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# Financial Literacy and Financial Strategies:

## The mediating role of financial concerns

### Abstract

This paper analyses how the financial literacy of elderly people affects their decisions on the adoption of various financial strategies. Multiple mediator models with bootstrap techniques are used to identify the mediating mechanisms of financial concerns that transmit the effects of financial literacy onto specific financial strategies. We find (1) financial concerns mediate the majority of financial literacy-strategy nexuses; specifically, financially illiterate people are more likely to have financial concerns and are more likely to cut back on spending, seek job opportunities, increase debts, and downsize or sell their residence as a result; (2) financially literate people are more likely to seek professional financial advice, purchase a life annuity, contribute more to superannuation, and invest more conservatively regardless of their concerns. Our findings suggest professional advisors and robo-advisor developers take into account financial concerns when recommending advice.

JEL Classification: D14, J14, J26, I31, G11

**Keywords:** Financial literacy; Financial decision-making; Financial concerns; Multiple mediator models; Bootstrap

## **1. Introduction**

Current pension schemes create a possibility of higher financial returns but also generate substantial uncertainty, particularly for those with low financial literacy levels. Today's retirees take more responsibility for making their own financial decisions. This engagement in financial practices challenges retired households' financial literacy because the investment risk has been shifted from employers to employees.

Another issue posing threats to retired households is longevity risk, which has brought about population ageing related problems (Lutz et al., 2008). With the advancement of medical care and subsequent decline of health risks, retired individuals live longer and hence experience longer retirement spans. This increases the probability of financial concerns, such as inflation eroding savings, unaffordable medical care, and insufficient savings to maintain current living standards (Orth, 2006; Tomlinson et al., 2008; Higgins and Roberts, 2011).

Therefore, how retired people choose their financial strategies to minimise the likelihood of outliving their savings becomes pertinent. Financially literate people are able to accurately assess their financial situation and are well-equipped with advanced financial knowledge and skills (Lusardi and Mitchell, 2011a; Lusardi et al., 2017). They are hence more likely to select well-informed financial strategies that generate a reliable and flexible source of retirement income to guarantee their financial security and manage their financial concerns.

Using survey data involving 15,000 elderly Australians, Xue et al. (2019a) developed a financial literacy index (FLI) and used it to show the demographic characteristics of the financially literate and the illiterate. We know from Xue et al. (2019a) that financial literacy plays an important role in the financial decisions of retired households. However, the mechanisms of how financial literacy affects decisions about adopting specific financial strategies are not revealed and await empirical testing. Therefore, building and extending on Xue et al. (2019a), we use the FLI to examine how financial literacy affects elderly Australian's decisions regarding the adoption of a variety of financial strategies. Each financial strategy is quantified, and the effects of financial literacy on selecting specific financial strategies are empirically tested.

An understanding of the relationship between financial literacy and financial strategies without considering financial concerns is distorted because financial concerns affect elderly people's mental health (Bruhn, 2015; Earl et al., 2015) and retirement well-being (Xue et al., 2019b). Financial concerns are quantitatively measured using a Likert-type scale survey question. Multiple mediator models with bootstrap techniques are used to identify the mediating mechanisms of financial concerns that transmit the effects of financial literacy onto a variety of financial strategies. This study finds support for mediation effects of financial literacy through financial concerns onto specific financial strategies. This study also provides evidence that causal inference without consideration of mediating mechanisms may lead to spurious and incomplete implications.

The empirical results not only shed light on how financially literate and illiterate elderly people react to their financial concerns when a variety of financial strategies are available, but also provide guidance for professional financial advisors and robo-advisor developers alike on how to take into account different financial concerns of elderly clients when recommending financial advice.

## **2. Review of Prior Research**

### **2.1. Financial Literacy and Financial Strategies**

The realization that financial literacy is critical to the adoption of financial strategies has led to a proliferation of studies on how financial literacy affects people's investment and saving strategies (Lusardi and Mitchell, 2007; Bruine de Bruin et al., 2010; Meier and Sprenger, 2013; Kramer, 2016; Gerrans and Heaney, 2019). With increasingly easier access to financial services, products, and technologies, the elderly are faced with diversified investment and saving options (Lusardi, 2012). The way to identify appropriate financial strategies is hence of high importance (Cheah et al., 2015).

Taylor et al. (2011) find that individuals with low levels of financial literacy are prone to high-cost mortgages and unprofitable investment strategies. This is worrying as they are more likely to experience asset loss (Bruhn, 2015). Even worse, a large proportion of pre-retired and retired households are not aware of the vulnerability of their finances and stick to deficient financial strategies (Cheah et al., 2015; van Rooij et al., 2011). In effect, financially illiterate people tend to follow rule-of-thumb financial advice suggested by their friends or relatives, rather than

financial professionals (Bodie, 2003). Even the few financially illiterate people who consult with professional advisors tend to blindly follow the recommended strategies to make decisions, even though some of them may be misleading (Bodie, 2003).

In contrast to the financially illiterate, financially literate people are more likely to manage superannuation accounts profitably, select reliable retirement income products, and identify appropriate life annuities, and thus receive higher investment returns (the basis of the current pension scheme) (Xiao et al., 2014; Earl et al., 2015; Chu et al., 2017) and perceive higher financial well-being (Netemeyer et al., 2018; Xue et al., 2019b).

Accordingly, financial literacy acts as a key determinant in identifying effective financial strategies. How to improve financial literacy and make well-informed financial decisions is therefore of prime importance to the elderly. This study includes a variety of financial strategies and analyses the determining power of financial literacy on the choice of specific strategies.

## **2.2. Financial Concerns as Mediating Mechanisms**

The positive nexus between financial literacy and sound financial decisions has been proposed in prior studies (Lusardi et al., 2010; Ali et al., 2015; Foster et al., 2015). However, with increasing average lifespan (Costa, 2003; Lutz et al., 2008) and diversified financial innovations (Cheah et al., 2015; Xue et al., 2019b), we have an incomplete picture of the financial literacy-strategy nexus if financial concerns are not taken into account.

Concerns arise with increasing life and retirement spans because of a more uncertain and unpredictable future (Griggs et al., 2013). Retired households are faced with an increasing possibility of insufficient financial resources to maintain current living standards and ultimately outliving their finances (Gerrans, 2012; Orth, 2006). Health problems gradually occur as people age (Katsarava et al., 2018), which requires greater wealth accumulation. Individuals are thus increasingly concerned about funds for their medical expenses as they reach an advanced age. The elderly who are not in good health may have greater concerns about being unable to afford long-term health care. This is worrying as mental problems arise with considerable financial concerns (Bruhn, 2015), which will result in decreased well-being of elderly people.

Retirees also express concerns about inflation erosion (Higgins and Roberts, 2011). Inflation eroding savings is the top concern amongst elderly Americans (Abkemeier, 2010), with fears

about whether their savings can be guaranteed if inflation rises unexpectedly (Chen et al., 2014). Higher inflation will weaken the purchasing capacity of retired households and lead to a decline in long-term wealth accumulation. With less savings left at an older age, the elderly are less likely to leave sufficient bequests to their children or other heirs (Higgins and Roberts, 2011).

Another financial risk that worries a large number of retired households is investment return risk caused by the instability of financial markets (Bekaert and Hoerova, 2014). Both poor performance of financial markets and negative economic shocks damage investment returns. Without advanced financial skills and adequate financial knowledge, individuals tend to be more concerned about the consequences of their investments (van Rooij et al., 2011).

Accordingly, financial literacy plays an important role in influencing financial concerns: the more financially literate, the less concerned, and vice versa. As documented in Xue et al. (2019a), financially illiterate people are more likely to display characteristics such as low education attainment, less income, and less net wealth. They thus arguably have more reasons to be concerned than the financially literate. Even worse, financially illiterate individuals tend to be overconfident with their savings, which makes their financial outlook more insecure (Van de Venter and Michayluk, 2008; Xia et al., 2014). Hence, financial literacy may act as the antecedent of financial concerns.

To manage different concerns, retired households may take different financial actions. Those who are concerned about maintaining their current living standards are likely to reduce spending. Unhealthy people with greater current or future medical burdens have to manage their superannuation account and investment strategies more cautiously. Those who intend to leave sufficient bequests for their heirs may choose to seek more job opportunities after they have retired. In order to cover increasing expenses on gift-giving and leisure, elderly people who have a large family or networks are more likely to consult with financial professionals to maintain assets accumulation. As such, the adoption of specific financial strategies is likely to be caused by certain financial concerns. In other words, financial strategies may be a consequence of financial concerns.

Taken together, financial concerns permeate retirement lives and play an important role in the financial literacy-strategy nexus. This study aims to unravel the mediating mechanisms of

financial concerns that transmit the effects of financial literacy onto specific financial strategies. Empirical results based on a consideration of four broad types of financial concerns are expected to provide a more comprehensive understanding of how people with different levels of financial literacy make their decisions when faced with different financial concerns.

### **2.3. Summary and Contributions**

Research on the relationship between financial literacy and financial decisions has recently received growing scholarly attention. Previous research, however, has provided little direct evidence on the effects of financial literacy on specific financial strategies. In addition, research on financial concerns remains scarce, which may be due in large part to the difficulty of quantitative measurement of financial concerns. Moreover, the role of financial concerns in the literacy-strategy nexus is rarely considered, which renders the mechanisms linking financial literacy and financial strategies incomplete. Furthermore, prior research utilises simple regression modelling to examine the effects of financial literacy on financial strategies (i.e., Bodie, 2003; Kramer, 2016) and so cannot identify the comprehensive mechanisms involved in the financial literacy-strategies nexuses.

In contrast to prior research, this study utilises multiple mediator models with bootstrap techniques, taking into account the mediating role of specific financial concerns and aggregate concerns to examine the relationship between financial literacy and financial strategies. We contribute to the existing literature in several ways. First, a large number of specific financial strategies are quantitatively measured and analysed. People normally make financial decisions using a number of financial strategies, and so the effects of financial literacy on specific strategies vary. The current study includes sixteen financial strategies, providing an in-depth assessment that contributes to financial decision-making research.

