are more likely to have higher levels of financial literacy.

Consistent with the univariate tests, results of the logistic regression analysis show that the coefficient for AGE is positively associated with all the three objective financial literacy indices (FLGEN $z = 1.67$, $p < 0.1$; FLSIM $z = 1.64$, $p < 0.1$; FLCOM $z = 1.58$, $p < 0.1$) but is not significant in relation to the subjective financial literacy index. This result indicates older fund members are likely to have higher levels of objectively measured financial literacy than younger members.

In contrast with findings from Lusardi and Mitchell (2011) and ANZ (2011) that financial literacy is lowest for the youngest and the oldest age groups, the results from this study provide support for Gallery *et al.* (2011) who found a linear association between fund members' age and their financial literacy. It is reasoned that the complexity of superannuation decision-making may be attributable to differences in the pattern of financial literacy among fund members than that of the broader population.

Also confirming the univariate tests, results from the logistic regression analysis show that gender (GEND) is a significant predictor of three of the four financial literacy indices. In particular, the results show that gender is associated with self-rated financial literacy (FLSUB $z = 5.28$, $p < 0.01$)

and the two more basic objective measures of financial literacy (FLGEN z = 5.51, p < 0.01; FLSIM z = 3.44, p < 0.01). However, no associations are found between gender and more advanced financial literacy. The gender differences in financial literacy identified in this research are generally consistent with those reported in prior studies across different countries and context (Atkinson & Messy, 2011; Bateman *et al.,* 2012; Dvorak & Hanley, 2010; Gallery *et al.,* 2011; Hung *et al.,* 2009; Lusardi & Mitchell, 2008, 2011, 2014; van Rooij *et al.,* 2011).

In terms of the association of education (EDU) and financial literacy, the regression results show that education is associated with general financial literacy (FLGEN z = 2.64, p < 0.01). However, no statistically significant associations are found between education and self-rated financial literacy (FLSUB) and the two investment options literacy (FLSIM and FLCOM). While these results are consistent with those found in the univariate tests, they are in contrast with the findings of prior studies (Bateman *et al.,* 2012; Gallery *et al.,* 2011; van Rooij *et al.,* 2011) which generally find financial literacy increases strongly with education. A possible explanation for this difference in findings is that the sample of this study was over-represented by superannuation fund members with high education levels with over 80 percent of the respondents having a TAFE/Trade Certificate or above qualification. It is reasoned that at these high levels of education qualifications, there might be little variation in terms of their associations with self-rated financial literacy and literacy concerning superannuation investment options.

There are mixed results regarding wealth and financial literacy. On the one hand, the regression analyses do not find significant coefficients for household income (HHINC), unlike prior studies (Dvorak & Hanley, 2010; Lusardi & Mitchell, 2009; Gallery *et al.*, 2011), which generally find financial literacy scores to be associated with household income levels. Similar to the reason given above for education, the sample was over-represented by respondents with high household income levels. Indeed 53 percent of the respondents had household income above $160,000 and there was small variance (standard deviation = 1.18) within the sample. These sample-specific attributes may potentially explain the difference in the findings. On the other hand, superannuation account balance (SUPBAL) is found to be positively and significantly associated with subjective financial literacy (FLSUB z = 3.44, p < 0.01), but not the three objectively measured financial literacy. This is an interesting observation in that although the stake is higher for

individuals with larger superannuation account balances, they may over-estimate their actual financial ability. This raises concern regarding how financially capable these cohorts of individuals actually are to make informed choices, especially in the context of complex superannuation investment decisions.

Similar to superannuation account balance, the results of the logistic regression in Table 10 show that the variables of dwelling (DWELL z = 2.41, p < 0.05), owning investment in cash products (OI*cash z* = 3.01, p < 0.01) and owning investment in shares (OI*share z* = 2.69, p < 0.01) are significant in predicting subjective financial literacy only. Having investments in property (OI*prop z* = 1.76, p < 0.1) marginally predicts simple investment options literacy only.

Model 1 explains 23.06 percent of the variance in the FLSUB, while the pseudo R-squares are 14.39 percent for FLGEN, 12.03 percent for FLSIM and 5.4 percent for FLCOM. Goodness of fit of the regression model can be evaluated by the classification accuracy shown as 74.7 percent, 74.2 percent, 69 percent and 64.1 percent respectively for the four financial literacy indices.

In summary, the findings have extended prior research by examining the factors that are associated with the four aspects of financial literacy in the context of superannuation investment decisions. For example, higher risk tolerance is found to be significant in predicting not only self-assessed financial literacy, as in van Rooij *et al.* (2007) but also all three objective measures of financial literacy. Furthermore, the results extend prior literature (e.g., ANZ, 2011; Bucher-Koenen & Koenen, 2011) by providing specific evidence concerning the types of financial experts that are associated with the different aspects of financial literacy. Unlike findings reported in Lusardi and Mitchell (2011) that financial literacy is highest for the middle-age groups, this study finds a linear association between fund members' age and their financial literacy levels, thus supporting findings reported in Gallery *et al.* (2011).

