The development of a complementary financial capability index

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Abstract

Achieving behaviour change only through improved financial knowledge levels is difficult when taking into account other factors which influence an individual's decision-making such as psychological factors, financial attitudes, and socio-demographic influencers. A deeper understanding of the relationship between psychological factors and financial capability levels provides educators and policymakers valuable insights to generate progression. Psychological biases are often innate, meaning individuals are usually not aware of the influence they may have on financial decisions. Education programmes which educate individuals on psychological influences as well as improving financial knowledge may collectively generate confidence and self-efficacy in one's decision-making abilities. Therefore, a better understanding of financial decision-making is a critical investment in the social capital of society both today and in the future.

Financial capability is an important behavioural element which contributes to the development of financial wellbeing at the individual and household level, as well as improving economic stability. Consequently, financial capability remains high on the priority list for governments seeking to improve retirement wellbeing and reduce reliance on debt funding and government funded benefits, thereby improving financial stability.

This research seeks to investigate the influence of psychological factors on financial decision-making, providing findings which confirm the relationship between psychological factors and financial capability levels. Within a New Zealand context, this thesis proposes a complementary financial capability index developed in support of the financial wellbeing conceptual model developed by Kempson and Poppe (2018) and to further strengthen existing behavioural finance models. The complementary financial capability index is developed using data from the Australia and New Zealand Banking Group, and particularly focuses on incorporating measures of time orientation, self-control, locus of control, impulsivity, social status, and action orientation. Results of this study confirm the statistical significance of psychological factors independent of financial behaviour when measuring financial capability levels. The robustness of the proposed complementary financial capability index is tested on two different datasets under variable conditions. Significant results in both applications highlight the sensitivity of the index to changes in data inputs, while also confirming the ability of the model to produce financial capability scores despite changes in data inputs. To further investigate the relationship between psychological factors and financial decision-making and

to understand the factors which influence financial behaviour in practice, a mixed methods study was undertaken on fourteen participants. The collection of survey data enables further applicability testing of the complementary financial capability index while thematic analysis of the one-on-one interview transcripts results in six key behavioural finance themes which further support the research objectives addressed in this thesis and provides valuable practical insights supporting existing behavioural finance literature.

This investigation confirms the significance of psychological factors on financial capability levels, over and above what may be captured by traditional factors such as financial knowledge and financial behaviour. The findings of this thesis inform policymakers and education providers on the elements of the financial decision-making process that can be targeted to generate progression in the financial capability levels and consequent financial wellbeing of New Zealanders.

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1. Introduction

In the days where money and wealth were accumulated as physical items (e.g. notes and coins), financial management was somewhat simple. Wealth could be quantified easily, financial wellbeing (although not likely a common concept at the time) was measured as an ability to make ends meet, and money management was often as simple as saving coins and notes under a mattress. Financial markets have become increasingly complex as a result of wider financial product offerings, developments in financial technology, and greater access to global markets for the individual investor. These developments have collectively highlighted the importance of financial capability, as a means to ensuring individuals are well prepared to make financial decisions.

The use of Defined Benefit (DB) plans where the responsibility of retirement planning is predominantly borne by the employer have reduced in popularity in many developed economies (e.g. New Zealand and United States) due to various issues faced by governments including unaffordability and risks associated with labour mobility (Fisch, Lusardi, & Hasler, 2020; Preston, 2008). The 1990s saw an increase in the use of Defined Contribution (DC) programmes, resulting in a shift of responsibility for retirement planning to the individual (Bernheim, 1998; Fisch et al., 2020; Fornero & Monticone, 2011; Mitchell & Schieber, 1998). For the first time individuals were responsible for making active financial decisions about retirement funds and wealth accumulation (Bernheim, 1998; Lusardi & Mitchell, 2007). This transition, combined with increasingly complex financial markets, highlighted a severe lack of individual financial literacy amongst individuals. High risk borrowing, indebtedness, and poor retirement planning are all behaviours that become more prominent as a result of financial illiteracy. These behaviours can lead to increased risk at the individual and household level, as well as instability in the wider economy. Governments globally have recognised the importance of financial literacy and subsequently invested in financial education programmes. The intention behind the focus on education is to improve financial knowledge levels to help guide financial decision-making at the individual and household level (Ambuehl, Bernheim, & Lusardi, 2014; Storchi & Johnson, 2016).

Initially explored by Tversky and Kahneman (1974) in the 1970s, the importance of personality and psychological factors on decision-making have been increasing in prominence. In response to pension reforms, governments began focusing on the measurement and development of financial literacy levels (Almenberg & Säve-Söderbergh, 2011; Banks & Oldfield, 2007; Clark

& O'Neill, 2023; Fornero & Monticone, 2011; Frijns, Gilbert, & Tourani-Rad, 2014). It wasn't until the 2000s that the concept of financial capability became commonly acknowledged as a more comprehensive measure of the factors influencing financial decision-making, predominantly replacing financial literacy (Atkinson, McKay, Collard, & Kempson, 2007; Johnson & Sherraden, 2007; Kempson, Perotti, & Scott, 2013). Traditional finance models make assumptions that humans have unbounded rationality and that markets are efficient. In contrast, behavioural economics recognises that decision-making is influenced by factors beyond information gathering including psychological influences and other external factors (de Meza, Irlenbusch, & Reyniers, 2008). As such, many behavioural economics studies have examined financial decision-making and how to measure financial capability (de Meza et al., 2008; Mudzingiri, Muteba Mwamba, & Keyser, 2018; Riyazahmed & Saravanaraj, 2016; Sahi, 2017). Financial capability is a term that captures the influence of financial knowledge, financial behaviour, and other influencing factors on the financial decision-making process. These include behavioural biases, attitudes, social norms, and motivations (Russell, Jutin, & Marriner, 2020; Storchi & Johnson, 2016). As a key aspect of financial capability, the cognitive psychology surrounding financial decision-making forms the basis of this thesis (Ritter, 2003). Financial capability is important as it is linked to informed financial decision-making, which is likely to contribute to improved financial wellbeing, and thus supporting financial stability at the individual, household, and economy level.

Financial capability is an important term describing financial behaviour and knowledge which captures the influence of factors which directly impact financial decision-making (de Meza et al., 2008; Storchi & Johnson, 2016). A key aspect of financial capability is effective financial decision-making (Russell et al., 2020). Therefore, it is important measures of financial capability are agile over time, evolving with new findings related to financial decision-making in practice. An increasing number of researchers have investigated areas of research within the wider behavioural finance discourse, including understanding and measuring the influence of psychological factors on financial decision-making (Kempson et al., 2013; Sahi, 2017). Studies have found that psychological factors have a direct influence on financial decision-making, thus indicating their consequent impact on financial capability levels (Forbes, Hudson, Skerratt, & Soufian, 2015; French, McKillop, & Stewart, 2020; Gentile, Linciano, & Soccorso, 2016; Sahi, 2017). Due to the relationship between psychological factors and decision-making, we recognise the importance of investigating the interaction between psychological factors and financial capability levels, mediated through their influence on financial behaviour (Sahi, 2017;

Storchi & Johnson, 2016; Tversky & Kahneman, 1974). This exploration will contribute to the expanding body of literature on financial capability and wellbeing.

To capture the relationship between psychological factors and financial capability, this study proposes a complementary financial capability index which supports the financial wellbeing conceptual model of Kempson and Poppe (2018) and strengthens other financial capability models within behavioural finance. Kempson and Poppe (2018) proposed a revised model of financial wellbeing, expanding the model to include psychological factors as a key determinant of wellbeing levels. Their study simultaneously provided a meaningful distinction between financial capability and financial wellbeing. Kempson and Poppe (2018) define financial wellbeing as "the extent to which someone is able to meet all their current commitments and needs comfortably and has the financial resilience to maintain this in the future" (p.15). As such, the model from Kempson and Poppe (2018) measures financial wellbeing as a combination of socio-economic factors, psychological factors, knowledge and skill, and financial behaviours.

We support the findings of this study which acknowledge the influence psychological factors have on financial behaviour and subsequent financial wellbeing levels (Kempson & Poppe, 2018). However, unlike Kempson and Poppe (2018), we acknowledge that financial behaviour and financial capability are not synonymous. Instead, in line with several behavioural studies, we consider financial capability to be multi-faceted, measured as a weighted combination of financial knowledge, financial behaviour, and psychological factors (Russell et al., 2020; Shephard, Contreras, Meuris, te Kaat, Bailey, Custers, & Spencer, 2017; Storchi & Johnson, 2016). Therefore, on the assumption that financial capability often leads to improved financial wellbeing, we propose leveraging the framework developed by Kempson and Poppe (2018) to develop a complementary financial capability index which supports and extends current behavioural finance models. This chapter introduces the research topic and the empirical foundation on which this study was undertaken. Secondly, this chapter provides context for the wider study while acknowledging the explicit contribution of the thesis, and an overview of the subsequent chapters.

1.1. Background to the thesis

One of the original factors triggering the attention from governments and policymakers on financial capability levels was the various pension reforms within retirement landscapes for many developed economies during the 1900s (e.g. Australia, New Zealand, United States). The

importance of financial literacy levels was particularly highlighted during the 1980-1990s in response to pension reforms which resulted in increased individual responsibility for managing retirement wealth (Almenberg & Säve-Söderbergh, 2011; Banks & Oldfield, 2007; Clark & O'Neill, 2023; Fornero & Monticone, 2011; Frijns, Gilbert, & Tourani-Rad, 2014). During the 1990s, many employer-provided Defined Benefit (DB) plans were replaced with private Defined Contribution (DC) plans for which employees had individual responsibility (Fernandes, Lynch Jr., & Netemeyer, 2014; Fornero & Monticone, 2011; Goyal & Kumar, 2021; Lusardi, 2011; Lusardi, 2019). During the 1990s, the shifts within global retirement landscapes were prompted by acknowledgement of the weaknesses in the governance and management of existing pension funds, as well as concerns around funding retirement schemes for an increasing population of retirement aged individuals (Noviarini, Coleman, Roberts, & Whiting, 2023; World Bank, 2008). Beyond governance and affordability concerns, there are several other factors that have prompted further pension reforms, including changing work patterns for families with increasing numbers of females returning to the workforce, aging populations, rising life expectancies, and increasing divorce rates (Banks & Oldfield, 2007; Lusardi & Mitchell, 2011b; OECD, 2016; OECD., 2019; World Bank, 2008).

In response, many governments have initiated pension policy reforms resulting in a gradual transition globally to pension landscapes saturated with DC plans (OECD, 2016). Although this transition favours labour mobility, it also shifts the risk of fund management and financial decision-making to the individual, increasing financial literacy requirements for the wider population (Lusardi & Mitchell, 2011a, 2011b). A further risk associated with the transition to DC retirement plans is the potential for a retirement wealth gap due to a lack of knowledge and skills to make informed investment decisions, which can subsequently increase an individual's reliance on debt (Frijns et al., 2014).

A key concern around shifts to defined contribution plans is the onus of retirement planning and decision-making often falls to the individual. Consequently, an increased self-reliance for retirement planning and other key financial behaviours, largely due to a shift towards DC plans, has resulted in a renewed focus on the importance of financial knowledge levels and an individual's ability to make informed financial decisions (Fernandes, Lynch Jr., & Netemeyer, 2014; Fornero & Monticone, 2011; Goyal & Kumar, 2021; Lusardi, 2008; Lusardi, 2011; Lusardi, 2019). An individual's retirement wealth is largely determined by their saving and investment choices during their working life, indicating the importance of having the appropriate knowledge and skills to make informed financial decisions (Fisch, Lusardi, &

Hasler, 2020; Lusardi, 2011). Subsequently, disintermediation enabled by developments in financial technology and a reduction in barriers to global financial markets has resulted in individuals facing overwhelming decisions about financial products and services (Fornero & Monticone, 2011; Lusardi, 2011; Lusardi & Mitchell, 2014). Beyond the importance of financial capability in informing the financial decision-making process, findings from a study by Noviarini, Coleman, Roberts and Whiting (2021) suggest that financial literacy plays a key role in reducing debt anxiety and improving risk tolerance. This highlights the importance of developing financial capability levels to increase retirement preparation as well as to improve overall financial wellbeing levels and reduce the social and fiscal pressures of old-age poverty.

A focus on the importance of financial capability as a key factor driving retirement planning also emphasised the important role capability plays in an individual's day-to-day financial behaviour. This is particularly important when considering informed decision-making in increasingly complex global financial markets (Lusardi, 2009). Of concern is the low levels of financial capability reported by many countries, which may indicate poor financial knowledge levels or an inability to use appropriate knowledge to drive informed financial decision-making (ANZ, 2018; OECD, 2016, 2018).

The global focus on financial capability levels was largely initiated by work undertaken in the United Kingdom in 2005 by the Financial Services Authority, but has since become a strong focus of personal finance research globally (Atkinson et al., 2007; Sherraden, 2010). Financial capability and the ability to make informed financial decisions is important for developed and developing economies (Kempson et al., 2013). Individuals in high-income countries face increasing responsibility for decision-making and retirement planning with lower reliance on financial intermediaries. Individuals in middle and low-income countries face financial stresses and variable levels of financial inclusion, while also having limited access to financial support and education services (Kempson et al., 2013).

Simplistically, an individual may be considered to be financially capable if they are in control of and actively managing their finances, synonymous with one's goal of positive financial outcomes (Storchi & Johnson, 2016). This definition of financial capability highlights three key considerations. Firstly, financial capability is a combination of knowledge, skills, and psychological factors/motivations towards positive financial behaviour. Secondly, financial capability is dynamic over the life-course in that financial decision-making is only deemed appropriate if the decision is adequate based on the individual's current circumstances. Lastly,

this definition alludes to the need for financial inclusion to enable access to the appropriate sources of knowledge and financial products to facilitate informed financial decision-making (Storchi & Johnson, 2016). On the basis that poor financial decision-making is often costly at the individual and economy level, governments globally have invested in the development of financial knowledge and behaviour, largely through formal financial education programmes (Johnson & Sherraden, 2007).

1.2.Motivation

Growing up with an accountant as a father, I have always understood and appreciated the value of money. In my high school accounting class, my teacher prioritised educating students about the importance of financial independence and financial security. I remember her encouraging us to read a book called 'A man is not a financial plan'. This was an important learning in a single sex school, where most students would soon face an array of overwhelming financial decisions once leaving high school. My personal experience and the learnings from my accounting teacher have contributed to the motivation for this study. Young people and females are two of the minority groups often found to have lower levels of financial capability and wellbeing. As a young female myself, I felt compelled to contribute to research within the behavioural finance paradigm that addresses financial capability and wellbeing. Addressing capability levels is a crucial step in ensuring young individuals can achieve long-term financial comfortability and independence.

It is important to understand what drives financial capability to be able to improve people's knowledge and skills in such a way that will promote individual and household wellbeing, as well as improved economic stability. Prior studies have shown that financial capability is influenced by factors outside of information gathering and financial literacy (de Meza et al., 2008; Tang & Baker, 2016). This study aims to incorporate recent findings related to financial decision-making into a complementary financial capability index to support and strengthen existing behavioural finance models. Further research exploring the factors which influence financial capability levels are likely to improve education provisions targeting financial behaviour and contribute to increased financial wellbeing for New Zealanders.

1.3. Objectives of the thesis

The increased self-dependence of financial decision-making coupled with increasingly complex global financial markets has prompted a renewed focus on financial capability within behavioural finance studies (Lusardi, 2011). This transition is largely due to researchers better

understanding the relationship between knowledge and behaviour, finding that knowledge is not the only component which influences financial behaviour and decision-making (Storchi & Johnson, 2016). A robust measure of financial capability provides critical information to policymakers about current financial capability levels, as well as enabling the evaluation of how capability levels may trend over time in response to policy reforms and financial education programmes (Kempson et al., 2013). For this study financial capability is defined as a state whereby an individual has adequate knowledge and attitudes to guide financial behaviour towards financial wellbeing given their personal financial circumstances (Czar, Gilbert, & Scott, 2021; Kempson, Finney, & Poppe, 2017; Xiao, Huang, Goyal, & Kumar, 2022). An individual's ability is thereby determined by a combination of their financial knowledge, financial behaviour, and other factors influencing decision-making. Around the world, countries have been investigating the connection between financial capability and financial wellbeing in an attempt to increase general wellbeing levels for both households and individuals, and subsequently seeking to explore practical policies which can address poor capability levels (Kempson et al., 2017).

Many countries report poor financial capability levels, which are often associated with low financial knowledge and an inability to utilise financial knowledge to guide positive financial decision-making (ANZ, 2018; OECD, 2016, 2018). In such cases, low financial capability may translate to negative financial behaviours including poor savings ability and money management, a lack of retirement planning, and low levels of financial resilience (Czar et al., 2021). To better understand financial decision-making, studies have explored the link between financial knowledge and psychological factors, in an attempt to understand the influence behavioural biases may have on the selection and processing of information throughout the financial decision-making process (Forbes et al., 2015; French et al., 2020; Gentile et al., 2016; Kiymaz, Öztürkkal, & Akkemik, 2016; Sahi, 2017; Shephard et al., 2017). This is supported by findings from French et al. (2020) which show financial capability is not solely determined by knowledge, understanding, and skills, but is also impacted by mental motivations and biases through the decision-making process (French et al., 2020; Sahi et al., 2013; Shephard et al., 2017; Tang & Baker, 2016). Therefore, when measuring and understanding financial decision-making, it is important to consider the influences biases may have on financial outcomes.

Currently, behavioural finance models tend to measure financial knowledge, financial behaviour, and a limited scope of financial attitudes. This complementary financial capability index is an important development within the behavioural finance discourse extending current

behavioural finance models to evolve with recent findings, particularly related to the influence of psychological factors on financial decision-making. The complementary financial capability index proposed in this study combines traditional financial literacy models with the psychological variable proposed in the financial wellbeing conceptual model developed by Kempson and Poppe (2018). This thesis aims to develop an index with financial capability as the dependent variable, calculated as a function of financial knowledge, financial behaviour, and psychological factors. Recognising the difference between financial behaviour and financial capability is an important distinction. This distinction recognises that although financial capability is often proxied by the outcomes of financial decision-making, it is a multifaceted concept which is influenced by financial knowledge, financial behaviour, and a range of external factors (e.g. attitudes, motivations, psychological function, financial inclusion).

Educators and policymakers are increasingly interested in developing strategies to improve financial capability levels to promote financial wellbeing and stability at an individual, household and economy level (Gudmunson & Danes, 2011; Taylor, 2011). A robust financial capability index is crucial for governments and policymakers for two key reasons. Firstly, it provides a consistent mechanism for measuring current levels of financial capability. Secondly, it provides a means to measure the progression of financial capability levels over time, particularly in response to policy reforms and financial education programmes (Kempson et al., 2013). A deeper understanding of the relationship between psychological factors and financial capability levels provides educators and policymakers valuable insights to generate progression. Further, the proposed financial capability index will enable policymakers and education providers to better understand whether low financial capability levels are more so related to financial knowledge levels, or other innate humans factors such as psychological biases and internal motivations which influence financial decisions (de Meza et al., 2008).

Retirement wellbeing is an important issue many governments are concerned with from both a personal finance and a macroeconomic perspective. Studies have shown that improvements in financial capability levels tend to positively influence retirement preparedness as individuals have the appropriate knowledge and skills to generate sufficient wealth to fund retirement (Fisch et al., 2020; Noviarini et al., 2021). From a macroeconomic perspective, wealth accumulation and retirement preparedness prompted through improved financial capability levels may reduce a retiree's reliance on public benefits and debt to fund living after exiting the paid workforce (Fisch et al., 2020; van Rooij, Lusardi, & Alessie, 2012). From both

perspectives, the importance of financial wellbeing has been highlighted, with governments globally becoming increasingly focused on financial capability and financial education programmes (Carpena, Cole, Shapiro, & Zia, 2011; Fernandes et al., 2014).

This thesis seeks to explore the relationship between psychological factors, financial decision-making, and financial capability. In doing so, it provides further information on the six identified psychological factors which are found to influence decision-making, proposes a complementary index to support current financial literacy and capability models, and finally, uses interview data to generate further insights into financial decision-making in practice. The key contribution of this study is the development of a complementary financial capability index within a New Zealand context which extends current measures to include an explicit measure of psychological factors. Therefore, this thesis has two key research objectives which summarise the academic contribution this body of research and inform the development of the research questions. The first objective is to investigate the influence of psychological factors on financial capability, distinct from the influence they have been found to have on financial wellbeing levels. In doing so, this thesis develops a complementary financial capability index which incorporates an explicit psychological factors variable, to support existing behavioural finance models and supplement the work of Kempson and Poppe (2018). The second research objective is to contribute to the expanding personal finance literature on factors influencing financial decision-making, including practical findings supported by interview insights. Based on these two research objectives, this thesis contributes to the literature by investigating the following research questions:

RQ1: Is the explanatory relationship between the six identified psychological factors and financial capability statistically significant?

RQ2: On the assumption that research question 1 holds true, does the relationship between the identified psychological factors and financial capability remain significant when measured independently from financial behaviour?

Sub-studies incorporated in subsequent chapters of this thesis are intended to provide additional support to the research objectives by confirming the influence of psychological factors on financial decision-making and financial capability. In forming a hypothesis about the research outcomes, we acknowledge two key relationships drawn from prior literature. Firstly, we make the distinction between financial capability and financial wellbeing as related yet separate concepts. Financial capability captures financial behaviour and influencing factors which guide

decision-making towards achieving wellbeing (Czar et al., 2021; Kempson et al., 2017; Xiao et al., 2022). Separately, financial wellbeing describes a state of comfortability and being able to meet one's financial wants and needs (Xiao, 2016). Based on these definitions, it is beneficial to measure financial capability and financial wellbeing separately, while continuing to acknowledge the distinct connection between the two concepts. Secondly, we assume the psychological influences captured in the Kempson and Poppe (2018) financial wellbeing conceptual model are likely appropriate to include in a model of financial capability on the basis that both capability and wellbeing models incorporate measures of financial behaviour and decision-making. This assumption is further supported by studies confirming the influence of psychological factors on financial behaviour and decision-making (de Meza et al., 2008; Mudzingiri et al., 2018; Riyazahmed & Saravanaraj, 2016; Sahi, 2017). On the basis of these two assumptions, we hypothesize that psychological factors have a significant influence on financial capability levels, independent of the influence captured by financial knowledge and financial behaviour variables.

Worldwide several measures of financial capability have not evolved to reflect the important influence of psychological factors on financial capability. The contribution of this study is to investigate the factors which influence financial decision-making and financial capability levels, with a particular focus on psychological factors. In response to findings supporting the influence of psychological factors on decision-making, this thesis seeks to develop a complementary financial capability index to better measure financial capability levels and provide a robust mechanism to inform education providers and policymakers on areas of decision-making that may require attention. Elaine Kempson is a strong leader in the behavioural finance discourse and is recognised most recently for the development of a robust financial wellbeing conceptual model in conjunction with Christian Poppe (Kempson & Poppe, 2018). This model has adapted with research over recent years, progressing from the measurement of financial knowledge and behaviour to a model which also incorporates socio-economic factors, personality traits, attitudes/confidence, and financial experience. This model comprehensively captures the key factors which influence financial wellbeing. More recently, a similar model was applied in a study by Kempson and Evans (2021) reviewing financial capability data in New Zealand to measure financial wellbeing and the components that that influence wellbeing.

Acknowledging the relationship between financial capability and the development of financial wellbeing, we leverage findings outlined in Kempson and Poppe (2018) supporting the

influence of psychological factors on financial decision-making. Consequently, the complementary financial capability index developed in this thesis supplements the findings of Kempson and Poppe (2018) by demonstrating the influence of psychological factors on financial behaviour and decision-making, which can support the actionable development of financial skills that ultimately impact financial outcomes and wellbeing levels.

1.4. Thesis outline

We propose a complementary financial capability index which builds on existing financial capability models, by including an explicit measure of psychological factors. This model contributes to existing literature, by providing an adjusted financial capability index enabling the computation of a financial capability score, which strengthens existing models by incorporating an explicit measure of psychological factors, while also supplementing well-adopted models including the financial wellbeing conceptual model developed by Kempson and Poppe (2018). The index therefore seeks to confirm the financial components to be combined to appropriately proxy financial capability scores. We utilise data from the Australia and New Zealand Banking Group Ltd Financial Wellbeing Survey (2017) to develop the proposed complementary financial capability index. The survey collected data from 1521 participants across New Zealand. Taking guidance from the methodologies utilised in Pesqué-Cela, Tian, Luo, Tobin and Kling (2021) and Kempson et al. (2013), we complete factor analysis on the treated data to identify components which are weighted by the portion of variance explained and subsequently used to form the retained components for regression analysis. In comparison to the model developed in Kempson and Poppe (2018), we make adjustments to the data inputs and model framework to accommodate financial capability as the dependent variable for regression analysis. The result is a complementary index which measures financial capability as a weighted summation of financial knowledge, financial behaviour, and psychological factors while controlling for income, age, gender, and wealth.

When developing a financial capability index, it is important to evaluate the wider applicability of the index under varying conditions and contexts. For this study we test the development methodology and resulting index using two different model applications. The first application of the index is testing the index formation methodology on a Financial Literacy survey undertaken by the Bank of Italy in 2020 collecting data from 2000 adult respondents. This application requires methodological adjustments to accommodate differences in the underlying dataset, with significant results supporting the validity of the index development methodology. The second application is to test the direct application of the index on a different dataset. In

this case, we apply the index to the 2021 iteration of the ANZ Financial Wellbeing Survey, which enables an investigation of the index when applied to a different dataset and an evaluation of how capability scores in New Zealand had trended over the four-year period between 2017 and 2021.

The last sub-study is the analysis of financial capability in practice, utilising primary data from a small number of New Zealanders. Thematic analysis is undertaken on the interview transcripts to further understand subjective insights into various aspects of behavioural finance. This analysis results in the identification and exploration of six themes covering subjective financial knowledge, financial decision-making, financial attitudes and awareness, retirement planning and preparation, financial education, and psychological influences.

This thesis facilitates a comprehensive exploration of financial capability with a particular focus on the influence of psychological factors on the financial decision-making process, thereby contributing to the behavioural finance discourse by strengthening and supporting existing personal finance models. The thesis is structured as six chapters. Chapter one introduces the study, summarising the overall theoretical contribution and outlining the research questions. Chapter two provides a review of previous personal finance literature which forms the empirical foundation for the thesis and research objectives. Although Chapter two reviews a large portion of the literature relevant to this study, further literature is included in subsequent chapters where appropriate to provide additional context to the analysis being undertaken. Chapter three details the index formation methodology used to develop a complementary financial capability index including factor analysis and multiple regression. Chapter four outlines the methodology and findings associated with the two separate applications of the index under different conditions. To further understand subjective measures related to the wider research question, Chapter five details a sub-study of the thesis which uses a mixed methods approach to apply the complementary financial capability index and subsequently draw insights from the interview transcripts of fourteen adults across New Zealand. Thematic analysis enabled the exploration of primary interview data resulting in six key themes related to financial capability and decision-making. Finally, Chapter six summarises discussion points and conclusions, limitations and areas for future research, and the overall thesis contribution.

2. Prior literature

The purpose of this section is two-fold. Firstly, it provides the justification for the development of a complementary financial capability index which incorporates an explicit measure of psychological influences. Secondly, it provides the conceptual foundation for the development of this index, comparing existing tools to identify areas for adaptation as well as leveraging the well-adopted financial wellbeing conceptual model developed in recent years by Kempson and Poppe (2018).

Financial knowledge is recognised as a key aspect of financial capability and describes the degree to which an individual understands foundational financial concepts and informs the financial decision-making (French et al., 2020). Financial behaviour is guided by the possession of financial knowledge and encompasses several actions and decisions every consumer will face throughout their lifetime. When combined with the understanding and consequent implementation of this knowledge to guide financial behaviours, an individual is considered to be financially literate (French et al., 2020). Financial literacy is a concept which extends financial knowledge by highlighting the mutual importance of financial skill. Financial literacy is understood to be comprised of two components, being the understanding of, and the use of financial concepts to achieve positive financial outcomes (Huston, 2010). The Organisation for Economic Co-operation and Development (OECD, 2019) provides a more specific definition of financial literacy, as the combination of financial awareness, knowledge of financial concepts, skill, positive financial attitudes, and behaviour. Financially literate individuals are those that are sufficiently informed to make decisions regarding saving, investing, borrowing, and general financial decision-making (Klapper, Lusardi, & van Oudheusden, 2014).

The focus of explorative financial behaviour studies has transitioned from financial knowledge and education, to a more holistic understanding of financial decision-making termed financial capability (Kempson et al., 2013). The shift to focus on financial capability is largely due to researchers acknowledging the complexity of the relationship between financial knowledge and financial behaviour recognising other factors play a role in the decision-making process (Kempson et al., 2013). These include various ‘noise’ factors during the financial decision-making process, such as financial attitudes, motivations, and behavioural biases (Friedline & West, 2016; Kempson, Collard, & Moore, 2005; Shephard et al., 2017). Financial capability therefore concerns all factors which influence behaviour and decision-making.

2.1. The importance of financial literacy

Pension reforms and retirement landscape developments are considered one of the key factors triggering governments and policymakers to focus on understanding and investing in the development of financial capability levels. Although over recent years researchers have recognised the importance of financial capability in improving financial wellbeing levels, attention was initially focused on financial literacy levels in a bid to ensure individuals had the knowledge to adequately plan for retirement (Fan & Henager, 2022; Fisch et al., 2020; Lusardi, 2011; Lusardi, 2019). A pivotal transition in the history of personal finance research which highlighted the importance of financial capability levels was the shift from DB to DC plans in several countries during the 1980s and 1990s, resulting in individuals having primary responsibility for retirement planning and preparedness (Fernandes et al., 2014; Fornero & Monticone, 2011; Goyal & Kumar, 2021; Lusardi, 2011). Prior to the 1980s, many countries relied on DB plans where individuals received a continuous stream of income upon retirement and the onus of investment was predominantly on employer institutions (Fisch et al., 2020; Morris, 2018). The 1990s saw the beginning of large pension reforms where several DB plans transitioned to DC plans (Fernandes et al., 2014; Fornero & Monticone, 2011; Goyal & Kumar, 2021). The importance of robust pension systems, both public and private, have been emphasised through aging populations (Preston, 2008). The key concern with this transition was that DC retirement plans place the responsibility for investment decisions on the individual, thereby increasing the level of financial understanding required to make informed decisions within financial markets that are growing in complexity (Agnew, Bateman, & Thorp, 2013; Fisch et al., 2020; Fornero & Monticone, 2011; Kempson et al., 2013; Lusardi, 2019; van Rooij et al., 2012; Widdowson & Hailwood, 2007).

Deviation from DB plans increases the degree of responsibility on the individual in relation to achieving financial wellbeing during retirement (Fisch et al., 2020). This means the onus of financial decision-making falls on individuals who are often ill-equipped, without the appropriate knowledge or motivations to make informed decisions (Lusardi & Mitchell, 2007). In response to rising life expectancies, a further risk associated with DC schemes is that the longevity of pension income streams now rests with the individual (Banks & Blundell, 2005). Therefore, if individuals are not well equipped to make informed investment decisions, they risk not generating sufficient retirement wealth to fund their post-income earning years (Lusardi & Mitchell, 2023). Insufficient funds to support retirement due to inappropriate wealth

accumulation or through outliving retirement savings is concerning for financial and general wellbeing (Noviarini et al., 2021; Noviarini, Coleman, Roberts, & Whiting, 2023).

Australia has been a leader in the pension reform space and was the first country to introduce a mandatory superannuation scheme (Agnew et al., 2013). This scheme, termed the Superannuation Guarantee (Administration) Act, was introduced in 1992 and required employers to contribute to a superannuation plan for their employees (Agnew et al., 2013; Clark & O'Neill, 2023; Feng, Gerrans, Moulang, Whiteside, & Strydom, 2019; Quiggin, 1998). The Superannuation Guarantee system was introduced to supplement the income some Australians received through the basic Age Pension scheme in Australia (Agnew et al., 2013; Bateman, Eckert, Geweke, Louviere, Thorp, & Satchell, 2012). Further, the Australian Government at the time encouraged the use of pension schemes providing an income stream during retirement, as opposed to funds which made lump sum payouts upon reaching the minimum retirement age (Atkinson & Creedy, 1996). As is the case for most DC plans, benefits provided in retirement from the Superannuation Guarantee scheme is dependent on the wealth accumulated over the time of the investment (Atkinson & Creedy, 1996). This highlights two key considerations; firstly, the earlier individuals join DC schemes, the more time their wealth has to accumulate before reaching retirement and secondly, financial literacy is important to ensure individuals are well equipped to make suitable investment decisions to generate sufficient retirement wealth.

Beyond the shift towards DC plans and the recognition of increased responsibility for retirement planning, deregulation of financial markets over the last three decades has led to greater ease of access for global markets and an increased availability of diverse financial products and services (Xue, Gepp, O'Neill, Stern, & Vanstone, 2019). Consequently, deregulation has elevated the level of financial knowledge and skill required and subsequently increased the risk of poor decision-making (Xue et al., 2019). To mitigate some of the risk associated with DC plans, some countries have introduced superannuation schemes with high visibility amongst employment age individuals. Over 2011-2012 Australia moved to the concept of a ‘default’ retirement plan where employees were automatically enrolled in the MySuper scheme unless they self-selected a different scheme (Australian Prudential Regulation Authority, n.d.). Although this was a positive step to ensure Australians participated in pension schemes, it also required individuals to interact with complex financial markets (Agnew et al., 2013). Therefore, mandatory savings schemes may increase retirement wealth and preparedness, although it does not necessarily address the complexity of decisions an

individual must make or ensure they are adequately equipped to make informed financial decisions. Such decisions could include the retirement plan to invest in, the contribution percentage, or where to seek advice (Agnew et al., 2013; Bateman et al., 2012). Similar to the default retirement plan introduced in Australia, the UK introduced automatic enrolment in 2012, in an attempt to bridge the gap between financial illiteracy and retirement planning (Department for Work & Pensions, 2022). By 2020, over 10 million UK citizens were automatically enrolled in a DC pension scheme (Department for Work & Pensions, 2022). Although automatic enrolment does not necessarily address financial capability levels directly, it is likely to result in higher retirement savings and a consequent reduction in the proportion of individuals experiencing a retirement wealth gap.

For a large portion of the 1900s, the New Zealand pension system was focused on a public funded universal flat-rate pension (the Old Age Pension), primarily introduced to address an increasing population of poor elderly individuals (Nolan, 2016; Preston, 2008). Pension reforms were a high political priority for the government from 1898 onwards as a result of an aging New Zealand population, requiring pension schemes to be paid out to an increasing proportion of New Zealanders. By the 1980s, in response to the cost pressures of funding the National Superannuation system during a period of economic crisis, New Zealand underwent a period of economic reform. This began in 1979 with the National Government making Superannuation cutbacks, reducing the pension provision benchmark to 80% of ordinary wages (Preston, 2008). Further tax reforms impacting pension systems were implemented under the incoming Labour Government from 1985, resulting in several changes to tax legislation associated with superannuation savings including reducing the pension-wage ratio to between 65-72.5% (Marriott, 2009; Preston, 2008). The National Government elected in 1990 introduced further reforms to address the cost pressures associated with the New Zealand pension system that were persisting. These included adjustment to pension rates resulting in a reducing pension-wage ratio and a programme to increase the pension eligibility age to 61 years in 1992 and to 65 years by 2001 (Marriott, 2009; Preston, 2008).

One of the key issues prompting pension reforms in New Zealand over the last 50 years is the unaffordability of maintaining a full public pension scheme due to inflationary pressures and an aging population (Task Force on Private Provision for Retirement, 1992). In 1991, the NZ Government developed the Task Force assigned to gather information and evaluate various reform options for the development of a pension system inclusive of both public and private provisions with the aim of working towards increased financial stability for retired New

Zealanders (Task Force on Private Provision for Retirement, 1992). The Task Force evaluated three options through public seminar consultations and the collation of advantages and disadvantages. The three options were voluntary contributions, funded compulsory, and tax incentives. The results of the report, often termed the 'Todd Report' indicate the Task Force favoured the voluntary option, citing flexibility of saving, affordability for the individual, lower fiscal costs, and competitive financial markets providing private investment mechanisms (Preston, 2008; Task Force on Private Provision for Retirement, 1992).

For pension provisions in New Zealand, there is a government funded flat-rate pension scheme termed New Zealand Superannuation which individuals are eligible to receive from the age of 65 years (Crossan, Feslier, & Hurnard, 2011; Noviarini et al., 2023). Further, the KiwiSaver scheme that was introduced in July 2007, acts as a mechanism for encouraging passive saving, implemented as a direct deduction from wage and salary payments (in response to the completion of an opt-in form). This scheme is in place to supplement New Zealand Superannuation and to address financial insecurities highlighted from the economic recession in 2007 (Crossan et al., 2011). However, due to the voluntary nature of KiwiSaver combined with the privatisation of retirement investment funds, New Zealanders are increasingly responsible for the management of at least a portion of their retirement wealth (Noviarini et al., 2021, 2023). In regard to the privatisation of retirement investment funds in New Zealand, beyond subscribing to the Kiwisaver scheme, it remains important that individuals have adequate levels of financial knowledge and skills to make informed investment decisions and accumulate sufficient retirement wealth. Further, unlike some other superannuation plans, the KiwiSaver scheme does not offer annuitisation of withdrawal upon reaching retirement age. Rather, the individual is responsible for requesting the withdrawal, as well as for the consequent financial management of the withdrawn lump sum (Noviarini et al., 2021). The introduction of the KiwiSaver scheme is an important step towards improving the pension landscape in New Zealand. However, the key aspect which is largely preventing 'buy-in' and active participation from young adults is the empowerment and motivation to be financially proactive that comes with effective financial education.

Globally, the general transition to DC plans has prompted governments and policymakers to focus on financial capability and improving wellbeing. Beyond retirement scheme transitions, the growing complexity of financial markets, an increase in financial technology and global events impacting the economy, such as the Global Recession or the COVID-19 pandemic, have further highlighted the importance of financial capability and financial wellbeing particularly

in terms of emergency savings and financial resilience (Fan & Henager, 2022). During declining economic times, rising interest rates, falling house prices, and increasing cost of living standards, the risks associated with financial instability have been highlighted. In such cases, the importance of financial capability is further recognised, particularly in terms of emergency savings and financial resilience.

Following global pension reforms and the subsequent reflection on the individual responsibility individuals now have for retirement planning, studies have increasingly explored the link between financial literacy and retirement planning (Almenberg & Säve-Söderbergh, 2011; Behrman, Mitchell, Soo, & Bravo, 2010; Fisch et al., 2020; Sekita, 2011; van Rooij, Lusardi, & Alessie, 2011; van Rooij et al., 2012). In particular, there are concerns around financial illiteracy levels, indicating many people do not have the appropriate knowledge and skills to make effective financial decisions towards saving and planning for the future (Behrman et al., 2010; Fornero & Monticone, 2011; Lusardi & Mitchell, 2011a; van Rooij et al., 2011). Although the initial focus on financial literacy stemmed from attempts to improve financial knowledge levels and equip individuals with the skills to adequately plan for retirement, studies have since recognised the important role financial capability plays in the financial decision-making of individuals throughout their working life (Lusardi & Mitchell, 2023; Sherraden, 2010; Storchi & Johnson, 2016). Subsequently, financial capability has become a key strategic focus for governments and policymakers on the basis that informed financial decision-making can improve financial stability and household wellbeing (The World Bank, 2013). Beyond being a key aspect of day-to-day financial decision-making, financial capability has been linked to retirement wellbeing, as individuals who are financially literate are more likely to plan and prepare for retirement (Behrman et al., 2010). There have been several initiatives taken to address financial illiteracy, with an initial focus on improving retirement planning and preparedness to reduce the risk of retirement wealth gaps. These include financial education programmes, automatic enrolment in pension plans, and simplifying pension plan enrolment processes (Lusardi, 2008). Subsequent studies have sought to understand the various factors influencing financial capability with a clear focus on the development of short-term and long-term financial wellbeing (Fan & Henager, 2022; Lusardi, 2019).

