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Financial literacy and retirees' resource allocation decisions in New Zealand

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ABSTRACT

We investigate the relationship between financial literacy, debt anxiety, risk tolerance, and subsequent resource allocation decisions for cohorts of retirees. Using a survey and the novel comparative method of Multi-Criteria Decision-Making Analysis we prioritise retirement allocation choices of older New Zealanders. Retirees display high financial literacy and together with debt anxiety this is significantly correlated with resource allocation preferences. Financial literacy reduces debt anxiety in men, increases the risk tolerance of women and is associated with a higher preference for KiwiSaver. Greater debt anxiety is associated with debt repayment, and debt avoidance in old age is critical to long-term wellbeing.

1. Introduction

The ability of countries to support their ageing populations and fund the increasing number of retirees is a worrying problem (World Economic Forum, 2018). New Zealand (NZ) is no exception. An increasing emphasis on individual responsibility for retirement planning and decision-making means that individual financial literacy (FL) is of growing importance. Our study investigates the relationship between FL, debt anxiety, risk tolerance, and subsequent resource allocation decisions of older New Zealanders.

The Life Cycle model theories suggest that older people could outlive their wealth if they spend their wealth too soon (Gourinchas and Parker, 2002). In contrast, the precautionary and bequest motives of many older people may mean that they spend their wealth too slowly (Niimi and Horioka, 2019). Our study attempts to bridge this gap by exploring the type of resource allocations that older people prefer, and whether the chosen allocations provide older people short-term or long-term benefits.

Our paper is the first to prioritise retirement allocation choices of older New Zealanders using the novel comparative method of Multi-Criteria Decision-Making Analysis (MCDMA). We investigate the impact of debt anxiety, risk tolerance and FL on NZ retirees' resource allocation decisions; in particular, how retirees rank the alternatives of consumption (general, health or luxury), financial (banking money, KiwiSaver (see section 2.4), purchasing shares, reducing debt), housing investment (home or investment property deposit or home improvements), bequest (giving money to family members), and philanthropic motives (donations).

Crossan et al. (2011) reported that New Zealanders in general have high FL, (but lower in the older age groups), but that FL has no

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impact on retirement planning. It appears that NZ's universal public pension may financially "cushion" (Crossan et al., 2011, p. 3) retirees and deter them from making additional preparations to support their retirement. However, in a more recent study, Noviarini et al. (2021) find that FL is high among older New Zealanders. As literature shows that FL has a positive effect on retirement preparedness among the older population (e.g. Hoffmann and Plotkina, 2020), it is appropriate to re-examine the relationship between FL and retirement preparedness of older New Zealanders. Limited research on retirement financial decisions also motivates the investigation. It is concerning that despite a universal pension, many New Zealanders may be financially vulnerable in retirement (Noviarini et al., 2021).

The NZ Government pays retirees meeting certain residency criteria a universal pension, referred to as NZ Superannuation (NZS), from age 65. Despite its universality, the Organisation for Economic Co-operation and Development (OECD, 2019) reports that NZS only covers around 40% of NZ's average income, making it one of the lowest among OECD countries.¹ Additionally, NZ does not have a mandatory contribution retirement savings scheme like most OECD countries, limiting New Zealanders' capacity to accumulate additional retirement savings. NZ does have a voluntary contributory retirement saving scheme (KiwiSaver), but annuitisation options for withdrawal are rare and rely on retirees' initiative. Retirees need to arrange their own annuitisation within the private sector (banks or investment institutions), or withdraw their KiwiSaver as a lump sum, and manage it themselves. The NZ retirement system puts pressure on retirees to personally manage their wealth and make financial decisions that prevent poverty in retirement or outliving their wealth.

Our results show that NZ's retiree age group FL level is high and New Zealanders' top three choices from a windfall of NZ\$50,000 is to (1) put money in the bank, (2) home improvements spending, and (3) invest in KiwiSaver. The least preferred alternatives are donations, general consumption, and health investment.

Using GSEM, the study explores the complex relationships between FL, debt anxiety, and risk tolerance on different resource allocation alternatives. We find that New Zealanders' resource allocation preference is significantly directly correlated with higher FL and debt anxiety. The effective strength depends on the demographic group and the type of decision considered. In addition, higher income and education is directly associated with better FL and FL indirectly mediates the positive relationship between these demographic variables and choosing KiwiSaver. FL is also associated with less debt anxiety. Relatively younger older individuals display greater personal debt anxiety and this debt anxiety indirectly mediates their choice to pay off debt. Older individuals are directly associated with less debt anxiety across gender, ethnicity and home ownership. Wide heterogeneity appears across subsample cohorts by gender, ethnicity, marital status, and living arrangements. Compared to female retirees, male retirees choose debt repayment as one of their top three preferences, Māori²/Pacific also choose debt repayment as one of their top three preferences, whereas NZ Europeans do not. The motivation for debt repayment is strongly mediated by higher debt anxiety, not only for Māori/Pacific but for Europeans, males, married, single and those renting.

Our study makes four contributions to the literature. It is the first research to prioritise retirement allocation choices using the novel comparative method of MCDMA. Second, we answer calls from Goyal and Kumar (2021) for further research into debt literacy, risk tolerance, links between FL and financial capability for decision-making and cohort analysis. A more recent bibliographic analysis also notes that there are fewer FL studies on savings behaviour, retirement planning and debt literacy, which are all part of this study (Kumar and Kumar, 2023). This research also responds to the research agenda developed by Brügggen et al. (2017) that seeks to investigate the effect of life events and personal factors on FL and ways to influence financial well-being and support favourable financial behaviour. Our findings support the theoretical role of mediators in the decision-making process. Our study bridges the literature on attributes associated with FL and debt anxiety, and the impact of FL and debt anxiety on decision-making. That is, we find an indirect influence of the antecedents on the resource allocation decisions through FL and debt anxiety. As we consider debt anxiety to be a financial concern, our results concur with Xue et al.'s (2021) finding on the mediating role of financial concerns on financial strategies of older pre-retirees. Risk tolerance does not act as a mediator. Third, our investigation of the relationships between Personal Resources (PR)³ (education and income), retiree age, family responsibility, health and the resultant allocation choices through mediators of debt anxiety and FL using GSEM is unique and alleviates issues of endogeneity (Goyal and Kumar, 2021; Noviarini et al., 2021). The results show that relationships among these factors are complex and depend on the demographic cohort. Finally, our findings add to the limited information on NZ retirees' financial knowledge and behaviour and can inform government decisions and policy. This is important because financially illiterate individuals may make poor financial decisions and therefore require government support (Lusardi and Mitchell, 2011a), subsequently affecting economic resource allocation, economic growth and stability (Widowson and Hailwood, 2007). The effect of FL has encouraged some governments (e.g. Japan and Sweden) to invest in financial education programs (Lusardi and Mitchell, 2007a).

The remainder of the study is organised as follows: Section 2 reviews the literature and develops the research questions. Sections 3 and 4 describe the method and report the results, respectively. Section 5 discusses implications, limitations and avenues for future research, whilst Section 6 provides a short conclusion.

¹ There are other compensating factors such as the public health system, accommodation subsidies etc. (Davey and Stephens, 2018).

² Indigenous New Zealanders.

³ Equivalent to "advantage" in Noviarini et al., 2021.

2. Literature review and research questions

2.1. Financial literacy

There are two main facets to FL, the knowledge and cognitive function to understand financial information, and the ability to take actions according to that information. [Widdowson and Hailwood \(2007\)](#) argue that FL consists of four components: 1) basic numeracy skills to estimate interest rates and returns; 2) understanding of risk and returns from financial decisions such as spending, investments, and leverage; 3) capability to comprehend basic financial concepts, such as risk and return, availability of different financial products, diversification and time value of money; 4) ability to seek professional help, knowing the questions to ask, and understanding advice. This study examines both the level of retiree financial knowledge and how retirees use that knowledge to make financial decisions.

FL research has expanded since [Lusardi and Mitchell \(2007a, 2007b\)](#) proposed a standard method of measuring FL (refined in [Lusardi and Mitchell, 2011a](#)). The measure consists of the “Big Three” skill-based questions ([Agnew et al., 2013](#), p. 1) covering interest compounding, inflation, and risk diversification. [Lusardi \(2008\)](#) argues that FL starts with financial knowledge and understanding, which supports financial skill development and perceived knowledge, and subsequently financial behaviour, experience and financial knowledge. [Hogarth and Hilgert \(2002\)](#) show that there is a positive correlation between financial knowledge and financial behaviour.

International studies have found that FL is still relatively low ([Lusardi and Mitchell, 2011b](#); [Niu et al., 2020](#)) and that financial illiteracy is more prominent in women, older and younger persons (compared to middle-aged) ([Lusardi and Mitchell, 2014](#)), those with the poorest educational background ([Noviarini et al., 2021](#)), single (compared to married) ([Xue et al., 2019](#)), non-homeowners ([Xue et al., 2019](#)) and non-white persons (e.g. US, [Lusardi and Mitchell, 2014](#)).

2.2. Financial literacy and financial decision-making

FL studies argue that the knowledge and skills accumulated with higher FL improves human capital ([Bialowolski et al., 2020](#)) and therefore the ability to make better financial decisions. These studies generally show a positive correlation with decision-making, such as retirement planning (e.g. [Lusardi and Mitchell, 2017](#)), wealth accumulation (e.g. [Jappelli and Padula, 2013](#)), investment/portfolio alternatives (e.g. [Hastings and Mitchell, 2020](#)) and less debt, debt charges or debt anxiety (e.g. [Lusardi and Tufano, 2015](#); [Noviarini et al., 2021](#)).

However, there are some studies that suggest otherwise. Although, [Xu and Zia \(2012\)](#) demonstrate that FL correlates with retirement planning, sophisticated investment alternatives, debt and mortgage consequences, and microeconomic implications in high income countries, results are somewhat different in low income countries. Also, [Crossan et al. \(2011\)](#) observe that FL does not influence retirement planning in NZ, suggesting that NZ's universal public pension provision discourages such behaviour.

Studies report a strong association between FL and investment decisions. [Dvorak and Hanley \(2010\)](#) report that many individuals are unable to distinguish among investment options despite moderate to high levels of FL. Differentiating basic FL from financial sophistication, and differing complexity levels of decision-making may explain this result ([Van Rooij et al., 2011](#)). Individuals with lower FL or financial sophistication are less likely to invest in stocks ([Van Rooij et al., 2011](#)). This resistance may be due to a specific lack of understanding about stocks, asset pricing and stock market operations, rather than a lack of general FL ([Campbell, 2006](#)). It may also be due to different risk appetites and investment strategies as the stock market is riskier than bank deposits.⁴ [Noviarini et al. \(2021\)](#) find that higher FL (incorporating knowledge of financial risk and diversified portfolios) is related to higher willingness to take more risk for certain groups of older New Zealanders.⁵ [Jappelli and Padula \(2015\)](#) show that FL accumulated early in life has a positive correlation with accumulation of wealth and participation in portfolio alternatives in the future.

[Lusardi and Tufano \(2015\)](#) analyse US individuals and associate lower FL and associated debt literacy with higher transaction costs such as credit card charges and fees, expensive borrowing, excessive debt loads/ownership, and inability to self-assess individual debt. [Stango and Zinman \(2009\)](#) find that those who could not estimate the correct interest rate from a payment stream had higher borrowing and less wealth accumulation. These findings suggest that financial illiteracy may cause individuals to incur more debt.