Model 2 - Predicting exercising investment choice

The second stage of the regression analysis investigates the factors that are associated with investment choice decisions. Results of the logistic regression analysis are presented in Table 11. The results show that the model is significant for all the four financial literacy indices with Chi-square statistics ranging from 214.65 for complex investment options literacy to 220.62 for

subjective financial literacy. The model correctly predicts 84 percent of the observations, and has pseudo R-squares of 33.8, 33.4, 33.2 and 32.9 percent respectively for the four financial literacy indices.

Consistent with univariate tests, the results from the logistic regression analysis show that, except for complex investment options literacy (RFLCOM), all the other three financial literacy variables are positively and significantly associated with exercising investment choice. Therefore, supporting hypothesis H1, members with higher levels of subjective financial literacy (RFLSUB $z = 2.52$, $p < 0.05$), general financial literacy (RFLGEN $z = 2.13$, $p < 0.05$) and simple investment options literacy (RFLSIM $z = 1.72$, $p < 0.1$) are more likely to exercise investment choice.

Prior studies generally find that individuals with higher levels of financial literacy are more likely to engage with financial decisions (Dvorak & Hanley, 2010; van Rooij & Teppa, 2008; van Rooij *et al.,* 2011). These stream of prior research has mainly examined financial literacy in the setting of voluntary financial decisions, such as having additional pension savings schemes (van Rooij & Teppa, 2008), making personal contributions in 401(k) plans (Dvorak & Hanley, 2010) and participating in stock market (van Rooij *et al.,* 2011). The finding from the current study therefore extends prior literature by providing empirical evidence in the context of the mandatory superannuation system in Australia which generally shows that fund members with higher levels of financial literacy are also more engaged with financial decisions and therefore more likely to exercise investment choice.

In terms of financial risk tolerance (RISK), the regression results are similar to that found in predicting financial literacy (Model 1) in that it is significant in the current model. Fund members with higher risk tolerance are more likely to exercise investment choice when either of the four financial literacy indices is concerned (RFLSUB $z = 2.6$, $p < 0.01$; RFLGEN $z = 2.68$, $p < 0.01$; RFLSIM $z = 2.68$, $p < 0.01$; RFLCOM $z = 2.65$, $p < 0.01$). van Rooij *et al.* (2007) test self-assessed financial literacy only and demonstrate that investors with higher risk tolerance are more likely to prefer investor autonomy in choosing pension plans. The finding from the current study enhances the literature by showing that not only self-rated but also objectively tested financial literacy are associated with exercising superannuation investment choice.

Consultation with different types of financial experts is also found to have differing associations with investment choice decisions. While consultation with accountants (ADV*acct*) is a significant predictor for higher financial literacy for the two investment options literacy, interestingly, it is not found to be significantly associated with exercising investment choice. On the other hand, while consulting with financial planners (ADV*fp*) is marginally significant for predicting complex investment options literacy, it is found to be significantly associated with exercising investment choice under all the four literacy indices in Model 2, (RFLSUB z = 2.93, p < 0.01; RFLGEN z = 2.91, p < 0.01; RFLSIM z = 2.94, p < 0.01; RFLCOM z = 3.00, p < 0.01). The results show that fund members who consult with financial planners are more likely to exercise investment choice.

These results again reflect the distinct preference that individuals may have in terms of learning and seeking help with actual financial decisions. More specifically, the Stage One regression results indicate that more financially literate individuals are more likely to consult accountants in their financial decision-making, particularly in relation to superannuation investment options. However, as far as actual investment choice decisions are concerned, individuals tend to solicit advice from financial planners, as the regression result from Model Two shows. While it is acknowledged that some financial experts may perform both roles (that is, some accountants also provide financial planning services and vice versa) these findings have important implications for both accounting and financial planning professional bodies in terms of clarifying their service offering to the superannuation fund members.

In terms of using key documents in relation to superannuation and investment decisions, results of the logistic regression analysis show that those who use the sampled fund's PDS are significantly more likely to exercise investment choice under all four financial literacy indices (RFLSUB z = 3.92, p < 0.01; RFLGEN z = 3.9, p < 0.01; RFLSIM z = 3.86, p < 0.01; RFLCOM z = 3.82, p < 0.01). These results make intuitive sense as the mere act of using the PDS is a form of time investment which in itself is an act of exercising choice. However, the other key document, namely Investment Choice Guide (ICG) is not found to be significantly associated with exercising investment choice.

Regarding socio-demographic factors, the regression analysis results in Table 11 show that AGE is significant at conventional levels under all the four financial literacy indices (RFLSUB z = 3.11, p < 0.01; RFLGEN z = 3.09, p < 0.01; RFLSIM z = 3.06, p < 0.01; RFLCOM z = 3.03, p < 0.01). Hence, older members are found to be more likely to exercise superannuation investment choice. These results are consistent with research has found that people are taking more interest in superannuation matters only later in their work life when the imminence of retirement becomes more salient (Mercer, 2006). Hence, older members who are closer to retirement are found to be more financially literate and are therefore more active in making superannuation investment choice decisions.

