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Money matters

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MONEY MATTERS

UNDERSTANDING AND IMPROVING FINANCIAL WELL-BEING

JENNA BARRETT

To teachers

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MONEY MATTERS

Understanding and Improving Financial Well-Being

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INTRODUCTION

Finance is critical to our daily and long-term lives. However, attaining and maintaining financial well-being can be a challenging pursuit. To be financially well, we need to balance current and future consumption (e.g., save for retirement), interpret complicated financial information (e.g., understand financial products' features), and make significant financial decisions (e.g., decide whether to take on a mortgage, save, or invest). These actions require an understanding of one's current financial situation, as well as the ability to translate one's future financial aspirations into actions in the present.

Financial well-being is a matter of concern for a significant proportion of the population. In the United States, only one in three adults states they are living comfortably financially (Federal Reserve, 2023) and saving rates are decreasing (Federal Reserve Bank of St. Louis, 2023). In the Netherlands, 29% of adults is concerned about their financial future (Statistics Netherlands, 2023) and the number of households with problematic levels of debt is increasing (ABN AMRO, 2023).

This dissertation addresses financial well-being by building bridges between objective and subjective perspectives on financial well-being. This approach enables me to further develop our understanding of financial well-being and allows me to develop novel insights on how financial well-being can be improved. In this introduction, I lay the groundwork for the dissertation. I first define financial well-being based on a combination of extant definitions in the literature of objective and subjective financial well-being. After defining financial well-being, I describe financial well-being's relevance from the perspective of the following key actors: individual consumers, companies and organizations, and governmental institutions and policymakers. I continue by describing the general academic interest in financial well-being and summarizing the current state of knowledge on improving financial well-being. Then, I note unresolved research questions concerning the understanding and improvement of financial well-being. Finally, I describe how my dissertation bridges gaps in the literature.

1. FINANCIAL WELL-BEING

Financial well-being can be approached from an objective or subjective perspective. The objective perspective defines financial well-being as "a consumer's potential access to financial resources, measured by an objective, external source" (Erner et al., 2016, p. 6), emphasizing the factual financial situation of a consumer. The subjective perspective defines financial well-being as "the perception of being able to sustain current and anticipated desired living standards and financial freedom" (Brüggen et al., 2017, p. 2), thereby highlighting the

subjective assessment of objective circumstances. In this dissertation, I move beyond the objective and subjective dichotomy of financial well-being. This does not mean that objective financial indicators and subjective financial well-being are interchangeable. Rather, there are different ways to assess and quantify whether individuals are doing "well" financially. I create and use a definition of financial well-being that allows for the objective as well as the subjective perspective on financial well-being. Throughout this dissertation, financial well-being is defined as an individual's objective ability and/or subjective perception of having the resources to sustain both current and anticipated desired living standards and financial freedom. Financial well-being's relevance can be understood from various parties' perspectives, which are described in the section below.

1.1 Relevance for Individuals: The Association between Financial and Overall Well-Being

The relevance of financial well-being at the individual level is revealed by its impact on overall well-being. For example, subjective assessments of one's financial situations are related to life satisfaction (Netemeyer et al., 2018; Ng & Diener, 2014). The relationship between subjective financial well-being and overall well-being is comparable in magnitude to the combined effects of job satisfaction, health perceptions, and relationship satisfaction (Netemeyer et al., 2018). Objective financial well-being indicators, such as wealth or income, are associated with outcomes such as happiness (Easterlin, 1974), health (Marmot, 2002), and mortality (Hajat et al., 2011). Financial well-being's importance is not restricted to people's current financial situations, but extends to one's (expected) financial future. Financial well-being in the present is not a guarantee of long-term financial well-being. This premise can be exemplified by looking at the retirement domain. Transitioning into retirement is associated with financial problems for many individuals, as they have insufficient savings to maintain their lifestyles during retirement (Benartzi & Thaler, 2013; McGowan & Lunn, 2020; Shin et al., 2019), which in turn affects health and happiness. In an increasingly complex financial landscape (Angrisani et al., 2020), individuals thus face the challenging task of ensuring their present and future financial well-being.

1.2 Relevance for Companies and Organizations: Absenteeism and Consumer Behavior

Financial well-being's relevance to companies and organizations can be illustrated using two perspectives. First, financial well-being's impacts on sleep and health are critical determinants of absenteeism and work productivity (Kim et al., 2003; Reynolds et al., 2017). Financial vulnerability is associated with sleep deprivation (Perales & Plage, 2017) and can create or

worsen health issues (Sturgeon et al., 2016). These issues affect not only employees' absolute availability for work but also their productivity during the hours they work. For example, 28% of UK employees report that money worries affect their work performance, and this number increases to 34% when considering low-income employees (Chartered Institute of Personnel and Development, 2022). Reduced productivity is also reflected in employers' observations; a report from the Dutch Institute for Household Finance shows that over half of employers who have staff with financial problems state that employees' work productivity decreases by a minimum of 20–30% (Dutch National Institute for Household Finance, 2017). The detrimental impacts of financial stress are not limited to the mental and physical well-being of employees; it affects organizations.

Second, it is highly relevant for companies and organizations that provide products or services to consumers to understand the ways in which financial well-being shapes consumer behavior. Consumers' financial situations affect a range of behaviors, such as dietary choice (Briers & Laporte, 2013), spending (De La Rosa & Tully, 2022), scarcity seeking (Sharma & Alter, 2012), and preferences for material goods rather than experiences (Tully et al., 2015). A customer's financial situation also affects their attentional focus on money. A focus on money and the costs of goods and services may reduce the effectiveness of marketing and pricing strategies, because the customer is focused on the product's cost rather than its features (Hamilton et al., 2019). Understanding customers' financial situations may be beneficial in understanding heterogeneity in response to marketing efforts.

Additionally, financial well-being is relevant for financial institutions, such as banks and pension funds. Not only can an individual's or household's financial situation constrain investing (Heimer & Imas, 2022) but it can also increase the odds of making financial mistakes—such as missing a required credit card payment despite having sufficient funds (Scholnik et al., 2013).

1.3 Relevance for Governmental Institutions and Policymakers: Economic Growth and Financial Inequality

Financial well-being is important for societies, governments, and policymakers because of its impact on economic stability and growth. Expressed through its Sustainable Development Goals (SDGs), the United Nations strives to eliminate poverty, ensure decent work and economic growth, and reduce inequality within and between nations, all of which stress the global importance of financial well-being. Insufficient financial well-being can cause financial

issues to accumulate and lead to detrimental global consequences (The Organization for Economic Cooperation and Development, 2018). If many people in society experience financial adversity—from job loss, for example—welfare program costs increase, and taxable income for the government decreases. Financially healthy individuals are likely to participate in the economy and contribute to economic growth and development (Jorda et al., 2016; Mian et al., 2017). As societies age and life expectancy increases, the social security costs required to prevent poverty among older adults increase (Engelhardt & Gruber, 2004). Governments are increasingly shifting the responsibility for an adequate pension income onto individuals; however, this may exacerbate poverty, as many individuals lack sufficient wealth to cover the income loss that accompanies retirement (Benartzi & Thaler, 2013).

Next to standard governmental policy on social security, government responses to crises can increase or decrease financial inequality. For example, governmental responses to the COVID-19 pandemic may have exacerbated existing financial inequalities. In 52.2% of high-income countries, governments provided unemployment benefits to people who lost their jobs during the pandemic. Conversely, only 0.8% of low-income countries made this support available (United Nations, 2020). As extreme poverty is expected to increase in the near future—even among working people (United Nations, 2020)—governmental agencies should aim to understand how they can improve financial well-being, especially among vulnerable populations, to reach the United Nations' 2030 SDGs.

2. ACADEMIC RESEARCH ON FINANCIAL WELL-BEING

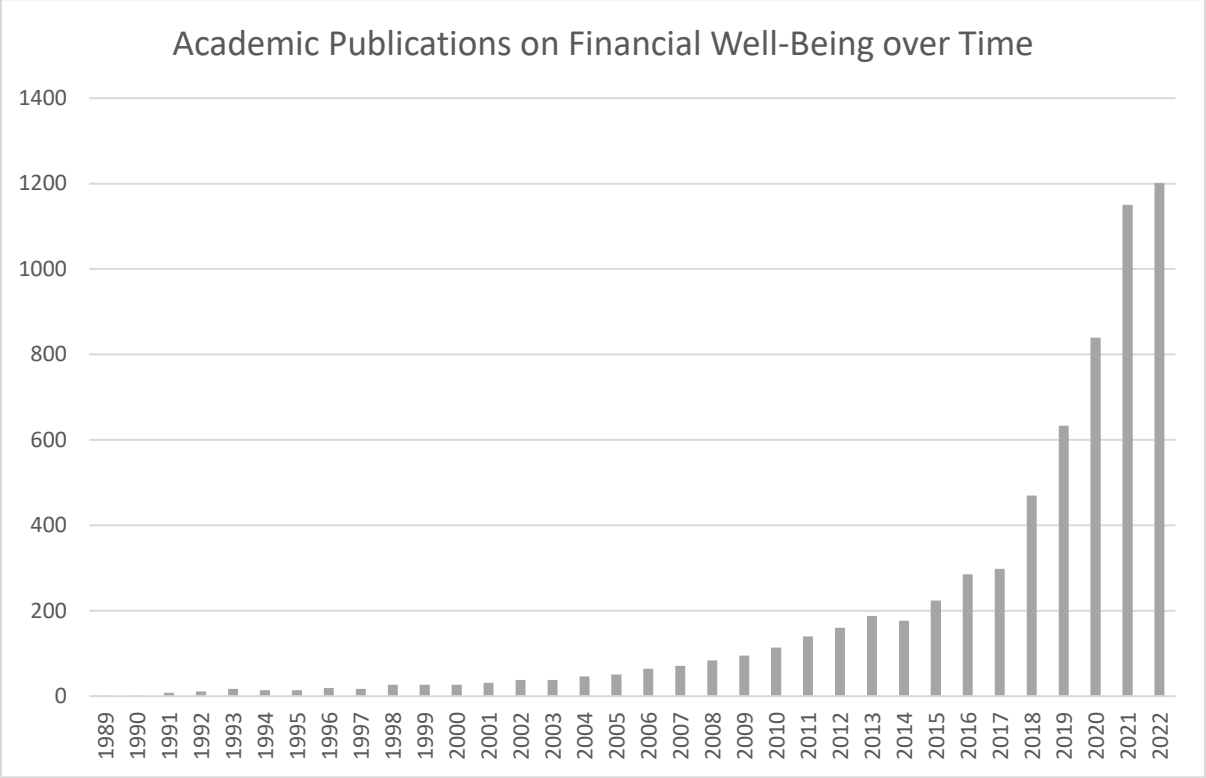
Financial well-being's relevance to individuals, companies, and governments illustrates the importance of generating additional insight and knowledge about it. In this section, I provide a brief overview of the financial well-being literature and outline how financial well-being research has developed over time. I also describe the current state of knowledge on interventions to improve financial well-being. The section concludes with a reflection on financial well-being knowledge gaps, and how this dissertation addresses these gaps in the literature.

2.1 Definition

As Figure 1 illustrates, academic interest in financial well-being has surged over time. A variety of disciplines, including economics, finance, psychology, and marketing, have explored financial well-being. This has led to various conceptualizations of what financial well-being encompasses.

Figure 1

The Prevalence of the Term "Financial Well-Being" in the Academic Literature



Note: This figure is based on a Web of Science search for papers with "financial well-being" in their titles or abstracts.

Financial well-being is distinguishable from other frequently used terms in the financial decision-making literature. Financial well-being differs from financial satisfaction because the latter concerns a person's level of contentment with their current financial situation, whereas financial well-being incorporates an individual's current situation and their financial future (Baek & De Vaney, 2004). Furthermore, financial well-being differs from financial constraints or stress. There is a rich literature on how financial constraints affect decision-making (Hamilton et al., 2019). Whereas financial stress concerns perceptions of financial constraint (Friedline et al., 2021), financial well-being entails a positive perception that one can meet a desired living standard, which includes financial freedom (Brüggen et al., 2017; Netemeyer et al., 2018). Financial well-being thus encompasses more than the absence of deprivation. However, as financial well-being research is scattered and there is currently no consensus on its definition or measurement, I provide a broad overview of research related to the overall domain of financial well-being. This means research focusing on positive financial outcomes—

including sound financial decision making and the absence of—using either objective or subjective indicators.

2.2 Measurements

2.2.1 Objective Measurements

Objective financial well-being can be defined as "a consumer's potential access to financial resources, measured by an objective, external source" (Erner et al., 2016, p. 6). Because the term well-being implies subjectivity, objective well-being can be deemed a paradoxical term. Perhaps therefore, the literature does not consistently use the term objective financial well-being. Objective measures of financial well-being provide insight into the facts of a consumer's financial situation. Measures of people's objective financial situations are described using many terms, including, but not limited to, financial situation, economic well-being, or objective financial wellness. Income is the predominant objective financial indicator used in the literature (e.g., Greninger, 1996; Singh et al., 2015; Western & Tomaszewski, 2016). Other measures used include credit scores (Erner et al., 2016; Mende & Van Doorn, 2015); assets (Tatom, 2010); a combination of income and the number of financial issues, such as not being able to keep up with one's bills (Western & Tomaszewski, 2016); banking data, such as payment issues, spending, the ability to cover an unexpected expense, and balances (Comerton-Forde et al., 2022); investment returns (Chu et al., 2017); and financial ratios and benchmarks, such as the ratio between household income and assets (Ammerman & Stueve, 2019; Greninger, 1996; Rutherford & Fox, 2010). There appears to be little consensus on or validation of the measures used in extant literature.

2.2.2 Subjective Measurements

Subjective financial well-being can be defined as "the perception of being able to sustain current and anticipated desired living standards and financial freedom" (Brüggen et al., 2017, p. 2). Various authors argue that financial well-being is a personal perception that only consumers can judge (Netemeyer et al., 2018; Zyphur et al., 2015). Subjective financial well-being measurements aim to assess how consumers perceive and experience their financial well-being (e.g., Netemeyer et al., 2018; Strömbäck et al., 2017). Multiple scales have been designed to measure individual differences in subjective financial well-being. For example, Netemeyer et al. (2018) divided subjective financial well-being into current money management stress and expected future financial security subdomains and developed two subscales to measure these subdomains. Other approaches combine current and future

financial well-being into a single scale (e.g., Botha et al., 2021). There is currently no consensus on which approach is most effective at measuring subjective financial well-being.

2.3 Determinants

Various individual characteristics have been proposed as financial well-being determinants. The literature on this subject is expansive and diverse, and it includes research on preferences, social comparison, objective skills, beliefs, and personality traits.

Time, risk, and ambiguity preferences affect financial outcomes. Risk-averse individuals are unlikely to participate in financial markets (Chu et al., 2017) and tend to accumulate less retirement wealth than risk-seeking individuals (Neelakantan & Chang, 2010). Individuals with high financial risk tolerance also display higher levels of financial satisfaction (Joo & Grable, 2004). In addition to risk attitudes, ambiguity attitudes are associated with financial well-being. For example, ambiguity aversion—the preference for lotteries with known probabilities over those with unknown probabilities—is negatively associated with stock market participation (Dimmock et al., 2016). Furthermore, the value that individuals assign to immediate versus later gains predicts financial outcomes. Individuals who are more present-biased—they prefer immediate consumption—are more likely to have credit cards with high debt balances (Meier & Sprenger, 2010). Conversely, more patient individuals are more likely to save (Falk et al., 2018). Accumulating retirement and investment wealth, as well as the absence of debt, are financial outcomes indicative of financial well-being (Chu et al., 2017). Individual preferences function as financial well-being determinants.

A large body of psychological literature studies the role of comparative processes and the individual tendency to engage in such processes as determinants of subjective financial well-being, documenting that individuals compare themselves to others to assess how they are doing (e.g., Festinger, 1954; Gerber et al., 2018; Suls et al., 2002). In the financial realm, the literature has focused mainly on understanding the relationship between relative income and happiness (e.g., Clark et al., 2008; Easterlin, 1974). The assessment of people's financial well-being is deemed inherently relative (Sharma & Alter, 2012; Tully & Sharma, 2022), and individuals generally compare their financial well-being to the situations of those proximate to them (Neman, 2020). There is consistent evidence that individuals assess their financial situation as worse if their friends, family, or co-workers have higher incomes than they do (Ferrer-i-Carbonell, 2005). Individuals differ in the extent to which they engage in social comparisons (Gibbons & Buunk, 1999). Consumers with stronger social comparison

orientations not only compare more often but also spend more time doing so and are more affected by social comparisons than others (Buunk & Gibbons, 2006; Gibbons & Buunk, 1999). Since individuals generally tend to compare themselves to people who are doing better than they are when they make social comparisons (Gerber et al., 2018), a strong social comparison orientation may cause people to negatively assess their subjective financial well-being (Sharma & Alter, 2012).

Economics and finance research has primarily focused on individual knowledge, skill, and capability differences that are essential for achieving financial well-being. In this field of research, the studied outcomes are generally objective financial indicators. This field's dominant construct is financial literacy—the understanding of financial concepts relevant to effective decision-making (Lusardi & Mitchell, 2014). Financial literacy is generally operationalized as objective financial knowledge and is measured by assessing financial concept knowledge, including interest, inflation, and investment (e.g., knowing the difference between stocks and bonds). Consumers with low financial literacy are less able to perform basic numerical calculations (Hastings et al., 2013). Due to differences in knowledge and skill, thinking about future finances is more costly (Delavande et al., 2008) and anxiety-inducing (Mrkva et al., 2021) for consumers with low financial literacy (Delavande et al., 2008). These factors contribute to differences in financial outcomes. The literature shows that individuals with higher levels of financial literacy are more likely to plan for retirement, to grow their wealth through stock investments, and to avoid high-cost debt (Lusardi & Mitchell, 2007; Lusardi et al., 2013; Lusardi & Mitchell, 2017; Van Rooij et al., 2012).

The financial skill and self-efficacy literature argues that subjective perceptions of skills and capabilities are more relevant predictors of financial outcomes than objective knowledge. Financial skill is "a consumer's ability to find, process, and act on financial information" (Consumer Financial Protection Bureau, 2018, p. 2), and it is regarded as a financial literacy component. Rather than focusing on objective financial knowledge—as is often the focus of traditional measurements of financial literacy (e.g., Lusardi & Mitchell, 2014)—financial skill concerns a consumer's subjective assessment of their abilities to process and use financial information. Subjective assessments of a person's financial capabilities, such as subjective financial knowledge (Lind et al., 2020) and money management skills (Donelly et al., 2012), are positively associated with financial well-being. An individual's belief that they are financially skilled contributes to their sense of financial well-being, keeping their objective

financial situation constant (Donelly et al., 2012). Similarly, financial self-efficacy—defined as a person's confidence in their ability to deal with finances (Lown, 2011)—is associated with positive financial outcomes, such as having less debt (Farrell et al. 2016).

Financial socialization contributes to individual differences in financial capabilities, resulting in differences in financial well-being (Gudmondson & Danes, 2011). Financial socialization is predominantly studied in the family context, in which parents socialize their children. However, financial socialization can be viewed as a lifelong process in which an individual adapts to their environment by learning or changing attitudes, values, and norms (Hayta, 2008). Financial socialization generally occurs through implicit, rather than explicit, training. Parents may not explicitly tell their children how to approach a financial decision; rather, a child may see that their parents carefully read financial product information before making a decision and may internalize this as a financial norm. In turn, these norms affect behavior and financial outcomes. For example, children of financially prudent parents are less likely to accrue debt because they are less likely to misuse credit cards (Hibbert et al., 2004).

A substantial body of literature connects personality traits to objective and subjective financial well-being. The dominant system for classifying personality traits is the big five classification (Costa & McCrae, 1992), which includes the following: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. These traits are related to financial outcomes. For example, individuals who are more open to experience, are more likely to hold shares (Brown & Taylor, 2014). Conscientious individuals tend to fare well financially because they manage money effectively (Donelly et al., 2012) and are less likely to hold credit card debt (Brown & Taylor, 2014). The association between conscientiousness and positive financial outcomes is also reflected in subjective perceptions of financial well-being (Joshanloo, 2022). Conversely, extraversion and agreeableness seem to be risk factors for reduced financial well-being. Extraverted individuals have a higher probability of holding credit card debt (Brown & Taylor, 2014), and agreeable individuals tend to experience greater financial hardship because they ascribe less importance to money (Matz & Gladstone, 2020). Finally, neuroticism—the tendency to experience negative emotional states (Widiger, 2009)—is generally associated with lower levels of financial well-being (Joshanloo, 2022). Tharp et al. (2020) demonstrate that neuroticism is negatively associated with financial satisfaction when controlling for financial characteristics such as net worth, income, and home ownership. They

argue that neurotic consumers may experience low financial satisfaction from their disposition to experiencing negative affect.

Beyond the big five personality traits, other dispositions are also closely linked to financial well-being. For instance, optimism about the future financial situation of a person's household is positively associated with subjective financial well-being when controlling for objective financial situation indicators, such as income (Barrafrem et al., 2020; Strömbäck et al., 2017). Optimistic consumers report higher financial resilience, indicating that they believe they have the resources to overcome financial adversity (Salignac et al., 2019). However, assessing the relationship between optimism and objective indicators of financial well-being may show an opposite pattern. Whereas moderate optimists show prudent financial behaviors, there is evidence that individuals who are extremely optimistic about their life expectancy are less likely to save, possibly due to their positively biased future expectations (Puri & Robinson, 2007).

Materialism, or "the importance ascribed to the ownership and acquisition of material goods in achieving major life goals or desired states" (Richins, 2004, p. 210), is another individual trait that is strongly linked to financial outcomes. Materialism is linked to worse objective financial circumstances because materialistic people are less effective at money management, resulting in fewer savings, more debt, and more compulsive buying (Donelly et al., 2012; Gardarsdottir & Ditmar, 2012). Materialism may also lead people to be dissatisfied with their financial situations. Since materialistic consumers are characterized by the continuous pursuit of goods (Richins & Dawson, 1992), they may experience dissatisfaction with their financial situations—irrespective of the reality of their financial situations—and focus primarily on deficiencies in their financial situations (Tsang et al., 2014; Tully & Sharma, 2022).

2.4 Interventions

Organizations can improve their employees' financial well-being by embedding financial well-being into HR practices. As job insecurity precedes financial stress, employers can provide more stable employment contracts to improve employees' subjective financial well-being (Choi et al., 2020). Furthermore, employers can implement financial counseling programs; however, the effectiveness of such interventions depends on employees' willingness to participate, which may be especially hampered for financially stressed employees (Clark, 2023; Joo & Grable, 2000).

Understanding psychological and economic preferences can help in designing effective interventions to increase financial well-being. One of the most successful examples of such an intervention is the “save more tomorrow” program (Thaler & Benartzi, 2004), which leverages present bias by letting employees commit to increasing their pension contributions along with future salary increases. The main premise of this program’s success is that individuals commit to a future action that requires no present cost; hence, it overcomes self-control challenges that generally favor immediate over future consumption.