2.3. Financial literacy and financial decision-making by older citizens

The majority of studies report a positive association between FL and both retirement preparedness ([Noviarini et al., 2021](#)) and wealth accumulation ([Lusardi and Mitchell, 2017](#)). [Lusardi \(2012\)](#) argues that money management and FL are important for the older population as they have limited capability to continue working past retirement. They must manage their wealth and avoid costly financial mistakes to ensure adequate retirement funds. Lower levels of FL among older people ([Lusardi and Mitchell, 2014](#)) suggests that they lack some financial knowledge and decision-making skills and can be prone to financial mistakes ([Stolper and Walter, 2017](#)), be victims of fraud ([Lusardi, 2012](#)), are more likely to hold debt in retirement ([Lusardi et al., 2016](#)), exhibit more anxiety about their debt levels ([Noviarini et al., 2021](#)) and not be financially ready for retirement ([Klapper et al., 2015](#)).

More specifically, older individuals may have difficulty repaying loan obligations if relying on debt throughout their retirement. [Lusardi et al. \(2016\)](#) reveal that the more recent (2010) cohort in their 3-period cohort study has more financial insecurity and higher debt levels because of higher mortgage debt. The higher mortgages are mostly due to higher priced homes purchased with smaller

⁴ Xue et al., (2019) examine conservative, balanced and growth preferences.

⁵ Female, European New Zealander, married or divorced/widowed, homeowner or renter.

down-payments. Higher FL, higher income, and education is associated with better debt management. [Lusardi et al. \(2016\)](#) note that: 1) debt interest rates are higher than most rates of return on investment, so managing debt is crucial to ensure that retirees do not outlive their retirement funds; 2) the ease of borrowing in more recent years and the smaller home down-payments may lead to higher borrowing rates and higher chances of mortgage defaults for low income households; 3) alternative lending services such as payday loans and pawnshops are dangerous, as they target mostly low income individuals and set very high interest rates.

[Vornovitsky et al. \(2011\)](#) also find that individuals aged over 55 have the highest relative growth in household debt ownership. [Masnick et al. \(2006\)](#) show that inadequate lending practices and higher tolerance for debt are responsible for the increase in mortgage debt among the older population. Older individuals also pay the highest debt fees and report the fastest growing numbers of bankruptcy filings, with most cases due to credit card interest payments and fees ([Bromberg et al., 2018](#)). They are also more prone to investment mistakes ([Calvet et al., 2009](#)) and may not benefit from optimal investment returns and subsequent wealth accumulation, due to a lack of understanding of diversification and portfolio alternatives, asset valuation, and investment fees ([Dvorak and Hanley, 2010](#)).

2.4. Financial literacy and retirement in NZ

There are two main studies investigating FL and retirement preparedness/planning in NZ. Using 2009 data, [Crossan et al. \(2011\)](#) find overall FL to be high, but lower in the older population, and not associated with retirement planning. They suggest that the security of NZ's universal public pension could explain the lack of retirement planning. Conversely, [Noviarini et al. \(2021\)](#)'s study ten years later finds that FL is high among older New Zealanders,⁶ and higher FL is associated with lower debt anxiety and higher risk tolerance for most, but not all demographic cohorts. [Noviarini et al. \(2021\)](#) argue that the NZ retirement provision system highlights the need for FL and better decision-making among older New Zealanders to avoid old-age poverty. Both studies show that FL is lower among those who are less educated and have lower incomes, female, and of Māori or Pacific Island ethnicity.

NZ's retirement system consists of 1) NZ Superannuation (NZS), a universal public pension with a 40% replacement rate ([OECD, 2019](#)), 2) no mandatory contributory public/private pension system, and 3) a voluntary contributory saving scheme (KiwiSaver). Considering ten countries in the Pacific Basin (US, Hong Kong, Australia, NZ, Japan, Malaysia, Singapore Indonesia, Philippines and Thailand), NZ is the only one with only basic coverage by the state (paid to everyone irrespective of contributions) ([OECD, 2018](#)); in fact, NZ is one of only two countries⁷ with such a universal pension ([OECD, 2019](#)). Other Pacific Basin countries have a variety of retirement pension regimes. For example, Australia has basic coverage plus private defined contribution schemes (individual accounts with resultant pension income stream) and the US has only a public defined benefit scheme (pension depends on contributions). Despite NZ's high coverage rate for residents, its replacement rate is among the lowest internationally ([OECD, 2019](#)). However NZS "ensures cost-effective, secure, equitable and sustainable basic income for all" ([St John, 2007](#), p. 532), providing an income floor for older persons so that they are able to support themselves at a very basic level without "creating intergenerational inequity, distortions that impede economic growth or fiscal bankruptcy" ([St John and Willmore, 2001](#), p. 1295). It is simple to administer, recognises both paid and unpaid contributions to society, eligibility is unaffected by spouse's income, and is indexed to living standards ([St John, 2007](#)).

Because of NZ's ageing population, poor saving by individuals and concerns about the sustainability of NZS ([ANZ Investments, 2017](#)), the NZ Government introduced a voluntary contributory retirement savings scheme in 2007 called KiwiSaver. It is an auto-enrolled voluntary occupational saving scheme (4–8% of gross salary), with mandatory contributions from employers (up to 4%) for contributing employees. Funds are initially placed with a default provider who invests in the conservative fund option. Individuals can switch to another approved fund provider. Those who seek financial advice,⁸ have higher FL and greater risk appetites can benefit from choosing different portfolios and fund providers or investing elsewhere with higher tax benefits⁹ ([St John, 2007](#)). The scheme's voluntary nature means it relies on individual initiative and asset management knowledge, more so than in the public mandatory schemes.¹⁰ KiwiSaver has limitations for wealth accumulation as there is allowance for contribution holidays and for first-home withdrawals ([Inland Revenue, 2021a](#)).

KiwiSaver withdrawal is a lump sum at retirement age with only criteria-based exceptions for first home ownership and severe financial hardship. This relative illiquidity before retirement age is similar to employer-related schemes in other English-speaking countries ([Beshears et al., 2017](#)). However, there are no annuitisation options upon withdrawal, nor a strong private annuities market in NZ ([St John, 2009](#)), meaning that without informed planning, individuals may outlive their asset. Instead, New Zealanders may invest in property and financial investments ([St John and Willmore, 2001](#)) to accumulate wealth, gain earlier access to funds, minimise tax¹¹ and reap better returns. Wealth accumulation during New Zealanders' working lives correlates with less likelihood of financial vulnerability in retirement ([Allen, 2019](#)). In NZ, housing investments are tax-favoured, as there is no capital gains tax on housing sales

⁶ [Noviarini et al. \(2021\)](#) explain that the difference in FL results may be due to different sample age profiles, different priorities of the sampled individuals, timing in relation to the Global Financial Crisis (2009) and introduction of KiwiSaver (2007).

⁷ The other is Mexico.

⁸ The financial advising industry in NZ is relatively small ([Richards et al., 2019](#)).

⁹ There is some tax credit available in KiwiSaver (up to \$521 p.a.).

¹⁰ Seven of the ten Pacific Basin countries mentioned above have either public defined benefit or defined. Contribution schemes (Japan, Malaysia, Singapore, Indonesia, US, Philippines and Thailand) ([OECD, 2018](#)).

¹¹ E.g. Portfolio Investment Enterprise funds have a lower tax rate (28%) than the highest individual tax rate (33%).

as long as the sale is not less than two years,¹² five years¹³ or ten years¹⁴ from purchase/built dates (Rehm and Yang, 2021). Therefore, the attractiveness of housing as an investment has led to housing becoming the major component of the dollar value of asset ownership in NZ (Le et al., 2012) and upon liquidation a source of additional income in retirement (Noviarini et al., 2019).

2.5. The research questions

The NZ retirement system puts pressure on retirees to be financially literate and responsible for making sound financial decisions, so they do not outlive their wealth. To date, the literature has predominantly explored relationships between demographic variables and FL, and separately the relationship between FL and decision-making activities, such as retirement planning and debt ownership among the older population (Goyal and Kumar, 2021).

Our study extends the work of Noviarini et al. (2021) and is the first study to investigate the mediating relationships between demographic factors (income and education, age, family responsibilities, work hours and health) through FL, debt anxiety, and risk tolerance, on allocation choices among retirees in general, and among NZ retirees specifically (Fig. 1). It asks the following research questions (RQs):

1. Does FL affect resource allocation choices among NZ retirees?
2. Do FL, debt anxiety, and risk tolerance mediate the relationship between income and education (PR), retiree age, family responsibilities, work hours and health and the resultant resource allocation choices?
3. Do the relationships vary across different cohorts?

The allocation alternatives refer to consumption (general or luxury), investment alternatives such as KiwiSaver or property investments, debt reduction, bequest motives such as giving money to family members, and philanthropic motives such as donations.

3. Method

3.1. Sample

This study is part of a more extensive study on FL in NZ. It uses primary data from New Zealanders aged 55 years elicited from an online survey as described in Noviarini et al. (2021).¹⁵ The final sample of 1185 observations closely resembles the distribution of the NZ population based on gender and ethnicity.

3.2. Variables

Fig. 2 reports the distribution of FL scores across the sample demographics using a series of histograms.¹⁶ For comparability, we follow Noviarini et al. (2021) and measure FL using the Lusardi and Mitchell (2011a) questions covering interest compounding,

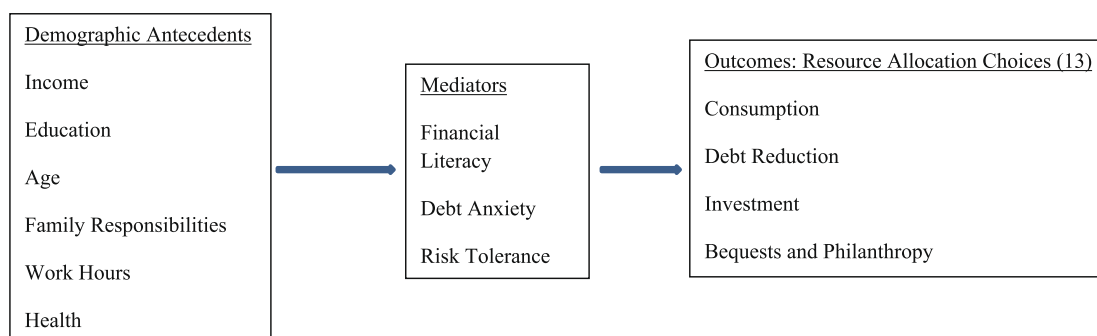


Fig. 1. Conceptual framework underlying the research questions.

¹² For homes purchased between October 1st, 2015 and March 28th, 2018 (Inland Revenue, 2020).

¹³ For homes purchased on or after March 29th, 2018 (Inland Revenue, 2020).

¹⁴ For homes purchased on or after March 27th, 2021 (Inland Revenue, 2021b).

¹⁵ Sample bias may be present in our web surveys (Grandcolas et al., 2003). The bias arises from online surveys being attractive to people with more time, better internet access and connection, better typing skills, more socialawareness, and those with greater curiosity levels (Novak et al., 1998). We have minimised the possibility of sample selection bias by adjusting requests to potential respondents to emulate the gender and ethnic distribution of the NZ population.

¹⁶ Paper details withheld at present to protect integrity of blind review.