A further challenge for retirement planning and financial decision-making is the growing complexity of financial markets (Lusardi, 2011). Financial technology developments and a wider variety of increasingly complex products requires individuals to have a higher level of financial understanding than previously required in order to make effective and informed

financial decisions (Lusardi, 2019). There has been a rise in disintermediation between investors and financial markets due to developments in financial technology, meaning 'small investors' now have access to global markets (Lusardi & Mitchell, 2014). Eliminating the use of financial intermediaries during the decision-making process means individuals may make decisions without guidance and often while facing information asymmetries, resulting in uninformed decision-making and poor financial outcomes (Widdowson & Hailwood, 2007). Positive financial outcomes are usually the result of informed financial decision-making. In comparison, ill-equipped individuals making inappropriate financial decisions can negatively impact their current and future financial outcomes (Lusardi & Mitchell, 2007). Consequently, the importance of understanding what drives informed financial decision-making is critical to achieving positive outcomes and financial stability (Lusardi, 2011; Lusardi, 2019; Lusardi & Mitchell, 2014).

Similarly, planning and preparation for retirement is now predominantly dependent on the proactive behaviour of the individual, rather than their incidental participation in a pension scheme which is usually initiated by the employment institution (Lusardi, 2011). Disintermediation, pension reforms and trends towards DC plans, and increasingly accessible yet complex financial markets have collectively highlighted the poor financial literacy levels maintained globally (Carpena et al., 2011). According to Widdowson and Hailwood (2007) deregulation of the New Zealand financial market has enabled easier access to a wider range of financial products, including debt products, resulting in higher levels of debt being held. This trend is concerning as poor financial literacy and unsophisticated debt behaviour has resulted in household debt growing three-fold between 1996 – 2006, well outpacing growth in household income according to data from the Reserve Bank of New Zealand (Widdowson & Hailwood, 2007).

Global policy agendas now recognize the importance of a sound financial education system to empower individuals financially and support the stability of the wider economy (OECD, 2018). An expanding field of research has identified the need to combine traditional financial education techniques with a focus on behavioural economics to achieve the desired behaviour change (Vlaev & Elliott, 2017). It is important to understand behavioral insights into effective behaviour change and how this can influence the delivery of financial education programmes, allowing individuals to understand their personal biases and how these biases can be controlled or challenged to improve the effectiveness of financial decisions (Anton-Díaz, 2018). There have been mixed responses as to whether financial education programmes have been effective

in improving financial literacy levels and consequent financial outcomes (Czar et al., 2021; Fernandes et al., 2014; Frijns et al., 2014; O'Connell, 2009; Xiao & O'Neill, 2016). This may relate to findings that indicate improved financial knowledge does not always translate to positive financial behaviour and informed decision-making (Lusardi & Mitchell, 2007). The presence of a disconnect between knowledge and behaviour relates to the fact that humans are not always rational in their decision-making with their decisions often impeded by cognitive biases (de Meza et al., 2008; Sahi, 2017).

Personal finance studies exploring financial decision-making have expanded research through the development of the behavioural finance discourse. This strand of research acknowledges that traditional finance models and associated assumptions are not always appropriate when reviewing personal finance concepts (Ritter, 2003). In contrast, behavioural finance models hold that decision-making agents are not fully rational due to a range of internal and external factors influencing the processing and use of financial information (Ritter, 2003). A key aspect of behavioural finance is understanding the biases which influence decision-making and may explain suboptimal outcomes (Ritter, 2003; Sahi, 2017). As financial decision-making is a large portion of what has been found to influence financial capability, studies exploring and attempting to quantify financial capability levels have increased in popularity, with the goal of improving financial wellbeing of individuals and households (Xiao, 2016). A focus on measuring and improving financial capability levels is therefore likely to have a positive influence on general economic conditions, particularly in low- and middle-income countries (Kempson et al., 2013).

Over time financial literacy and financial capability studies have identified areas of the population that are oppressed or struggling financially. Literature is consistent in the notion that financial capability is influenced by one's financial knowledge and behaviour (Atkinson & Messy, 2012; French et al., 2020; Lusardi & Mitchell, 2023; OECD, 2014; Xiao, 2016). One key issue in behavioural financial studies is gender. Several studies identify gender differences in financial literacy levels, usually explained by discrepancies in financial knowledge levels, with males having a higher understanding of financial concepts (Chambers, Asarta, & Farley-Ripple, 2019; Lusardi, Mitchell, & Curto, 2009). Further studies find that gendered roles, reduced exposure to financial education or experiences, the gender pay gap, and lower general education levels all contribute to the persistent gender gap in financial literacy (Lusardi & Mitchell, 2008; Moon, Ohk, & Choi, 2014; Mottola, 2013). This discrepancy has been found to have flow on effects to retirement savings, with a gender pension gap being evident (Feng et

al., 2019). A further consideration is the impact of culture on financial capability and subsequent levels of financial satisfaction. Çera, Khan, Belas and Ribeiro (2020) find that risk tolerance and financial attitudes are often influenced by an individual's culture, thereby influencing financial capability levels, financial satisfaction, and often subsequent levels of financial wellbeing. Governments and policymakers across numerous countries are working to improve financial capability levels, acknowledging the social and economic benefits to individuals and the wider economy (Kempson et al., 2013; Taylor, 2011). The first step in the implementation of these strategies is to identify an appropriate indicator to measure existing financial literacy or financial capability levels (Potrich, Vieira, & Kirch, 2018). Although measuring financial capability (rather than financial literacy) attempts to capture the impacts of socio-demographic factors on an individual's financial inclusion and ability to make financial decisions, the additional challenge is developing a robust framework to measure a multi-dimensional concept across various country contexts (Kempson et al., 2013).

2.2. What is financial capability?

Despite empirical assumptions about the relationship between financial knowledge and financial behaviour, the two concepts are not mutually inclusive. Financial literacy is a common term used to denote the ability to combine financial knowledge to guide financial behaviours and decision-making towards financial wellbeing (Atkinson & Messy, 2012; French et al., 2020; Lusardi & Mitchell, 2023; OECD, 2014). It is possible that the possession of financial knowledge alone does not constitute positive financial behaviour and outcomes (Kempson et al., 2013; Matthews, Stangl, & Wood, 2023). Over time, it became clear that the possession of financial knowledge did not always translate to positive financial behaviour (Matthews et al., 2023). This was largely due to the influence of various 'noise' factors during the financial decision-making process, such as financial attitudes, motivations, and behavioural biases (Friedline & West, 2016; Kempson et al., 2005; Shephard et al., 2017). Several studies have investigated financial literacy on the assumption that increased financial knowledge could drive positive financial decision-making, increase financial inclusion levels, and improve financial stability at the household and economy level (Goyal & Kumar, 2021; Matthews et al., 2023; OECD, 2014). This was important following the transition from DB plans to DC plans through the 1980s and 1990s as well as in response to the growing complexity and expansion of financial markets (Atkinson et al., 2007; Fernandes et al., 2014; Fornero & Monticone, 2011; Goyal & Kumar, 2021; Lusardi, 2011; OECD, 2014). In response to the shift of retirement saving responsibility from the employer to the individual, the importance of financial literacy

has been recognised, resulting in an increased investment in the provision of financial education programmes (Goyal & Kumar, 2021; Lusardi & Mitchell, 2023; OECD, 2014).

In response to behavioural finance studies exploring financial decision-making, it was found financial literacy was not a sufficient concept to measure the influences on behaviour and decision-making. Therefore, the term financial capability was introduced and has become prevalent among behavioural finance studies (Johnson & Sherraden, 2007; Kempson et al., 2013). This shift was predominantly initiated by the United Kingdom as the first country to undertake a nationwide survey exploring financial capability, but has subsequently been adopted by other countries (Kempson et al., 2005; Xiao, 2016). A key example is the Australian Government who revised their National Financial Literacy Strategy in 2022, replacing it with a National Financial Capability Strategy in response to the economic burdens caused by Covid-19 (Australian Government, 2022). In doing so the Australian Government recognised the prevalence of financial capability in the global policy space (Australian Government, 2022). Similarly, New Zealand revised their National Financial Capability Strategy for the 2021-2024 period in response to the economic impact of Covid-19, particularly highlighting the importance of financial resilience. This strategy focuses on the financial capability community, with the vision of encouraging this community to drive positive behaviour change within the wider New Zealand population (Te Ara Ahunga Ora Retirement Commission, 2021a)[1].

Financial capability extends beyond knowledge and financial literacy by measuring actual behaviours, skills, and attitudes used to guide financial decision-making (Czar et al., 2021; Xiao, 2016). Decision-making is the underlying cognitive process which guides positive financial behaviour including daily money management, long-term saving/planning and the development of financial resilience (Russell et al., 2020). Simplistically, an individual is financially capable if they are able to identify their financial needs and find solutions for these needs given their life stage and individual financial circumstances (Lee, Smith, & Lee, 2019; Storchi & Johnson, 2016). This description of financial capability highlights three key considerations. Firstly, financial capability is a combination of knowledge, skills, and psychological factors/motivations to guide positive financial behaviour in the context of an individual's current financial circumstances. Secondly, financial capability is dynamic over the life-course meaning that financial decisions are only deemed appropriate if they align with an individual's current circumstances. Lastly, this definition alludes to the need for financial

[1] Note, Te Ara Ahunga Ora Retirement Commission has had several names including the Commission for Financial Capability. For this thesis, we will use the current name, Te Ara Ahunga Ora Retirement Commission.

inclusion to enable access to knowledge and products to inform financial decision-making (Storchi & Johnson, 2016). Xiao (2016) asserts the importance of financial capability as a means to improve financial wellbeing. Therefore, as financial capability lays the foundation for achieving financial wellbeing, it is important to understand how to measure and improve financial capability levels.

Financial capability describes the combination of financial knowledge, financial behaviour and other 'noise factors' which influence the decision-making process e.g. financial attitudes, psychological influences, and motivations (Kempson et al., 2013). Literature agrees that financial capability levels are difficult to measure directly. Alternatively, a selection of key observable components are measured and combined to proxy financial capability levels (Kempson et al., 2013). The Financial Services Authority in the United Kingdom developed a framework for measuring financial capability which identified three main elements: knowledge and understanding, skills, and confidence and attitudes (Kempson et al., 2005). Similarly, the financial wellbeing conceptual model developed by Kempson et al. (2017) identifies the key determinants of financial wellbeing as behaviours, social norms, and economic factors (Kempson et al., 2017; The World Bank, 2013). Each of these components is independently influenced to some degree by psychological factors. For this study financial capability is defined as a state whereby an individual has adequate knowledge and attitudes to guide financial behaviour towards financial wellbeing given an individual's personal financial circumstances (Czar et al., 2021; Kempson et al., 2017; Xiao et al., 2022). In contrast, financial wellbeing details a state of being where individuals are comfortably able to meet their wants and needs (Xiao, 2016). As such, we acknowledge that financial capability differs from financial wellbeing as it captures the objective factors which influence an individual's financial decisions rather than financial outcomes such as financial comfortability or resilience.

One key issue surrounding financial capability is the implementation and effectiveness of financial education (Matthews et al., 2023). Financial education can take many forms, including formal and informal practices. One form which is of increasing interest to researchers is the process of financial socialisation and learning through exposure during one's childhood years. Financial socialisation is the term used to describe the process whereby individuals acquire knowledge, attitudes, and behaviours during their childhood years which often persist to guide their decision-making when they become financially independent (Gudmunson & Danes, 2011). Traditionally, financial socialisation was associated with one's childhood years only, however, modern definitions recognise the socialisation process is often dynamic,

evolving beyond adolescence and into adulthood (Gudmunson & Danes, 2011). Parents have repeatedly been recognised as the primary financial socialisation agents for adolescents (Gudmunson & Danes, 2011; Zhu, 2018). However, recent studies show this may be changing, with personal experience found to be a key driver of financial knowledge (Matthews et al., 2023). In the case of financial socialisation, it is concerning that in many cases parents are not aware of the role they play in the financial education of their children during their adolescent years. Due to the importance of learned behaviours in shaping the financial behaviour of individuals in adulthood, the review and development of financial capability levels is vital in developing the financial capability and wellbeing of future generations.

Adequate use of financial products and services is highly dependent on the degree to which one is financially included. Financial inclusion is the term used to describe an individual's ability to participate in financial markets and access financial products/services. Without access to these products and services, individuals are limited in their ability to manage their personal funds and prepare for their financial future. Many researchers suggest that financial capability combines the opportunity to act (financial inclusion), with the appropriate knowledge and skills to make positive financial decisions towards wellbeing (Birkenmaier, Rothwell, & Agar, 2022; Sherraden, 2013).

2.3. What is financial wellbeing?

Although academia is yet to settle on a common definition, financial wellbeing can be measured as the comfortability of one's current financial position, and the ability to weather any unexpected future financial shocks (French et al., 2020). The Commonwealth Bank of Australia identified four key factors for achieving financial wellbeing; meeting financial obligations, financial freedom to make decisions purely for enjoyment, control of personal finances, and financial security both current and in the future (Commonwealth Bank of Australia, Melbourne Institute, & University of Melbourne, 2019). Literature largely agrees that financial wellbeing is multi-faceted, encompassing subjective and objective components (Kempson et al., 2017). For this paper, financial wellbeing is defined as a state in which an individual is financially comfortable, making ends meet, has low money-related stress, and is taking pro-active steps to manage their finances within the context of their current circumstances. Based on this definition, financial wellbeing differs from financial capability as it predominantly measures financial outcomes rather than behaviours and factors which influence financial decision-making. The adapted model of financial wellbeing established by Kempson and Poppe (2018) measures three components to proxy wellbeing: meeting

commitments, being financially comfortable, and resilience for the future. In terms of psychological measurement for the financial wellbeing conceptual model, the 2018 questionnaire measured time orientation, impulsivity control, social status, self-control, locus of control, and action orientation (Kempson & Poppe, 2018).

Financial wellbeing is often thought of as a by-product of achieving financial capability on the basis that informed financial decisions usually have a positive influence on financial outcomes (Fan & Henager, 2022). Particular aspects of financial capability are especially important when considering the development of financial wellbeing, such as retirement planning, emergency savings, and general money management (Fan & Henager, 2022). Traditional studies often measured financial wellbeing objectively, focusing on an individual's resistance to financial shocks and the presence of emergency funds. More recent studies have explored measuring financial wellbeing as a combination of subjective and objective antecedents. For example, subjective factors such as self-efficacy, savings orientation, and a focus on social status are also considered to be related to the development of financial wellbeing (Kabadayi & O'Connor, 2019). In particular, confidence in financial knowledge levels and self-efficacy can affect an individual's motivation and subsequent financial behaviour (Xiao & Porto, 2022). Further, Çera et al. (2020) explore the influence of financial capability on financial satisfaction, a key indicator of an individual's financial wellbeing levels. Beyond the existing relationship between financial capability and financial wellbeing, these concepts are further related in that they are both influenced by psychological and subjective factors.

2.4. Financial capability in New Zealand

The OECD created a programme for international student assessment (PISA) which sought to measure the knowledge and skill levels of students nearing the end of their education years. The PISA study is a continuous programme providing ongoing insights to inform education policies across many countries, with the first assessments completed in 2000 and 2002 (OECD, 2014). Alongside measures of mathematics, reading, science, and problem-solving, the 2012 iteration of the PISA study included a review of the financial literacy levels of 15-year-old students from different countries around the world (OECD, 2014). The results of the 2012 PISA assessment in New Zealand identified a mean financial literacy score of 520; NZ students were only outperformed by students from Australia, Estonia, Flemish Community, Belgium, and Shanghai-China (OECD, 2012). Despite results in the top six countries of the OECD study, approximately 16% of NZ students did not reach the minimum financial literacy score to be classified as proficient, compared with the OECD average of 15.3% (OECD, 2012).

ANZ Bank completed analysis exploring the financial wellbeing of adults from Australia and New Zealand in 2018, based on the financial wellbeing conceptual model commissioned by Elaine Kempson (Kempson et al., 2017; Kempson & Poppe, 2018). A progressive study from earlier financial knowledge and behaviour surveys undertaken by ANZ, the 2018 study found an average financial wellbeing score of 59/100 for New Zealand adults (the same as Australia), based on four categories: no worries, doing ok, getting by, and struggling. The ANZ Financial Wellbeing Survey categories are 'Struggling' (0-30), 'Getting by' (30-50), 'Doing OK' (50-80), and 'No worries' (80-100). Of the 2018 survey respondents, 23% achieved scores qualifying them for the 'no worries' category while 37% of respondents were in the 'getting by' or 'struggling' category (ANZ, 2018). One shortcoming of the ANZ Financial Wellbeing model was it did not distinguish between subjective and objective financial wellbeing measures.

Financial capability and financial wellbeing are not mutually inclusive concepts. Rather, based on the Kempson and Poppe (2018) model, financial capability measures the behaviours (and what guides/influences the behaviours) whereas financial wellbeing is proxied by financial outcomes. Within the New Zealand context, a recent study commissioned by Te Ara Ahunga Ora Retirement Commission (previously the Commission for Financial Capability) found that 65% of New Zealanders had not planned financially for their retirement and only 29% of participants had access to an emergency savings account equivalent to three months income. (Galicki, 2020a). In addition, a similar New Zealand study exploring financial capability was undertaken in 2021 and found that on average participants achieved a financial wellbeing score of 61 out of 100 (Galicki, 2021). The financial wellbeing scores were calculated based on measures for meeting commitments, being financially comfortable, and achieving financial resilience, leveraging the model developed by Kempson and Poppe (2018). Active saving, spending restraint, not borrowing for everyday expenses, and informed product choice were key behaviours found to have a strong impact on financial wellbeing (Galicki, 2021). Looking at New Zealand participant scores for specific financial wellbeing components, the average score for meeting commitments was 73 out of 100. Although this is a reasonable score, it is low compared to average scores of 81, 91, and 80 for Canada, Norway, and Ireland respectively (Galicki, 2021). In terms of financial preparedness for retirement (beyond New Zealand Superannuation), adults scored 43 out of 100. This highlights the low level of private retirement savings held by New Zealanders. Looking collectively at the components measuring capability and wellbeing, New Zealanders performed poorly in the following categories: informed

product choice (48), financial inclusion (31), lack of concern about social status (46), and action orientation (50). The survey identified that despite often having adequate knowledge and capability, women, Māori, and Pacific Islanders often achieve worse outcomes and have lower financial wellbeing overall (Galicki, 2021).

More recently, the Fin-Ed Centre completed the third iteration of the Financial Literacy Longitudinal study which explores the financial knowledge, behaviours and attitudes of young New Zealanders over a 20 year period (Matthews et al., 2023). At the study's inception in 2012, all participants were aged between 18-22 years, and by the most recent survey in 2022, participants were aged between 28-32 years. The survey shows that since the 2012 baseline study, financial knowledge has continued to trend upwards with an average score of 4.7 in 2022 compared to 3.5 in 2012 (Matthews et al., 2023). The 2022 data showed a reduction in the financial literacy gender gap as compared to the baseline results from 2012. The average score for female participants in 2022 was 4.47 compared to 3.44 in 2012 (Matthews et al., 2023). For male participants, the average financial literacy score was 5.25 in 2022 as compared to 3.75 in 2012 (Matthews et al., 2023). This data is encouraging for two reasons; firstly it indicates general financial literacy levels have improved and secondly, it demonstrates that female scores are trending closer to that of males.

2.5. Existing measures of financial capability

A comparison of existing indices provides the theoretical justification for a complementary financial capability index which supports and strengthens existing personal finance models. Existing measures have been developed on the understanding that financial capability is a combination of financial knowledge, financial behaviour, and attitudes. Although some psychological influences may be captured when measuring financial attitudes, modern studies have identified that the psychological influence on financial capability is more comprehensive, including factors such as behavioural biases, financial responsibility, and heuristics. One example is the work by Kempson and Evans (2021) who analyse financial capability survey data using principal component analysis to explore financial wellbeing levels in New Zealand and the factors that influence it e.g. financial behaviour, financial knowledge and experience, psychological function, and attitudes. Although this study is comprehensive and clearly recognises the influence of psychological factors on financial decision-making, the study largely measures financial wellbeing outcomes, with financial capability used in conjunction with financial behaviour as a component of achieving financial wellbeing. This provides an opportunity to develop a complementary financial capability index which incorporates a

comprehensive measure of psychological factors that will support and strengthen existing financial capability and financial wellbeing models.

Several financial capability indices exist internationally, although to our knowledge, measures have not fully adjusted in response to findings which indicate the impact of psychological factors on financial decision-making. Examples of these include the Armenian financial capability barometer, the World Bank financial capability index, and the OECD/INFE financial literacy toolkit (Alliance for Financial Inclusion, 2017; Kempson et al., 2013; OECD, 2017). Although these measures are well accepted, they have not evolved to capture the influence of certain psychological factors which have been found to directly influence the financial decision-making process (Kempson & Poppe, 2018; Russell et al., 2020; Storchi & Johnson, 2016; Tang & Baker, 2016). One measure captures the six psychological factors found to influence financial decision-making, being the financial wellbeing framework developed by Kempson and Poppe (2018). We therefore identify the opportunity to leverage the framework developed by Kempson and Poppe (2018) and adjust the index methodology to develop a complementary financial capability index which supports the Kempson and Poppe (2018) financial wellbeing conceptual model and strengthens existing financial capability and financial literacy models. Table 1 provides a review of the strengths and limitations of selected measures in the financial literacy and wellbeing space.

Table 1: Comparison of existing financial capability measures

Index	Description	Advantages	Limitations
Financial capability barometer - Armenia[2]	• Central Bank of Armenia and Alliance for Financial Inclusion measure created in 2013 and 2014 • Aims to inform policymakers and financial educators, and monitor public progression	• Rigorous questionnaire and scoring matrix • Cross-country application • Measures knowledge, skill, attitudes, and behaviour	• Attitudes component of the index looks at 'willingness and readiness' to invest in increasing financial capability • Does not capture psychological influences
OECD / INFE Adult Financial Literacy Survey[3]	• Uses the global OECD/INFE toolkit to measure financial literacy in 26 countries (Asia, Europe, and Latin America) – including 12 OECD countries • Measures financial knowledge, financial behaviour, and financial attitudes • Includes data from c. 125,000 participants	• Cross-country comparison using country's toolkit application – notes potential for data collection methods to vary • Comprehensive measure of financial literacy & recommendations for policy • Includes measure of 'long-term orientation' as well as savings attitudes	• Measures financial literacy rather than financial capability (focus on knowledge, behaviour, and attitudes) • Does not capture psychological influences on financial decision-making
UK Adult Financial Capability Framework[4]	• Interview data collected in 2005 in the UK • Financial capability defined by four sections: managing money, planning ahead, making choices about financial products, getting help	• Comprehensive model underpinning the questionnaire • Robust scoring system for financial capability • Includes some psychological factors e.g. impulsivity	• Does not include a comprehensive psychological factor e.g. time orientation, locus of control, self-control, social status, action orientation

[2] Alliance for Financial Inclusion. (2017). *Financial capability barometer: A new methodology for measuring the financial capability of a country's population*. https://www.afi-global.org/sites/default/files/publications/2017-03/2017-Financial%20Capability%20Barometer.pdf

[3] OECD. (2020). *OECD/INFE 2020 International Survey of Adult Financial Literacy*. https://www.oecd.org/financial/education/oecd-infe-2020-international-survey-of-adult-financial-literacy.pdf

[4] Kempson, E., Collard, S., & Moore, N. (2005). *Measuring financial capability: an exploratory study* https://www.bristol.ac.uk/media-library/sites/geography/migrated/documents/pfrc0510.pdf

New Zealand Financial Capability Survey [5]	• Survey of c. 3,000 New Zealand adults • Based on Kempson and Poppe model (2018) • 2021 data collection	• Comprehensive measure of financial behaviour, financial knowledge, psychological factors, and demographic information	• The dependent variable of the model is financial wellbeing rather than financial capability
Financial capability barometer (CFCC NZ)[6]	• 2017 survey of c. 15,000 adult New Zealanders • Developed by market research company to explore financial attitudes and behaviours • Comprehensive measure of personal finance in New Zealand	• Covers spending and saving, self-control, internal locus of control and time-orientation • First attempt in New Zealand to develop a rigorous financial capability measure	• Includes information on attitudes and behaviours but does not provide the ability to measure financial capability • Uniquely constructed for the organisation – not based on a financial capability framework
FINRA National Financial Capability Study[7]	• Explores perceptions, attitudes, experiences, and behaviours related to financial capability in the United States in 2021 (c. 27,000 participants) • Evolving study, with iterations every 3 years, commencing in 2009 • Enables comparison across American states but no cross-country applicability	• Measures financial capability by four areas: making ends meet, planning ahead, managing financial products and financial knowledge • Focus on measuring knowledge, behaviour, and attitudes	• Strong focus on financial behaviour and captures financial knowledge. • Other noise factors influencing decisions are not captured except for self-efficacy and subjective knowledge
Global Financial Inclusion and Consumer Protection (FICP) Survey[8]	• Financial inclusion focus • Responses from 124 jurisdictions covering 141 economies • Self-reported data collected between November 2016 and June 2017	• Cross-country measure for comparison	• Measure is focused on the financial inclusion and regulatory space • Does not capture financial behaviour, financial knowledge, or psychological factors

[5] Kempson, E., & Evans, J. (2021). *New Zealand financial capability survey 2021*. https://assets.retirement.govt.nz/public/Uploads/Research/TAAO-RC-NZ-Fincap-survey-Tech-Report.pdf

[6] Galicki, C. (2020a). *Financial Capability Barometer 2018-2019*. https://assets.retirement.govt.nz/public/Uploads/Research/CFFC-Barometer-Report-2018-2019.pdf

[7] Lin, J. T., Bumcrot, C., Mottola, G., Valdes, O., Ganem, R., Kieffer, C., Lusardi, A., & Walsh, G. (2022). *Financial Capability in the United States: Highlights from the FINRA Foundation National Financial Capability Study*. https://finrafoundation.org/sites/finrafoundation/files/NFCS-Report-Fifth-Edition-July-2022.pdf

[8] World Bank Group. (2017). *Global Financial Inclusion and Consumer Protection Survey*. https://openknowledge.worldbank.org/server/api/core/bitstreams/a9aeea4c-28fa-5825-8f0d-397cf57b33e6/content

World Bank/Russia Financial Literacy and Education Trust Fund Financial Capability Survey[9]	• Data from Armenia, Colombia, Lebanon, Mexico, Nigeria, Turkey, and Uruguay • Measures financial capability in low- and middle-income nations	• Cross-country measure for comparison • Comprehensive survey that captures psychological factors during financial capability exploration • Robust procedure with focus groups informing survey development	• The six psychological factors were identified in the focus group stage of analysis. • Only impulsivity, achievement focus and attitudes towards future / time orientation were used in the questionnaire and component calculations
Survey on the Financial Literacy of the Portuguese Population[10]	• 2,000 Portuguese individuals over 16 years old. • Face-to-face interviews –more detailed responses • Data collected in 2010	• Measures five key areas: financial inclusion, budget planning and savings, bank account management, selection of banking products and financial understanding	• Does not capture wider aspects of financial capability e.g. focus on decision-making for wellbeing outcomes • Does not capture psychological influences
A Conceptual Model of Financial Wellbeing [11]	• Developed by Elaine Kempson & Christian Poppe (2016) in collaboration with Consumption Research Norway • Extends previous studies by Personal Finance Research Centre, University of Bristol, and the World Bank • Mainly financial wellbeing but includes financial capability as an independent variable	• Well-adopted in several countries for measuring financial wellbeing • Includes measures of knowledge, behaviour/capability, psychological factors, and socio-demographic factors • Robust methodology to calculate a single score for financial capability - using PCA analysis to create sub-variables for regression	• With the dependent variable being financial wellbeing, financial capability is combined with financial behaviour to form one of the independent variables
Global Findex Database[12]	• Survey data collected every 3-4 years since 2011	• Cross-country financial measure	• Does not comprehensively

[9] Kempson, E., Perotti, V., & Scott, K. (2013). *Measuring financial capability: a new instrument and results from low- and middle-income countries*. World Bank. https://openknowledge.worldbank.org/entities/publication/74d7956c-a67f-563d-afa1-cdc0b7a1bd8b

[10] Banco de Portugal. (2010). *Survey on the financial literacy of the Portuguese population*. https://clientebancario.bportugal.pt/sites/default/files/2020-11/SinteseInqueritoLF2010_EN.pdf

[11] Kempson, E., Finney, A., & Poppe, C. (2017). *Financial well-being: A conceptual model and preliminary analysis* https://www.bristol.ac.uk/media-library/sites/geography/pfrc/pfrc1705-financial-well-being-conceptual-model.pdf

[12] Demirgüç-Kunt, A., Klapper, L. F., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19.*

	• 2021 iteration captured data from 128,000 adults in 123 economies • Measures a wide range of personal financial information, particularly related to financial inclusion	• Important measure of financial inclusion – often recognised as a requirement to being able to develop financial capability	measure financial capability

A common trend across the reviewed indices shown in Table 1 is the lack of inclusion of a comprehensive psychological component when measuring financial capability. Relevant literature has identified that psychological factors have an important impact on financial capability levels (de Meza et al., 2008; Kempson et al., 2017; Storchi & Johnson, 2016). The complementary financial capability index developed in Chapter 3 uses data from the Australia and New Zealand Banking Group's Financial Wellbeing survey, and particularly focuses on incorporating measures of time orientation, self-control, locus of control, impulsivity, social status, and action orientation. As this thesis utilises secondary data, the psychological component incorporated into the complementary financial capability index is guided by the relevant psychological questions available from the ANZ Financial Wellbeing Survey, noting the survey is based on the Financial Wellbeing model developed by Kempson et al. (2017). The above review of existing indices demonstrates that often only impulsivity and time orientation are included in financial capability and wellbeing models, usually as part of the financial attitudes component. Notably missing from most reviewed indices are measures of social status, action orientation, and in a majority of cases, locus of control.

Figure 8-1: The conceptual model

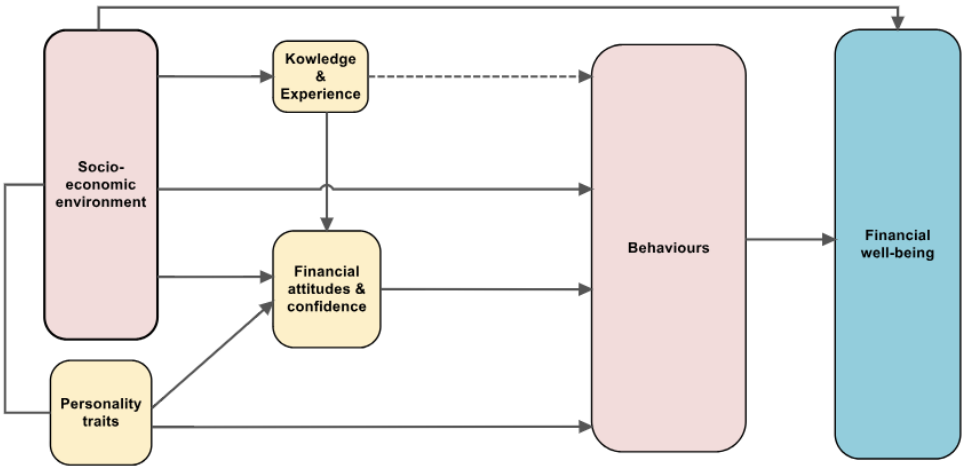

Figure 1: Financial wellbeing conceptual model - Kempson & Poppe (2018)[13]

As presented in Figure 1, the conceptual model of financial wellbeing developed by Kempson and Poppe (2018) focuses on the collective components influencing financial wellbeing, measured as an ability to meet current commitments, financial comfortability, and financial resilience. The model also assumes the impact of these collective components flows from left to right as illustrated in Figure 1. As such, the model indicates socio-economic factors and personality traits influence attitudes and knowledge levels, which guide behaviours and determine one's level of financial wellbeing. The conceptual model of financial wellbeing developed by Kempson and Poppe (2018) is the closest model to the hypothesised index for this thesis. That is, this thesis seeks to develop, using an amended version of the methodology in Kempson and Poppe (2018), a complementary financial capability index which includes financial knowledge, financial behaviour, and psychological factors as the independent variables. The conceptual model proposed for this study resembles that of Figure 1, instead aiming to capture the influence of socio-demographic factors, financial knowledge levels, and psychological factors on financial behaviour and decision-making, and subsequent financial capability levels. The conceptual complementary financial capability index is presented in Figure 2. The dotted arrow to the financial wellbeing component distinguishes the model from

[13] Figure sourced from Kempson, E., & Poppe, C. (2018). *Understanding financial wellbeing and capability - A revised model and comprehensive analysis*. https://www.researchgate.net/publication/326847922_Understanding_Financial_Well-Being_and_Capability_-_A_Revised_Model_and_Comprehensive_Analysis/citations

the conceptual financial wellbeing model from Kempson and Poppe (2018) while also indicating that financial capability (in conjunction with other factors) is an important influencer on financial wellbeing levels (Xiao, 2016).

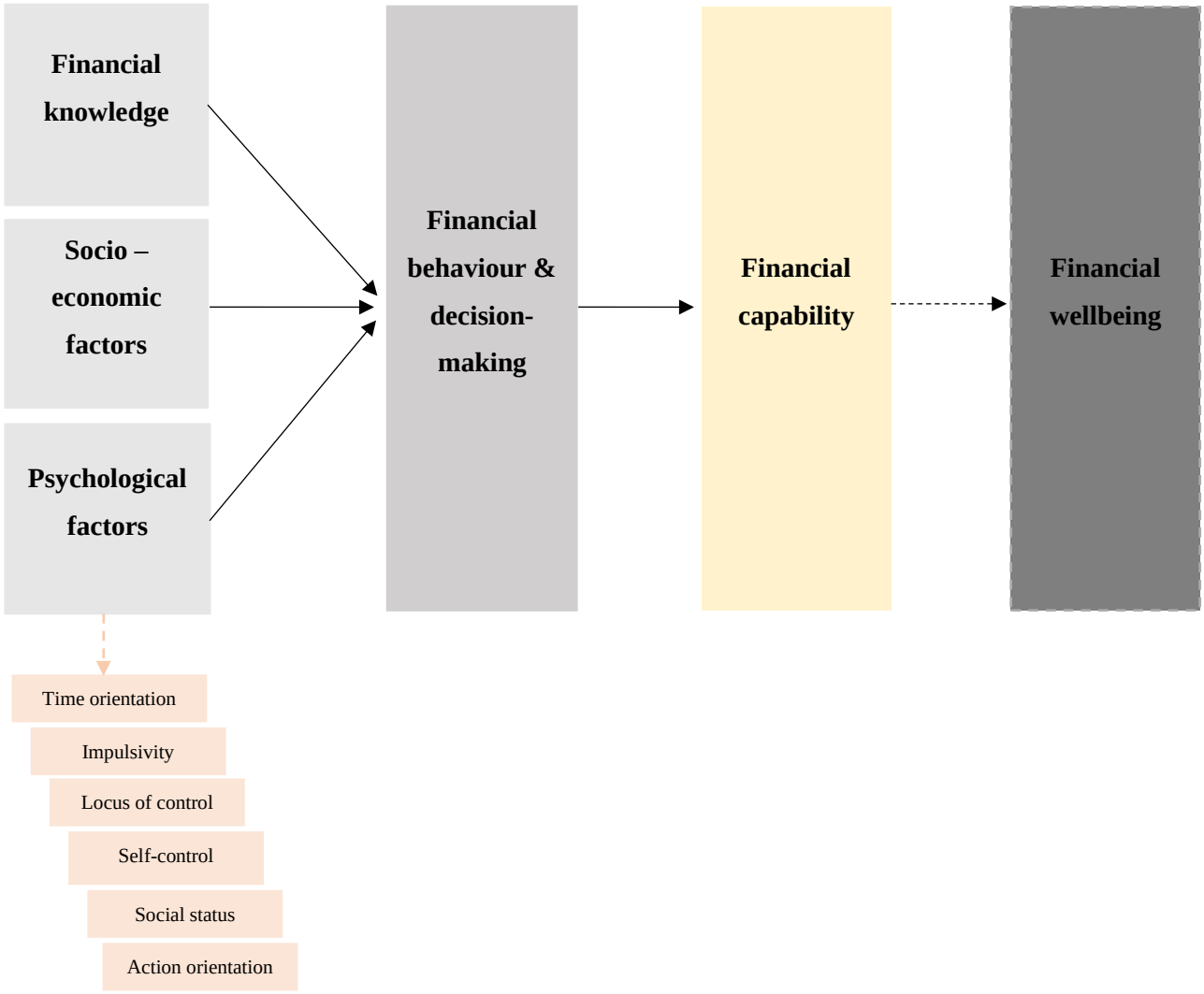

Figure 2: Conceptual model of financial capability

The six key psychological factors intended for inclusion in the index development, namely impulsivity, time orientation, self-control, action orientation, social status, and locus of control, were all identified as having a statistically significant impact on financial wellbeing in Kempson and Poppe (2018). Based on the assumption that improvement in financial capability levels often leads to improvements in financial wellbeing, we deduce that these psychological factors are important to consider when measuring financial capability (Fan & Henager, 2022). Therefore, this study seeks to address the limitations of other financial

capability indices by proposing a complementary financial capability index, which supports the financial wellbeing conceptual model developed by Kempson and Poppe (2018) and strengthens other behavioural finance models.

Financial capability is something that governments across the world are actively working towards improving (Kempson et al., 2013; Taylor, 2011). This commitment is crucial given the poor financial capability levels reported in developed and emerging nations. It is well documented that financial capability is considered a key factor in achieving financial wellbeing (Fan & Henager, 2022). Therefore, investment in the development of financial capability levels is crucial to the improvement of financial wellbeing and resilience levels of individuals, as well as society at large. It is also well founded that behavioural biases have a real impact on the financial decision-making process (de Meza et al., 2008; Sahi, 2017). Given the prevalent influence financial decision-making has on the determination of financial capability, current indices should comprehensively capture their influence.

Financial literacy is largely concerned with measuring the ability for individuals to use financial knowledge and skill to make adequate financial decisions (Kempson et al., 2013) However, it has been recognised that factors beyond financial knowledge are often required to make informed financial decisions towards current and future wellbeing (Kempson et al., 2017; Shephard et al., 2017). As a more holistic concept, financial capability is therefore understood to capture the wide range of factors which influence financial decision-making and financial outcomes (Kempson et al., 2013; Xiao, 2016). Kempson et al. (2013) note that financial capability is a somewhat abstract convention which is best measured as a manifestation of other related factors (e.g. knowledge, behaviour, psychological factors etc.). On the basis that financial wellbeing at the individual and household level often improves financial stability in the overall economy, this study assume that improved financial wellbeing is usually driven by improved levels of financial capability (Gudmunson & Danes, 2011). Development of a complementary financial capability index will provide an instrument for measuring current financial capability levels, while also helping to identify areas where individuals are lacking to inform policy and education plans to generate progression.

3. A complementary financial capability index

3.1. Introduction

This thesis explores the influence psychological factors have on financial capability, mediated through their influence on financial behaviour and financial decision-making. Current financial capability models tend to mirror traditional measures of financial literacy, limiting measured components to financial knowledge, financial behaviour, and financial attitudes. Leveraging the findings from Kempson and Poppe (2018), this study proposes a complementary financial capability index, which combines traditional financial literacy components with a measure of key psychological factors to proxy financial capability levels. Therefore, the complementary index proposes that financial capability should be measured as a weighted summation of financial knowledge, financial behaviour, and psychological components, while controlling for key socio-economic factors. The purpose of this complementary index is to support the financial wellbeing conceptual model developed by Kempson and Poppe (2018), by providing a supplementary index focusing on financial capability, while also strengthening existing personal finance models.

The financial wellbeing conceptual model constructed by Kempson and Poppe (2018) is the first to comprehensively measure the psychological factors which influence financial wellbeing. The model asserts that financial knowledge and psychological factors have a collective and direct influence on financial behaviour and decision-making, which ultimately determines one's level of financial wellbeing. Specifically, the model captures the influence of time orientation, impulsivity control, locus of control, social status, self-control, and action orientation. Research has confirmed that increased financial capability levels have a direct and positive influence on financial wellbeing. This indicates two key findings which underpin the research contribution of this thesis. Firstly, financial capability is distinct from financial wellbeing, as it is focused on factors and behaviours which guide financial decision-making. Secondly, although research continues to explore the inter-relationship between financial capability and financial wellbeing, studies have found support that increases in financial capability levels often lead to improvements in financial wellbeing levels. Due to this relationship, we propose leveraging the financial wellbeing conceptual model from Kempson and Poppe (2018) to develop a complementary financial capability index. Adapting the dependent variable to capture financial capability levels is made possible by measuring financial skills and behaviours as compared with measuring a state of being or financial outcomes.