Regression results also show that gender (GEND) is significant in predicting whether a fund member will exercise investment choice. Male members are more likely to exercise investment choice under all four financial literacy indices (RFLSUB z = 2.63, p < 0.01; RFLGEN z = 2.76, p < 0.01; RFLSIM z = 2.76, p < 0.01; RFLCOM z = 2.71, p < 0.01). Prior studies find evidence to suggest that males are more engaged with financial decisions than their female counterparts in a range of contexts (Agnew *et al.,* 2003; van Rooij *et al.,* 2007, 2011). The results from this research add to this body of literature by showing gender differences in investment choice decision-making in the superannuation setting.

With regard to education (EDU), the logistic regression analysis in Table 11 shows that it is significant at the 10 percent level in the current model. Hence, more highly educated fund members are more likely to exercise investment choice when either of the four aspects of financial literacy is considered (RFLSUB z = 1.79, p < 0.1; RFLGEN z = 1.87, p < 0.1; RFLSIM z = 1.88, p < 0.1; RFLCOM z = 1.86, p < 0.1). Prior studies found that education is positively associated with exercising choice in a range of voluntary financial decisions, such as pension schemes choice in the Netherlands (van Rooij *et al.,* 2007) and stock market participation (van Rooij *et al.,* 2011). The findings from this study therefore provide evidence regarding the relationship between education and exercising choice in the context of mandatory superannuation investment decisions.

Regarding wealth and investment choice decisions, household income (HHINC) is not found to be a significant predictor for exercising choice. However, superannuation account balance (SUPBAL) is positively and significantly associated with exercising investment choice under all four financial literacy indices, (RFLSUB z = 5.61, p < 0.01; RFLGEN z = 5.61, p < 0.01; RFLSIM z = 5.63, p < 0.01; RFLCOM z = 5.57, p < 0.01). Prior literature, such as those from Clark *et al.* (2006), suggests that 'the size-of-bet' is a significant issue for informed investors in their asset allocation decisions. The results also show that the higher the stake in superannuation assets, the more likely the members are to take an active interest in exercising investment choice. While prior studies found that individuals with higher wealth were more likely to be engaged with financial decisions such as investing in shares (Christelis *et al.,* 2010; van Rooij *et al.,* 2011), or exercising choice in pension schemes (van Rooij *et al.,* 2007), limited research has examined specifically the relationship between wealth and exercise choice in the superannuation context. Therefore, the findings from this study contribute to the extant literature by providing empirical evidence regarding the association between superannuation account balances and exercising investment choice.

Similar to superannuation account balance, the results show that the variables of owning investment in property (OI*prop*) and owning shares (OI*share*) are significant in predicting whether an individual will exercise investment choice. These results suggest that for those members who held investment outside of superannuation and thus might already have experience in investment, they are likely to be more engaged in financial decisions and are therefore also more likely to be more engaged in superannuation investment decisions.

In summary, the results show that fund members with higher subjective financial literacy, general financial literacy and simple investment options literacy are more likely to exercise investment choice. Similarly, fund members with higher risk tolerance are more likely to exercise investment choice. Consulting with financial planners is also associated with exercising investment choice. Older, male, more educated members and those with larger superannuation account balances are also found to be more likely to exercise investment choice. While these factors have been tested in prior studies, they were examined mainly in voluntary financial decisions. The results from this study therefore extend prior literature by demonstrating that these factors are also

significantly associated with investment choice decisions in the context of the mandatory superannuation system in Australia.

Model 3 - Predicting active/passive default choice

For members who indicated that they had exercised investment choice (*N*=452), hypothesis H2 proposes that superannuation fund members with higher levels of financial literacy are more likely to make an 'active default and/or active others' choice than 'passive default'. More specifically, 'active default' refers to respondents who have chosen only the default option (i.e., 100 percent investment in the 'Balanced' option) as it is the one best suited to their circumstances. 'Active others', refers to those respondents who have selected 'Balanced' and/or other investment options. Due to a lack of theoretical basis for arguing that those members who have actively chosen the default option are more financially literate than those who chose other options, these two subgroups are combined in testing H2[xi]. On the other hand, 'passive default' refers to fund members who have chosen the 'Balanced' option only as they viewed it as the implicit recommendation from the fund.

T-test results show that only the mean self-rated financial literacy (FLSUB) factor score is significantly higher for those who actively chose default and/or other options than those who passively defaulted, that is, selected the default option because they viewed it as the implicit recommendation from the fund ($t = 2.157$, $p < 0.05$), and Chi-square test results indicate that this relationship is statistically significant only for FLSUB ($X^2 = 6.705$, $p < 0.05$). These results suggest that members who perceive themselves to be more financially literate are more likely to make an active investment choice than those rating themselves as less financially literate. There are no such associations between objective measures of financial literacy and likelihood of making an active choice. These preliminary univariate tests of hypothesis H2 indicate it may not be supported.

Based on the sub-sample of respondents who had exercised investment choice, Regression Model 3 tests hypothesis H2 which proposes that fund members with higher levels of financial literacy

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[xi] Results from test for equivalence of these groups also indicate that these groups are not different.

are more likely to make an 'active default and/or active others' choice than 'passive default' choice.