Next to employee financial well-being, companies and organizations can implement practices that affect consumer financial well-being. Individuals often construct their preferences at the moment of choice and are thus heavily affected by the ways in which choices are presented (Johnson et al., 2012). Companies can affect customers’ financial behavior via small tweaks in their choice architecture. For example, providing individuals with numerical cues can increase savings rates (Choi et al., 2017). In general, the ways in which messages are framed can affect consumer behavior. For example, message framing in email communication can affect the engagement of individuals with long-term financial planning (Eberhardt et al., 2021), and labeling specific dates as a “fresh start” can trigger financial behavior (Beshears et al., 2021). The ability of organizations to affect financial well-being is not limited to nudges and framing—the myriad of approaches that can change consumer behavior include gamification (Zhang et al., 2021), reminders (Karlan et al., 2016), and creating imagery of consumers’ future selves (Hershfield et al., 2011).

Companies may also use the availability of rich data to better understand their customers’ financial situations. For example, banking data can be used to understand the financial behaviors that create a sense of financial well-being (Comerton-Forde et al., 2022). Data availability can also be used to gain fine-grained insights into heterogeneous relationships between financial behaviors (such as spending) and happiness while accounting for personality differences (Matz et al., 2016; Matz & Netzer, 2017).

Next to companies and organizations, governmental institutions and policymakers play a key role in improving financial well-being. Governments can directly affect financial well-being through welfare programs, taxation, and redistribution policies. They can also reduce the impact of negative financial shocks, for example, by increasing insurance eligibility (Hu et al., 2016) or by providing financially vulnerable households with support to cover increased energy costs (Eerste Kamer, 2023). Governments can also foster long-term financial well-being

by introducing policies such as auto-enrollment into pension saving plans (Cribb & Emerson, 2019).

Another route that governmental institutions and policymakers have followed to improve financial well-being is focusing on financial education to improve financial literacy. Various governments worldwide have developed platforms to foster financial literacy. For instance, the Dutch government implemented the "Money Wise" ("Wijzer in Geldzaken") platform. This Ministry of Finance initiative combines insights from financial service providers, academic researchers, consumer organizations, and governmental bodies to help citizens make well-informed financial decisions. These insights are combined on a website that provides information on topics ranging from financial management and the financial consequences of life events to retirement. Despite early concerns that financial education does not change downstream financial behaviors (Fernandes et al., 2014), accumulating evidence demonstrates that financial literacy programs increase financial knowledge and prompt positive financial behaviors (Kaiser et al., 2022; Kaiser & Menkhof, 2017; Miller et al., 2015).

3. RESEARCH GAPS IN UNDERSTANDING AND IMPROVING FINANCIAL WELL-BEING

Despite increasing knowledge about financial well-being's conceptualization, measurement, drivers, and consequences, there are ample research questions that still require addressing to obtain a comprehensive understanding. I focus on furthering our understanding of financial well-being by bridging the two main approaches to studying financial well-being—objective indicators and subjective perceptions. I focus on three approaches that can be used to improve financial well-being. First, I explore the interplay between consumers and financial service providers and study how a lack of engagement with financial services can be understood and improved. Next, I take a more individual approach and assess how individual differences in cognitive ability are associated with a range of financial outcomes. Finally, I focus on decision environment design for saving decisions and seek to design an intervention that eases future-oriented choices. In my dissertation, I expand the financial well-being literature by addressing the research questions below.

3.1 To What Extent Do Objective and Subjective Financial Well-Being Correspond?

Financial well-being is defined and measured in many ways (Tully & Sharma, 2022), but as explained above, it can be classified into objective (e.g., Greninger 1996; Singh et al., 2015; Western & Tomaszewski, 2016) and subjective measurements (e.g., Botha et al., 2021;

Netemeyer et al., 2018). Generally, financial well-being is addressed from either an objective perspective—for example, by reviewing how much income or savings an individual has—or a subjective perspective—for example, by asking people how they feel about their financial situations. However, it is currently still unclear which objective indicators of financial well-being translate into perceptions of subjective financial well-being. There is some evidence that individuals with more higher incomes also have higher levels of subjective financial well-being, but the correlation is not strong (i.e., between .20 and .30). The current conclusions in the literature on the relationship between objective and subjective financial well-being are limited by data availability constraints. For example, self-reported objective financial data are error-prone (Heady et al., 2005). Next to this, a one-item measure capturing financial satisfaction is often used to proxy financial well-being, however, this variable does not capture assessments of expected future financial well-being. Therefore, we do not yet know which objective financial indicators matter for people's subjective senses of financial well-being and to what extent objective financial indicators and subjective perceptions correspond.

3.2 How Can Retirement Planning Engagement Be Improved?

Retirement planning—one of the most important yet complex financial decisions—is highly relevant for future financial well-being. However, customer engagement with long-term financial planning is lacking. For example, only 3–6% of individuals respond to information about important changes in their retirement plans (Eberhardt et al., 2021). This lack of engagement can have detrimental effects on retirement outcomes. For unengaged customers, retirement gaps likely tend to go unnoticed until they can no longer be salvaged. These retirement gaps, in turn, affect consumption, economic viability, and social support demands at the societal level (Munnell et al., 2021). Hence, finding ways to increase engagement is critical. There is a large stream of research on customer engagement; however, it is predominantly set in hedonic service settings. Research on utilitarian services, such as retirement planning, is limited. Hedonic services (e.g., hotels and movies) are associated with fun and pleasure, and they are inherently experience- and process-oriented (Collier et al., 2014; Prebensen & Rosengren, 2016). Conversely, utilitarian services, such as financial services, are functional and useful, and their consumption is primarily outcome oriented (Collier et al., 2014; Dhar & Wertenbroch, 2000). Hedonic and utilitarian services' fundamental characteristics differ, which means that insights on customer engagement in hedonic contexts

are not transferrable to utilitarian services. Additional knowledge about how to foster engagement in utilitarian contexts and how context affects customer engagement is needed.

3.3 How Does Cognitive Ability Affect Consumer Financial Well-Being?

Many individual factors have been proposed to explain the differences financial behavior and outcomes. Given an increasingly complex financial landscape (Angrisani et al., 2020), cognitive ability, "the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience" (Gottfredson, 1997, p. 13), is generally a relevant predictor of financial well-being (Furnham & Cheng, 2016; Strenze, 2007). Prior research has shown that people with greater levels have higher incomes (Strenze, 2007), more wealth (Banks & Oldfield, 2007; Banks et al., 2010; Duckworth & Weir, 2010; Estrada-Meija et al., 2020), and make fewer financial mistakes (Agarwal & Mazumder, 2013). However, it is unknown whether the relationship between cognitive ability and financial well-being is linear. Are greater levels of cognitive ability always associated with greater levels of financial well-being? Or it is possible that for some financial outcomes such as savings, greater levels of cognitive ability are no longer beneficial, or provide a greater advantage than we previously assumed? To improve financial well-being, a more comprehensive understanding of the form of the relationship between cognitive ability and financial well-being is required to understand which individuals are prone to adverse financial outcomes.

3.4 How Can We Increase Pension Contribution Rates?

The pension contribution rate—the percentage of current income that is set aside for retirement savings—is a critical determinant of financial well-being in retirement. Generally, individuals prefer immediate benefits to delayed ones (Berns et al., 2007). While the existence and consequences of this preference are well documented in the literature, there is still limited evidence of methods for nudging people to be more future-oriented in their saving decisions. Governmental interventions, such as auto-enrollment, have successfully improved retirement plan participation, but are still insufficient to ensure retirement adequacy, as participants often enroll at the minimum required saving rate. Evaluative structures, a collective term for communication formats in which outcomes are mapped on an evaluative scale, improve decision-making in the health and food consumption domains. In these domains, an evaluative structure would, for example, map medical procedure risks on a scale from bad to good or the percentage of fat in cookies from low to high. In the financial domain, labeling a saving rate decision's consequences (i.e., if your expected pension income is €1,200,

what type of lifestyle will you have?) may encourage people to select a saving rate that matches their future aspirations because the evaluative structure creates vivid mental imagery of the future self. Alternatively, this may not affect savings if consumers see the next upward lifestyle as unachievable. It is currently unknown whether such an approach would help or hinder consumer saving.

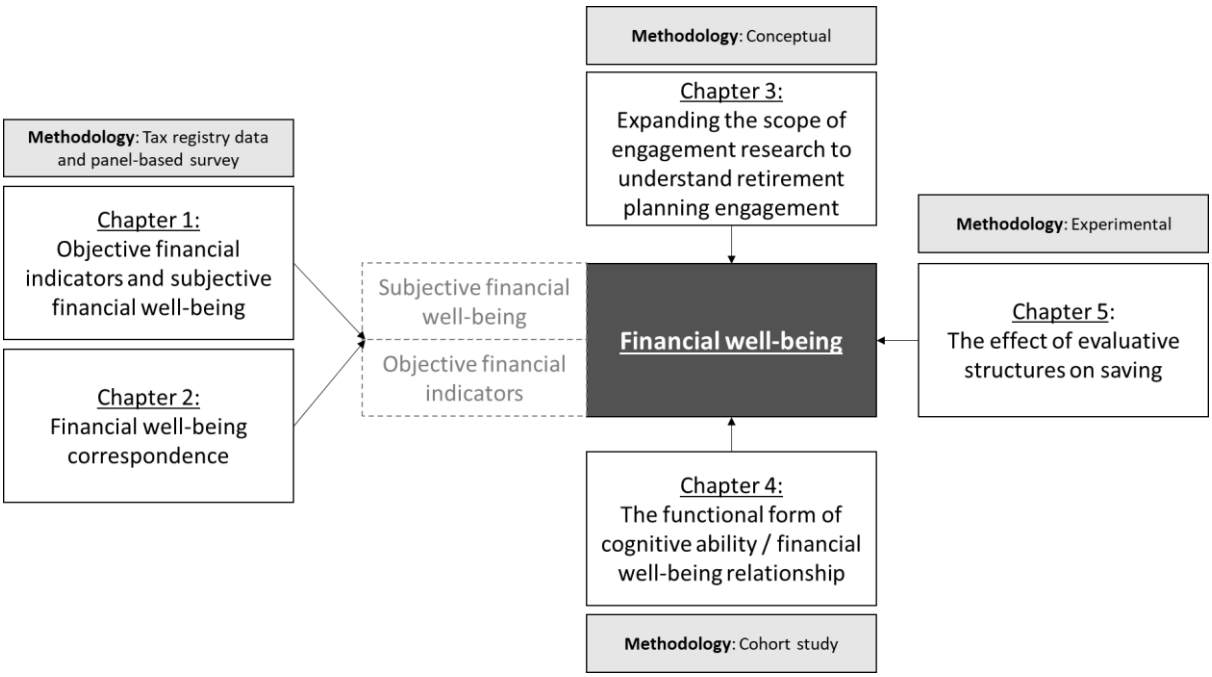
4. DISSERTATION OVERVIEW

In this dissertation, I study financial well-being from a multidisciplinary, multi-method perspective to advance the understanding of the nature of financial well-being and to develop novel strategies to improve it. Specifically, this dissertation is positioned at the intersection of the academic disciplines of marketing, psychology, finance, and behavioral economics. I build on insights from these bodies of literature, as each of these disciplines has devoted attention to the understanding and improvement of financial well-being.

As illustrated in Figure 2, my dissertation contains five chapters. Chapter 1 assesses the association between objective financial indicators and subjective financial well-being. Chapter 2 takes a holistic perspective on financial well-being and aims to disentangle the extent to which objective and subjective approaches to financial well-being correspond. In Chapter 3, I focus on how academic research can expand its scope to increase the understanding of customer engagement with utilitarian service providers, such as pension providers. In Chapter 4, I focus on understanding how individual differences contribute to financial well-being by delving into the relationship between cognitive ability and financial outcomes. In Chapter 5, I explore interventions that service providers and policymakers can use to improve retirement savings adequacy by developing a nudge intervention to increasing savings.

Figure 2

Dissertation Overview



Note: This figure displays the titles (white boxes), methodology used per chapter (light gray boxes), and main topic of the dissertation (dark gray box).

This dissertation uses diverse methods to study financial well-being. I combine data from a panel-based survey in an online probability panel with tax registry data to understand the correspondence between objective and subjective indicators of financial well-being. This unique combination of data allows me to precisely estimate the correspondence between subjective and objective financial indicators by eliminating common sources of measurement error. Furthermore, I use a conceptual methodology consisting of a literature synthesis and consequent theory adaptation to gain insight into how our current academic practices and perspectives on customer engagement can be expanded for application in a utilitarian service context, such as retirement planning. I analyze survey data from the British Cohort Study, which follows the lives of thousands of people born in the same week in 1970, to understand the association between childhood cognitive ability and adult financial outcomes. Specifically, I use polynomial models to test the functional form of the association between cognitive ability and financial well-being. Finally, I use experimental research to causally establish how providing evaluative structures for saving outcomes affects saving decisions. The content per chapter is described below.

Chapter 1. The first chapter, "Improving our understanding of the relationship between objective financial indicators and subjective financial well-being using tax registry data" (co-authored with Jan van den Brakel (Statistics Netherlands, Maastricht University), Elisabeth Brüggen (Netspar, Maastricht University), and Jens Hogreve (Katholische Universität Eichstätt-Ingolstad)) contributes to the financial well-being literature. Because consumer finances directly impact spending, choice, and well-being, understanding consumer financial well-being is critically relevant for research and practice. Academic research increasingly deems financial well-being as a subjective perception that is only moderately linked to objective indicators of a consumer's financial situation. If this assumption holds, this is problematic for companies and organizations that can generally access to data reflecting objective indicators of financial well-being but cannot directly assess their customers' subjective senses of financial well-being. I challenge the assumption that objective and subjective financial well-being are only moderately correlated and argue that the current measures and data sources are insufficient for studying the influence of an individual's objective financial situation on their subjective sense of financial well-being. In this study, I use Dutch tax registry data to measure objective financial indicators (e.g., income, wealth, and debt). I enrich these data with survey data on subjective financial well-being collected by the Longitudinal Internet studies for the Social Sciences (LISS) panel, a nationally representative and randomly recruited sample. By merging these two data sources, I can identify which objective financial indicators are most closely linked to subjective perceptions of financial well-being.

I find that most variance is explained by the cumulative share of assets and income, which is a measure that combines relative assets and income into a single score. The association between a household's cumulative share of assets and income and subjective financial well-being is consistent across gender, age group, and education level. As the association between the cumulative share of assets and income and subjective financial well-being is stronger than prior objective indicators of financial well-being in the literature, this chapter finds that the association between objective financial circumstances and subjective perceptions is stronger than previously assumed.

Chapter 2. In the chapter "Understanding non-correspondence of objective financial indicators and subjective financial well-being," I use the dataset from Chapter 1 to delve into the individual characteristics associated with differences between objective financial

indicators and subjective financial well-being. This chapter was written in collaboration with Jan van den Brakel (Statistics Netherlands, Maastricht University), Elisabeth Brüggen (Netspar, Maastricht University), and Jens Hogreve (Katholische Universität Eichstätt-Ingolstad). Whereas research has identified the drivers of subjective financial well-being (e.g., Anvari-Clark et al., 2022) and objective financial indicators (e.g., Rutherford & Fox, 2010), I contribute to the financial well-being literature by assessing which demographic characteristics and individual traits are predictive of a mismatch between objective and subjective financial well-being. This study's analyses provide initial insights into the underlying individual differences that may explain why objective and subjective financial well-being may not correspond.

I find that for the majority of individuals, the objective financial situation and subjective perception of financial well-being align. The study reveals that individual differences in optimism, materialism, and financial skill can explain the differences between subjective and objective financial indicators. Specifically, optimistic individuals and individuals with a high level of subjective financial skill have higher subjective financial well-being relative to their objective financial situation. For materialistic individuals, the opposite pattern is found, where the objective financial situation is greater relative to subjective financial well-being. Furthermore, I draw attention to specific demographic groups. Individuals who are older and have larger households have lower subjective financial well-being relative to their objective financial situation. Conversely, individuals with lower education levels tend to have greater subjective financial well-being relative to their objective financial situation.

Chapter 3. In the chapter "How to engage the unengaged? Expanding the scope of engagement research," co-authored with Jonas Heller (Maastricht University), Elina Jaakkola (University of Turku), and Elisabeth Brüggen (Netspar, Maastricht University), I compare the customer engagement literature to the reality of retirement engagement and derive assumptions often taken for granted in engagement research that require revising. In this chapter, I use a qualitative approach to contribute to both the retirement planning literature and customer engagement literature. This article informs the existing theory on engagement from the perspective of engagement with retirement planning, thus performing "theory adaptation" (Jaakkola, 2020). I review the engagement literature to identify its key assumptions and foci. Moreover, I analyze studies conducted in the retirement research domain that focus on engaging customers to locate potentially differing premises of engagement in utilitarian settings. In this conceptual study, I use a broad definition of financial

well-being, as increased retirement planning engagement likely contributes to both objective and subjective financial well-being.

By synthesizing insights from engagement and retirement planning research, I a) identify assumptions in engagement research that need revising and b) provide systematic guidelines for the future research that needs to be conducted to augment the scope of engagement research. The main finding is that engagement research's foci (e.g., Brodie et al., 2011; Jaakkola & Alexander, 2014; Kumar & Pansari, 2016; Kumar et al., 2010) are primarily applicable to hedonic, rather than utilitarian, contexts. I specifically identify key differences in the nature of engagement, customer and provider engagement drivers, and customer and provider engagement outcomes. I develop a research agenda to increase engagement with utilitarian services that benefit consumer financial well-being.

Chapter 4. In the chapter "Understanding the functional form of the relationship between childhood cognitive ability and adult financial well-being," co-authored with Joe Gladstone (University of Colorado, Boulder), I study the association between childhood cognitive ability and adult financial outcomes (debt, savings, retirement planning, investing, and financial stress). In this study, I use the British Cohort Study, which tracks a cohort of individuals born in 1970 in the United Kingdom over their lifetimes. I link measures of cognitive ability in childhood at age 10 to financial outcomes in adulthood at ages 42 and 46. As financial decision-making becomes increasingly complex (Angrisani et al., 2020), cognitive ability is a prime candidate for explaining individual differences in financial outcomes. In this chapter, I challenge the assumption that cognitive ability is linearly associated with financial well-being. Overall, I contribute to the subjective financial well-being literature (e.g., Brüggen et al., 2017; Netemeyer et al., 2018) by demonstrating that cognitive ability predicts not only objective measures but also subjective assessments of people's financial situations. By understanding the complex interplay between cognitive ability, financial resources, and financial outcomes, targeted financial education interventions can be developed to help people at the greatest risk of experiencing financial hardship.

I find that the relationship between cognitive ability and financial outcomes differs across various financial well-being indicators. Notably, I find an inverse U-shaped relationship between cognitive ability and debt accumulation, in which individuals with average cognitive abilities have the highest debt levels. Furthermore, I find an exponential relationship between cognitive ability and savings. However, the nonlinear trend was largely seen at the extreme

ends of the cognitive ability distribution; whereas a linear trend. Finally, I find that a linear trend most accurately describes the relationship between cognitive ability and financial stress.

Chapter 5. Finally, in the chapter "When, how, and for whom evaluative labels and consumption baskets increase savings," I demonstrate in a series of experiments how financial well-being in retirement can be improved by providing lifestyle labels (e.g., minimum, moderate, and comfortable) and concrete examples of what people can purchase with their pension income. This chapter was written in collaboration with Elisabeth Brüggen (Netspar, Maastricht University), Peiran Jiao (Maastricht University), and Thomas Post (Maastricht University). In this chapter, I use laboratory and online experiments to estimate the causal effects of different evaluative structures on saving rates. I study how evaluative structures change saving decisions and find that they increase savings through increased mental imagery and anchoring effects. I also highlight individual differences in trust, financial literacy, and patience, as well as test whether these differences affect the effectiveness of saving interventions. This chapter builds on the rich financial decision-making literature and combines insights from other relevant research areas (e.g., the work on evaluative labels from medical decision-making; Dieckmann et al., 2012) to contribute a novel solution to the societal problem of inadequate retirement savings (Benartzi & Thaler, 2013; McGowan & Lunn, 2020; Shin et al., 2019).

Across three experimental studies, including one incentivized experiment, I find that evaluative structures are an effective intervention to increase savings. Evaluative labels alone, as well as evaluative labels with consumption baskets, increase pension saving rates, regardless of people's levels of patience or trust in pension institutions. Evaluative labels with consumption baskets lead to higher pension saving rates by increasing mental imagery. I show that the effectiveness of evaluative structures depends on the starting saving rate and individual financial literacy levels. Evaluative structures trigger consumers to increase savings at moderate saving rates more than numerical tables do. Finally, I show that the positive effects of evaluative structures generalize to a decisions with real monetary consequences. In a shorter-term saving context, evaluative structures increase savings because they augment the difference between the mental imagery of the future and current consumption. However, in this context, the perceived attractiveness of the consumption baskets is a boundary condition: savings only increase if the categorical ordering of the evaluative structure is deemed increasingly attractive.

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CHAPTER 1

IMPROVING OUR UNDERSTANDING OF THE RELATIONSHIP BETWEEN OBJECTIVE FINANCIAL INDICATORS AND SUBJECTIVE FINANCIAL WELL-BEING USING TAX REGISTRY DATA

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1. INTRODUCTION

A person's financial situation is a key component of their overall well-being (Ng & Diener, 2014; Netemeyer et al., 2018), and there is increasing agreement that financial well-being should be a central policy goal (Consumer Financial Protection Bureau, 2015; OECD, 2020). Despite increased policy efforts to improve financial well-being (e.g., Consumer Financial Protection Bureau, 2015; Financial Capability Lab, 2018), it is still a concern even in developed countries (OECD, 2020). For example, less than half of Americans deem their financial situation to be good (Gallup, 2023), and almost 1 in 3 households with dependent children in the European Union are unable to cover unexpected financial expenses (Eurostat, 2021). The prevalence of financial adversity demonstrates the importance of gaining a more comprehensive understanding of which factors contribute to financial well-being. Identifying whether and how objective financial circumstances contribute to financial well-being can inform policy efforts to effectively improve financial well-being. In this article, we ask which and to what extent objective indicators of a household's financial situation align with subjective perceptions of financial well-being.

Financial well-being is generally conceptualized as a subjective perception (i.e. "The perception of being able to sustain current and anticipated desired living standards and financial freedom" (Brüggen et al., 2017), and there is a growing consensus in the academic literature that financial well-being is shaped by psychological beliefs and comparisons (Blocker et al., 2022; Hamilton et al., 2018*;* Kappes et al., 2021; Netemeyer et al., 2018). The notion that such beliefs and comparisons, rather than the objective financial situation, drive perceptions of financial well-being is supported by the moderate relationship that has previously been found between subjective financial well-being and components of objective measures such as income or other financial indictors (e.g., Comerton-Forde et al., 2022; Consumer Financial Protection Bureau, 2017; Diener, 1984; Federal Reserve, 2021; Netemeyer et al., 2018; OECD, 2022; Riitsalu & Murakas, 2019; Tenney & Kalenkoski, 2019). This gives the impression that the objective measures of financial situation that are widely used in literature and practice do not explain the subjective financial well-being of an individual well.