This chapter aims to investigate and further confirm the significance of the relationship between psychological factors, financial decision-making, and financial capability. After reviewing the empirical literature and forming the theoretical justification for a complementary model, we leverage the Kempson and Poppe (2018) financial wellbeing framework to propose a financial capability index. Beyond utilising the framework and index construction approach outlined in Kempson and Poppe (2018), guidance was also taken from studies by Pesqué-Cela et al. (2021) and Kempson et al. (2013) which are comparable in terms of the methodology and scope of work. Following the methodological frameworks used in these studies, we complete data cleaning and data treatment of the 2017 ANZ Financial Wellbeing Survey questions by recoding data where appropriate to achieve consistencies in the data inputs, in most cases resulting in 1-5 Likert scale response options. Note, the psychological questions from the ANZ Financial Wellbeing Survey focus on six key components, being time orientation, self-control, impulsivity, action orientation, locus of control and social status. Following data treatment, we complete factor analysis using Principal Component Analysis (PCA) to identify the underlying data relationships within the wider dataset. The components retained through factor analysis are then weighted to form the index components, financial knowledge, financial behaviour, and psychological factors. After calculating the financial capability components using weighted summations, the dataset is randomly split into two subgroups; the base dataset (approximately two thirds of the data which is used to develop the regression model) and the test dataset (approximately one third of the data which is used to test the robustness of the regression model). Using the base dataset, we complete a multiple regression analysis to construct a regression equation, using a financial capability proxy as the dependent variable and financial knowledge, financial behaviour, and psychological factors as the explanatory variables. The final step in index development is to apply the regression model to the test dataset to validate the robustness of the model. Significant results of a one sample means test comparing the financial capability proxy variable in the base dataset and the financial capability index variable in the test dataset, confirm the robustness of the proposed complementary financial capability index.

3.2. Prior research

3.2.1. The behavioural finance discourse

Applying the findings of Tversky and Kahneman (1974) within a financial decision-making context demonstrates that traditional finance theories are not always appropriate to use when evaluating financial behaviour. Consequently, an alternative field of financial theory was

developed and termed behavioural economics (Bloomfield, 2009; Ritter, 2003; Sahi, 2017). Traditional finance theories hold that markets are efficient and that when making financial decisions individuals exercise unbounded rationality with the goal of achieving utility maximisation (Riyazahmed & Saravanaraj, 2016). Recent behavioural economists have challenged traditional finance theories, citing factors which challenge unbounded rationality and barriers to perfect information gathering such as uncertainty and risk (Baker, Kumar, & Goyal, 2021; Mudzingiri et al., 2018). Bloomfield (2009) indicates that behavioural finance research acknowledges that financial markets operate with some participants attempting to maximise utility combined with other participants who are susceptible to sub-optimal outcomes as a result of psychological influences impeding decision-making. Sahi (2017) asserts that the financial decision-making process is influenced by heuristics, emotions, and other psychological motives which hinder the presence of unbounded rationality. This directly challenges the assumptions of traditional finance theories by acknowledging that financial decisions are influenced by factors outside of basic information gathering and often without perfect rationality.

The behavioural finance strand of research was developed largely based on two foundational concepts, cognitive psychology and limits to arbitrage (Ritter, 2003). Cognitive psychology describes the way people behave and make decisions considering heuristics, confidence, and self-efficacy (Ritter, 2003). On the basis that decision-making is a critical component of financial capability, the role cognitive psychology plays in the financial decision-making process forms the basis of analysis for this chapter. The second aspect of behavioural finance is limits to arbitrage which describes the notion that some deviations from fundamental value related to asset pricing (and the efficient market hypothesis) can be explained by financial and trading decisions made by agents who are not fully rational (Barberis & Thaler, 2002; Bloomfield, 2009; Ritter, 2003). In essence, this research paradigm provides alternative financial models to evaluate the influence of financial decision-making more effectively by taking into account factors outside of information gathering that often impair the rationality of the decision-making agent, such as psychological and personality factors (Nigam, Srivastava, & Banwet, 2018).

The innate tendency for individuals to be driven by emotion and psychological factors is an important consideration when evaluating financial decision-making (Ahmad, 2020). When applied to financial decision-making of humans who are not perfectly rational, the standards outlined by traditional finance theories render most financial decisions inappropriate based on

available information (de Meza et al., 2008). Instead, behavioural finance theories provide an alternative basis to evaluate financial decisions, giving consideration to psychological and internal factors to explain deviations from the 'expected' decision-making process if humans were perfectly rational (Barberis & Thaler, 2002; Ritter, 2003). Unlike neoclassical economics, the behavioural economics discipline recognises that financial behaviour and decision-making are influenced by psychological functioning (and associated factors) as well as an individual's ability to gather and process information (de Meza et al., 2008; Mudzingiri et al., 2018; Riyazahmed & Saravanaraj, 2016; Sahi, 2017). Consequently, financial behaviour is more appropriately reviewed using behavioural finance theories on the basis that the financial decision-making is influenced by psychological functioning in addition to information gathering.

3.2.2. Financial capability and decision-making

Psychological factors have been linked to financial capability levels largely due to a focus on behavioural economics and the influence behavioural biases may have on the financial decision-making process (Kempson et al., 2017; Shephard et al., 2017). Prior studies show that financial behaviour is the predominant indicator of financial capability levels and despite being informed by financial knowledge, financial decision-making is also impacted by other key components including impulsivity, behavioural biases, and locus of control (Russell et al., 2020; Storchi & Johnson, 2016). The concept of decision-making being governed by factors outside of information gathering was first introduced by Tversky and Kahneman (1974), who explored the idea that individuals often rely on heuristics to govern decision-making to avoid the complexity of weighing up the probability of various outcomes. The findings of Tversky and Kahneman (1974) and other behavioural theorists, directly challenge traditional financial theories where individuals are assumed to make decisions based entirely on information sourcing. In many circumstances, the concept of unbounded rationality is not applicable due to behavioural biases and other personality factors (Barberis & Thaler, 2002; Ritter, 2003).

Decision-making is the cognitive process which underpins positive financial behaviour including daily money management, long-term planning and the ability to weather financial adversity (Russell et al., 2020). Traditional studies focused on the link between financial knowledge and financial decision-making. Separately, psychological economists have explored the influence psychological factors can have on financial behaviour, and more importantly, financial decision-making (Tang & Baker, 2016). The capabilities approach and related theory referred to by Storchi and Johnson (2016) indicates that financial capability

supersedes financial literacy by better representing the combination of knowledge, skills and psychological factors that influence financial decision-making. Following the capabilities approach, the components of financial capability may be considered the supply of financial services, social norms, cultural values, and personal characteristics (a combination of financial literacy levels, psychological influences, and socio-demographic factors) (Storchi & Johnson, 2016).

To demonstrate financial capability is to make informed financial decisions directed towards achieving financial wellbeing (French et al., 2020). Therefore, the ability to exercise positive financial behaviour is imperative in the determination of financial capability and financial wellbeing. Studies have shown that effective financial decision-making depends on the source of information and the individual's ability to collect and process the relevant information (French et al., 2020; Gentile et al., 2016; Shephard et al., 2017). It is the collection and processing of the relevant information which is often influenced by psychological factors. Several studies have explored the link between financial knowledge and psychological factors, particularly exploring the influence behavioural biases may have on the selection and processing of information during the financial decision-making process (French et al., 2020; Gentile et al., 2016; Shephard et al., 2017). The importance of considering psychological factors is emphasised in the 'sourcing and processing' component of decision-making. Qualitative studies within the behavioural economics discourse have identified that, although financial knowledge plays an important role informing financial decision-making, psychological factors may have a diluting, or in some cases, voiding effect on financial behaviour largely due to the impact of behavioural biases (Kempson et al., 2017). A study found that including psychological factors in measuring financial behaviour, doubled the explanatory power of the model as compared with an economic model that measured only financial knowledge and attitudes (Shephard et al., 2017). Both financial knowledge and psychological factors have an important influence on financial decision-making.

3.2.3. The influence of psychological factors

When considering the influence of psychological factors on decision-making, researchers have commonly explored the impact of behavioural biases (Gentile et al., 2016; Kahneman, 2003; Tversky & Kahneman, 1981). Certain behavioural biases may impact investors negatively during the financial decision-making process, leading to inappropriate and potentially detrimental financial outcomes (Gentile et al., 2016). Following the initial works of Tversky and Kahneman (1981), Kahneman (2003) further explored the impact behavioural biases may

have on decision-making, in particular identifying intuition and rationality as the two systems that are believed to govern the decision-making process. The intuitive system draws on easily accessible knowledge and experience and is usually strongly influenced by emotion. The rationality system is slower and more deliberate while also considered more effortful (Kahneman, 2003). Although traditional finance models assume unbounded rationality, individuals can often feel a sense of comfort in using intuition to make effortless decisions (Kahneman, 2003). Gentile et al. (2016) focus on the impact overconfidence can have on the financial decision-making process, finding that individuals who are overconfident in their level of financial knowledge often make risky decisions related to upward biased forecasts. Eventually coined as the Dunning-Kruger effect, a study by Kruger and Dunning (1999) showed that individuals are unaware of what they do not know. In a financial context, the Dunning-Kruger effect describes a situation where individuals who lack financial knowledge, may not hold the necessary metacognitive skills required to accurately assess subjective financial knowledge levels. As a result, individuals may make financial decisions beyond the scope of their own knowledge, which can result in suboptimal financial outcomes.

Within the behavioural finance discourse, an expanding strand of research has directly challenged traditional investor assumptions of unbounded rationality and utility maximisation (Sahi, 2017). Sahi (2017) identified several behavioural biases that have a strong influence on an investor's decision-making ability, including self-control biases, overconfidence, and an individual's tendency to budget (Russell et al., 2020). Kruger and Dunning (1999) explored overconfidence and decision-making and found that incompetence may invoke poor financial decision-making while also inhibiting an individual's ability to self-assess their competence level, rendering them over-confident and exposed to exacerbated financial risk. Therefore, behavioural biases and framing effects can provoke sub-optimal decision-making, indicating financial literacy is not necessarily conducive to achieving financially capable behaviour (Gentile et al., 2016). When measuring financial capability, it is important to capture the collective impact of financial knowledge and psychological factors on financial decision-making.

Several studies have explored human behaviour and individual' approach to general decision-making (Russell et al., 2020; Storchi & Johnson, 2016; Tversky & Kahneman, 1974). A key contribution of behavioural economics is the role which emotions, internal instincts and past experiences have on an individual's financial decision-making process. Often individuals will develop mental shortcuts (heuristics) based on past interactions and decisions (Russell et al.,

2020; Storchi & Johnson, 2016). The concept of heuristics was developed based on the notion that humans are bounded rationally where people seek to make informed decisions in life but are usually more concerned with the actual act of being able to decide (Forbes et al., 2015). Most people make decisions under conditions of uncertainty and risk, rather than situations where risk probabilities can be quantified easily. Therefore, the use of heuristics for financial decision-making gives individuals a basis for reasonable and adaptive inferences, in a context where time and knowledge may be limited (Forbes et al., 2015). Importantly, these heuristics are likely to influence financial decision-making, providing a mechanism for guiding reactive behaviour while also in some cases impairing an individual's ability to make proactive financial decisions (Storchi & Johnson, 2016).

Based on findings from Kempson et al. (2017), five key psychological factors were found to impact financial decision-making and financial wellbeing. These are time orientation, impulsivity, social status (particularly related to social perceptions), self-control, and locus of control. In addition to these five psychological biases, Kempson and Poppe (2018) found action orientation also influenced financial wellbeing levels, thereby adjusting the model. Based on the impact psychological factors were found to have on financial decision-making and financial wellbeing, it is important to explore the influence they may also have on financial capability.

Time orientation (or future orientation) is an important factor influencing financial decision-making which details an individual's focus on their long-term or short-term self-interest (Benton, Meier, & Sprenger, 2007). Within behavioural finance studies, future orientation has been linked to concepts such as self-control. The idea is based on the assumption that individuals who make informed and optimal decisions are usually able to effectively discount costs and benefits to the present and use this information to make decisions in line with their 'long-run self-interest' (Benton et al., 2007). This concept is also linked to the idea that people, especially younger people, may feel disconnected from their financial futures. For example, some people may feel overwhelmed by the enormity and complexity of planning for their financial futures (Russell et al., 2020). In such cases, individuals may become passive in their financial actions and decisions. This is also often referred to as present bias, where individuals spend impulsively for instant gratification, with little regard for their long-term goals (Erta, Hunt, Iscenko, & Brambley, 2013). In particular, time/future orientation has been linked to long-term thinking and active future financial planning which are key behaviours aligned with spending and saving (Kempson et al., 2017). In contrast time orientation can be problematic in

situations when individuals overweight short-term outcomes, meaning their motivation to plan-ahead and undertake behaviours to build financial resilience is low (Erta et al., 2013).

Studies have also found a link between locus of control and financial behaviour (Kempson et al., 2017). Locus of control describes the degree to which an individual feels their behaviour determines the consequences or outcomes they face (Bucciol & Trucchi, 2021). Therefore, an internal or higher locus of control describes when individuals feel they can make decisions to actively control their current and future situation (ANZ, 2020; Bucciol & Trucchi, 2021). Alternatively, an external locus of control describes when individuals feel situations and events happen to them and, instead of being self-determined, outcomes may be influenced by factors such as luck (Bucciol & Trucchi, 2021; Kempson & Poppe, 2018). In such cases, a lower or external locus of control can impair an individual's ability to make proactive and informed financial decisions (ANZ, 2020). Therefore, an individual's locus of control is likely to influence their financial decisions, with a higher locus of control likely to be aligned with positive saving behaviour and motivation (Bucciol & Trucchi, 2021). Aligned with locus of control and related to an active focus on outcomes is the concept of action orientation which describes the ability for an individual to collect and apply knowledge to generate decisions or drive behaviour (Consumer Financial Protection Bureau, 2015). In a financial context, action orientation may describe a situation where individuals are motivated to actively manage their finances and make decisions.

Self-control and impulsivity are closely related based on the impact they may have on financial capability and decision-making. Financially literate individuals are likely to be less impulsive and better able to exercise self-control (Katauke, Fukuda, Khan, & Kadoya, 2023). A key behaviour recognised in a recent New Zealand Financial Capability Survey is spending restraint; in order for individuals to exercise restraint from spending, they need to be able to control spending impulses and undertake informed financial decision-making (Galicki, 2021). Similarly, informed financial decision-making often requires an individual to exercise self-control when faced with complex or enticing financial situations. Unlike impulsivity control, self-control is concerned with the development of enduring habits when faced with financial decisions (Galicki, 2021). Studies have shown that within a financial context, problems exercising self-control can result in low wealth accumulation (Gathergood, 2012). Considering impulsivity control, in a single moment or a long-term habit of exercising self-control, both influences can positively impact decision-making and financial outcomes.

The final psychological influence explored in Kempson and Poppe (2018) and used in this study is social status. By nature, humans are often concerned with their status or reputation amongst society. In many cases, this can lead to over-spending or poor financial decision-making in an attempt to manage appearances or social opinions. Consequently, being less motivated by social status and external opinions may have a positive influence on financial decision-making, where decisions are based on the needs and requirements of the individual's situation as opposed to what would be considered socially acceptable (Galicki, 2021; Kempson et al., 2017). Table 2 details the definition for each of the six psychological factors found to influence financial decision-making which are used in this study based on findings from Kempson and Poppe (2018). Humans are not perfectly rational and beyond information gathering are often influenced by behavioural biases and other personality influences (de Meza et al., 2008; Sahi, 2017).

Table 2: Summary of the selected psychological factors

Behavioural bias	**Definition**
Time orientation	The degree to which an individual is able to focus on the long-term benefits of decisions. Often linked to long-term thinking and positive spending/saving behaviours (Kempson et al., 2017)
Locus of control	The degree to which an individual feels their actions relate to the consequent outcomes or are in control of what happens to them (Bucciol & Trucchi, 2021)
Self-control	Development of enduring habits and exercising of self-restraint (Galicki, 2021)
Impulsivity	A quick decision based on an inability to exercise patience and short-term benefits (Stevens, 2017)
Action orientation	The ability to use or apply knowledge to act or make decisions (Consumer Financial Protection Bureau, 2015)
Social status	An awareness or concern for how one is perceived by others in society

3.3. Methodology

Like many concepts within the behavioural finance discourse, financial capability is not directly observable. Rather, it is often considered best measured as a combination of related components, such as financial knowledge, financial behaviour, and other factors which influence the financial decision-making process. A study by Cámara and Tuesta (2014) acknowledges the difficulty in measuring financial inclusion and details the use of Principal Component Analysis (PCA) to identify the components which can be used to predict financial inclusion. The research objective and resulting approach used by Cámara and Tuesta (2014) is considered comparable to the research questions and conceptual model informing analysis in this chapter. The study by Cámara and Tuesta (2014) demonstrates the effective use of principal component analysis (PCA) in the development of an index predicting a latent variable which is determined through a linear combination of other more observable components.

This study proposes a complementary financial capability index which is created based on the financial wellbeing conceptual model developed by Kempson and Poppe (2018). The study by Kempson and Poppe (2018) defines financial wellbeing as the ability to meet current financial commitments while concurrently achieving financial comfortability and resilience. The subsequent conceptual financial wellbeing developed by Kempson and Poppe (2018) measures financial wellbeing as a combination of financial knowledge, financial behaviour/financial capability, and psychological factors. This study takes guidance from the financial wellbeing conceptual model, developing a linear model of financial capability with independent variables which resemble those included in the Kempson and Poppe (2018) model, namely financial knowledge, financial behaviour, and psychological factors while controlling for key demographic factors. To enable computation of a financial capability score, this study uses a financial capability proxy as the dependent variable. The first step in data processing is to undertake factor analysis to understand the nature of any empirical interrelationships between variables and identify the effects individual items have on the proposed index. This is an important step in item selection for indexation as it enables identification of data points which are most relevant in explaining the dependent variable, while eliminating superfluous or repetitive variables.

Selected questions from the ANZ Financial Wellbeing Survey are used to form factors for the financial capability index. Item selection for principal component analysis was largely based on the financial wellbeing framework, as well as consensus drawn from the literature regarding factors which are likely to influence financial decision-making. Some researcher discretion is

exercised in selecting items, particularly for the financial capability proxy variable created to be used as the dependent variable in regression analysis. After data treatment and cleaning, the data is processed using factor analysis methodologies.

3.3.1. Sample and procedure

The data source used for index development is the 2017 ANZ Financial Wellbeing Study[14]. This survey is considered comprehensive and appropriate to undertake the intended analysis. The survey collected data from 1521 participants across New Zealand. We note that since the beginning of this study in August 2020, the Commission for Financial Capability has released the 2018 – 2019 Financial Capability Barometer Survey results. This survey is extensive and provides comprehensive data regarding financial capability in New Zealand. The 2021 ANZ Financial Wellbeing Survey results have also subsequently been released and will be used for further analysis in Chapter 4.

[14] The 2017 Financial Wellbeing data was kindly provided by Australia and New Zealand Banking Group Ltd and has been used under license with its permission (see https://www.anz.com/about-us/corporate-sustainability/community/investing). The ANZ Financial Wellbeing Survey was conducted by Galaxy Research as per Market Research Society Privacy Principles and delivered to participants online. Please note that the views expressed in this analysis are not necessarily those of ANZ and ANZ takes no responsibility for these views.
The financial wellbeing model survey questions can be found in Table 1 of the Technical Appendix at financial-wellbeing-nz18.pdf (anz.com.au).

Table 3: Respondent population characteristics – 2017 ANZ Financial Wellbeing Survey

Characteristic	Category	No.	Prop.	2018 Census[15]
Gender	Male	745	49.0%	49.4%
	Female	776	51.0%	50.6%
Age[16]	up to 24 years	339	22.3%	9.3%
	25 - 39 years	362	23.8%	20.4%
	40 - 54 years	355	23.3%	19.6%
	55 - 69 years	376	24.7%	16.9%
	70 years and older	89	5.9%	10.3%
Income[17]	up to $25,000	263	20.5%	
	$25,000 - $49,999	368	28.7%	
	$50,000 - $74,999	236	18.4%	
	$75,000 - $124,999	277	21.6%	
	$125,000 and over	139	10.8%	
Education	Primary school or below	16	1.1%	10.5%
	Secondary – Year 11 or below	188	12.4%	9.3%
	Secondary – Year 12 / 6th form	334	22.0%	8.3%
	Trade / apprenticeship	102	6.7%	9.2%
	Polytech/ technical certificate or	322	21.2%	13.7%
	Undergraduate certificate or diploma	212	13.9%	9.5%
	Degree/ Masters degree / Doctorate	347	22.8%	39.6%
Ethnicity[18]	New Zealand European	1121	73.7%	70.2%
	Māori	154	10.1%	16.5%
	Pacific Islands	55	3.6%	8.1%
	Asian	179	11.8%	15.1%
	Other, please specify	147	9.7%	n/a

Table 3 shows a frequency breakdown by gender, age, income, education, and ethnicity with the 2018 New Zealand census figures presented for comparison where possible. Please note, 2018 Census figures for income were only available at the individual level and not at the household level and have therefore not been included above. Census figures for education were not collected at the same level compared to the underlying ANZ survey. Comparative statistics

[15] All Census figures are from Stats NZ: Tatauranga Aotearoa. (2020). *New Zealand: Population and dwellings* https://www.stats.govt.nz/tools/2018-census-place-summaries/new-zealand

[16] Age information was collected on a more granular level. The age brackets documented were adjusted as per the table above for this analysis. Note, the Census also collected age data for ages 0-17 (remaining 23.5%) which was excluded from the data presented above in line with the age brackets used for this study.

[17] Income information was collected on a more granular level. The income brackets documented were adjusted as per the table for this analysis.

[18] Participants could select more than one ethnicity they identified with. Data is presented as broad ethnic groups. Note, the survey data collected has a high representation of NZ Europeans and notably lower representation of ethnic minorities.

are provided where possible, noting that figures relating to primary school as the highest qualification were not available. The Census also collected information for Level 3 certificates, no qualification, overseas qualification, and other categories that are not captured in the underlying study and have therefore not been included. Relative to population statistics from 2018, the dataset is considered reasonably representative of the New Zealand population in terms of ethnicity. Despite the majority (73.7%) of respondents identifying as New Zealand European, the survey captures information from minority ethnic groups to reflect the diverse ethnic profile of New Zealand.

The ANZ Financial Wellbeing Survey covers six key subcategories. The first section identifies important demographic screening variables and a range of questions on financial habits. Section two captures measures of objective and subjective financial wellbeing. Section three includes financial capability and financial knowledge questions. Section four covers a range of topics which can be summarised as financial attitudes, motivations, and psychological factors. Section five covers three new topics included in the 2017 financial wellbeing survey: namely planning and preparation for retirement, cost of housing stress, and comfort in discussing one's financial situation. The final section provides a comprehensive set of profiling demographics tailored to the New Zealand population.

3.3.2. Questionnaire

The ANZ questionnaire was largely constructed based on Likert scales which removes the ambiguity of open-ended question responses and enables efficient classification and grouping of responses. For example, several financial behaviour questions were allocated scaled response options of always, often, sometimes, rarely, never, and don't know. Categorical answers were given numerical values. Use of the data for this study required data cleaning and manipulation to ensure the data was standardised before further analysis. Informed researcher discretion is used to treat the data, including recoding or reverse coding to ensure the data was standardised in terms of scale response options and score allocations. As categorical responses were allocated a numerical value at the time of data collection, to achieve consistency answer scales are recoded to fit a 1-5 scale. In a similar way, to achieve consistency for our analysis, a numerical value of 1 is allocated to the answer that least aligns with financial capability, and a value of 5 is allocated to the response which is most aligned with financial capability. Consequently, some question responses were reverse coded. Table 43 in the appendix shows the survey items which are selected for analysis including answer scales and recoding treatments.

Although the Financial Wellbeing Framework and associated findings from Kempson and Poppe (2018) are leveraged to develop a complementary financial capability index, the index development methodology largely resembles the financial wellbeing analysis in Kempson and Evans (2021). Following this methodology, data analysis began with data cleaning and treatment, followed by PCA analysis, construction of components, and finally, multiple regression analysis. The key contribution of this study in contrast to Kempson and Poppe (2018) and Kempson and Evans (2021) is the development of a model with financial capability as the dependent variable, calculated as a function of financial knowledge, financial behaviour, and psychological factors while controlling for socio-demographic factors.

3.3.3. Factor analysis

A consensus within behavioural finance research is that financial capability is difficult to directly measure and is often best proxied as a combination of factors found to impact financial decision-making (Kempson et al., 2013). We follow a similar methodology as Kempson et al. (2013) and Kempson and Evans (2021) for developing a new measure of financial capability, by forming a regression equation where financial capability is proxied by a weighted combination of financial knowledge, financial behaviour, and psychological factors. This is achieved by completing factor analysis on the underlying data, followed by component computation, and the calculation of weightings for each component in the resulting regression equation.

The first step in data processing is to undertake factor analysis. Factor analysis identifies and groups variables that are highly correlated, known as components, which represent a specific dimension in the dataset (Hair, Black, Babin, & Anderson, 2014). The aim of factor analysis within the context of this study is to identify financial knowledge, financial behaviour, and psychological factor groupings which, when appropriately weighted, collectively represent a financial capability score. In relation to the research objective, factor analysis achieves a combination of unit of analysis specification, data filtering and reduction, and identification of appropriate variables into factors (Hair et al., 2014). Item selection for PCA, a common method of factor analysis utilised for this study, is largely based on the ANZ classifications within the survey, as well as leveraging the Financial Wellbeing Framework from Kempson and Poppe (2018).

To undertake factor analysis, we first differentiate between common and component analysis to determine the appropriate factor extraction method. Common factor analysis is based on the

common or shared variance amongst variables and is most justified when the aim of analysis is to identify latent dimensions of the data set. In contrast, component analysis considers variance at the total level, including common, specific, and error variance measures. Component factor analysis is deemed most appropriate when the aim of factor analysis is to reduce data inputs and identify a small number of factors which represent the maximum level of variance (Hair et al., 2014). PCA is a commonly used methodology for processing explanatory data particularly relating to the exploration and evaluation of financial variables. Ang and McKibbin (2007) utilised PCA to build a financial depth index within the Malaysian context. Similarly, Le, Kim and Lee (2015) explored measures of financial development in Asia, utilising PCA as part of their methodology. In contrast, Pesqué-Cela et al. (2021) used confirmatory factor analysis (CFA) to evaluate two existing financial inclusion models. On the basis that CFA is largely informed by theory rather than by data (as is PCA), Pesqué-Cela et al. (2021) use CFA to confirm whether existing models appropriately measure financial inclusion as a single or multi-dimensional construct. This is considered appropriate given they are evaluating existing models and comparing the results to findings in the literature. Alternatively, for this study, although informed by existing research for factors influencing financial capability levels, we approach index formation with the intention of using the underlying dataset as the driver of component formation and consequent equation development. PCA and CFA also differ in the equation outputs that are produced through the analysis. CFA results in a structural equation model based on a latent variable which is difficult to directly measure and is instead proxied by a large set of indicators. In contrast, PCA analysis results in a single linear equation where the dependent variable is proxied by a combination of weighted components (Pesqué-Cela et al., 2021). Based on the success of PCA in similar behavioural finance research, the intention to identify independent variables driven by the underlying data, and the objective to produce a single linear model of financial capability, this study utilises PCA to undergo index formation. The respective retained variables are used to calculate the financial knowledge, financial behaviour, and psychological variables, with the components weighted relative to their variance contribution. The three calculated variables are subsequently used as the independent variables in multiple regression to test their explanatory power relative to the financial capability proxy variable.

3.3.4. Multiple regression

Multiple regression analysis explores the relationship between independent variables and a single dependent variable. The academic validity of multiple regression analysis is grounded

in the belief that a single variable can be collectively explained by a combination of other related variables. The independent variables are weighted to reflect their relationship with the dependent variable and maximise the collective explanatory power of the model. The regression variable is formed through a linear combination of the independently weighted explanatory variables (Hair et al., 2014).

Before undertaking factor analysis to construct the independent variables, we first compute the dependent variable used to proxy financial capability. The financial capability dependent variable is calculated as the mean score of eight financial wellbeing questions from the ANZ Financial Wellbeing Survey, equally weighted at 0.125. The use of financial wellbeing questions to proxy financial capability is justified based on the findings from prior research indicating that financial capability levels are linked to financial wellbeing levels (Fan & Henager, 2022; Xiao, 2016). The selected questions are presented in Table 4. Collectively, these eight questions covered each of the topics indicated by the Commonwealth Bank of Australia et al. (2019) as relating to financial wellbeing, namely meeting financial obligations, freedom of financial decisions, control of finances, and financial security. Key questions captured under the financial wellbeing section of the ANZ survey that were omitted from the computation of the financial capability proxy variable related to emergency savings, confidence in one's financial situation over the next 12 months, financial resilience, and financial freedom. These topics, although holistically related to financial capability when considered from a behavioural perspective, predominantly measure financial outcomes associated with financial wellbeing, as opposed to informing financial behaviours. To illustrate the difference between the financial capability proxy variable computed for this study and the financial wellbeing variable used in Kempson and Poppe (2018), the components of both variables are outlined in Table 4. The components for the financial wellbeing conceptual model developed by Kempson and Poppe (2018) broadly capture meeting commitments, financial comfortability, and resilience for the future. Comparatively, the components used to proxy financial capability for this study predominantly focus on behavioural elements or outcomes directly related to key financial capabilities such as saving behaviour, and an ability to meet regular expenses.

Table 4: Dependent variable component comparisons

Financial wellbeing conceptual model [19]		**Proposed complementary financial capability index**			
Component	**Coeff.**	**Component**	**Coeff.**	**Low**	**High**
How often has no money for food and expenses	0.56	How would you describe your current financial situation?	0.125	1 (very bad)	5 (very good)
Ability to pay bills	0.59	Which of the following best describes how you generally feel about your current financial situation?	0.125	1 (out of control all the time)	5 (in control all the time)
How often payment problems at the final reminder due to lack of money	0.58	How often do you have any money left over after you have paid for food and other regular expenses?	0.125	1 (never)	5 (always)
How often has money left over at the end of the month	0.48	How often do you run short of money for food or other regular expenses?	0.125	1 (always)	5 (never)
How good/bad is your current financial situation	0.53	Which of the following best describes how well you are meeting bills and credit commitments?	0.125	1 (it is a constant struggle)	5 (without any difficulty)
How confident are you about financial situation in next 12 months	0.48	Thinking about the total income of your household, approx. how many months income do you have in savings?	0.125	1 (I don't have any savings)	5 (more than 12 months)
My finances allow me to do the things I want and enjoy life	0.51	Do you know how much money you spent last week?	0.125	1 (don't know)	5 (yes exactly)
How much could cover of an unexpected expense of one month's income	0.53	I try to stay informed about money matters and finance	0.125	1 (strongly disagree)	5 (strongly agree)
How much would need to borrow to cover unexpected expense	0.52				
How long could cover fall of income by a third without having to borrow	0.45				
Savings in terms of number of months' income	0.50				

Following factor analysis and the computation of the dependent variable for regression analysis, the dataset is split into two randomly selected sub-samples. One is the base set

[19] Kempson, E., & Poppe, C. (2018). *Understanding financial wellbeing and capability - A revised model and comprehensive analysis*. https://www.researchgate.net/publication/326847922_Understanding_Financial_Well-Being_and_Capability_-_A_Revised_Model_and_Comprehensive_Analysis/citations

(approximately two thirds of the original dataset) which provides the basis for the development of the multiple regression equation, and consequently the financial capability index. The second sub-sample (approximately one third of the original dataset) is the test set which is used to check the validity and robustness of the proposed financial capability index. Multiple regression analysis is undertaken on the base dataset to identify the coefficients and form the regression equation.

$$Financial\_Capability = \alpha_1 + \alpha_2 Financial\_Knowledge + \alpha_3 Financial\_Behaviour + \alpha_4 Psychological + \alpha_5 Gender + \alpha_6 Household\_Income + \alpha_7 Age + \alpha_8 Gross\_Assets \quad (1)$$

As shown in Equation (1), gender, household income, age, and gross assets are included as control variables. These control variables are selected based on previous research identifying relationships between financial capability and each of the selected socio-demographic factors. Studies have noted that income levels can limit financial choices and opportunities, women (and ethnic minorities) are often found to have lower financial wellbeing, and that life stage/age can impact on financial wellbeing (Galicki, 2021; Potrich, Vieira, & Kirch, 2015). Potrich et al. (2015) identified a relationship between financial literacy and a number of socio-demographic factors, including gender, education, and income. Further, Kempson and Poppe (2018) incorporate a range of social and economic factors in the financial wellbeing conceptual model, further supporting the inclusion of age, gender and income variables in our financial capability index. Leveraging the assumption that financial capability increases with income, wealth is also likely to impact financial capability levels (and wellbeing) and therefore a gross assets variable is included as a control variable.

The final step in the creation of the financial capability index is to examine the statistical significance of the model. After forming the regression equation, the proposed financial capability model is applied to the test dataset. Using the proposed model to calculate financial capability scores in the test dataset enables a comparison between the financial capability index scores (calculated using the proposed financial capability index) and the original financial capability proxy variable. If the difference between the mean of the financial capability proxy and financial capability index variables in the test dataset are not statistically different from zero, we are able to conclude the financial capability model is robust.

The result of regression analysis is a model where financial capability is predicted as a function of financial knowledge, financial behaviour, and psychological factors, while controlling for gender, income, age, and wealth. The model allows researchers to calculate a financial

capability score for participants, while also enabling simpler identification of areas where individuals score lower, thereby providing information to inform financial education programmes.

3.4. Results

As outlined above, the first step in the construction of the financial capability index is factor analysis. Factor analysis using principal component analysis with orthogonal rotation was undertaken resulting in 49 retained factors, 9 related to financial knowledge, 15 related to financial behaviour, and 25 related to psychological factors. For this project, SPSS software was used to complete PCA on the questions selected from the ANZ Financial Wellbeing Survey. Factor analysis results in 13 retained components across financial knowledge, financial behaviour, and psychological factors. Factors are retained with factor loadings of 0.4 and above on the orthogonally rotated matrix. Although general practice is to retain items with factor loadings above 0.3, a factor loading threshold of 0.4 and the selection of the orthogonally rotated items reduces the number of duplicate item loadings. For this analysis, the general rule of thumb is to retain components with eigenvalues greater than 1.0.

3.4.1. Factor analysis

Financial knowledge

Factor analysis for the financial knowledge questions results in three retained factors. Table 5 shows the eigenvalues, factor loadings and variance explained for the retained components. The three retained components collectively explain 68.6% of the variance. The results of the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and the Bartlett's test of sphericity presented in Table 5 indicate the data is adequate to undertake PCA. Collectively the components capture the influence of both objective and subjective financial knowledge. Beyond objective knowledge, it is important to measure components of subjective knowledge on the principle that cognitive psychology underpins the behavioural finance paradigm. Hence, to capture the overarching influence of financial knowledge, factor analysis retains components indicative of objective knowledge as well as perceived confidence in one's knowledge.

Table 5: Factor analysis - Financial knowledge

	Subjective_ knowledge	*Financial_ confidence*	*Objective_ knowledge*
Eigenvalues	3.8	1.3	1.0
Variance explained (%)	42.7	14.6	11.3
Rate your knowledge of: How to find more information about a financial product or investment when you feel you don't know enough to make a decision on your own (reverse coded)	0.867		
Rate your knowledge of: longer term financial investments to help you improve your financial situation and plan for retirement (reverse coded)	0.847		
Rate your knowledge of: Bank accounts and other products to help you manage your money day-to-day (reverse coded)	0.786		
How confident are you in: your ability to manage your money day-to-day		0.741	
How confident are you in: your ability to plan for your financial future	0.440	0.724	
How confident are you in: your ability to make decisions about financial products and services	0.468	0.713	
My parents discussed with me how to manage financial matters when I was growing up		0.601	
Risk knowledge - borrowing more than three times your household income to buy a home substantially increases the risk of payment problems (reverse coded)			0.853
Risk knowledge - a high-return investment is also likely to be high risk (reverse coded)			0.784
Model statistics			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.82		
Bartlett's Test of Sphericity – Sig.	0.00		

Financial behaviour

Factor analysis for the financial behaviour questions results in four retained components covering the key aspects of money management, planning, and financial decision-making and collectively explaining 64.9% of the total variance. The results of the KMO test for sampling adequacy and the Bartlett's test of sphericity presented in Table 6 indicate the data is adequate to undertake PCA. The eigenvalues, variance explanatory power, and factor loadings for each of the retained items are presented in Table 6. The overall question selection is predominantly determined by the questions under the respective financial knowledge, behaviour, and attitudes categories from Kempson and Poppe (2018). However, preference for this study is given to the portion of factor analysis covering psychological components. That is, if the topic of a question is justifiable for inclusion in two categories of factor analysis (e.g. 'a tendency to save' question

could imply time orientation focus, as well as savings behaviour), preference is given to inclusion in the psychological factor analysis. This aligns with the research question, aiming to explore and measure the influence of psychological factors on financial capability. Therefore, questions selected for the financial behaviour analysis focus predominantly on money behaviours rather than factors which influence behaviours.

Table 6: Factor analysis - Financial behaviour

	Saving	*Money_ management*	*Budgeting*	*Financial_ decision-making*
Eigenvalues	4.9	2.4	1.4	1.1
Variance explained (%)	32.5	15.7	9.1	7.6
I try to save money to have something to fall back on in the future (Reverse coded)	0.876			
I try to save some money regularly even if it is only a small amount (Reverse coded)	0.865			
I always make sure I have money saved for bad times (Reverse Coded)	0.825			
How often do you save money so that you could cover major unexpected expenses or a fall in income? (Reverse coded)	0.778			
How often do you have to borrow money or go into debt to buy food or to pay expenses because you have run short of money?		0.815		
How often do you have to borrow money to pay off debts?		0.800		
Fail to pay bill by the due date		0.724		
Overdraw or go into negative balance where your account is below $0 on your everyday transaction account		0.623		
I run short of money because I overspend		0.451		
Do you plan exactly how you will use the income or only make a rough plan? (Reverse coded)			0.777	
For your regular income, how often do you make a plan or a budget for how it will be used? (Reverse coded)			0.768	
How often do you keep to the plan you make for using your income? (Reverse coded)			0.717	
Which of the following best describes the extent to which you control your regular household expenses/personal expenses			0.554	
I always get information or advice when I have an important financial decision to make (reverse coded)				0.855
I spend a lot of time considering the options before I make financial decisions (reverse coded)				0.771
Model statistics				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.84			
Bartlett's Test of Sphericity – Sig.	0.00			

Psychological factors

The final portion of factor analysis is on the selected psychological questions. Questions identified for inclusion in the wider study with overlapping concepts are included in the psychological factor analysis as first preference. This ensures appropriate analysis for testing the research questions, while concurrently challenging the tendency of behavioural finance studies to prioritise measures of financial knowledge and financial behaviour above attitudes and psychological factors. Question selection for the psychological portion of analysis is largely guided by categorisation of questions in the underlying survey, with a particular focus on covering personality factors or psychological factors influencing financial decision-making. The eigenvalues, variance explanatory power and factor loadings of the retained factors from PCA are presented below in Table 7. The six psychological components retained from factor analysis collectively explain 57.0% of the total variance. The results of the KMO test for sampling adequacy and the Bartlett's test of sphericity presented in Table 7 indicate the data is adequate to undertake PCA. Factor analysis enables the identification of trends within the psychological questions, grouping data inputs into components that are related and represent a behavioural bias. The retained components match the psychological factors identified in the original study by Kempson et al. (2017), namely time orientation, impulsivity, locus of control, social status, self-control, and action orientation.