Second, financial concerns are quantitatively measured using a Likert-type scale survey question with four ordered options: not at all concerned, not too concerned, somewhat concerned, and very concerned. The eight survey questions about financial concerns are grouped into four broad financial concerns using categorical principal component analysis (CPCA), which reflects four major and popular concerns amongst elderly people.

Third, the mediating role of specific financial concerns and aggregate financial concerns in the financial literacy-strategy nexuses is examined. Financially literate and illiterate people are

likely to experience different degrees of financial concerns, and as a result, they are more, or less, likely to take specific financial strategies to manage their concerns (Li et al., 2015). The inclusion of financial concerns in the mediation analysis not only demonstrates a more nuanced and complete understanding of the relationship between financial literacy and financial strategies, but also provides evidence that causal analysis without consideration for moderators may lead to spurious and incomplete implications.

Moreover, multiple mediator models with bootstrap techniques are used to examine total and specific mediation effects of financial literacy through financial concerns. The non-parametric estimation technique avoids the often-violated multivariate normality assumptions<sup>1</sup> and allows examination of how financial literacy by itself affects people's financial strategies and how specific and aggregate financial concerns transmit the effects of financial literacy onto different financial strategies.

Lastly, this study focuses specifically on the elderly that constitute the most financially illiterate and vulnerable population segment. Due to their lack of financial literacy, they are more likely to have financial concerns and may choose inappropriate financial strategies to mitigate their concerns, which makes their situation even worse (Lusardi and Mitchell, 2007, 2011a; Higgins and Roberts, 2011). The main financial concerns and a large number of financial strategies concerning elderly people are examined in this paper. Therefore, it is of vital importance to analyse how financially literate and illiterate elderly people react to their concerns when a variety of financial strategies are available.

### **3. Methodology**

This paper uses the same dataset as used in Xue et al. (2019a), which was collected through a national survey of 15,000 randomly selected National Seniors Australia members (aged 55 or above), investigating retired individuals' financial knowledge, financial behaviour, superannuation management and consumption patterns. The survey contained three questions about respondents' investment strategies and the time value of money, which are key components of financial literacy.<sup>2</sup> Based on these financial literacy questions, Xue et al.

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<sup>1</sup> The necessary assumptions for the implementation of conventional mediator models are multivariate normality of the paths (i.e. financial literacy to financial concerns, and financial concerns to financial strategies) and of the indirect effects (i.e. the effects of financial literacy on financial strategies through financial concerns) (Preacher and Hayes, 2008). This is discussed in more detail in Section 3.3.2.

<sup>2</sup> Original survey questions can be found on Page 895 in Xue et al. (2019a).



(2019a) developed a financial literacy index (FLI) to measure financial literacy using Item Response Theory and Lasso regression. The financial literacy variable is a continuous variable, with higher values representing higher financial literacy levels. Using the FLI, we apply multiple mediator models with bootstrap techniques to examine the direct effect of financial literacy on financial strategies and the indirect (mediating) effects through financial concerns. A post hoc Harman single factor analysis is implemented to test whether a strong correlation between the variables used in this study is created by a common source (Chang et al., 2010; Linnenluecke et al., 2015). The results show that only 21.885% of the total variance in the data is attributed to a common factor, suggesting no common method bias.

### **3.1. Measures of Financial Concerns**

The respondents were asked about eight specific financial concerns that may affect their retirement life. These questions were:

#### **How concerned are you that...**

**C1:** You might not have enough money to pay for a long stay in a nursing home or a long period of nursing care at home.

**C2:** You might not have enough money if your spouse or partner requires a nursing home or long term care at home.

**C3:** Your spouse/partner may not be able to maintain the same standard of living after your death, if you should die first.

**C4:** You might not be able to keep the value of your savings and investments up with inflation.

**C5:** You might not be able to maintain a reasonable standard of living for the rest of your life.

**C6:** You might not be able to afford to stay in your current home for the rest of your life.

**C7:** You might not be able to leave money to your children or other heirs.

**C8:** You might outlive your savings.

Responses to each question were:

**A.** *Very concerned*, **B.** *Somewhat concerned*, **C.** *Not too concerned*, **D.** *Not at all concerned*.

Table 1 presents responses to these eight questions.<sup>3</sup> The biggest financial concern of the elderly is inflation erosion (C4), with 42.11% and 23.40% of respondents expressing moderate and great concern about this risk, respectively. Only 8% reported “*not at all concerned*”.

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<sup>3</sup> Unrecognisable and missing responses have been excluded, with a percentage of approximately 1% for all concerns.

[Insert Table 1 about here]

Other major concerns include maintaining reasonable living standard (C5), nursing home affordability (C1), and depleted assets (C8). More than half of all respondents were somewhat or very concerned about these possibilities. A close fifth concern is partner's nursing home affordability, with 48.83% expressing this concern.

In addition, nearly 40% reported worries about home ownership (C6) and maintaining partner's standard of living (C3). In contrast to the above concerns, most respondents were not concerned about insufficient bequest (C7).

These findings reflect retired households' concerns about their uncertain financial future. This uncertainty is even greater within current private pension schemes as the elderly have to make investment and saving decisions on their own. Therefore, selecting sound financial strategies can provide an effective conduit to mitigate financial concerns of older adults (Li et al., 2015).

### ***Classification of Financial Concerns***

Since some concerns have common characteristics and reflect similar financial worries, categorical principal component analysis (CPCA) is utilised to reduce the original eight concerns. The reason for using CPCA is that each concern variable is a Likert scale with 4 ordinal responses (categorical variable). Table 2 presents the results.

[Insert Table 2 about here]

Based on the signs of the coefficients of the first three dimensions (Nishisato, 1993)<sup>4</sup>, the original eight concerns can be classified into three groups: C1, C2, and C3 (group 1); C4, C5, and C8 (group 2); and C6 and C7 (group 3). To confirm these classification results, 3D plots

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<sup>4</sup> The classifications are based on the signs of the coefficients (normally using the first three dimensions). The first step is to classify group members with the same signs of the first dimension. Next, the classified groups in the first step will be grouped again based on the signs of the second dimension. A similar process applies to the third dimension. As shown in Table 2, the signs of all the first-dimension coefficients are negative, so they are all in the same group; next, the signs of the second-dimension coefficient of C1, C2 and C3 are positive, while the signs of the other five are negative. Hence C1, C2 and C3 are grouped as grouped together and finally form group 1 based on the same signs of the third dimension. Among the other five, C6 and C7 are grouped together (group 3) and the remaining three constitute group 2 according to the signs of the third-dimension coefficients.

are assessed, which clearly show that C6 (green) and C7 (blue) should be grouped separately as the distance between them is large relative to the in-group distances of other groups from all six views.<sup>5</sup> Therefore, the original eight financial concerns are re-classified into four new groups. Table 3 shows the re-classification results for financial concerns. The re-classified four groups reflect four major areas of the elderly's financial concerns, and can be summarised as: long-term care (CN1), investment performance (CN2), current home affordability (CN3), and bequest (CN4).<sup>6</sup>

[Insert Table 3 about here]

As mentioned, the original concern variable is on a 4-point scale, where 1=*not at all concerned* and 4=*very concerned*. For each re-classified concern group, the highest value of all original concerns within this group is selected as the new value of the group. The breakdown of responses to the four new concerns based on socio-demographic characteristics is provided in Figure 1 through Figure 4.<sup>7</sup>

[Insert Figure 1 through Figure 4 about here]

[Insert Table 4 about here]

Figure 1 illustrates concerns about long-term nursing care (CN1) based on socio-demographic factors. It shows that this concern increases slightly with age, but there is a drop as respondents enter their 80s. This drop may result from reduced life expectancy and better understanding of medical outlays and consumption patterns.

Drops with increased age are also observable for other concerns. For those who were very concerned, Figure 2 and Figure 3 both demonstrate a downward trend, suggesting that concerns about investment performance (CN2) and home equity (CN3) gradually diminish with

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<sup>5</sup> 3D plots are illustrated in Appendix A.

<sup>6</sup> The classifications and definitions of the four re-classified concerns were validated by consultations with multiple finance experts. The re-classifications of financial concerns are consistent with literature reviewed in Section 2.2.

<sup>7</sup> A regression tree and Lasso regression are utilised to select the important socio-demographic factors. Six socio-demographic variables were retained, including *Age, Gender, Marital Status, Health, Home Ownership, and Education*; the other six were eliminated, including *Wealth, Retirement Status, Income, Type of Work, Loan and Earning*. Table 4 displays the socio-demographic information.

increasing age. There is a fluctuation in the insufficient bequest concern (CN4), with new retirees (<60 years old) and those in their 70s worrying more.

Males appear to worry more about their finances. Historically, males have shorter life expectancy than females (Holden, 1987) and so it is not surprising that males express more concern about their own retirement life and their partner's future life quality after their death.

In general, as shown in Figure 1 through Figure 4, financial concerns are associated with less education achievement, poorer health condition, and renters/mortgagors. Education attainment has a positive association with wealth and employment type (Lusardi and Mitchell, 2007), and so people who are more educated are more likely to accumulate more savings and are less likely to worry about their finances.

Respondents who assessed themselves as being in above-average health (from good to excellent) tend to have an optimistic expectation of their healthcare expenses and so express less financial worries than those in poor health. Notwithstanding the similar overall pattern, investment performance concerns (CN2) demonstrate a slightly different result. For those somewhat concerned about this risk, there is a greater proportion of healthy compared to unhealthy people. This is explicable by the fact that healthier retirees do have some worries about outliving their finances as they may have a longer life expectancy.