Generally, there is a consensus that the association between objective financial indicators and subjective financial well-being is moderate, but individual estimates per study vary. Prior reported correlations between objective financial indicators and indicators of subjective financial well-being range from non-existent (e.g. Losada-Otalora et al. year report

a correlation of income and financial satisfaction of r =.00), to moderately strong and positive (e.g., Hansen et al. (2008) report a correlation of wealth and how a household reports to be faring financially of r = .45). Whereas one might conclude that assets are more important for financial well-being than income is when comparing these studies, these numbers cannot directly be compared as the strength of the association depends on the indicators and measurement levels used. For example, the association between a dichotomized 1-item measure of financial satisfaction (satisfied or not) and a measure of income with 3 categories is likely to be stronger than the associations between more detailed measures.

We argue that the current measures and data sources are insufficient to study the influence of an individual's objective financial situation on their subjective financial well-being perception. There are three key limitations of current measures and data sources: the use of single indicators, self-report data and categorization. First, studies on the association between an individual's objective financial situation and subjective financial well-being have generally explored the association between single indicators of a person's financial situation. The most dominant indicator of one's objective financial situation used is income (Diener, 1984). Other indicators include wealth (Wolff and Zacharias 2009), credit scores (Mende & van Doorn, 2015), bank balances (Gladstone et al., 2020), or debts (Hu et al., 2018). Yet, single indicators used in isolation do not depict the entirety of a person's financial situation. For example, two households may have similar income levels but major wealth differences and therefore differ in their subjective financial well-being. Second, most studies measured objective indicators through self-reported measures in surveys. Hence, measurement bias, non-response, social desirability, misunderstanding, or misreporting, and common method bias that are associated with financial reporting may affect results (Headey et al., 2005). Third, existing research often uses categorical objective financial indicators, which may overestimate the association between a household's exact financial situation and financial well-being. These major issues combined limit the assessment of the relative importance of objective indicators for subjective financial well-being.

Understanding the relationship between subjective financial well-being and various indicators of a household's objective financial situation has implications for theory and practice. Knowledge of the relationship between subjective financial well-being and the objective financial situation informs the measurement of both indicators in future research. If subjective measures of financial well-being are not strongly associated with objective

indicators of financial well-being, this would hamper the validity of the use of subjective measurements, as they may be confounded by overconfidence or optimism rather than being clear measurements of subjective financial well-being. Simultaneously, it would hamper the use of objective measures, as subjective self-reports might be more informative of behavior and overall well-being.

Knowledge of the relationship also have policy implications by guiding policymakers in their efforts to improve the objective financial conditions of citizens as a route to improving subjective financial well-being. A more complete and accurate assessment of objective financial situation is important so that governments and policymakers understand where to direct their policy efforts to improve subjective financial and general well-being. Policymakers generally rely on objective indicators of how their target population is faring, whereas policy goals increasingly pertain to improving a subjective sense of well-being (Consumer Financial Protection Bureau, 2015). If objective indicators do not shape subjective perceptions of financial well-being, policy efforts should be focused on improving drivers of positive perceptions of financial well-being, such as financial self-efficacy. In contrast, if objective indicators align with subjective perceptions of financial well-being, more effort should be guided toward improving the objective financial conditions of households.

To accurately test the association between subjective financial well-being and a household's objective financial situation, detailed objective financial data is required. To understand the relationship between objective financial indicators and subjective financial well-being in the population and across various demographic group, a nationally representative sample is required. In this study, we use Dutch tax registry data to measure objective financial indicators (e.g., income, assets, and debt). Dutch tax registry is highly accurate since it draws the information directly from objective sources such as local governments, banks, and insurers (Bakker 2012; Bakker et al. 2014). We enrich this data with survey data collected in the LISS panel, a nationally representative and randomly recruited sample. We test to which extent different objective measures and metrics of people's financial situation are associated with their subjective financial well-being perceptions.

We find that the cumulative share of assets and income most closely relates to subjective financial well-being. In addition, we find that adjusting income for household composition allows for more accurate predictions of subjective financial well-being. Our findings illustrate the importance of using sound measurements of objective indicators of

financial well-being to understand the importance of an individual's objective financial situation - but only if there is a complete picture of people's financial situation that captures several dimensions.

2. METHODOLOGY

2.1 Data

We use multiple data sources. First, we use data from the LISS (Longitudinal Internet Studies for the Social Sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The LISS panel is a representative panel of approximately 7,500 Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the Dutch population register. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including health, work, education, income, housing, time use, political views, values, and personality (Scherpenzeel & Das, 2010). Second, in addition to using data from this annual survey, we fielded a survey to a subset of the LISS panel to gain additional data on subjective financial well-being (Botha & de New, 2021). Third, through a unique respondent identifier, we link the survey responses to microdata from Statistics Netherlands, which contains information about the income and assets of respondents based on tax registry data. Tax filings in the Netherlands generally take place online, and document the income and assets of a household on an annual basis. A unique feature of the Dutch tax registry system is that most information is not self-reported as in the annual tax filing is pre-filled, as it is directly shared by employers (e.g., paycheck information), banks (e.g., financial assets) and social security providers (e.g., governmental benefits) with the tax office. The Dutch tax registry office shares the data from annual tax filings with Statistics Netherlands. It should be noted that there is no perfect alignment in the timing of the measurements. The objective financial indicators as measured through tax registry data are gathered in the last month of 2021, whereas the survey on subjective financial well-being took place in September of that year.

2.2 Participants

Participants were recruited through the LISS panel and were rewarded for participation. In total, 1,227 respondents completed the survey, which corresponds with a response rate of 84.6% of all invited participants, who were randomly selected from the total pool of eligible LISS panel members. Of these respondents, we were able to link 1103 full responses (89.9%)

to the tax registry data. Appendix A reports the balance checks comparing the matched and non-matched respondents. We do not find any significant differences based on whether a match was possible or not. The sample (51.59% male) age ranged from 25 to 65 years as we focus on the working-age population. Table 1 summarizes the characteristics of the sample.

Table 1

Demographic Sample Characteristics (n = 1103)

Characteristic	Mean (SD), %
Age	48.17 (11.38)
Household size	2.41 (1.32)
Male	51.59%
Education	
Primary	3.63%
Secondary	20.49%
Practical	29.01%
Applied	30.83%
University	15.51%

2.3 Measures

Subjective Financial Well-Being.

Subjective financial well-being was assessed with the short form of the reported financial well-being scale developed by Botha and de New (2021).[1] The 5-item scale (α = .70) derives an overall subjective financial well-being score that includes assessments of both current and future financial well-being. Participants were asked to indicate the applicability of each statement to their financial situation on a 5-point scale. An example item is "I could handle a major unexpected expense". [2]

Consumption.

We use self-report data on consumption behavior collected in the LISS panel. Participants are asked for a range of behaviors (e.g., "Do you go out for dinner at least once in two

[1] As there is currently no consensus on the preferred measure of subjective financial well-being, we also measured the Current Money Management Stress and Expected Future Financial Security scale by Netemeyer et al. (2018) and financial satisfaction. As reported in appendix B, our results are robust when these alternative scales are used.

[2] Other items include: I can enjoy life because of the way I'm managing my finances / I feel on top of my day to day finances / I am comfortable with my current levels of spending / I am on track to have enough money to provide for my financial needs in the future.

months?") to indicate whether they engage in this behavior or not. We dummy code the responses to these variables with 1 indicating that individuals engage in this behavior and 0 indicating they do not.

Objective Financial Indicators.

To assess a household's objective financial situation, we use a range of financial indicators. Table 2 describes the measures in detail. All objective financial indicators are measured at the household level. For analyses, we standardize all financial indicators.

Table 2

Objective Financial Indicators Descriptions and Descriptives

Indicator	Description	Mean	S.D.
Income-based measures			
Gross income	Primary income + social security benefits + received income transfers + employer contributions to social security premiums.	€92,908.34	€56,376.41
Net income	Gross income minus income transfers (e.g., alimony), social security premiums, and tax.	€54,144.92	€28,972.65
Standard income	Net income corrected for household size and composition.	€35,842.54	€16,458.07
Asset-based measures			
Net wealth	The total worth of liquid wealth, obligations and shares, housing wealth, entrepreneurial wealth, and other assets minus the total level of debt.	€230,085.20	€389,876.10
Financial assets	Total worth of financial assets (bank accounts, saving accounts, and worth of shares and obligations).	€64,282.46	€152,029.40
Housing assets	The total worth of own home and other property.	€246,417.00	€214,098.50
Debt	The total worth of debts of a household. Mortgage debt, study debt and debt for consumption purposes, financing of shares or obligations, and debts for financing secondary or other property.	€128,512.80	€146,209.70
Other debt	Debt for consumption purposes, financing of shares or obligations, debts for financing secondary or other property.	€7294.82	€33,372.50)
Combination-based measures			
The mean of income and assets	(Z-scored net wealth) + (z-scored standardized income) / 2	€132,963.90	€197,955.80
Asset income ratio	(Net wealth) / Standardized income	6.74	25.61
Cumulative share of assets and income (Van den Brakel & Gidding, 2019)	Standardized income and wealth (minus debt) are first ranked. The cumulative share of assets and income is calculated as the sum of the cumulative share in the total income of the sample and the cumulative share in the total wealth of the sample.	0.28	0.22

3. RESULTS

3.1 Associations between Objective Financial Indicators and Subjective Financial Well-Being

To quantify the strength of the association between objective financial indicators and subjective financial well-being, we use simple correlations. Figure 1 demonstrates the correlations between subjective financial well-being and objective indicators of financial well-being. Correlations range from *r* = .01 to *r* = .49, depending on the objective indicator used.

Figure 1

Correlates of Subjective Financial Well-Being

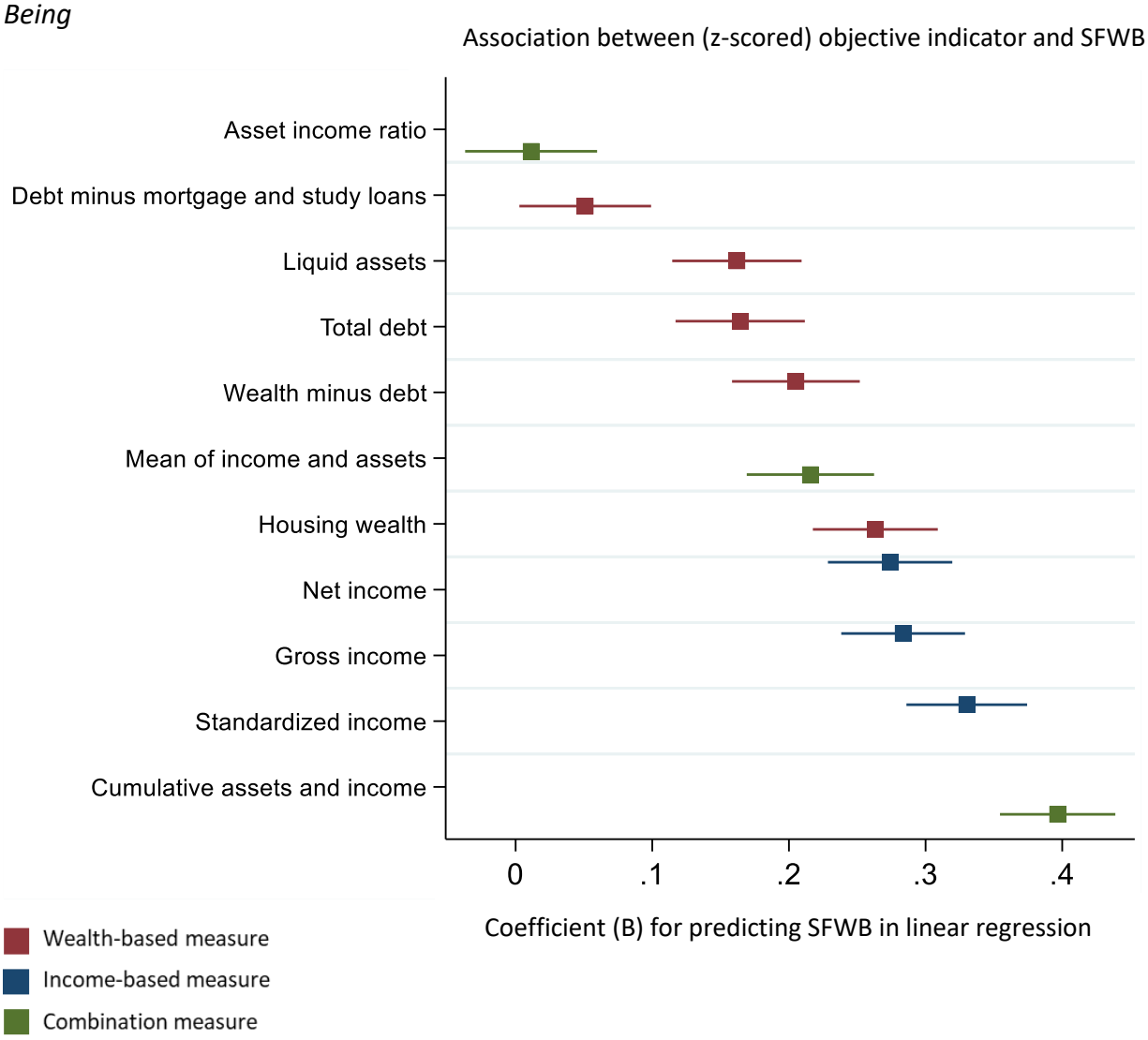
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Subjective financial well-being	-										
(2) Net household income	.34***	-									
(3) Gross household income	.35***	.97***	-								
(4) Standardized income	.40***	.88***	.89***	-							
(5) Financial assets	.20***	.24***	.31***	.24***	-						
(6) Housing assets	.32***	.60***	.61***	.53***	.24***	-					
(7) Mean of income and assets	.25***	.38***	.38***	.35***	.58***	.50***	-				
(8) Total debt	.20***	.44***	.43***	.38***	-.03	.65***	.04	-			
(9) Debt minus mortgage and study loans	.06*	.14***	.10**	.12***	.03	.19***	.12***	.36***	-		
(10) Net wealth	.26***	.41***	.41***	.39***	.58***	.52***	.99***	.05	.12***	-	
(11) Asset income ratio	.01	.01	.01	-.03	.19***	.13***	.33***	-.02	.03	.32***	-
(12) Cumulative share of assets and income	.49***	.75***	.75***	.77***	.36***	.76***	.59***	.35***	.14***	.61***	.12***

Note – * = $p < .05$, ** = $p < .01$, *** = $p < .001$

To visually gauge the relative strength of asset-based, income-based, or combination-based financial indicators, we also create a coefficient plot (Figure 2), which plots the results of separate linear regression coefficients for each financial indicator.

Figure 2

Coefficient Plot of Association between Objective Indicators and Subjective Financial Well-Being



We find that a rank-order-based measure that combines cumulative wealth and income has the strongest association with subjective financial well-being (r = .49, p <.001). Furthermore, we see that income-based predictors have relatively stronger associations with subjective financial well-being than asset-based measures or combination-based measures.

3.2 Selection of Objective Financial Indicator

To select the strongest objective predictor of subjective financial well-being, we use regression analyses and compare model fit statistics (Table 3). We compare the use of net income (columns 1 without controls and 5 with controls), which is one of the frequently used indicators of a household's financial situation in the literature, to measures with increased complexity. First, we assess whether a relative measure of income, in which the net income

of a household is expressed in centiles of the population improves the amount of explained variance in subjective financial well-being (columns 2 and 6). Next, we compare this relative income measure to a relative income measure that is adjusted for household composition (columns 3 and 7). Finally, we include total assets (the difference between assets and debts) to the indicator (columns 4 and 8).

We find that most variance is explained by a measure that combines relative assets and income into one score (Cumulative share of assets and income, column 4, B = 0.40, p <.001, R^2_{adj}= .24, ΔBIC = 172.78). This measure explains 13 percentage points more variance in subjective financial well-being than net income does. A more parsimonious objective financial indicator that constitutes of relative income, corrected for household composition approaches also improves the R^2_{adj} in subjective financial well-being by 10 percentage points in comparison to net income (B = 0.38, p < .001, R^2_{adj} = .21, ΔBIC = 138.21). As the cumulative share of assets and income explains more variance in subjective financial well-being, without significantly increasing model complexity, we focus on this objective indicator in further analyses.

Table 3

Regression Results for the Association between Objective Indicators on Subjective Financial Well-Being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Net income	Relative net income	Relative standard income	Cumulative share of assets and income	Net income	Relative net income	Relative standard income	Cumulative share of assets and income
Objective indicator	0.27***	0.31***	0.38***	0.40***	0.24***	0.28***	0.35***	0.37***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.00	-0.00	-0.00	-0.00	-0.24*	-0.30**	-0.24*	-0.07
	(0.02)	(0.02)	(0.02)	(0.02)	(0.11)	(0.10)	(0.10)	(0.10)
Controls	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1,102	1,100	1,100	1,100	1,095	1,093	1,093	1,093
Adjusted R^2	.11	.14	.21	.24	.14	.17	.23	.24

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

***Note**. Controls include gender, age, and education level*

3.3 Validation of Objective Financial Indicator

We test the validity of our objective financial indicator in two ways. First, we assess whether the association between the objective financial indicators and subjective financial well-being generalizes across demographic groups. Second, we assess the characteristics of individuals with various levels of the objective financial indicator to understand whether this indicator is associated with differences in demographics and consumption behavior.

To test whether the association between our objective financial indicator and subjective financial well-being is consistent across demographic groups, we run three regression analyses with main and interaction effects of gender, age, and income. As illustrated in Figure 3-5, the association between a household's cumulative share of assets and income and subjective financial well-being is consistent across gender, age groups, and education levels. The error margins for the association between the cumulative share of assets and income and subjective financial well-being are larger at the primary education level as this level is only reflected by approximately 3% of the total sample.

Figure 3

Margins Plot of Association between Objective Indicators and Subjective Financial Well-Being across Gender

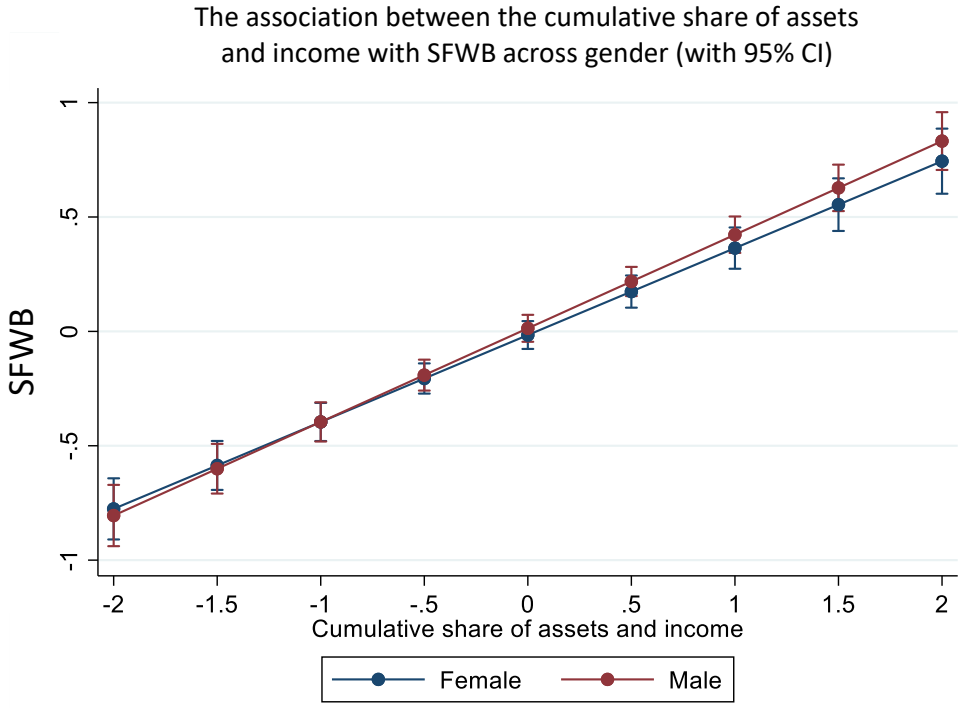


Figure 4

Margins Plot of Association between Objective Indicators and Subjective Financial Well-Being across Age

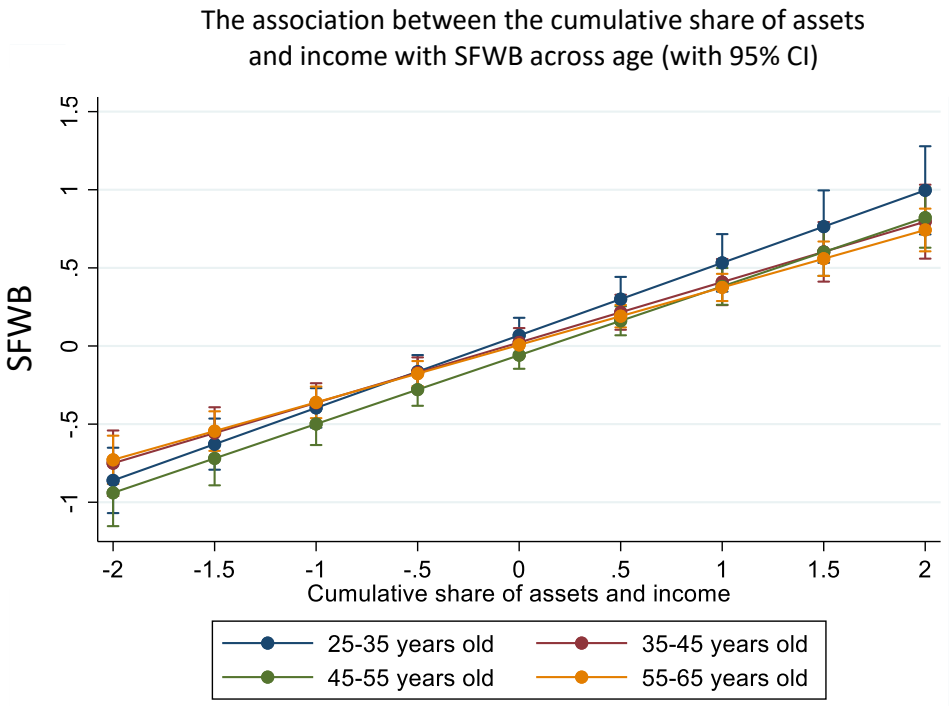
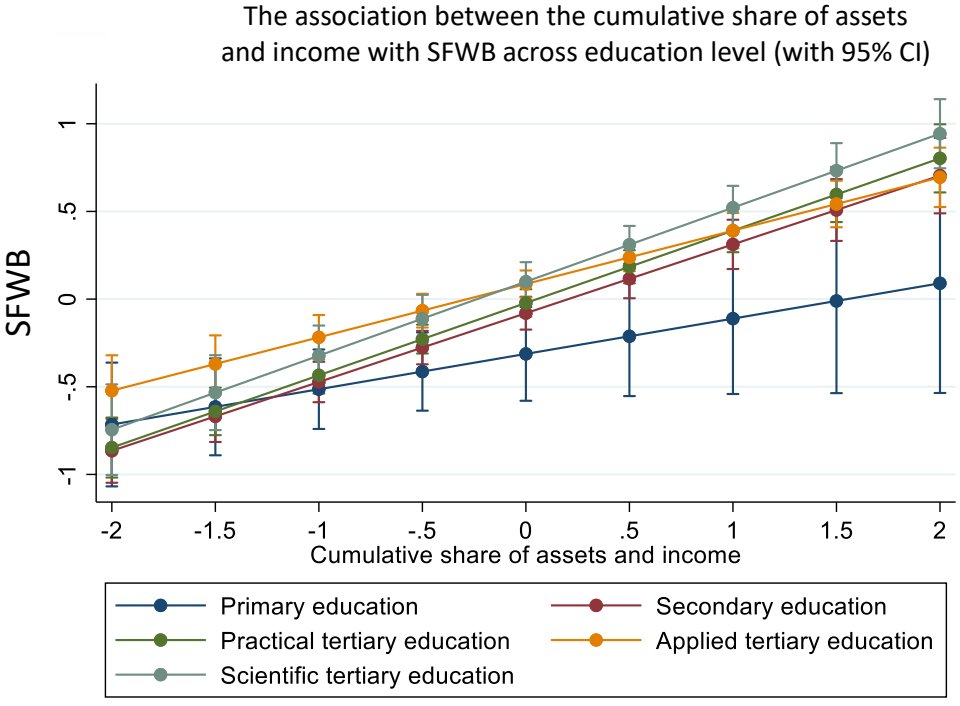


Figure 5

Margins Plot of Association between Objective Indicators and Subjective Financial Well-Being across Education Level



3.3 Characteristics and Consumption by Objective Financial Situation

To further understand the characteristics of individuals with varying levels of objective financial situations, we create four quartile groups based on the cumulative share of assets and income of a household and describe the demographic characteristics (Table 4) and consumption behavior (Figure 6) per quartile. We see that individuals in the lowest quartile earn less, own less, and consume less than individuals in higher quartiles. The differences in housing assets between the lowest and highest quartile are remarkable. We see that the average housing assets in the highest quartile is more than 15-fold that of those in the lowest quartile. Interestingly, we also see that debts are higher in the highest quartile. Also when mortgage and study loans are excluded, we generally see higher levels of debt in the higher objective quartiles. Furthermore, we see some large differences in consumption patterns. For example, 26.27% of individuals in the lowest quartile indicate that they regularly dine out, compared to 60.45% of consumers in the highest quartile.