Table 7: Factor analysis - Psychological factors

	Time_ orientatio	*Impulsivi ty*	*Locus_ of_*	*Social_ status*	*Self_ control*	*Action_ orientatio*
Eigenvalues	6.2	2.5	1.8	1.5	1.2	1.0
Variance explained (%)	24.9	10.0	7.2	5.8	5.0	4.1
I live more for the present day than for tomorrow	0.729					
I prefer to spend any money I have rather than save it for unexpected expenses or an income fall	0.666					
I find it more satisfying to spend money than to save it	0.610					
I focus on the long term (Reverse coded)	0.586		0.459			
The future will take care of itself	0.579					
I have a tendency to save rather than to spend (Reverse coded)	0.566					
My financial situation is largely outside my control	0.500					
I am impulsive		0.754				
I say things before I have thought them through		0.696				
I often do things without giving them much thought		0.622				
I find it difficult to break undesirable habits		0.576				
I am impulsive and tend to buy things even when I can't really afford them		0.505				
I can pretty much determine what happens in my life (Reverse coded)			0.741			
I am always in control of my actions (Reverse coded)			0.710			
When I make financial plans, I do everything I can to succeed (Reverse coded)			0.613			
I am good at resisting temptation (Reverse coded)			0.600			
When I have to do something important I don't like, I do it immediately to get it done (Reverse coded)			0.525			0.413
I care about how other people see me				0.863		
I am concerned about my status among people I know				0.816		
I want other people to respect me				0.757		
I would rather cut back than put everyday spending on a credit card I couldn't repay in full each month (Reverse coded)					0.798	
I prefer to buy things on credit rather than wait and save up					0.595	
Before I buy something I carefully consider whether I really need it (reverse coded)					0.469	
When I have a difficult decision to make, I tend to put it off to another day						0.753
When I have to choose between a lot of options, I find it difficult to make up my own mind						0.680
Model statistics						
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.88					
Bartlett's Test of Sphericity – Sig.	0.00					

3.4.2. Formation of the variables

Following factor analysis, the retained components are calculated by multiplying the factor loading and the data item value. PCA results in 13 retained components as shown in Table 8. The next step in the analysis is to compute new variables for financial knowledge, financial behaviour, and psychological factors based on the results of factor analysis. The independent variables are calculated as a weighted sum of the retained components, where components are weighted in accordance with the proportion of variance they contribute to the explanatory power of the model. The eigenvalues, percentage of variance explained, and allocated weighting for each retained component are presented in Table 8. Equations (2), (3), and (4) below show the computation of each of the components.

Table 8: Factor analysis eigenvalues, variance, and weightings

Component	**Initial Eigenvalues**		
	Total	% of Variance	Weighting[20]
Financial knowledge			
Subjective_knowledge	3.8	42.7	0.62
Financial_confidence	1.3	14.6	0.21
Objective_knowledge	1.0	11.3	0.17
Financial behaviour			
Saving	4.9	32.54	0.50
Money_management	2.4	15.73	0.24
Budgeting	1.4	9.10	0.14
Financial_decision-making	1.1	7.56	0.12
Psychological			
Time_orientation	6.2	24.89	0.44
Impulsivity	2.5	10.01	0.18
Locus_of_control	1.8	7.22	0.13
Social_status	1.5	5.85	0.10
Self_control	1.2	4.95	0.09
Action_orientation	1.0	4.12	0.07

*Financial_Knowledge = (0.62*Subjective_knowledge) + (0.21*Financial_confidence) + (0.17*Objective_knowledge)* (2)

[20] Weighting is allocated based on % of variance explained for each component within three separate analyses (financial knowledge, financial behaviour, psychological factors). Note, the weightings as presented in the table (and throughout the thesis) may sum to more than or less than 1.0 due to rounding.

*Financial_Behaviour = (0.50*Saving + (0.24*Money_management) + (0.14*Budgeting) + (0.12*Financial_decision-making)* (3)

*Psychological = (0.44*Time_Orientation) + (0.18* Impulsivity) + (0.13*Locus_of_control) + (0.10* Social_status) + (0.09*Self_control) + (0.07*Action_orientation)* (4)

The results in Table 8 depict the statistical outcomes resulting from robust data treatment and factor analysis methodology. Application of this methodology on the dataset resulted in retaining variable components which capture the various influences prior research has found to impact financial capability. This is particularly encouraging for the psychological factors, given the retained components closely resembled the psychological factors included in the Kempson and Poppe (2018) Financial Wellbeing Framework.

3.4.3. Regression analysis

The next step in index formation is multiple regression. The regression variable is formed through a linear combination of the independently weighted explanatory variables (Hair et al., 2014). Following factor analysis, the original dataset (1521 participants) was split into two randomly selected sub-samples. The base dataset (1051 participants) was used to develop the financial capability index. The test dataset (470 participants) was used to test the validity and robustness of the proposed complementary financial capability index. Multiple regression analysis was undertaken on the base dataset to identify the variable coefficients and form the regression equation.

Multiple regression analysis is justified for this study on the basis that the Kempson and Poppe (2018) framework this study takes guidance from models financial wellbeing as a multi-faceted function of knowledge/skills, financial behaviour, and psychological factors. Based on the assumption that financial capability can be modelled as a similar function with adjusted data inputs to accommodate a financial capability proxy as the dependent variable, multiple regression is justified as the appropriate index methodology. Regression analysis is undertaken on the base dataset, with financial capability as the dependent variable, financial knowledge, financial behaviour, and psychological factors as the independent variables, and income level, age, gross assets, and gender as control variables.

Table 9: Base group multiple regression

	Beta	*T-value*
Constant	0.45	3.58***
Financial Knowledge	0.04	4.07***
Financial Behaviour	0.14	15.00***
Psychological	0.04	3.15***
Age	0.07	4.47***
Gross Assets	0.05	3.28***
Household Income	0.10	6.74***
Gender	-0.07	-2.07**
Model summary		
R^2	0.61	
Adjusted R^2	0.60	

*N=1051; * p<10%, ** p<5%, *** p<1%*

Table 9 shows the coefficients and t-statistics for the regression model. With an adjusted R^2=0.60 (and an R^2=0.61), the independent variables included in the regression model collectively explain 60% of the variance in the dependent variable, financial capability. A confidence interval of 95% is used for this analysis. Coefficients are significant at the 5% level for all independent and control variables. We note the small yet significant coefficients for the financial knowledge and psychological factor variables as compared to financial behaviour. We anticipate this aligns with findings from Kempson and Poppe (2018) stating that the influence of knowledge and psychological factors is often mediated through the financial behaviour variable. This hypothesis is tested in the subsequent correlation analysis section. We further note the constant coefficient of 0.45 which is indicative of the base level financial capability score if the value of all independent and control variables was zero. This is generally important to note in regression analysis, although in the case of this study, the constant has no economic meaning due to the impracticality of all independent variable scores, particularly gender and age, being zero. Finally, the gender control variable has a small and negative coefficient. This is likely due to the nature of categorical responses being given numeric values and the inevitable 'ranking' that occurs as a result. The response options for gender are coded as 1 for male, and 2 for female as that was the way in which the data from the Financial Wellbeing survey was supplied. The results of multiple regression analysis reveal a model where financial capability is calculated as a function of financial knowledge, financial behaviour, and psychological factors, while controlling for gender, household income, age, and gross assets.

The success of this methodology is largely due to the appropriateness of the underlying survey data which was originally constructed based on the work of Kempson and Poppe (2018). In order to test the wider applicability of the complementary financial capability index and development methodology, Chapter 4 details two separate test applications of the financial capability index using different datasets. Firstly, the index formation methodology is repeated on a financial literacy dataset from Italy which is materially different to the dataset used to develop the original index. This provides the opportunity to test whether adjustments during the index formation methodology are feasible and continue to result in a robust financial capability index model. Secondly, the index is tested through a direct application on a more recent (2021) iteration of the ANZ Financial Wellbeing Survey. Due to small differences in the survey data identified through thorough question mapping, the methodology is re-run eliminating questions that are not included in the 2021 iteration of the survey. This ensures the data inputs are as closely aligned as possible between the 2017 and 2021 datasets. The adjustments in the data inputs allow a reasonably direct application of the financial capability index to the 2021 data, enabling a comparison of scores over time and an interpretation of potential trends in financial education and behaviour. Testing applications of the methodology and the financial capability index is important to further validate the effectiveness of the index and test for robustness. Detailed methodology and results from the index applications are outlined in Chapter 4.

3.4.4. Correlation analysis

Findings from Kempson and Poppe (2018), found the nature of the relationship between financial knowledge and psychological factors on financial capability to be predominantly indirect. This is because the impact of financial knowledge and psychological factors are considered to be largely mediated through the financial behaviour variable due to the influence they have on the financial decision-making process. Therefore, financial behaviour is often assumed to be the largest determinant when measuring financial capability, given it is the outcomes of financial decisions which are thought to determine financial outcomes and wellbeing levels. Correlation analysis provides the ability to review the potential presence of multicollinearity between independent variables, while also providing an opportunity to assess the findings from Kempson and Poppe (2018) related to the direct and indirect influences on financial decision-making.

Table 10: Correlation analysis - independent variables

	Psychological	Financial Behaviour	Financial Knowledge	Age	Gross Assets	Household income	Gender
Psychological							
Financial Behaviour	0.61**						
Financial Knowledge	0.43**	0.46**					
Age	0.39**	0.28**	0.11*				
Gross Assets	0.30**	0.43**	0.39**	0.45**			
Household income	-0.03	0.12*	0.13*	0.03	0.36**		
Gender	-0.03	-0.15**	-0.1*	-0.13*	-0.18**	-0.14**	

** p<0.01 (2-tailed); * p<0.05

The results of Pearson correlation analysis between the independent variables are shown in Table 10, with the asterisk denoting the significance value indicating the strength, and statistical significance of the relationship. Both the financial knowledge and psychological independent variables have significant, yet small coefficients indicated by the results of regression analysis. The correlation results show that both variables have a moderate to strong positive correlation with the financial behaviour variable. Consequently, the additional impact over and above what is captured by the financial behaviour variable is small, yet significant. In terms of control variables, gross assets have a weak-moderate correlation with the financial behaviour, psychological factors, and financial knowledge variables. This is unsurprising given that accumulation of wealth is often the result of positive financial decision-making. One important aspect of the correlation results is the irrelevance of the negative correlation between gender and other variables. This is due to categorical responses being given numerical values to enable quantifying of the data.

Table 11: Correlation diagnostics and VIF

	Tolerance	VIF
Psychological	0.53	1.90
Financial Behaviour	0.53	1.90
Financial Knowledge	0.69	1.46
Age	0.68	1.47
Gross Assets	0.55	1.81
Household income	0.83	1.21
Gender	0.94	1.06

Finally, a variance inflation factor (VIF) is computed for each of the explanatory variables to review the potential presence of multicollinearity. Assessment of the VIF provides an indication as to the level of correlation between an explanatory variable and other variables in the regression model. The results shown in Table 11 indicates all VIF values are below 2.0, confirming multicollinearity among explanatory variables is low and has not detrimentally impacted the statistical significance of the multiple regression results.

3.4.5. Robustness testing

To test the validity of the model, the regression equation developed using the base dataset is subsequently applied to the test dataset, which enables the calculation of a financial capability index score for each participant. Valid financial capability scores are only calculated for participants who have complete sets of data for each of the data points included in the analysis. As shown in Table 12, only 265 valid financial capability scores are calculated compared to the wider test dataset group of 470 participants. Descriptive statistics are compared to assess the accuracy of the proposed index in predicting an individual's financial capability score based on their responses to selected financial knowledge, financial behaviour, and psychological questions. For ease of interpretation and comparison, financial capability scores from the base and test groups are converted to a score out of 100 using a multiplier of 20 (based on the highest maximum score across the 3 score categories below). The adjusted results are shown in Table 12.

Table 12: Financial capability (base and test) adjusted descriptive statistics

	Financial Capability Proxy (Base)	*Financial Capability (Test) Proxy*	*Financial Capability Index (Test)*
N	1051	470	265
Minimum	20.00	25.71	36.73
Maximum	100.00	100.00	90.96
Mean	68.57	67.95	67.25
Standard deviation	14.98	15.21	11.31

Robustness testing confirms the validity of the proposed complementary financial capability index. The index developed using the base dataset is applied to the test dataset to assess the wider applicability of the index on a different subset of survey cases. To test the predictability strength of the regression model, it is compared to the financial capability proxy variable in the

test dataset which is calculated using the same financial wellbeing proxies that are used to calculate the dependent variable in the base dataset. A one sample means test is used to compare the means of the financial capability proxy (test dataset) and the financial capability index variables, as shown in Table 13. The results show a t-value of -1.13 and a two-sided significance value of 0.26. Collectively, these indicate there is insufficient evidence to reject the null hypothesis that there is no statistically significant difference between the means of the financial capability proxy and the financial capability index variables. Consequently, we conclude that the financial capability index can robustly predict the financial capability scores of individuals within the dataset.

Table 13: Financial_Capability_Index100 one-sample means test

	Mean	*T value*	*Two-sided sig.*	*Mean diff.*	*95% CI Lower*	*95% CI Upper*
Financial Capability Proxy	67.95					
Financial Capability Index	67.25	-1.13	0.26	-0.79	-2.17	0.58

To further test the robustness of the financial capability index calculated above, we complete forward regression modelling. Based on the core research question of the paper, the methodology used in this chapter prioritised the psychological variable to confirm the individual impact of psychological factors on financial capability scores, over and above what may be captured by the financial behaviour variable. Forward regression modelling enables the construction of a model through iterative analysis, understanding the impact that adding an additional variable to the model may have on the explanatory power (R^2 value).

$$Model\ 1: Financial\_Capability = \alpha_1 + \alpha_2\, Psychological$$

$$Model\ 2: Financial\_Capability = \alpha_1 + \alpha_2\, Psychological + \alpha_3\, Financial\_Knowledge$$

$$Model\ 3: Financial\_Capability = \alpha_1 + \alpha_2\, Psychological + \alpha_3\, Financial\_Knowledge + \alpha_4\, Financial\ Behaviour$$

$$Model\ 4: Financial\_Capability = \alpha_1 + \alpha_2\, Psychological + \alpha_3\, Financial\_Knowledge + \alpha_4\, Financial\ Behaviour + \alpha_5\, Gender + \alpha_6\, Household\_Income + \alpha_7\, Age + \alpha_8\, Gross\_Assets$$

Through the application of the forward regression analysis, we utilise a four-step model, adding an additional independent variable for Models 1-3, and including all independent and control

variables in Model 4. As the focus of this chapter is the impact of psychological factors, the psychological variable was given precedence in the regression modelling, with Model 1 including the psychological variable in isolation. From this position, an additional independent variable is added with each successive model, with the increase in the R^2 value indicative of the strength of the influence the independent variable has on financial capability. This provides the opportunity to understand the ability of the psychological variable to explain a portion of the variance in financial capability in isolation from financial behaviour, as well as identifying the explanatory power of the index through gradual addition of independent and control variables. Undertaking linear regression analysis as per each of the models detailed above results in two conclusions regarding the robustness of the model. Firstly, statistical significance of the independent variable coefficients in regression analysis confirm the individual relationship between the explanatory and dependent variables. Secondly, the significance of Model 4 confirms the overall significance of the financial capability index proposed in this chapter. The results of the four-model forward regression are shown in Table 14.

Table 14: Forward regression four-model analysis

	Model 1	**Model 2**	**Model 3**	**Model 4**
R	0.56	0.60	0.73	0.78
R^2	0.31	0.36	0.54	0.61
Adjusted R^2	0.31	0.36	0.54	0.60
R^2 change		0.05	0.18	0.07
Std error	0.62	0.60	0.51	0.47
Durbin-Watson	1.94	1.88	1.93	1.93
Coefficients				
Constant	1.03 (8.32***)	0.79 (6.36***)	0.48 (4.26***)	0.45 (3.58***)
Psychological	0.21 (19.75***)	0.15 (12.74***)	0.04 (3.45**)	0.04 (3.15***)
Financial knowledge		0.11 (8.36***)	0.06 (5.55***)	0.05 (4.07***)
Financial behaviour			0.17 (16.99***)	0.14 (15.00***)
Gender				-0.07 (-2.07**)
Age				0.07 (4.47***)
Gross Assets				0.05 (3.28***)
Income				0.10 (6.74***)

*t-statistics are presented in parentheses; * p<10%, ** p<5%, *** p<1%*

Importantly, the results of Model 1 indicate that a model containing only the psychological variable and a constant explains just over 30% of the variance in the financial capability dependent variable. This supports research question one, by confirming the statistical significance of the psychological factors variable. Looking at the results of Model 2, the addition of the financial knowledge variable only increases the variance explained by 0.05 and reduces the standard error from 0.62 to 0.60. This somewhat supports the indication of prior studies suggesting that the influence of financial knowledge on financial capability is indirect, largely captured through the role knowledge plays informing financial decision-making (Consumer Financial Protection Bureau, 2015; Kempson et al., 2017). Model 3 shows the addition of the financial behaviour variable to the index results in a variance explained which is higher than Model 2 by 0.18 and reduces the standard error by 0.09. These results indicate the addition of the financial behaviour variable is appropriate and results in a model with a considerably higher explanatory power. Models 1-3 collectively confirm the three independent variables are justified in the model, on the basis of the positive and significant coefficients, as well as the simultaneous increase in the R^2 value and decrease in the standard error. Finally, Model 4 includes the control variables identified previously to have an impact on financial capability levels. Model 4 explains 60% of the variation in the financial capability dependent variable, which is 7% higher than Model 3 while also further reducing the standard error by 0.4. Unlike the other control and independent variables, gender has a negative coefficient which is irrelevant in this context. This is due to categorical data being given numerical values to enable the use of quantitative analysis techniques and is not an accurate measure of the relationship between gender and financial capability. The above results provide additional support for the explanatory variables selected in this model and further confirm the value of incorporating an independent measure of psychological factors.

The results from forward regression modelling as detailed in Table 14 confirm the robustness of the financial capability index developed in this chapter. Further, the results indicate that despite differences in their explanatory contribution, the addition of each independent variable (and the control variables in Model 4) improves the level of variance explained by the model, while also lowering the standard error. This confirms the importance of incorporating an explicit measure of psychological factors independent of what may be captured by the financial behaviour variable, to increase the strength of the financial capability index model.

3.5. Demographic analysis

Despite low financial capability being a systemic issue, many subgroups in society are found to have lower levels than others. For this reason, it is important to undertake demographic analysis to better understand the influence they may have on financial capability levels.

Table 15: Demographic analysis TEST financial capability index scores (adjusted)

Characteristic	Category	Min	Mean	Max	Mean diff.	Sig.
Gender	Male	47.16	69.94	90.76	5.67	0.000[21]
	Female	35.96	64.27	86.40		
Age	Under 25 years	46.87	61.91	82.74		
	25 - 39 years	35.96	61.94	83.51		
	40 - 54 years	48.02	68.11	87.68		
	55 - 69 years	45.88	73.74	90.76		
	70 - 74 years	64.91	77.15	87.74		
Ethnicity	New Zealand European	45.88	67.71	90.76	5.59	0.12[22]
	Māori	45.88	62.12	83.48		

Table 15 provides the demographic breakdown for the test dataset participant financial capability scores. As mentioned above, the financial capability index scores for the test dataset are adjusted using a factor of 20, resulting in possible scores ranging from 0 to 100. On average, males are more financially capable than females, with average financial capability scores of 69.94 and 64.27, respectively. The results of an independent t-test for the equality of means, indicates a statistical difference between males and females of 5.67, t(262.93) = 4.19, p=0.00, not assuming equal variances.

Table 16 provides the results of the one-way ANOVA test comparing financial capability index scores across age brackets. Using the results of the Tukey HSD test exploring the significance of the mean differences across age brackets, we find that financial capability tends to be lower in younger age brackets and higher in older age brackets (F(4,260) = [20.04], p=0.00). For example, the mean financial capability index score for 18–24-year-olds is lower than all other age bracket excluding 25-39 years, with the mean differences significant at the 1% confidence level. Similarly, looking at the 70 years and over category, mean scores are significantly higher

[21] This is based on an independent sample t-test for equality of means.
[22] This is based on a summary independent samples test, using mean and standard deviations and assuming equal variances.

than all age brackets up to 54 years, with a mean difference range of 9 – 15. These findings align with those in Galicki (2021), where age is found to impact an individual's ability to develop financial knowledge and experience, and therefore influences financial capability levels.

Table 16: Mean financial capability index score difference by age bracket

	18-24 years	**25-39 years**	**40-54 years**	**55-69 years**
18-24 years				
25-39 years	0.03			
40-54 years	6.20**	6.17**		
55-69 years	11.83**	11.80**	5.62*	
70 years & over	15.24**	15.21**	9.03**	3.41

** p<0.01; * p<0.05

The breakdown of financial capability scores by ethnic group revealed a reasonably high level of variability. Due to the random nature of the data split between the base and test groups and general under-sampling of non-NZ Europeans in the survey, limited data is available for ethnic groups outside of NZ European and Māori, particularly within the test data set. Therefore, without accurate representation within the financial capability scores, the descriptive statistics have not been presented. It is however still important to highlight the important impact ethnicity can have on the development of financial capability levels as identified in Lusardi and Mitchell (2011b). This is demonstrated to some degree in the results of demographic analysis, with NZ Europeans scoring an average financial capability index score of 67.71 as compared to 62.12 for Māori. Once again, an independent samples test between the mean scores of NZ European and Māori participants shows a mean difference of 5.59. However, this is not considered statistically significant with a p-value of 0.12. Although these results are generally indicative of financial capability level discrepancies between NZ Europeans and Māori, large differences in sample sizes between the two ethnic groups is a limitation on these results.

3.6. Discussion and conclusions

To provide context for the conclusions drawn from this study, it is important to outline the similarities and differences between the Kempson and Poppe (2018) model and the proposed complementary financial capability index developed in this study. Table 17 shows a comparison of the retained components from factor analysis for the complementary financial capability index and the components from Kempson and Poppe (2018) financial wellbeing conceptual model.

Table 17: Financial wellbeing conceptual model and complementary financial capability index comparison

	Kempson & Poppe	**Proposed complementary index**	
	Component	**Component**	**Weight**
Financial knowledge	Knowledge of money management	Subjective knowledge	0.62
	Experience of money management	Financial confidence	0.21
	Understanding of managing financial risk	Objective knowledge	0.17
	Financial inclusion		
	Knowledge of how to compare financial products		
Financial behaviour	Active saving	Saving	0.50
	Not borrowing for day-to-day expenses	Money management	0.24
	Planning use of income	Budgeting	0.14
	Informed financial decision-making	Financial decision-making	0.12
	Spending restraint		
	Keeping track of money		
	Restrained use of consumer credit		
	Informed product choice		
Psychological	Time orientation	Time orientation	0.44
	Impulsivity	Impulsivity	0.18
	Social status	Social status	0.10
	Self-control	Self-control	0.09
	Locus of control	Locus of control	0.13
	Action orientation	Action orientation	0.07
	Attitudes towards spending, saving, & borrowing		
	Financial confidence		
Dependent variable	Meeting commitments	Which of the following best describes how well you are meeting bills and credit commitments?	0.125
	Being financial comfortable	Which of the following best describes how you feel about your current financial situation	0.125
	Resilience for the future	Thinking about the total income of your household, approx. how many months income do you have in savings?	0.125
		How often do you run short of money for food or other regular expenses?	0.125
		How would you describe your current financial situation?	0.125
		How often do you have any money left over after you have paid for food and other regular expenses?	0.125
		Do you know how much money you spent last week?	0.125
		I try to stay informed about money matters and finance	0.125

Comparing the components of the complementary financial capability index with the components of the Kempson and Poppe (2018) financial wellbeing conceptual model reveals a clear resemblance and some important deviations. It is important to highlight that the components retained for the complementary financial capability index developed in this chapter were measured to proxy financial capability levels. This differs distinctly from the model developed by Kempson and Poppe (2018) where the framework measures financial wellbeing levels. The key difference being that the financial capability index measures financial behaviours and factors which influence financial decision-making as opposed to measuring the ability to meet financial commitments, financial comfortability, and resilience for the future (Kempson & Poppe, 2018).

For financial knowledge, there is two noticeable distinctions between the complementary financial capability index components and the Kempson and Poppe (2018) model. Firstly, financial inclusion questions were largely not included in the ANZ Financial Wellbeing Survey used to develop the financial capability index. Secondly only one objective knowledge component is retained, focusing on objective measures of financial risk knowledge. This differs from the Kempson and Poppe (2018) financial wellbeing conceptual model which includes three separate knowledge components covering money management, financial products, and financial risk. It is important to recognise that the ANZ Financial Wellbeing Survey utilised to develop the financial capability index focuses on a combination of objective and self-evaluated measures of financial knowledge. This aligns with literature asserting objective knowledge can only guide effective decision-making when it coincides with improved self-efficacy and confidence (Russell et al., 2020). Consequently, retained financial knowledge and experience components sufficiently proxy both objective and subjective measures of financial knowledge. To further proxy financial knowledge, question inputs related to subjective financial confidence are included in the financial knowledge portion of this study. This results in a financial confidence variable being calculated as part of the financial knowledge components, as compared with the psychological portion as in the model by Kempson and Poppe (2018).

For financial behaviour, the complementary financial capability index construction resulted in four retained components which closely resemble the components in the model by Kempson and Poppe (2018). The main difference is the lack of a ‘restrained use of consumer credit’ measure, although upon reflection, the money management component of the complementary financial capability index sufficiently covers topics including the use of debt to cover day-to-day expenses and the overdrawing of accounts which may be considered related to the use of

consumer credit. We also make the assumption that the money management component retained in this study covers questions included in the 'not borrowing for daily expenses', 'spending restraint', and 'keep tracking of money' components from the Kempson and Poppe (2018) model.

Finally, the psychological components retained for the complementary financial capability index are similar to the psychological components included in the financial wellbeing conceptual model by Kempson and Poppe (2018), excluding the 'attitudes towards spending, saving, and borrowing' and 'financial confidence' variables. This is likely due to researcher selection for data inputs in the complementary financial capability index formation, with items being excluded for one of two reasons: a high number of missing data or irrelevance in relation to the study's definition of financial capability adopted for this study. The financial confidence questions are included in the financial knowledge analysis section due to being classified by the researcher as relating to subjective knowledge and confidence.

Our analysis provides evidence that psychological factors have an explicit influence on financial capability levels. Traditional studies have focused on the explanatory power of financial knowledge, financial attitudes, and financial behaviours. The Kempson and Poppe (2018) financial wellbeing conceptual model provides a deeper understanding of the influence psychological factors have on the development of financial capability and consequent levels of financial wellbeing. Leveraging this model to develop a complementary financial capability index which strengthens and supports existing financial capability and wellbeing models justifies the inclusion of an explicit psychological variable.

The Kempson and Poppe (2018) financial wellbeing conceptual model clearly identifies the relative influence each of the components (financial knowledge/experience, financial behaviour, psychological factors and social & economic environmental) have on determining financial wellbeing. Unsurprisingly, socio-economic factors play an important contextual role either adding to or detracting from environmental influences on financial wellbeing that are often outside of an individual's control (e.g. age, ethnicity, gender). The model demonstrates that financial knowledge combines with psychological factors to influence an individual's decision-making process and guide financial behaviour. Ultimately, it is the outcomes of this behaviour combined with self-efficacy and subjective comfort that determines an individual's financial wellbeing. Therefore, as financial capability measures knowledge and skills

associated with achieving positive financial outcomes, we attribute a similar model to the measurement of financial capability levels.

This study finds that financial behaviour has the greatest impact on financial capability. The explanatory power of financial knowledge in determining financial capability levels over and above what is captured by financial behaviour measures is much smaller than what has been implied by several earlier studies exploring financial literacy. This reconfirms the findings of modern studies which assert that financial knowledge has a limited impact on financial capability when considered in isolation from other factors such as financial behaviour and decision-making. An individual who is financially knowledgeable will only achieve improved financial capability levels if the knowledge is used to effectively guide positive financial decision-making towards achieving their financial goals. Similarly psychological factors have a small, yet significant influence on financial capability. The findings of this study confirm that psychological factors have a statistically significant influence on financial capability, largely due to their direct influence on decision-making. Therefore, it is likely some of the influence of the psychological variable is captured by the financial behaviour variable, which is indicated by the moderate to strong positive correlation between the two variables. Collectively, the results of index development support the robustness of the complementary financial capability index proposed in Figure 1.

The inclusion of a psychological component in the financial capability index is supported by themes explored in behavioural finance and economics research, particularly regarding gender differences in preferences and financial decision-making. Croson and Gneezy (2009) find that women are often more risk-averse when compared to men. This may directly impact psychological factors which can consequently influence financial decision-making (e.g. impulsivity and time orientation). This finding extends work by Finucane, Slovic, Mertz, Flynn and Satterfield (2000) which shows that controlling for risk understanding, men and women differ in their risk perceptions as on average, women tend to be more risk averse than men. Further, studies have found that the gender differential related to risk appetite is more prominent in majority ethnic groups as compared with ethnic minorities (Finucane et al., 2000). Therefore, it has been found that risk appetite and other psychological factors influencing decision-making may be influenced by gender as well as ethnicity, culture, and other socio-demographic factors.

Research finds that females are more likely to allow emotions to affect their decision-making, including nervousness and fear about the potential for a negative outcome. This may explain the tendency for females to be more risk averse than males, avoiding risky decisions to reduce the likelihood of a suboptimal result (Croson & Gneezy, 2009). These phenomena directly impact an individual's perception of financial decisions. However, the impact is not comprehensively captured in traditional financial capability measures. These findings support the work of de Meza et al. (2008) who show that much of the variability in financial capability levels displayed in the United Kingdom Financial Services Authority survey could be explained by differences in intrinsic psychological attributes as opposed to differences in financial information, understanding, or skill. Generally, the contribution of behavioural economics and finance is that individuals do not simply act on information and skill level but are also influenced by psychological factors. Humans are unavoidably prone to cognitive biases which often influence decision-making and may result in suboptimal outcomes (de Meza et al., 2008). Hence, it is crucial financial capability measures evolve to capture the influence of behavioural biases through the inclusion of a psychological variable.

The findings from the behavioural economics literature presented above highlight the importance of the relationship between financial decision-making and psychological factors. Unsurprisingly, one of the key measures of financial capability is financial decision-making ability. Although current literature confirms the presence of this relationship, it is important that traditional measures of financial capability adapt with these findings. Overall, the development of a complementary financial capability index contributes to the wider body of literature within the behavioural finance discourse, supporting the financial wellbeing conceptual model developed by Kempson and Poppe (2018) and further strengthening existing behavioural finance models by highlighting the need to capture a psychological variable. As the circumstances and awareness of individuals change over time, it is crucial measures of financial capability are dynamic and evolve to remain effective. Therefore, while acknowledging the importance and value of existing financial capability models, this study offers a complementary index to extend financial capability research. A holistic and comprehensive index which evolves to reflect modern findings is crucial for further analysis to achieve consistency and allow for comparison across future studies.

A robust financial capability index is also critical for policymakers. It is important to understand which factors are most influential on achieving financial capability and financial wellbeing. The complementary financial capability index proposed indicates that government

funded financial education programmes are unlikely to be sufficient when they are solely focussed on the development of an individuals' knowledge levels. Given the prevalent role of financial behaviour in determining financial capability, it is essential policymakers implement strategies to achieve effective behaviour change. This includes providing a platform which offers individuals the opportunity to understand their personal psychological biases, how these may affect their financial decision-making, and what actions can be taken to ensure they behave in a financially capable manner. Therefore, this complementary index supports and strengthens existing models, and provides policymakers a foundation for assessing financial capability levels, and identifying shortfalls in financial knowledge, financial behaviour, and psychological factors to inform targeted education programmes.

4. Applications of the complementary financial capability index

This chapter applies the new complementary financial capability index in two scenarios to further understand the robustness of the index and the formation methodology. A key limitation of the index formation results in Chapter 3 is that the index has been developed using a single dataset. To better understand the robustness of the model, we test the index under two different conditions. The first application enables an evaluation of how successful the index development methodology is on a dataset which varies greatly from the original dataset used in Chapter 3. This application uses the Italian Adult Financial Literacy Survey which differs in terms of question wording, topics covered, volume of data inputs, and country context. The second application tests a direct application of the index on a similar dataset (the 2021 iteration of the ANZ Financial Wellbeing Survey) which collected a similar quantum and nature of data four years after the 2017 iteration. This provides the opportunity to evaluate score progression over time between 2017 and 2021 and identify potential reasons for any general changes in financial capability levels.

4.1. Application of index formation methodology – Bank of Italy

The aim of this portion of the study is to test whether the index development methodology can produce significant results when applied to a dataset that greatly differs from the original dataset used in index formation, thereby supporting the robustness of the index developed in Chapter 3. A cross-country financial capability index could deepen the ability to capture financial levels and identify further factors which influence capability and wellbeing. However, due to differences in culture and contexts as well as the availability of data, the development of a financial capability index with multi-country applicability is difficult. The application of the complementary financial capability index to an international dataset provides the opportunity to test whether the index formation methodology can be adjusted to accommodate considerable variability in data inputs and continue to facilitate the calculation of significant financial capability scores, providing a mechanism to partially compare and contrast financial capability levels across varying countries. This is an important element of robustness testing as it enables an evaluation of the strength of the formation methodology separately from an evaluation of financial capability scores. The applicability testing utilises data from the 2020 Adult Financial Literacy Survey commissioned through the Bank of Italy. This survey data differs in scope, collecting a lower volume of information covering financial knowledge and financial behaviours.

The data inputs selected from the Italian dataset are identified in line with the components of the index developed in Chapter 3 which takes guidance from the Kempson and Poppe (2018) financial wellbeing framework. Where possible, data inputs included in this portion of the study are selected to proxy the original questions from the index development methodology in Chapter 3. As this index application focuses on investigating the index formation methodology under variable conditions, the same methodological steps are followed up to the component computation stage, utilising the Italian financial literacy survey. The first step is data cleaning and recoding, followed by factor analysis to identify related concepts within the dataset and reduce data inputs, and ending with component computation of the independent variables. Once the appropriate components are calculated in response to the results of factor analysis, the resulting regression equation from Chapter 3 is applied directly to the computed independent variables in the Italian dataset.

4.1.1. Methodology – Bank of Italy application

Description of selected dataset

This study uses financial literacy data collected by the Bank of Italy in 2020. The study captured responses from 2,000 adults. In addition to standard demographic data, the survey collected information on financial knowledge, financial behaviour and financial attitudes (Banca D'Italia, 2020). The Italian dataset was selected for use in this study due to accessibility and comparability of the survey topics, as well as providing an opportunity to test the applicability of the index on an international dataset. This dataset is considered appropriate to test the index formation methodology on the basis that the questionnaire captured similar information to the ANZ Financial Wellbeing Survey, which is used to develop the original index, albeit a considerably smaller number of data inputs covering a reduced range of behavioural finance concepts. Table 18 provides a demographic breakdown of the respondents from the Bank of Italy dataset.

Table 18: Bank of Italy data descriptive statistics

Characteristic	Category	No	Proportion
Gender	Male	1019	50%
	Female	1017	50%
Age	18-30 years	293	14%
	31-45 years	447	22%
	46-60 years	653	32%
	61-75 years	449	22%
	75 years and older	194	10%
Working status	Self-employed	249	12.2%
	Employed	769	37.8%
	Homemaker	247	12.1%
	Unemployed	126	6.2%
	Retired	524	25.7%
	Student	121	5.9%
Marital status	Single	491	24.1%
	Married	1163	57.1%
	Widowed	156	7.7%
	Divorced	55	2.7%
	Cohabiting partner	113	5.6%
	Separated	58	2.8%
Education	Attended elementary school (not complete)	44	2.2%
	Primary school certificate	170	8.3%
	Attended middle school without completing	27	1.3%
	Middle school certificate	462	22.7%
	Attended high school without graduating	108	5.3%
	High school diploma	894	43.9%
	Attended university without graduating	82	4.0%
	University degree	249	12.2%

Table 44 in the Appendix provides an overview of the questions selected for analysis from the Bank of Italy Financial Literacy Survey. The survey was delivered over the phone and many questions had true or false options while others were structured as Likert scales. In the case of some survey topics, individuals who had answered affirmatively to an initial question were asked related follow up questions. However, when individuals answered ‘no’ to the initial question, the follow up questions were not asked, resulting in some question inputs with incomplete data responses. The Bank of Italy data was numeric by nature where categorical answers were allocated numerical values to enable quantitative analysis. For use in this study, many of the ‘refused’ or ‘don’t know’ responses are recoded to ‘system missing’ to avoid skewed or biased results. For data recording, the numeric values are allocated to categorical

responses in the Italian dataset to match those that are applied in the index formation methodology in Chapter 3. To achieve consistency, answer scales are recoded to fit a 1-5 scale, where a numerical value of 1 is allocated to the answer that is least aligned with financial capability, and a value of 5 is allocated to the response that is most aligned with financial capability. Data recoding is outlined in Table 44 in the Appendix.

Factor analysis

As per the original methodology, after data cleansing and recoding, factor analysis is completed to reduce the number of data inputs while simultaneously identifying data points which dual load on factors. Factor analysis is used to identify the minimum number of components which explain the maximum level of variance in the dependent variable (Hair et al., 2014). Factor analysis facilitates the identification of relationships between data inputs which are highly correlated. These data inputs load on components and combine to form a reduced number of data inputs which summarise specific dimensions of the underlying dataset. As per the index formation methodology, factors are retained with loadings of 0.4 or above and components are retained with an eigenvalue of 1.0 or above. Data inputs for factor analysis are selected, where possible, to 'match' the topics covered by the data inputs from the ANZ Financial Wellbeing Survey, e.g. financial knowledge, financial behaviour, and psychological factors at the highest level.

Table 19: Factor analysis - Financial knowledge

	Objective_ knowledge	*Subjective_ knowledge*
Eigenvalues	1.93	1.09
Variance explained (%)	38.66	21.71
High inflation means that the cost of living is increasing rapidly (recoded)	0.786	
An investment with high return is also likely to be high risk (recoded) OR If someone offers you the chance to make a lot of money it is likely that there is also a chance that you will lose a lot of money (recoded)	0.733	
It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares (recoded) OR It is less likely that you will lose all of your money if you save it in more than one place (recoded)	0.592	0.537
Imagine that five brothers are given a gift of € 1,000 in total. They have to wait for one year to share the money equally and inflation stays at 1%. In one year's time will they be able to buy:	0.517	
Could you tell me how you would rate your overall knowledge about financial matters compared with other adults in Italy		0.931

Table 19 shows the results of factor analysis for the selected financial knowledge questions from the Bank of Italy dataset. Factor analysis results in two retained components, objective knowledge and subjective knowledge which collectively explain 60.4% of the total variance. This partially matches the financial knowledge factor analysis results presented in section 3.4.1, although did not return a financial confidence component. Although the retained components do not directly map to the retained financial knowledge components from the index development methodology, a financial knowledge variable can be computed, which holistically captures the subjective and objective aspects of financial knowledge, and can be used as an independent variable for the regression equation application.

Table 20: Factor analysis - Financial behaviour

	Budgeting	*Meeting_ commitments*	*Track_ spend_ and_ saving*	*Money_ management*	*Planning_ ahead*
Eigenvalues	2.47	1.40	1.21	1.08	1.04
Variance explained (%)	19.00	10.74	9.33	8.31	8.00
Keep money for bills separate from day-to-day spending money	0.661				
Saving cash at home or in your wallet	0.612				
Make a note of upcoming bills to make sure you don't miss them	0.601				
Keep a note of your spending	0.431				
Make a plan to manage your income and expenses					
I pay my bills on time		0.787			
I keep a close personal watch on my financial affairs		0.753			
Arrange automatic payments for regular outgoings			0.754		
Use a banking app or money management tool to keep track of your outgoings			0.743		
Paying money into a savings account			0.442		
Income does not quite cover their living expenses – last 12 months				0.812	
I have too much debt right now		0.434		0.590	-0.424
I set long term goals and strive to achieve them					0.830

Table 20 shows the results of factor analysis for the selected financial behaviour questions, including eigenvalues, variance explained and the relative factor loadings of retained data inputs. Factor analysis results in five retained components, namely budgeting, meeting commitments, track spend and saving, money management and planning-ahead. Collectively, the five retained components explain 55.4% of the total variance. The question covering 'make a plan to manage your income and expenses' does not load on any of the retained components for the orthogonally rotated results. Although it is included in factor analysis, without a factor loading on any of the retained components, it is subsequently excluded from variable computation.

The results above partially resemble the retained components from factor analysis of the financial behaviour questions as outlined in section 3.4.1. For example, factor analysis for the financial behaviour questions in the original study and the Italian application result in saving, budgeting, and money management retained components. The Italian application also results

in a ‘planning ahead’ and ‘meeting commitments’ component as compared to the original index formation methodology which results in a ‘financial decision-making’ component. The differences in factor analysis results for financial behaviour questions reflect the variability in the topics and quantum of the underlying data inputs. However, despite these deviations, factor analysis of the financial behaviour questions from the Italian dataset results in retained components covering key financial behaviours. This consequently enables a financial behaviour variable to be computed.