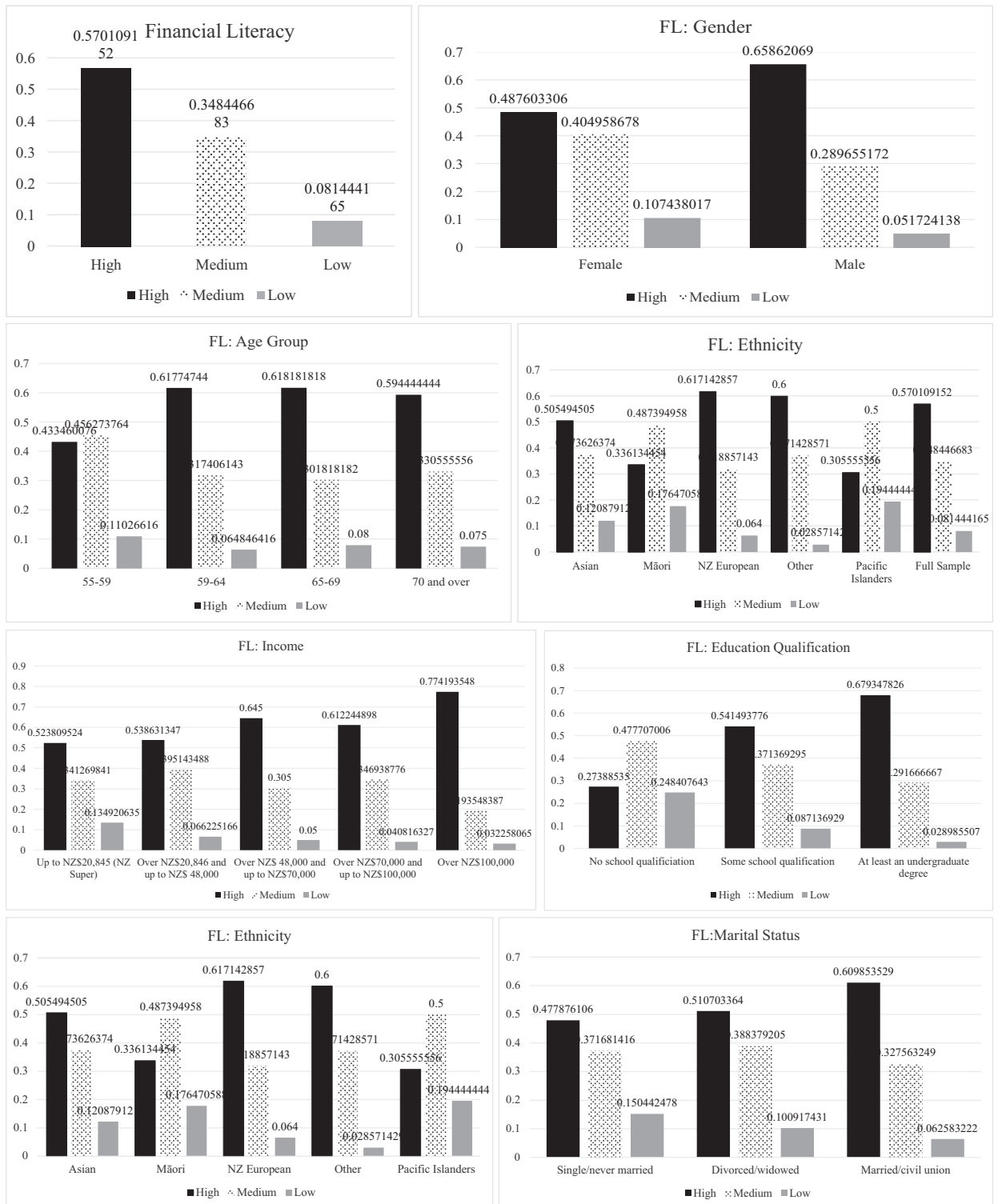


Fig. 2. Total sample descriptive statistics of FL score.

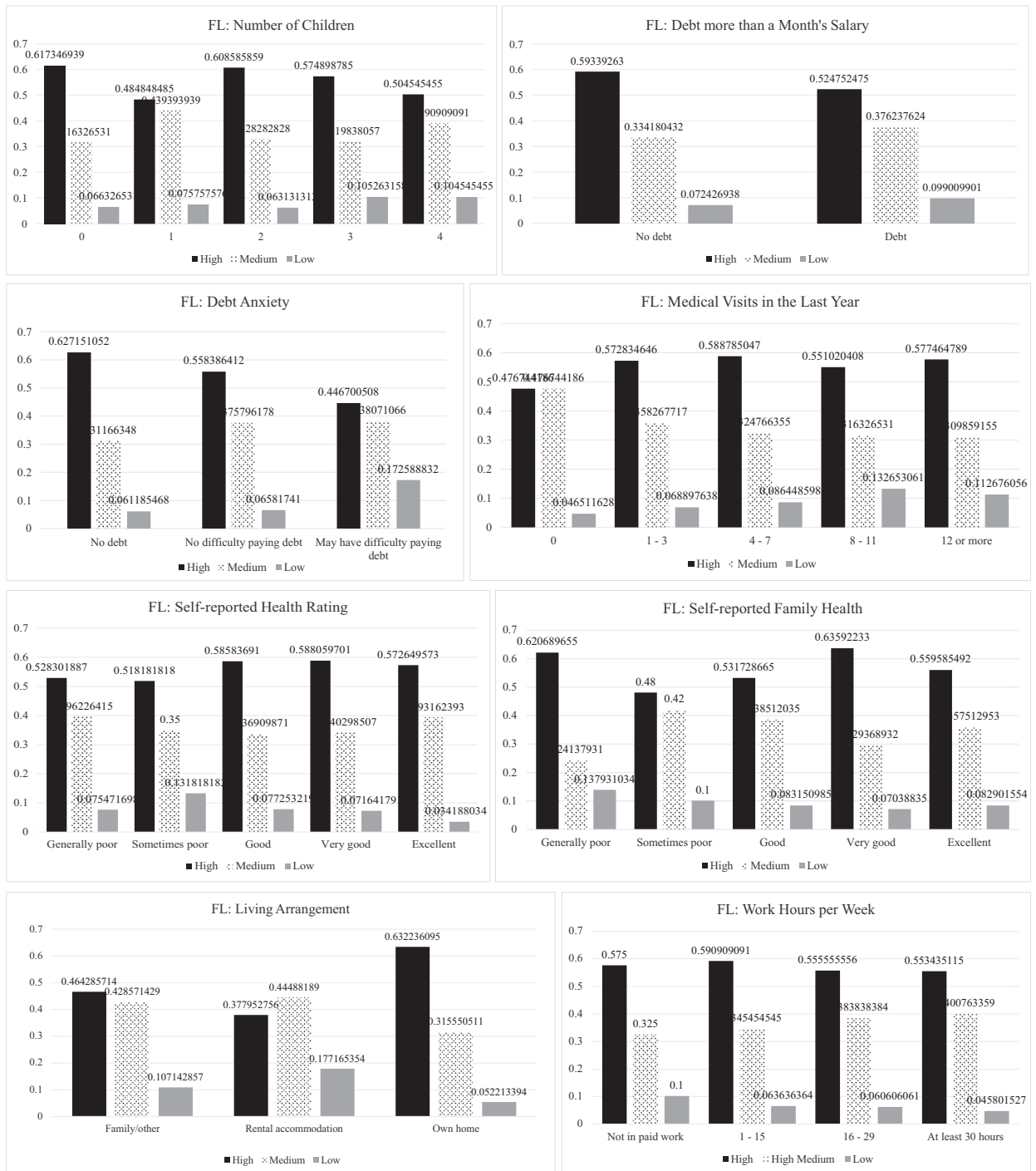


Fig. 2. (continued).

Table 1
Survey questions.

Variable	Component	Question	Alternative answers	References
Financial Literacy	Interest compounding	Suppose you had \$100 in a savings account and the interest rate was 2% per annum. After 5 years, how much do you think you would have in the account if you left the money to grow?	a. More than \$102 b. Exactly \$102 c. Less than \$102 d. Do not know	Lusardi and Mitchell (2011a)
Financial Literacy	Inflation	Imagine that the interest rate on your savings account was 1% per annum and inflation was 2%. After 1 year, how much would you be able to buy with the money in this account?	a. More than today b. Exactly the same c. Less than today d. Do not know	Lusardi and Mitchell (2011a)
Financial Literacy	Risk diversification	Please tell me whether this statement is true or false. 'Buying a single company's shares usually provide a safer return than buying a mixture of shares from different companies in different industries'.	a. True b. False c. Do not know	Lusardi and Mitchell (2011a)
Financial Literacy	Investment risks and return	Please tell me whether this statement is true or false. 'An investment with high return is likely to be high risk' (if someone offers you the chance to make a lot of money, it is likely there is also a chance that you can lose a lot of money).	a. True b. False c. Do not know	https://www.oecd.org/finance/g20-oecd-infe-report-adult-financial-literacy-in-g20-countries.htm
Debt	Debt ownership	Do you have any outstanding debt more than a month's worth of salary/your income?	a. Yes b. No	Lusardi and Tufano (2015)
Debt	Debt anxiety	Which of the following best describes your current debt worry?	a. I may have difficulty paying it off b. I face no problems paying my debt c. I have no debt a. Reckless/hasty b. Willing to take evaluated risk c. Careful d. Low risk-taking capability e. Extremely unwilling to take risk	Noviarini et al. (2021)
Risk Tolerance		How would you 'honestly' describe yourself as a risk-taker?		Noviarini et al. (2021)

This table reports the questions used to measure FL, debt variables and risk tolerance.

inflation, and risk diversification (Agnew et al., 2013). "Stock" was changed to "shares" as New Zealanders may misinterpret "stock" as livestock. In addition, the instrument includes a question on the concept of investment risks and returns from the G20/OECD INFE Report on Adult Financial Literacy in G20 Countries (Noviarini et al., 2021). The questions are shown in Table 1.

The total FL score is calculated as the number of questions respondents answered correctly and ranges from 0 to 4. A score of zero or 1 is classified as "Low" FL, two or three correct is "Medium", and all four questions correct is "High" FL.

Following Lusardi and Tufano (2015) and Noviarini et al. (2021), debt is a self-assessed measurement, using two questions (Table 1). One question is about indebtedness (debt ownership) and the other question refers to the respondent's perceived inability to pay off their debt (debt position, which we have renamed debt anxiety for clarity). Higher debt anxiety values show that individuals are more worried about their inability to pay off their debt. The study also uses a self-assessed measurement of risk-taking tolerance (Table 1) because resource allocation alternatives may be affected by risk appetite (Hayhoe et al., 2000).

Following Noviarini et al. (2021), the variable "PR" is calculated using principal component analysis (PCA) applied to income (Wold et al., 1987) and educational attainment (Goyal and Kumar, 2021), both of which are highly correlated. The eigenvalues for education and income are 1.2 and 0.75, respectively. The former explains 63% of the variation and 37% is explained by the latter. PCA is also applied to "family health" and "children" to create "Family Responsibility" with weights of 53% and 47%, respectively. PCA analysis for the variables (i) "medical visits" and "health ratings" and (ii) "debt anxiety" and "debt ownership" showed that medical visits and debt anxiety were dominant.¹⁷ Further analysis in our study focuses on debt anxiety.