Retirees who are outright residence owners are less concerned than renters and mortgagors. Those who completely own their residence do not need to worry about rents and mortgage repayments. In contrast, retirees who are renting or paying off their residence are normally in poorer financial circumstances, and so they are less confident in their financial outlook.

Single households express more concerns about investment performance (CN2), residence ownership (CN3), and insufficient bequest (CN4). Married households make decisions through shared financial information and a relatively comprehensive discussion strengthened by greater social networks (Blinder and Morgan, 2005). However, there is no clear pattern in concerns about household long-term health care (CN1). This may reflect the fact that married households have to take into account the health problems of two people. As a result, they are likely to have higher medical outlays than one-person households.

### 3.2. Measures of Financial Strategies

Access to financial instruments has become much easier due to the increasing deregulation of financial markets (Bolton et al., 2016; Novotný and Urga, 2017) and the rise of FinTech (Cai, 2018). These diversified financial products and services have also introduced uncertainty, challenging people's financial knowledge and skills. This uncertainty is even greater if the elderly are endowed with low levels of financial literacy (Von Gaudecker, 2015). Therefore, choosing appropriate financial strategies to manage financial risks is of high importance to retired households (Cocco et al., 2005).

The respondents in the sample were also asked their actions when considering sixteen specific financial strategies:

#### **To protect yourself financially, have you or do you plan to**

**S1:** Cut back on spending

**S2:** Work longer

**S3:** Obtain professional financial advice

**S4:** Buy a life annuity or other product to provide guaranteed income for life

**S5:** Increase contributions to superannuation

**S6:** Increase savings outside superannuation

**S7:** Move assets to more conservative assets

**S8:** Take out or increase reverse mortgage or home refinancing

**S9:** Take out or increase other debt (e.g. credit cards, personal loans)

**S10:** Completely pay off mortgage

**S11:** Pay off all credit cards and personal loans

**S12:** Buy real estate or invest in property (including upsizing or renovations)

**S13:** Move to a smaller home/less expensive area

**S14:** Sell household goods, investment property or other material assets

**S15:** Approach others for financial support/loan

**S16:** Increase insurance cover (life, disability, trauma, accident or private health)

Responses to each question were:

**A.** *Already done*, **B.** *Plan to do in future*, **C.** *No plans*, **D.** *Don't know/unsure*.

Table 5 presents responses to these questions. More than 60% of all respondents have completely paid off their mortgage, credit cards, and personal loans (S10 and S11), suggesting that elderly Australians are currently maintaining a reasonable financial outlook. Responses to

S8, S9, and S15 provide additional support for this conclusion as only less than 5% have increased their debts.<sup>8</sup>

[Insert Table 5 about here]

Reduction in spending (S1) and professional financial advice consultation (S3) are also popular amongst the elderly, suggesting that elderly Australians are somewhat concerned about their future finances and are not confident in their financial literacy. Planned reduction in spending and planned downsizing of their residence might also reflect their financial concerns as more than 20% considered these possibilities.

It can be inferred from responses to S5-S7 that the investment strategy of the elderly is not conservative. Only a minority of them (less than one-third) chose to save or preferred conservative assets. The lower planning rates observed also support these results.

Buying a life annuity (S4) and increasing insurance cover (S16) are strategies with regard to insurance. Approximately 23% of all respondents stated that they already had a life annuity; however, Australians' actual purchase rates of life annuities are much lower than this figure, at about 3% (Doyle et al., 2004; Higgins and Roberts, 2011). A possible explanation is that some respondents may misinterpret a life annuity as an account-based pension, but the latter does not guarantee a regular income. It is thus not surprising that around 17% of all respondents chose "*don't know*" or were "*unsure*" about S4. The initial results are likely to reveal that the annuity market in Australia is not well-developed. The low proportion of increasing insurance cover (S16) may be due to either stable insurance cover level or a failure to meet increased insurance needs due to financial constraints.

Given that the respondents are elderly, they are more likely to have health problems and are therefore less likely to work longer (S2) and buy/invest in property (S12). Lastly but more importantly, on average, more than 10% of all respondents provided "*don't know*" or "*unsure*" responses about these strategies, possibly implying a lack of financial literacy amongst elderly Australians.

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<sup>8</sup> Responses to S14 also offer support for these results as only 7.52% of all respondents have already sold their household goods or investment property.

### 3.3. Model Specification

#### 3.3.1. Theoretical Model

Prior studies have examined the relationship between financial literacy and financial decision-making, but studies on how financial literacy affects the decision-making process remain scarce, despite there being a clear need.

Financial concerns permeate retirees' retirement lives and may act as intervening variables that mediate the financial literacy-strategy nexus. Figure 5 illustrates the theoretical model of this study.

[Insert Figure 5 about here]

The total effects of financial literacy on financial strategies ( $\lambda$ , panel A) can be apportioned into direct effects ( $\lambda'$ , panel B) and indirect effects ( $\alpha$ s and  $\beta$ s, panel B).  $\lambda'$  represents the direct effects of financial literacy on financial strategy after partialling out the effects through other intervening variables (mediators). The indirect effects represent the effects through which financial literacy can exert influences on financial strategies via other variables.

Specifically, the aforementioned four broad financial concerns are considered as potential mediators, including concerns about long-term nursing care (CN1), investment performance (CN2), staying in current home (CN3), and insufficient bequest (CN4).  $\alpha$ s represent the effects of financial literacy on financial concerns (mediators) and  $\beta$ s represent the effects of financial concerns on financial strategies. The products of  $\alpha$ s and  $\beta$ s are the indirect effects or mediating effects; for example,  $\alpha_1\beta_1$  represents the effects of financial literacy on a specific financial strategy through concerns about long-term care (CN1). Therefore, the total indirect effects of financial literacy on this financial strategy through financial concerns are  $\sum_{n=1}^4 \alpha_i\beta_i$  and total effects ( $\lambda$ ) = direct effects ( $\lambda'$ ) + indirect effects ( $\sum_{n=1}^4 \alpha_i\beta_i$ ).<sup>9</sup>

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<sup>9</sup> This is the conceptual model for one financial strategy not for all, so the model is applied 16 times, once for each financial strategy.

### 3.3.2. Multiple Mediator Models with Bootstrap Techniques

Several methods have been proposed to estimate the (multiple) mediation effects, including causal steps (Baron and Kenny, 1986), difference in coefficients (Freedman and Schatzkin, 1992), and product of coefficients (Sobel, 1982).<sup>10</sup>

Although the causal steps (normally four steps) method has been widely used in testing moderation and mediation effects (Judd and Kenny, 1981; Baron and Kenny, 1986; MacKinnon et al., 2002; Martins et al., 2016; Hu et al., 2018), there are two major shortcomings: first, it assumes that the paths (i.e. financial literacy to financial concerns  $\alpha$ s, and financial concerns to financial strategies  $\beta$ s) have to follow a normal distribution, but the normality assumption is rarely satisfied in practice (Shrout and Bolger, 2002); second, it fails to take into account the total (aggregate) mediation effects, in other words, only individual mediation path(s) are included without consideration of all mediation effects as a whole (Preacher and Hayes, 2008). Failure to incorporate multiple mediators as a whole will increase the probability of parameter bias related to omitted predictors (Preacher and Hayes, 2008).

The normality assumption remains in other approaches such as difference in coefficients and product of coefficients (Preacher and Hayes, 2008; Hayes, 2017). Although these two methods enable the estimation of total mediation effects, the total and specific mediation paths have to follow a multivariate normal distribution that is also rarely satisfied (Preacher and Hayes, 2008).

Multiple mediator models using bootstrap techniques outperform other mediation testing approaches in overcoming the above problems. The multivariate normality assumption is not required because bootstrap is a non-parametric estimation technique that creates a larger dataset by re-sampling with replacement from the original sample; as a result, an original observation may occur zero, one, or more times in the new sample. The mediation path parameters ( $\alpha$ s and  $\beta$ s) will be estimated based on the new sample and the estimation process will be implemented  $n$  times using  $n$  different new samples produced by the replacement process.<sup>11</sup> The  $n$  estimates are then sorted and yield an ordered sampling distribution, and so given the significance level, the lower and upper confidence limit will be the  $\frac{\alpha}{2}n$ th and  $(1 - \frac{\alpha}{2})n$ th value of the ordered

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<sup>10</sup> MacKinnon et al. (2002) provide an overview of a dozen approaches of estimating mediation effects and comparisons of these models.

<sup>11</sup> The commonly-used number for  $n$  is 1,000 or 5,000.



distribution (Preacher and Hayes, 2008). As the confidence limits are constructed using the ordered sampling distribution rather than assuming a multivariate normal distribution, the model overcomes the biased distribution problem and improves the accuracy of parameter estimations (Preacher and Hayes, 2008; Zhao et al., 2010; Hayes, 2017).

Overall, multiple mediator models using bootstrap techniques enable the examination of how specific financial concerns transmit the effects of financial literacy on financial strategies, as well as how aggregate financial concerns mediate the effects without the multivariate normality assumption. As such, the results for the causal mechanisms are more accurate and reliable.

## 4. Results

Multiple mediator models using bootstrap techniques with  $n = 5,000$  are used.<sup>12</sup> Table 6 shows the total effects of financial literacy on financial strategies ( $\lambda$ ).<sup>13</sup>

[Insert Table 6 about here]

Overall, financially literate people are more likely to seek professional financial advice, purchase a life annuity, increase savings to/outside superannuation, invest more conservatively, pay off debts, and buy real estate. In contrast, the elderly with lower levels of financial literacy are more likely to reduce spending, take out debts, and look for financial support. The total effects of financial literacy on working longer, downsizing or selling residence/investment property, and increasing insurance cover are not statistically significant.