Table 21: Factor analysis - Psychological factors

	Locus_of_control	*Impulsivity*
Eigenvalues	2.50	1.60
Variance explained (%)	35.72	22.81
My finances control my life	0.831	
My financial situation limits my ability to do the things that are important to me	0.796	
Because of my money situation, I feel like I will never have the things I want in life	0.779	
Before I buy something, I carefully consider whether I can afford it	-0.524	
I tend to live for today and let tomorrow take care of itself	0.484	
Money is there to be spent		0.876
I find it more satisfying to spend money than to save for the long term		0.866

Factor analysis for the psychological questions selected from the Italian dataset results in two retained components as per Table 21. The table also shows the eigenvalue and variance explained for each component as well as the factor loadings for each retained data input. Collectively, the two retained components explain 58.5% of the total variance. It is important to note that the results of the Bank of Italy data factor analysis retain only locus of control and impulsivity as psychological components. In comparison to the results of the New Zealand analysis where six psychological components were retained, the results of factor analysis for the Italian dataset do not capture time orientation, self-control, social status, and action orientation. However, the results above remain significant, and allow for the computation of a psychological variable to be used in regression analysis, noting it is comprised of only two psychological components.

After undertaking factor analysis, the next step is the formation of the variables. Applying the same calculations as the index formation methodology, the independent variables are

calculated as a weighted sum of the retained components, with each weighted in accordance with the proportion of variance it contributes to the explanatory power of the model. For example, considering the financial knowledge questions, two components are retained, explaining 60.4% of the total variance. The objective knowledge component explains 38.7% of the variance and is therefore divided by the total variance percentage explained, resulting in an allocated weighting of 0.64. The same process is undertaken for the subjective knowledge component, resulting in a weighting of 0.36. This process is then applied to the financial behaviour and psychological factor analysis results, respectively. Table 22 shows the retained variables from factor analysis, the percentage of variance explained by each component, and the allocated weighting based on this percentage.

Table 22: Factor analysis eigenvalues, variance, and weightings

Component	**Initial Eigenvalues**		
	Total	% of Variance	Weighting
Objective_knowledge	1.93	38.66	0.64
Subjective_knowledge	1.09	21.71	0.36
Budgeting	2.47	19.00	0.34
Meeting_commitments	1.40	10.74	0.19
Track_spend_and_saving	1.21	9.33	0.17
Money management	1.08	8.31	0.15
Planning_ahead	1.04	8.00	0.14
Locus_of_control	2.50	35.72	0.61
Impulsivity	1.60	22.81	0.39

Equations (5), (6), and (7) below show the computation of the financial knowledge, financial behaviour, and psychological variables to be used in regression analysis respectively.

$$Financial\_Knowledge = (0.64*Objective\_knowledge) + (0.36*Subjective\_knowledge) \quad (5)$$

$$Financial\_Behaviour = (0.34*Budgeting) + (0.19*Meeting\_commitments) + (0.17*Track\_spend\_and\_saving) + (0.15*Money\_management) + (0.14*Planning\_ahead) \quad (6)$$

$$Psychological = (0.61*Locus\_of\_control) + (0.39*Impulsivity) \quad (7)$$

Regression analysis

Traditional studies measuring financial capability have focused on financial knowledge, behaviour, and attitudes. The index developed in Chapter 3 maintains that financial capability is best modelled as a function of financial knowledge, financial behaviour, and psychological factors. To test the validity and applicability of the financial capability index, we apply the same standardised regression equation to an alternative dataset. We directly apply the regression equation identified in Chapter 3 to the independent variables calculated based on the factor analysis results from the Italian financial literacy survey, as detailed in section 4.1.1.2. Note, as per the regression equation developed in Chapter 3, the constant coefficient of 0.45 is indicative of the base level financial capability score if the value of all independent and control variables was zero. This is important to note in regression analysis, although in this case has no economic meaning due to the impracticality of all independent variable scores being zero.

Table 23: Regression results - 2017 ANZ financial capability index

	Beta	*T-value*
Constant	0.45	3.58***
Financial Knowledge	0.04	4.07***
Financial Behaviour	0.14	15.00***
Psychological	0.04	3.15***
Age	0.07	4.47***
Gross Assets	0.05	3.28***
Household Income	0.10	6.74***
Gender	-0.07	-2.07**

*N=1051; * p<10%, ** p<5%, *** p<1%*

Table 23 above shows the results of regression analysis undertaken in the index formation methodology in Chapter 3 using the 2017 ANZ Financial Wellbeing Survey (the original dataset). The regression coefficients calculated in Chapter 3 are applied directly to the independent variables calculated from the Bank of Italy dataset to test the application of the index development methodology. Due to the Italian dataset not capturing wealth data, we exclude the wealth control variable. Therefore, the modified application of the equation for this dataset is:

$$Financial\_Capability = 0.45 + (0.05*Financial\_Knowledge) + (0.14*Financial\_Behaviour) + (0.04*Psychological) + (0.08*Age) + (-0.07*Gender) + (0.10*Household\_Income) \quad (8)$$

Equation (8) shows the regression equation applied to the components calculated from the Bank of Italy dataset, modelling financial capability as a function of financial knowledge, financial behaviour, and psychological factors while controlling for income, age, and gender.

4.1.2. Results – Bank of Italy application

Equation (8) is used to compute a financial capability index score for participants in the Italian financial literacy dataset. We note differences in question inputs result in varying components being retained from factor analysis. Consequently, the independent variables calculated from the Italian financial literacy dataset deviate to some degree from the variables used in regression analysis in the original index formation. Despite significant results, we recognise the index is adjusted to accommodate data availability. At the regression stage of analysis, the equation is a direct application of the financial capability index equation with the exception of the gross assets/wealth variable. For ease of interpretation and comparison, financial capability index scores are converted to a score out of 100 using a multiplier of 32.47 (one hundred divided by the 3.08, mean of the index score variable). The descriptive statistics for the adjusted financial capability scores are presented in Table 24.

Table 24: Financial Capability Index descriptive statistics

	Financial Capability Index (adj.)
N	1161
Minimum	42.46
Maximum	99.85
Mean	71.01
Standard deviation	10.14

As Clark (2015) asserts, it is important that indices are tested on diverse populations and varying datasets to validate the index. This enables application of the index to existing and future datasets without requiring the survey to have identical question inputs. The above analysis evaluates the new complementary financial capability index under different conditions by applying the index formation methodology to an Italian Financial Literacy Survey which differs greatly from the original dataset in terms of volume and breadth of information collected. One limitation of this application is the limited data available from the Italian Financial Literacy Survey. In comparison, the index formation methodology outlined in

Chapter 3 utilised a high volume of data inputs which effectively enabled the grouping of correlated data inputs through factor analysis, resulting in multidimensional variables. However, an incidental limitation of the complementary financial capability index being developed using multidimensional measures is that the resulting index is sensitive to changes in the data inputs. Although we cannot determine the absolute validity of the index based on one application, the ability to apply the index methodology to a different data source supports the robustness of the complementary financial capability index formation methodology.

4.2. Application of index – 2021 ANZ Financial Wellbeing Survey

The second application of the complementary financial capability index developed in Chapter 3 is to test the index on data collected more recently, providing an additional review of how the index can accommodate changes in the underlying data inputs. The opportunity to explore scores over time allows reflection on the progression of financial capability levels in New Zealand in response to initiatives by key stakeholders within the financial capability sector.

Covid 19, both at the peak of the pandemic and currently, has had a large impact on financial wellbeing levels in New Zealand. Despite ongoing campaigns and initiatives to improve the financial capability of New Zealanders, financial wellbeing remains dependent on the financial circumstances and individual financial confidence of the wider population. One of the largest impacts of Covid-19 was on financial stability and job security. In a study exploring the impacts of Covid-19 on the financial wellbeing levels of New Zealanders, 34% of respondents admitted to facing financial difficulty, with individuals aged 35-54 years, Māori, households in rented properties, and sole parents/ individuals with no children being over-represented in this group. Of this grouping, only approximately 20% of individuals had savings they could easily access equivalent to more than one month's household income (Galicki, 2020b). Within the same study, roughly 40% of respondents were categorised as 'exposed to financial shocks'. In this category, an individual's financial strain was not as severe as the 'financial difficulty' group, however, they had lower levels of financial resilience and were more exposed to financial difficulty when compared to the 'financially secure' group. Almost half of the 'exposed to financial shocks' group had struggled to pay regular expenses at some point and approximately 20% owed money due to missing payment of financial commitments. Socio-demographic groups over-represented in this category were individuals aged 18-34 years, Asians, individuals with a mortgage, and couples with dependent children living at home (Galicki, 2020b).

The Ministry of Social Development and Te Ara Ahunga Ora Retirement Commission are two large institutions in New Zealand who have provided important investment and demonstrated commitment to the improvement of financial capability and financial wellbeing levels. Since 2016, the Ministry of Social Development has shifted their intention, taking a more holistic approach by targeting behaviour change to improve financial capability as opposed to teaching individuals about money and budgeting (Ministry of Social Development, 2021). This approach recognises the important role financial mentorship (in both official and unofficial capacities) can play in improving financial capability levels and developing financial wellbeing. The Ministry of Social Development has since funded a number of campaigns and initiatives to drive progression in the financial capability sector including financial mentoring services, MoneyMates (peer-led support groups), Kahukura (support to individuals with more complex needs and situations), MoneyTalks (a free helpline service for advice and connectivity), Microfinance credit facilities, and The Generator (a form of seed funding for micro enterprise in New Zealand) (Ministry of Social Development, 2021). Collectively, these programmes contribute to the continued progression of financial capability levels in New Zealand, while also successfully raising awareness of the important role financial education can play in the development of financial wellbeing.

Te Ara Ahunga Ora Retirement Commission's mission is to actively improve the financial capability and retirement wellbeing of New Zealanders. Between 2017 – 2020, to help the progression of financial capability levels in New Zealand, Te Ara Ahunga Ora Retirement Commission committed to improving the understanding of how financial capability is key to sustained economic growth at the individual, household, and economy level and to increase the number of New Zealanders actively planning and preparing for their retirement (Commission for Financial Capability, 2017). Over the period 2020-2021, the Te Ara Ahunga Ora Retirement Commission's investments and initiatives have strongly impacted the New Zealand financial capability sector, particularly through the launch of their new Strategy for Financial Capability. This strategy covers three main goals: to provide consistent content, to work together to provide information and collaborate, and to demystify money (Galicki, 2020b; Te Ara Ahunga Ora Retirement Commission, 2021a). Importantly, the strategy named priority audiences as women, Māori, and Pacific peoples. These minority groups have consistently been found to have lower financial scores compared to men and majority ethnic groups (Te Ara Ahunga Ora Retirement Commission, 2021a).

Other initiatives implemented by Te Ara Ahunga Ora Retirement Commission in 2021 that were found to have had a positive impact on financial capability were the Sorted website which provided financial education and money sources to 1.5 million users, the Sorted in Schools programme which shared financial education resources to 66.5% of New Zealand secondary schools, and the Sorted at Work scheme which delivered 205 programmes reaching a total of 3355 people across New Zealand workplaces (Te Ara Ahunga Ora Retirement Commission, 2021b). The Commission also launched the 'Making Sense of Money' campaign which targeted young New Zealanders and reached over 700,000 individuals across various social media platforms on launch day alone. Finally, the Commission established a new Money Week campaign focused on providing a non-judgemental forum to enable New Zealanders to ask money questions. This resulted in 1000 money related questions asked on the Sorted website and 10,000 new website users (Te Ara Ahunga Ora Retirement Commission, 2021b).

Over the last few years New Zealand financial education providers have invested considerably in the improvement of financial capability and wellbeing levels in New Zealand. Despite difficult economic circumstances and the impacts of Covid-19 highlighting financial vulnerabilities within New Zealand households, further progression of financial capability levels to drive positive financial behaviour will enable households to develop financial resilience and withstand these economic constraints. Utilising the 2021 iteration of the ANZ Financial Wellbeing Survey enables the opportunity to evaluate the performance of the index on a dataset over a period of time where data collected for the survey remained reasonably consistent. Rather than testing the index formation methodology, this portion of analysis seeks to test a direct application of the index on a survey with very similar question inputs and data conditions. Where possible, the financial wellbeing questions from the 2021 study are mapped to the original data inputs, enabling a reasonably direct application of the index. The aim of this application was to understand how financial capability scores have trended in New Zealand over the period from 2017 to 2021, and to reflect on potential reasons for movements in financial capability levels.

4.2.1. Methodology – ANZ 2021 application

Data and variables

This index application utilises the 2021 iteration of the ANZ Financial Wellbeing Survey to test the applicability of the complementary financial capability index developed in Chapter 3 on a more recent dataset. The survey collected data from 1505 New Zealand participants over

the age of 18 years. A demographic breakdown of participants by gender, region, age, ethnicity, and education level is presented in Table 25. The financial capability index developed in Chapter 3 is constructed based on the financial wellbeing conceptual model of Kempson and Poppe (2018) and is subsequently applied to the selected data from the 2021 study.

Table 25: Respondent population characteristics - 2021 ANZ Financial Wellbeing Survey

Characteristic	**Category**	**No**	**Proportion**
Gender	Male	718	47.7%
	Female	777	51.6%
	Non-binary	10	0.7%
Age	up to 24 years	156	10.4%
	25 - 39 years	437	29.0%
	40-54 years	349	23.2%
	55 - 69 years	357	23.7%
	70 years and older	206	13.7%
Region	Auckland	491	32.6%
	Northland	53	3.5%
	Waikato	134	8.9%
	Bay of Plenty	96	6.4%
	Wellington	172	11.4%
	Other North Island	192	12.8%
	Christchurch	201	13.4%
	Dunedin	73	4.9%
	Other South Island	93	6.2%
Ethnicity[23]	New Zealand European	1236	82.1%
	Māori	163	10.8%
	Pacific	59	3.9%
	Asian	185	12.3%
	Other	29	1.9%
Education	Primary school or below	13	0.9%
	Secondary-year 11 or below	189	12.60%
	Secondary-year 12/6th form	194	12.90%
	Trade/apprenticeship	103	6.80%
	Polytech/technical certificate or diploma	305	20.30%
	Undergraduate certificate or diploma	218	14.50%
	Degree - Masters/Doctorate	478	31.80%
	Other, please specify	5	0.30%

[23] Note, participants of the ANZ Financial Wellbeing Survey could select more than one ethnicity to identify with. The survey data collected has a high representation of NZ Europeans and notably lower representation of ethnic minorities

Data mapping and analysis

As per the 2017 survey, the 2021 iteration of the survey contains questions on capability, financial wellbeing, financial behaviours, knowledge/experience, attitudes/motivations, opportunity/motivation, and demographics. It is important to note there are some key changes in the survey data collected in 2021 which directly impact the index methodology. Consequently, the original financial capability index data inputs are adjusted slightly to enable direct mapping with the 2021 data inputs as presented in Table 26. Before directly applying the financial capability index to the 2021 data, the original index requires adjustment to enable comparison of financial capability levels in 2017 and 2021. Accommodating changes in the underlying data inputs requires re-running of factor analysis, component computation, and regression analysis. The resulting model is adjusted to account for changes in survey questions in the 2021 dataset and is referred to as the 2017 Adjusted Index for the remainder of this chapter. After adjusting the index to accommodate data changes, the 2017 Adjusted Index is applied to the 2021 dataset, resulting in financial capability scores that are comparable to the 2017 adjusted financial capability scores.

To identify changes in data inputs, the questions used for index development from the 2017 dataset are mapped to the questions from the 2021 survey. As mapping of the data identified some questions in the original study that are not available in the 2021 survey, and to enable comparison between the 2017 and 2021 results, the development methodology is re-run using adjusted data inputs from the 2017 survey. It is important to note the methodology is identical to that in Chapter 3 except for minor changes to the original data inputs. Therefore, we use the same split of data, using the 'base' dataset for index construction and the 'test' dataset to test the validity and robustness of the index. After factor analysis and variable computation, the final step in constructing the 2017 Adjusted Index is to undertake regression analysis on the base dataset and subsequently apply the variable computations and regression equation to the data in the test dataset. Following the index formation methodology outlined in Chapter 3, income, age, gender, and gross assets/wealth are included as control variables. Likewise, the dependent variable for regression analysis is the same as the dependent variable used in the original index construction, using a proxy variable calculated as the mean of eight financial wellbeing questions.

Table 26: Mapping survey questions – 2017 and 2021

	2017 questions	2021 questions[24]
Subjective knowledge	Rate knowledge: Bank accounts and other products to help manage day-to-day money	Bank accounts and other products to help you manage your money day-to-day
	Rate knowledge: longer term financial investments	Longer term financial investments to help you improve your financial situation and plan for retirement
	Rate knowledge: How to find more info about a financial product or investment	How to find more information about a financial product or investment when you feel you don't know enough to make a decision on your own
Financial confidence	Confidence: Your ability to manage your money day-to-day	Manage your money day to day
	Confidence: Your ability to plan for financial future	Plan for your financial future
	Confidence: Your ability to make decisions about financial products and services	Make decisions about financial products and services
	How well: My parents discussed with me how to manage financial matters when growing up	My parents discussed with me how to manage financial matters when I was growing up.
Objective knowledge	Risk knowledge - borrowing more than three times your household income to buy a home substantially increases the risk of payment problems (reverse coded)	n/a
	Risk knowledge - a high-return investment is also likely to be high risk (reverse coded)	n/a
Saving	How often do you save money so that you could cover major unexpected expenses or a fall in income	How often save money to cover major unexpected expenses or fall in income
	I try to save money to have something to fall back on in future	I try to save money to have something to fall back on in the future
	I try to save some money regularly even if it is only a small amount	I try to save some money regularly even if it is only a small amount
	I always make sure I have money saved for bad times	I always make sure I have money saved for bad times
Money management	How often: Overdraw or go into negative on everyday account	Incur a fee for going into negative balance on your everyday bank account
	How often: Fail to pay a bill by the due date	Find yourself unable to pay a bill by the due date because you've run short of money
	How often do you have to borrow money or go into debt to buy food or to pay expenses?	How often borrow money or go into debt to buy food or pay expenses because run short of money

[24] Note, grey coloured rows indicate where 2017 data inputs could not be mapped to the 2021 survey questions. These questions have been excluded from the 2017 Adjusted Index analysis.

	How often do you have to borrow money to pay off debts?	How often borrow money to pay off debts
	I run short of money because I overspend	I run short of money because I overspend
Budgeting	For your regular income, how often do you make a plan or a budget for how it will be used?	n/a
	Do you plan exactly how you will use the income or only make a rough plan	Plan or a budget for how your regular income will be used
	How often do you keep to the plan you make for using your income?	How often keep to the plan for using income(s)
	Which of the following best describes extent to which you control your household/personal expenses	Ensuring that regular household expenses e.g. mortgage, household bills or a loan repayments on money borrowed are paid
Financial decision-making	I always get information or advice when I have an important financial decision to make (reverse coded)	I always get information or advice when I have an important financial decision
	I spend a lot of time considering the options before I make financial decisions (reverse coded)	I spend a lot of time considering the options before I make financial decisions
Time orientation	I have a tendency to save rather than to spend	There are things I resist buying today so I can save for tomorrow
	I focus on the long term	I focus on the long term
	I live more for the present day than for tomorrow	I live more for the present day than for tomorrow
	The future will take care of itself	The future will take care of itself
	My financial situation is largely outside of my control	My financial situation is largely outside of my control
	I prefer to spend any money I have rather than save it for unexpected expenses income fall	I prefer to spend any money I have rather than save it for unexpected expenses income fall
	I find it more satisfying to spend money than to save it	I find it more satisfying to spend money than to save it
Impulsivity	I am impulsive and tend to buy things even when I can't really afford them	I am impulsive and tend to buy things even when I can’t really afford them
	I often do things without giving them much thought	I often do things without giving them much thought
	I am impulsive	I am impulsive
	I say things before I have thought them through	I say things before I have thought them through
	I find it difficult to break undesirable habits	I find it difficult to break undesirable habits
Social status	I care about how other people see me	I care about how other people see me
	I am concerned about my status among people I know	I am concerned about my status among people I know
	I want other people to respect me	I want other people to respect me
Locus of control	I am good at resisting temptation	I am good at resisting temptation
	I am always in control of my actions	I am always in control of my actions

	I can pretty much determine what happens in my life	I can pretty much determine what happens in my life
	When I make financial plans, I do everything I can to succeed	When I make financial plans, I do everything I can to succeed
	When I have to do something important I don't like, I do it immediately to get it done	When I have to do something important I don't like, I do it immediately to get it done
Self-control	Before I buy something I consider carefully whether I really need it	I control myself so that I make sure that I get the most from my money
	I prefer to buy things on credit rather than wait and save up	I prefer to buy things on credit rather than wait and save up
	I would rather cut back then put reg exp on a credit card I couldn't repay in full each month	I would rather cut back then put reg exp on a credit card I couldn't repay in full each month
Action orientation	When I have a difficult decision to make, I tend to put it off for another day	When I have a difficult decision to make, I tend to put it off for another day
	When I have to choose between a lot of options, I find it difficult to make up mind	When I have to choose between a lot of options, I find it difficult to make up mind

4.2.2. Results – ANZ 2021 application

Factor analysis

Collectively, factor analysis for the financial knowledge, financial behaviour, and psychological grouping questions in the base dataset result in 12 retained factors. All parameters of the methodology match that of the original index formation methodology outlined in Chapter 3 including a factor loading baseline of 0.4 and an eigenvalue baseline of 1.0 or above. As per Table 27, factor analysis on the 2017 adjusted financial knowledge questions results in two retained factors which collectively explain 67.8% of the total variance. These differ from the three retained factors in the financial knowledge factor analysis from Chapter 3 due to the two risk questions being excluded from the 2017 Adjusted Index analysis. The table also provides the eigenvalues and variance explained for the retained components.

Table 27: Factor analysis - Financial knowledge 2017 Adjusted Index

	Subjective_ knowledge	*Financial_ confidence*
Eigenvalues	3.7	1.0
Variance explained (%)	52.8	15.0
Rate knowledge: How to find more info about a financial product or investment (reverse coded)	0.865	
Rate knowledge: longer term financial investments (reverse coded)	0.830	
Rate knowledge: Bank accounts and other products to help manage day-to-day money (reverse coded)	0.804	
Confidence: Your ability to manage your money day-to-day (reverse coded)	0.419	0.713
Confidence: Your ability to plan for financial future (reverse coded)	0.484	0.695
Confidence: Your ability to make decisions about financial products and services (reverse coded)	0.521	0.681
How well: My parents discussed with me how to manage financial matters when growing up (reverse coded)		0.652

Factor analysis for the adjusted financial behaviour questions results in four retained components. The eigenvalues, variance explained, and factor loadings for each of the retained components are presented in Table 28. The retained factors match the components from the financial behaviour factor analysis in the original methodology outlined in Chapter 3 and are in line with the behaviour components identified in the Kempson and Poppe (2018) model.

Table 28: Factor analysis - Financial behaviour 2017 Adjusted Index

	Saving	*Money_ management*	*Budgeting*	*Financial_ decision-making*
Eigenvalues	4.9	1.9	1.4	1.1
Variance explained (%)	34.7	13.5	9.8	7.9
I try to save money to have something to fall back on in future	0.877			
I try to save some money regularly even if it is only a small amount	0.866			
I always make sure I have money saved for bad times	0.827			
How often do you save money so that you could cover major unexpected expenses or a fall in income	0.779			
How often do you have to borrow money or go into debt to buy food or to pay expenses?		0.826		
How often do you have to borrow money to pay off debts?		0.814		
How often: Fail to pay a bill by the due date		0.720		
How often: Overdraw or go into negative on everyday account		0.613		
I run short of money because I overspend		0.405		
Do you plan exactly how you will use the income or only make a rough plan			0.808	
How often do you keep to the plan you make for using your income?			0.734	
Which of the following best describes extent to which you control your household/personal expenses			0.545	
I always get info or advice when making important financial decision				0.854
I spend a lot of time considering the options before I make financial decisions				0.787

The final portion of factor analysis is undertaken on selected questions covering psychological factors and attitudes. Table 29 below shows the eigenvalues, variance explained, and factor loadings of the retained components from principal component analysis. Factor analysis results in six psychological components being retained for the 2017 Adjusted Index, which directly match the retained components from the original index formation methodology, and the psychological factors included in the financial wellbeing conceptual model by Kempson and Poppe (2018).

Table 29: Factor analysis - Psychological factors 2017 Adjusted Index

	Time_ orientation	*Impulsivity*	*Locus_of_ control*	*Social_status*	*Self_control*	*Action_ orientation*
Eigenvalues	6.2	2.5	1.8	1.5	1.2	1.0
Variance explained (%)	24.9	10.0	7.2	5.8	5.0	4.1
I live more for the present day than for tomorrow	0.729					
I prefer to spend any money I have rather than save it for unexpected expenses income fall	0.666					
I find it more satisfying to spend money than to save it	0.610					
I focus on the long term	0.586		0.459			
The future will take care of itself	0.579					
I have a tendency to save rather than to spend	0.566					
My financial situation is largely outside of my control	0.500					
I am impulsive		0.754				
I say things before I have thought them through		0.696				
I often do things without giving them much thought		0.622				
I find it difficult to break undesirable habits		0.576				
I am impulsive and tend to buy things even when I can't really afford them		0.505				
I can pretty much determine what happens in my life			0.741			
I am always in control of my actions			0.710			
When I make financial plans, I do everything I can to succeed			0.613			
I am good at resisting temptation			0.600			
When I have to do something important I don't like, I do it immediately to get it done			0.525			0.413
I care about how other people see me				0.863		
I am concerned about my status among people I know				0.816		
I want other people to respect me				0.757		
I would rather cut back then put reg exp on a credit card I couldn't repay in full each month					0.798	
I prefer to buy things on credit rather than wait and save up					0.595	
Before I buy something, I consider carefully whether I really need it					0.469	
When I have a difficult decision to make, I tend to put it off for another day						0.753
When I have to choose between a lot of options, I find it difficult to make up mind						0.680

Formation of the variables

After completing factor analysis, the retained components from each factor grouping are used to compute the explanatory variables for regression analysis. Following the original index methodology, new variables are calculated as a weighted sum of the retained component variables, with each variable weighted in accordance with the proportion of variance it contributes to the explanatory power of the model. The eigenvalues, percentage of variance explained, and allocated weighting for each retained component are presented in Table 30. Equations (9), (10), (11) show the computation of each of the components.

Table 30: Factor analysis eigenvalues, variance, and weightings – 2017 adjusted index

Component	**Initial Eigenvalues**		
	Total	% Of Variance	Weighting
Subjective_knowledge	3.7	52.8	0.78
Financial_confidence	1.0	15.0	0.22
Saving	4.9	34.7	0.53
Money_management	1.9	13.5	0.21
Budgeting	1.4	9.8	0.15
Financial_decision-making	1.1	7.9	0.12
Time orientation	6.2	24.9	0.44
Impulsivity	2.5	10.0	0.18
Locus of control	1.8	7.2	0.13
Social status	1.5	5.8	0.10
Self_control	1.2	5.0	0.09
Action orientation	1.0	4.1	0.07

$$Financial\_Knowledge = (0.78*Subjective\_knowledge) + (0.22*Financial\_confidence) \quad (9)$$

$$Financial\_Behaviour = (0.53*Saving) + (0.21*Money\_management) + (0.15*Budgeting) + (0.12*Financial\_decision\text{-}making) \quad (10)$$

$$Psychological = (0.44*Time\_orientation + (0.18*\ Impulsivity) + (0.13*Locus\_of\_control) + (0.10*\ Social\_status) + (0.09*Self\_control) + (0.07*Action\_orientation) \quad (11)$$

Regression analysis

Results of factor analysis are used to inform variable computation to form the explanatory variables for the 2017 Adjusted Index. Multiple regression analysis is undertaken on the base dataset, where the financial capability proxy variable is regressed against the adjusted explanatory variables to calculate the 2017 Adjusted Index. As per the original methodology, financial knowledge, financial behaviour, and psychological factors are included as independent variables, while controlling for age, gender, income, and wealth.

Table 31: Base group multiple regression - 2017 Adjusted Index

	Beta	*T-value*
Constant	0.55	4.49***
Financial_Knowledge	0.04	4.40***
Financial_Behaviour	0.14	14.94***
Psychological	0.04	3.28***
Age	0.08	4.69***
Gender	-0.07	-1.97**
Household income	0.10	6.60***
Gross Assets[25]	0.05	3.19***
Model Summary		
R^2	0.61	
Adjusted R^2	0.60	

*N=1051; * p<10%, ** p<5%, *** p<1%*

Table 31 shows the results of multiple regression using the adjusted explanatory variables. Adjustment of the model to accommodate the questions available in the more recent iteration of the survey enables the direct application of the adjusted regression equation to the 2021 data and subsequently provides the opportunity to review progression over time. The model explains 60% of the variance in the dependent variable with an adjusted R^2 of 0.60. All variable coefficients are significant at the 5% level excluding gender which is significant at the 10% level. As noted in the regression results in Chapter 3, the constant coefficient of 0.55 is indicative of the base level financial capability score if the value of all independent and control variables is zero. However, in this case, the constant has no economic meaning due to the impracticality of all independent variable scores being zero, particularly for the gender and age variables.

[25] Gross assets are calculated as the combined value of 'wealth estimate' and 'estimated KiwiSaver balance' per participant and allocated a value from 1-5 based on the bracket they fall into.

Following regression analysis, the resulting regression equation is applied to the test dataset to calculate a financial capability score for each participant using the 2017 Adjusted Index. Table 32 below shows the descriptive statistics for the financial capability proxy variables in the base and test datasets prior to being scaled to a score out of 100, as well as for the financial capability index variable in the test dataset, computed using the 2017 Adjusted Index. For the remainder of this chapter, the new variable will be referred to as the financial capability index 2017 (adj.).

Table 32: Financial capability (base and test) descriptive statistics - 2017 Adjusted Index

	Financial capability proxy (Base)	*Financial capability proxy 2017 (adj.)*	*Financial capability index 2017 (adj.)*
N	1051	470	265
Minimum	1.00	1.29	1.78
Maximum	5.00	5.00	4.53
Mean	3.43	3.40	3.36
Standard deviation	0.75	0.76	0.57

As per the methodology outlined in Chapter 3, for ease of interpretation and comparison financial capability scores from the base and test groups are converted to a score out of 100 using a multiplier of 20. The multiplier is calculated based on converting the maximum financial score of 5 to a measure out of 100. This multiplier ensures that potential financial capability scores do not exceed 100.

Finally, a one sample means test is used to determine the predictability strength of the 2017 Adjusted Index equation within the test dataset. This is achieved by comparing of the mean scores of the financial capability proxy (the weighted average of eight wellbeing questions) and the financial capability index variable. The results of the one-sample means test are presented in Table 33. With $t(264) = -1.168$, $p=0.244$, we conclude there is insufficient evidence to reject the null hypothesis and therefore there is no statistical difference between the means of the financial capability proxy and the financial capability index variable.

Table 33: Financial capability one-sample means test - 2017 Adjusted Index

	Mean	*T value*	*Two-sided sig.*	*Mean diff.*	*95% CI Lower*	*95% CI Upper*
Financial capability proxy 2017 (adj.)	67.95					
Financial capability index 2017 (adj.)	67.14	-1.17	0.244	-0.81	-2.19	0.56

After testing the regression model on the test dataset and confirming the significance of the 2017 Adjusted Index equation, the base and test datasets are combined to restore the data to the original grouping of 1521 participants. This enables the application of the 2017 adjusted index to the entire dataset resulting in valid financial capability scores for 876 participants. Subsequently, a direct application of the 2017 Adjusted Index to the 2021 ANZ dataset enabled a financial capability score for each participant (with complete datasets) to be calculated. Table 34 provides the descriptive statistics for the 2017 (adjusted) and 2021 financial capability index scores. The adjusted financial capability index developed using the 2017 ANZ data provides the mechanism for computing financial capability scores for the 2021 data, as well as enabling a basis to review progression over time.

Table 34: Financial Capability Index (2017 and 2021) descriptive statistics

	Financial capability index 2017 (adj.)	*Financial capability index (2021)*
N	876	876
Minimum	1.78	2.19
Maximum	4.57	4.92
Mean	3.44	3.85
Standard deviation	0.57	0.53

Based on the assumption that the financial capability index scores from the 2017 survey are comparable to the 2021 results, a comparison of index scores facilitates an evaluation of how financial capability levels of New Zealanders have trended over the four-year period. Table 35 contains a comparison of the 2017 and 2021 financial capability index scores (both scaled and non-scaled). Due to wording differences in some of the questions selected for index development in the 2021 dataset, we cannot draw absolute conclusions about progression.

Table 35: Comparison of financial capability index scores 2017 and 2021

	Non-scaled financial capability index scores		*Scaled financial capability index scores*	
	2017 (adj.)	*2021*	*2017 (adj.)*	*2021*
N	876	876	876	876
Minimum	1.78	2.19	35.65	43.83
Maximum	4.57	4.92	91.32	98.35
Mean	3.44	3.85	68.77	77.09
Standard deviation	0.57	0.53	11.42	10.52

An increase in financial capability score descriptives from 2017 to 2021 indicates a general improvement in financial capability scores. Table 36 shows the results of a summary independent sample means test between the financial capability scores for the 2017 (adjusted) and 2021 data respectively. With t(1738.1) = -15.85, p=0.00 (not assuming equal variances), the results indicate financial capability levels have likely increased between 2017 and 2021. We reject the null hypothesis that the means for the 2017 (adjusted) and 2021 financial capability index scores are not statistically different. Acknowledging minor wording differences which impede the ability to draw absolute conclusions on progression, a comparison of means enables a review of how financial capability scores had trended over the 2017 – 2021 period. Given efforts of New Zealand institutions to improve financial capability and financial wellbeing levels, upwards trends in financial capability scores are encouraging.

Table 36: Summary independent samples means test - non-scaled scores

	Mean	*Mean diff.*	*Std. Error Diff*	*T value*	*Sig.*
Financial capability index 2017 (adj.)	3.44	-0.42	0.026	-15.85	0.000
Financial capability index 2021	3.86				

Beyond the success of applying the financial capability index to the 2021 data and despite variations in the question inputs, we note the scaled (and non-scaled) mean financial capability scores have increased by around 12% from 68.77 (3.44) to 77.09 (3.85). Encouragingly, mean financial capability scores have increased across all demographic groups. The groups with the largest score improvements were females (13.6%), 25–29-year-olds (14.1%) and Māori (20.7%), Indians (15.1%), and Other Asians (14.1%). For the 2021 results, average adjusted

financial capability scores for all demographic groups sit between 74-83 (out of 100) excluding under 25-year-olds who have an average of 68.24.

Demographic analysis

As established in the original index results presented in Chapter 3, younger people, females, and ethnic minorities tend to have lower average financial capability levels, although only some differences in average scores are statistically significant in our data analysis. Demographic analysis of the 2021 financial capability index scores is important for two reasons. Firstly, it provides the ability to measure current financial capability levels by gender, ethnicity, and age groupings, thereby enabling evaluation of societal sub-groups where further education may be beneficial. Secondly, it enables a review of how the financial capability levels of certain subgroups may have trended over time, particularly in response to targeted financial education initiatives.

Table 37: Demographic analysis 2021 financial capability index scores (scaled)

Characteristic	Category	N	Min	Mean	Max	Mean	Sig.
Gender[26]	Male	407	45.43	78.83	98.35	3.24	0.00
	Female	467	43.83	75.59	95.10		
	Non-binary	2	70.63	73.59	76.55		
Age	Under 25 years	63	48.26	68.24	88.25		
	25-39 years	278	46.70	75.05	92.83		
	40-54 years	215	43.83	76.15	96.96		
	55-69 years	207	51.96	80.60	98.35		
	70 years or older	113	45.43	82.39	98.32		
Ethnicity	NZ European	756	43.83	76.98	98.35	2.28	0.043
	Māori	85	50.64	74.71	96.44		

Table 37 provides a breakdown of the 2021 financial capability index scores by gender, age, and ethnicity. Table 38 shows the financial capability score comparison across all age groups for 2017 and 2021 respectively.

[26] Non-binary was a gender option added to the 2021 survey. Only two people classified themselves as non-binary, and they have therefore been omitted from further analysis due to the limited sample size.

Table 38: Financial capability mean scores comparison - by demographics

Characteristic	Category	2017 Mean	2021 Mean	Percentage change
Gender	Male	70.89	78.83	11.2%
	Female	66.52	75.59	13.6%
Age	Under 25 years	62.55	68.24	9.1%
	25-39 years	65.78	75.05	14.1%
	40-54 years	69.39	76.15	9.7%
	55-69 years	73.76	80.60	9.3%
	70 years or older	78.10	82.39	5.5%
Ethnicity	NZ European	68.84	76.98	11.8%
	Māori	61.89	74.71	20.7%

Based on the demographic results shown in Table 37 the average financial capability index score for males is higher than for females, with a mean difference of 3.24 points for the 2021 data. Table 38 shows the mean financial capability score comparison between 2017 and 2021 by demographic grouping. Although it is difficult to directly compare given the differences in question wording, a comparison provides a guide as to how financial capability levels have trended since 2017. The table shows that mean financial capability levels based on the results of index analysis look to have progressed for both males and females, with average scores for males increasing by approximately 11% as compared to a percentage increase of approximately 14% for women. The collective improvement in scores across gender groupings is encouraging, as well as the narrowing of the gender score disparity. This result is particularly pleasing on the basis that during the 2020 - 2021 period, Te Ara Ahunga Ora Retirement Commission (2021a) released their new strategy on Financial Capability, naming women, Māori, and Pacific Peoples as priority audiences, acknowledging these societal subgroups have historically scored lower across all measures of financial capability. Results of the means test are presented in Table 39 with the ANOVA test on the 2021 financial capability scores confirming females tend to score lower on average when compared to males, $F(2,873) = [10.64]$, $p=0,00$, and reaffirming literature which asserts females tend to report lower financial capability levels on average.

Table 39: One way ANOVA financial capability index scores by age and gender 2021

Base category	Test category	Mean diff.
Male	Female	3.24***
18-24 years	25-39 years	-6.81***
	40-54 years	-7.91***
	55-69 years	-12.35***
	70-74 years	-14.15***
25-39 years	Under 25 years	6.81***
	40-54 years	-1.10
	55-69 years	-5.54***
	70-74 years	-7.34***
40-54 years	Under 25 years	7.91***
	25-39 years	1.10
	55-69 years	-4.45***
	70-74 years	-6.24***
54-69 years	Under 25 years	12.35***
	25-39 years	5.54***
	40-54 years	4.45***
	70-74 years	-1.79
70 years and over	Under 25 years	14.15***
	25-39 years	7.34***
	40-54 years	6.24***
	55-69 years	1.79

** p<10%, ** p<5%, *** p<1%*

Literature asserts that financial capability levels tend to increase with age, demonstrating that individuals gain financial knowledge and skill over their lifetime, both through education and experience (Galicki, 2021; Potrich et al., 2015). Table 37 shows the mean financial capability scores by age category where the results confirm average financial capability scores tended to increase with age. Under 25-year-olds have the lowest mean financial capability scores compared to all age brackets, with an average score of 68.24 compared to 82.39 for 70-year-olds (or older), and with all other age categories returning mean scores of 70 or above. A comparison of the mean financial capability scores for age categories between 2017 and 2021 is presented in Table 38, and indicates mean financial capability scores across all age groupings improved between 2017 and 2021. The highest respective improvement is found amongst 25–39-year-olds, with a mean financial capability score increase of approximately 14% over the four-year period.

To determine the statistical significance of the mean differences across age categories, a one-way ANOVA and Tukey HSD test is undertaken, comparing mean financial capability scores

and the associated significance of mean differences across age brackets. The corresponding results are presented in Table 39 with F(4,871) = [30.81], p=0,00, indicating financial capability scores tend to increase with age. The results show the mean differences between all age group categories are statistically significant, with mean financial capability scores increasing with age except for when comparing the scores of the 25-39 years category with the 40-54 years category, and the 55–69-year-old category with the 70 years and older category. As per Table 38 the respective mean differences between these groups of 1.10 and 1.79 were not statistically significant at the 95% confidence level.

Finally, a review of financial capability scores by ethnic group demonstrate a high level of variability, while noting a large discrepancy in the sample population sizes across ethnic groups. Due to low representation across all ethnic groups, only the financial capability score descriptives for the ethnic groupings with a sample size 80 or above are presented in Table 37. The NZ European participant mean financial capability score is 76.98, as compared to 74.71 for Māori. Table 37 also shows the results of an independent t-test for the equality of means, which indicates a statistical difference between the mean financial capability scores of NZ European and Māori of 2.28, t(108.87) = 2.04, p=0.04, not assuming equal variances. It is important to note the large discrepancy in sample sizes between NZ European (756 participants) and Māori (85 participants). Although significance testing indicates a statistically significant difference of 2.28, this may not be economically significant in the context of the wider New Zealand population. Based on the results presented in Table 39, NZ European mean scores have improved by approximately 12% as compared with approximate percentage improvements of 21% for Māori. Further work is required to better understand the financial scores and relevant score improvements for non-NZ Europeans. Based on the commitment of Te Ara Ahunga Ora Retirement Commission (2021a) targeting women, Māori, and Pacific Peoples in their new financial capability strategy plan (2020-2021), the indication of progression in financial capability scores amongst Māori is encouraging.