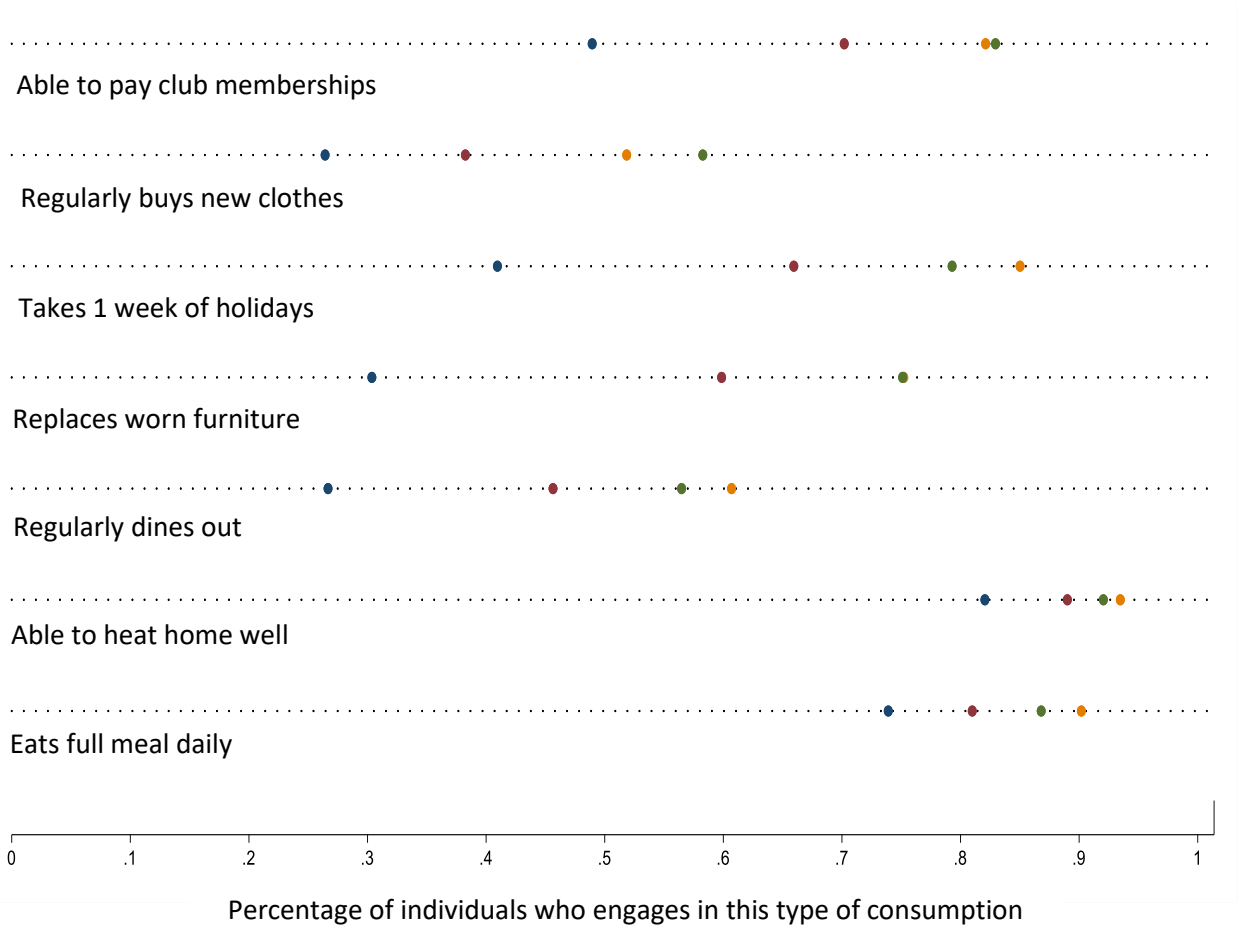
Table 4

Demographic and Financial Characteristics per Cumulative Share of Assets and Income Quartile

	Q1	Q2	Q3	Q4
Age	46.28	45.87	48.88	51.62
	(12.34)	(11.12)	(10.88)	(10.19)
HH size	1.91	2.50	2.61	2.63
	(1.19)	(1.37)	(1.36)	(1.20)
% Male	45.29%	53.09%	51.81%	56.00%
Education				
Primary or Secondary	37.32%	21.71%	18.83%	19.55%
Practical	33.70%	33.09%	27.90%	21.45%
Applied	17.75%	30.55%	39.86%	34.91%
University	9.93%	14.65%	13.41%	24.09%
Net income	€27,305.92	€47,359.78	€58,636.93	€83,358.30
	(€12,482.30)	(€16,496.00)	€19,300.56)	(€30,363.68)
Standardized income	€20,714.17	€31,717.51	€37,991.36	€52,994.32
	(€6324.60)	(€8121.76)	(€10,181.70)	(€18,186.16)
Assets	€5103.721	€95,665.02	€234,352.90	€586,021.60
	(€39,437.22)	(€126,557.00)	(€204,515.40)	(€595,766.90)
Financial assets	€11,711.98	€31,709.96	€63,742.87	150,158.20
	(€20,434.98)	(€42,753.62)	(€10,3059.70	(€262,137.20)
Housing assets	€27,065.85	€195,903.8 0	€316,095.10	€447,147.50
	(€83,860.03)	(€140,956.70)	(€150,125.20)	(€196,665.60)
Debt	€35,284.53	€138,858.40	€172,746.90	€167,339.40
	(€98,820.92)	(€137,008.40)	(€133,436.20)	(€164,651.80)
Debt minus study and mortgage loans	€2945.928	€3496.742	€8399.283	€14,349.14
	(€13,685.21)	(€17,579.22)	(€35,264.93)	(€51,433.10)

Figure 6

Consumption Patterns by Cumulative Share of Assets and Income Quartile



4. GENERAL DISCUSSION

We find that subjective assessments of financial well-being generally align with objective indicators of financial well-being, measured through tax registry data. Specifically, a rank-based measure that includes income and wealth has the strongest association with subjective financial well-being. Our analyses of the association between subjective financial well-being and objective financial indicators alleviate concerns that people are not able to form accurate representations of their financial situation. Furthermore, we find that measuring the full detail of one's financial situation is not always necessary; a parsimonious measure that corrects household income for household composition also closely relates to subjective perceptions of financial well-being.

The association we find between objective and subjective indicators of financial well-being is stronger than those previously reported in the literature (e.g., Comerton-Forde et al., 2022; Consumer Financial Protection Bureau, 2017; Diener, 1984; Federal Reserve, 2021; Netemeyer et al., 2018; OECD, 2022; Riitsalu & Murakas, 2019; Tenney & Kalenkoski, 2019). We posit that two possible reasons explain the weaker associations found in prior research. For objective indicators, self-reported financial data is error-prone (Headey et al., 2005). Whereas the validity of self-report measures can be questioned generally, the issue is enlarged for the reporting of household finances. The level of detail that is required to gain an accurate insight into an individual's financial situation may lead to careless responses or fatigue. In addition, providing fine-grained details on one's financial situation may be undesirable, as money is seen as a private, or even taboo topic (e.g., Romo, 2011), which may lead to missing data or socially desirable responses. Even if individuals are motivated to provide thorough answers to survey questions about their income and assets, individuals may not consider all sources of income and assets such as housing assets, but may only consider the amounts they see on their bank account.

Our results indicate that income-based measures of a household's financial situation, such as net income, generally have a stronger association with subjective financial well-being than asset-based measures such as financial assets. This might reflect a salience effect, where income comes to mind more easily when individuals are evaluating their subjective financial well-being as it is a continuous inflow. In contrast, the stock of accumulated assets and debts a household has might be more difficult to evaluate and may thus play less of a role in the formation of a perception of subjective financial well-being. Another possibility is that income-based measures are a better proxy of spending ability than asset-based measures are which in turn strengthens its association with subjective financial well-being.

4.1 Theoretical Implications

This article contributes to our understanding of financial well-being by disentangling objective financial indicators and subjective financial well-being. We show that the strength of the association between objective financial indicators and subjective financial well-being depends on the indicator used. This implies that research about the association between a household's objective financial situation and subjective financial well-being should consider the relative importance of the objective financial indicator they study. Our use of tax registry data provides a more accurate estimate of the association between objective financial indicators and

subjective financial well-being by minimizing by the bias that generally associated with self-reported financial data.

Our finding that a relative measure that includes income and assets relative to the total income and assets of a population has the strongest association with subjective financial well-being is in line with work on the rank income hypothesis, which states that people gain utility from their ranked income position in a comparison group (Boyce et al., 2010; McBride 2001; Ravo & Becker, 2007). Our work suggests that this hypothesis can be extended to the objective financial situation of a household beyond income, as we find that the cumulative share of assets and income has a stronger association with subjective financial well-being than relative income does. Furthermore, we show that the impact of relative comparisons goes beyond that on life satisfaction, but also affects evaluations of one's financial situation.

4.2 Practical Implications: The Importance of the Objective Financial Situation

Currently, there is an increasing agreement that financial well-being should be a central policy goal (Consumer Financial Protection Bureau, 2015). Prior literature showed that subjective perceptions of financial well-being are not strongly linked to people's objective financial reality (Tully & Sharma, 2022), which creates doubt about the suitability of subjective financial well-being as a basis for policy-making. Our findings, using high-quality data sources for subjective financial well-being as well as a household's objective financial situation, alleviate the concern that subjective financial well-being is a perception that is detached from reality. Thereby justifying the use of objective financial data to make inferences about citizens' subjective financial well-being.

The justification of the use of objective financial data does not mean that subjective measures should be abandoned. Combining objective financial data with surveys on subjective financial well-being will provide a more detailed insight into how a population is faring. However, surveys are time-intensive to collect and expensive. Therefore, depending on the policy-goal, policy-makers should aim to capture the relevant data.

Our results indicate that individuals in the lowest quartile of the relative rank of income and assets have fewer consumption possibilities than those in higher quartiles. As subjective financial well-being reflects the perception that an individual is able to meet their desired living standard and a sense of financial freedom, interventions that broaden the consumption possibilities that households have may be a promising route to increase financial well-being. If a household's financial situation becomes less of a barrier to one's desired lifestyle, financial

well-being may improve. Policy initiatives that provide access to a desired, rather than minimum standard of living may be a promising direction for governmental interventions.

4.3 Limitations and Future Directions

In our research, there is no perfect alignment in the timing of the measurement of objective financial situation and subjective financial well-being. Whereas subjective financial well-being was assessed at one point in time, the objective indicator of financial well-being is a summary of a specific year in a household's financial situation. However, if the timing of objective finances and subjective financial well-being would be closer to each other in time, a stronger association is expected.

In this study, we focus on objective financial characteristics at the household level, as people's financial situations are generally shared (Garbinsky et al., 2020). However, future research could address the relative strength of the association between shared and individual household finances. For example, Lersch (2017) finds that for men, individual wealth is more strongly related to their subjective financial well-being than the wealth of their partner. Replicating and extending this finding with tax registry data, rather than self-report data could further enhance our understanding of the link between objective financial status and subjective financial well-being.

Future research should address whether the strength of the association between objective financial situation and subjective financial well-being is stable over time. Furthermore, a fruitful direction of future research is to understand when and for whom a household's objective financial situation is not in line with subjective perceptions of financial well-being. Whereas the relationship between objective financial status and subjective financial well-being is generally stronger than previously reported relationships in the literature, the correlation is still moderate. This implies individuals could experience financial well-being while being in an adverse objective financial state and vice versa. Identifying and quantifying the existence and degree of non-correspondence between a household's financial perceptions and reality is of importance for better understanding the antecedents and consequences of financial well-being.

5. CONCLUSION

In this article, we quantify the importance of objective financial indicators for subjective financial well-being. We conclude that it is incorrect to state that the association between objective finances and subjective perceptions is weak if this conclusion rests on data sources

for objective financial situation that are incomplete and possibly inaccurate. A household's objective financial situation contributes to subjective financial well-being. Individuals are thus able to translate their objective, as well as relative financial standing into a perception of financial well-being. Next to this, other unobserved (e.g., expected inheritances) or unmeasured factors (e.g., inflation levels) may be able to explain the remaining difference between objective financial indicators and subjective financial well-being systematically. Attaining a nuanced and complete comprehension of the objective financial indicators that matter for subjective financial well-being enables governments, organizations, and policymakers to strategically allocate their efforts to improve subjective financial well-being.

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APPENDIX A. BALANCE-CHECK FOR MATCHED AND NON-MATCHED SAMPLES

To assess whether the individuals who allow to link their survey responses to tax registry differ on any measurable characteristics compared to the sample who does not allow this data linkage, we run balance checks on our key variables from the self-report survey (Table S1). We report the *p*-values for independent samples t-tests for all continuous variables and χ^2 tests for categorical variables. To correct for multiple hypothesis testing we only interpret differences with a *p*-value of (0.05 / 18) .003 or lower. The balance checks indicate no major differences between the two samples. Whereas the matched sample consists of more males and larger households, these effects are not significant after correcting for multiple hypothesis testing.

Table A1

Differences in Financial Well-Being, Personality Traits, Demographic Characteristics and Self-Reported Income for Matched and Non-Matched Sample

	Matched sample		**Non-matched sample**		***p*-value**
	Obs.	*Mean (se) / %*	*Obs.*	*Mean (se) / %*	
Subjective financial well-being					
SFWB	1100	2.68 (0.02)	127	2.67 (0.07)	.882
CMMS	1099	1.07 (0.23)	127	1.14 (0.07)	.312
EFFS	1099	2.18 (0.02)	127	2.26 (0.07)	.262
Individual differences					
Materialism	1088	1.66 (0.02)	125	1.66 (0.06)	.972
Social comparison orientation	1087	1.71 (0.02)	125	1.64 (0.06)	.240
Neuroticism	1065	2.52 (0.01)	121	2.50 (0.03)	.539
Optimism	1063	3.20 (0.02)	121	3.18 (0.05)	.766
Financial skill	1085	2.63 (0.02)	125	2.60 (0.05)	.463
Peer comparison	1087	3.89 (0.04)	125	3.94 (0.11)	.715
Demographic characteristics					
Male	1100	51.55%	127	40.94%	.024
Age	1100	48.17 (0.34)	127	48.21 (1.04)	.972
Household size	1100	2.41(0.04)	127	2.13 (0.09)	.021
Education level					
Primary or secondary education	1093	24.34%	127	28.35%	.982
Practical education	1100	29.09%	127	24.41%	.269
Applied science	1100	30.64%	127	30.71%	.987
University education	1093	15.55%	127	16.54%	.773
Objective financial indicators (self-reported)					
Gross household income	1021	€5147.92 (€185.25)	101	€5374.22 (€347.72)	.706
Gross personal income	1054	€2905.73 (€56.14)	106	€2895.50 (€212.42)	.957

APPENDIX B. ADDITIONAL ANALYSES FOR OTHER OPERATIONALIZATIONS OF SUBJECTIVE FINANCIAL WELL-BEING

To assess whether the cumulative share of assets and income is also the strongest correlate of subjective financial well-being when other operationalizations of subjective financial well-being are used, we report the correlates of three alternative measures of subjective financial well-being with objective financial indicators. We measured the expected future financial security and current money management stress subscales of the financial well-being scale by Netemeyer et al. (2018), which each consist of 5 items rated on a 5-point Likert scale. We also include a measure of financial satisfaction from the LISS-survey, in which respondents are asked to rate on a scale from 0-10 how satisfied they are with their financial situation. For all three measures, the cumulative share of assets and income is the strongest predictor.

Table B1

Correlates of Expected Future Financial Security

Variables	Expected future financial security	Current money management stress	Financial satisfaction
(1) Subjective financial well-being measure	-	-	-
(2) Net household income	.28***	-.25***	.21***
(3) Gross household income	.30***	-.27***	.23***
(4) Standardized income	.34***	-.30***	.26***
(5) Financial assets	.20***	-.16***	.13***
(6) Housing assets	.27***	-.25***	.24***
(7) Mean of income and assets	.25***	-.19***	.16***
(8) Total debt	.16***	-.16***	.17***
(9) Debt minus mortgage and study loans	.08***	-.08**	.05
(10) Net wealth	.26***	-.20***	.17***
(11) Asset income ratio	.04	-.03	.03
(12) Cumulative share of assets and income	.40***	-.38***	.32***

Note – * = $p < .05$, ** = $p < .01$, *** = $p < .001$



CHAPTER 2

UNDERSTANDING NON-CORRESPONDENCE OF OBJECTIVE FINANCIAL INDICATORS AND SUBJECTIVE FINANCIAL WELL-BEING

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1. INTRODUCTION

Imagine two consumers: Alex and Robin. Alex rarely worries about finances, is optimistic about his financial future, and believes he is greatly skilled with money. On the other hand, Robin consistently worries about money and his financial future and is not so certain about his financial skills. What does this information tell us about the objective financial situation of Alex and Robin?

An important assumption in research on financial well-being is that subjective perceptions reflect the objective reality or vice versa - that the objective situation translates into subjective perceptions of financial well-being. However, subjective perceptions and objective realities may not necessarily be aligned, or not for everyone. Whereas we might assume that Alex's financial situation is better than that of Robin, Alex may be objectively doing worse. Whereas some consumers may feel well off even though their objective situation would suggest otherwise, others feel good despite their objective situation being adverse. Vulnerable consumers may be overlooked when the correspondence between objective financial situation and subjective financial well-being is not considered. For example, when an economy is experiencing inflation, only assessing the objective situation of households is insufficient, as this would overlook consumers who worry, even though their financial situation is objectively not problematic. Similarly, if we only assess subjective financial well-being, vulnerable consumers who are doing poorly objectively, but who are not acknowledging their financial issues (Hilbert et al., 2022), may be overlooked.

In this article, we ask two main questions. First, to what extent do a household's objective financial situation and subjective financial well-being correspond? Second, which demographic (e.g., gender, home-ownership, education level) and psychological (Financial skill, optimism, positive peer comparison, social comparison orientation, materialism, and neuroticism) characteristics are associated with financial well-being correspondence? To answer these questions, we combine survey data from a nationally representative sample (N = 1,227) with administrative tax registry data that provides an accurate representation of the objective financial situation of a consumer (e.g., income, wealth, debt), thereby advancing our understanding of the correspondence of objective financial situation and subjective financial well-being.

Thus far, research mostly focuses on the antecedents and consequences of objective financial indicators or subjective financial well-being separately (De La Rosa & Tully, 2022;

Erner et al., 2016; Maison et al., 2019; Warmath, 2022). Whereas both the objective financial situation and subjective financial well-being are important to understand consumer behavior (Warmath, 2022), we argue that a dichotomous approach in which objective financial situation and subjective financial well-being are viewed separately overlooks a relevant component of financial well-being: the correspondence between objective financial situation and subjective financial well-being. We define "financial well-being correspondence" as the extent to which a consumer's subjective assessment of their financial situation aligns with their objective financial situation.

A recent survey on household economics and decision-making by the United States Federal Reserve (Federal Reserve, 2021) provides an indication that consumer perceptions are not necessarily aligned with objective facts. For instance, just over half (59%) of adults have 3 months' worth of emergency savings, whereas 78% of adults indicate they are doing "okay" or are "living comfortably" financially. Consumers who do not have emergency savings to cover financial shocks such as unemployment but feel that they are living comfortably, may be especially vulnerable to financial adversity and may behave differently than consumers who have a stronger alignment between their objective financial situation and subjective financial well-being. Before studying the possible consequences of deviations between one's objective financial situation and subjective financial well-being, it is important to assess its existence and prevalence in the population.

Studying the correspondence between objective financial situation and subjective financial well-being provides unique insights for policymakers and public institutions (Brüggen et al., 2017). By assessing both objective financial situation and subjective financial well-being, we will be able to identify vulnerable consumers, gain insight into why a mismatch may occur, and which factors should be taken into account when designing interventions to reduce this mismatch. These insights are relevant for financial education programs, which may first assess whether consumers are experiencing a mismatch between objective financial situation and subjective financial well-being, and then target information based on a holistic assessment of their financial situation. Similarly, financial service providers can focus on aligning people's perceptions with their objective financial reality to improve financial decision-making (Warmath, 2022).