### 4.1. Mediation Effects

Table 7 provides results for mediation effects generated by specific financial concerns and aggregate financial concerns. Given the estimation process is repeated 5,000 times, a strict significance criteria of 1% significance level is used. The bootstrap confidence interval is bias-corrected to reduce the likelihood of type I errors.<sup>14</sup> To make the results clearer and more

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<sup>12</sup> Given the original sample size is 3,484,  $n = 5,000$  rather than 1,000 is chosen to improve the estimation accuracy as repetition frequency is normally required to be larger than the original sample size (Preacher and Hayes, 2008).

<sup>13</sup> Socio-demographic variables are used as control variables in explaining each financial strategy. Since they are not the core of this study, for brevity the results are not shown here and are available upon request.

<sup>14</sup> Exact process about bias-corrected confidence interval introduced by Preacher and Hayes (2008) has been applied in this research.

readable, the identified mediation effects are summarised in Table 8 and the identified detailed mediation path  $\alpha$ s and  $\beta$ s are illustrated in Figure 6.

[Insert Table 7 about here]

[Insert Table 8 about here]

[Insert Figure 6 about here]

The total mediation effects via all financial concerns are statistically significant in eleven out of sixteen financial literacy-strategy nexuses, indicating that overall, financial concerns mediate/transmit the effects of financial literacy on financial strategies. The elderly with lower financial literacy levels are more likely to be financially concerned and are thus more or less likely to take specific financial actions due to these concerns.

Specifically, financial illiterate people are more likely to worry about long-term health care, investment performance, and staying in their current home. As a result, they are more likely to reduce spending (S1) to protect themselves financially.

Financial literacy is highly associated with wealth (Smith, 2006; Yoong, 2010). People with higher financial literacy levels tend to accumulate greater wealth and thus have sufficient funds to afford long-term nursing care for their households and maintenance and repairs for their current residence. They are also more likely to be equipped with advanced financial skills and make well-informed investment decisions. As a result, a reduction in spending is not necessary.

Financially illiterate people with concerns about their investment performance (CN2) and insufficient bequest (CN4) are more likely to work longer (S2). Young retirees and senior retirees who worry about outliving their savings tend to seek job opportunities after they have retired (Vigtel, 2018), and the same holds true for those with a bequest motive (Chiang and Tsai, 2016).

Health problems occur as people age, and so retired individuals are gradually unable to perform housework by themselves and have to pay maintenance and repair fees. Affordability of housing, utility, and household service expenses (CN3) also becomes more challenging with

increasing age. This is even problematic for those with lower levels of financial literacy. As such, they are more likely to borrow from financial intermediaries (S8, S9) or relatives (S15), and are less likely to increase savings (S6) or pay off their mortgage (S10), credit cards and loans (S11). Similarly, financially illiterate individuals with concerns about insufficient funds for nursing care (CN1) are more likely to downsize their residence (S13).

In contrast, financially literate households are less likely to be concerned about long-term care (CN1) and staying in their current residence (CN3), and thus they can spend more time collecting financial information and engaging in financial practice, such as property investment (S12). The elderly with lower financial literacy levels, however, are not well-equipped with financial skills and so they appear to be more concerned about their investment performance (CN2) (van Rooij et al., 2011), and they are therefore more likely to sell their fixed assets (S14).

#### **4.2. Direct Effects**

Of much greater importance is to correct some spurious conclusions indicated by the results for total effects, which again highlights the importance of a consideration of financial concerns as mediators in the relationship between financial literacy and financial strategies.

Table 9 presents the results for the direct effects of financial literacy on financial strategies. Compared to the results shown in Table 6, two major differences in terms of statistical significance are observed: the effects of financial literacy on working longer (S2) and taking out/increasing reverse mortgage (S8).

[Insert Table 9 about here]

Although the total effects of financial literacy on working longer (S2) are not statistically significant, the direct effect for financial literacy is significant at the 1% level. Results for mediation effects help explain this difference; namely, the significant, positive direct effect of financial literacy on working longer is offset by the significant, negative indirect effects (mediation effects), yielding insignificant total effects. As such, financial literacy affects the elderly's decision to seek job opportunities through both financial literacy itself and through the mediating mechanisms of financial concerns. Therefore, the insignificant relationship between financial literacy and working longer (total effects) is spurious and incomplete.

The effect of financial literacy on increasing reverse mortgage (S8) reveals a different story; namely, the total effects are statistically significant, but the direct effect is not. As can be inferred from Table 7 and Figure 6, the significant, negative total effects are mainly attributed to the significant, negative mediation effects rather than the direct effect generated by financial literacy itself. Therefore, the significant relationship between financial literacy and reverse mortgage increase is again incomplete and somewhat misleading as it is likely to misinterpret this significant total effect as a direct effect. These findings highlight the importance and necessity of considering mediation effects in causal analysis.

In addition, as can be summarised by Table 8 and Table 9, financially literate people are more likely to seek professional financial advice (S3), purchase a life annuity (S4), contribute more to their superannuation account (S5), and invest more conservatively (S7) regardless of their financial concerns.<sup>15</sup> Prior research, such as van Rooij et al. (2011), found a positive relationship between financial literacy and stock market participation. While it may initially appear so, our findings do not contradict with this prior research about a specific financial asset class. Our finding that financial literacy has a direct and positive effect on moving to more conservative assets relates to aggregate investment strategies, which include investment in stock markets, real estate markets, bank savings and more. Our findings may, to some extent, reflect the phenomenon that people with higher financial literacy levels tend to invest more cautiously and select more reliable (retirement) products.

### **4.3. Discussion**

Endogeneity problems are assessed in terms of omitted variables and reversed causality. Consistent with the literature (Lusardi and Mitchell, 2011a,b; Kramer, 2016), this study attempts to resolve endogeneity problems sourced from omitted variables by taking into account more socio-demographic information. The models are re-estimated with additional socio-demographic variables added, including wealth, employment type, partner's employment type, and retirement status. The main findings regarding financial literacy, financial concerns and financial strategies are consistent when additional control variables are added individually or as an aggregate.

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<sup>15</sup> The direct effects of financial literacy on these strategies are statistically significant at 1% level whereas the indirect effects are not.

The results also likely suffer from reverse causality bias. The strategy “obtain professional financial advice” (S3) is a likely driving force of financial literacy. The advice received from professional financial advisors may help improve people’s financial literacy level (Lusardi and Mitchell, 2007), equipping advised individuals with broader financial knowledge and more advanced financial skills than the non-advised (Kramer, 2016). Reverse causality bias is assessed by collecting additional information regarding respondents’ frequency of seeking professional advice from the survey. The question asked was: “how often do you consult with professionals to assist with your financial decision making?”<sup>16</sup> The frequency of professional consultation is processed as a categorical variable with 1=*never* and 6=*Fortnightly, weekly, or more often than weekly*, and the models are re-estimated to examine the effects of financial literacy on the frequency of seeking financial advice. The effects are statistically significant and negative (-0.6148,  $p < 0.001$ ), suggesting that financially literate people are less likely to frequently consult with financial professionals. The results provide evidence to reject the possibility of reverse causality that seeking more financial advice can improve retired households’ financial literacy level.

The results remain robust when taking into account omitted variables and reverse causality bias. Therefore, interpretations of empirical results in this study are validated and reliable.

## 5. Conclusions

This study proposes an integrative mediation model to examine how financial literacy affects the elderly’s decisions when faced with a variety of financial strategies and investigates the mediation mechanisms of specific financial concerns and aggregate financial concerns that transmit the effects of financial literacy on these financial strategies.

Multiple mediator models using bootstrap techniques are utilised to examine the issue, avoiding the often-violated multivariate normality assumption. The empirical results demonstrate three important findings. Firstly, financial concerns do indeed mediate most financial literacy-strategy nexuses. Financially illiterate people are more likely to have financial concerns, and are more likely to reduce spending, seek more job opportunities, increase debts, and downsize or sell their residence as a result. The findings also reveal that people with different financial concerns adopt different strategies. Secondly, financially literate people are more likely to seek

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<sup>16</sup> Further detail about this question is provided in Appendix B.

professional financial advice, purchase a life annuity, contribute more to superannuation, and invest in more conservative assets regardless of their financial concerns.

Lastly but more importantly, results for the causal relationship between financial literacy and financial strategies may be misleading if the mediation effects of financial literacy through financial concerns are ignored. There are two possible spurious implications. Firstly, the overall relationship between financial literacy and a specific financial strategy is not observed, indicating that financial literacy by itself does not influence the adoption of this strategy. In fact, the direct effect of financial literacy is statistically significant but offset by the opposite mediation effects, and so as a whole, financial literacy is not significant despite it playing a key role. Secondly, the significant total effects of financial literacy on a specific financial strategy are generated by the indirect effects (mediation effects), not by financial literacy itself. Based on the total effects, it is possible to conclude that financial literacy by itself does affect the adoption of such a strategy; however, in fact, the total effects are produced by the mediation effects of financial literacy via financial concerns. This highlights the importance and necessity of considering mediating variables.

Future studies on causal inference should therefore take into account and test for the mediation effects. Multiple mediator models not only demonstrate a more nuanced understanding of how an antecedent variable affects a subsequent variable, but also help correct spurious and incomplete implications. Additionally, the use of bootstrap techniques in multiple mediator models overcomes the multivariate normality assumption that is rarely satisfied in practice. Therefore, the use of bootstrap techniques in exploring mediating mechanisms is recommended, particularly for studies with small sample sizes.

Professional financial advisors may wish to identify and take into account consumers' personal financial concerns when providing financial advice. With the rise of Fintech, robo-advisors - an innovative financial service that automatically provides financial advice based on the customer's personal circumstances - are becoming more popular in financial practice. Although risk preferences and desired target returns are included, in order to make the recommended financial advice more effective and reliable, robo-advisor developers can also benefit from taking into account an individual's financial concerns.