Our study seeks to better understand the preferences for resource allocations between cohorts and to determine if these decisions have an impact on the long-term wellbeing of the respondents. Consumption and income fall in retirement (Bonsang and Klein, 2012). The Life Cycle model posits that individuals planning for retirement face a trade-off between spending more pre-retirement than

¹⁷ Combining highly correlated variables using PCA improves the structural equation modelling results (Kock and Hadaya, 2018).

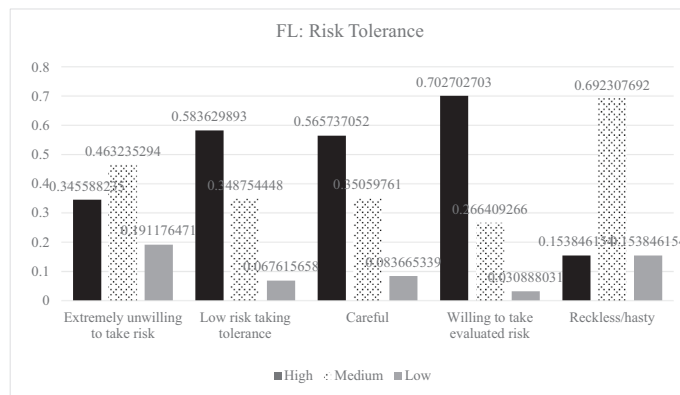


Fig. 2. (continued).

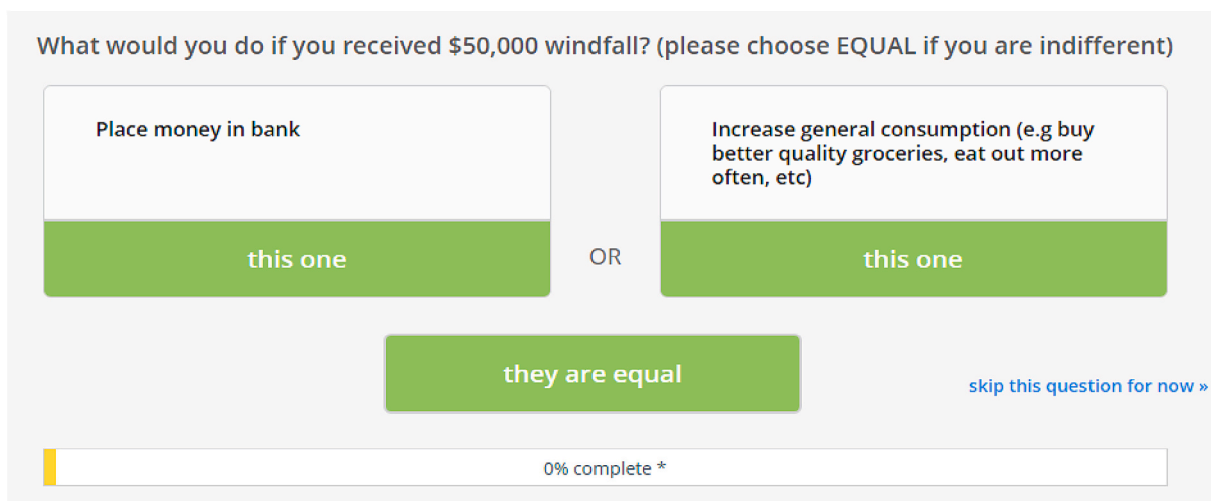


Fig. 3. Presentation of alternatives in 1000Minds.

Table 2

Resource allocation choices and sample ranking.

Possible resource allocation choice	Mean preference rank	Median preference rank	Rank	Min	Max	Std. Dev
Put money in bank	0.106	0.105	1	0.019	0.217	0.034
Place in KiwiSaver or investment fund	0.092	0.091	2	0.011	0.214	0.037
Make improvements on house/upgrade	0.092	0.093	2	0.011	0.206	0.038
Pay off debt	0.091	0.091	4	0.011	0.217	0.048
Luxury purchases	0.080	0.077	5	0.011	0.214	0.039
Give money to family/friends now	0.077	0.074	6	0.011	0.217	0.038
Leave money to family/friends when I die	0.074	0.071	7	0.011	0.210	0.034
Purchase shares in share market	0.068	0.063	8	0.011	0.217	0.037
Put a deposit on home for myself	0.068	0.063	9	0.011	0.214	0.037
Put a deposit on an investment property	0.068	0.065	9	0.011	0.201	0.032
Increase general consumption	0.064	0.061	11	0.011	0.193	0.033
Invest in health	0.063	0.056	12	0.011	0.188	0.034
Make donations	0.058	0.054	13	0.011	0.195	0.035

Columns 1 and 2 list the possible alternatives for decision-making. The third column reports the total sample's mean weight preference of each alternative relative to other choice alternatives assuming a windfall of NZ\$50,000. Rank indicates preference (rank 1 = most preferred; 13 = least preferred).

5. E.g. buy better quality groceries, eat out more often.

8. E.g. overseas holidays, boats.

11. E.g. private health insurance, private operations/procedures.

12. E.g. personal and/or mortgage.

provides benefits in the later years (for example, investing in health, buying their own home, saving money) and delaying consumption in order to ensure there is enough income post-retirement to support ongoing needs for assets and other costs of living (including leaving an inheritance) (Gourinchas and Parker, 2002).

We use a MCDMA software package, 1000Minds¹⁸ (Ombler and Hansen, 2012) to measure allocation choices. Unlike traditional MCDMA methods that require respondents to rank the importance from a list of alternatives, the Potentially All Pairwise Rankings of all possible Alternatives (PAPRIKA) method applied in 1000Minds software creates a ranking from participants' pairwise preferences. Participants indicate their preferences from a repetition of two alternatives each time (Fig. 3) until all combinations of alternatives are presented. The 1000Minds software processes the responses to produce a preference weight for each alternative for each participant, totalling to 1. The software ranks the alternatives and then tests the weighting of an alternative compared to other alternatives. The algorithm produces different combinations for each pair of alternatives until it is able to estimate the relative rank of all alternatives (Hansen and Ombler, 2009). Respondents in this study are asked:

What would you do if you received a \$50,000 windfall?

Respondents are given 13 resource allocation alternatives that cover motivations such as day-to-day consumption, investments (financial products and property), debt reduction, health investment, family, and philanthropy (Table 2).¹⁹

The Fractional Multinomial Logistic Regression (FMLR) sets one of the parameters to zero and the 13 alternatives are regressed separately on the independent variables and demographic characteristics. Other alternatives are compared to a 'base' category within each alternative and the coefficients of the other alternatives are compared to the 'base' alternative. The alternative weight predicted values (\hat{y}) are determined by the independent variable and demographic characteristics (x) of each respondent (Buis, 2010).

$$\hat{y}_{1i} = \frac{1}{\sum_{k=1}^{13} \exp(x_i \beta_k)}$$

$$\hat{y}_{2i} = \frac{\exp(x_i \beta_{k1})}{\sum_{k=1}^{13} \exp(x_i \beta_k)}$$

$$\hat{y}_{13i} = \frac{\exp(x_i \beta_{k12})}{\sum_{k=1}^{13} \exp(x_i \beta_k)}$$

where 1, 2, ... 13 are the thirteen alternatives. So

$$\hat{y}_{13i} = \frac{\exp(x_i \beta_{k13})}{1 + \sum_{k=1}^{13} \exp(x_i \beta_k)}$$

where 1... 13 are the thirteen alternatives, $\beta_1 = 0$.

The loglikelihood function for the FMLR states that:

$$\ln(L_i) = y_{1i} \ln(\hat{y}_{1i}) + y_{2i} \ln(\hat{y}_{2i}) + \dots + y_{13i} \ln(\hat{y}_{13i})$$

Each category of dependent variable is continuous and takes a value between zero or one. All \hat{y} are included in the log likelihood function maximised to produce the β coefficients

Each alternative,²⁰ x_i is given by:

$$x_i = \alpha + \beta_1 FinLit + \beta_2 Debt_{Anxiety} + \beta_3 Risk_{attitude} + \beta_4 Male + \beta_5 NZ_{European} + \beta_6 Age_{55} + \beta_7 No_{Educ} + \beta_8 Single + \beta_9 Low_{income} + \beta_{10} Health + \beta_{11} Fam_{Resp} + \beta_{12} Work + \epsilon_i$$

Our study follows Noviarini et al. (2021) by using maximum likelihood estimation in GSEM to explore and test the direction and magnitude of mediating relationship paths between demographic factors of PR (income and education) retiree age, family responsibilities, working hours and health through mediators, FL, debt anxiety, risk tolerance and resultant allocation choices. GSEM addresses endogeneity (reverse causality) concerns from previous FL studies (Goyal and Kumar, 2021). GSEM reports the covariance of the relationship between variables without assuming direction of causality.

¹⁸ <https://www.1000minds.com/>

¹⁹ The \$50,000 amount for the windfall gain is the average dollar amount of funds held in KiwiSaver at age 65. It also allows for a home deposit of 10% given the median house value of \$520,000. The windfall amount is not expected to change the investment choice since research by Camerer and Hogarth (1999) and Carpenter et al. (2005) show that the effect of changing stakes in economic experiments have little effect on average behaviour.

²⁰ See Appendix Table A1 for variable definitions and references to support the choice of resource allocation alternatives.

Table 3
Fractional multinomial logistic regression choices.

Comparable alternative preference is against KiwiSaver		Preferred resource allocation alternative				
		Home deposit	Property investment deposit	Donations	General consumption	Money for family and friends now
		Odds Ratios				
Financial literacy		0.929**	0.922**	0.898***	0.928**	0.918**
	No problem paying debt	1.139***	2.305**	1.028	1.054	1.064
Debt anxiety (compared to no debt)	Difficulty paying debt	1.210***	1.123**	0.919	1.257***	1.085
	Low risk-taking capability	1.043	2.625	0.998	1.068	0.956
	Careful	1.014	1.074	0.971	1.008	0.859**
	Willing to take evaluated risk	0.996	1.147*	0.990	0.985	0.880
Risk tolerance (compared to extremely unwilling to take risk)	Reckless/hasty	0.922	1.557*	0.909	1.200	1.610**
Gender (Compared to Female)	Male	0.973	1.021	0.839***	1.007	0.877***
	Māori	1.101	1.081	0.999	0.838**	1.044
	Pacific Island	1.108	1.124	1.208	0.914	0.979
Ethnicity (compared to European New Zealander)	Asian	1.192**	1.169**	1.040	1.113	0.857**
	Other	1.074	1.049	1.003	0.980	0.992
	60–64	0.998	0.946	1.008	0.924	1.028
	65–69	0.884*	0.923	1.145*	0.877**	1.068
Age group (compared to age 55–59)	Over 70	0.891*	0.951	1.297***	0.966	1.195***
Personal resources		0.951**	1.002	1.011	0.941**	0.994
	Married/partnered	1.182***	1.201**	0.993	0.964	1.097
Marital Status (compared to single)	Divorced/widowed	1.073	1.120	0.988	0.987	1.119
Family responsibility		0.999	0.981	0.950*	0.978	1.028
	1–3	0.935	0.957	0.932	0.867	0.935
	4–7	0.903	0.945	0.941	0.916	0.943
Medical visits in past year (compared to 0)	8–11	0.914	0.899	1.074	0.879	0.824*
	12 or more	1.031	0.844	0.911	0.865	0.854
	Renting/in supported care	1.422***	1.068	1.003	0.987	0.972
Living arrangement (compared to living in own home)	Living with family/other	1.150	1.007	0.896	1.024	0.912
	1–15	0.926	0.921	0.862**	0.900	0.881**
	16–29	0.993	0.993	0.937	0.868*	0.843**
Work hours per week (compared to 0)	at least 30	0.940	0.908*	0.844***	0.817***	0.806***
Constant		0.844	0.772	1.007	1.296	1.115
Wald Chi ² (336)		2247***				