Our contribution to the literature is threefold. First, we develop and measure a new conceptualization of financial well-being correspondence that theoretically advances our

understanding of financial well-being. Whereas research from other domains such as financial knowledge, poverty and trading behavior has shown that consumers' subjective assessments may systematically deviate from their objective knowledge, situation, or capabilities (Carletto & Zezza, 2006; Daniel & Hirshfleier, 2015; Lind et al., 2020), this non-correspondence has not yet been established in the domain of subjective financial well-being and a household's objective financial situation. Authors have described that consumers with the same financial situation may have differential construals of their subjective financial well-being (Tully & Sharma, 2022; Warmath, 2022), but this assumption has not been quantified empirically.

We demonstrate which consumers are more likely to experience non-corresponding objective financial situation and subjective financial well-being. Whereas research has identified the drivers of subjective financial well-being (e.g., Anvari-Clark et al., 2022) and objective financial status (e.g., Rutherford & Fox, 2010), we contribute to the literature on financial well-being by assessing which demographic characteristics and individual traits are predictive of a mismatch between objective financial situation and subjective financial well-being. Our analyses provide initial insights into the underlying individual differences that may explain why objective financial situation and subjective financial well-being may not correspond.

Testing the true correspondence between a household's objective financial situation and subjective financial well-being requires high quality data, to ensure that observations of non-correspondence are not driven by measurement error in either the measurement of objective or subjective financial well-being. Therefore, we investigate financial well-being correspondence in a nationally representative sample. Our data provides unique insights based on high-quality data that eliminates the most common sources of measurement error. Our access to tax registry data provides an indicator of a household's objective financial situation that is not affected by non-response, social desirability, misunderstanding, or misreporting that often obstruct the interpretability of self-reported financial data (Headey et al., 2005). Next to that, our survey data from a true non-probability panel (Scherpenzeel & Das, 2010) overcomes the potential exclusion of population-relevant consumers that may be present in other sampling methods.

We derive policy implications by defining and quantifying non-corresponding subjective financial well-being and a household's objective financial situation. Individuals with non-corresponding objective financial situation and subjective financial well-being are

potentially vulnerable consumer groups. Our demonstration of the prevalence and drivers of this phenomenon may aid financial educators, service providers and policymakers in moving beyond the assessment of the objective financial situation and subjective financial well-being independently.

In sum, we aim to investigate the non-correspondence of financial well-being empirically. By doing so, we aim to open a new research direction in the field of financial well-being that concerns the empirical assessment of the drivers, existence and consequences of correspondence between objective financial situation and subjective financial well-being.

2. LITERATURE

2.1 Differentiating Financial Well-Being and Related Constructs

Financial well-being can be distinguished from other related terms used in the financial decision making literature. Financial well-being can be distinguished from financial satisfaction, as financial satisfaction concerns how content a person is with their current financial situation, whereas financial well-being incorporates both one's current situation as well as financial future (e.g., Baek & DeVaney, 2004; Warmath, 2022). Furthermore, financial well-being can be differentiated from financial constraints or financial stress. There is a rich literature on how financial constraints affect (financial) decision making (Hamilton et al., 2019). Whereas financial stress concerns (perceptions of) financial constraint (Friedline et al., 2021), financial well-being concerns a positive perception that one is able to meet a desired living standard, which includes financial freedom (Brüggen et al., 2017; Netemeyer et al., 2018). Financial well-being thus encompasses more than the absence of deprivation.

2.2 The Operationalization and Measurement of Financial Well-Being

A person's financial situation is a key component of their overall well-being (Ng & Diener, 2014). Financial well-being can affect many areas of a person's life. For example, financial well-being is associated with better health (O'Neill et al., 2005), reduced absenteeism at work (Kim et al., 2003) and fewer financial worries (Comerton-Forde et al., 2022; Taft et al., 2013). Financial well-being has been studied from many different perspectives (e.g., economics, marketing, psychology, and sociology) which has led to the development of a multitude of terms and measures of financial well-being. Overall, there are three dominant ways to measure financial well-being: objectively, subjectively, or through a combination of objective and subjective measures.

2.2.1 Objective Measurements

Objective indicators of financial well-being can be defined as "a consumer's potential access to financial resources, measured by an objective, external source" (Erner et al., 2016). Objective financial indicators thus provide insight into a consumer's factual financial situation. There is no consistent term for objective financial indicators in the literature. Rather, measures of one's objective financial situation are described under a variation of terms including but not limited to financial situation, economic well-being, or objective financial wellness. Examples of objective measures of financial well-being are fact driven and assess indicators such as income or savings (e.g., Greninger, 1996; Singh et al., 2015; Western & Tomaszewski, 2016). There appears to be little consensus about, nor validation of the measures used. Among the measures used are credit scores (Mende & van Doorn, 2015; Erner et al., 2016), total assets (Tatom, 2010), a combination of income and the amount of financial issues such as not being able to keep up with bills one has (Western & Tomaszewski, 2016), banking data such as payment issues, spending, and the ability to cover an unexpected expense (Comerton-Forde et al., 2022), investment returns (Chu et al., 2017) and financial ratios such as the ratio between household income and assets (Ammerman & Stueve, 2019; Greninger, 1996; Rutherford & Fox, 2010).

There is currently no consensus on how a household's financial situation should be measured. We argue that to fully capture a household's financial situation, a complete multi-faceted indicator is preferable. Table 1 demonstrates previous objective financial indicators that are present in the literature. To determine how a household's financial situation should be measured to study its correspondence with subjective financial well-being we derive four criteria, based on the definition of objective financial situation we use as well as data collection and analysis feasibility. First, as we study financial well-being, we indicate whether the objective measurements are indicative of well-being rather than deprivation (i.e. not measuring debt or poverty). Second, as we study overall financial well-being, the measure should be multi-faceted (i.e. not measuring only one indicator of one's financial situation such as income). Third, for analysis purposes, we consider whether the measures provide a continuous rather than categorical measure, so that we can study the degree of non-correspondence. Finally, for data availability and generalizability purposes, we note whether measurements are applicable to a general population (i.e. not measuring a country specific indicator such as credit scores, a population specific indicator such as student debt or a

membership based indicator such as banking data). One measurement that meets these criteria, is an index that combines household assets, debt and income. Such an index has been developed by Statistics Netherlands (van den Brakel & Gidding, 2019). The measure is based on tax registry data. It is multifaceted and indicative of well-being, as it does not only regard negative outcomes (e.g., debt) but also includes positive outcomes such as income and assets. The index leads to one, continuous financial well-being score and is applicable to the general population. Based on these criteria, we argue that the index developed by Statistics Netherlands is a valid operationalization of a household's objective financial situation. The operationalization of objective financial situation is elaborated upon in the methodology section.

Table 1

Overview of Measurements of Objective Financial Situation.

Reference	Measure	Term	Indicative of well-being	Multifaceted	Scoring continuous	Applicable to the general population
Ammerman & Stueve (2019)	Debt ratio and current ratio	Debt-related financial well-being indicators	-	✓	-	✓
Baek & DeVaney (2004)	Combination of liquidity ratio, debt to asset ratio, and investment ratio.	Financial wellness	✓	✓	-	✓
Bøe et al. (2019)	Family income to needs ratio	Objective economic well-being	✓	-	✓	✓
Chu et al. (2017)	Household portfolio performance	Financial well-being	✓	✓	✓	-
Comerton-Forde et al. (2022)	Banking data of payment issues, low balance, savings, and expenses	Financial well-being	✓	✓	✓	-
Easterlin et al. (1990)	Income	Economic well-being	✓	-	✓	✓
Erner et al. (2016)	Credit score	Objective consumer financial well-being	✓	-	✓	-
Fox & Chancey (1998)	Employment instability, uncertainty, income, and subjective assessment of economic situation.	Economic distress	-	✓	✓	✓
Gasiorowska (2014)	Latent variable combining personal income, household income and income per person in the household.	Objective wealth	✓	-	✓	✓
Gladstone et al. (2020)	Bank account data (including days in overdraft, financial volatility, income, account balance, and log-ins)	Objective financial well-being	✓	✓	✓	-
Greninger et al. (1996)	Ratios for liquidity, savings, asset allocation, inflation protection, tax burden, housing expenses, insolvency/credit	Financial well-being	✓	✓	✓	✓

Reference	Measure	Term	Indicative of well-being	Multifaceted	Scoring continuous	Applicable to the general population
Hu et al. (2018)	Various sources of debt and bills	Financial well-being	-	✓	✓	✓
Madero-Cabib & Fasang (2016)	Consumer income and household equivalence income	Financial well-being	✓	-	✓	✓
Maison et al. (2019)	Income	Objective financial situation	✓	-	✓	✓
Mende & Van Doorn (2015)	Credit score	Objective financial well-being	✓	-	✓	-
Porter et al. (1990)	Self-reported financial behavior/situation in cash management, credit management, and capital accumulation	Objective attributes of financial well-being	✓	✓	✓	✓
Rutherford & Fox (2010)	Liquidity ratio, asset allocation ratio, and combined ratio	Financial wellness	✓	✓	-	✓
Schmeiser & Seligman (2013)	Non-housing assets	Financial well-being	✓	-	✓	✓
Singh et al. (2015)	Banking data on overspending, trouble, and late payment	Financial well-being	✓	✓	✓	-
Vörös et al. (2021)	Ability to meet unexpected large expense (yes/no)	Financial well-being	✓	-	-	✓
Western & Tomaszewski (2016)	Income, financial hardship, and material deprivation	Objective well-being	✓/ -	✓	✓	✓
Wolff & Zacharias (2009)	Income from wealth	Economic well-being	✓	-	✓	✓
This study	Wealth and income index (Statistics Netherlands)	Objective financial situation	✓	✓	✓	✓

NOTE. — The current table solely includes references in which an objective measure is intended to measure financial well-being, financial wellness, or economic well-being. Whereas other financial measures may be used in other domains of literature (e.g., on poverty), they are out of the scope of the current overview.

2.2.2 Subjective Measurements

Subjective financial well-being can be defined as "the perception of being able to sustain current and anticipated desired living standards and financial freedom" (Brüggen et al., 2017, p.2). Measurements of subjective financial well-being aim to measure how consumers perceive and experience their financial well-being (e.g., Netemeyer et al., 2018; Strömbäck et al., 2017). Various authors argue that financial well-being is a personal perception, and can only be judged by consumers themselves (Netemeyer et al., 2018; Zyphur et al., 2015). Subjective financial well-being is an important predictor of overall well-being, as it influences overall well-being comparable in magnitude to the combined effect of job satisfaction, physical health assessment, and relationship satisfaction (Netemeyer et al., 2018).

Various scales to measure subjective financial well-being have been developed and validated, but there is no consensus in the literature on which measure is preferred. To determine how subjective financial well-being should be measured to study its correspondence with a household's financial situation we derive three criteria, based on the definition of subjective financial well-being by Brüggen et al., (2017). First, a measure of subjective financial well-being must be truly subjective. For example, many scales include items that assess how often a household has money left at the end of the month (e.g., Comerton-Forde et al., 2022; Consumer Financial Protection Bureau, 2017; Kempson & Poppe, 2018) or how often an individual pays bills on time (Vieira et al., 2022). These items are direct measures of one's objective financial situation and obscure an accurate view of one's true subjective financial well-being. Second, the measure should contain perceptions of indicators of well-being and financial freedom, not solely the absence of financial stress. If an individual does not experience financial stress, this does not mean they are experiencing financial wellness. Third, financial well-being is more than just the assessment of one's current financial situation (Brüggen et al., 2017), it should also include an assessment of one's future financial situation. This is of importance as consumers could expect a positive financial future, regardless of current objective or subjective financial issues (Netemeyer et al., 2018). Table 2 provides an overview of commonly used measures of subjective financial well-being and their adherence to these criteria. Two measurements meet all criteria that follow from the definition of subjective financial well-being we follow the reported financial well-being scale (Botha & de New, 2021) and the perceived financial well-being scale (Netemeyer et al., 2018).

These measures of subjective financial well-being are elaborated upon in the methodology section.

Table 2

Overview of Measurements of Subjective Financial Well-Being

Reference	Scale / Term	Subjective	Indicative of well-being	Current and future dimension
Botha & de New (2021)	Short form of reported financial well-being scale (Comerton Forde et al., 2018)	✓	✓	✓
Consumer Financial Protection Bureau (2017)	Consumer Financial Protection Bureau Financial Well-being Scale	-	-	✓
Comerton-Forde et al. (2018)	Reported financial well-being	-	✓	✓
Fox & Chancey (1998)	Perceived economic well-being	✓	✓	-
Kempson & Poppe (2018)	Financial well-being	-	-	✓
Netemeyer et al. (2018)	Perceived Financial Well-Being Scale	✓	✓	✓
Prawitz et al. (2006)	Incharge Financial Distress / Financial Well-being Scale	-	-	-
Schnusenberg et al., (2013)	Financial well-being	-	-	-
Vieira et al. (2022)	Perceived Financial Well-Being Scale	-	✓	✓
Walson & Fitzsimmons (1993)	Perceived economic well-being	✓	✓	-

Note — The current table solely includes references in which a scale is developed. Articles that measure financial well-being by using, combining, or adapting measures developed by others are not included. Scales that are developed for a specific sub-group (e.g., emerging adults) are not included.

2.2.3 Compound Measurements

In general, the literature on objective financial indicators is not integrating developments in the measurement of subjective financial well-being and vice versa. An exception is a limited number of studies that combine objective financial situation and subjective financial well-being into a compound score (e.g., Kempson & Poppe 2018; Shim et al., 2009; West & Cull 2020). For example, Kempson and Poppe (2018) combine objective indicators such as saving in terms of month's income with subjective indicators such as how people feel about their current financial situation into one overall financial well-being score. However, what does not become clear from compound measures is whether the objective financial situation is in line

with consumers' perceptions of their financial well-being. A consumer who perceives their financial well-being favorably but does not have a positive objective financial situation (e.g., low savings) could receive the same financial well-being score in a compound measurement as an individual who has a favorable financial situation (e.g., high savings) but perceives their financial well-being as bad.

2.3 Predictors of the Difference between Objective Financial Situation and Subjective Financial Well-Being

Non-correspondence of objective financial situation and subjective financial well-being can take two forms: subjective financial well-being can exceed the objective financial situation, or the objective financial situation can exceed subjective financial well-being. There is currently no empirical evidence on which individual differences predict the correspondence of objective financial situation and subjective financial well-being. However, some individual differences are likely to affect whether consumers have higher subjective financial well-being than would be expected based on their objective financial situation or vice versa. In this section, we describe six individual differences that are possible drivers of non-correspondence between objective financial situation and subjective financial well-being. The individual differences that we describe were selected based on our review of the literature on objective financial situation and subjective financial well-being. We describe three predictors of having higher subjective financial well-being relative to their objective financial situation (Financial skill, optimism, and positive peer comparison) and three predictors of having lower subjective financial well-being relative to their objective financial situation (social comparison orientation, materialism, and neuroticism).

Consumers may perceive their financial situation as better than it objectively is. This type of miscalibration might occur due to the assessment of their own skill level. If individuals believe they are financially skilled, this contributes to their sense of financial well-being, keeping their objective financial situation constant (Donnelly et al., 2012). To assess this reasoning, we include self-reported financial skill as a factor that may drive non-correspondence. Another possibility is that the tendency to view situations in a positive way contributes to non-correspondence. For example, optimism about the future may affect assessments of subjective financial well-being (Barrafrem et al., 2020; Strömbäck et al., 2017). To test this possibility, we include optimism as a possible influencing factor for the mismatch between a household's objective financial situation and subjective financial well-being.

Finally, we predict that feeling financially better off than one's peer may lead to higher levels of subjective financial well-being relative to a household's objective financial situation. Consumers may compare their wealth through comparative processes, in which one's objective wealth is compared to reference points, which may include relevant others, or previous financial states (Tully & Sharma, 2022). To capture this, we include positive peer comparison as a contributing factor for the non-correspondence between objective financial situation and subjective financial well-being.

To predict which consumers feel subjectively worse than their objective financial situation we focus on social comparison orientation, neuroticism, and materialism as they are likely to be associated with reduced subjective, but not necessarily with reduced objective financial status. Engaging in social comparisons may create negative assessments of one's subjective financial well-being (Sharma & Alter, 2012). As individuals with a stronger social comparison orientation (Buunk & Gibbons, 1999) engage in social comparisons more frequently, we include this as a contributing factor to non-correspondence. Neuroticism is another trait that may explain a negative assessment of one's subjective financial well-being keeping one's objective financial situation constant. As this trait has been associated with negative feelings and expectations in a range of domains (Anglim et al., 2020), we include it as a possible contributing factor to the mismatch between objective financial situation and subjective financial well-being. Finally, having lower objective than subjective financial well-being may be explained by differences in ambitions. Materialism is associated with a continuous pursuit of the acquisition of goods and dissatisfaction with one's current (financial) situation. Therefore, we include it as a contributing factor to the non-correspondence of objective financial situation and subjective financial well-being.

We do not formulate specific hypotheses about demographic group membership; however, we do include these as exploratory variables that may explain differences between objective financial situation and subjective financial well-being. Figure 1 provides a visual overview of all hypotheses.

2.3.1 Financial Skill

Financial skill is "a consumer's ability to find, process, and act on financial information" (Consumer Financial Protection Bureau, 2018) and is regarded as a component of financial literacy. Rather than focusing on objective financial knowledge, as is often the focus of traditional measurements of financial literacy (e.g., Lusardi & Mitchell, 2014), financial skill

concerns a consumer's subjective assessment of their skills to process and use financial information. Given the subjective nature of financial skill that follows from its definition, we argue it is more likely to be associated with the non-correspondence of objective financial situation and subjective financial well-being than objective indicators such as financial knowledge. Financial skill positively predicts subjective financial well-being when controlling for objective characteristics such as poverty status and demographics (Xiao & Porto, 2022). In addition, other subjective assessments of one's financial capabilities, such as subjective financial knowledge (Lind et al., 2020) and money management skill (Donnelly et al., 2012), are positively associated with financial well-being. Subjective financial skill may thus positively affect the evaluation of one's subjective financial well-being, keeping one's objective financial situation constant, resulting in a non-corresponding objective financial situation and subjective financial well-being.

H1: Consumers with greater financial skill are more likely to have *higher* subjective financial well-being relative to their objective financial situation.

2.3.2 Optimism

Optimism, the disposition to have a positive general outlook toward the future (Puri & Robinson 2007), affects subjective interpretations of objective circumstances. Optimism about the future financial situation of one's household has been found to be positively associated with subjective financial well-being when controlling for objective indicators of one's financial situation such as income (Barrafrem et al., 2020; Strömbäck et al., 2017). Next to this, optimistic consumers report higher financial resilience, indicating that they believe to have the resources to overcome financial adversity (Salignac et al., 2019). However, these optimistic subjective assessments may not align with one's objective financial situation. In terms of financial well-being, optimistic consumers may thus have more positive subjective expectations or interpretations of their (near) future financial situation than their objective financial situation would suggest. For example, overly optimistic consumers are less likely to save, possibly due to their positively biased future expectations (Puri & Robinson, 2007). As dispositional optimism increases the odds of positively assessing one's subjective financial well-being, whereas it decreases the odds of displaying positive financial behaviors, we hypothesize:

H2: Consumers who are more optimistic are more likely to have *higher* subjective financial well-being relative to their objective financial situation.

2.3.3 Positive Peer Comparison

A large body of psychological literature documents that individuals compare themselves to others to assess how they are doing (e.g., Festinger, 1954; Gerber et al., 2018; Suls et al., 2002; Wood, 1996). In the financial realm, the literature has mainly focused on understanding the relationship between relative income and happiness (e.g., Clark et al., 2008; Easterlin, 1974). There is consistent evidence that individuals assess their financial situation as worse if individuals in their proximity, such as friends, family or co-workers have a higher income (Ferrer-i-Carbonell, 2005). However, comparisons of one's financial situation are not limited to one's relative income position. The assessment of one's financial well-being is also inherently relative (Sharma & Alter, 2012; Tully & Sharma 2022), and individuals generally compare their financial well-being to the situation of those in close proximity to them (Neman, 2020). Whereas individuals may compare themselves to a large set of social comparands, such as family, co-workers or neighbors, we focus on the comparison to peers (i.e. friends and acquaintances). As friends and acquaintances are generally closer in age to an individual than other comparands, it may be easier to infer an evaluation of one's financial situation from a comparison to this group than from a comparison to a more distant group. When individuals perceive that their reference groups are in a financially superior position, this may lead to negative feelings and a sense of inferiority (Sharma & Alter, 2012). On the other hand, if an individual perceives that their financial situation exceeds that of peers, they may be more likely to assess their subjective financial well-being as high, regardless of their objective financial situation.

H3: Consumers who feel that their financial situation is better than that of their peers are more likely to have *higher* subjective financial well-being relative to their objective financial situation.

2.3.4 Social Comparison Orientation

Consumers differ in the extent to which they seek out information about how they compare to other consumers. Consumers with a stronger social comparison orientation do not only engage in more comparisons, they also spend more time doing so and are more affected by social comparisons than others (Buunk & Gibbons, 1999; 2006). Schneider and Schupp (2014) report that one's social comparison orientation can explain consumer variability in effects that were previously deemed universal. For example, they find that the prosperity of one's neighborhood only predicts life satisfaction for consumers with a strong social comparison

orientation (Schneider & Schupp, 2014). Consumers with a stronger social comparison orientation may engage more frequently in social rather than non-social comparisons when assessing their subjective financial well-being (Tully & Sharma, 2022). In a meta-analysis, Gerber et al. (2018) find that consumers have a preference for upward social comparison, in which one compares oneself to others who are doing better. As engaging in social comparisons may create negative assessments of one's subjective financial well-being (Sharma and Alter 2012), we hypothesize:

H4: Consumers who tend to engage more in social comparisons (i.e. have a stronger social comparison orientation) are more likely to have *lower* subjective financial well-being relative to their objective financial situation.

2.3.5 Neuroticism

Neuroticism can be defined as the "tendency to experience worry, depression, anger, and distress" (VandenBos, 2007). A recent meta-analysis demonstrates that neuroticism is a strong predictor of reduced well-being (Anglim et al., 2020). This negative association is also present in the financial realm, where there is evidence that neurotic consumers experience lower subjective financial well-being (Joshanloo, 2022). There are multiple reasons to believe that consumers who are more neurotic are more likely to evaluate their subjective financial well-being worse than their objective financial situation. For example, in a study on financial satisfaction, Tharp et al. (2020) demonstrate that neuroticism has a negative association with financial satisfaction when controlling for financial characteristics such as net worth, income, and home-ownership. Tharp et al. (2020) argue that neurotic consumers may experience lower financial satisfaction due to their disposition to experience negative affect. Next to the tendency for negative affect, the responsiveness to negative events may play a role in understanding the role of neuroticism in the correspondence between objective financial situation and subjective financial well-being. A negative financial stressor, such as negative income volatility, may have a larger negative impact on the construction of one's subjective financial well-being for more neurotic consumers, as they respond stronger to stressors (Bolger & Schilling, 1991). Next to this, neuroticism may reduce the effect of factors that would normally increase financial well-being, such as a sense of personal control (Chhatwani, 2022).