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Table 1: Responses to financial concerns

Concern	Not at all Concerned (%)	Not too Concerned (%)	Somewhat Concerned (%)	Very Concerned (%)	Proportion of Somewhat and Very Concerned (%)
C1	12.09	36.41	35.43	16.07	51.50
C2	21.68	29.49	33.08	15.75	48.83
C3	29.37	32.70	25.40	12.54	37.94
C4	8.67	25.83	42.11	23.40	65.51
C5	9.40	33.02	37.85	19.73	57.58
C6	21.00	39.76	24.77	14.47	39.24
C7	37.36	38.62	15.97	8.06	24.03
C8	15.35	33.51	30.97	20.17	51.14

Table 2: Results for categorical principal component analysis of financial concerns

Concern	Dimension 1	Dimension 2	Dimension 3
C1	-0.2815	0.1089	-0.0010
C2	-0.2644	0.1926	-0.0367
C3	-0.2513	0.1159	-0.0810
C4	-0.2579	-0.0201	0.1487
C5	-0.2810	-0.0763	0.1008
C6	-0.2582	-0.1092	-0.0615
C7	-0.2140	-0.1405	-0.2053
C8	-0.2743	-0.0942	0.0856

Table 3: Re-classification of financial concerns

Concern group	Concerns included	Reflecting concerns about
CN1	C1, C2 and C3	long-term care
CN2	C4, C5 and C8	investment performance
CN3	C6	current home ownership
CN4	C7	insufficient bequest

Table 4: Socio-demographic information

Variable	Response rate	Type	Category	Level	Count	Percent
Age	97.88%	Continuous		<60	236	6.92
				60 – 69	1292	37.89
				70 – 79	1027	30.12
				≥80	855	25.07
Gender	98.28%	Categorical		Female	1523	44.44
				Male	1904	55.56
Marital Status	90.67%	Categorical	Unmarried	Single	223	6.51
				Widowed	364	10.63
				Separated/divorced	302	8.82
			Married	Married	2408	70.33
				De facto	127	3.71
Health	98.22%	Categorical	Healthy	Excellent	415	12.13
				Very good	1288	37.64
				Good	1112	32.50
			Unhealthy	Fair	493	14.41
				Poor	114	3.33
Home Ownership	95.72%	Categorical	Outright	Outright	2601	77.99
				Not Outright	Paying off	565
				Renting	169	5.07
Education	90.67%	Categorical	Higher Education	University degree or higher	993	31.43
				Trade certificate or diploma	318	10.07
				Other certificate or diploma	742	23.49
				Year 12 or equivalent	313	9.91
			Other	Year 10 or 11	540	17.09
				Year 9 or below	208	6.58
				Never attended school	3	0.09
				Other education attainment	42	1.33

**Note:** The socio-demographic statistics are similar to those displayed in Xue et al. (2019a).

Table 5: Responses to financial strategies

Strategies	No plans	Plan to do	Already done	DK/Unsure
S1: Cut back on spending	20.55	21.18	52.21	6.06
S2: Work longer	52.99	10.02	17.25	19.75
S3: Obtain professional financial advice	23.45	11.77	56.49	8.30
S4: Buy a life annuity	54.48	5.83	23.05	16.65
S5: Increase contributions to superannuation	53.16	6.72	28.56	11.57
S6: Increase savings outside superannuation	44.92	13.61	29.88	11.60
S7: Move assets to more conservative assets	45.09	11.65	27.70	15.56
S8: Take out/increase reverse mortgage	81.89	2.73	3.47	11.91
S9: Take out/increase other debt	86.68	0.95	4.13	8.24
S10: Completely pay off mortgage	12.74	17.80	61.68	7.78
S11: Pay off all credit cards and personal loans	10.22	19.60	63.32	6.86
S12: Buy real estate/invest in property	62.34	7.78	19.46	10.42
S13: Move to a smaller home	48.39	23.88	15.67	12.06
S14: Sell household goods or investment property	67.11	15.50	7.52	9.87
S15: Approach others for financial support/loan	88.98	1.46	1.18	8.38
S16: Increase insurance cover	79.25	2.15	10.42	8.18

Table 6: Total effects of financial literacy on financial strategies ( $\lambda$ )

Dependent variable	Total effects	Std.err	<i>t</i> value	<i>P</i> value
S1: Cut back on spending	-.1902	.0241	-7.8992	<.001***
S2: Work longer	.0429	.0266	1.6152	.1064
S3: Obtain professional financial advice	.2998	.0255	11.7717	<.001***
S4: Buy a life annuity	.1511	.0279	5.4097	<.001***
S5: Increase contributions to superannuation	.3217	.0278	11.5680	<.001***
S6: Increase savings outside superannuation	.2151	.0276	7.7958	<.001***
S7: Move assets to more conservative assets	.2773	.0280	9.9131	<.001***
S8: Take out/increase reverse mortgage	-.0286	.0127	-2.2452	.0248*
S9: Take out/increase other debt	-.0419	.0127	-3.3076	.0010**
S10: Completely pay off mortgage	.1973	.0215	9.1892	<.001***
S11: Pay off all credit cards and personal loans	.1567	.0202	7.7578	<.001***
S12: Buy real estate/invest in property	.1769	.0251	7.0578	<.001***
S13: Move to a smaller home	-.0434	.0235	-1.8442	.0653
S14: Sell household goods or investment property	.0142	.0190	.7439	.4570
S15: Approach others for financial support/loan	-.0223	.0076	-2.9240	.0035**
S16: Increase insurance cover	-.0295	.0194	-1.5191	.1288

\*\*\*:p<0.001; \*\*:p<0.01; \*:p<0.05.

Table 7: Results for mediation effects ( $\alpha_i\beta_i$  and  $\sum_{n=1}^4 \alpha_i\beta_i$ )

Dependent variable	Mediators	Mediation	Boot SE	Boot LLCI	Boot ULCI
S1: Cut back on spending	Total	-.0492**	.0092	-.0735	-.0258
	CN1	-.0210**	.0050	-.0353	-.0101
	CN2	-.0144**	.0048	-.0289	-.0034
	CN3	-.0105**	.0039	-.0219	-.0016
	CN4	-.0032	.0024	-.0103	.0026
S2: Work longer	Total	-.0253**	.0062	-.0422	-.0098
	CN1	-.0060	.0043	-.0191	.0043
	CN2	-.0083**	.0036	-.0188	-.0012
	CN3	-.0040	.0038	-.0153	.0059
	CN4	-.0069**	.0031	-.0165	-.0006
S3: Obtain professional financial advice	Total	.0020	.0037	-.0072	.0122
	CN1	-.0038	.0040	-.0150	.0067
	CN2	-.0049	.0028	-.0142	.0010
	CN3	.0087	.0040	-.0007	.0212
	CN4	.0020	.0025	-.0045	.0103
S4: Buy a life annuity	Total	.0064	.0040	-.0036	.0169
	CN1	-.0065	.0042	-.0193	.0035
	CN2	.0032	.0029	-.0036	.0122
	CN3	.0052	.0044	-.0062	.0170
	CN4	.0046	.0032	-.0032	.0141
S5: Increase contributions to superannuation	Total	.0068	.0039	-.0029	.0171
	CN1	.0024	.0045	-.0095	.0146
	CN2	-.0043	.0033	-.0143	.0038
	CN3	.0066	.0047	-.0058	.0201
	CN4	.0022	.0028	-.0052	.0101
S6: Increase savings outside superannuation	Total	.0205**	.0051	.0082	.0342
	CN1	-.0026	.0045	-.0150	.0091
	CN2	.0023	.0031	-.0058	.0120
	CN3	.0180**	.0054	.0058	.0337
	CN4	.0028	.0031	-.0051	.0119
S7: Move assets to more conservative assets	Total	.0046	.0042	-.0064	.0159
	CN1	-.0041	.0051	-.0189	.0083
	CN2	-.0050	.0035	-.0155	.0032
	CN3	.0117	.0050	-.0005	.0271
	CN4	.0019	.0030	-.0056	.0106
S8: Take out/increase other debt	Total	-.0059**	.0023	-.0125	-.0001
	CN1	.0035	.0025	-.0025	.0109
	CN2	-.0023	.0015	-.0068	.0010
	CN3	-.0067**	.0025	-.0139	-.0011
	CN4	-.0005	.0016	-.0048	.0039

\*\*p<0.01.

Total: aggregate financial concerns; CN1:

concerns about long-term care;

CN2: concerns about investment performance;

CN3: concerns about affordability to stay in current home;

CN4: concerns about insufficient bequest.

Boot LLCI: lower limit of 99% bootstrap confidence interval; Boot

ULCI: upper limit of 99% bootstrap confidence interval;

If the confidence interval includes 0, the mediation effect is not significant at 1% level; otherwise, it is significant.