Comparable alternative preference is against KiwiSaver		Preferred Resource Allocation Alternative						
		Money for family and friends later	Luxury goods	Money in bank	Home improvements	Health Investment	Pay off Debt	Purchase Shares
		Odds Ratios						
Financial literacy		0.920**	0.991	0.945**	0.956	0.922**	0.928**	0.969
	No problem paying debt	1.003	1.062	0.984	1.168***	1.107**	1.799***	0.927*
Debt anxiety (compared to no debt)	Difficulty paying debt	1.053	1.102	1.103**	1.313***	1.259***	2.195***	0.947
	Low risk-taking capability	0.957	1.113	0.979	0.988	0.970	1.190	1.150**
	Careful	0.946	1.023	0.951	0.945	0.929	0.984	1.259***
	Willing to take evaluated risk	0.882*	1.015	0.850***	0.909	0.888	0.994	1.462***
Risk tolerance (compared to extremely unwilling to take risk)	Reckless/hasty	1.613**	1.800**	1.351	0.986	1.132	0.986	1.208
Gender (Compared to Female)	Male	0.948	0.993	1.041	0.963	0.963	1.037	1.101**
	Māori	1.088	0.856**	0.979	1.025	1.029	1.041	1.067
Ethnicity (compared to European New Zealander)	Pacific Island	1.298**	0.907	1.003	1.024	1.230*	1.247**	1.190
	Asian	0.980	1.016	0.999	0.910	1.260***	1.066	0.990
	Other	1.040	0.937	1.629	0.991	0.963	0.956	1.129*
Age group (compared to age 55-59)	60-64	1.064	1.000	1.017	0.983	1.079	0.991	1.031
	65-69	1.149**	0.983	1.026	0.959	0.934	0.903*	1.031

(continued on next page)

Table 3 (continued)

Comparable alternative preference is against KiwiSaver		Preferred Resource Allocation Alternative						
		Money for family and friends later	Luxury goods	Money in bank	Home improvements	Health Investment	Pay off Debt	Purchase Shares
		Odds Ratios						
Personal Resources	Over 70	1.276**	0.988	1.058	0.945	1.047	0.946	1.115*
		0.984	0.974	0.988	0.972	1.011	0.964*	1.042**
Marital Status (compared to single)	Married/partnered	1.007	1.141*	1.009	1.169**	1.059	1.169**	0.991
	Divorced/widowed	1.004	1.092	1.008	1.149**	1.062	1.117	0.975
Family responsibility	1-3	0.962	1.044	0.924	0.988	1.008	0.940	1.049
	4-7	0.993	1.060	0.922	0.972	0.992	0.925	0.991
Medical visits in past year (compared to 0)	8-11	0.972	1.068	0.928	0.994	0.975	0.823**	0.926
	12 or more	0.878	1.116	0.915	1.035	1.084	1.077	0.972
Living arrangement (compared to living in own home)	Renting/in supported care	1.002	0.869	0.969	0.616***	0.918	0.964	1.017
	Living with family/other	0.919	0.952	0.933	0.774***	0.990	0.940	0.835**
Work hours per week (compared to 0)	1-15	0.862**	0.931	1.091*	0.950	0.991	0.911	0.939
	16-29	0.889*	0.952	0.929	0.887*	0.783***	1.038	0.839**
	at least 30	0.844**	1.143	0.883***	0.887***	0.887**	0.966	0.849***
Constant		1.037	0.814	1.553	1.200	0.793	0.915	0.567
Wald Chi ² (336)		2,247***						

Models are fitted using the data from the 1000Minds survey on FL, debt anxiety, risk-taking tolerance, and demographic factors. The coefficient shows the magnitude of the likelihood for preferring another option compared to choosing KiwiSaver. Sample size = 1185 observations.

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4. Results

4.1. Descriptive results

The summary statistics (see Fig. 2 and Table A2 in the Appendix) report 57% of New Zealanders aged 55 and over scored a “high” FL score, 35% scored a “medium” score, and 8% of the sample scored “low”. Over 80% had at least 3 out of 4 questions correct. This high level of FL in the older NZ population differs from low levels found for older citizens in most prior literature (e.g. Alessie et al., 2011; Lusardi and Mitchell, 2011b), but is similar to that found in Germany (Stolper and Walter, 2017).

Similar to prior studies (Noviarini et al., 2021; Crossan et al., 2011) males, married, more highly educated, higher income, homeowners and European extraction individuals have higher FL scores than females, single/divorced/widowed, less educated, lower income, non-homeowners and Asian and Māori and Pacific Islander ethnicities, respectively. FL scores are similar across age bands (except for the lower score in the 55–59 age band), hours of paid work, number of medical visits per year and number of children.

>60% of individuals in the sample do not have debt worth more than a month's salary. Individuals with debt valued at more than a month's salary are associated with a lower proportion of scoring “high” and a higher fraction of “low” FL scores. Similar findings are present among those with more worrying levels of debt. Debt ownership²¹ is lower among married, older, not in paid work, European New Zealanders, living in their own home, with better personal and family health. Māori, male, not living in their own home, working at least 30 h a week, with more frequent medical visits, poorer personal and family health have higher levels of debt. Debt anxiety is spread similarly across gender, income, education, marital status, number of children, and risk tolerance.

Individuals with a careful risk-taking tolerance make up >40% of the sample and the highest fraction of “high” FL scores is associated with those taking some risk. Younger working males in the sample, across ethnicity group, marital status, number of children, medical visits per year, living arrangements, with higher income and education, and better personal and family health, and less than month's salary and lower debt levels have a higher degree of risk tolerance.

Table 2 reports the highest and lowest ranked allocation choices of older New Zealanders when receiving a \$50,000 windfall. Preferences are ranked as follows: put money in the bank (1), spend on home improvements (2), and invest in Kiwi Saver (3). The least preferred alternatives are donations (13), health investments (12), and general consumption (11). The results suggest that older New Zealanders on average are prudent and prefer conservative and liquid alternatives as banking money is the most preferred alternative. Second ranked home improvement suggests that older New Zealanders are potentially homeowners who value home maintenance. Third, older New Zealanders, on average, value saving additional money for retirement and trust KiwiSaver as an investment alternative compared to share purchases (rank 8). The least preferred alternative, donations, suggests that philanthropic motives are valued far less than putting aside money for family members (ranks 6 and 7, respectively). Health investment is the second least preferred

²¹ Available upon request from authors.

alternative. The NZ public health care system provides health coverage, although the application of treatment is based on a point system that is queue centred on urgency and several other extenuating factors (Goodyear-Smith and Ashton, 2019). The findings suggest that older New Zealanders have confidence in the public health care system, and tolerance of treatment waiting times. Increase in general consumption is the third least preferred alternative and suggests that older New Zealanders have careful spending habits.

Table 2 shows the minimum, maximum, and standard deviation of each alternative's weight preference. The minimum is the same across all alternatives, and the maximum is higher among the more preferred alternatives than the less preferred. There is comparable variation across alternatives but highest for debt payment and luxury items. This suggests that there may be other factors associated with those alternatives, such as debt anxiety. Appendix tables A3 – A6 report the highest and lowest ranked allocation alternatives according to gender, ethnicity, marital status and, living arrangement. The results are similar to those reported for the overall sample.

4.2. Empirical results using the FMLR

RQ1 and preliminary exploration for RQ2 and RQ3 are analysed using the FMLR, an extension of the fractional logit model (Table 3).²²

Table 3 highlights some direct relationships between demographic factors and allocation choices. Older individuals show a significant preference for donations and giving money to family members now and later but have a lower preference for general consumption compared to KiwiSaver investment. On average, more educated and higher income individuals report significantly less preference for home deposits (0.95 times) and general consumption (0.94 times) but report odds of 1.04 times for share purchase investments, in contrast to KiwiSaver.

Answering RQ1, the odds ratios show that those with high FL prefer KiwiSaver to spending on home deposits, investment property deposits, donations, general consumption, giving money to family now or later, putting money in the bank, investments in health, and paying off debt.

Answering RQ2, on average those with higher debt anxiety report higher odds of using the \$50,000 windfall for home deposits, general consumption, money in the bank, home improvements, health investments, and paying off debt rather than choosing to invest in KiwiSaver compared to those with no debt. Respondents with higher risk tolerance showed greater odds of leaving money for family now or later, purchasing luxury goods, and purchasing shares over choosing to invest in KiwiSaver. They are also 15% less likely to put the money in the bank compared to investing in KiwiSaver.

In relation to RQ3, Table 3 reports heterogeneity for allocation choices across cohorts. Sampled males (compared to females) demonstrate a significant preference for making KiwiSaver investments, rather than donations (0.84 times) and leaving money to family now (0.88 times), but are 1.1 times more likely to purchase shares rather than KiwiSaver compared to females. There are also ethnic differences. Māori in the sample show a significantly lower preference for general consumption (0.84 times) and purchasing luxury goods (0.86 times) than investing in KiwiSaver, in comparison to European New Zealanders. Pacific Islanders show significant preference for leaving money for family later (1.3 times), investing in health (1.23 times), and paying off debt (1.25 times) relative to KiwiSaver, than European New Zealanders.

Married individuals in the sample report significant odds ratios for home deposit (1.18 times), investment property deposit (1.2 times), home improvements (1.17 times), and paying off debt (1.17 times) over investing in KiwiSaver, when compared to single individuals.²³ On average divorced/widowed individuals 1.15 times more likely to invest in home improvements rather than KiwiSaver when compared to singles. Compared to healthy individuals (0 medical visits in prior year), individuals in the sample who have bad health (8–11 medical visits in prior year) 18% less likely to pay off their debt than investing in KiwiSaver. Individuals who rent are 1.4 times more likely to use the windfall as a home deposit but prefer home improvements less than KiwiSaver, in comparison to homeowners. Individuals who work report significantly higher odds for KiwiSaver relative to donations, general consumption, leaving money for family now/after, home improvements, and purchasing shares.

Overall, KiwiSaver is preferred by a majority of the sample across cohorts, with some exceptions. When compared to single NZ Europeans who live at home and prefer KiwiSaver: 1) Pacific Islanders significantly prefer leaving money for family later, investing in health, and paying off debt; 2) Married or divorced/widowed have a significant preference for investing in homes, for investment property, or health; 3) Renters prefer home deposits; and 4) Married individuals report a preference to pay off debt and undertake house improvements.

4.3. Results from GSEM

GSEM using maximum likelihood estimation is used to explore and test the direction and magnitude of mediating relationship paths between demographic factors of PR, retiree age, family responsibilities, work hours and health through mediators FL, debt anxiety, risk tolerance and resultant allocation choices. We split the sample into cohort subsamples by gender (Tinghög et al., 2021), ethnicity, marital status, and living arrangement to investigate potential heterogeneity (Goyal and Kumar, 2021), and report results to address RQ2 and RQ3 concentrating on paths with a strong effect that reports a correlation of at least 0.30.²⁴

²² 1000Minds software allows for results of each alternative preference to be in the form of fractions that all add up to 1 (Koch, 2010).