H5: Consumers who have higher levels of neuroticism are more likely to have *lower* subjective financial well-being relative to their objective financial situation.

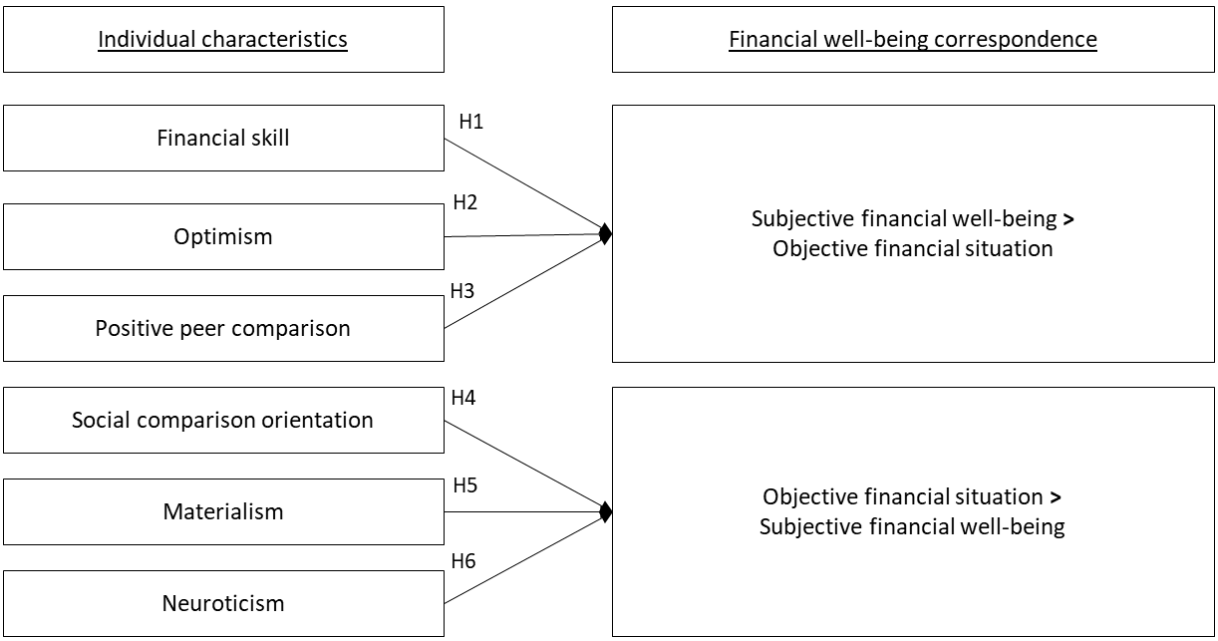
2.3.6 Materialism

Materialism is a consumer value that may explain a mismatch between objective financial situation and subjective financial well-being. Materialism is defined as "the importance ascribed to the ownership and acquisition of material goods in achieving major life goals or desired states" (Richins, 2004, p. 210). Materialistic consumers are characterized by a continuous pursuit of goods (Richins & Dawson, 1992), therefore, they may experience dissatisfaction with their financial situation, irrespective of what their financial situation is. Prior research has indeed linked materialism with dissatisfaction with one's income (Richins & Dawson, 1992). Whereas materialistic consumers are more likely to have a worse objective financial situation, as they are more likely to spend compulsively and accrue debt (Gardarsdottir & Ditmar, 2012), we argue that materialism makes it more likely that consumers have lower subjective financial well-being relative to their objective financial situation. Firstly, materialistic consumers are often not fulfilled after the acquisition of goods (Richins, 2013). Therefore, materialistic consumers may value their financial well-being more negatively than less materialistic consumers who have the same level of assets. Second, materialistic consumers may have a larger focus on deficiencies in their financial situation (Tsang et al., 2014; Tully & Sharma, 2022). This focus on deficiencies may explain why a materialistic consumer undervalues their objective financial situation. Finally, materialistic consumers are less likely to experience gratitude (Shrum et al., 2021). With regard to financial well-being, this lack of gratitude may lead to a lack of appreciation of one's financial situation, despite its objective value.

H6: Consumers who are more materialistic are more likely to have *lower* subjective financial well-being relative to their objective financial situation.

Figure 1

Visual Overview of Hypotheses



3. METHODOLOGY

In this paper, we make use of data of the LISS (Longitudinal Internet Studies for the Social Sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The LISS panel is a representative panel of approximately 7,500 Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the Dutch population register. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including health, work, education, income, housing, time use, political views, values, and personality (Scherpenzeel & Das, 2010). In addition to using data from this annual survey, we fielded a survey to a subset of the LISS panel (*n* = 1,227) to gain additional data on subjective financial well-being. Through a unique respondent identifier, we are able to link the survey responses to microdata from Statistics Netherlands, which contains information about the income and assets of respondents based on tax registry data. The Dutch tax authority transfers the information from the tax files of all Dutch citizens to Statistics Netherlands. By using tax registry data, measurement, non-response and misreporting errors that are often problematic in the assessment of objective financial indicators (Headey et al., 2005) are overcome.

3.1 Participants

Participants were recruited through the LISS panel and were rewarded for their participation. In total, 1227 respondents completed the survey, which corresponds with a response rate of 84.6% of all invited participants, who were randomly selected from the total pool of eligible LISS panel members. Of these respondents, we were able to link 1103 full responses (89.9%) to the tax registry data. The sample (51.59% male) age ranged from 25 to 65 years (M_{age} = 48.17, *SD* = 11.38), as we were interested in a working-age population. See Table 3 for further sample characteristics. There are no significant differences in subjective financial well-being, self-reported income, personality traits or demographics between the matched and non-matched samples. For details on the conducted balance checks, see Appendix A in chapter 1.

Table 3

Sample Characteristics (N = 1103)

Characteristic	**M (S.D) /%**
Demographic Characteristics	
Gender (Male)	51.59%
Age	48.17
	(11.38)
Household Size	2.41
	(1.32)
Education level	
Primary	3.63%
Secondary	20.49%
Tertiary practical (MBO)	29.01%
Tertiary applied science (HBO)	30.83%
Tertiary scientific (WO)	15.51%
Objective Financial Characteristics	
Assets	€230,085.20
	(€389,876.10)
Standardized income	€35,842.54
	(€16,458.07)
Cumulative rank of assets and income	1.00
	(0.50)
Subjective Financial Characteristics	
Subjective financial well-being	2.68
	(0.76)
Current money management stress	1.07
	(0.77)
Expected future financial security	2.18
	(0.77)

3.2 Procedure

Participants first provided self-reported measures of their subjective financial well-being. After this, they completed a range of self-report measures on materialism, social comparison orientation, the comparison of their own financial situation to that of peers, self-control, and financial skill. The self-report survey took place in September 2021, and the tax registry data covers the financial situation of a household at the end of 2021.

3.3 Measures

3.3.1 Objective Financial Situation

We operationalize a household's objective financial situation with the measure of financial wealth proposed by Statistics Netherlands (van den Brakel & Gidding, 2019). This measure combines a standardized net income measure and household assets and scores households based on their relative position in the population. Household income is defined as the dispensable income a household has after the applicable taxes, premiums and alimony transfers are withdrawn. Household assets are defined as the difference between assets and debts. Assets include savings, equities, properties, and other possessions. Debts include mortgages on one's own home, student debts and other sources of debt. The financial wealth of a household is calculated in four steps. First, a household's cumulative share in the total income of all households in the population is calculated. Second, a household's cumulative share in the total assets of all households in the population is calculated. Third, the sum of the cumulative share in income and assets are ranked from low to high. Fourth, the ranking is used to create percentile groups, in which the wealth of households is divided into 100 equally sized groups. The advantages of this method are that it is based on objective tax registry data, rather than self-reports, it provides one clear indicator, rather than separate sub-components, and it provides a holistic overview of a household's objective financial situation by including both income and assets.

3.3.2 Subjective Financial Well-Being

Subjective financial well-being was assessed in two ways as the literature on subjective financial well-being is not conclusive on the preferred measurement of subjective financial well-being. First, the short form of the reported financial well-being scale developed by Botha & de New (2021) was used to measure overall subjective financial well-being. The 5-item scale derives an overall subjective financial well-being score that includes assessments of both

current and future financial well-being. Participants are asked to indicate the applicability of each statement to their financial situation on a 5-point scale. An example item is “I could handle a major unexpected expense”. To create more detailed insight into the temporal dimensions of financial well-being, the perceived financial well-being scale developed by Netemeyer et al. (2018) was also included. With this subjective scale, consumers are asked to indicate on a five-point scale the extent to which 10 items describe them or do not describe them. The items are evenly distributed over the scale’s two dimensions. The first dimension is current money management stress. An example of an item in this subscale is, “I am unable to enjoy life because I obsess too much about money.” The second part of the scale measures expected future financial security. One of the items assessed for this dimension is, “I am securing my financial future.”

3.3.3 Individual Difference Measures

Next to measures of financial well-being, we assessed individual differences in financial skill, optimism, peer comparison, social comparison orientation, materialism, and neuroticism in random order. Differences in *financial skill* were measured through the Consumer Financial Protection Bureau’s measure of financial skill (Consumer Financial Protection Bureau, 2018). *Optimism* was assessed through the Revised Optimism Scale (Scheier et al., 1994). The scale consists of six items that measure generalized expectancies for positive versus negative outcomes. To assess whether consumers felt that their financial situation was better than that of their peers *(positive peer comparison)*, they were asked to indicate to what extent they agree that they are financially better off than their friends and acquaintances. The short scale of the Iowa-Netherlands Comparison Orientation Measure was used to assess individual differences in *social comparison orientation* (Schneider & Schupp, 2014). *Materialism* was measured with the 6-item brief materialistic values scale (Richins, 2004). *Neuroticism* was measured through the neuroticism sub-scale of the International Personality Item Pool (IPIP), which measures markers of the Big-Five personality traits (Goldberg, 1992). Table 4 shows the correlations between all measures and Appendix A provides an overview of all measures used.

Table 4

Means, Standard Deviations and Reliability per Measure

Measure	Range	*M*	*SD*	α	1	2	3	4	5	6	7	8
1. Reported financial well-being (Botha and De New 2021)	0-4	2.68	0.76	.70	-							
2. Expected future financial security	0-4	2.18	0.77	.79	.72***	-						
3. Current money management stress	0-4	1.07	0.77	.83	-.71***	-.51***	-					
4. Positive peer comparison	1-5	3.58	0.72	.75	.53***	.55***	-.40***	-				
5. Financial skill	1-5	3.63	0.57	.82	.60***	.50***	-.50***	.32***	-			
6. Social Comparison Orientation	1-5	3.35	0.65	.86	-.10***	-.05	.25***	.02	-.18***	-		
7. Optimism	1-5	3.27	0.89	.65	.47***	.41***	-.43***	.31***	.39***	-.19***	-	
8. Materialism	1-11	6.51	2.23	.82	-.28***	-.19***	.44***	-.08*	-.24***	.43***	-.20***	-
9. Neuroticism	1-5	3.53	0.81	.86	-.37***	-.32***	.37***	-.20***	-.37***	.30***	-.69***	.26***

Note -- * = p < .05, ** = p <.01, *** = p <.001

4. RESULTS

4.1 The Correspondence between Objective Financial Situation and Subjective Financial Well-Being

To measure the degree of agreement between objective financial situation and subjective financial well-being, we conduct a concordance analysis (Kwiecien et al., 2011). In contrast to correlation, which demonstrates whether two measurements are associated with each other, a concordance analysis demonstrates whether two measurements are in agreement. Specifically, it calculates the difference between the rate of agreement that is observed and the rate of agreement that would be expected by chance alone. This value can be qualified from poor (< .20) to very good (.81-1.00). After standardizing the measurements of objective and subjective well-being based on z-scoring, we find that the quality of agreement between objective and subjective well-being is moderate (k_k = 0.479, p <.001). This provides initial evidence that the objective financial indicator and subjective financial well-being are generally aligned.

Visually, we can gauge the non-correspondence of objective financial situation and subjective financial well-being by mapping the constructs onto a Bland-Altman plot (Figure 2) (Giavarina, 2015). The figure plots the difference between the two measurement methods per respondent against their mean. In doing so, the plot visualizes the agreement between the two measurements (Bland & Altman, 1999). According to this method, which is mostly used in medicine, when less than 5% of the data points lie beyond ± 2SDs of the mean difference, there is evidence for a correspondence between objective financial situation and subjective financial well-being (Giavarina, 2015). We find that for a majority of consumers, the objective financial situation and subjective financial well-being are in line with each other. For 72.3% of individuals, objective financial situation and subjective financial well-being do not deviate more than 1 standard deviation from each other. For 96.36% of individuals, objective financial situation and subjective financial well-being do not deviate more than 2 standard deviations from each other. It is approximately equally common for subjective financial well-being to be 1 SD higher than objective financial situation (13.6% of the sample) as vice versa (13.7% sample). Table 5 provides descriptive characteristics of these groups.

Several observations can be made on the differences in characteristics of groups with matching or non-matching subjective financial well-being and objective financial situation. As shown in Table 5, individuals with higher subjective financial well-being than their objective

financial situation have fewer assets and lower incomes than the other two groups. Furthermore, they have lower levels of debt, also when excluding mortgage and study debt. Finally, we see that the group where subjective financial well-being is higher than the objective financial situation has a higher benefit dependency (i.e. the percentage of income that is coming from governmental benefits) than other groups.

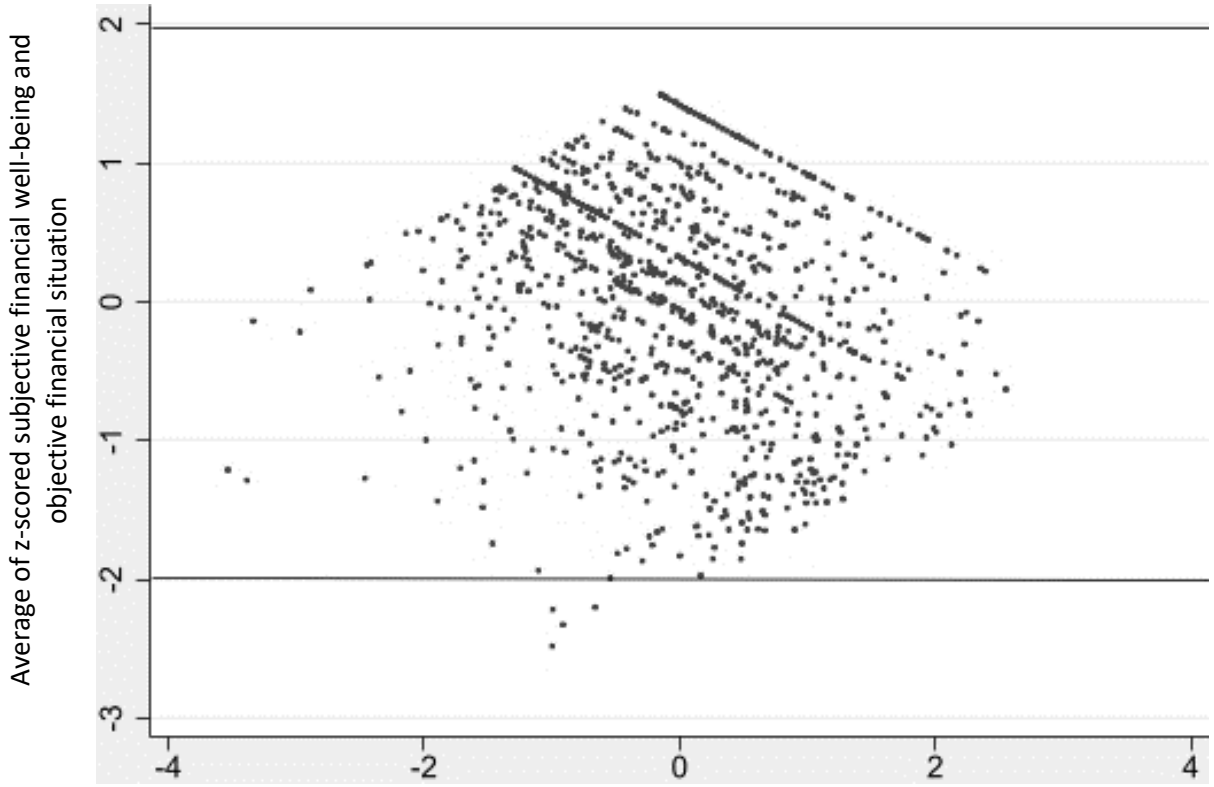
Table 5

Demographic Characteristics per Correspondence Group

Characteristic	**M (S.D) / %**		
	Subjective > Objective (n = 151)	Objective > Subjective (n =150)	Match (n = 802)
Demographic Characteristics			
Gender (Male)	47.71%	50.00%	52.56%
Age	48.18 (12.52)	50.45 (10.86)	47.76 (11.21)
Household Size	2.03 (1.14)	2.85 (1.31)	2.40 (1.32)
Education level			
Primary	9.15%	< 6,67%	2.62%
Secondary	22.88%	17.81%	20.60%
Tertiary practical (MBO)	35.29%	22.60%	29.09%
Tertiary applied science (HBO)	20.92%	35.62%	31.59%
Tertiary scientific (WO)	11.76%	18.31%	15.79%
Financial Characteristics			
Assets	€60.232,50 (€102.302,20)	€525.884,80 (€474.909,40)	€209.384,40 (€353.452,30)
Gross household income (annual)	€32.191,92 (€18.016,70)	€102.952,30 (€46.339,79)	€68.054,19 (€43.092,45)
Debt	€61.545,00 (€96.146,31)	€165.818,70 (€163.840,00)	€134.564,00 (€147.056,80)
Debt (excluding mortgage & study debt)	€2.883,25 (€15.368,32)	€16.215,35 (€58.160,80)	€6501,30 (€29.249,54)
Benefit dependency	23.18%	4.82%	10.03%
Individual Differences			
Materialism	-0.14 (0.75)	0.16 (0.72)	0.00 (0.67)
Social comparison orientation	-0.07 (0.78)	0.12 (0.68)	0.00 (0.74)
Neuroticism	0.04 (0.82)	0.20 (0.72)	-0.04 (0.72)
Optimism	-0.01 (0.61)	-0.17 (0.56)	0.03 (0.61)
Financial skill	0.19 (0.69)	-0.29 (0.63)	0.02 (0.65)
Peer comparison	-0.05 (1.03)	-0.14 (1.04)	0.03 (0.99)

Figure 2

Bland-Altman Plot of Correspondence Objective Financial Situation and Subjective Financial Well-Being



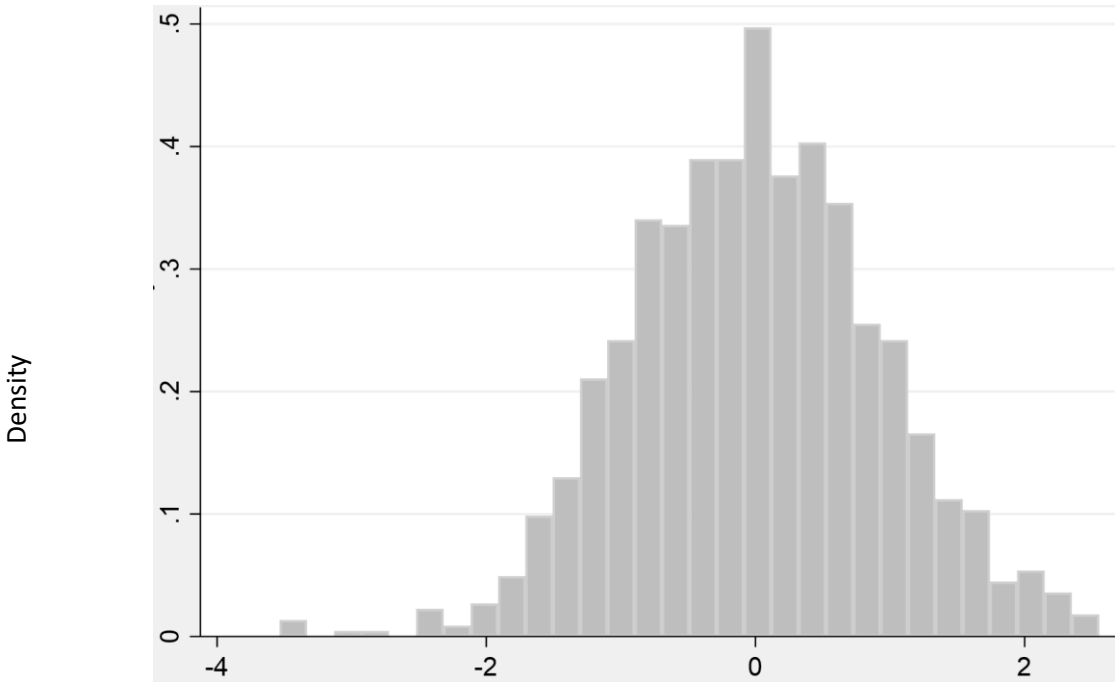
Note – According to the guidelines for a Bland-Altman analysis, only 5% of the observations should be outside of the marked area between + / - 2 SD on the Y-axis to demonstrate that two measurements are equivalent measures of a construct. In our data, we find that 3.64% of observations fall outside of this area, indicating correspondence of measurements.

4.2 The Difference between Objective Financial Situation and Subjective Financial Well-Being

When objective financial situation and subjective financial well-being do not correspond, this can be due to people feeling worse than their objective situation, or better than their objective situation. Figure 3 demonstrates that the difference between objective financial situation and subjective financial well-being approximates a normal distribution. To understand which individual differences explain whether a consumer has higher subjective financial well-being relative to their objective financial situation, we conduct a regression analysis to predict the difference between objective financial situation and subjective financial well-being.

Figure 3

Histogram of Difference Scores Objective Financial Situation and Subjective Financial Well-Being



Difference between z-scored subjective financial well-being and objective financial situation

Our regression analysis explains 12.9% of the variance of the difference between subjective financial well-being and a household's objective financial situation (Table 6, column 6). With regard to psychosocial characteristics, consumers with higher levels of optimism and individuals with greater perceived financial skill are more likely to have higher subjective financial well-being relative to their objective financial situation, thereby confirming hypotheses 1 and 2. We do not find support for hypothesis 3, which posited that individuals who feel that their financial situation is better than that of friends and acquaintances would have higher subjective financial well-being than their objective financial situation. We also do not find support for hypothesis 4, which posited that individuals with a stronger social comparison orientation would tend to have lower subjective financial well-being than their objective financial situation. We do find support for hypothesis 5, as individuals who score higher on materialism are more likely to have an objective financial situation that exceeds their subjective financial well-being. Finally, we do not find evidence for hypothesis 6, which expected that individuals who are more neurotic have lower subjective financial well-being than their objective financial situation.