Table 7: Results for mediation effects (continued)

Dependent variable	Mediators	Mediation	Boot SE	Boot LLCI	Boot ULCI
S9: Take out/increase reverse mortgage	Total	-.0102**	.0027	-.0177	-.0038
	CN1	-.0016	.0023	-.0082	.0046
	CN2	-.0027	.0016	-.0075	.0007
	CN3	-.0057	.0025	-.0127	.0004
	CN4	-.0001	.0016	-.0044	.0040
S10: Completely pay off mortgage	Total	.0163**	.0041	.0066	.0275
	CN1	.0008	.0037	-.0091	.0110
	CN2	-.0006	.0022	-.0068	.0054
	CN3	.0103**	.0037	.0019	.0215
	CN4	.0058	.0028	-.0002	.0141
S11: Pay off all credit card and personal loans	Total	.0161**	.0037	.0070	.0264
	CN1	.0048	.0034	-.0038	.0141
	CN2	-.0040	.0025	-.0117	.0011
	CN3	.0097**	.0035	.0017	.0202
	CN4	.0055	.0025	-.0001	.0130
S12: Buy real estate/invest in property	Total	.0277**	.0051	.0157	.0421
	CN1	.0155**	.0049	.0043	.0305
	CN2	-.0037	.0029	-.0124	.0030
	CN3	.0118**	.0044	.0022	.0247
	CN4	.0041	.0025	-.0016	.0119
S13: Move to a smaller home	Total	-.0153**	.0042	-.0269	-.0056
	CN1	-.0106**	.0043	-.0227	-.0002
	CN2	-.0042	.0028	-.0130	.0021
	CN3	-.0022	.0036	-.0124	.0067
	CN4	.0017	.0025	-.0052	.0091
S14: Sell household goods or investment property	Total	-.0141**	.0039	-.0247	-.0050
	CN1	-.0005	.0031	-.0087	.0079
	CN2	-.0072**	.0027	-.0158	-.0014
	CN3	-.0035	.0031	-.0124	.0043
	CN4	-.0030	.0024	-.0103	.0026
S15: Approach others for financial support/loan	Total	-.0067**	.0017	-.0117	-.0029
	CN1	-.0014	.0012	-.0049	.0015
	CN2	-.0004	.0007	-.0025	.0015
	CN3	-.0037**	.0015	-.0081	-.0003
	CN4	-.0012	.0011	-.0044	.0014
S16: Increase insurance cover	Total	-.0065	.0031	-.0148	.0010
	CN1	-.0038	.0033	-.0130	.0049
	CN2	-.0026	.0021	-.0093	.0025
	CN3	.0032	.0033	-.0055	.0121
	CN4	-.0033	.0024	-.0100	.0027

\*\*: $p < 0.01$ .

Total: aggregate financial concerns;

CN1: concerns about long-term care;

CN2: concerns about investment performance;

CN3: concerns about affordability to stay in current home;

CN4: concerns about insufficient bequest.

Boot LLCI: lower limit of 99% bootstrap confidence interval;

Boot ULCI: upper limit of 99% bootstrap confidence interval;

If the confidence interval includes 0, the mediation effect is not significant at 1% level; otherwise, it is significant.

Table 8: Summary of identified mediation effects

Identified relationship
Financial Literacy → Total, CN1, CN2 & CN3 → S1: Cut back on spending (-)
Financial Literacy → Total, CN2 & CN4 → S2: Work longer (-)
Financial Literacy → Total, CN3 → S6: Increase savings outside superannuation (+)
Financial Literacy → Total, CN3 → S8: Take out/increase other debt (-)
Financial Literacy → Total → S9: Take out/increase reverse mortgage (-)
Financial Literacy → Total, CN3 → S10: Completely pay off mortgage (+)
Financial Literacy → Total, CN3 → S11: Pay off all credit card and personal loans (+)
Financial Literacy → Total, CN1 & CN3 → S12: Buy real estate/ invest in property (+)
Financial Literacy → Total, CN1 → S13: Move to a smaller home (-)
Financial Literacy → Total, CN2 → S14: Sell household goods or investment property (-)
Financial Literacy → Total, CN3 → S15: Approach others for financial support/loan (-)

Total: aggregate financial concerns;

CN1: concerns about long-term care;

CN2: concerns about investment performance;

CN3: concerns about affordability to stay in current home;

CN4: concerns about insufficient bequest.

Table 9: Direct effects of financial literacy on financial strategies ( $\lambda'$ )

Dependent variable	Direct effects	<i>P</i> value
S1: Cut back on spending	-.1410	<.001***
S2: Work longer	.0682	.0095**
S3: Obtain professional financial advice	.2978	<.001***
S4: Buy a life annuity	.1447	<.001***
S5: Increase contributions to superannuation	.3148	<.001***
S6: Increase savings outside superannuation	.1946	<.001***
S7: Move assets to more conservative assets	.2727	<.001***
S8: Take out/increase reverse mortgage	-.0227	.0759
S9: Take out/increase other debt	-.0318	.0123*
S10: Completely pay off mortgage	.1810	<.001***
S11: Pay off all credit cards and personal loans	.1406	<.001***
S12: Buy real estate/invest in property	.1492	<.001***
S13: Move to a smaller home	-.0281	.2332
S14: Sell household goods or investment property	.0283	.1368
S15: Approach others for financial support/loan	-.0156	.0411*
S16: Increase insurance cover	-.0230	.2406

\*\*\*:p<0.001; \*\*:p<0.01; \*:p<0.05.