4.3. Discussions and conclusions – Index applications

This chapter seeks to review two separate applications of the complementary financial capability index developed in Chapter 3. Specifically, the first application tests the robustness of the index formation methodology on an Italian financial literacy survey which differs considerably from the ANZ Financial Wellbeing Survey utilised in the original index study. The second application tests the use of an adjusted version of the original index on a more recent iteration of the ANZ Financial Wellbeing Survey, thereby providing the opportunity to

review progression of financial capability scores over time. Based on the results of this chapter, the two sub-studies collectively confirm the robustness of the model when applied in varying contexts and under variable conditions. Although it is difficult to develop a universal financial capability model, we assert the complementary index developed in Chapter 3 and tested in Chapter 4 strengthens research assessing financial capability across different populations and over periods of time when appropriately applied and/or adjusted.

A regression model is sensitive to the underlying data inputs available for analysis. Therefore, we acknowledge the complexity of attempting to develop a model which is directly applicable under varying conditions. Collectively the above analysis demonstrates two applications of the index, indicating that under different conditions the complementary financial capability index can produce significant results when adjusted appropriately. Firstly, adjustment of the index and application to a dataset utilising an existing Italian financial literacy survey demonstrates the index formation methodology is robust, producing a modified yet significant financial capability model. Secondly, the adjustment of the original inputs for data analysis and the subsequent application of the 2017 Adjusted Index on a more recent iteration of the ANZ Financial Wellbeing Survey supports the robustness of the model across different time periods and enables a comparison of financial capability scores over time. One limitation of the 2021 dataset is that the same individuals are not included in both samples, rendering us unable to assess financial capability score progressions of individual respondents. More generally, we review the progression of financial capability scores in New Zealand between 2017 and 2021, while also testing the malleability of the index when data inputs are adjusted. Although we cannot draw absolute conclusions regarding the progression of New Zealand financial capability levels, there are several initiatives from The Ministry of Social Development and Te Ara Ahunga Ora Retirement Commission which are likely to have contributed to improved financial capability levels in New Zealand over the period from 2017 to 2021. This is reflected in the indicative financial capability scores shown in section 4.2.2 of this chapter.

The results of this section show that there has likely been improvements in the financial capability levels of New Zealanders. This is encouraging given the ongoing economic implications of Covid-19 and reaffirms the importance of the work institutions such as the Ministry of Social Development and Te Ara Ahunga Ora Retirement Commission do towards the continual progression of financial wellbeing levels in New Zealand. Secondly, the significance of the results presented in Table 31 and the successful application of the financial capability index to the 2021 data collectively demonstrates the robustness of the financial

capability index when applied to datasets which differ from the survey data used in the original index development study.

The wider research objective of this thesis is to develop a complementary financial capability index which incorporates a psychological variable, to support and strengthen existing behavioural finance models. The results of this chapter support this research objective, further demonstrating a financial capability index and associated index development methodology which is robust and can be applied to survey datasets under varying conditions when appropriately adjusted.

This chapter provides an opportunity to review the application of the index formation methodology, as well as the resulting financial capability index. It is important to note that despite promising results in both sub-studies, it has only been tested under two differing conditions using two datasets. In the application of the index formation methodology, we recognise that the data used to develop the model is considerably different to the data used in the original index formation. For this reason, factor components retained in the index developed using the Italian dataset varied considerably from the original index developed using the ANZ Financial Wellbeing Survey data. We acknowledge the successful results of this application which support the wider research objective, indicating the capability of the model to produce robust results despite variability in data inputs. In the second sub-study, we successfully adjust data inputs to enable an application of the model to the 2021 dataset, producing valid financial capability scores. However, we note that the success of this application is largely due to the 2021 dataset almost entirely capturing the same data inputs as the original methodology, due to the dataset being from the same institutional source. The adjustments required in both applications indicate the complementary financial capability index is sensitive to the data inputs used for index development. Further research is therefore required to understand whether a model can be created which is applicable under variable conditions and has reduced sensitivity to changes in the underlying data inputs.

5. Financial capability in practise – Thematic analysis

5.1. Introduction

Many traditional finance models assume individuals exercise unbounded rationality, whereby decisions are made based on information gathering and processing, guided by the goal of maximising utility (Riyazahmed & Saravanaraj, 2016). However, this assumption has been challenged by behavioural economists who argue that decision-making is also influenced by factors outside of information gathering such as risk, uncertainty, and behavioural biases. Consequently, studies have transitioned to using behavioural finance theories to examine behaviour, incorporating findings originally proposed by Tversky and Kahneman (1974) to develop theories on the basis that the financial decision-making is influenced by psychological functioning and other 'noise' factors in addition to information gathering (de Meza et al., 2008; Mudzingiri et al., 2018; Sahi, 2017).

An important contribution of the wider behavioural finance discourse is the assertion that cognitive biases influence the decision-making process. In such cases, although individuals may strive to make informed decisions, factors outside of information gathering can influence the decision-making process due to financial agents not being perfectly rational (Ritter, 2003). Factors influencing decision-making and consequent financial capability levels may include behavioural biases, heuristics, motivations, emotions, and other personality traits (Sahi, 2017). As a key aspect of behavioural finance, cognitive psychology plays an important role in explaining how and why financial agents make decisions (Ritter, 2003). Although some financial capability and wellbeing surveys incorporate questions capturing psychological factors and behavioural biases, survey data is limited in terms of the breadth of information that can be collected. Collecting open-ended responses relative to subjective aspects of personal finance can provide beneficial insights which are otherwise difficult to collect from survey data, particularly when response scales are utilised.

The aim of the wider thesis is to further understand and measure the influence of psychological factors on financial decision-making and financial capability levels. Beyond undertaking an application of the financial capability index developed in Chapter 3, we also seek to further understand subjective aspects of behavioural finance and practical insights related to decision-making, financial wellbeing, financial education, and retirement preparedness. This chapter utilises a mixed methods approach to further understand practical aspects of financial decision-making. Survey data in conjunction with interview transcripts enables practical behavioural

finance insights through the use of quantitative analysis, as well as subsequent qualitative analysis using interview data. One-on-one structured interviews with the opportunity for participants to provide open-ended responses allowed the researcher to gather self-insights which are otherwise difficult to collect using traditional survey data. A study by Anderson and Thoma (2021) used thematic analysis to gain insights into analytical decision-making of financial traders. As the use of thematic analysis is largely under-represented within research in the behavioural finance discourse, the study by Anderson and Thoma (2021) provided guidance for the analysis undertaken in this chapter.

Chapter 3 describes the development of a complementary financial capability index which incorporates an explicit measure of psychological factors, thereby supporting and extending existing behavioural finance models. This index was created using the 2017 ANZ Financial Wellbeing Survey data collected using Likert scales. Surveys of this nature provide an appropriate and easily collectable source of data to review current levels of financial capability and wellbeing. However, participants are predominantly asked to select one of the multiple-choice options and often do not have the opportunity to provide further subjective insights supporting their responses. Beyond the measurement of current financial capability levels based on survey data, we recognised the benefit interview data can provide in relation to aspects of financial behaviour and decision-making which are historically influenced by subjective factors. Collecting data through an online survey enabled the collection of general survey data to compute a financial capability score for each participant. We simultaneously collected contact information from participants on a voluntary basis to facilitate follow up one-on-one interviews with a small number of New Zealanders. The interview format and structured interview questions enabled participants to provide detailed responses to their perceived interpretation of the questions asked and provided insightful information on financial confidence, perceived financial capability and the financial decision-making process.

Thematic analysis is a method of reviewing qualitative data to identify common themes and is commonly used within psychology research. Thematic analysis facilitates the identification of themes to generate insights from data sources which are otherwise difficult to quantify when using more traditional statistical methods. Themes are generated by the researcher through identifying similarities and linkages across interview transcripts. An application of thematic analysis on the fourteen interview transcripts results in six key themes with various subthemes. These themes cover a range of personal and behavioural finance concepts with a particular focus on self-efficacy, subjective knowledge/capability, financial confidence, and financial

decision-making. The findings within this chapter align with the literature detailed in Chapter 2 regarding financial decision-making and financial capability. This chapter adds to the wider contribution of this thesis by providing further evidence of the strong influence psychological and subjective factors have on financial capability, largely mediated through the financial decision-making process.

5.2. Methodology

5.2.1. Survey and interview development

A subsequent test of the application of the financial capability index developed in Chapter 3 enables further support for the first research objective of this thesis, to confirm the influence psychological factors may have on financial capability levels distinct from the influence they have been found to have on financial wellbeing levels (Kempson & Poppe, 2018). The questions for part one of the survey were largely selected to represent the retained components from factor analysis undertaken as part of the index formation methodology outlined in Chapter 3. A single question was included in the survey to respectively represent each of the components that were retained for the financial behaviour and psychological variable components as identified in the index development methodology. For the financial knowledge portion, questions were broadly selected to cover both objective and subjective financial knowledge, using the recognised 'Big Three' financial literacy questions developed by Lusardi and Mitchell (2011b) combined with a separate question covering self-assessment of financial capability levels. These questions were selected for two reasons. Firstly, the 'Big Three' questions have been adopted globally to measure financial capability levels. Secondly, the 'Big Three' questions combined with the subjective knowledge question cover all topics related to the retained components from financial knowledge factor analysis in the index formation methodology (objective knowledge, subjective knowledge, and financial confidence).

Data collection for the second portion of the study involved one-on-one interviews with questions developed at the discretion of the researcher based on the components of financial capability where analysis of subjective perspectives was likely to be advantageous or where additional understanding of financial behaviour in practice could be beneficial. The behavioural finance discourse recognises that the financial decision-making process is influenced by heuristics, emotions, and other psychological motives which hinder the presence of unbounded rationality (Sahi, 2017). Therefore, the interview questions were developed based on topics recognised by the literature to influence the financial decision-making process and where the opportunity for participants to provide open-ended responses was considered

likely to provide insights broader and more detailed than may be captured by Likert scale survey responses. Based on the existing research outlined in Chapter 2, the topics of particular interest are subjective financial capability and self-efficacy, financial decision-making, financial education and socialisation, and retirement planning/preparedness. The use of structured interview questions covering the aforementioned behavioural finance topics allows further investigation of the various factors influencing financial decision-making in practice, in line with the second research objective of this thesis.

5.2.2. Procedure and samples

Massey University has a Code of Ethics which applies to research and data collection involving humans. All ethical requirements relevant to this study have been met. The project was evaluated by peer review and deemed low risk. Recruitment of participants was completed using the researchers' social media platforms. Participants were supplied with a copy of the information sheet at the beginning of the online survey, outlining data collection information, the researcher's intentions for data use, participant rights, and research ethics. Participants were subsequently required to answer a question confirming they read and understood the information sheet and consent to survey and interview participation.

Online survey

The survey portion of this sub-study was completed using Qualtrics technology. Due to the delivery of the survey using the Qualtrics software and the need to maintain confidentiality of the survey data, two separate surveys were developed. The first survey collected anonymous responses to financial capability questions. Upon completion of the financial capability survey, participants were directed to a second survey which collected consent to be contacted for the interview portion of the survey as well as contact details and demographic information. Demographic information was also collected as part of the consent survey to capture the age, gender, and ethnic composition of the interview participants. Table 45 in the appendix provides the questions from the financial capability survey delivered online. Table 40 below provides a demographic breakdown of the participants who completed the online financial capability survey and the participants who took part in the online interviews. Note, in many cases individuals chose not to answer certain questions, resulting in variability of response volumes for various survey questions.

Table 40: Survey and interview respondent demographics

		Survey respondents		Interview respondents	
Characteristic	**Category**	**No.**	**Proportion**	**No.**	**Proportion**
Gender	Male	29	43.3%	6	42.9%
	Female	33	49.3%	7	50.0%
	Non-binary/third gender	0	0.0%	0	0.0%
	Prefer not to say	5	7.5%	1	7.1%
Age	18-24 years	5	7.6%	1	7.1%
	25-39 years	42	63.6%	6	42.9%
	40-54 years	4	6.1%	0	0.0%
	55 - 69 years	12	18.2%	6	42.9%
	70 years or over	1	1.5%	1	7.1%
	Prefer not to say	2	3.0%	0	0.0%
Ethnicity[27]	NZ European	49	67.1%	10	71.4%
	Māori	5	6.8%	1	7.1%
	Pacific	3	4.1%	0	0.0%
	Asian	10	13.7%	2	14.3%
	Other	3	4.1%	2	14.3%
	Prefer not to say	3	4.1%	0	0.0%

Interview study

For the thematic analysis portion of the study, data was collected through one-on-one interviews between volunteer participants and the researcher. Where possible, randomization of selected participants was used to achieve diversity in gender, age, and ethnicity. To uphold ethical standards and ensure unbiased data collection, participants who completed the survey and provided consent to be contacted yet were known to the interviewer in a capacity that may have influenced the openness of responses, were excluded from the interview selection process at the researcher's discretion. This is particularly important in the context of conversations about money, ensuring both the interviewer and participant were able to have open and comfortable conversations about sometimes confronting and personal topics. Interviews were completed online for ease and to improve potential participant reach across New Zealand by removing geographical restraints. Participants were contacted by the researcher to arrange an appropriate time to deliver the interview portion of the survey over video call, ensuring the interview was recorded and transcribed. Participants were allocated an ID number e.g. 001 to use as reference to ensure confidentiality was upheld. Note, three selected participants were

[27] Participants were able to select more than one ethnicity they identify with.

allocated an ID originally yet were subsequently excluded as a result of non-response issues. Further non-response participants were not allocated an ID. At the beginning of each interview, participants were asked to confirm consent to take part in the interview, and that the interview be recorded and transcribed. Table 46 in the appendix details the questions asked for the interview portion.

The interview was centred on a structured outline of intended questions covering topics identified by the researcher as likely to benefit from open-ended responses. Although using a structured interview style in comparison to the 'semi-structured' interview style used by Anderson and Thoma (2021), both approaches enable specific topics to be asked by the researcher while also allowing the participant to interpret the question and respond how they see appropriate. Consequently, the interview was mostly led by the interviewer questions, yet was somewhat fluid in response to participant answers. In some instances, the discussion deviated from that of the question script particularly when participants required further explanation about a question or topic, or when the researcher sought clarity or further information prompted by the participant's response. Fourteen interviews were completed, resulting in fourteen transcripts available for thematic analysis.

The survey and interview procedure had two key limitations of note. Firstly, the requirement to keep the two surveys separate resulted in a large drop in survey completion between the financial capability survey and the consent and demographic survey. Ninety-three individuals responded to the financial capability survey as compared to only 31 individuals who completed the supporting consent survey. Consequently, the pool of participants who consented to be contacted was small, reducing the diversity of interview participants and responses that were collected. Secondly, contacting participants through email to arrange follow up interviews was heavily impacted by non-response issues. Several individuals who completed the supporting survey consenting to being contacted for an interview did not respond to interview invites. The non-response issue further reduced the pool of possible interviewees.

5.2.3. Thematic analysis

The use of thematic analysis to undertake qualitative investigation of interview data with open-ended responses is largely informed by two key studies. Firstly, Braun and Clarke (2006) are strong proponents for the use of thematic analysis within qualitative research, particularly in psychology studies, largely due to its flexible approach and ability to extract insights from data which are otherwise difficult to quantify. This study is particularly informative on the

procedure of undertaking thematic analysis on the interview transcripts. Secondly, Anderson and Thoma (2021) extend the work of Braun and Clarke (2006) by utilising thematic analysis to investigate the financial decision-making of professional traders. Given the overlap between this thesis and their work exploring financial decision-making, Anderson and Thoma (2021) support the use of thematic analysis to explore subjects related to personal finance.

Thematic analysis is a method used to identify and organize insights from a range of datasets. This type of analysis is often beneficial when the researcher seeks to draw conclusions or trends from personal experiences and interview transcripts. A common limitation of survey data is that respondents are usually asked to select an answer from a range of pre-determined responses. Therefore, survey data can inhibit the depth of insights the researcher can develop when reviewing subjective concepts such as self-efficacy, subjective wellbeing, and financial decision-making. Interview data provides valuable insights into how individuals feel about a certain topic, enabling a deeper understanding of behavioural finance concepts which are otherwise difficult to compute based on scaled survey responses. Interview information is particularly useful for understanding financial decision-making and how psychological functioning can impact financial decisions and associated outcomes. As per the application of thematic analysis in Anderson and Thoma (2021), we seek to further understand subjective perspectives related to behavioural finance through 'lived' experiences of participants related to financial decision-making and financial capability.

For this chapter, thematic analysis is undertaken using the 'Big Q' method. This is an approach within the qualitative research paradigm which recognises the influence the researcher's interpretation has on the resulting themes. As such, this approach is fluid based on how the researcher reviews the data and allows for the collection, review, and derivation of insights from subjective information. In particular, this analysis utilises critical realist/contextualist thematic analysis which is an approach that recognises that there is a 'reality' while also acknowledging that the influence of socio-cultural factors means the experiences of participants and the resulting themes are more appropriately termed 'versions of reality' (Smith, 2015).

Braun and Clarke (2006) provide guidelines for undertaking thematic analysis to explore psychological data. Although the data collected for this analysis is not classified as psychological data, it does seek to better understand the psychological influences on financial decision-making. The interview data covered a range of topics related to behavioural finance,

where financial decision-making is influenced by psychological functioning in addition to information gathering and other innate factors. Therefore, we take guidance from Braun and Clarke (2006) to complete theoretical thematic analysis on the interview transcripts, resulting in six key themes. In line with Braun and Clarke (2006) the general procedure for undertaking thematic analysis is as follows. The first step in thematic analysis is reviewing data transcripts and 'coding' the data based on key concepts or subjects. In this study, the codes used are largely based on the researcher's interpretation of the data, although partially guided by the personal finance literature. The initial coding is the first step in reviewing data for trends and consequently forms the most detailed level of data categorisation. The second step is to identify and review overarching themes within the codes, resulting in the refinement and consolidation of codes. The third step is a review of the retained themes and the elimination of some themes that are not strongly evidenced across the broader dataset. The fourth step is to define and name themes based on their overarching relationship to personal finance concepts within the literature. And finally, the themes and evidential excerpts from the interview transcripts are used to generate meaningful insights about personal finance in practice (Braun & Clarke, 2006).

Theoretical thematic analysis is often driven by the original research question posed by the researcher, and thus themes are largely constructed based on findings within the existing literature. This can result in high levels of detailed analysis focused on certain aspects found within the qualitative data (Braun & Clarke, 2006). This thesis utilises theoretical thematic analysis, predominantly using findings from the literature to guide theme construction. This analysis uses a critical realist approach to understand the subjective perspectives of participants, thus acknowledging that although there is likely one 'reality', socio-cultural factors influence individuals' subjective perspectives meaning they create their own 'versions of realities' (Smith, 2015).

Using inductive thematic analysis, the interview transcripts were inputted into Nvivo software, reviewed by the researcher, and excerpts of text coded into 'nodes' to identify certain trends present throughout the data. The original codes were then reviewed to understand relationships between codes, explore codes with high volumes of relevant text, and identify broader themes emerging from the data. Researcher discretion is used to merge codes (and in some cases exclude codes where data was insufficient), resulting in six key themes.

5.3. Results – index application

The questions selected for the financial capability survey portion of this study are crafted to represent each of the retained components from the financial capability index methodology detailed in Chapter 3. That is, for each retained component from factor analysis for the financial knowledge, financial behaviour, and psychological questions respectively, there is a corresponding survey question. This enables the application of the component computation using the weights identified in the index formation methodology outlined in Chapter 3. Subsequently, the complementary financial capability index is applied to the computer components, enabling a financial capability score to be calculated. Table 41 below shows the retained components from the methodology in Chapter 3, the questions developed for the purpose of the online study to match the retained components, and the relevant question weightings based on the weightings allocated to the equivalent components in the index development methodology outlined in section 3.4.2.

Table 41: Financial capability survey inputs

Component	Question	Weight
Subjective knowledge	How would you rate your level of financial knowledge?	0.62
Financial confidence	If financial capability is described as having the knowledge, skill, and motivation to make informed financial decisions, how would you rate your level of financial capability	0.21
Objective knowledge	Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	0.17
Saving	How often do you save money in case of future financial needs?	0.50
Money management	How often would you find it difficult to cover your regular expenses (e.g. food, utilities, rent/mortgage payments, petrol)?	0.24
Budgeting	For your regular income, how often do you make a plan of how your money will be used?	0.14
Financial decision-making	How often would you spend a lot of time gathering information and considering options before making a financial decision?	0.12
Time orientation	I live more for the present day than for tomorrow	0.44
Impulsivity	I am impulsive and often do things without giving them much thought	0.18
Locus of control	I am always in control of my actions	0.13
Social status	I care about how other people see me	0.10
Self control	Even if I can't afford something, if I really want it, I will just purchase it on credit	0.09
Action orientation	When I am faced with difficult or important decisions, I put it off for another day	0.07

The result of component computation is financial knowledge, financial behaviour, and psychological factor variables which act as proxies for the components retained in the original index development methodology. These variables, combined with the socio-demographic data inputs collected in the online study, enables a direct application of the regression equation, to calculate a financial capability index score for each of the respondents. Due to the simplification of data inputs used in construction of the index, the application of the financial capability regression equation results in a slightly varied score profile. As per the methodology outlined in Chapter 3, the results are adjusted to achieve a maximum possible score of 100. Based on the maximum of 2.46 shown in Table 42, we adjust all scores by a multiplier of 40 to achieve a score range that aligns with the development methodology and improved ease of interpretation. The descriptive statistics for the scaled and unscaled financial capability index scores are shown in Table 42.

Table 42: Financial capability descriptive statistics - scaled and unscaled

	N	Minimum	Maximum	Mean	Std. Dev
Financial capability index	55	1.47	2.47	2.03	0.27
Financial capability index (scaled)	55	58.63	98.74	81.16	10.61

Based on the application of the financial capability index to the survey data collected for this study, the mean financial capability index score is approximately 81 for the 55 participants for which valid scores are calculated. However, these results highlight the sensitivity of the index to changes in question inputs (despite including questions which proxied each of the retained components) and to any missing data. Within SPSS, valid financial capability index scores are not calculated for participants with incomplete datasets. This ensures financial capability index scores are not skewed or misrepresentative of an individuals' actual financial capability levels due to missing data. However, this results in only 55 valid financial capability index scores out of 94 participants, confirming the sensitivity of the model to missing data.

Despite highlighting the sensitivity of the index, the above results also demonstrate the successful application of the financial capability index model on a dataset which is considerably simpler and more refined than the other datasets used in previous chapters to develop (Chapter 3) and test (Chapter 4) the financial capability index. From the index formation methodology outlined in Chapter 3, we recognise that multiple factor loadings on a single component provide a more comprehensive and accurate measure of the aspect of

financial capability being measured. However, the results indicate that a simplified version of the survey can produce significant results to proxy financial capability levels in the absence of more detailed data inputs. This is an encouraging result as it illustrates the wider applicability of the financial capability index on datasets which differ from the ANZ Financial Wellbeing study used to develop the index in Chapter 3. In essence, if the dataset contains information that can proxy each of the 14 retained components from factor analysis in the development methodology, an appropriate proxy score for financial capability can be computed. Further, the results of index application provide additional support to the first research objective of this thesis, confirming the influence psychological factors have on financial capability levels.

5.4. Results – thematic analysis

As per the methodology described in the previous section, thematic analysis is a stepwise process undertaken by the researcher. First transcripts are assessed and 'coded' based on themes or concepts present in the interview dialogue. Reviewing and coding of transcripts continues until the majority of relevant information contained in the interview data are categorised to the relevant code. This results in a series of inter-related codes which are further reviewed and consolidated to form more general themes. In line with traditional applications of theoretical thematic analysis, the retained themes (and sub-themes) are largely shaped by the original research question and findings from the literature. Figure 3 provides a breakdown of the six general themes that are identified as well as the relevant sub-themes which are combined and grouped in relation to the overarching theme. Collectively the six themes provide additional support to research objective two, providing insights into the range of factors influencing financial decision-making in practice. The following section provides further insights into each of the retained themes, supported by excerpts from the interview transcripts.

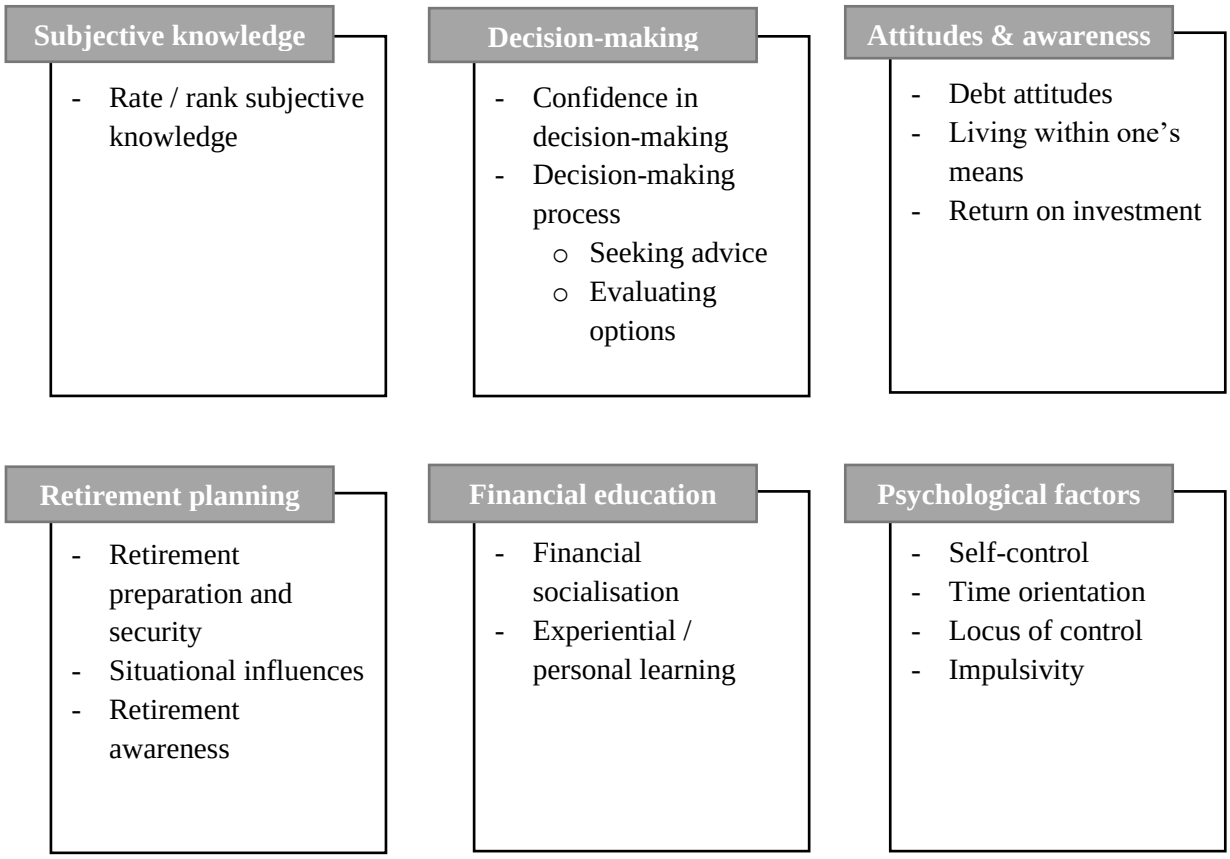

Figure 3: Thematic analysis themes and sub-themes

5.4.1. Theme one: The role of subjective knowledge and self-efficacy in financial capability

Financial knowledge plays a crucial role in guiding decision-making towards positive financial behaviour. Traditionally, an individual is considered financially literate when they are successfully able to apply financial knowledge to guide positive financial behaviour (French et al., 2020). An understanding of financial knowledge allows an individual to actively draw on the appropriate information to make informed financial decisions. Distinct from objective knowledge is how an individual views their own level of financial knowledge. Subjective financial knowledge is in part synonymous with self-efficacy, describing how 'self-assured' an individual feels in their ability to manage their personal finances (Farrell, Fry, & Risse, 2016). The distinction between objective and subjective knowledge therefore plays an important role in distinguishing the appropriate approach to financial education. Improving objective financial knowledge without appealing to an individual's level of financial confidence or self-efficacy is unlikely to be successful in generating appropriate behaviour change to improve financial

outcomes. Generally, objective knowledge can only guide effective decision-making when it coincides with improved self-efficacy and confidence (Russell et al., 2020).

Participants in the financial capability study were diverse in their self-reported level of financial knowledge. Importantly, as the interviews were separate from the financial capability portion of the survey, the questions related to financial knowledge were largely intended to gauge how confident participants felt in their own level of financial capability. Several individuals felt compelled to rate or rank themselves based on their perceived level of financial knowledge:

ID005: 'Yeah, I say like maybe like an 8 out of 10'

ID008: 'So I would rate myself as better than most but not as good as some.'

ID014: 'Um, yeah my level of financial capability is reasonably high, I would imagine compared to the average person'

ID017: 'Um good, uhh yeah like I think, I guess if it was a scale of sort of 1-10, I'd probably characterize myself as maybe 9, 9 or 10.'

Interview question one (see Table 46) was worded in a way that asked participants about their perceived levels of financial capability. However, most participants responded with a self-reflection on their level of financial knowledge or their ability to make financial decisions. Despite financial decision-making being one of the key measures of financial capability, the narrowness of the responses provided indicate that in many cases participants viewed financial capability over-simply, driven predominantly by knowledge levels or an ability to make financial decisions.

ID009: 'Uh I guess I've got age on my side in terms of I feel reasonably confident about some decisions… but in general terms and terms of I guess our standard financial things like buying houses and selling houses and all of those sorts of things, I feel reasonably confident about investing.'

ID014: 'Um but yeah, I would say um I can definitely make informed decisions'

ID015: Um I, (.)[28] at this point in my life, I feel reasonably confident about making decisions as long as I have access to appropriate information.'

The UK Financial Services Authority created a framework which measures financial capability as a combination of knowledge & understanding, skills, and confidence & attitudes (Kempson, Collard, & Moore, 2005). The interview responses tend to indicate that individuals perceive financial capability as their level of knowledge and/or their ability to make informed financial decisions. As financial decision-making is a critical measure of financial capability, it is also important individuals understand the variety of inputs and influences that impact those financial decisions beyond the possession of financial knowledge. Further, to promote behaviour change, financial education programmes should aim to educate individuals on positive financial decision-making by improving financial knowledge levels as well as financial confidence. It is important individuals understand that their ability to make an informed decision is not simply based on their ability to gather and process information but is also determined by their mental motivations and biases (Tang & Baker, 2016). In relation to participant self-reports regarding financial capability levels, interview responses captured two key trends. Firstly, responses indicate the common belief that perceived financial knowledge is important to drive decision-making. Secondly, the responses show that people often view financial capability as synonymous with financial knowledge or decision-making. Therefore, to improve financial capability levels, it is important to increase an individual's understanding of what determines financial capability level and what factors may impact subjective confidence in a way that is likely to induce behaviour change.

5.4.2. Theme two: How confidence can affect decision-making

Financial confidence

Arguably one of the most important components of financial capability is the ability to make informed financial decisions. It is possible that an individual may have adequate financial knowledge yet be unable to use this knowledge to guide positive financial behaviour due to various 'noise' factors during the decision-making process (Kempson, Perotti, & Scott, 2013). The UK Financial Services Authority identified three main elements for measuring financial capability, namely knowledge and understanding, skills and behaviour, and attitudes and confidence (Kempson et al., 2005). This definition recognises that beyond measuring financial knowledge and behaviour, it is important to understand how psychological influences affect

[28] Note, (.) denotes a pause.

the decision-making process and financial confidence. Drawing on findings under Theme 1, perceived confidence in one's own financial decision-making abilities seems to be a proxy for evaluating subjective financial capability levels. Self-confidence in one's financial ability is important as individuals require the motivation and confidence to source and apply the appropriate information to make informed financial decisions. Where differences between interviewees are more pronounced is the source of decision-making confidence. Sources of confidence include evaluation of the expected end results and outcome planning, financial preparation and information sourcing for a decision, and situational factors.

Response excerpts from several interview participants revealed that despite the source of confidence, individuals require some degree of self-efficacy to motivate them to make informed decisions. One interviewee used option evaluation to improve confidence, by identifying the financial benefit of potential options so they knew they 'weren't gonna be losing' (ID001). Another interviewee felt confident in their decision to lease their farm due to their current life cycle stage (retired and not going to re-enter the workforce) and self-evaluation of their financial situation (ID011). A third interviewee sourced their confidence from being financially prepared, by setting a goal and saving for five years to purchase an asset without going into debt (ID009).

ID001: 'Umm I felt confident because I could say the financial gain like we weren't gonna be losing'

ID009: 'Uh, very confident cause I had been saving for 5 years for it and so I had the money to be able to pay cash for it'

ID011: 'Quite, yeah quite confident, yes, we did. Quite confident…Well I guess our age, we aren't going to start farming again um so yeah. (.) Confidence too, that it was time for our son who is farming next door to us to be able to lease some of our farm and yeah, that sort of thing'

Tang and Baker (2016) find there is a distinct difference between objective financial knowledge and self-esteem, yet both have a real impact on the financial decision-making process. Therefore, beyond gathering relevant information, it is important individuals are able to feel self-assured in their decision-making abilities. Financial preparedness, review and risk-assessment of various potential outcomes, and evaluation of one's current and future financial circumstances are all various methods of information gathering and preparation for decision-

making. While not always changing the level of financial information required to evaluate various alternatives, each method is seen to increase the level of confidence the individual had in their ability to make an informed financial decision. Behavioural biases, including self-confidence, have an important impact on subjective financial knowledge. Improved self-efficacy combined with the ability to source the appropriate information, increases the ability of individuals to make rational and informed financial decisions (Farrell et al., 2016). Therefore, actions taken to increase an individual's self-efficacy are also likely to increase their ability to manage their financial situation and make informed financial decisions (Farrell et al., 2016; French et al., 2020).

Decision-making process

Due to research challenging unbounded rationality, behavioural finance theorists have found that decision-making is reliant on information gathering as well as self-efficacy and other 'noise factors' such as behavioural biases and cultural expectations (Storchi & Johnson, 2016; Tang & Baker, 2016; Tversky & Kahneman, 1974). As identified in the previous section, self-efficacy and financial confidence are important factors influencing an individual's ability to utilise objective financial knowledge to make informed financial decisions. This confidence can relate to an individual's perceived financial ability, as well as in the reliability of the information they source. In response to a question asked about sources of financial confidence, responses were mixed, yet largely fell into one of two categories: seeking advice from others and exploring all possible options.

Firstly, considering the 'seeking advice' category, it is noticeable that advice and information is collected from a wide variety of sources including financial advisors, professional bodies, and other trusted individuals. One theme related to seeking advice was trust, with one individual saying 'I got a good feedback from the advisor I was speaking with… I trusted this person' (ID003), and another stating 'I think getting advice is good if you've got someone that you trust' (ID016). The responses highlight that seeking advice plays an important role in increasing an individual's confidence in their decision.

> *ID003: 'Uh I got a good feedback from the advisor I was speaking with…um, and that basically mostly, I talked to this person, I trusted this person, and I seen a good positive feedback on it and it does to me seems like a good plan, so (.) and that's basically what uh makes me very confident'*

ID014: 'I also had consulting with ACC [Accident Compensation Corporation] as well. It's not the first time that they've been through the process, so um, uh yeah I had a consultant period with one of the workers there who does this as a job, so, um had quite a lot of recommendations and quite a lot of people to talk to a good support network for that…And yeah, I guess any large financial decision you're gonna make, you need to um talk with a lot of people, a lot of people that are knowledgeable so…'

ID016: 'I think getting advice is good if you've got someone that you trust and it doesn't , and it doesn't necessarily have to be an expert but making the decision with a bit of advice um and but also giving yourself permission to do it as well'

The second category that emerges from the interview responses is the importance of evaluating all options to build confidence in decision-making. An ability to evaluate financial options prior to deciding may be influenced by key behavioural biases. Self-control and impulsivity control are two psychological factors which are closely linked and play an important role in decision-making by slowing down an individual's decision-making process and encouraging them to gather and assess all relevant information. Approach goal orientation describes the tendency for an individual to actively seek positive financial outcomes (Shephard et al., 2017). Therefore, if an individual is able to exercise self-control and control impulsive behaviour, they are more likely to take time to evaluate financial options, increasing the likelihood of informed financial decisions and positive financial outcomes.

ID008: 'And what the variability and response will be over time as well, you know how, how good or how bad can that decision actually be?'

ID012: Umm I think it's knowing the options and stuff… yeah and knowing you can shop around, I think is something that didn't occur to and sort of realised yeah.'

ID017: 'Um yep, pretty confident at the time…I think partly because we had options so yeah, at the time, confident at the time…Um just understanding or exploring all of the different outcomes and scenarios, all of the possibilities. Um, you know, cost escalations, delays, all that sort of

thing, um and just understanding and planning for all of those and actually planning just for the worst case.'

An important step in the decision-making process is to first understand what the 'variability and response will be over time' (ID008) and 'knowing the options' (ID012). An evaluation of the potential outcomes of the different options available to an individual increases the likelihood that their decision will be well-informed and not impulsive. Most simply, an evaluation of anticipated outcomes ensures an individual is prepared to make an informed decision based on the information available.

5.4.3. Theme three: Financial attitudes and awareness

Studies have demonstrated the possession of financial knowledge does not always translate to positive financial behaviour due to other influences on the decision-making process, namely financial attitudes, motivations, and behavioural biases (Kempson et al., 2005; Friedline & West, 2016; Shephard et al., 2017). Beyond an ability to gather and process information, individuals are guided by money attitudes and motivations which may develop as a result of financial socialisation or cultural norms. Several studies have found evidence that individuals acquire knowledge, attitudes, and behaviour through exposure and imitation of socializing agents, particularly during childhood (Shim, Barber, Card, Xiao, & Serido, 2010). This is important as the financial socialisation process plays a key role in the development of financial knowledge and money habits that may persist during adulthood.

Debt attitudes

Through observation and exposure during childhood, individuals learn financial behaviours and adopt the attitudes of their socializing agents. Further, a study by LeBaron, Runyan, Jorgensen, Marks, Li and Hill (2019) indicates that positive and negative habits that children are exposed to before entering adulthood, are largely expected to persist even after the individual becomes financially independent.

ID005: 'But I think if I didn't have that, I think I would be, yeah, I think I'd be very stressed right now. Like if I'd gone into debt to pay for those flights or something, I kind of think of it like I'm in debt to my savings account.'

ID015: 'So you don't go into debt to buy things, you don't do higher purchase or any of those sorts of things. Other than a mortgage obviously. Um so you don't go into debt to buy things. And I've only ever done it for a

major purchase I think other than buying a house – buying a houses, you know, maybe a couple of times for motor vehicles or things like that…If there isn't and it's a significant issue, is it, is the cost benefit going into debt, worth it?'

Attitudes towards debt were mentioned by a few participants and usually discussed with negative connotations where debt was considered "bad" or to be avoided. Although in some cases a reliance on debt can indicate poor money management and higher financial risk, in other cases debt can be managed appropriately to achieve positive financial outcomes with the appropriate knowledge and skill. It is therefore important that individuals can differentiate between good and bad debt. As described in the New Zealand Financial Capability Barometer study, 'good debt' is the borrowing of money to increase wealth of the borrower in the future. 'Bad debt' is the borrowing of money to fund consumption (Galicki, 2020a). A mature understanding of how debt can be utilised to generate future wealth aligns with positive financial behaviours such as retirement planning and investment. When debt is related to over-consumption and living beyond one's means, it can negatively impact an individual's level of financial wellbeing (Galicki, 2020). The interview responses demonstrate that debt is often viewed negatively by definition rather than evaluated situationally. For example, one respondent mentioned that they would have been 'very stressed right now… like if I'd gone into debt to pay for the flights' (ID005). Another respondent mentioned 'you don't go into debt to buy things… other than a mortgage obviously' (ID015). These responses indicate a single perspective of debt rather than the polarity of debt based on the context and motivation of debt usage. It is important that individuals are fully educated on financial concepts to have mature attitudes on various money behaviours such as the use of debt to generate future wealth.