Table 6

Predictors of Correspondence, Objective Financial Situation and Subjective Financial Well-Being

VARIABLES	(1) Subjective financial well-being	(2) Subjective financial well-being	(3) Objective financial situation	(4) Objective financial situation	(5) Subjective – Objective	(6) Subjective – Objective
Financial skill	0.50***	0.50***	0.21***	0.19***	0.29***	0.31***
	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)
Optimism	0.25***	0.23***	0.12	0.05	0.12	0.18**
	(0.04)	(0.04)	(0.07)	(0.06)	(0.07)	(0.07)
Positive peer comparison	0.20***	0.20***	0.24***	0.24***	-0.04	-0.04
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Social comparison orientation	0.07**	0.07**	0.09*	0.10*	-0.01	-0.02
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Materialism	-0.18***	-0.16***	-0.10*	-0.04	-0.08	-0.12**
	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)
Neuroticism	-0.01	-0.01	-0.09	-0.07	0.08	0.05
	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)
Male		-0.05		0.02		-0.09
		(0.03)		(0.05)		(0.06)
Age		0.01**		0.02***		-0.01***
		(0.00)		(0.00)		(0.00)
Household size		0.01		0.15***		-0.13***
		(0.01)		(0.02)		(0.02)
Education level (reference group = bachelor's degree of applied science)						
Primary		-0.10		-0.65***		0.59***
		(0.09)		(0.14)		(0.15)
Secondary		-0.06		-0.36***		0.30***
		(0.05)		(0.08)		(0.08)
Practical tertiary		0.015		-0.24***		0.24***
		(0.04)		(0.067)		(0.07)
University		0.01		0.13		-0.10
		(0.05)		(0.08)		(0.09)
Constant	-0.76***	-0.98***	-0.93***	-1.99***	0.15	-1.00***
	(0.05)	(0.11)	(0.09)	(0.17)	(0.09)	(0.17)
Observations	1,171	1,164	1,051	1,044	1,051	1,044
R-squared	.54	.54	.22	.31	.05	.13

Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Note – The VIF of predictors from 1.03 to 2.09 with a mean of 1.40, thereby alleviating the concern for multi-collinearity affecting the interpretability of results.

Exploratory analyses show that consumers with specific demographic characteristics are also likely to experience worse subjective financial well-being relative to their objective financial situation. Specifically, we find that age and household size are associated with feeling worse than one's objective financial situation. Finally, we find that individuals with lower education levels are more likely to have higher subjective financial well-being relative to their objective financial situation.

The characteristics that are associated with a difference between one's objective financial situation and subjective financial well-being have differential impacts on subjective financial well-being and the objective financial situation. For example, some traits and characteristics are not associated with a difference in subjective financial well-being but are associated with the objective financial situation, thus creating a mismatch. We see this pattern for education level and household size. In contrast, materialism and optimism are associated with subjective financial well-being but have no significant relationship with the household's objective financial situation. Finally, some characteristics are associated with both a household's objective financial situation and subjective financial well-being, but at a different relative strength. For example, financial skill is associated with a household's objective financial situation, but is even more strongly associated with subjective financial well-being and may thereby create a mismatch between objective financial situation and subjective financial well-being.

We do not see effects of social comparison orientation and positive peer comparison on the difference between objective financial situation and subjective financial well-being. As shown in Table 6, both characteristics are positively associated with subjective financial well-being as well as a household's objective financial situation. The strength of both effects is similar, therefore, we do not see significant differences between the objective financial situation and subjective financial well-being for those who feel their financial situation is better than that of peers, and those who tend to compare themselves to others.

4.3 The Difference between Objective Financial Situation and Current vs. Future Subjective Financial Well-Being

In addition, we assess whether the characteristics that are associated with a difference between a household's objective financial situation and subjective financial well-being differ based on the temporal dimension of subjective financial well-being we assess. In Table 7, we run regression analyses to predict the difference between current money management stress and a household's objective financial situation (Table 7, column 1) and the difference between one's expected future financial security and objective financial situation (Table 7, column 2).

Firstly, we find further support for the hypotheses that optimistic individuals and individuals with greater financial skill have higher subjective financial well-being relative to their objective financial situation. This trend replicates for current money management stress as well as expected future financial security. With regard to peer comparison, we find evidence in the opposite direction of our hypothesis. Contrary to expectations, we see that individuals who feel that their financial situation is better than that of peers have lower subjective financial well-being relative to their objective financial situation when assessing their current financial situation. We do not find an effect of positive peer comparison on the difference between one's expected future financial situation and objective financial situation. We find partial evidence for hypothesis 4, as Individuals with a stronger social comparison orientation tend to feel worse about their current financial satisfaction than their objective situation would indicate. With regard to materialism, we find that materialism is associated with having lower subjective financial well-being compared to one's objective financial situation in the present, but not in the future.

With regard to demographic characteristics, we replicate the effect of age and household size for both current money management and expected future financial security. Individuals who are older and have larger households have lower subjective financial well-being relative to their objective financial situation. The effect of education level on the difference between a household's objective financial situation and subjective financial well-being is mostly similar across the temporal dimensions of subjective financial well-being, with individuals with lower education levels having higher subjective financial well-being relative to their objective financial situation. One notable difference is that individuals with a university education have lower expected future financial security relative to their objective financial situation.

Table 7

Temporal Dimensions of the Difference between Subjective Financial Well-Being and Objective Financial Situation

VARIABLES	(1) Current money management stress – Objective financial situation	(2) Expected future financial security – Objective financial situation
Materialism	-0.33***	-0.04
	(0.05)	(0.05)
Social comparison orientation	-0.16***	-0.02
	(0.05)	(0.05)
Neuroticism	0.04	0.07
	(0.06)	(0.06)
Optimism	0.16*	0.15*
	(0.07)	(0.07)
Financial skill	0.13*	0.20***
	(0.05)	(0.05)
Positive peer comparison	-0.10***	0.00
	(0.02)	(0.02)
Male	-0.10	-0.03
	(0.06)	(0.06)
Age	-0.02***	-0.01***
	(0.00)	(0.00)
Household size	-0.15***	-0.13***
	(0.02)	(0.02)
Education level (reference group = applied science)		
Primary	0.58***	0.60***
	(0.16)	(0.16)
Secondary	0.27**	0.32***
	(0.09)	(0.09)
Practical tertiary	0.17*	0.24**
	(0.08)	(0.08)
University	-0.11	-0.24**
	(0.09)	(0.09)
Constant	1.50***	0.75***
	(0.19)	(0.19)
Observations	1,044	1,044
R-squared	.16	.09
Standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05		

5. GENERAL DISCUSSION

Individuals differ in the presence and degree of financial well-being correspondence. We find that subjective assessments of financial well-being measured in a survey generally align with a household's cumulative share of income and assets, as measured through tax registry data. For a large majority of our sample, objective financial situation and subjective financial well-being do not deviate more than 1 standard deviation from each other. We find that the percentage of individuals who have higher subjective financial well-being relative to their objective financial situation is of similar magnitude to the percentage of individuals who have lower subjective financial well-being relative to their objective financial situation.

Individual differences explain the difference in objective financial situation and subjective financial well-being. Specifically, our analyses show that individuals with higher levels of optimism and financial skill tend to have subjective financial well-being relative to their objective financial situation. For optimism, this difference is driven by differences in subjective financial well-being, which is in line with prior research on optimism (Barrafrem et al., 2020; Strömbäck et al., 2017). We do not find a significant association between optimism and one's objective financial situation, despite the negative relationship between high levels of optimism and savings reported in prior research (Puri & Robinson, 2007). Financial skill has a positive association with subjective as well as a household's objective financial situation, but a stronger effect on subjective assessments of financial well-being, thereby driving a mismatch. The positive association between financial skill and subjective financial well-being is in line with research by Xiao and Porto (2022) who found that financial skill predicted subjective financial well-being when controlling for poverty status.

Materialistic individuals tend to have lower subjective financial well-being relative to their objective financial situation. Whereas prior research posited a negative relationship between materialism and one's objective financial situation, as materialistic individuals are more likely to overspend and accrue debt (Gardarsdottir & Ditmar, 2012), we do not find a negative association between materialism and the objective financial situation of a household in our research. It is possible that the motivation to accrue more materialistic goods does not only drive spending but also drives the motivation to gain income. In line with prior research on materialism, we find that individuals with higher levels of materialism are more negative than others with the same financial situation (e.g., Richins & Dawson, 1992), thereby leading

to higher levels of objective than subjective financial well-being. Interestingly, this non-correspondence does not extend to expected future financial security.

In our sample, older individuals are more likely to have lower subjective financial well-being relative to their objective financial situation. This may be explained by the differential meaning that older individuals give to financial well-being, where the concept is less closely related to financial freedom than it is for younger individuals (Riitsalu et al., 2023). Furthermore, we find that larger households have lower subjective financial well-being relative to their objective financial situation. This effect may be driven by a variety of sources. We find that household size plays a role in the difference between objective financial situation and current, as well as future financial well-being. Therefore, we posit that this effect may be driven by larger expenses in the presence as well as larger expected expenses (e.g., education costs for children) in the future.

Contrary to hypotheses, we do not find significant effects of peer comparison and social comparison orientation. For social comparison orientation as well as positive peer comparison, their respective effects on subjective financial well-being and a household's financial situation are of a similar magnitude. When separately assessing current and future financial well-being we do see an effect of positive peer comparison for the difference between current financial well-being and objective financial situation, but in the opposite direction as hypothesized. Our mixed evidence for social comparison processes affecting the difference between objective and subjective finances may be due to the nature of the questions in our survey. For social comparison orientation, we used a general social comparison orientation scale (Buunk & Gibbons, 1999). However, it is possible that general social comparison does not strongly relate to the tendency to compare one's financial situation. Similarly, our measure of positive peer comparison may not have captured the relevant comparison to understand the difference between subjective financial well-being and a household's objective financial situation. In our survey, we asked participants to indicate how they perceived their financial situation to be, in comparison to the financial situation of their friends and acquaintances. However, the comparison of one's financial situation to other reference points, such as that of neighbors, family members, or colleagues may be more relevant to explain the difference between subjective and objective financial status (Ferrer-i-Carbonell, 2005; Schneider & Schupp, 2014).

Finally, we do not find the hypothesized effect of neuroticism on the difference between objective financial situation and subjective financial well-being. This finding is in contrast with prior research that found a negative association between neuroticism and well-being (Anglim et al., 2020), subjective financial well-being (Joshanloo, 2022), and financial satisfaction (Tharp et al., 2020). One of the mechanisms that link neuroticism to lower subjective evaluations of one's finances is the tendency of neurotic individuals to experience negative affect and to react strongly to financial shocks. One possibility is that this effect is country-specific. The Netherlands has a strong social security system, where social benefits are aimed at mitigating the negative impact of financial shocks due to illness or job loss (Sociaal en Cultureel Planbureau, 2023), weakens the impact of financial shocks on subjective financial well-being for neurotic individuals.

5.1 Theoretical Implications

A consumer's financial well-being is of importance to consumption (Warmath, 2022), health (O'Neill et al., 2005) and overall well-being (Netemeyer et al., 2018). Previous research has either focused on the antecedents and consequences of either objective (e.g., Rutherford & Fox, 2010) or subjective (e.g., Anvari-Clark et al., 2022) financial well-being. Whereas the correspondence of objective financial situation and subjective financial well-being has been described conceptually (Brüggen et al., 2017; Tully & Sharma, 2022; Warmath, 2022), it has not been tested empirically. Assessing the correspondence of objective financial situation and subjective financial well-being provides a holistic understanding of financial well-being and helps identify vulnerable consumers who could otherwise be overlooked. We open a new research direction that concerns the empirical assessment of the drivers, existence and consequences of correspondence between objective financial situation and subjective financial well-being.

We contribute to the literature on financial well-being by defining and measuring financial well-being correspondence. This approach aligns with prior research from other domains of literature such as financial knowledge (e.g., Lind et al., 2020), poverty (e.g., Carletto & Zezza, 2006) and trading behavior (e.g., Daniel & Hirshfleier, 2015). A unique challenge in assessing the alignment of a household's objective financial situation and subjective financial well-being is the difficulty of measuring both factors soundly. Our unique data ensures that non-correspondence is not driven by measurement error. Research on financial well-being is often based on self-reported financial characteristics, which could

confound the assessment of non-correspondence if the traits that are associated with the difference between objective financial situation and subjective financial well-being are also the traits that affect how people respond to financial questions in surveys (e.g., level of detail, misreporting). The use of tax registry data in combination with a scale-based approach for subjective financial well-being improves enables us to create a fine-grained view on the alignment of a household's objective financial situation and subjective financial well-being.

Finally, we provide insights into consumer and measurement heterogeneity. We show that whereas for most consumers there is a general alignment between objective financial situation and subjective financial well-being, there are specific consumer groups with unique traits and characteristics for which this trend does not hold. Next to this, we show that the drivers of non-correspondence of the objective financial situation and subjective financial well-being may differ depending on the temporal element of subjective financial well-being that is assessed. Understanding this measurement heterogeneity is important for further understanding how perceptions of financial well-being are derived from the objective financial situation, and how future expectations may be dependent on different characteristics than assessments of the present are.

5.2 Managerial Implications

Our findings illustrate that whereas most individuals are well-aligned with regard to their objective financial situation and subjective financial well-being, this does not hold true for all consumers. Whereas for the majority of consumers, there is an alignment between their subjective financial well-being and objective financial situation, the policy-relevance of the minority groups for which this is not the case should not be depreciated. Our analyses of individual differences that relate to non-correspondence provide initial insights into the underlying individual differences that may explain non-correspondence. Our demonstration of the prevalence and drivers of this phenomenon may aid financial educators and service providers in understanding and aiding these potentially vulnerable consumer groups. Financial education programs may first assess whether consumers are experiencing a mismatch between objective financial situation and subjective financial well-being, to target information based on a holistic assessment of a consumer's financial situation. Similarly, financial service providers can focus on aligning consumers' perceptions with their objective financial reality to ensure that consumers are better informed when making choices about finances and consumption.

Understanding the extent to which subjective perceptions deviate from the objective financial situation enables us to develop evidence-based interventions aimed at improving how consumers process financial information. Negative financial situations do not necessarily translate to negative perceptions of subjective financial well-being, for example if individuals avoid negative financial information (Hilbert et al., 2022). On the other hand, the absence of objective financial adversity does not equate with the absence of excessive financial stress. Therefore, there is no one-size-fits all approach to improving financial well-being. A holistic approach that assesses the extent of alignment between their objective financial situation and subjective financial well-being will enable us to better understand why individuals with similar financial situations may show very different consumption behaviors. The misalignment between objective financial situation and subjective financial well-being should thus be considered to better understand societal and economic issues.

5.3 Limitations and Future Research

Our study reveals that individual differences can explain the differences between subjective financial well-being and a household's objective financial situation; however, we acknowledge that other unmeasured characteristics may also influence this difference. One such unmeasured factor that may influence financial well-being is financial literacy, which is known to predict financial well-being and reduce financial errors (Bücher-Koenen & Ziegelmeyer, 2011; Lusardi & Mitchell, 2014). Furthermore, in our analyses we do not distinguish whether to what extent the respondent is responsible for the household finances. On the one hand, it is possible that individuals who have a clearer overview of household finances have a better alignment between subjective financial well-being and the household's objective financial situation. On the other hand, this may create a "curse of knowledge" where individuals who are aware of the household's exact financial situation cannot ignore this negative information and thus deem their financial situation more negatively (Camerer et al., 1989).

As our study is the first to empirically quantify the correspondence between a household's objective financial situation and subjective financial well-being, there are many questions open to further inquiry. Our results do not provide insights into the temporal development of non-corresponding objective and subjective finances. Longitudinal research that tracks subjective financial well-being and a household's objective financial situation is required to understand whether non-correspondence is consistent over time and whether it is strengthened or reduced by financial shocks. Currently, it is unknown what the

consequences of non-correspondence of financial well-being and a household's objective financial situation are. Future research should assess the impact of this non-correspondence on a variety of outcomes. For example, in the financial domain it would be relevant to assess whether individuals who have high subjective financial well-being relative to their objective financial situation are more likely to engage in risky financial behavior, such as taking out risky loans. In this same domain it would be relevant to assess whether individuals with low subjective financial well-being relative to their objective financial situation do not sufficiently decumulate their savings during retirement (Shu & Shu, 2018). If non-correspondence has negative consequences, a fruitful direction for future research would be the development and testing of interventions to align objective and subjective financial well-being.

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APPENDIX A. OVERVIEW OF MEASURES

Table A

Overview of Items per Measure

Scale	Items
Reported financial well-being scale (Botha & de New, 2021)	1. I can enjoy life because of the way I'm managing my finances.
	2. I could handle a major unexpected expense.
	3. I feel on top of my day to day finances.
	4. I am comfortable with my current levels of spending.
	5. I am on track to have enough money to provide for my financial needs in the future.
Perceived financial well-being scale (Netemeyer et al., 2018)	*Current Money Management Stress*
	1. Because of my money situation, I feel I will never have the things I want in life.
	2. I am behind with my finances.
	3. My finances control my life.
	4. Whenever I feel in control of my finances, something happens that sets me back.
	5. I am unable to enjoy life because I obsess too much about money.
	Expected Future Financial Security
	1. I am becoming financially secure.
	2. I am securing my financial future.
	3. I will achieve the financial goals that I have set for myself.
	4. I have saved (or will be able to save) enough money to last me to the end of my life.
	5. I will be financially secure until the end of my life.
Financial skill (Consumer Financial Protection Bureau, 2018)	1. I know how to make complex financial decisions.
	2. I am able to make good financial decisions that are new to me.
	3. I know how to get myself to follow through on my financial intentions.
	4. I am able to recognize a good financial investment.
	5. I know how to keep myself from spending too much.
	6. I know how to make myself save.
	7. I know where to find the advice I need to make decisions involving money.
	8. I know when I do not have enough information to make a good decision involving my money.
	9. I know when I need advice about my money.
	10. I struggle to understand financial information.

Scale	Items
Revised Optimism Scale (Scheier et al., 1994).	1. In uncertain times, I usually expect the best.
	2. If something can go wrong for me, it will. (R)
	3. I'm always optimistic about my future.
	4. I hardly ever expect things to go my way. (R)
	5. I rarely count on good things happening to me. (R)
	6. Overall, I expect more good things to happen to me than bad.
Positive peer comparison	If I compare myself with my friends and acquaintances, I think in general I am financially better off.
Iowa-Netherlands Comparison Orientation Measure short scale (Schneider & Schupp, 2014)	1. I always pay a lot of attention to how I do things compared with how others do things.
	2. I often compare how I am doing socially (e.g., social skills, popularity) with other people.
	3. I am not the type of person who compares often with others. (R)
	4. I often try to find out what others think who face similar problems as I face.
	5. I always like to know what others in a similar situation would do.
	6. If I want to learn more about something, I try to find out what others think about it.
Brief materialistic values scale (Richins, 2004)	1. I admire people who own expensive homes, cars, and clothes.
	2. The things I own say a lot about how well I'm doing in life.
	3. Buying things gives me a lot of pleasure.
	4. I like a lot of luxury in my life.
	5. My life would be better if I owned certain things I don't have.
	6. I'd be happier if I could afford to buy more things.
Neuroticism sub-scale of the International Personality Item Pool (IPIP) (Goldberg, 1992).	1. I get stressed out easily.
	2. I am relaxed most of the time. (R)
	3. I worry about things.
	4. I seldom feel blue. (R)
	5. I am easily disturbed.
	6. I get upset easily.
	7. I change my mood a lot.
	8. I have frequent mood swings.
	9. I get irritated easily.
	10. I often feel blue.

NOTE. – Items range from 1-5, except positive peer comparison (1-7) and materialism (1-11).



CHAPTER 3

HOW TO ENGAGE THE UNENGAGED? EXPANDING THE SCOPE OF ENGAGEMENT RESEARCH

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1. INTRODUCTION

Customer engagement (CE) has become a key concept in service research as it can explain customer relationships in modern markets and is associated with positive business outcomes, such as improved customer-brand relationships, customer satisfaction, loyalty, and profitability (e.g., Brodie et al., 2011; Jaakkola & Alexander, 2014; Kumar & Pansari, 2016; Kumar et al., 2010). The academic interest in engagement has notably increased over time, with the number of publications with the term "customer engagement" in their title increasing from 52 in 2011 to 993 in 2021, with a total of 100,671 citations (Web of Science, 2022). CE is defined as "a dynamic and iterative process that reflects actors' dispositions to invest resources in their interactions with other connected actors in a service system" (Brodie et al. 2019, 174). In other words, engagement reflects customers' heightened emotional and cognitive stances toward a service, brand, or provider, which results in resource investments, such as participation, spending time, or focusing effort on the object of engagement (e.g., Jaakkola & Alexander, 2014).

Existing CE literature offers rich insights into various antecedents and outcomes of engagement (Brodie et al., 2011; Hollebeek, 2013; Kumar &Pansari, 2016). As noted by Fehrer et al. (2018), most engagement research relates to experiential, interactive, and thus hedonic service settings, and utilitarian services are seldom studied. Indeed, most engagement studies have been conducted in hedonic product and service settings, such as hospitality, fashion, social media, or brand communities (Alvarez-Milán et al., 2018; Breidbach et al., 2014; Groeger et al., 2016; Hollebeek et al., 2014). Extant research has found that hedonic aspects of customer experiences, such as fun, excitement, and other positive emotional triggers, drive engagement (e.g., Alvarez-Milán et al., 2018; Hollebeek, 2013; Hollebeek et al., 2014), and its outcomes also often include hedonic aspects, such as affective commitment toward a brand or advertising (Calder et al., 2009; Vivek et al., 2012) or emotional brand connections (Brodie et al., 2011). Most of our knowledge on engagement thus revolves around the notion that customers engage with brands or services they enjoy and have a positive emotional connection with.

This paper argues that the present research focus hampers reaching the full potency of the engagement concept. Facilitating customers' emotional and cognitive dispositions, which lead to higher participation, activity, and empowerment, is also of great importance in utilitarian contexts, such as healthcare or financial services. For example, financial well-being

research shows that many people are not sufficiently engaged with their retirement planning (e.g., Eberhardt et al., 2021, 2022; Hentzen et al., 2022), which can have detrimental effects for individuals and societies. For unengaged customers, potential retirement income gaps likely go unnoticed until they reach retirement age (HSBC, 2015), which significantly decreases their ability to take action (e.g., by saving more or adjusting their work situations) in time to ensure financial well-being in retirement. This also has negative effects for society as a whole: if a significant proportion of a population does not have sufficient income during retirement, it will affect consumption and economic viability in the markets and raise the demand for social support (Munnell et al., 2021). For marketers and policymakers, stimulating engagement with utilitarian service settings, such as retirement planning, is thus critical to improve customer, company, and societal outcomes.