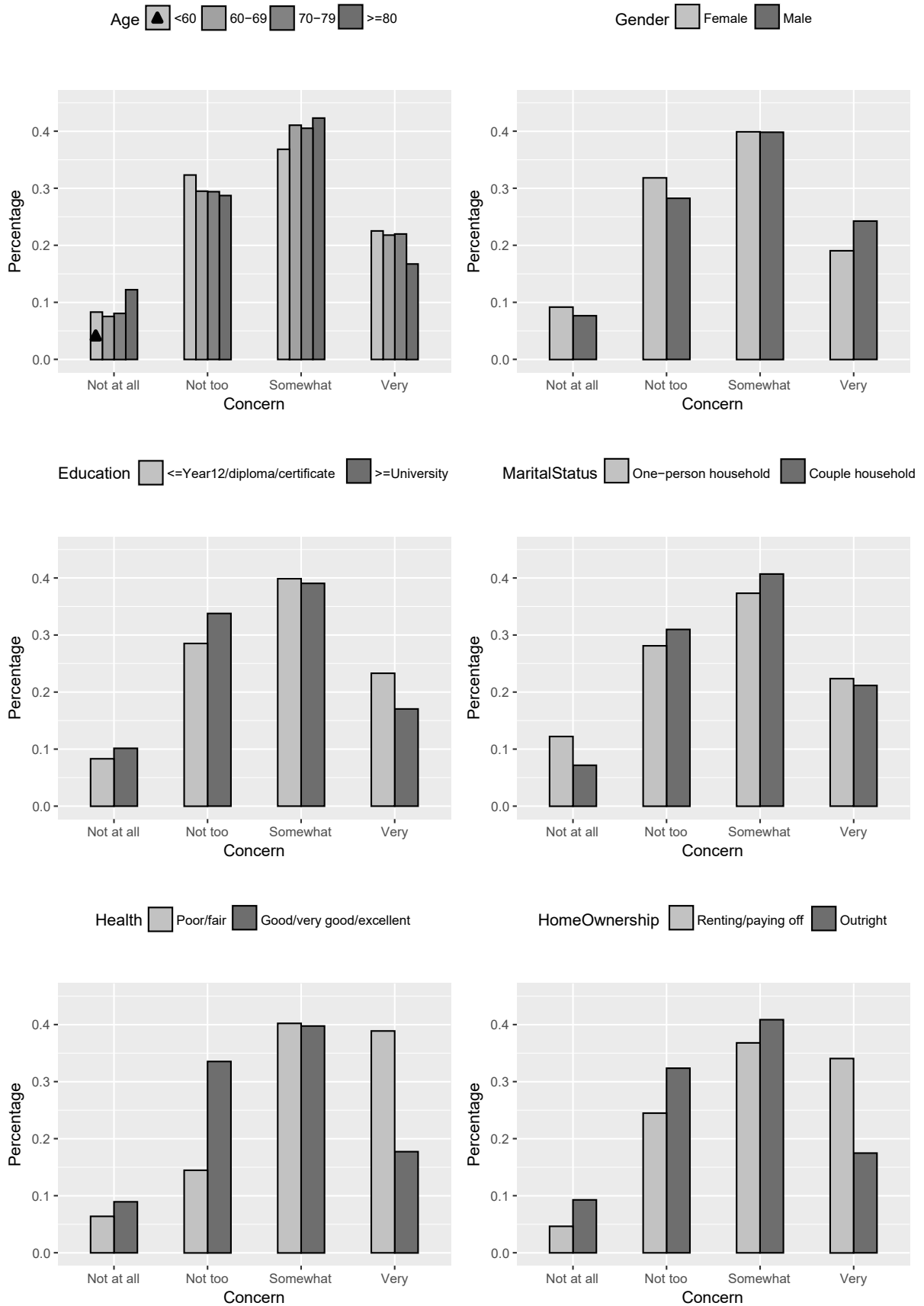


Figure 1: Responses to concerns about long-term care (CN1) by demographics



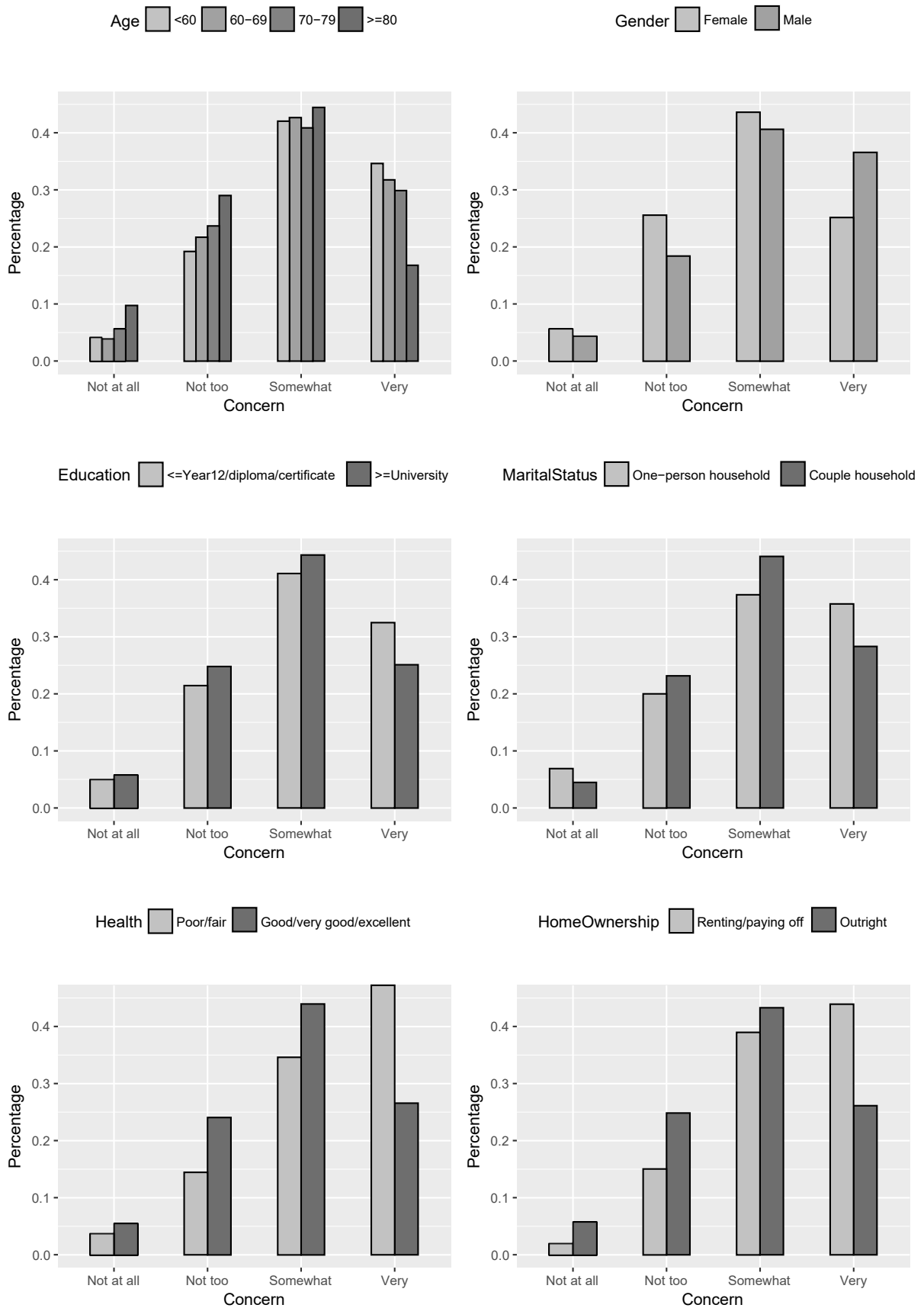


Figure 2: Responses to concerns about investment performance (CN2) by demographics

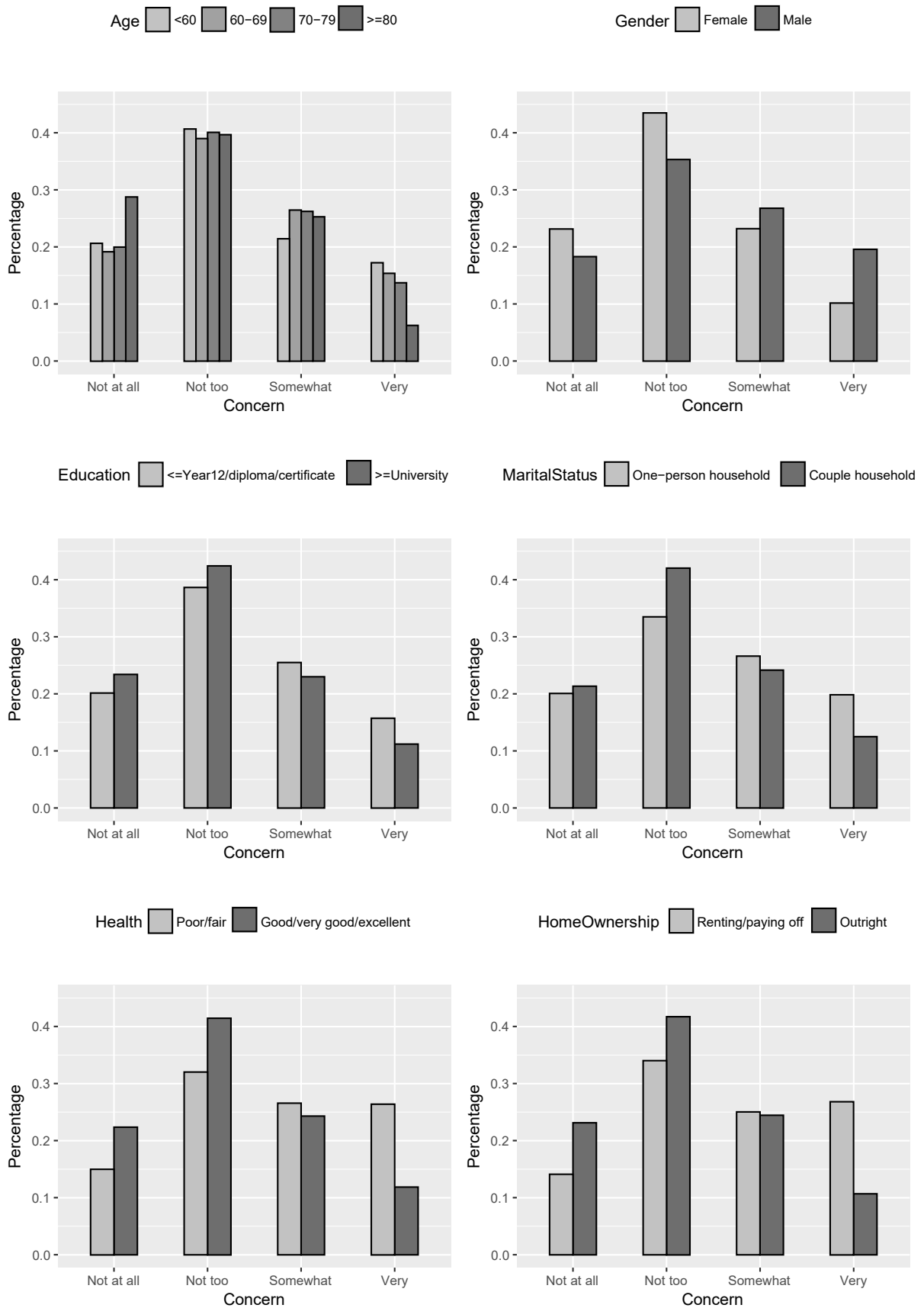


Figure 3: Responses to concerns about current home ownership (CN3) by demographics

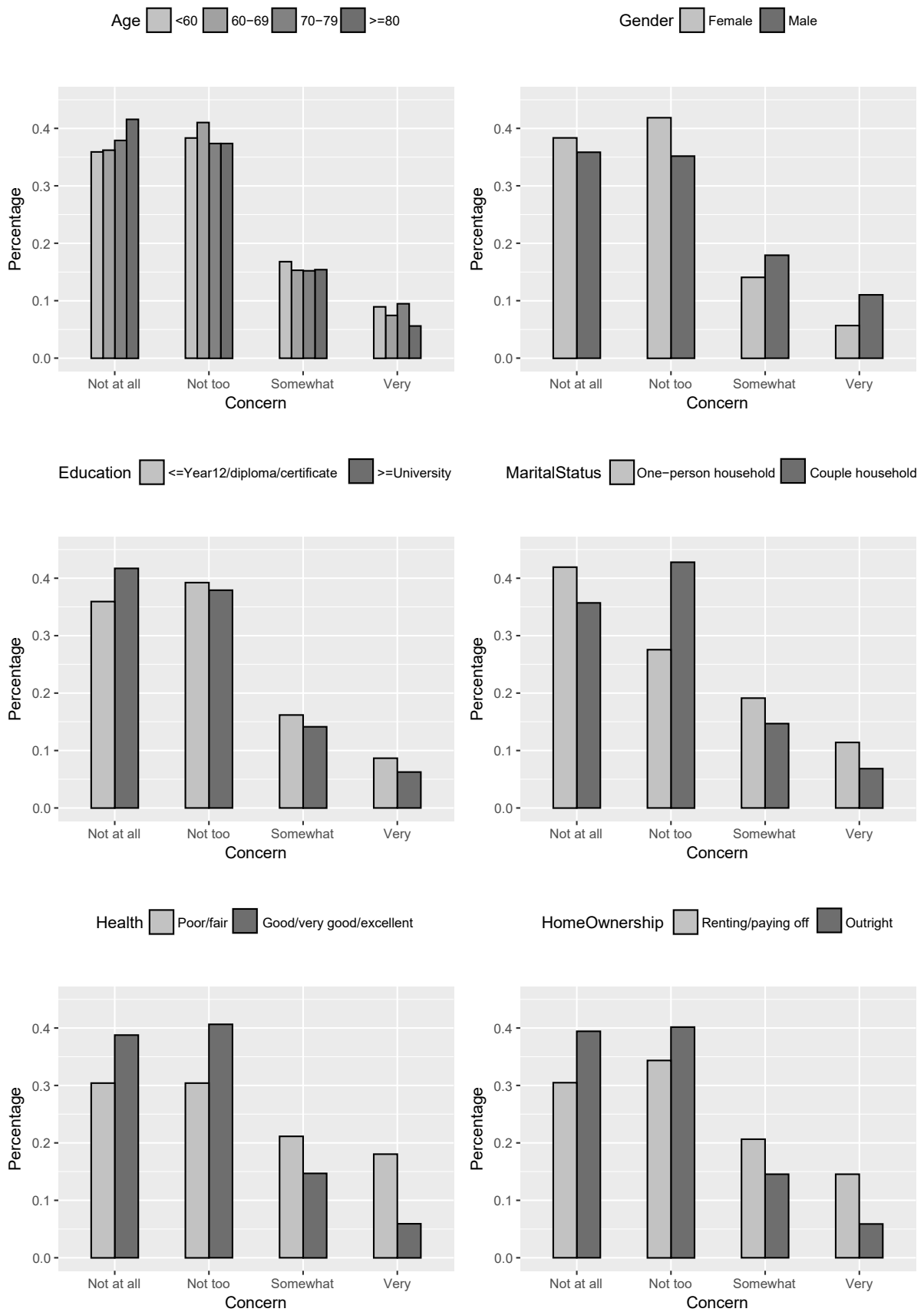
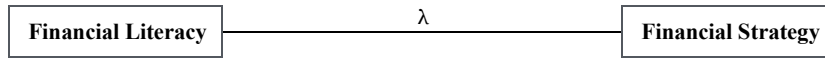