²³ There are more financially adequate older married individuals in NZ compared to singles due to homeownership (Noviarini et al., 2019).

²⁴ Following Kock and Hadaya (2018) a path effect size of 0.30 is determined to be important for a sample size of at least 100. For smaller subsamples with required sample size of 51, Kock and Hadaya (2018) suggest effect sizes of 0.15 and 0.35 are medium and large, respectively.

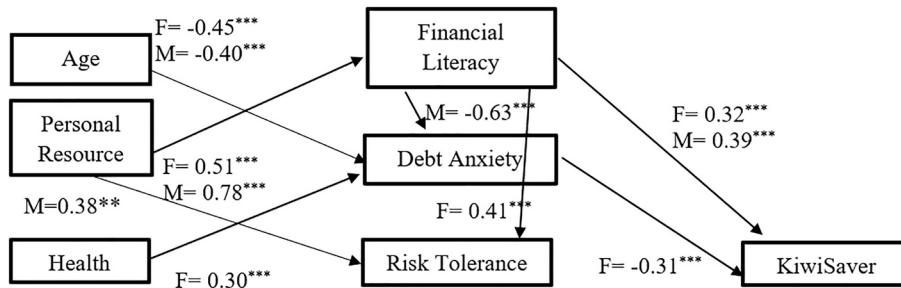


Fig. 4. GSEM for female and male cohorts who on average say “choose KiwiSaver.”
Notes: Arrow signifies the direction of the relationship and the value signifies the strength; F=Female, M = Male.

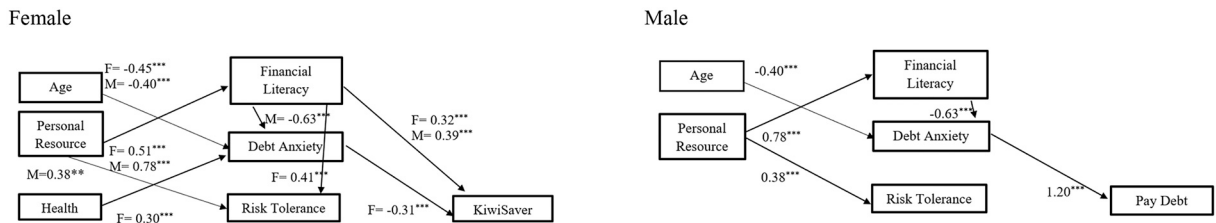


Fig. 5. GSEM for female who on average say “put money in bank” vs male cohort who on average say “choose pay debt.”
Notes: Arrow signifies the direction of the relationship and the value signifies the strength.

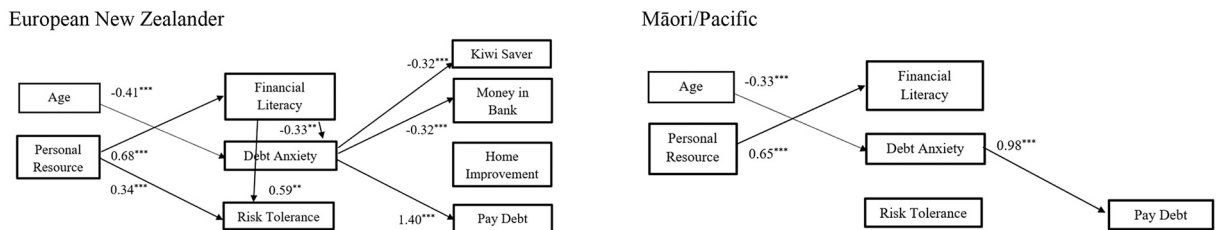


Fig. 6. GSEM for stated choices of European New Zealander vs Māori/Pacific cohorts.
Notes: Arrow signifies the direction of the relationship and the value signifies the strength.

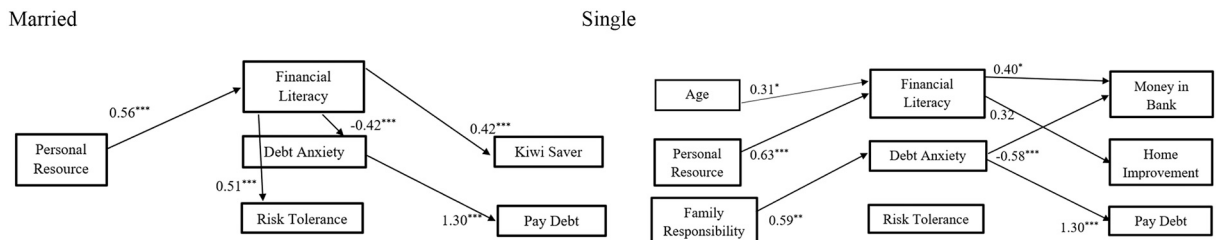


Fig. 7. GSEM for stated choices of different marital status cohorts.
Arrow signifies the direction of the relationship and the value signifies the strength.

4.3.1. Gender

Figs. 4 and 5 show that for females in the sample, FL mediates the relationship between PR (income and education) and investing in KiwiSaver. PR has a strong positive association with FL (0.51), and FL has a strong positive association on females choosing KiwiSaver (0.32). FL also has a strong positive association with risk tolerance (0.41) but this does not impact on allocation choices. Debt anxiety acts as a mediating variable between age and health to allocation choices. Older individuals are associated with less worrying levels of debt ($F = -0.45$, $M = -0.40$) whereas women in poorer health are associated with greater debt anxiety (0.3). More debt anxiety deters females from choosing putting money in the bank (-0.37) or investing in KiwiSaver (-0.31).

Both FL and debt anxiety mediate males' allocation choices. PR is positively associated with male FL (0.78) and this positively

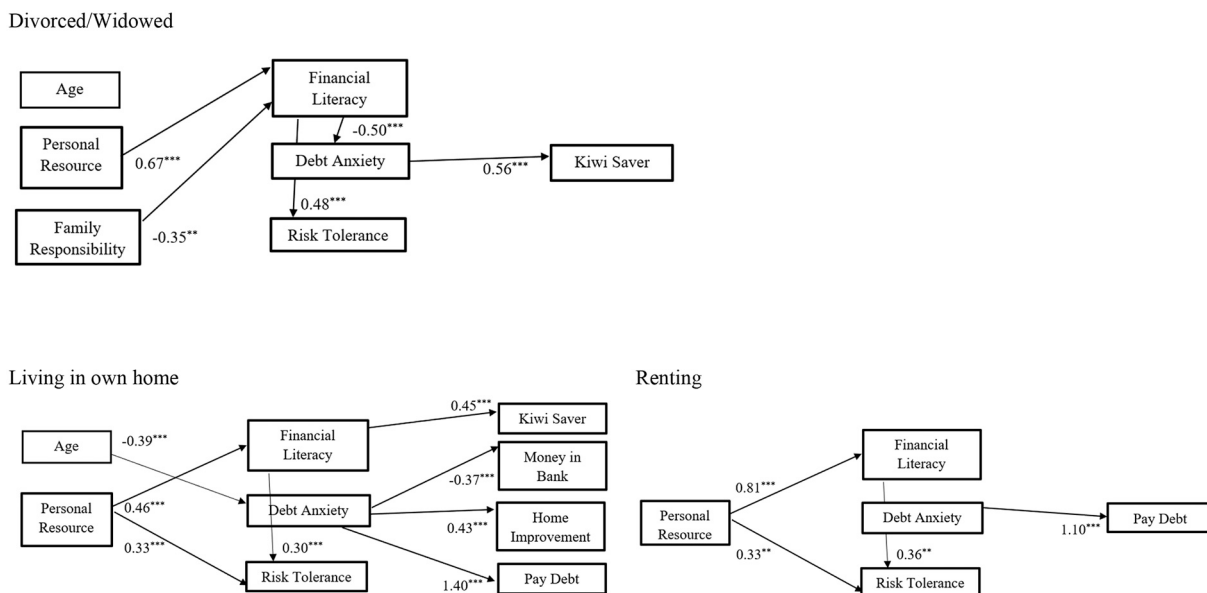


Fig. 8. GSEM for stated choices of different living arrangement cohorts. Notes: Arrow signifies the direction of the relationship and the value signifies the strength.

influences investment in KiwiSaver (0.39) but is negatively associated with debt anxiety (-0.63). From Fig. 5 higher debt anxiety for males is strongly associated with a higher preference for paying debt (1.20). PR also has a strong positive association with risk tolerance (0.38) but no resultant influence on allocation choices.

For both genders, the findings suggest that PR improves FL which has a positive correlation with investing in KiwiSaver. Older retirees and more financially literate males have less debt anxiety. Preferring to pay off debt is strongly associated with debt anxiety for males whereas females with higher debt anxiety are less likely to place windfall money in the bank (RQ3). Risk tolerance does not act as a mediating variable on allocation choices.

4.3.2. Ethnicity

Fig. 6 shows that debt anxiety mediates the relationship between age and choosing KiwiSaver, money in the bank, and debt reduction for European New Zealanders. PR is strongly positively associated with FL (0.68), and FL has a negative association with debt anxiety (-0.33). Older European NZ individuals are associated with less worrying debt (-0.41), and similar to females, debt anxiety has a negative association with choosing money in the bank (-0.32). Greater debt worry is also associated with a lower preference for KiwiSaver (-0.32) and a higher preference for reducing debt (1.4). PR (0.34) and FL (0.59) both have a positive association with risk tolerance, but there is no influence on allocation choices.

PR is also strongly positively associated with the FL level of Māori/Pacific Islanders in the sample (0.65). However, FL does not have a mediating influence on any allocation choices. Debt anxiety has a mediating influence for Māori/Pacific Islanders in the sample. Older Māori/Pacific Islanders have less debt anxiety on average (-0.33), and debt anxiety has a strong association with choosing to pay debt (0.98).

4.3.3. Marital status

Fig. 7 shows that FL mediates married individuals' relationship between PR (0.56) and choosing KiwiSaver (0.42). Greater FL for married individuals has a positive association with risk tolerance (0.51), and a negative association with higher debt anxiety (-0.42). Higher debt anxiety positively influences the desire to pay off debt (1.30).

The results for singles show mediation by FL and debt anxiety. Age (0.31) and PR (0.63) both have a positive association with FL, and FL has a positive association with money in the bank (0.4) and home improvement (0.32). Greater family responsibility is associated with more debt anxiety (0.59). Debt anxiety acts as a mediator as it is subsequently associated with less desire to put money in the bank (-0.58) and a strong association with reducing debt (1.3).

Divorced/widowed individuals' results show less family responsibility (-0.35) and greater PR (0.67) are associated with greater FL but in this case, there is no direct relationship with investing in KiwiSaver. However, FL is positively associated with risk tolerance (0.48) and negatively associated with debt anxiety (-0.50). Debt anxiety is positively associated with choosing to invest in KiwiSaver (0.56). Debt anxiety is the key mediating variable for the divorced/widowed group; however it is indirectly influenced by FL.

4.3.4. Living arrangement

Considering individuals living in their own home, Fig. 8 reports a positive association between PR and FL (0.46) and this mediates

the relationship with paying debt (0.44). FL has a positive association with higher risk tolerance (0.30). Older retirees living in their own homes have less debt anxiety (−0.39). Greater debt anxiety mediates the relationship with allocation choices as it is associated with home improvements (0.43) and less money in the bank (−0.37). PR has a positive association with risk tolerance (0.33), but risk tolerance is not associated with allocation choices.