For respondents who indicated that they had exercised investment choice, hypothesis H2 predicts that members with higher levels of financial literacy are more likely to make an 'active default and/or other options' choice than passive default. Logistic Regression Model 3 uses the sub-sample of respondents who had exercised choice to test for differences between respondents in the 'Active Default & Active Others' and 'Passive Default' groupings.

Results of the logistic regression analysis for Model 3 are presented in Table 12. The results reveal that subjective financial literacy is marginally significant in predicting investment choice outcome (RFLSUB z = 1.87, $p < 0.1$). However, none of the other financial literacy variables are significant in predicting investment choice outcome. That is, objective financial literacy is not found to be associated with actively choosing the default (Balanced) option and/or active other options versus passively defaulted to the Balanced option.

The lack of evidence from the logistic regression models regarding the objective financial literacy variables is consistent with the univariate results, where none of the financial literacy variables is found to be correlated with active or passive default choice. The model under the four financial literacy indices also has low explanatory power with Pseudo R-squares in the order of two to three percent.

There appears to be no evidence of an association between financial literacy and investment choice outcome. Thus, hypothesis H2 is rejected in relation to objective measures of financial literacy but is accepted in relation to self-rated financial literacy. This result shows that, controlling for other factors, fund members who perceive themselves to be more financially literate are more likely to make an active choice, but their objectively-measured financial literacy is not statistically different from those who passively default.

Robustness tests

Robustness of the estimates from the multivariate regression models is tested by a series of path analysis. As the explanatory variables are expected to be associated with both financial literacy

and investment choice, there is the potential issue of endogeneity. In the path analysis, instead of using the residuals of the financial literacy variables as the independent variables, the original literacy variables are used to estimate the mediating effects of the explanatory variables on financial literacy as well as onto investment choice outcome.

The results generally confirm the estimates from regression model 2. Except for complex investment options literacy (FLCOM), all the other financial literacy variables are positively and significantly associated with exercising investment choice.

Regression Model 3 uses the sub-sample of respondents who indicated that they had exercised investment choice to test for differences between respondents in the 'Active Default & Active Others' and 'Passive Default' groupings, and there is potentially sample selection bias when the inference from Model 3 is referred to the population represented by the full sample. A HeckmanProbit model is estimated, following the step used in prior studies with sample selection issues such as those from Bucher-Koenen and Koenen (2011).

The Heckman probit model outcome, with the rho estimated to be not significantly different from 0, indicates that there is no statistically significant sample selection bias. Thus, it is not different from the outcome obtained by fitting the "Choice Model" (Model 2) and "Active Model" (Model 3) separately.

A final robustness test was to include the superannuation-related items that were removed after the confirmatory factor analysis process. First, the factors that are associated with Superannuation Financial Literacy (hereafter refers to as FLSUP) are assessed using the equation presented in Model 1. Second, the residual of the financial literacy variable (RFLSUP) is tested using the equation of Model 2 to assess its association with exercising investment choice. Lastly, Model 3 is re-estimated to investigate whether superannuation financial literacy, together with the other background factors, are associated with 'active default and/or active others' and 'passive default' choice. In all three tests, the results confirmed the previous regression results.

Summary and conclusions

Results from univariate and multivariate analysis shows that fund members with higher levels of financial literacy are also more engaged with financial decisions and therefore more likely to exercise investment choice. Prior studies found that individuals with higher levels of financial literacy are more likely to engage with voluntary financial decisions such as investing in shares or making additional retirement saving contributions. The finding from the current study therefore extends prior literature by providing empirical evidence in the context of the mandatory superannuation system in Australia.

Regarding the investment choice outcome for fund members who had exercised choice, the regression analysis shows that those who perceived themselves with higher financial literacy are more likely to choose the 'active default and/or other options' choice than passively default. This finding suggests that higher confidence in one's financial capability increases the likelihood of making a distinct choice, further pointing to the need and benefit of improving superannuation fund members' financial literacy.

Results from Regression Model 1 confirm the prediction that fund members who are willing to tolerate higher levels of financial risk are likely to have higher levels of financial literacy across all four financial literacy indices. Besides, individuals who consult with financial experts and use more financial information sources are also more likely to have higher financial literacy. In relation to the association of socio-demographic characteristics with financial literacy, the results generally confirm findings from prior financial literacy studies that older, male, more highly educated, and members with larger superannuation account balances, have higher levels of financial literacy, although the strength of associations differed across the four financial literacy indices.

The results from stage two of the multivariate regression show that, except for complex investment options literacy, all the other three financial literacy variables are positively and significantly associated with exercising investment choice. Therefore, the findings from this study extend prior literature which has mainly examined the association of financial literacy with voluntary financial decisions by providing empirical evidence of the association of financial literacy with mandatory superannuation decisions.

Overall, the findings reported in this study provide several important contributions to understanding the association of financial literacy and investment choice decisions in the context of the mandatory superannuation system in Australia. More broadly, the findings contribute to the financial literacy literature by providing a comprehensive analysis of the levels of financial literacy of superannuation fund members. Additionally, building from the subjective and objective tests of financial literacy in prior literature, the model developed in this study, which encompasses an extensive range of measures, provides an important tool for identifying potential areas of concerns such as under- or over-confidence in financial knowledge.