Living within one's means

As outlined in the index formation methodology detailed in Chapter 3 of this thesis, spending restraint is recognised as having an important influence on behaviour and decision-making. This follows research from Kempson and Poppe (2018) and Galicki (2021) who find that spending restraint and impulsivity control are key psychological factors influencing money management behaviours and consequent levels of financial capability. Spending restraint demonstrates the tension between financial behaviour and psychological factors, explaining the slowing down of the decision-making process through the use of self-control and impulsivity control. Beyond psychological factors, an understanding of what it means to 'live within one's

means' is an important concept likely to impact an individual's ability to exercise spending restraint. Further, an ability to spend within one's means often includes an ability to differentiate between a want (a luxury item or a good/service which does not meet the definition of a necessity) and a need (a necessity).

ID001: 'And do I really need it? Do I really really need it or would I prefer something else?'

ID014: 'then I guess it's just how much, what, what enjoyment do you get from every dollar you spend?'

The interview excerpts above are examples of how spending restraint influences decision-making. Interviewees were asked the kinds of inputs or influences they consider to be important when making financial decisions. One respondent detailed they often think 'do I really need it' (ID001) before making a financial decision. This indicates the presence of several factors influencing decision-making including self-control, impulsivity control, spending restraint and an understanding of 'living within one's means'. The presence of this thought pattern during the financial decision-making process is encouraging and is likely to improve the likelihood of positive financial outcomes.

Return on investment

Informed product choice is recognised as a positive financial behaviour which may enhance financial wellbeing levels. Informed product choice includes measures of how well an individual can select financial products/services to meet their current and future needs, an understanding of the associated terms and conditions of a product/service, and regular evaluation of the suitability of financial products, particularly in response to a change in circumstances. In relation to financial decisions, informed product choice may include behaviours such as evaluation of potential options and the seeking out of relevant and trusted advice. When evaluating potential financial options, a key consideration is the return on investment. It is important individuals consider whether the money they spend is likely to result in a measurable return on investment. This return may be financial, time-related, or alternatively, generate sufficient utility to warrant the expenditure. For example, one participant commented that they consider 'what's going to be the payoff in terms of the return on investment' and further commented that the return can take many forms including 'increased capital or cash reserves or increased security, increased potential for wellbeing' (ID015).

ID001: 'How can I make my money go, or our money go the furthest?'

ID003: 'it's always the return on investment.'

ID009: 'Uhh I always work on the principle are you making a decision to invest in something that will return, have an asset return?…like if you buying an asset to has to have a return, umm things like a car I don't think are assets really they're kind of you know, more hobbies that tend not to be assets. So from a financial decision perspective, is it going to is it gonna take you forward? I suppose this kind of the thing I think about.'

ID015: 'it's what's going to be the payoff in terms of the return on investment and that return can be either in terms of increased capital or cash reserves or increased security, increased potential for wellbeing.'

The excerpts above indicate the relationship between financial decision-making and spending restraint may be bi-directional. This is likely because informed decision-making induces the use of several considerations and techniques such as needs and wants analysis, evaluation of alternatives, and return on investment, which collectively slow down the decision process and improve the level of information collected and applied. A financial wellbeing study undertaken by Kempson and Poppe (2018) found that 'spenders' were more likely to have low levels of self-restraint, a stronger focus on the short-term, often made decisions without evaluating options, and had lower levels of money management knowledge and financial confidence. One interview respondent commented that they make financial decisions based on the likelihood of achieving asset returns and financial progression. Another participant articulated this consideration more simply saying for them it is about 'how can I make my money go, or our money go the furthest?' (ID001).

5.4.4. Theme four: Retirement planning

Retirement preparation and security

A key aspect of financial capability is retirement planning due to the impact financial preparation can have on long-term financial wellbeing as discussed in chapters 1 and 2. Based on the definition from the Commonwealth Bank of Australia (2019), financial wellbeing is measured based on four key factors, namely meeting financial obligations, financial freedom for decision-making, control of one's finances and financial security (both current and future). Future financial security is largely determined by the level of planning and wealth

accumulation an individual achieves during their working life. Therefore, retirement planning, and preparation can increase the likelihood that individuals are able to maintain their level of financial security once exiting the paid workforce. On the basis that increased financial capability levels often improve financial wellbeing levels, preparation for retirement is a critical financial behaviour. A trend identified across several interview responses is the importance of financial assets to provide retirement security. The assets referred to by participants are diverse, including ownership of residential property, family inheritance, investment properties, and retirement savings (e.g. KiwiSaver). However, all interview responses about retirement security indicate that ownership of financial assets provide security and increase comfortability when considering retirement.

ID001: 'Uh, for me, I mean like we own our own home, so I find personally I think that that's beneficial and we're fortunate with both like my husband's family and my family (.) I think that we've got security there.'

ID007: 'And so we have investment properties, and we have some other investments that will provide us with a comfortable income stream in addition to our superannuation, um once we, I suppose exit the paid workforce.'

ID008: 'So for me, retirement savings is about security and choices.'

Retirement and situational influences

Retirement planning and preparation seems to be largely influenced by an individual's age and situation. Several interview responses show that younger individuals are less likely to have actively planned or begun thinking about retirement, with retirement feeling too far away cited as a reason by some respondents. Psychological factors have been found to have a strong influence on financial behaviour largely due to their influence on the selection and processing of information during financial decision-making (Gentile, Linciano, & Soccorso, 2016; Tang & Baker, 2016; Shephard et al., 2017; French et al., 2020). Psychological factors such as time orientation can have a strong influence on an individual's ability to form long-term financial plans. Time orientation explains the degree to which an individual is focused on their long-term self-interest (Benton et al., 2007). This concept is also linked to the idea that people, especially younger people, can feel disconnected from their financial futures. For example, some people might feel overwhelmed by the enormity and complexity of planning for their

financial futures, which can result in individuals becoming passive in their financial actions and decisions (Russell et al., 2020). In contrast, this means that individuals with a long-term focus may have an increased likelihood of planning for retirement even from a young age (Galicki, 2021). This phenomenon is particularly obvious when exploring retirement planning and preparedness among young individuals. Responses from several interview participants reveal that younger individuals often believe retirement is 'too far away' for them to actively prepare for. This is a trend across the below interview excerpts from participants aged between 18-29 years.

> *ID003: 'I'm at an age where I'm middle of my adult like, if you want, or even a little bit work wise, early in my adult life, which means that a retirement is a longer, long, longer distance away which is very hard to compute… So, it's a very, very hard to plan thing. You can put things in motion, but it's a period so far into my life, that I can only agree on the fact that I want to retire and from there see what it could be the situation as it is from now and realize that depends on me securing myself and after financial sustainability for our retirement'*

> *ID005: 'I think it's too far away from me to worry about right now… and I know that I've got Kiwisaver and other savings as well, but it's like in the context of buying a house which is broadly in the category of my future financial situation.'*

> *ID013: 'Umm sometimes "…" I thought about that after I retirement, but it's too far away so not concerned too much'*

> *ID014: 'Um as much as any 25-year-old does. Um like my KiwiSaver is sort of the higher risk stuff... but I suppose there's more focus on the shorter-term goals, such as purchasing a house and stuff like that, than focus on long term at the moment.'*

The Te Ara Ahunga Ora Financial Capability Barometer (2018-2019) indicates that most New Zealanders do not maintain a long-term financial focus and are therefore not actively thinking about retirement (Galicki, 2020a). A lack of retirement planning is particularly common in the younger age brackets with 41% of 18–30-year-olds and 29% of 31–40-year-olds thinking about their retirement 'hardly at all' (Galicki, 2020). This trend is often linked to locus of control.

When an individual who focuses on the short-term also has an external locus of control, they are more likely to expect things to 'happen for them' and for the future to 'take care of itself'. When combined, these two phenomena are likely to have a detrimental impact on an individual's current and future wellbeing, including their retirement preparedness (Galicki, 2021). In contrast, a long-term orientation combined with an internal locus of control is likely to motivate individuals to proactively plan for retirement.

> *ID001: 'I'm probably a little bit short-sighted in that I don't think about it necessarily enough. That it's maybe also like the season that we're in at the moment and like we're on one income because we've got a young family, we've got a 2-year-old. So I'm personally not working and I suppose that that's like the sacrifice umm that we make, yeah'*

A 2021 study by Te Ara Ahunga Ora (formerly the Commission for Financial Capability) measures individuals' preparedness for retirement as part of a wider financial wellbeing survey. The study looks at the retirement preparedness of New Zealanders beyond a reliance on New Zealand Superannuation. On average, participants score 43 out of 100, which highlights the low level of private retirement savings held by New Zealanders. Considering New Zealand Superannuation and private retirement savings, approximately 30% of participants did not believe they would have sufficient income to support themselves during retirement and would consequently need to work beyond the age of 65 years (Galicki, 2021). It is pleasing several of the interviewees mentioned KiwiSaver and other long-term investments intended to provide financial support during retirement, indicating they are not solely reliant on New Zealand Superannuation.

> *ID007: 'And so we have investment properties and we have some other investments that will provide us with a comfortable income stream in addition to our superannuation, um once we, I suppose exit the paid workforce.'*

> *ID009: 'But on the whole I've got reasonable retirement savings and I think we're still the generation that will get government super … We have a number of different vehicles we've got, we've got, I guess, significant investment in a property which is our own property…we've got some other things, like investments that mature kind of stuff as we are turning 60 or 65*

and then I've got a KiwiSaver which I've been saving superannuations and stuff like that for a long time.'

ID012: 'Yes, I'm part of the KiwiSaver scheme through my bank but I've just started looking at other KiwiSaver options, and once I'm in a bit more of a stable situation, I'm gonna also see if there's other options for retirement as well.'

ID019: 'Um I'm always looking at my super, so always watching my super but um I'm also, as far as retirement goes, the current property we own I'm hoping will um uh provide us a reasonable comfortable retirement'

A separate study by Te Ara Ahunga Ora surveyed just over 15,000 New Zealanders between 2018 – 2019 to further understand financial capability levels (Galicki, 2020a). This survey finds that 38% of New Zealanders believe New Zealand Superannuation will be their main source of retirement income, and 23% expect their main retirement income source to be KiwiSaver. Several fundings from this study demonstrate the impact of age on retirement planning and expected retirement income sources. Of the 18–30-year-olds surveyed, 30% believe their main retirement income source would be KiwiSaver as compared to 18% who believe it would be NZ Superannuation. For 61–70-year-olds who were surveyed, 66% believe NZ Superannuation would be their main retirement income source as compared to 6% who believe this would be KiwiSaver (Galicki, 2020).

Retirement awareness

Beyond wealth accumulation, it is important that individuals have confidence in their long-term planning abilities. A Financial Capability Barometer study by Galicki (2020a) finds that subjective factors, such as perceived retirement preparedness or financial self-efficacy, may not have a direct impact on wealth accumulation or retirement comfortability, yet may have a real impact on proactive financial behaviour and planning which can improve financial preparedness. It is encouraging that several interview participants acknowledge preparing for retirement beyond a reliance on New Zealand Superannuation and participation in the KiwiSaver scheme. A few participants note the fragile condition of New Zealand Superannuation and recognise that they may not be able to rely on receiving a pension at age 65.

ID008: 'So I know there's a financial element, a social element, health, and welfare. So I think you need to look at retirement from a holistic perspective and if you don't plan for all of those elements, then you can get quite out of kilter. Um the financials enable all of the other things at the end of the day if you're financial stressed, then you can't afford necessarily good health care. You can't afford enjoyable activities, you can't afford to, you know, spend time doing the activities you want to do.'

ID015: 'so, retirement for me initially was um slightly um worrying in that I didn't know what I was going to do and then it became, as I said, it just became boring as I did all the things that needed to be done. And now I'm contemplating do I retire when I'm 70 or do I retire when I'm 75?'

ID016: 'So I've thought, have I got enough, will it last, will they get rid of government super "…" will I own my house, will I be able to retire at 65, am I gonna retire at 65 "…" so I keep on saying well um deciding on whether I leave work at 65 actually isn't really probably a monetary decision, so don't worry about that'

ID017: 'Specifically that the retirement age when we retire will be 67, if not higher… which seems like ages away, it's probably going to be somewhere between 67-70 years. So and people live longer and all of that, so I've thought about it heaps I guess is the short answer.'

The interview extracts indicate a holistic mindset around retirement and preparation. Although some participants focus on New Zealand superannuation or KiwiSaver participation, other participants recognised\ that retirement is a stage of life as well as a situation that requires planning and preparation. One participant commented that when considering retirement, there is 'a financial element, a social element, health and welfare' and noted that retirement should be viewed from a 'holistic perspective'.

5.4.5. Theme five: Financial education

Financial socialisation

Studies have shown there are several ways through which individuals can experience financial learnings, including financial socialisation, active financial education at home, work experience, or formal financial education programmes (Danes, 1994; Shim et al., 2010;

Jorgensen, Rappleyea, Schweichler, Fang, & Moran, 2017). These methods can be broadly separated into two categories; formal and informal education (Matthews et al., 2023). Formal education methods include schooling and financial education providers, compared to informal sources such as financial socialisation and general life experiences (Matthews et al., 2023). Socializing agents can include family, friends, schools, and colleagues (Matthews et al., 2023; Xiao, 2016). The term consumer socialisation describes the process where children acquire the appropriate knowledge and skills to allow them to become financially independent. The theory of consumer socialisation was originally proposed by Ward (1974) and has been further explored in association with the development of financial knowledge and attitudes. Consumer socialisation is grounded in the idea that despite having little relevance during their adolescent years, exposure to positive financial behaviours and attitudes during childhood is highly beneficial in the development of financial skills that can be drawn upon in future years. Consumer socialisation can therefore occur through conscious or unconscious mediums including observation, participation, and active financial education (Jorgensen, Rappleyea, Schweichler, Fang, & Moran, 2017).

In comparison, financial socialisation is a narrower concept which describes the acquisition of financial knowledge and behaviours during childhood to enable the eventual self-management of financial matters during adulthood. Studies have identified the positive impact financial socialisation has on an individual's financial capability levels as they become financially independent. This link is often attributed to the belief that financial socialisation prompts the development of financial self-efficacy, which can lead to positive behaviour change (Ahn, Bae, Serido, & Shim, 2018). Despite financial socialisation typically being attributed to the childhood years, it is believed financial skills and attitudes are dynamic, evolving in response to the economic environment an individual lives in (Gudmunson & Danes, 2011; Ahn et al., 2018). However, based on the results shown in Matthews et al. (2023) exploring the financial capability of young adults, the reliance on parental figures for financial education has decreased over time as participants have aged. To illustrate, 45% of individuals indicated that a high proportion of their financial knowledge is gained through personal experience. In comparison, only 26% of individuals reported that parents are the largest source of financial knowledge, reducing from 47% in 2017 (Matthews et al., 2023). In many cases, interview participants note their parents are one of the largest sources of financial education, both deliberate and incidental.

ID001: 'I don't think that my parents really went out of their way to, like, teach us about finance, but I think that umm, through day-to-day living'

ID003: 'So I would say that family in general, I think it's a source of education just because you grow around it'

ID005: 'I think even more passively than that in in the way my parents talked about finances…When they did talk about finances, they talk about things like being careful about this and having like a buffer and stuff like that.'

These learnings are generally achieved through observation, with children witnessing their parents financial habits and often adopting their financial values. It is thought that financial socialisation, particularly in a parent-child relationship, can be described using three main factors, namely behaviours, rules and monitoring, and direct communication (Xiao & O'Neill, 2016). This indicates that in some cases, parents provide intentional learnings through active conversation or inclusion in financial undertakings. Communication is a key instrument in the disintermediation of knowledge and behaviour in the socialisation process, with family social interactions believed to have a strong influence on the behaviour of children (Xiao & O'Neill, 2016). In response to a question about financial education sources, it is encouraging that money conversations were apparent in several interview responses.

ID003: 'sometimes as a kid I had sometimes I had, you know, Christmas money or stuff like that. And I was always encouraged to save them and then to use them wisely, which I took very much to care.'

ID005: 'my mother kind of drilled that sort of stuff into me about not spending more than you have.'

ID009: 'So in our family we've always talked about money and we've always talked about savings "…" it's one thing I think is really missing in our curriculum actually because it is one of those ones that's the benefit of who your family are is to how you feel about money and how you relate to money. It really is that and civics I think need to be taught a lot more in our education system.'

In the New Zealand context, the presence of formal financial education programmes within the school curriculum is minimal. Therefore, it is natural that financial socialisation has been considered the most prominent source of financial education (LeBaron et al., 2019). However, much of the learnings that occur during the financial socialisation process are dependent on the

existing knowledge levels and behaviours of the socializing agents. A child's reliance on socializing agents to provide financial education, highlights the risk that financial learnings during childhood may be insufficient, leaving individuals ill-equipped to make appropriate financial decisions when entering adulthood. This indicates that learnings are conditional, based on the opinions, norms and money values held by the parents or socializing agents.

ID001: 'talked a little bit about saving and about not spending everything…putting money aside…and like the opportunity cost.'

ID015: 'One which is more a maxim than an education was from my parents… if you don't have the money, you don't buy it… um so one is we don't spend money we don't have.'

A couple of interview participants acknowledged they felt their opinions on money behaviours such as investment and debt are largely influenced by their parents. They also acknowledge that it was not until they entered adulthood, that they found some level of financial independence and were able to adjust their financial opinions through further education or upskilling. Further, one interview participant acknowledges the strong role culture plays in shaping money attitudes and behaviours. Habits that children are exposed to before entering adulthood, both positive and negative, may persist even after the individual has left the environment they were brought up in (LeBaron et al., 2019). A study by Almenberg, Lusardi, Säve-Söderbergh and Vestman (2021) found that often debt attitudes were at least in part influenced by cultural factors through intergenerational learnings.

ID014: 'Um growing up my parents were quite conservative when it came to investments "…" umm I would probably have liked to have known more about the stock market and um things that I suppose we couldn't quite have even known were gonna become a commodity in like cryptocurrencies and stuff like that.'

ID017: 'um yes I think in hindsight, a little bit more about debt. Um so from my parents I learned really nothing about debt except that it was bad. Asian families, it's just like no debts not good, don't borrow money to spend today, like, so it's kind of like a real savings culture "…" So because it's a savings culture, we didn't have mature views about debt. So um we

just stayed away from it right, rather than know how to use it to your advantage'

Culture plays an important role in shaping social norms, including attitudes towards debt and other financial behaviours (Almenberg et al., 2021). Asian cultures have traditionally been found to maintain a 'savings culture' based on tendencies towards uncertainty and risk avoidance (Zhao, Sun, Devasagayam, & Clendenen, 2018). This is noted by one participant who felt that their 'savings culture' meant they grew up feeling 'debt's no good' and that an individual should not 'borrow money to spend today' (ID017). Similarly, another interviewee commented that 'growing up my parents were quite conservative when it came to investment' (ID014). For this respondent, the exposure to more diverse forms of investment was limited until their early adulthood when they were able to do their own research and discuss varying investments with likeminded people.

Experiential/personal learning

Particularly during adulthood, financial learnings are often a result of trial and error through lived experiences and iterative reflection on financial outcomes (LeBaron et al., 2019). Once individuals enter adulthood and are expected to be financially independent, it is critical they have the appropriate knowledge and skills to make informed financial decisions. The importance of life experience as a source of financial education is supported by findings from Matthews et al. (2023) who report 45% of participants attribute majority of their financial knowledge to learning through experience. This statistic remained reasonably stable since the 2017 survey, where 44% of participants reported life experience as their predominant knowledge source (Matthews et al., 2023). One interview participant commented on acquiring financial knowledge through experience, stating they learned through 'like personal growth or like simply encountering the world' (ID003). Another participant acknowledged experiential learning as a key education source where they acquired knowledge from 'the daily grind' (ID011).

ID003: 'And then you know, I have, when you start living "…"by yourself, it comes to you, you need to start budgeting for yourself…And these kind of obviously these are "…" I would say like personal growth or like simply encountering the world.'

ID011: 'Probably actually just the daily, the daily grind and knowing what you have to spend'

ID015: 'And some it's just the stuff you pick up as you go along, as you grow old and hopefully reading, thinking, all the rest of it.'

We note the majority of individuals who discussed personal experience as a large source of financial education also acknowledged the influence of their parents as a source of financial learnings. The ideology supporting consumer socialisation is that learnings are anticipatory; individuals acquire knowledge and understanding through exposure to concepts and processes without having to take part themselves (Shim, Barber, Card, Xiao, & Serido, 2010). However, when individuals enter adulthood and become financially independent, it provides the opportunity to apply financial behaviours they were exposed to during childhood. This is also the time where individuals can form their own, or adjust their existing financial attitudes based on their own risk preferences, psychological functioning, and beliefs about money.

ID014: 'You know, if I'd known a little bit more I maybe I would have made, you know, a small invest investment. But yeah, my parents weren't really like keen on the whole um, stock investments, cryptocurrency investments, they were more like property and land investors'

Although not a common theme throughout the interview transcripts, two participants commented on financial attitudes they had observed during their socializing years that were challenged upon entering adulthood. One participant began researching and educating themselves around more risky investment instruments during their high school years which directly challenged the risk averse tendencies of their parents they had observed growing up. This individual noted that their parents tended to invest in safe property/land investments. However, during their school years they had an interest in stock and alternative investments. Transitioning to some level of financial independence allowed this participant the opportunity to research and upskill, providing them the opportunity to shape their own money values and beliefs. Similarly, a second individual grew up in an Asian household with strong money norms around saving. Beginning employment at a bank provided learnings about the opportunities 'good debt' may provide which challenged this individual's perspective that all debt should be considered as bad debt. These two individuals provide lived experiences of learnings acquired through financial socialisation which are later challenged and, in some cases, changed upon entering adulthood.

Research has shown that financial socialisation is a key source of financial education for the majority of individuals (Jorgensen & Savla, 2010; Shim et al., 2010). However, the level of education one receives during their childhood is highly dependent on the knowledge and skill of the socializing agents and their pre-existing money norms and attitudes (Jorgensen & Savla, 2010). Therefore, experiential learning during adulthood is important to ensure individuals can shape their financial attitudes, adjusting their views and behaviours about money learned during childhood based on further knowledge and upskilling.

5.4.6. Theme six: Psychological function and decision-making

The first major proponents of the influence of external factors on decision-making were Tversky and Kahneman (1974). In more recent years, behavioural economists have applied the findings of Tversky and Kahneman (1974) to financial behaviour, finding that decisions around money are influenced by factors outside of information gathering (Storchi & Johnson, 2016; Tang & Baker, 2016). The behavioural finance paradigm asserts that traditional finance theories are not always appropriate to explain financial behaviour due to humans being bounded rationally (Barberis & Thaler, 2002; Ritter, 2003). Behavioural biases are a key influence on the financial decision-making process which can inhibit individuals from making decisions that would be considered more appropriate based only on available information (French et al., 2020; Gentile et al., 2016; Kempson et al., 2017; Shephard et al., 2017). The following sub-sections explore the various psychological factors and internal influences which interview participants report experiencing or being aware of. These responses were predominantly related to question 6 in Table 46 asking what factors they felt were important to consider when making financial decisions.

Self-control

One of the key psychological factors that influence financial behaviour is the ability to exercise self-control, often by demonstrating an understanding of delayed gratification (Rey-Ares, Fernández-López, Castro-González, & Rodeiro-Pazos, 2021). The relationship between self-control and financial behaviour illustrates a tension during the decision-making process, where individuals feel they need to weigh up short-term compensation with long-term pay-offs (Rey-Ares et al., 2021). This concept highlights the importance of delayed gratification and impulse control when considering financial behaviour, which is particularly relevant in terms of spending within ones means.

ID011: 'Not getting too carried away with luxury items'

ID014: 'I supposed one of the most important factors is just knowing your means, I guess.'

The influence of self-control is conveyed in interview excerpts talking about needs versus wants. The ability to differentiate between a necessity and what may be considered a luxury good is important for prioritisation of spending when making financial decisions. Research has found that both impulsivity and a lack of self-control can have a negatively impact financial decision-making and consequent levels of financial wellbeing (Rey-Ares et al., 2021). An ability to exercise self-control increases the likelihood that decisions are well-informed and are conducive with one's current situation and goals, rather than related to overweighting the value of short-term benefits (Erta et al., 2013). One participant discussed evaluating if the purchase or spend is needed.

ID016: 'Yeah so I suppose some of it's to do with your need, why are you having to make a decision'

Time orientation

Time orientation has been found to influence financial decision-making and relates to the weight an individual places on their long-term self-interest compared to short-term benefits (Benton et al., 2007). In some cases, individuals may feel a sense of disconnect from their financial futures, due to the enormity of responsibility for things such as retirement planning (Russell et al., 2020). This may result in overweighting short-term outcomes, commonly known as present bias, where individuals spend impulsively for instant gratification, with little regard for their long-term goals (Erta et al., 2013). In contrast, individuals with a long-term time orientation may be more likely to consider the future impacts of financial decisions, increasing the likelihood of exercising self-control.

ID003: 'And so this kind of data required me to think about where I want to be in two, 5, 10 years.'

ID005: 'yeah so I guess I think mainly, at the moment it's like within a year, think I'm thinking like year and then kind of the future is a little bit hazy.'

A short-term focus can become problematic when an individual's motivation to plan-ahead and build financial resilience is low, meaning they may value short-term financial outcomes over long-term benefits (Erta et al., 2013).

Locus of control

Locus of control describes the degree to which an individual feels they are responsible for the outcomes and experiences they face. An internal locus of control describes when individuals feel they can actively make decisions to control current and future outcomes (Bucciol & Trucchi, 2021). Alternatively, an external locus of control describes when individuals feel situations and events happen to them and may be influenced by things such as luck or fate (Bucciol & Trucchi, 2021; Kempson & Poppe, 2018). Locus of control is an important psychological factor which has been found to impact financial wellbeing due to the influence it can have on financial confidence and motivation. Within a financial context, an external locus of control may reduce an individual's motivation to make active and informed financial decisions (Bucciol & Trucchi, 2021; Shephard et al., 2017). Kempson and Poppe (2018) explored the impact of various factors on financial wellbeing, finding locus of control had a statistically significant impact on meeting financial commitments and being financially comfortable. Locus of control is not a commonly evidenced theme in the interview transcripts yet was discussed by two respondents.

ID003: 'I realize that for me the future is very much reliant to me.'

ID005: 'but I kind of know I'm sort of aiming for a house and if I put a bit of money away in KiwiSaver and stuff, I don't really need to worry about it. It'll just sort of as long as something's going in there, it'll eventually happen.'

One respondent demonstrated an internal locus of control, stating that the 'future is very much reliant on me' (ID003). The perception of being 'in charge' of their financial future has a positive impact on an individual's increasing motivation to be make informed and proactive financial decisions. Alternatively, a second respondent used language indicating an external locus of control. When discussing retirement they felt they 'don't really need to worry about it' as 'it'll eventually happen' (ID005). In contrast to an internal locus of control, this passive attitude towards future planning is likely to discourage proactive planning behaviours and impair the development of financial resilience.

Impulsivity

Finally, impulsivity control is a key psychological factor that is closely related to self-control and can impact an individual's decision-making process. In line with the influence of self-

control, impulsivity can be linked to the concept of instant gratification where individuals overweight short-term benefits compared to long-term pay-offs (Rey-Ares et al., 2021). Traditional finance models were developed on the assumption that individuals are rational when making financial decisions. The deviation from traditional theories resulted in the formation of the behavioural finance discourse, as researchers recognised that financial decision-making was governed by factors outside of simple information gathering and processing (Tversky & Kahneman, 1974; de Meza, Irlenbusch, & Reyniers, 2008; Sahi, 2017). This is particularly important when considering the influence of emotions, heuristics, and other mental motivations (Tang & Baker, 2016; French et al., 2020). A lack of impulsivity control can result in impetuous and uninformed financial decisions influenced by present bias and driven by emotions (Erta et al., 2013). In such cases, decisions may be driven by an inability to exercise patience or the overweighting of short-term benefits. Individuals often trade-off between instant satisfaction that may be of lesser overall value as compared with greater rewards that are considered to be cost more in terms of time or risk (Stevens, 2017).

One participant commented on an expensive car purchase noting the decision was driven by emotion, related to the use of prize money following quitting cycling. This participant acknowledged that the decision was situational, driven by their mental state at the time, and based on the immediate benefit to them rather than taking in to account their current circumstances and future financial goals.

> *ID014: 'I had some money and when I got back to New Zealand, I had just quit cycling, so I wasn't in the best frame of mind. I went and purchased a very expensive car, which I didn't take care of and cost me a **** ton of money in the end.'*

> *ID015: 'Um certainly in my younger days, I made some impetuous decisions that I perhaps somewhat regretted as I got older.'*

Another participant acknowledged feeling regret about impetuous decisions made at a young age. Humans are irrational by nature and often driven by emotion and psychological factors when making financial decisions. Collectively, several behavioural biases can have a negative impact on financial decisions, often leading to ill-informed or inappropriate financial outcomes (Gentile et al., 2016). These behavioural biases can manifest as heuristics or mental shortcuts, reducing the effort individuals require to make financial decisions (Russell et al., 2020; Storchi & Johnson, 2016). In a similar way, heuristics are therefore likely to influence financial

decision-making, providing a mechanism for guiding reactive behaviour while also often inhibiting an individual's ability to make proactive financial decisions (Storchi & Johnson, 2016).

The findings detailed above are beneficial for three important reasons. Firstly, they provide further evidence supporting the influence of psychological factors on financial decision-making, especially considering the influence of time orientation, self-control, impulsivity, and locus of control (Benton et al., 2007; Bucciol & Trucchi, 2021; Erta et al., 2013; Katauke et al., 2023; Kempson et al., 2017). Secondly, theme six provides additional evidence supporting the research questions by confirming the influence of psychological factors on decision-making from a practical self-reported perspective (de Meza et al., 2008; Sahi, 2017). The excerpts under theme six confirm the influence of psychological factors on financial decision-making in practice and reaffirm the importance of incorporating a psychological factor into financial capability models. Finally, we note that although several interview participants acknowledge the influence of psychological factors on decision-making, most of the references are indirect and 'described' as opposed to named. This indicates that although participants can in some cases recognize influencing factors, they may not always be aware of the role psychological factors can play in the financial decision-making process. This provides further insight into how an awareness of psychological factors can be incorporated into financial education programmes to achieve positive behaviour change.

5.5. Findings and conclusions – financial capability in practise

5.5.1. Index application – findings

This sub-study enables an extension of the findings developed in Chapters 3 and 4 related to the new complementary financial capability index and provides the opportunity to further explore subjective influences on financial capability which are otherwise difficult to quantify based on categorical responses. The use of the online financial capability survey enables the testing of a direct application of the financial capability index to a dataset with a single question input for each retained component of the index. Unlike the two applications in Chapter 4, the methodology does not require adjustment to accommodate differences in data inputs. This is an important robustness check for the index, confirming the index can produce significant financial capability scores despite differences in data inputs, assuming there is sufficient information to proxy each of the 14 retained components as outlined in the index formation methodology in Chapter 3. In essence, if the dataset contains information that can proxy each

of the 14 retained components, an appropriate proxy score for financial capability can be computed.

A considerable limitation of this 14-question survey is that each retained component used to compute the financial capability index is one-dimensional. The 14 retained components are only proxied by a single question. This differs from the original methodology outlined in Chapter 3, where each of the retained components from factor analysis has multiple factor loadings. Due to the complexity of the components informing the regression model and considering the methodology used in Kempson et al. (2013) and Kempson and Evans (2021) to develop financial models, multidimensional components enable more detailed measurement of the various factors which influence financial capability. Therefore, components computed from a single measure are not considered robust but can act as an appropriate proxy for the regression components in this sub-study.

Malleability of a financial capability index is an important consideration due to the volume and variability in surveys measuring financial behaviour, financial capability, and financial wellbeing. The results of the direct index application confirm that, if the 14 retained components forming the financial knowledge, financial behaviour, and psychological factors variables can be appropriately proxied, a meaningful financial score can be calculated in the absence of more robust data input levels.

5.5.2. Thematic analysis - findings

Beyond testing the financial capability index application using the online survey data, the interview portion of the study enabled the collection of practical insights through open-ended responses covering a range of financial capability and wellbeing topics. Interview data is useful for topics related to financial behaviour and financial decision-making where the true influence on financial capability is difficult to quantify based on categorical or numerical data. Open-ended responses to interview questions provides further evidence supporting the influence of psychological factors on financial capability and decision-making.

Thematic analysis on the interview transcripts results in six key themes. These themes cover financial knowledge, subjective confidence, decision-making, financial education, retirement planning, and psychological factors. Open-ended responses from interview participants provide deeper insights into financial behaviour and perspectives which are otherwise difficult to measure using survey data based on scale or closed-answer responses.

Theme one is predominantly related to subjective knowledge, which is found to influence decision-making and financial capability levels. When individuals were asked about how they felt about their financial capability, most respondents reflected on their perceived level of financial knowledge. This is an important finding which indicates that, beyond objective financial knowledge, subjective knowledge acts as a source of confidence for financial decision-making. Consequently, it is important that financial education programmes promote improvement of self-efficacy and subjective knowledge to generate behaviour change towards financial capability.

Theme two explores the impact of confidence on financial decision-making, finding that improved confidence and self-efficacy have a positive impact on an individual's ability to make proactive decisions. Themes one and two are closely linked, both recognising the influence subjective knowledge and confidence can have on financial decision-making.

Theme three is largely based on responses to a question about inputs and influences on the financial decision-making process. Responses largely fall into one of three sub-themes being, debt attitudes, living within one's means, and return on investment. Responses related to debt indicate it is often viewed negatively and as something to be avoided. Although this attitude is relevant in some instances, it indicates a lack of understanding of how debt can be used to generate wealth when used appropriately. The living within one's means and return on investment sub-themes collectively indicate the importance of evaluating financial options and potential financial outcomes prior to making decisions. Although positive attitudes and awareness do not always translate to positive financial decision-making, it is encouraging that a number of participants take time to reflect before making larger financial decisions.

Theme four provides insights into retirement planning and preparedness. It is clear the level of retirement planning is often linked to age, with older participants seemingly thinking about retirement planning to a larger extent than younger individuals. This theme overlaps with evidence from theme six, which indicates retirement planning is linked to time orientation. That is, if an individual is young and focused on the short-term, they are less likely to prioritise planning and preparation for retirement.

Theme five explores sources of financial education and the key aspects of personal finance that are learned through formal or informal education. Financial socialisation is the most prevalent form of financial education, with almost all participants acknowledging their parents as the largest source of financial learnings. Beyond financial socialisation, although some participants

acknowledge learning through work or school/university, several participants also mention much of their learning is experiential during adulthood, where they upskill through trial and error and exposure to financial decision-making.

Finally, theme six explores the influence of psychological factors on decision-making. This theme is particularly valuable as it provides further support to the overall research objective of the thesis. Of the six components which form the psychological variable in the financial capability index developed in Chapter 3, four are identified as sub-themes under theme six. Self-control, time orientation, locus of control, and impulsivity are psychological factors which were either explicitly or implicitly mentioned by participants as a factor which impacts financial decision-making.

The themes extracted from the interview transcripts provide quality practical insights into how individuals feel about financial capability and decision-making. The findings largely support existing theories related to financial capability and decision-making and provide additional evidence confirming the influence of psychological factors on financial capability, as well as further support for the research objectives of the wider thesis. Importantly, theme six evidences the practical importance of including psychological factors when measuring financial capability, given the crucial impact they have on decision-making. Further, findings of this chapter indicate the valuable information that can be gathered when participants are provided a forum for offering open-ended responses. However, it is important to note that due to small sample sizes, data sourced from the online survey and interview participants predominantly generate insights rather than absolute conclusions. Despite the small sample size, these insights provide valuable information about financial capability in practice, while also indicating areas where further study could be concentrated to generate additional insights.

Collectively, the themes identified through thematic analysis provide additional information supporting both research objectives, confirming the influence of psychological factors on financial capability levels and providing insights into the various factors influencing financial decision-making in practice. In particular, theme six provides further support for the impact psychological factors can have on the financial decision-making process and the practical implications of psychological factors on financial capability levels. One key insight from theme six is that psychological biases are often innate, meaning individuals are usually not aware of the influence they may have on financial decisions. An understanding of how psychological factors may impact financial decision-making in practice can be used to guide education

providers and help raise awareness among decision-making agents about how biases can be controlled or challenged to improve the effectiveness of financial decisions (Anton-Díaz, 2018).

6. Discussion and Conclusions

6.1. Introduction

This thesis further explores the relationship between financial capability and psychological factors, focusing predominantly on better understanding the factors which influence financial decision-making. In particular, this thesis confirms the influence psychological factors have on financial capability, mediated through their effect on the financial decision-making process. Further, this thesis provides deeper insights into subjective measures of behavioural finance, particularly exploring financial education, subjective confidence and self-efficacy, and financial decision-making. Chapter 2 provides an overview of the existing literature exploring financial capability and the relationship between psychological factors and financial decision-making. Chapter 3 proposes a complementary financial capability index, leveraging the works of Kempson and Poppe (2018) and Kempson and Evans (2021), which supports and strengthens existing models. The proposed model calculates financial capability as a function of financial knowledge, financial behaviour, and psychological factors, while controlling for key socio-demographic influences. The wider applicability of the model under variable conditions is further explored in Chapter 4, confirming the robustness of the index when applied using different datasets. Finally, Chapter 5 details the use of thematic analysis to analyse primary data and identifies key themes from interview information. The interview transcripts provide insights into financial capability in practice based on the subjective perspectives of individuals related to financial decision-making, financial learnings, and retirement planning. The following section describes the findings of this study which supports the research questions and details the contribution of the wider thesis.

Based on pension reforms in the 1990s, shifts from DB to DC plans, and greater independent responsibility for financial and retirement planning, the importance of financial capability has increased (Almenberg & Säve-Söderbergh, 2011; Banks & Oldfield, 2007; Clark & O'Neill, 2023; Fornero & Monticone, 2011; Lusardi, 2009; Lusardi, 2011). The term financial capability was developed in response to findings that financial knowledge alone was not sufficient to drive positive financial behaviour (Lusardi & Mitchell, 2007). Further, research exploring financial decision-making has found that financial behaviour is often driven by factors outside of information gathering, including heuristics, emotions, and other psychological influences (de Meza et al., 2008; Mudzingiri et al., 2018; Sahi, 2017). Acknowledging the influence of psychological factors on decision-making, for this study financial capability is defined as a state whereby an individual has adequate knowledge and

attitudes to guide financial behaviour towards financial wellbeing given their personal financial circumstances (Czar et al., 2021; Kempson et al., 2017; Xiao et al., 2022). Although academia is yet to settle on a common definition, financial wellbeing can be measured as the comfortability of one's current financial position, and the ability to weather any unexpected future financial shocks (French et al., 2020). This is distinct from financial capability as it focuses on financial outcomes. This study focuses on behaviour and seeks to further understand how psychological factors influence financial capability, particularly through the impact they can have on the financial decision-making process (Russell et al., 2020; Tang & Baker, 2016; Tversky & Kahneman, 1974). This study provides clarity as to the specific components which combine to proxy financial capability, confirming the influence of financial knowledge, financial behaviour, and psychological factors on determining financial capability levels. Ultimately, targeted progression in key behavioural finance areas, particularly related to financial decision-making, will improve financial capability levels of New Zealanders and their consequent financial wellbeing levels.

6.2. Findings

This thesis proposes a complementary financial capability index which incorporates a psychological factor that is independent of the financial behaviour and financial knowledge variables captured by existing models. As such, this index proxies financial capability as a weighted linear combination of financial knowledge, financial behaviour, and psychological factors, while controlling for key socio-demographic factors. We developed this index in support of Financial Wellbeing Conceptual Model developed by Kempson and Poppe (2018) and to strengthen existing personal finance models to ensure they reflect modern findings about psychological factors and decision-making. The findings from each of the chapters collectively provide answers to the two research objectives, and related research questions:

RQ1: Is the explanatory relationship between the six identified psychological factors and financial capability statistically significant?

In direct response to the first research objective and RQ1, the results of regression analysis in Chapter 3 confirm that psychological factors have a significant influence on financial capability levels, beyond what may be captured by other independent variables (e.g. financial behaviour). These findings are important, confirming the ability to measure the influence of psychological factors on financial capability and decision-making separately to their influence on financial wellbeing levels. This aligns with the relationship acknowledged during the development of

RQ1, that financial capability and financial wellbeing are related yet separate concepts, as well as the significance of measuring financial capability separately from financial wellbeing models. Based on the evidence from prior literature supporting the influence of psychological factors on the decision-making process, and on the basis that financial decision-making is a key component of financial capability, the findings of Chapter 3 and Chapter 4 unsurprisingly support the importance of including a psychological variable in the new complementary index. Therefore, we conclude that the explanatory relationship between the six identified psychological factors and financial capability is statistically significant. Beyond significance, research question two sought to understand the relationship between psychological factor and financial behaviour variables, by assessing the independence of the psychological variable in regression analysis.