The GSEM analysis for renters shows no mediating relationships. PR is positively associated with FL (0.81) and risk tolerance (0.33). FL is positively associated with risk tolerance (0.36). Greater debt anxiety is associated with choosing to reduce debt (1.1).

Overall the GSEM analysis increases our understanding of the impact of resource allocation preferences across cohorts on long-term wellbeing. FL is associated with greater investment in KiwiSaver for all cohorts. FL reduces debt anxiety for men and increases risk tolerance in women. Individuals with poor health, low incomes and lower levels of education are more vulnerable. Greater debt anxiety is associated with debt repayments for all cohorts and is prominent for men. A key outcome of our findings is that avoiding debt in old age is critical to long-term wellbeing.

5. Discussion

5.1. Theoretical contributions and implications

This study investigates FL of older New Zealanders and the relationship between FL, debt anxiety, risk tolerance, and resource allocation decision-making. We support findings from [Noviarini et al. \(2021\)](#) and contribute to the understanding of FL in older citizens. Contrary to the findings of [Crossan et al. \(2011\)](#) which showed that although New Zealanders are financially literate, there is no association between FL and retirement planning, our study suggests that FL does affect retirement allocation choices. This study extends [Noviarini et al. \(2021\)](#) by investigating resource allocation decision-making among NZ retirees. Answering calls from [Brüggen et al. \(2017\)](#) and [Goyal and Kumar \(2021\)](#), this study also provides insight on the complexity of the relationships because for different cohorts, FL and debt anxiety may have mediating roles in the relationship between demographic characteristics and resource allocation choices ([Xue et al., 2021](#)).

The results show that FL is high with 57% of older New Zealanders in the sample scoring “high” (all four FL questions correct) and 80% answering three out of four correctly.²⁵ Younger females of Māori or Pacific Islands ethnicity with lower education attainment, lower incomes, and high family responsibility in the sample have significantly lower levels of FL. Lower FL is concerning because these individuals are the most vulnerable to financial mistakes ([Stolper and Walter, 2017](#)).

This study makes a substantial contribution to the literature as it is the first to investigate how FL affects allocation choices in general, and among older New Zealanders in particular. The analysis covers a wide variety of resource allocations and is the first to prioritise these choices using the novel comparative method of MCDMA ([Hansen and Ombler, 2009](#)).

Certain allocation choices by NZ retirees are significantly correlated to higher FL (RQ1). Higher FL has a strong positive association with choosing KiwiSaver. Lower FL is associated with more debt anxiety, and on average those with higher debt anxiety are significantly associated with using the \$50,000 windfall for home deposits, property investment deposits, general consumption, home improvements, health investments, and paying off debt rather than choosing to invest in KiwiSaver. Both these results concur with [Xue et al. \(2021\)](#)'s findings for elderly Australians. Outside of FL we find that respondents with higher risk tolerance are significantly associated with leaving money for family now or later, purchasing luxury goods, and purchasing shares over choosing to invest in KiwiSaver or putting money in the bank. We also report that renters prioritise using a windfall to pay a home deposit before other spending. This finding is encouraging because rising unaffordability of home ownership, increasing rent prices, and the lack of social housing may result in more old age poverty in New Zealand ([Noviarini et al., 2019](#)). Overall the results suggest that, on average, New Zealanders act prudently by preferring to invest in KiwiSaver, putting money in the bank and undertaking home improvements when choosing among the resource allocation alternatives. The least preferred alternatives are donations, general consumption, and health investment.

This study contributes to the very limited literature examining the complex relationships between demographic variables, FL, debt, risk tolerance, and allocation choices in or close to retirement (RQ2 and RQ3). This study also contributes to the call for cohort analysis and efforts to deal with endogeneity concerns in FL studies ([Goyal and Kumar, 2021](#)). GSEM demonstrates that mediating relationships are complex ([Xue et al., 2021](#)) and vary by gender, ethnicity, marital status and living arrangement cohort subsamples (RQ3).

We find that debt anxiety, risk tolerance and FL are critical in understanding how individuals' unique circumstances affect their resource allocation choices. In particular we note the following sample-wide results:

1. FL reduces debt anxiety for men
2. FL increases risk tolerance in women
3. FL is associated with a higher preference for KiwiSaver
4. Education, income and health are critical in determining financial vulnerability
5. Debt anxiety is associated with a higher emphasis on repaying debt

All cohorts with debt anxiety prioritise reducing debt when faced with resource allocation choices. This supports [Xue et al. \(2021\)](#)'s

²⁵ The definition of “high” financial literacy follows from [Noviarini et al. \(2021\)](#). The [Crossan et al. \(2011\)](#) study reported that less than one quarter answered all of the first three questions correctly. In contrast, 65% answer the first three questions correctly in our sample.

finding on the mediating role of financial concerns on financial strategies by older pre-retirement Australians. An important finding is that avoiding debt in old age is critical to long-term wellbeing.

Consistent with [Goyal and Kumar \(2021\)](#) we find that greater income and education benefit FL, but that it subsequently impacts on retirement decision-making for most NZ retirees. FL fulfils a strong positive mediating role between PR (educational attainment and income) and investing in KiwiSaver across gender and for married individuals (RQ2).

However, there is no direct association between FL and subsequent allocation alternatives for Māori/Pacific Islanders, divorced/widowed, and those renting. A more indirect relationship is observed. Lower educational attainment and income (PR) negatively impacts FL (RQ2). FL is negatively related to debt anxiety and those with more worrying levels of debt sensibly prefer to pay off debt, so FL indirectly affects this allocation choice. Males, European New Zealanders, Māori/Pacific Islanders, married, single, divorced/widowed and renters, with greater debt anxiety are strongly associated with choosing to pay off debt (RQ3).

PR is also associated with higher risk tolerance (male, European New Zealander, living in own home and renters) and higher FL is associated with greater risk tolerance for females, European New Zealanders, married, divorced/widowed, homeowners and renters (RQ3). Risk tolerance has no influence on allocation choices.

5.2. Implications for practice

The findings of this study have several implications for government policy, the financial sector and retirees. Understanding the FL levels of New Zealanders can assist the government to identify those who are more vulnerable to poverty and lower health and wellbeing ([Netemeyer et al., 2018](#)) due to financial illiteracy. The findings also show how individuals with different demographic characteristics and FL levels vary in their decision-making. By focusing on the most illiterate, and understanding the motives behind decision-making, the government can better allocate resources for more effective financial education efforts.

Financial education can have mixed effectiveness and [Lusardi and Mitchell \(2007a\)](#) argue that education programs are most effective if they are targeted to particular cohorts, so as to address differences in saving needs and in preferences. Results of this study help to delineate target cohorts. FL education aimed at avoiding worrying debt levels appears to be most important in NZ and debt management education efforts could be targeted at those with higher debt ownership of older age (Māori, male, not living in their own home, working at least 30 h a week, with more frequent medical visits, poorer personal and family health). Our findings that suggest those with high debt anxiety levels who put a priority on reducing their debt (males living in own home/renting across ethnicity and marital cohorts) could indicate potential wellbeing concerns. NZ retirees may be more impacted than those in other Pacific Basin countries with additional mandatory saving schemes and pension annuities ([OECD, 2018](#)). With the government's NZS provision only covering basic needs in retirement, retirees would either use up their NZS/personal wealth to extinguish debt or continue to work past retirement. The financial sector can benefit by having a better understanding of subgroups' resource allocation decisions and target individuals who are more concerned about investing their money. The limited number of annuitisation options for KiwiSaver provides opportunities for the financial sector to offer annuities suited to cohort preferences.

[Xue et al. \(2019\)](#) suggest that user-friendly financial technological tools may be most effective for the older population. Significant levels of NZ retirees do engage digitally ([Koopman-Boyden and Reid, 2009](#)). Digital engagement is significantly related to gender, income (and hence computer resources), and education, so this makes financial education through digital tools potentially problematic, as financial illiteracy and digital exclusion may be observed in the same group of potentially vulnerable individuals ([Allen, 2019](#)), and digital tools may not reach their intended recipients. Finally, by having a better understanding of what affects New Zealanders' decision-making, the government and the private sector may benefit from providing more efficient retirement savings related policies and products.

5.3. Limitations and future research directions

First, we acknowledge the possible limitation of sample bias from using an online survey (footnote 12). Second, the measure for risk tolerance may inadvertently contain elements of risk tolerance other than that due to financial risk, which may introduce some bias into the results. However the study's results provide the opportunity for further research. Survey data can be analysed down to the individual facets of FL (the Big Three questions). Second, further investigation can be made into FL and retirement planning for particular vulnerable categories of retirees (e.g. those with higher levels of debt anxiety). Future research using experimental studies to examine resource allocation choices and FL that considers investment strategies (conservative, balanced and growth portfolios), risk and the time value of money would also be beneficial.

6. Conclusion

This study investigates retirement allocation choices using MCDMA. We address calls from [Brüggen et al. \(2017\)](#), [Goyal and Kumar \(2021\)](#) and [Kumar and Kumar \(2023\)](#) for further research on debt literacy, risk tolerance and links between FL and financial decision-making and cohort analysis. We report evidence of an indirect influence of demographic antecedents (PR), retiree age, family responsibility and health) on the resource allocation decisions through mediators FL and debt anxiety. NZ's retiree age group's FL is high and that the majority of New Zealanders are prudent (prefer to bank money) and long-term-investment-minded (prefer KiwiSaver and home improvements).

Higher income and education is directly associated with better FL and FL has a strong positive association with choosing KiwiSaver. FL is associated with less debt anxiety (males) and greater risk tolerance (females). Older individuals are associated with less debt

anxiety across gender, ethnicity and home ownership. Debt repayment motivation is strongly affected by higher debt anxiety for males, Europeans, Māori/Pacific, across marital and living arrangement cohorts.

The findings show that while FL is important, the demographic antecedents that affect FL mean that decisions affecting resource allocation in older age are complex. Our study explores these resource allocation preferences and whether the chosen allocations provide older people with short-term, long-term or well-being benefits. Our research supports action by the NZ government that directs financial education efforts at the least financially literate²⁶ and debt education efforts (Kumar and Kumar, 2023) at individuals with concerning levels of debt.²⁷

CRedit authorship contribution statement

Jelita Noviarini: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft. **Andrew Coleman:** Supervision. **Helen Roberts:** Project administration, Resources, Supervision, Writing – review & editing. **Rosalind H. Whiting:** Supervision, Writing – review & editing.

Appendix

Table A1
Variable definitions.

Variable name	Definition
<i>Alternative_i</i>	The propensity to choose to invest in Resource Allocation Alternative <i>i</i>
<i>FinLit</i>	FL levels
<i>DebtAnxiety</i>	Debt anxiety level (perceived inability to pay off debt)
<i>RiskAttitude</i>	Risk tolerance level
<i>Male</i>	The difference of the male gender when compared to female
<i>NZEuropean</i>	The difference of the NZ European ethnicity compared to other ethnicities
<i>Age55</i>	The difference of the 55–59 age group when compared to other age groups
<i>NoEduc</i>	The difference of the no education group when compared to other education groups
<i>Single</i>	The difference of the single marital status when compared to other marital statuses
<i>LowIncome</i>	The difference of the low-income group when compared to other income groups
<i>Health</i>	Health levels (frequency of last year’s medical visits)
<i>FamResp</i>	Family Responsibility levels, a combination of number of children and family health levels
<i>Work</i>	Groups of the number of hours work per week

Explanation for the choice of resource allocation alternatives

The alternatives for consumption choice were taken from the existing literature. Each of the alternatives was selected with support from the studies cited in the list below. A pilot was conducted prior to the survey distribution and the alternatives were narrowed down to the 13 choices presented in the study.