Moreover, the finding from this study has extended prior research by examining the factors that are associated with the four aspects of financial literacy in the context of superannuation investment decisions. For example, higher risk tolerance is found to be significant in predicting not only self-assessed financial literacy, as in van Rooij, Kool & Prast (2007) but also all three objective measures of financial literacy. It also offers insights by providing specific evidence concerning the types of financial experts that are associated with the different aspects of financial literacy, thereby further extending prior research (ANZ, 2011; Bucher-Koenen & Koenen, 2011).

More importantly, mirroring findings reported in Gallery *et al*. (2011), by identifying the key aspects of financial literacy relevant to the superannuation context, this thesis went beyond the study of day-to-day household finances by providing important insights towards understanding context-specific components of financial literacy. As such, the findings from this study could aid in the development of financial literacy programs targeted to improve financial knowledge and skills specific to superannuation matters.

Therefore, the findings from this research have implications for policy-makers and the superannuation industry. First, this study identifies fund members who are more likely to have lower levels of financial literacy and therefore are less likely to exercise superannuation investment choice. Second, the superannuation industry is aware of the need for fund members to take an active interest in their superannuation savings. By identifying cohorts of fund members who are likely to have lower levels of financial literacy and therefore at greater risk of not exercising investment choice, financial education programs, particularly those relating to

understanding the risks and returns associated with superannuation investment options, can be

targeted to the groups that need them most.

Table 2 Sample Demographics

	Sample Respondent %
Gender	
Male	54
Female	46
Age	
18 - 24 years	9
25 - 34 years	8
35 - 44 years	13
45 - 54 years	17
55 - 64 years	25
65 and over	29
Superannuation Account Balance	
$0 - $4,999	5
$5,000 - $24,999	8
$25,000 - $49,999	12
$50,000 - $99,999	13
$100,000 - $199,999	12
$200,000 - $499,999	22
$500,000 plus	23
Preferred Not to Answer[xii]	5
Investment Options	
Balanced	71
Moderate	4
Socially Responsible	2
Indexed Mix	3
Aggressive	6
Cash	16
Diversified Bonds	12
Australian Shares	12
International Shares	9

[xii]5.2% (n=31) cases of Preferred Not to Answer (PNA) for Superannuation Account Balance were replaced by the mean response ($100,000 - $199,999), thereby increasing the frequency of this group from 12.3% to 17.5%. As per Hair *et al.* (2006), PNA responses are replaced with the mean value as deleting these cases could create distortion to the data. Subsequent analyses are conducted with and without this subgroup of cases with PNA and the results are substantively the same.

Table 3 Operationalisation of financial literacy constructs

Constructs	Survey Question No.	Variable Code	Indicators	Source
Subjective Financial Literacy	1a	FLS1	Budget day-to-day finance Saving money	Mercer, 2006
	1b	FLS2	Managing debt	Financial Literacy
	1c	FLS3	Investing money	Foundation, 2007
	1d	FLS4	Planning for financial future	
	1e	FLS5	Retirement planning	
	1f	FLS6		
Objective Financial Literacy				
1. Basic financial knowledge	2	FLO1	Compound interest	Lusardi &
	3	FLO2	Inflation	Mitchell, 2006,
	4	FLO3	Time value of money	2007a, 2009
	5	FLO4	Money illusion	
				van Rooij *et al.*,
2. General investment knowledge	6	FLO5	Risky assets	2011
	7	FLO6	Long period returns	
	8	FLO7	Volatility	Bateman *et al.*,
	9	FLO8	Risk diversification	2012
3. Superannuation general knowledge	10a	FLO9	Legislation	Mercer, 2006
	10b	FLO10	Taxation	ANZ, 2008, 2011
	10c	FLO11	Asset allocation	
4. Advanced superannuation investment options knowledge	11	FLO12	Performance indicator	
				Gallery *et al.*, 2008,
	12a-12i	FLPRK1-FLPRK9	Risk rating of nine investment options	Gallery *et al.*, 2011
	13a-13i	FLPRT1-FLPRT9	Returns rating of nine investment options	

Table 4 Summary of financial literacy latent factors

Factor Acronym	Factor Name	Description
FSSUB	Subjective Financial Literacy	Factor score for self-rated financial literacy from six items (FLS1 – FLS6)
FSGEN	General Financial Literacy	Factor score for general financial literacy from five items (FLO1, FLO2, FLO5, FLO6, FLO7)
FSSUP	Superannuation Financial Literacy	Factor score for superannuation-related financial literacy (FLO9 – FLO12)
FSSIM	Simple Investment Options Literacy	Factor score for the understanding of risk and returns of simpler investment options, i.e., Cash and Diversified Bonds (FLPRK1 – FLPK2; FLPRT1 – FLPRT2)
FSCOM	Complex Investment Options Literacy	Factor score for understanding of risk and return of more complex investment options, i.e., International Shares and Australian Shares (FLPRK3 – FLPRK4; FLPRT3 – FLPRT4)