RQ2: On the assumption that research question 1 holds true, does the relationship between the identified psychological factors and financial capability remain significant when measured independently from financial behaviour?

In support of research question two, the use of forward regression modelling in section 3.4.5 enables the prioritisation of the psychological variable to confirm the individual impact of psychological factors on financial capability scores, over and above what may be captured by the financial behaviour variable. The results outlined in Table 14 indicate the explanatory power of four individual models, with each model successively adding an additional explanatory variable. Model 1, only regressing financial capability on the psychological variable, confirms the significance and independence of the psychological factors variable included in the regression modelling. Further, the significance of the regression results in Chapter 3 and Chapter 4 indicate that financial capability as a concept is multifaceted, best proxied as a combination of financial knowledge, financial behaviour, psychological factors, and other direct influencers such as socio-demographic factors. In further support of the research question, results of correlation analysis indicate that financial knowledge and psychological factors are both significant in their explanatory power on financial capability. However, based on the size of the coefficient, the influence of both psychological factors and financial knowledge is largely mediated through the impact they have on the financial behaviour variable. These results indicate two key findings. Firstly, psychological factors are significant in their explanatory power on financial capability levels, confirming the importance of including an independent psychological variable. Secondly, in line with prior literature, financial behaviour remains the most prominent determinant of financial capability levels,

although behaviour remains informed by financial knowledge and psychological factors such as impulsivity, behavioural biases, and locus of control (Russell et al., 2020; Storchi & Johnson, 2016). Therefore, we conclude that, although the independent influence of psychological factors is small, the explanatory relationship between the six psychological factors and financial capability remains statistically significant when measured independently of financial behaviour.

Despite significant results in Chapter 3, it is important to test indices under different circumstances and in response to changes in the underlying data. Chapter 4 seeks to review the applicability of the index under varying conditions through two smaller sub-studies. First the development methodology is tested on an Italian dataset which varies largely from the dataset used for index development in Chapter 3. This application enables the testing of the methodology under geographically diverse conditions, as well as utilising data originally collected to measure the financial literacy of Italian adults. This sub-study produces a modified version of the index that continues to proxy financial capability as a combination of knowledge, behaviour, and psychological factors, confirming the applicability of the index methodology on a diverse set of data inputs. The second sub-study tests the direct application of the financial capability index on a more recent version of the ANZ Financial Wellbeing Survey. The adjustment of the original inputs for data analysis and the subsequent application of the financial capability index to the data supports the robustness of the index when applied to data collected at different points in time.

Finally, in line with research objective two, we collect primary data to undertake a small study exploring financial capability and decision-making in practice. This portion of the study has two key purposes; to test the direct application of the financial capability index developed in Chapter 3 using a simple questionnaire delivered to New Zealand adults online, and to gather practical insights into various behavioural finance concepts through the collection of interview data. Development and delivery of a 14-question survey enables a direct application of the financial capability index and computation of a financial capability score. Each survey question was developed to proxy a component of the underlying financial capability index. This is an important robustness check for the index, confirming it can be applied to datasets which differ in scope and quantity of data inputs, assuming there is sufficient information to proxy each of the 14 retained factor analysis components. These results indicate that if data allows each of the financial capability components to be appropriately proxied, the index should enable the computation of a valid financial capability score. Due to the complexity of the components

informing the regression model, we note that, in line with the development methodology in Chapter 3 and the methodologies used by Kempson et al. (2013), Kempson and Poppe (2018) and Kempson and Evans (2021), multidimensional measures allow for a more comprehensive measure of the various factors which influence financial capability. Components proxied by a single measure are not often considered comprehensive by nature; however, do enable valid financial capability scores to be calculated.

The second portion of this sub-study was the collection of primary interview data through follow up one-on-one interviews. Interview data provides the opportunity to receive open-ended and practical insights into areas of behavioural finance that are difficult to measure when relying on survey data. The main aim of this portion of the study is to gather further insights into how individuals feel when asked about their financial capability, financial behaviour, and decision-making abilities. These findings provide important information about an individual's motivations and attitudes towards aspects of behavioural finance. Thematic analysis results in the identification and exploration of six key themes. The themes identified from the interview data largely support existing theories related to financial capability, decision-making, and related concepts, and help to further strengthen the contribution of this thesis by confirming the influence of psychological factors on financial capability. In direct response to RQ1, theme six further supports the practical importance of including psychological factors when measuring financial capability given the crucial impact they have on decision-making. Further, with consideration to research objective two, the collective themes extracted from the interview transcripts provide insightful information on the various factors influencing individual's financial behaviours and financial decision-making. A crucial insight drawn from the results of Chapter 5 is the influence of psychological factors on decision-making is often considered to be innate. That is, decision-making agents may not always be aware or able to recognise the impact psychological factors may have on their ability to make informed decisions. The results of Chapters 3, 4, and 5 collectively provide additional insights into how an awareness of psychological factors may be incorporated into financial education programmes to achieve positive behaviour change.

The results of index development (Chapter 3), index robustness testing (Chapter 4), and thematic analysis (Chapter 5) collectively confirm the important impact psychological factors have on financial decision-making and financial capability levels. These psychological factors are often innate and can influence decision-making without active awareness of the decision-making agent. Identification of the relationship between psychological factors and financial

capability is important for two key reasons. Firstly, it supports the proposition of a complementary financial capability index which captures the influence psychological tendencies can have on financial capability levels, thereby supporting and strengthening behavioural finance models. Secondly, it provides information to guide the development and/or improvement of financial education programmes. The intrinsic nature of psychological tendencies means that behavioural biases are difficult to change or 'fix'. This research acknowledges the importance of psychological factors when considering financial decision-making and raising awareness of these tendencies. Awareness, although not likely to eliminate the influence of behavioural biases, may enable individuals to recognise during the decision-making process where they may need more time or guidance to make adequate decisions. An awareness of personal biases combined with positive behaviour such as long-term planning and budgeting, may result in fewer decisions influenced by impulsivity, lack of self-control, or a tendency to overweight short-term outcomes.

6.3. Limitations and future research

Based on literature supporting the influence of psychological factors on decision-making, this thesis proposes a complementary financial capability index, measuring financial capability as a combination of financial knowledge, financial behaviour, and psychological factors. This index supports the Financial Wellbeing Conceptual Model developed by Kempson and Poppe (2018) and strengthens other financial capability models, ensuring indices evolve when the theoretical basis underpinning the model changes. The results of prior chapters support the development of a complementary financial capability index and confirm the impact psychological factors have on financial capability and decision-making. Further, this study provides a deeper exploration into financial capability in practice which is otherwise difficult to collect when examining survey data.

Despite the success of this thesis in providing valuable information on the relationship between psychological factors and financial capability, we acknowledge some important areas for future research. To our knowledge, this is the first financial capability index to leverage the works of Kempson and Poppe (2018), creating a financial capability index which includes an explicit measure of psychological function, beyond what is captured by financial behaviour. However, considering this work in isolation provokes questions requiring further research. Despite valid results when applying the index on a dataset from a different country, the index is highly sensitive to changes in data inputs. This is evident in the results of Chapter 4, where in both test applications, the index required adjustment to accommodate differences in data inputs.

Further research could explore how to create a model which is less sensitive to wording differences in question inputs or attempt to develop an 'indicative' model only focusing on the weightings for each of the independent variables. For this reason we reaffirm the role the complementary index from this study plays in strengthening current research by providing supplementary findings.

Further, this model is developed using data from New Zealand adults and only tested using a single international dataset. A broader financial capability index with multi-country applicability is advantageous, enabling the ability to compare and contrast financial capability levels across varying countries. This capability would deepen the ability to capture financial levels and identify further factors which influence capability and wellbeing. However, we acknowledge the difficulty in developing a cross-country instrument, given the need to develop and deliver a survey instrument that remains relevant under variable country contexts.

We acknowledge similar reflection points as the financial capability study by Kempson et al. (2013) related to timing limitations and in particular, the difficulty in developing a financial capability measure which is consistent over time to allow a direct measurement of progression. This is because research on financial capability is dynamic in nature and continues to evolve based on findings of ongoing studies. The difficulty comparing financial capability levels over time is apparent in the data analysis outlined in Chapter 4 related to the application of the financial capability index to the 2021 iteration of the ANZ Financial Wellbeing Survey. This application allows a general evaluation of how financial capability levels had trended over the four-year period and yet, due to the sensitivity of the model to any changes in data inputs, we are unable to draw absolute conclusions about progression.

Another important area where further research is required is to better understand the relationship between culture and financial capability. Due to a reliance on survey data to develop the complementary financial capability index, it is difficult to capture the influence of culture. This is because the dataset used for index construction is heavily weighted towards New Zealand European participants. Culture extends beyond ethnicity, including social and cultural norms, habits, and practices, and is often closely related to religion. An example of the importance of culture is highlighted in the interview responses detailed in Chapter 5. One participant discussed growing up in an Asian culture where they maintained strong views about savings behaviour and debt. This highlights the key role culture can play in financial decision-making particularly through money motivations and attitudes. To develop the accuracy of

financial capability indices, future research could explore how to incorporate the influence of culture.

Finally, this model is developed on the assumption that financial capability often leads to financial wellbeing. This is directly related to the distinction between financial capability and financial wellbeing made in Chapter 2. For this thesis, we defined financial capability as a state whereby an individual has adequate knowledge and attitudes to guide financial behaviour towards financial wellbeing given their personal financial circumstances (Kempson et al., 2017). We subsequently defined financial wellbeing as a state in which an individual is financially comfortable, making ends meet, has low money-related stress, and is taking pro-active steps to manage their finances given their current circumstances. As such, financial capability differs from financial wellbeing as it captures behaviour and behavioural influences rather than outcomes, resilience, and comfortability levels. For this study, we assume that financial wellbeing is achieved as a product of positive financial decisions, and therefore often improves as a result of increases in financial capability levels. This assumption informs the question selection for the eight financial wellbeing questions which are used to proxy four key aspects of financial capability, namely choosing and using financial products, and accessing and using financial information and advice (Kempson et al., 2005). Consequently, the model is reliant on the accuracy of this assumption. Future research could explore whether this model is valid in situations where the relationship between financial capability and financial wellbeing is not as strong or is bi-directional. For example, West, Cull and Johnson (2021) assert income plays a crucial role in the development of financial wellbeing for University students, and financial literacy levels play a considerably smaller role. Similarly, Netemeyer, Warmath, Fernandes and Lynch (2017) find that income plays a strong moderation role on overall financial wellbeing levels in cases where perceived financial stress is high. In both cases, poor financial wellbeing levels may be less influenced by an individual's financial capability level and more so determined by socio-demographic influences and situational factors such as low incomes or perceived financial satisfaction. Further, to extend the results of Chapter 4 related to progression of financial capability scores between 2017 – 2021, future research could explore whether financial wellbeing levels also improved in New Zealand other the same or similar time period.

6.4. Contribution

One of the key issues prompting pension reforms in New Zealand over the last 50 years is the unaffordability of maintaining a full public pension scheme due to inflationary pressures and

an aging population (Task Force on Private Provision for Retirement, 1992). Global pension reforms and shifts to a larger reliance on DC plans in response to affordability of public provisions has highlighted the responsibility individuals are facing for retirement planning, with studies increasingly exploring the link between financial literacy and retirement preparation (Almenberg & Säve-Söderbergh, 2011; Behrman et al., 2010; Fisch et al., 2020; Sekita, 2011; van Rooij et al., 2011, 2012). At a similar time, the breadth and complexity of products offered in financial markets was growing, meaning individuals required a higher level of financial understanding to make adequate financial decisions (Xue et al., 2019). Similarly, deregulation of the New Zealand financial markets in the 1990s loosened policies around access to financial products and services, increasing financial risk for individuals who were poorly equipped to make financial decisions (Widdowson & Hailwood, 2007). Pension reforms, increasing complexity of financial products and markets, and market deregulation are three key trends which collectively highlighted the importance of financial literacy. This prompted a renewed focus on measuring financial knowledge and skill levels, while also understanding how to achieve effective behaviour change through financial education. Although the initial focus on financial literacy was largely prompted by attempts to ensure individuals had the appropriate skills for retirement planning, studies have since acknowledged the importance of developing financial capability levels to guide informed financial decision-making and improve the likelihood of achieving financial wellbeing throughout one's working life (Lusardi & Mitchell, 2023; Sherraden, 2010; Storchi & Johnson, 2016).

A renewed focus on financial capability was initiated by the acknowledgement that positive financial outcomes are achieved through a combination of financial knowledge development, positive behaviour and decision-making, and financial inclusion. The concept of financial capability was believed to better capture the breadth of factors influencing financial decision-making and financial outcomes. This study defines financial capability as a state where an individual has adequate knowledge and ability to make positive financial decisions towards achieving financial wellbeing in consideration of their personal circumstances. This definition indicates two key factors which underpin the contribution of this thesis. Firstly, it indicates the importance of financial behaviour and decision-making in determining financial capability. A holistic definition of financial capability recognises that decision-making and financial behaviour are influenced by financial knowledge and psychological factors. Therefore, due to the high volume of literature confirming the relationship between psychological factors and decision-making, we deduce that a comprehensive financial capability index should include an

explicit measure of psychological factors. Secondly, the definition describes the direct relationship between financial capability and financial wellbeing, while also highlighting they are related concepts which can, and should be measured separately. Many models focus on measuring financial wellbeing and therefore often include financial capability/behaviour as an explanatory variable. Financial wellbeing describes the outcomes that are realised in response to financial capability and informed financial decision-making. In contrast, financial capability describes an ability to make decisions and behave in a way that is positively contributing to financial comfortability, financial resilience, and future financial security. As such, to improve financial outcomes for individuals, it is important to improve financial capability levels by providing education and empowerment to induce effective behaviour change.

Studies have found that psychological factors influence financial decision-making and in response financial wellbeing models have evolved to capture the influence of these psychological factors on financial outcomes (Kempson & Evans, 2021; Kempson & Poppe, 2018). This thesis seeks to further explore the influence behavioural biases and other psychological influences have on the decision-making process, and therefore on consequent financial capability levels. The results of Chapters 3, 4, and 5 confirm the influence psychological factors have on financial capability. Data analysis indicates that financial behaviour (including financial decision-making) explains the largest portion of variance in financial capability levels. On the assumption that improved financial capability levels often lead to improved financial outcomes, we assume the components that are used to model financial wellbeing can also be used to calculate financial capability scores. Therefore we leverage the Financial Wellbeing Conceptual Model developed by Kempson and Poppe (2018) which calculates financial wellbeing as a function of financial knowledge, financial behaviour, and psychological factors. The key differential in this thesis is the creation of a financial capability proxy variable which is used as the dependent variable in regression analysis.

Financial capability is an important factor contributing to the general and economic wellbeing of individuals, households, and the wider economy. At an individual and household level, individuals who are financially capable are better able to make informed financial decisions which align with their current and future goals. Secondly, individuals are less likely to make poor decisions around debt and other ‘buy now, pay later’ products particularly if they place weight on the long-term implications of their financial decisions. Thirdly, individuals who are financially capable are less susceptible to being targeted by financial scams and untrustworthy schemes which are increasing in prominence. These scams often have the greatest impact on

individuals who are uneducated and/or lack financial confidence and understanding. For the wider economy, better decisions around borrowing and investment will likely improve the stability of economic markets. Financial capability is a key determinant in the development of financial wellbeing. Further, financial wellbeing reduces the impact of poverty and increases comfortability and resilience at the individual and household level. Therefore, a better understanding of financial decision-making and consequent improvements in financial capability levels is a critical investment in the social capital of society both today and in the future.

This thesis contributes to the research on financial capability, with the aim of supporting and strengthening the research on financial capability and financial. The research completed by Kempson and Poppe (2018) found that to achieve progression in financial wellbeing, policy and intervention behaviours should aim to improve financial capability levels. This thesis provides findings which confirm the relationship between psychological factors and financial capability and develops a complementary index for calculating current financial capability levels, ensuring the index considers all factors which influence financial decision-making. This index is intended to complement the Financial Wellbeing Conceptual Model developed by Kempson and Poppe (2018) while concurrently strengthening existing financial capability and literacy models. Finally, the findings provide guidance to education providers and policy makers on the appropriate approach to achieve behaviour change through financial education. Psychological biases are often innate, meaning individuals are usually not aware of the influence they may have on financial decisions. Attempts by education providers to educate individuals in a way that challenges or changes their psychological biases is difficult. Instead, effective policymakers should take into account the psychological themes which impact consumer behaviour and use these to inform policy remedies such as opt-in or opt out financial schemes for retirement savings (de Meza et al., 2008). Education programmes which educate individuals on psychological influences as well as financial knowledge may generate confidence and self-efficacy in one's decision-making abilities. With psychological factors, education programmes can raise awareness of the influence these biases can have on financial behaviour, so decision-making agents are able to proactively take steps to diminish the impact of such biases.

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Appendices

Table 43: ANZ index development data inputs

No.	Question	Current	Recoded
	Financial Knowledge		
C22 (A)	Rate your knowledge: *Bank accounts and other products to help you manage your money day-to-day*	1 - Very good - - - 5 - Very poor 6 - Don't know	1 - Very poor - - - 5 - Very good 6 - System missing
C22 (B)	Rate your knowledge: *Longer term financial investments to help you improve your financial situation and plan for retirement*	1-5 Very good - Very poor 6 - Don't know	1-5 Very poor - Very good 6 - System missing
C22 (C)	Rate your knowledge: *How to find more information about a financial product or investment when you feel you don't know enough to make a decision on your own*	1-5 Very good - Very poor 6 - Don't know	1-5 Very poor - Very good 6 - System missing
C25 (A)	A high-return investment is also likely to be high risk	1- 5 Strongly agree - Strongly disagree 6 - Don't know	1-5 Strongly disagree - strongly agree 6 - System missing
C25 (C)	Borrowing more than three times your household income to buy a home substantially increases the risk of payment problems	1- 5 Strongly agree - Strongly disagree 6 - Don't know	1-5 Strongly disagree - strongly agree 6 - System missing
D2 (A)	Rate your confidence: Your ability to manage your money day to day	1-5 Very confident - Not confident at all 6 - Don't know	1-5 Not confident at all - Very confident 6 - System missing
D2(B)	Rate your confidence: Your ability to plan for your financial future	1-5 Very confident - Not confident at all 6 - Don't know	1-5 Not confident at all - Very confident 6 - System missing
D2(C)	Rate your confidence: Your ability to make decisions about financial products and services	1-5 Very confident - Not confident at all 6 - Don't know	1-5 Not confident at all - Very confident 6 - System missing
E11	My parents discussed with me how to manage financial matters when I was growing up	1-5 Fits very well – Does not fit at all 6 – Don't know	1-5 Does not fit at all – Fits very well 6 – System missing
	Financial Behaviour		
C1 (A)	Statement fit you: *I run short of money because I overspend*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
C1 (B)	Statemen fit you: *I am impulsive and tend to buy things even when I can't really afford them*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing

C1 (C)	Statement fit you: *I have a tendency to save rather than to spend*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C1 (D)	Statement fit you: *Before I buy something, I consider carefully whether I really need it*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C2 (C)	Overdraw or go into negative balance where your account is below $0 on your everyday transaction account	1 - This happens to me most months 2 - This happens to me several times a year 3 - This happens to me about once a year 4 - This has happened to me but not in the past 2 years 5 - This has never happened to me 6 - Don't know 7 - Not applicable	6 - System missing 7 - System missing
C2 (E)	How often do you tend to do any of the following? Fail to pay a bill by the due date	1-5 This happens to me most months - This has never happened to me 6 - Don't know 7 - Not applicable	6 - System missing 7 - System missing
C3	How often do you save money so that you could cover major unexpected expenses or a fall in income?	1-5 Always - Never 6 - Don't know	1-5 Never - Always 6 - System missing
C4 (A)	Statement fit you: *I try to save money to have something to fall back on in future*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C4 (B)	Statement fit you: *I try to save some money regularly even if it is only a small amount*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C4 (C)	Statement fit you: *I always make sure I have money saved for bad times*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C5	How often do you have to borrow money or go into debt to buy food or to pay expenses because you have run short of money?	1-5 Always - Never 6 - Don't know	1-5 Always - Never 6 - System missing
C6	How often do you have to borrow money to pay off debts?	1-5 Always - Never 6 - Don't know	1-5 Always - Never 6 - System missing
C7	For your regular income, how often do you make a plan or a budget for how it will be used?	1-5 Always - Never 6 - Don't know	1-5 Never - Always 6 - System missing

C8	Do you plan exactly how you will use the income or only make a rough plan?	1 - Exactly 2 - Rough plan 3 - Don't know	1 - Don't know 3 - Rough plan 5 - Exactly
C9	How often do you keep to the plan you make for using your income(s)?	1-5 Always - Never 6 - Don't know	1-5 Never - Always 6 - System missing
C13	Which one of the following best describes the extent to which you control your regular household expenses/ personal expenses?	1 - I don't keep an eye on expenses at all 2 - I keep my eye on expenses a bit 3 - Without keeping written records, I keep a fairly close eye on expenses 4 - I use written records to keep a close eye on expenses 5 - Don't know	1 - I don't keep an eye on expenses at all 2.33 - I keep my eye on expenses a bit 3.67 - Without keeping written records, I keep a fairly close eye on expenses 5 - I use written records to keep a close eye on expenses
C19 (A)	Statement fit you: *I always get information or advice when I have an important financial decision to mak*e	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
C19 (B)	Statement fit you: *I spend a lot of time considering the options before I make financial decisions*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
Psychological			
D1 (A)	Statement fit you: *I focus on the long term*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (B)	Statement fit you: *I live more for the present day than for tomorrow*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (C)	Statement fit you: *The future will take care of itself*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (D)	Statement fit you: *I often do things without giving them much thought*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (E)	Statement fit you: *I am impulsive*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (F)	Statement fit you: *I say things before I have thought them through*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (G)	Statement fit you: *I care about how other people see me*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing

D1 (H)	Statement fit you: *I am concerned about my status among people I know*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (I)	Statement fit you: *I want other people to respect me*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (J)	Statement fit you: *I am good at resisting temptation*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
D1 (K)	Statement fit you: *I find it difficult to break undesirable habits*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (L)	Statement fit you: *I am always in control of my actions*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
D1 (M)	Statement fit you: *I can pretty much determine what happens in my life*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
D1 (N)	Statement fit you: *My financial situation is largely outside my control*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (O)	Statement fit you: *When I make financial plans, I do everything I can to succeed*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
D1 (P)	Statement fit you: *When I have a difficult decision to make, I tend to put it off for another day*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (Q)	Statement fit you: *When I have to do something important I don't like, I do it immediately to get it done*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing
D1 (R)	Statement fit you: *When I have to choose between a lot of options, I find it difficult to make up my own mind*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (S)	Statement fit you: *I prefer to buy things on credit rather than wait and save up*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (T)	Statement fit you: *I would rather cut back than put everyday spending on a credit card I couldn't repay in full each month*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Does not fit at all - Fits very well 6 - System missing

D1 (U)	Statement fit you: *I prefer to spend any money I have rather than save it for unexpected expenses or an income fall*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
D1 (V)	Statement fit you: *I find it more satisfying to spend money than to save it*	1-5 Fits very well - Does not fit at all 6 - Don't know	1-5 Fits very well - Does not fit at all 6 - System missing
Financial capability			
B1	How would you describe your current financial situation?	1-5 Very bad - Very good 6 - Don't know	1-5 Very bad - Very good 6 - System missing
B3	Which of following best describes how you feel about current financial situation	1 - Out of control all of the time 2 - Out of control most of the time 3 - Fluctuates between being in control and out of control 4 - In control most of the time 5 - In control all of the time 6 - Don't know	6 - System missing
B4	How often do you have any money left over after you have paid for food and other regular expenses?	1-5 Always - Never 6 - Don't know	1-5 Never - Always 6 - System missing
B5	How often do you run short of money for food or other regular expenses?	1-5 Always - Never 6 - Don't know	1-5 Always - Never 6 - System missing
B6	Which of the following best describes how well you are meeting bills and credit commitments?	1 - Without any difficulty 2 - It is a struggle from time to time 3 - It is a constant struggle 4 - Don't have any bills or credit commitments 5 - Don't know	1 - It is a constant struggle 3 - It is a struggle from time to time 5 - Without any difficulty
B12	Thinking about the total income of your household, approx. how many months income do you have in savings?	1 - More than 12 months 2 - Between 7-12 months 3 - Between 3-6 months 4 - Between 1-2 months 5 - Between 1-3 weeks 6 - Less than a week 7 - Don't know	1 - Less than a month 2 - Between 1-3 weeks 3 - Between 1-2 months 4 - Between 3- 6 months 5 - Between 7-12 months 6 - More than 12 months

			7 - System missing
C10	Do you know how much money you spent last week?	1 - Yes, exactly 2 - Yes, approximately 3 - Don't know	1 - Don't know 3 - Yes, approximately 5 - Yes, exactly
C21	I try to stay informed about money matters and finance	1- Strongly disagree 2 - Disagree 3 - Agree 4 - Strongly agree 5 - Don't know	1 - Strongly disagree 2.33 - Disagree 3.67 - Agree 5 - Strongly agree
Demographic			
A2	How old are you?	1 - 17 years or under 2 - 18-24 years 3 - 25-29 years 4 - 30 - 34 years 5 - 35 - 39 years 6 - 40 - 44 years 7 - 45 - 49 years 8 - 50 - 54 years 9 - 55 - 59 years 10 - 60 - 64 years 11 - 65 - 69 years 12 - 70 - 74 years 13 - 75 years and older 14 - rather not say	1 - up to 24 years 2 - 25 - 39 years 3 - 40-54 years 4 - 55 - 69 years 5 - 70 years and older
F13	Into which of these categories does your total annual 'household' income fall before tax?	1 - Under $25,000 2 - $25,000 - $49,999 3 - $50,000 - $74,999 4 - $75,000 - $99,999 5 - $100,000 - $124,999 6 - $125,000 - $149,999 7 - $150,000 or more 8 - prefer not to say	1 - up to $25,000 2 - $25,000 - $49,999 3 - $50,000 - $74,999 4 - $75,000 - $124,999 5 - $125,000 and over
F20	Total amount of money including savings & investments	1 - Less than $1,000 2 - $1,000 - $4,999 3 - $5,000 - $9,999 4 - $10,000 - $19,999 5 - $20,000 - $49,999 6 - $50,000 - $99,999 7 - $100,000 - $249,999 8 - $250,000 - $499,999 9 - $500,000 - $749,999	1 - $0 - $19,999 2 - $20,000 - $99,999 3 - $100,000 - $499,999 4 - $500,000 - $1,000,000 5 - $1,000,000 or more

		10 - $750,000 - $999,999 11 - $1 million or more 12 - Don't know 13 - Prefer not to say	
F21	And thinking now about your KiwiSaver. Into which of these categories would the balance of your KiwiSaver fall?	1 - Less than $1,000 2 - $1,000 - $4,999 3 - $5,000 - $9,999 4 - $10,000 - $19,999 5 - $20,000 - $49,999 6 - $50,000 - $99,999 7 - $100,000 - $249,999 8 - $250,000 - $499,999 9 - $500,000 - $749,999 10 - $750,000 - $999,999 11 - $1 million or more 12 - Don't know 13 - Prefer not to say 14 - I do not have a KiwiSaver	

Table 44: Bank of Italy index development data inputs

No.	Question	Possible Answers	Recoded
Financial Knowledge			
QK1	Could you tell me how you would rate your overall knowledge about financial matters compared with other adults in Italy	1 – Well above average - - - 5 – Well below average -97 - Don't know -99 - Refused	1 – Well below average - - - 5 – Well above average -97 – System missing -99 – System missing
QK3	Imagine that five brothers are given a gift of € 1,000 in total. They have to wait for one year to share the money equally and inflation stays at 1%. In one year's time will they be able to buy:	1 - More than you could today 2 – The same amount 3 – Less than you could buy today 4 – It depends on the types of things you want to buy -97 - Don't know -99 - Refused	1 – All other answers 5 – Less than you could buy today -97 – System missing -99 – System missing
QK7_1	An investment with high return is also likely to be high risk	0 – False 1 – True -97 - Don't know -99 - Refused	0 – don't know, refused, and were not asked 1 – False 5 - True
QK7_1 alternative	If someone offers you the chance to make a lot of money it is likely that there is also a chance that you will lose a lot of money	0 – False 1 – True -97 - Don't know -99 - Refused	
QK7_2	High inflation means that the cost of living is increasing rapidly	0 – False 1 – True -97 - Don't know -99 - Refused	1 – False 5 – True -97 – System missing -99 – System missing
QK7_3	It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares	0 – False 1 – True -97 - Don't know -99 - Refused	0 – don't know, refused, and were not asked 1 – False 5 - True
QK7_3 alternative	It is less likely that you will lose all of your money if you save it in more than one place	0 – False 1 – True -97 - Don't know -99 - Refused	
Financial Behaviour			

QF2_1	Budgeting: Make a plan to manage your income and expenses	0 – No 1 – Yes	1 – No 5 - Yes
QF2_2	Budgeting: 2_Keep a note of your spending	0 – No 1 – Yes	1 – No 5 - Yes
QF2_3	Budgeting: 3_Keep money for bills separate from day-to-day spending money	0 – No 1 – Yes	1 – No 5 - Yes
QF2_4	Budgeting: 4_Make a note of upcoming bills to make sure you don't miss them	0 – No 1 – Yes	1 – No 5 - Yes
QF2_5	Budgeting: 5_Used a banking app or money management tool to keep track of your outgoings	0 – No 1 – Yes	1 – No 5 - Yes
QF2_6	Budgeting: 6_Arrange automatic payments for regular outgoings	0 – No 1 – Yes	1 – No 5 - Yes
QF3_1	In the past 12 months, have you been [personally] saving money in any of the following ways, whether or not you still have the money? Please, don't take into account any money paid into a pension, but think about all kinds of savings, such as building up a rainy-day fund or putting money aside for a special occasion 1_Saving cash at home or in your wallet	0 – No 1 - Yes	1 – No 5 - Yes
QF3_2	In the past 12 months, have you been [personally] saving money in any of the following ways, whether or not you still have the money? Please, don't take into account any money paid into a pension, but think about all kinds of savings, such as building up a rainy-day fund or putting money aside for a special occasion 2_Paying money into a saving/deposit account	0 – No 1 - Yes	1 – No 5 - Yes
QF11	Sometimes people find that their income does not quite cover their living expenses. In the last 12 months, has this happened to you personally?	0 – No 1 – Yes -97 – Don’t know -99 - Refused	1 – Yes 5 – No -97 – System missing -99 – System missing

QS1_5	I am now going to read out some statements. I would like to know how much you agree or disagree with each of these statements (as it relates to you) e.) I keep a close personal watch on my financial affairs (5)	1 -5 Completely agree - Completely disagree -97 – don't know -99 refused	1 –5 Completely disagree - Completely agree -97 – System missing -99 – System missing
QS1_8	I am now going to read out some statements. I would like to know how much you agree or disagree with each of these statements (as it relates to you) g.) I set long term financial goals and strive to achieve them (8)	1 – 5 Completely agree - Completely disagree -97 – don't know -99 refused	1 – 5 Completely disagree - Completely agree -97 – System missing -99 – System missing
QS1_10	I am now going to read out some statements. I would like to know how much you agree or disagree with each of these statements (as it relates to you) i.) I have too much debt right now (10)	1 -5 Completely agree - Completely disagree -97 – don't know -99 refused	1 – 5 Completely agree – Completely disagree -97 – System missing -99 – System missing
QS2_5	I pay my bills on time	1 – 5 Always – Never -97 – Don't know -99 Refused	1 – 5 Never – Always -97 – System missing -99 – System missing
Psychological			
QS1_1	I find it more satisfying to spend money than to save it for the long term	1 –5 Completely agree – Completely disagree -97 – Don't know -99 - Refused	1 – 5 Completely agree – Completely disagree -97 – System missing -99 – System missing
QS1_3	Money is there to be spent	1 – 5 Completely agree – Completely disagree -97 – Don't know -99 - Refused	1 –5 Completely agree – Completely disagree -97 – System missing -99 – System missing
QS1_7	My financial situation limits my ability to do the things that are important to me	1 –5 Completely agree – Completely disagree	1 –5 Completely agree – Completely disagree

		-97 – Don't know -99 - Refused	-97 – System missing -99 – System missing
QS2_2	My finances control my life	1 –5 Always – Never -97 – Don't know -99 Refused	1 –5 Always – Never -97 – System missing -99 – System missing
QS2_3	Before I buy something I carefully consider whether I can afford it	1 –5 Always – Never -97 – Don't know -99 Refused	1 – 5 Never – Always -97 – System missing -99 – System missing
QS3_3	Because of my money situation, I feel like I will never have the things I want in life	1 –5 Completely agree – Not agree at all -97 – Don't know -99 - Refused	1 –5 Completely agree – Not agree at all -97 – System missing -99 – System missing
QS3_11	I tend to live for today and let tomorrow take care of itself	1 –5 Completely agree – Not agree at all -97 – Don't know -99 - Refused	1 –5 Completely agree – Not agree at all -97 – System missing -99 – System missing

Table 45: Financial capability online survey questions

No.	Question	Current	Recoded
Q3	Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	1 – More than $102 2 – Exactly $102 3 – Less than $102 4 – Don't know	5 – More than $102 1 – Exactly $102 1 – Less than $102 4 – System missing
Q4	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account, would you be able to buy:	1 – More than today 2 – Exactly the same as today 3 – Less than today 4 – Don't know	*Not required*
Q5	True or false - Buying a single company stock/share usually provides a safer return than a stock mutual fund	1 – True 2 – False 3 – Don't know	1 – True 5 – False 3 – System missing
Q6	How would you rate your level of financial knowledge?	1 – Very poor 2 – Poor 3 – Satisfactory 4 – Good 5 – Very good 6 – Don't know	1 – 5 Very poor – Very good 6 – System missing
Q7	How often do you save money in case of future financial needs?	1 – Never 2 – Rarely 3 – Sometimes 4 – Most of the time 5 – Always 6 – Don't know	1 – 5 Never - Always 6 – System missing
Q8	How often would you find it difficult to cover your regular expenses (e.g. food, utilities, rent/mortgage payments, petrol)?	1 – 5 Never - Always 6 – Don't know	1 – 5 Always - Never 6 – System missing
Q9	Before you buy something, how often would you take the time to evaluate if you really need it?	1 – 5 Never - Always 6 – Don't know	1 – 5 Always - Never 6 – System missing
Q10	For your regular income, how often do you make a plan of how your money will be used?	1 – 5 Never - Always 6 – Don't know	1 – 5 Never - Always 6 – System missing
Q11	How often would you spend a lot of time gathering information and considering options before making a financial decision?	1 – 5 Never - Always 6 – Don't know	1 – 5 Never - Always 6 – System missing
Q28_1	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - I live more for the present day than for tomorrow	1 – Strongly disagree 2 – Disagree 3 – Undecided 4 – Agree 5 – Strongly agree	1 – 5 Strongly agree – Strongly disagree
Q28_2	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - I am always in control of my actions	1 – 5 Strongly disagree – Strongly agree	1 – 5 Strongly disagree – Strongly agree

Q28_3	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - I am impulsive and often do things without giving them much thought	1 – 5 Strongly disagree – Strongly agree	1 – 5 Strongly agree – Strongly disagree
Q28_4	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - I care about how other people see me	1 – 5 Strongly disagree – Strongly agree	1 – 5 Strongly agree – Strongly disagree
Q28_5	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - When I am faced with difficult or important decisions, I put it off for another day	1 – 5 Strongly disagree – Strongly agree	1 – 5 Strongly agree – Strongly disagree
Q28_6	When thinking about your own behaviour (over the last 6 months), to what extent would you agree with the following statements - Even if I can't afford something, if I really want it, I will just purchase it on credit	1 – 5 Strongly disagree – Strongly agree	1 – 5 Strongly disagree – Strongly agree
Q18	Throughout your life so far, what has been your main source (s) of financial education? You may select more than one answer.	1 – Parents 2 -Other family 3 – Friends 4 – School (Primary or Secondary) 5 – Tertiary 6 – Formal financial education 7 – Workplace 8 – Community 9 – Financial Services Provider 10 – Personal experience 11 - Other	*Not required*
Q19	If financial capability is described as having the knowledge, skill, and motivation to make informed financial decisions, how would you rate your level of financial capability?	1 – 5 Very poor - Very good 6 – Don't know	1 – 5 Very poor – Very good 6 – System missing
Q20	Have you thought about your retirement?	1 – Yes - a lot 2 – Yes – but not frequently 3 – No 4 – Don't know	*Not required*
Q21	If you have made a larger financial decision recently (last 12 months), other than day to day purchases, how confident did you feel in your decision-making abilities?	1 – I felt confident in my ability to make an informed decision 2 – I felt confident in my ability combined with information/advice from a trusted source	*Not required*

		3 – I felt somewhat confident but relied predominantly on other sources of information/advice 4 – Not overly confident 5 – Not confident at all 6 – I have not made a larger financial decision recently 7 – Don't know	
Q23	What gender do you identify with?	1 – Male 2 – Female 3 – non-binary/third gender 4 – Prefer not to say	*Not required*
Q24	How old are you?	1 - 18-24 years 2 - 25-29 years 3 - 30 - 34 years 4 - 35 - 39 years 5 - 40 - 44 years 6 - 45 - 49 years 7 - 50 - 54 years 8 - 55 - 59 years 9 - 60 - 64 years 10 - 65 - 69 years 11 - 70 - 74 years 12 - 75 years and older 13 – Prefer not to say	1 – 18-24 years 2 – 25 – 39 years 3 – 40 - 54 years 4 – 55 – 69 years 5 – 70 years and over
Q25	What ethnic group(s) do you associate with? You may select more than one answer	1 – New Zealand European 2 – Māori 3 – Samoan 4 – Cook Islands Māori 5 – Tongan 6 – Niuean 7 – Other Pacific Peoples 8 – Chinese 9 – Indian 10 – Other Asian 11 – other 12 – Prefer not to say	*Not required*
Q26	What is the highest level of education you have completed?	1 – Primary school or below 2 – Secondary – Year 10 or below 3 - Secondary – Year 11, 12, 13 4 – Trade/ apprenticeship 5 – Polytech/Technical certificate or diploma	*Not required*

		6 – Undergraduate certificate or diploma 7 – Postgraduate degree – Honours, Masters, or Doctorate 8 – Prefer not to say	
Q27	Approximately which of the following categories does your individual total annual income fall before tax?	1 -up to $25,000 2 - $25,000 - $49,999 3 - $50,000 – 74,999 4 - $75,000 - $124,999 5 - $125,000 or over 6 – Prefer not to say	1 -up to $25,000 2 - $25,000 - $49,999 3 - $50,000 – 74,999 4 - $75,000 - $124,999 5 - $125,000 or over 6 – System missing
Q28	Thinking about your overall wealth including assets (car & house), investments, (general & KiwiSaver), and cash savings, into which category does the total amount approximately fall?	1 - $0 - $19,999 2 - $20,000 - $99,999 3 - $100,000 – $499,999 4 - $500,000 - $999,999 5 - $1,000,000 or over 6 – Prefer not to say	1 - $0 - $19,999 2 - $20,000 - $99,999 3 - $100,000 – $499,999 4 - $500,000 - $999,999 5 - $1,000,000 or over 6 – System missing

Table 46: Interview questions - thematic analysis

No.	Component	Question
1	Subjective financial capability	If financial capability is described as having the knowledge, skill, and motivation to make informed financial decisions, how do you feel personally about your level of financial capability?
2	Subjective financial wellbeing	How do you feel about your current financial situation? What feelings/emotions come up when I ask about your current financial situation
3	Retirement preparedness	Have you thought about your financial situation in retirement? [if yes] – What specifically have you thought about? [if no] – Why do you think you have not thought about it?
4	Financial learnings	What, if any, financial decision have you made that, with the benefit of hindsight, you might have made it differently. What have you done differently since then as a result?
5	Financial education	Throughout your life so far, what has been your main source or sources of financial education?
6	Financial decision-making	Everyday individuals face various financial decisions. What do you think is important to consider when putting financial knowledge into practice?
7	Confidence in decision-making	Have you have made a larger financial decision recently (last 12 months), other than day to day purchases? [if yes] – How confident did you feel in your decision-making abilities? [if no] - Why do you think you felt that way? What could contribute to you having more confidence in making that decision? OR - You noted you have not experienced a larger financial decision. If you were faced with a larger financial decision tomorrow, how confident would you feel in making this decision and why?