Financial decisions include spending, borrowing, and investing (Widdowson and Hailwood, 2007). The study uses various sources of literature in financial literacy, and in decision-making on consumption (Yogo, 2016; Aguiar and Hurst, 2013), investment (Jappelli and Padula, 2013, 2015; Van Rooij et al., 2011; Dvorak and Hanley, 2010), debt (Lusardi et al., 2016; Lusardi and Tufano, 2015), housing (Andreasson and Shevchenko, 2018; Kraft et al., 2017; Yogo, 2016) and bequeath motives (Andreasson and Shevchenko, 2018; Andreasson et al., 2017). Multiple alternatives are presented for each of the categories: “investment”, “consumption”, “bequeath” as identified in the literature.

Table A2
Total sample distribution, comparison to the New Zealand population and FL score.

Sample distribution	Percentage	Sample size	Statistics NZ Population (Percentage, 2013 Census)	FL Score (Percentage)			
				Low	Medium	High	
Gender	Male	48.95	580	51.30	5.17	28.97	65.86
	Female	51.05	605	48.70	10.74	40.50	48.76
Age	55–59	22.08	263	23.64	11.03	45.63	43.35
	60–64	24.60	293	21.19	6.48	31.74	61.77
	65–69	23.09	275	17.81	8.00	30.18	61.82

(continued on next page)

²⁶ Younger respondents of Māori or Pacific Islands ethnicity, female, with lower educational attainment, lower incomes, and high family responsibility (Noviarini et al., 2021).

²⁷ Māori, male, not living in their own home, working at least 30 h a week, with more frequent medical visits, poorer personal and family health (Noviarini et al., 2021).

Table A2 (continued)

Sample distribution	Percentage	Sample size	Statistics NZ Population (Percentage, 2013 Census)	FL Score (Percentage)			
				Low	Medium	High	
Ethnicity	70 and over	30.23	360	37.36	7.50	33.06	59.44
	NZ European	73.47	875	70.67	6.40	31.89	61.71
	Māori	9.99	119	6.90	17.65	48.74	33.61
	Pacific Islands	3.02	36	2.90	19.44	50.00	30.56
	Asian	7.64	91	6.00	12.09	37.36	50.55
	Other	5.88	70	2.67	2.86	37.14	60.00
Income Group	Up to NZ\$20,845 (NZS)	31.74	378	35.45	13.49	34.13	52.38
	\$20,846–\$48,000	38.08	453	31.40	6.62	39.51	53.86
	\$48,001–\$70,000	16.74	200	9.60	5.00	30.50	64.50
	\$70,001–\$100,000	8.23	98	5.70	4.08	34.69	61.22
	Over \$100,000	5.21	62	4.80	3.23	19.35	77.42
Highest Education	No school qualification	13.18	157		24.84	47.77	27.39
	Some school qualification	40.47	482		8.71	37.14	54.15
	At least an undergraduate degree	46.35	552		2.90	29.17	67.93
Marital status	Single/never married	9.49	113		15.04	37.17	47.79
	Married/civil union	63.06	751		6.26	32.76	60.99
	Divorced/widowed	27.46	327		10.09	38.84	51.07
	0	16.46	196		6.63	31.63	61.73
Number of Children	1	11.08	132		7.58	43.94	48.48
	2	33.25	396		6.31	32.83	60.86
	3	20.74	247		10.53	31.98	57.49
	4	18.47	220		10.45	39.09	50.45
Debt ownership - debt more than a month's salary	No	66.08	787		7.24	33.42	59.34
	Yes	33.92	404		9.90	37.62	52.48
	No debt	43.91	523		6.12	31.17	62.72
Debt anxiety	No difficulty paying debt	39.55	471		6.58	37.58	55.84
	May have difficulty paying debt	16.54	197		17.26	38.07	44.67
	0	7.22	86		4.65	47.67	47.67
Medical visits in the last year	1–3	42.65	508		6.89	35.83	57.28
	4–7	35.94	428		8.64	32.48	58.88
	8–11	8.23	98		13.27	31.63	55.10
	12 or more	5.96	71		11.27	30.99	57.75
	Generally poor	4.45	53		7.55	39.62	52.83
Self-reported health rating	Sometimes poor	18.47	220		13.18	35.00	51.82
	Good	39.13	466		7.73	33.69	58.58
	Very good	28.13	335		7.16	34.03	58.81
	Excellent	9.82	117		3.42	39.32	57.26
	Generally poor	2.43	29		13.79	24.14	62.07
Self-reported family health	Sometimes poor	8.40	100		10.00	42.00	48.00
	Good	38.37	457		8.32	38.51	53.17
	Very good	34.59	412		7.04	29.37	63.59
	Excellent	16.20	193		8.29	35.75	55.96
Living arrangement	In own home	73.97	881		5.22	31.56	63.22
	Living in rental accommodation	20.99	250		17.60	44.40	38.00
	Live in family member's home	3.11	37		10.81	51.35	37.84
	In supported care	0.34	4		25.00	50.00	25.00
	Other	1.60	19		10.53	26.32	63.16
Work hours per week	Not in paid work	60.45	720		10.00	32.50	57.50
	1–15	9.24	110		6.36	34.55	59.09
	16–29	8.31	99		6.06	38.38	55.56
	At least 30	22.00	262		4.58	40.08	55.34
	Extremely unwilling to take risk	11.42	136		19.12	46.32	34.56
Risk tolerance	Low risk taking tolerance	23.59	281		6.76	34.88	58.36
	Careful	42.15	502		8.37	35.06	56.57
	Willing to take evaluated risk	21.75	259		3.09	26.64	70.27
	Reckless/hasty	1.09	13		15.38	69.23	15.38

This table reports the distribution of the sample in the study compared to the NZ population according to the 2013 Census by Statistics NZ and the distribution of FL scores across the sample demographics.

Table A3
Alternative ranking for female and male cohorts.

Female alternative	Mean preference weight	Rank	Min	Max	Std. Dev
Money in Bank	0.103	1	0.022	0.217	0.033
Home Improvements	0.094	2	0.018	0.194	0.039
Kiwi Saver	0.090	3	0.127	0.184	0.035
General Consumption	0.064	11	0.011	0.179	0.032
Donation	0.062	12	0.011	0.195	0.033
Share Purchase	0.062	13	0.011	0.210	0.034

Male alternative	Mean preference weight	Rank	Min	Max	Std. Dev
Money in Bank	0.108	1	0.019	0.214	0.034
Kiwi Saver	0.093	2	0.011	0.214	0.038
Debt Payment	0.092	3	0.011	0.214	0.048
General Consumption	0.064	11	0.011	0.172	0.034
Health Investments	0.062	12	0.011	0.188	0.033
Donation	0.055	13	0.011	0.194	0.036

This table shows the mean weight preference of each alternative relative to other alternatives for each individual for the three highest and the three lowest ranked alternatives. It measures the average preference weight for each alternative across the total female and male cohorts respectively. The total preference weight for each individual equals 1. Rank indicates preference (rank 1 = most preferred; 13 = least preferred).

Table A4
Alternative ranking for European New Zealander, and Māori/Pacific cohorts.

European New Zealander alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Money in Bank	0.106	1	0.019	0.217	0.034
Home Improvements	0.095	2	0.011	0.194	0.038
Kiwi Saver	0.092	3	0.011	0.214	0.037
Home Deposit	0.064	11	0.011	0.179	0.036
Health Investments	0.062	12	0.011	0.161	0.033
Donation	0.059	13	0.011	0.195	0.035

Māori/Pacific alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Debt Payment	0.107	1	0.013	0.201	0.043
Money in Bank	0.101	2	0.033	0.211	0.032
Kiwi Saver	0.088	3	0.013	0.207	0.037
Health Investments	0.065	11	0.011	0.155	0.031
General Consumption	0.056	12	0.011	0.147	0.03
Donation	0.056	13	0.011	0.139	0.032

This table shows the mean weight preference of each alternative relative to other alternatives for each individual for the three highest and the three lowest ranked alternatives. It measures the average preference weight for each alternative across the total European New Zealander, and Māori/Pacific cohorts, respectively. The total preference weight for each individual equals 1. Rank indicates preference (rank 1 = most preferred; 13 = least preferred).

Table A5
Alternative ranking for married, single and divorced/widowed cohorts.

Married alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Money in Bank	0.105	1	0.023	0.217	0.033
Home Improvements	0.096	2	0.011	0.194	0.036
Kiwi Saver	0.091	3	0.011	0.188	0.036
Health Investments	0.063	11	0.011	0.188	0.033
General Consumption	0.062	12	0.011	0.179	0.033
Donation	0.057	13	0.011	0.163	0.034

Single alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Money in Bank	0.109	1	0.019	0.211	0.036
Kiwi Saver	0.096	2	0.012	0.195	0.041
Debt Payment	0.095	3	0.011	0.208	0.045
Property Investment Deposit	0.066	11	0.011	0.172	0.034
Health Investments	0.063	12	0.011	0.15	0.034
Donation	0.06	13	0.011	0.164	0.036

(continued on next page)

Table A5 (continued)

Single alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Divorced/Widowed alternative	Mean preference weight	Rank	Min	Max	Std. Dev.
Money in Bank	0.107	1	0.022	0.207	0.034
Kiwi Saver	0.091	2	0.011	0.214	0.037
Home Improvements	0.088	3	0.011	0.192	0.04
General Consumption	0.066	11	0.011	0.173	0.033
Health Investments	0.063	12	0.011	0.161	0.033
Donation	0.061	13	0.011	0.195	0.036

This table shows the mean weight preference of each alternative relative to other alternatives for each individual. It measures the average preference weight for each alternative across the total Married, Single and Divorced/Widowed cohorts, respectively. The total preference weight for each individual equals 1. Rank indicates preference (rank 1 = most preferred; 13 = least preferred).

Table A6

Alternative ranking for people living in own home and renting cohorts.

People living in own home alternative	Mean preference weight	Rank	Min	Max	Std. Deviation
Money in Bank	0.106	1	0.022	0.217	0.034
Home Improvements	0.1	2	0.014	0.206	0.036
Kiwi Saver	0.092	3	0.011	0.214	0.037
Health Investments	0.063	11	0.011	0.188	0.034
Home Deposit	0.06	12	0.011	0.181	0.033
Donation	0.059	13	0.011	0.195	0.035

People renting alternative	Mean preference weight	Rank	Min	Max	Std. Deviation
Money in Bank	0.105	1	0.019	0.201	0.033
Debt Payment	0.101	2	0.013	0.208	0.042
Home Deposit	0.091	3	0.015	0.214	0.041
General Consumption	0.065	11	0.011	0.172	0.036
Health Investments	0.061	12	0.011	0.143	0.031
Donation	0.058	13	0.011	0.158	0.034

This table shows the mean weight preference of each alternative relative to other alternatives for each individual. It measures the average preference weight for each alternative across the total people living in own home and renting respectively. The total preference weight for each individual equals 1. Rank indicates preference (rank 1 = most preferred; 13 = least preferred).

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