Table 5 Estimates of internal reliability of financial literacy constructs

Factor	Measured variables	*Cronbach's alpha*
FSSUB – Subjective Financial Literacy	FLS2, FLS3, FLS4, FLS5, FLS6	0.898
FSGEN – General Financial Literacy	FLO2, FLO5, FLO6, FLO7	0.584
FSSIM – Simple Investment Options Literacy	FLPRK1, FLPRK2, FLPRT1, FLPRT2	0.704
FSCOM – Complex Investment Options Literacy	FLPRK3, FLPRK4, FLPRT3, FLPRT4	0.811

Table 6 Fit indices

Parameter	Fit indices	Criteria	Comment
CMIN/DF	3.985	<3 <5 for exploratory study	A good fit of the model to the data for exploratory study
CFI	0.933	>0.9	A good fit of the model to the data
RMSEA	0.071	<0.05	Reasonably acceptable level of fit with model to the data
Standardised RMR	0.0734	<0.05	Reasonably acceptable level of fit with model to the data

Table 7 Standardised estimates for financial literacy variables

	Standardised Regression Weights	Squared Multiple Correlations
FLS2	0.623	0.388
FLS3	0.628	0.394
FLS4	0.802	0.644
FLS5	0.935	0.875
FLS6	0.9	0.809
FLO2	0.445	0.198
FLO5	0.629	0.395
FLO6	0.485	0.235
FLO7	0.672	0.451
FLPRK1	0.535	0.286
FLPRK2	0.582	0.338
FLPRT1	0.509	0.259
FLPRT2	0.754	0.569
FLPRK3	0.447	0.2
FLPRK4	0.5	0.25
FLPRT3	0.914	0.835
FLPRT4	0.933	0.87

Table 8 Variables description

Acronym	Variable Name	Measure	Model	Related Hypotheses
Dependent variables				
FLSUB	Subjective Financial Literacy	Coded 1 for high literacy and 0 for low	1	
FLGEN	General Financial Literacy	Coded 1 for high literacy and 0 for low	1	
FLSIM	Simple Investment Options Literacy	Coded 1 for high literacy and 0 for low	1	
FLCOM	Complex Investment Options	Coded 1 for high literacy and 0 for low	1	
CHOICE	Investment Choice Outcome	Exercised investment choice = 1; Had not exercised choice = 0	2	1
ACTIVE	Active/Passive Default	Active Default & Active Others = 1; Passive Default = 0	3	2
Independent variables				
	Financial Literacy:			
RFLSUB	Subjective Financial Literacy – Residual	Logit residual of Subjective Financial Literacy (FLSUB) derived from Model 1	2, 3	1, 2
RFLGEN	General Financial Literacy – Residual	Logit residual of General Financial Literacy (FLGEN) derived from Model 1	2, 3	1, 2
RFLSIM	Simple Inv't Options Literacy – Residual	Logit residual of Simple Investment Options Literacy (FLSIM) derived from Model 1	2, 3	1, 2
RFLCOM	Complex Inv't Options Literacy – Residual	Logit residual of Complex Investment Options Literacy (FLCOM) derived from Model 1	2, 3	1, 2
	Financial Risk Tolerance:			
RISK	Risk Tolerance	Factor scores derived from four objective risk tolerance items	1, 2, 3	
	Sources of Advice & Information:			
ADV*acct*	Consulted accountant	Consulted accountant = 1; otherwise 0	1, 2, 3	
ADV*fp*	Consulted financial planner	Consulted financial planner = 1; otherwise 0	1, 2, 3	
INFO	Number of info sources used	Number of financial information sources used	1	
PDS	Used PDS	Used fund's Product Disclosure Statement =1; otherwise 0	2, 3	
ICG	Used ICG	Used fund's Investment Choice Guide = 1; otherwise 0	2, 3	
	Socio-demographic:			
AGE	Age	1 = 18 – 24; 2 = 25 – 34; 3 = 35 – 44; 4 = 45 – 54; 5 = 55 – 64; 6 = 65 and over	1, 2, 3	
GEND	Gender	Male = 1; Female = 0	1, 2, 3	
EDU	Education level	1 = Below Year 12; 2 = Year 12; 3 = TAFE / Trade Certificate; 4 = Degree/Diploma; 5= Postgraduate	1, 2, 3	
HHINC	Household income	1 = Less than $100,000; 2 = $100,000 - $159,999 3 = $160,000 - $219,999; 4 = $220,000 - $279,999 5 = More than $280,000	1, 2, 3	
SUPBAL	Superannuation account balance	1 = Less than $25,000; 2 = $25,000 - $99,999 3 = $100,000 - $199,99; 4 = $200,000 - $499,999 5 = More than $500,000	1, 2, 3	
DWELL	Home ownership	Own home (mortgaged/mortgaged-free) = 1; otherwise 0	1, 2, 3	
WORK	Work status	Working full-time = 1; otherwise 0	1, 2, 3	
OI*cash*	Hold investments in cash products	Hold investments in cash or cash management account = 1; otherwise 0	1, 2, 3	
OI*prop*	Hold investments in property	Hold investments in property (owned/mortgaged) = 1; otherwise 0	1, 2, 3	
OI*share*	Hold investments in shares	Hold investments in Australian and/or International shares = 1; otherwise 0	1, 2, 3	

Table 9 Descriptive statistics (*N* = 594)