Figure 4: Responses to concerns about insufficient bequest (CN4) by demographics

A



B

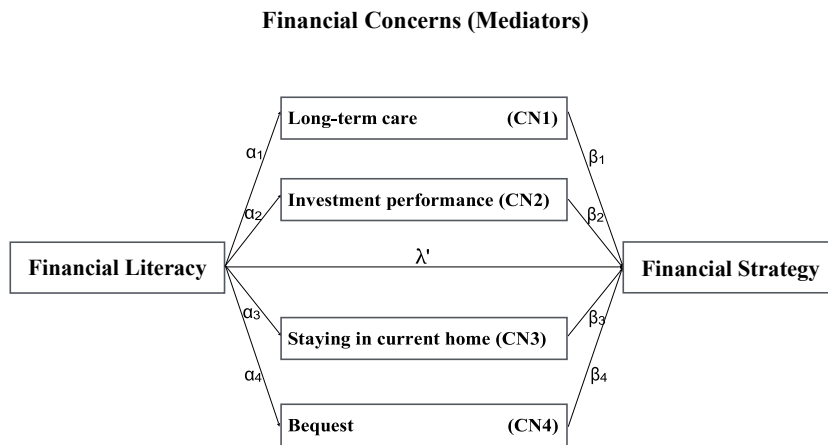


Figure 5: Illustration of the conceptual models

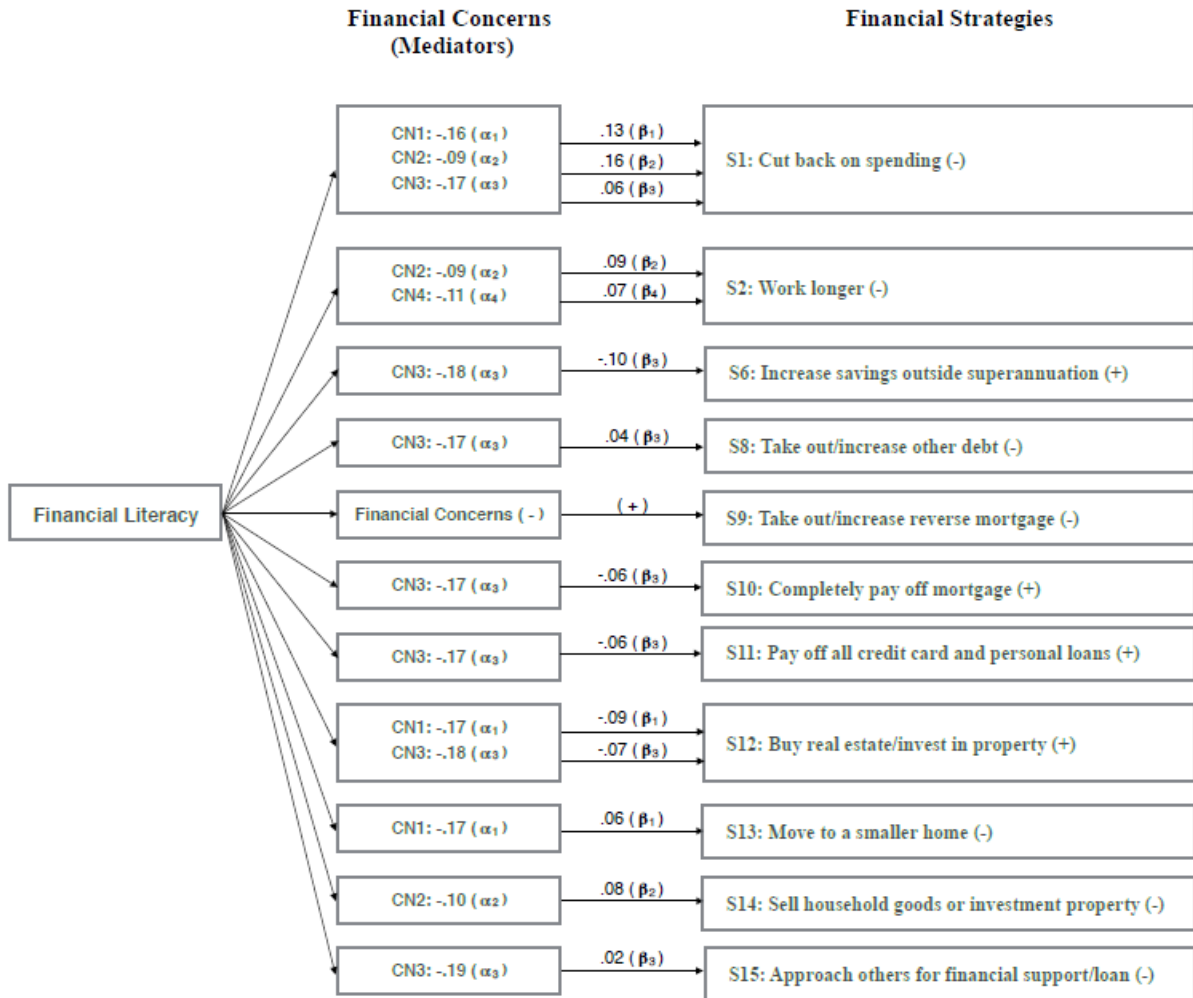
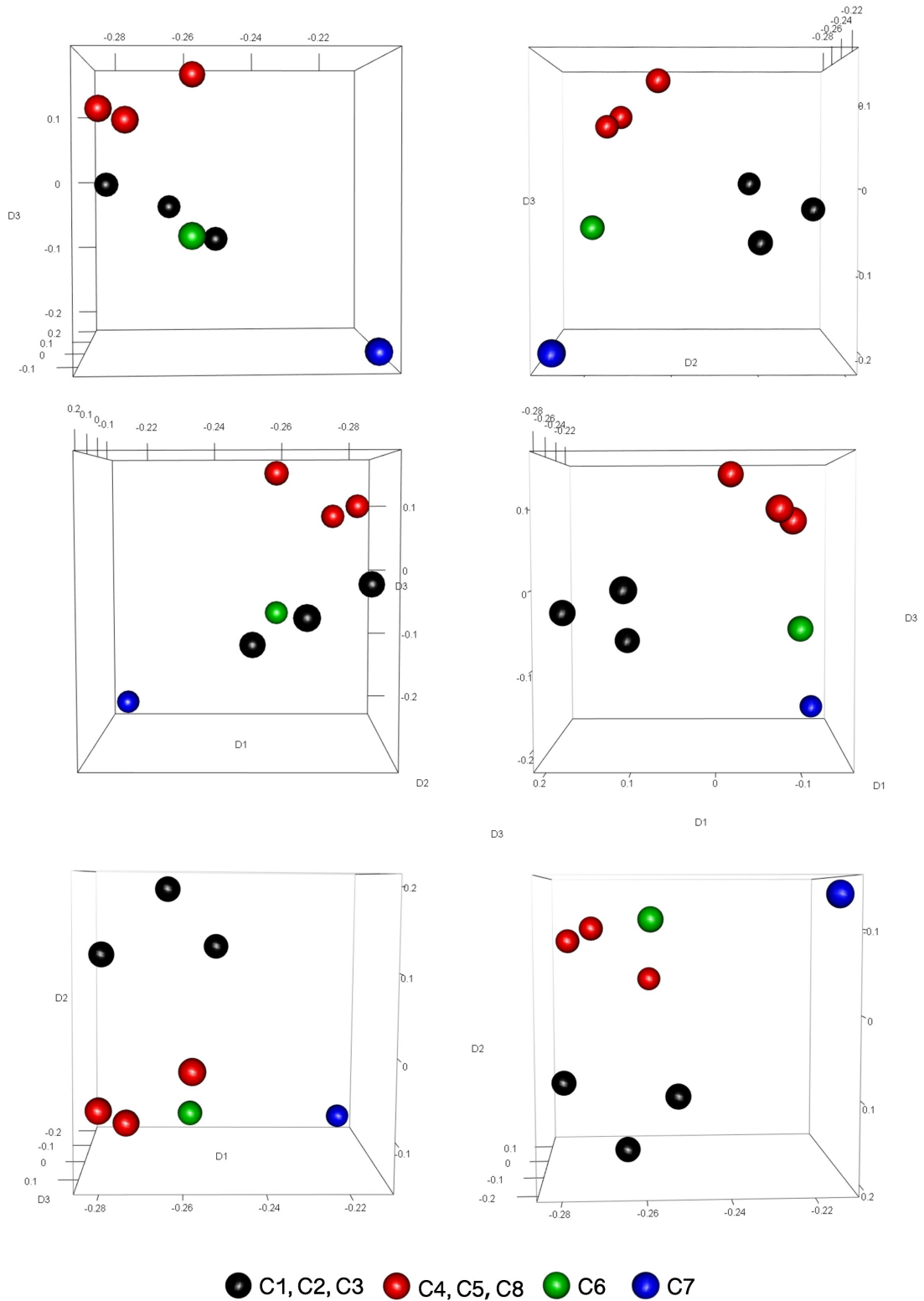


Figure 6: Illustration of identified mediation effects

# Appendix



Appendix A: 3D plots of the classifications of financial concerns

## **Appendix B**

Q6.10: Individuals may consult with professionals to assist their financial decision-making. Professionals may include: accountants or taxation specialists, mortgage brokers, stock brokers, insurance brokers, bank managers or employees, or financial planners or advisers. How often, if at all, do you consult with any of these professionals to assist with your financial decision-making?

- Fortnightly, weekly or more often than weekly
- Monthly or quarterly
- About once a year
- About once every two years
- Every three years or less often
- Never