Panel A: Dichotomous variables – Dependent variables	Coded	1	0
FLSUB (Subjective Financial Literacy, High = 1)		51.2%	48.8%
FLGEN (General Financial Literacy, High = 1)		70.0%	30.0%
FLSIM (Simple Investment Options Literacy, High = 1)		61.4%	38.6%
FLCOM (Complex Investment Options Literacy, High = 1)		55.9%	44.1%
CHOICE (Exercised investment choice = 1)		76.1%	23.9%
ACTIVE (Active Default &/Active Others = 1; Passive Default = 0) (N=452)		75.9%	24.1%

Panel B: Dichotomous variables – Independent variables	Coded	1	0
ADVacct (Consulted accountant = 1)		84.0%	16.0%
ADVfp (Consulted financial planner = 1)		52.9%	47.1%
PDS (Used Product Disclosure Statement = 1)		75.8%	24.2%
ICG (Used Investment Choice Guide = 1)		63.3%	36.8%
GEND (Male = 1; Female = 0)		53.5%	46.5%
DWELL (Own home (mortgaged or mortgage-free) = 1)		81.3%	18.7%
WORK (Working full-time = 1)		52.7%	47.3%
OIcash (Hold Investments in term deposit or cash management account = 1)		43.9%	56.1%
OIprop (Hold Investments in property (owned/mortgaged) = 1)		26.4%	73.6%
OIshare (Hold Investments in Australian and/or international shares = 1)		46.3%	53.7%

Panel C: Continuous / Ordinal variables – Independent variables	Mean	Median	S.D.	Min	Max
RFLSUB (Logit residual of FLSUB from Model I)	-0.09	1.02	3.02	-28.30	17.44
RFLGEN (Logit residual of FLGEN from Model II)	-0.04	1.14	3.01	-33.98	4.61
RFLSIM (Logit residual of FLSIM from Model III)	-0.07	1.20	2.64	-25.84	5.12
RFLCOM (Logit residual of FLCOM from Model IV)	-0.02	1.34	2.12	-6.25	4.09
RISK (Objective risk tolerance factor score)	0.00	-0.39	1.00	-1.11	2.16
INFO (Number of information sources used)	4.78	5	2.25	0	8
AGE (18-24 = 1; 25-34 = 2; 35-44 = 3; 45-54 = 4; 55-64 = 5; over 65 = 6)	4.28	5	1.60	1	6
EDU (Below Year 12 = 1; Year 12 = 2; TAFE/Trade Cert = 3; Degree/Diploma = 4; Postgraduate = 5)	3.66	4	1.18	1	5
HHINC (Below $100,000 = 1; $100,000-$159,999 = 2; $160,000-$219,999 = 3; $220,000-$279,999 = 4; Over $280,000 = 5)	2.72	3	1.18	1	5
SUPBAL (Below $25,000 = 1; $25,000-$99,999 = 2; $100,000-$199,999 = 3; $200,000-$499,999 = 4; Over $500,000 = 5)	3.17	3	1.37	1	5

Variables are as described in Table 8

Table 10 Logistic regression analysis of variables associated with financial literacy (*N*=594)

	Subjective Financial Literacy (*N*=290 Low, 304 High)		General Financial Literacy (*N*=178 Low, 416 High)		Simple Investment Options Literacy (*N*=229 Low, 365 High)		Complex Investment Options Literacy (*N*=262 Low, 332 High)	
	Coeff.	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*
RISK	0.274	2.47*	0.252	2.26*	0.243	2.34*	0.250	2.57**
ADV*acct*	0.142	0.52	0.416	1.52	0.906	3.54**	0.539	2.22*
ADV*fp*	0.180	0.80	0.141	0.59	0.037	0.17	0.371	1.83^
INFO	0.199	3.98**	0.209	4.15**	0.211	4.45**	0.106	2.41*
AGE	0.053	0.72	0.122	1.67^	0.119	1.64^	0.102	1.58^
GEND	1.074	5.28**	1.153	5.51**	0.662	3.44**	0.218	1.20
EDU	0.040	0.47	0.227	2.64**	0.097	1.20	-0.052	-0.68
HHINC	0.090	0.97	-0.044	-0.46	-0.150	-1.66	-0.075	-0.89
SUPBAL	0.294	3.44**	0.023	0.26	0.056	0.68	0.075	0.97
DWELL	0.683	2.41*	0.346	1.31	0.148	0.58	-0.083	-0.34
WORK	-0.029	-0.13	0.147	0.64	-0.022	-0.10	0.248	1.23
OI*cash*	0.616	3.01**	0.336	1.57	0.271	1.37	0.127	0.69
OI*prop*	0.216	0.94	0.280	1.16	0.391	1.76^	-0.050	-0.24
OI*share*	0.546	2.69**	0.148	0.69	0.254	1.29	0.065	0.35
Constant	-4.145	-6.71**	-2.702	-4.83**	-2.507	-4.79**	-1.440	-2.96**
Model Chi-square	189.79		104.38		95.3		44.04	
Significance	0.000		0.000		0.000		0.000	
Degree of Freedom	14		14		14		14	
% Correctly classified	74.7		74.2		69.0		64.1	
Pseudo R-square	23.06%		14.39%		12.03%		5.40%	

^, *, ** significant at the 0.1, 0.05 and 0.01 levels (two-tailed)

Variables are as described in Table 8

Table 11 Logistic regression analysis of financial literacy and other factors associated with investment choice (*N*=594)

Exercised Choice (*N*=452); Not Exercised Choice (*N*=142)

	Subjective Financial Literacy		General Financial Literacy		Simple Investment Options Literacy		Complex Investment Options Literacy	
	Coeff.	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*
RFLSUB	0.104	2.52*						
RFLGEN			0.088	2.13*				
RFLSIM					0.082	1.72^		
RFLCOM							0.018	0.31
RISK	0.176	2.60**	0.182	2.68**	0.181	2.68**	0.178	2.65**
ADV*acct*	0.306	1.13	0.339	1.25	0.298	1.10	0.286	1.06
ADV*fp*	0.847	2.93**	0.837	2.91**	0.842	2.94**	0.861	3.00**
PDS	2.030	3.92**	2.037	3.9**	1.966	3.86**	1.938	3.82**
ICG	0.281	1.02	0.312	1.13	0.305	1.11	0.289	1.05
AGE	0.268	3.11**	0.265	3.09**	0.263	3.06**	0.258	3.03**
GEND	0.683	2.63**	0.717	2.76**	0.716	2.76**	0.703	2.71**
EDU	0.194	1.79^	0.201	1.87^	0.202	1.88^	0.200	1.86^
HHINC	-0.195	-1.60	-0.190	-1.56	-0.176	-1.44	-0.175	-1.44
SUPBAL	0.629	5.61**	0.627	5.61**	0.627	5.63**	0.616	5.57**
DWELL	0.142	0.47	0.165	0.55	0.165	0.55	0.173	0.57
WORK	0.390	1.36	0.340	1.21	0.336	1.19	0.340	1.21
OI*cash*	0.121	0.45	0.145	0.54	0.120	0.45	0.128	0.48
OI*prop*	0.483	1.65^	0.504	1.72^	0.483	1.67^	0.484	1.66^
OI*share*	0.584	2.09**	0.582	2.09*	0.561	2.02*	0.575	2.08*
Constant	-4.738	-5.52**	-4.854	-5.65**	-4.824	-5.64**	-4.772	-5.58**
Model Chi-square		220.62		218.39		217.22		214.65
Significance		0.000		0.000		0.000		0.000
Degrees of freedom		16		16		16		16
% Correctly classified		83.5		84		84.2		83.5
Pseudo R-square		33.77%		33.42%		33.25%		32.85%

^, *, ** significant at the 0.1, 0.05 and 0.01 levels (two-tailed)

Variables are as described in Table 8

Table 12 Logistic regression analysis of financial literacy and other factors associated with active/passive default choice (*N*=452)

Active Default &/or Active Others (*N*=343); Passive Default (*N*=109)

	Subjective Financial Literacy		General Financial Literacy		Simple Investment Options Literacy		Complex Investment Options Literacy	
	Coeff.	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*	*Coeff.*	*z-value*
RFLSUB	0.061	1.87^						
RFLGEN			0.010	0.28				
RFLSIM					0.003	0.07		
RFLCOM							0.000	0.00
RISK	-0.018	-0.14	-0.027	-0.22	-0.026	-0.21	-0.026	-0.21
ADV*acct*	0.484	1.47	0.475	1.45	0.471	1.44	0.471	1.44
ADV*fp*	0.458	1.76^	0.441	1.71^	0.439	1.70^	0.439	1.70^
PDS	0.315	1.19	0.310	1.18	0.308	1.17	0.309	1.17
ICG	0.176	0.72	0.167	0.69	0.165	0.68	0.165	0.68
AGE	0.049	0.52	0.052	0.56	0.052	0.56	0.052	0.56
GEND	0.264	1.09	0.231	0.96	0.227	0.94	0.228	0.95
EDU	0.047	0.49	0.045	0.47	0.045	0.46	0.045	0.47
HHINC	-0.047	-0.43	-0.046	-0.43	-0.044	-0.41	-0.044	-0.41
SUPBAL	0.101	0.97	0.101	0.97	0.101	0.97	0.101	0.97
DWELL	0.524	1.58	0.494	1.50	0.492	1.49	0.492	1.49
WORK	0.012	0.05	-0.012	-0.04	-0.017	-0.06	-0.017	-0.06
OI*cash*	0.261	1.09	0.242	1.01	0.238	1.00	0.239	1.00
OI*prop*	0.041	0.15	0.033	0.12	0.034	0.13	0.035	0.13
OI*share*	0.136	0.58	0.114	0.49	0.112	0.48	0.112	0.48
Constant	0.804	1.15	0.909	1.30	0.913	1.31	0.910	1.31
Model Chi-square	15.18		11.86		11.79		11.78	
Significance	0.051		0.075		0.076		0.076	
Degrees of Freedom	16		16		16		16	
% Correctly classified	76.1		75.9		75.9		75.9	
Pseudo R-square	3.04%		2.37%		2.36%		2.36%	

^ significant at the 0.1 level (two-tailed); Variables are described in Table 8

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