Gaining a better understanding of engagement, especially in more utilitarian settings, is therefore of great importance. The rich literature in consumer behavior on hedonic versus utilitarian products (Dhar & Wertenbroch, 2000; Hirschman & Holbrook, 1982; Voss et al., 2003) suggests that there should be a conceptual difference between utilitarian and hedonic services, which means that existing research knowledge on engagement, developed in studies focusing on hedonic contexts, does not necessarily hold in more utilitarian settings. Hedonic services (e.g., hotels, movies) are associated with fun and pleasure, and they are inherently experience- and process-oriented (Collier et al., 2014; Prebensen & Rosengren, 2016). In contrast, utilitarian services, such as banking, car washes, and financial services, are functional and useful, and their consumption is primarily outcome-oriented (Collier et al., 2014; Dhar & Wertenbroch, 2000). How these aspects might change our assumptions regarding engagement is not currently known.

Against this backdrop, the objective of this article is to *identify which assumptions in extant engagement research need revising, and what new future research is needed to expand the coverage of engagement research to utilitarian settings*. To achieve this, we draw from insights outside the engagement contexts that are traditionally studied. We focus on retirement planning, as it is highly relevant from a (financial) well-being perspective; represents a utilitarian service setting with low baseline levels of engagement; and extant research contains empirical studies that investigate attempts to raise customers' interest and activity (i.e., engagement) regarding retirement planning.

This article informs the existing theory on engagement from the perspective of engagement with retirement planning, thus performing "theory adaptation" (Jaakkola, 2020). First, we review engagement research to identify its key assumptions and foci. Second, we analyze studies conducted in the retirement research domain that focus on engaging customers to locate potentially differing premises of engagement in utilitarian settings. By synthetizing insights from engagement and retirement planning research, we a) identify assumptions in engagement research that need revising and b) provide systematic guidelines for future research that needs to be conducted to augment the scope of engagement research.

This paper offers a fourfold contribution. First, we demonstrate the importance of context for engagement. Through our comparison of utilitarian and hedonic contexts, we demonstrate that the current assumptions regarding engagement are not necessarily generalizable across contexts. Second, we highlight and problematize the current premises of engagement research. Third, we shift the applicability domain of engagement research. We discuss how the scope of engagement research can be expanded by focusing on customer well-being rather than firm-focused outcomes. Fourth, we contribute to the research on retirement planning by demonstrating how insights from engagement research may help to reduce the lack of engagement in utilitarian service contexts. The insights from our analyses extend the scope of how engagement is conceptualized and offer guidelines for moving the engagement field forward. Through our analysis, we provide a future research agenda that addresses how the boundaries of engagement research can be expanded.

As its practical implication, this study provides learnings from the engagement literature to help enhance engagement in utilitarian service contexts. Managers in utilitarian service contexts, such as financial planning and healthcare, can use these insights to change their managerial practice. We also provide practical recommendations for managers in hedonic service contexts by broadening the current view on relevant customer outcomes of engagement.

2. RETIREMENT PLANNING AS AN EXEMPLARY UTILITARIAN SERVICE CONTEXT

Hedonic services reflect customers' need for pleasure and fun, and customers select them looking for pleasurable experiences (Davis et al., 1992; Dhar & Wertenbroch, 2000). The perceived value of the service experience and the CE process are important for hedonic services, while utilitarian services, on the other hand, are outcome-oriented (Blinda et al., 2019). These services are mainly instrumental or functional in nature (Batra & Ahtola, 1991;

Foxall, 1990), characterized by low affective emotional content and a short duration (Jang & Namkung, 2009). Research has shown that hedonic and utilitarian services differ in service participation outcomes (Blinda et al., 2019), illicit various different affective responses (Calvo-Porral & Otero-Prada, 2021), and emphasize the importance of emotions to different degrees (Wang & Jiang, 2019). Therefore, managers and service providers need to understand how to trigger CE with utilitarian services and potentially design hedonic and utilitarian services differently to maximize engagement.

The literature acknowledges that hedonism and utilitarianism are not necessarily mutually exclusive, as services can be high in both hedonic and utilitarian features (Huber et al., 2018), and customer perceptions may depend on their consumption goals (Ding & Keh, 2016). Yet, in the literature, there is large consensus that some services are clearly utilitarian: retirement planning is one such example (e.g., Eberhardt et al., 2021, 2022; Hentzen et al., 2022).

Retirement planning is highly relevant from a transformative service research (TSR) perspective since it affects financial well-being. Netemeyer and colleagues (2017) empirically demonstrate that financial well-being is a key predictor of overall well-being and comparable in magnitude to the combined effect of other life domains (job satisfaction, physical health assessment, and relationship support satisfaction). Even though customers acknowledge the importance of retirement planning, people around the world currently do little to engage with it. Aegon and GFK find that 29% of people prefer to visit a dentist rather than engage in financial planning, and 64% would rather iron or vacuum (Aegon, 2015). Research verifies that most people do not read the information that is relevant for retirement planning, nor conduct desired behavior, such as logging on to portals that provide an overview of their accumulated retirement incomes, contacting the governmental agency responsible, seeking financial advice, or saving or investing money themselves (e.g., Eberhardt et al., 2021, 2022). For example, click rates for links in newsletters that contain crucial information about changes to pension schemes are a mere 3%–6% (Eberhardt et al., 2021).

Engagement with retirement planning requires many different facets of affective, cognitive, and behavioral involvement over a long period of time. To provide a concrete context for analyzing engagement with retirement planning, Figure 1[3] illustrates the nature

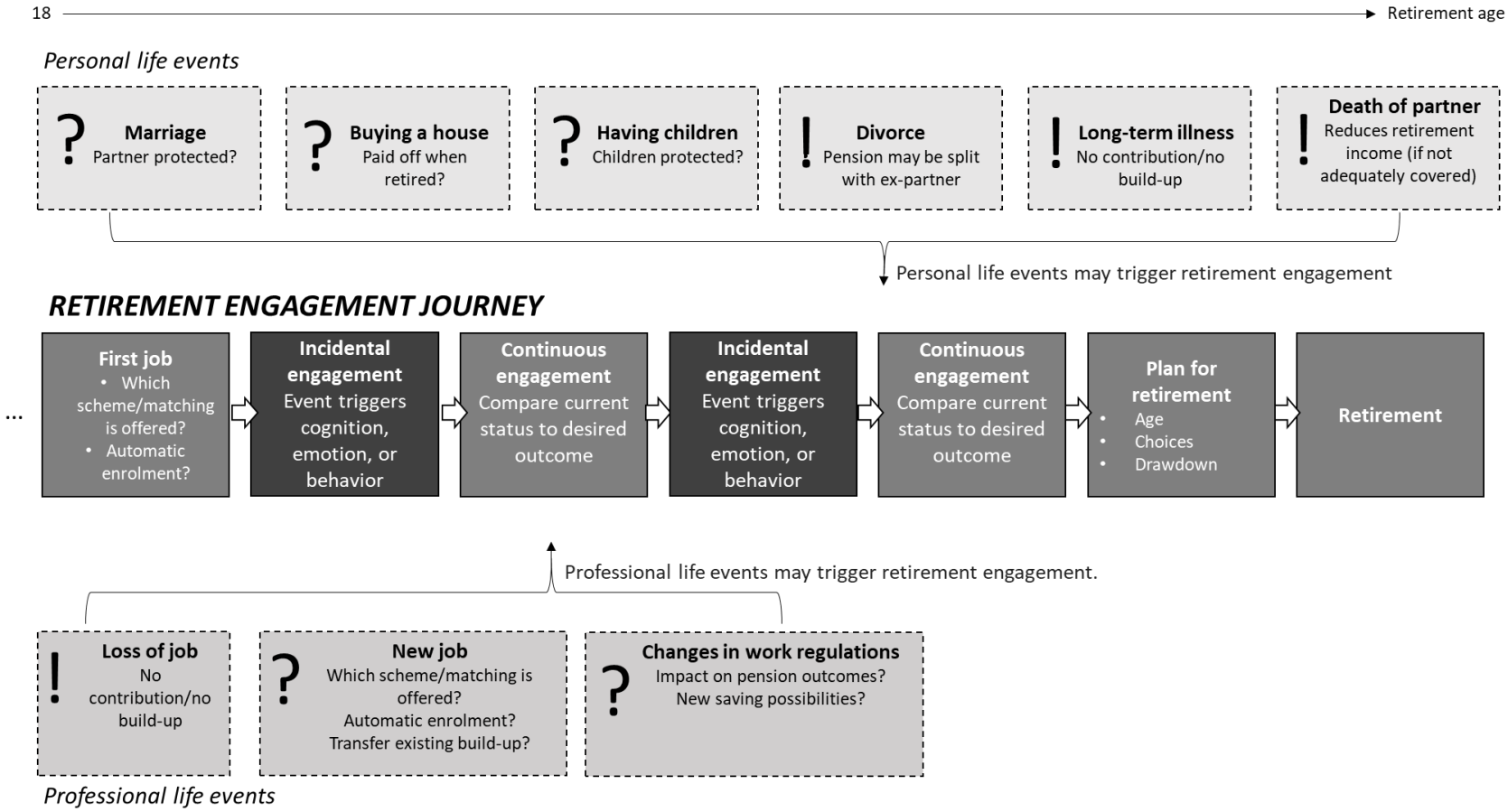
[3] Figure 1 was drafted to exemplify a typical customer journey with retirement planning, based on discussion with pension industry managers and publications from Blakstad, Brüggen, and Post (2017) and Eberhardt et al.

and complexity of the retirement engagement journey that customers follow and highlights the manifestations and role of engagement along the journey. This journey does not focus on one specific retirement product or service as, from a financial well-being perspective, a holistic overview that considers the aggregated retirement income accumulation is the most relevant perspective.

(2022). It serves only an illustrative purpose. It is important to note that the details of this journey differ depending on the retirement system in each country (Ebbinghaus 2019).

Figure 1

Illustrative Retirement Planning Journey



Legend

! = Requires attention – event has direct consequences for pension accumulation or outcomes

? = Requires consideration – event may have impact on pension accumulation or outcomes

Figure 1 illustrates one possible, general retirement engagement journey that focuses on employment-related retirement income provisions. The journey starts at the commencement of employment. When an individual starts their first job, they need to engage cognitively by thinking about the scheme that is offered and whether they need to take additional action to enroll in the scheme. Some schemes also require that a contribution rate or the risk appetite for the investment portfolio is selected. Ideally, a customer should engage with their retirement planning on a regular basis, for example, by thinking about whether their projected retirement income matches their needs and desires. For example, they could compare their current projected retirement income to their desired one and act if there is a mismatch between them. A customer may consider taking out additional retirement products, changing their savings rate, or even adjusting their retirement age.

Besides this continuous engagement, life events and professional events can trigger additional, incidental engagement. Customers must first be aware that a life event may impact their retirement. After this, they should check the specifics of their own situation, acquire information, and possibly seek advice. Every event has unique features and consequences for one's retirement planning. For example, in the case of divorce, the question arises as to whether and how retirement assets are divided between partners. Besides the behavioral engagement that such a life event requires, it also changes the emotional and cognitive dispositions of people. Such emotional and cognitive engagement with life events affects behavioral engagement – both positively (e.g., through possibly taking action and the necessary administrative steps) and negatively (e.g., because people are occupied with other aspects of the divorce and hence forget to make retirement arrangements) (Blakstadt al., 2017). Individuals need to consider the consequences of the events they experience and should engage emotionally, cognitively, and behaviorally with their retirement planning when they occur.

3. EXTANT VIEW OF CUSTOMER ENGAGEMENT

Before we highlight the assumptions that need revising and the knowledge gaps in the engagement literature, the next section gives a state-of-the-art overview of what is known about engagement (see Table 1).

Table 1

Overview of Research on Customer Engagement

Study	Research focus	Research method	Research setting	Engagement drivers	Engagement initiator	Engagement focus	Engagement outcomes	Temporal perspective
Alvarez-Milan et al. 2018	Outline a comprehensive decision-making framework that articulates five strategic facets of CE marketing	Qualitative	Consumer goods (beer, branded footwear)	Content creation, emotional triggers	Firm	Hedonic	Customer value	Cross-sectional
Beckers et al. (2018)	Investigate the value-related consequences of firm-initiated CE behaviors for the firm	Event study	Various	WOM, feedback invitations, co-creation	Firm	Hedonic	Market value	Cross-sectional
Bowden (2009)	Propose a CE framework for service brands	Conceptual	Branding	Commitment, involvement	Customer	Hedonic	Trust, loyalty, repeat purchase	Both
Breidbach et al. (2014)	Study the role of engagement platforms for value co-creation, the performance of service and ecosystems, and managing service quality	Conceptual and exploratory	Online engagement platforms	N/A	Customer	Both	Value co-creation	Cross-sectional
Brodie et al. (2011)	Explore the theoretical foundations of CE and derive fundamental propositions to distinguish it from other concepts	Conceptual	N/A	Involvement, participation, flow, rapport, satisfaction	Customer	Hedonic	Commitment, trust, self-brand connection, emotional brand attachment, loyalty	Both
Calder et al. (2009)	Study how engagement with online media increases advertising effectiveness	Conceptual and empirical	Online advertising	N/A	Customer	Both	Usage, attentiveness, affective response, reactions toward ads	Cross-sectional

Study	Research focus	Research method	Research setting	Engagement drivers	Engagement initiator	Engagement focus	Engagement outcomes	Temporal perspective
Fehrer et al. (2018)	Extend existing engagement research by operationalizing the dynamic nature of the engagement process within a customer-brand dyad and test the interrelationships with other network actors in a triadic network setting	Empirical	Insurances	Engagement disposition, satisfaction, involvement, loyalty, engagement intensity	Both	Utilitarian	Engagement disposition, satisfaction, involvement, loyalty	Longitudinal
Groeger et al. (2016)	Propose the concept of non-paying consumer (e.g., receiving free trials) engagement behaviors and how they might be leveraged to create firm value	Conceptual and empirical	Consumer brands in the food industry	Consumer drivers (self-concept, personality, mood), situational factors (perceived benefit, timing, perceived risk), firm drivers (brand characteristics, reputation, size, information usage)	Customer	Hedonic	Firm value	Cross-sectional
Harmeling et al. (2017)	Conceptualize CE marketing and test the framework's predictions in a supermarket setting	Conceptual and empirical	Empirical application: supermarket	Engagement marketing	Firm	Hedonic	Firm performance	Cross-sectional
Heller et al. (2021)	Conceptualize the technology-enabled engagement process (TEEP) for services	Conceptual	N/A	Spatial presence	Customer	Hedonic	WOM, value perception of services	Cross-sectional

Study	Research focus	Research method	Research setting	Engagement drivers	Engagement initiator	Engagement focus	Engagement outcomes	Temporal perspective
Henkens et al. (2021)	Investigate the impact of smart services on well-being through CE	Systematic review and empirical	Home appliances	Awareness, connectivity, actuation, dynamism	Customer	Hedonic	Customer well-being	Cross-sectional
Hollebeek (2011)	Conceptualize customer brand engagement	Conceptual and empirical	Various consumer goods	Immersion, activation, passion	Firm	Hedonic	Brand equity	Cross-sectional
Hollebeek (2013)	Conceptualize how CE contributes to customer value	Conceptual and empirical	Various consumer goods	N/A	Customer	Both	Customer value	Cross-sectional
Hollebeek and Macky (2019)	Conceptualize the relationship of digital content marketing (DCM) with cognitive, emotional, and behavioral engagement	Conceptual	Digital content marketing	Digital content marketing	Both	Both	Consumer-based brand equity, firm-based brand equity	N/A
Hollebeek et al. (2014)	Conceptualize, develop, and validate a scale for consumer brand engagement in social media	Conceptual and empirical	Social media	Cognitive processing, affection, activation	Customer	Hedonic	Self-brand connection, brand usage intent	Cross-sectional
Jaakkola and Alexander (2014)	Conceptualize the role of CE behavior in value co-creation	Conceptual and empirical	Public transport service system	Focal customer and firm drivers	Both	Both	Value creation for customers and firms	Cross-sectional
Kumar and Pansari (2016)	Develop an engagement framework with focal constructs of CE and employee engagement and validate the framework	Conceptual and empirical	Manufacturing and service firms	Customer and employee drivers	Both	N/A	Firm performance	Both

Study	Research focus	Research method	Research setting	Engagement drivers	Engagement initiator	Engagement focus	Engagement outcomes	Temporal perspective
Kumar et al. (2019)	Develop a framework to facilitate CE in services	Conceptual and empirical	Service firms	Service experience, satisfaction, emotional attachment	Firm	N/A	Firm performance	Cross-sectional
Lehmann et al. (2012)	Develop models of user engagement with online services and establish relations between engagement metrics	Empirical	Online services (web pages)	N/A	Customer	N/A	Popularity, activity, loyalty	Both
van Doorn et al. (2010)	Develop and discuss the concept of CE behaviors	Conceptual	General	Customer characteristics and firm drivers	Both	N/A	Firm value	N/A
Verleye et al. (2014)	Propose and test a theoretical model of managerial and psychological processes to encourage CE behaviors that are embedded in a broader network of customers and stakeholders	Conceptual and empirical (survey, correlational)	Nursing home sector	Customer affect, customer role readiness	Customer	Utilitarian	Compliance, cooperation, feedback, helping other customers, positive WOM	Cross-sectional
Vivek et al. (2012)	Explore the nature and scope of CE as a component of relationship marketing	Conceptual	General	Involvement, customer participation	Customer	N/A	Value, trust, affective commitment, WOM, loyalty, brand community involvement	Cross-sectional
This study	Propose that behavioral engagement from a well-being perspective is dynamic and should be sustained over time to create well-being	Conceptual	Retirement planning	Context dependent	Both	Both	Customer well-being	Longitudinal

3.1 Nature of Engagement

The main body of CE research resides in the marketing and service research domains. Most engagement research is conceptual or survey-based and often takes a cross-sectional perspective. Widely established and accepted among most scholars, CE is commonly defined as a multi-dimensional concept, comprising cognitive, affective, and behavioral dimensions, which reflect an individual's willingness to invest in focal interactions with particular engagement objects (Brodie et al., 2015; Harmeling et al., 2017; Hollebeek et al., 2016). Our literature analysis (Table 1) reveals that while no single definition for CE exists, most studies draw from Brodie et al. (2011, 258), who describe engagement as "a psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent/object (e.g., a brand) in focal service relationships."

Many studies specifically focus on the behavioral manifestation of engagement (e.g., Jaakkola & Alexander 2014; van Doorn et al., 2010). Engagement behaviors represent contributions of resources (e.g., knowledge, money, skills, time, and effort) directed toward the service provider or other customers (Jaakkola & Alexander, 2014; van Doorn et al., 2010). For example, customers can support service development by offering their ideas and can influence and mobilize other customers by extending their recommendations and preferences (Azer & Alexander, 2020; Jaakkola & Alexander, 2014; van Doorn et al., 2010). Vivek and colleagues (2012, p. 133) describe CE as the "intensity of an individual's participation in and connection with an organization's offerings and/or organizational activities, which either the customer or the organization initiate."

Engagement research thus considers customers' psychological dispositions, which manifest themselves in behaviors. Importantly, CE has been conceptualized as the affective and cognitive commitment toward a service, which ultimately serves as the basis of service (re-)consumption and other relevant behavior, such as loyalty toward or the patronage of a service provider and their offered services (Bowden, 2009; Kumar et al., 2019). This leads us to synthesize the different definitions and define CE as "the intensity and propensity of a customer's voluntary affective, cognitive, or behavioral resource contribution towards or due to a service provider's offering" (Brodie et al., 2019; Hollebeek et al., 2018).

3.2 Drivers of Engagement

Customer Drivers

Our overview of the engagement literature (Table 1) reveals that studies often consider the customer, as opposed to the firm, as the initiator of engagement. Research often investigates the role of customer-related drivers of CE, such as participation, involvement, satisfaction (Brodie et al., 2011; Vivek et al., 2012), activation (Hollebeek, 2013; Hollebeek et al., 2014), or emotional and affectional drivers (Groeger et al., 2016; van Doorn et al., 2010; Verleye et al., 2014). Verleye and colleagues (2014) also highlight customer affect and customer role readiness as important drivers of engagement outcomes. The underlying assumption, thus, is that engagement occurs within a pre-existing customer relationship where a customer and firm interact, and the customer has an affective or cognitively aroused stance toward the brand or firm.

Firm Drivers

Some research focuses on firm-related drivers (i.e., what firms can do to trigger engagement from customers) (Fehrer et al., 2018). Similarly, Alvarez-Milán et al. (2018) outline five facets of CE marketing (conceptualization, target, domain, experiential routes, and value) that companies can follow to influence their customers and, thus, root engagement at the strategic level of the firm. In addition, Beckers et al. (2018) provide empirical evidence that firm-initiated CE activities, such as launching an application, user-generated content competitions, or blogs, can backfire and, therefore, need to be fully understood and carefully implemented by firms to reap the expected benefits, such as positive word of mouth (WOM). Harmeling et al. (2017) conceptualize CE marketing as a tool for firms that can, if applied correctly, significantly impact firm performance. In sum, some of the research takes the perspective of positioning the firm as the driver of engagement or acknowledges the dichotic nature of engagement drivers. These examples highlight that CE drivers need to be understood from a customer and a firm perspective to explicitly optimize the outcomes of CE for the focal actor, the customer, and the firm.

3.3 Outcomes of Engagement

When reviewing the literature on CE outcomes, it becomes evident that most literature, while focusing on customer-related drivers, investigates outcomes that are relevant for the firm, such as firm performance, market value, repeat purchase behavior, or brand loyalty and value (Table 1). For example, Groeger et al. (2016) identify how customer-related drivers, such as

personality and mood, impact awareness, knowledge, and future purchase intentions of a firm's offerings. One stream of research identifies brand- or image-related outcomes (Brodie et al., 2013; Hollebeek, 2011, 2013; Hollebeek et al., 2014; 2017) or directly investigates the effect of CE on competitive advantage and the subsequent firm performance (Kumar et al., 2016; Kumar & Pansari ,2016; Kumar et al., 2019). Another set of CE-related outcomes focuses on the concept of value creation, addressing either service or firm value (Heller et al., 2021; van Doorn et al., 2010) or value co-creation for firms and customers (Breidbach et al., 2014; Jaakkola & Alexander 2014). While the research on value co-creation takes the customer into account when discussing outcomes of CE, only a few examples focus on customers as beneficiaries of their own engagement activities (Hollebeek, 2013) or posit customers' well-being at the center of the service system (Henkens et al., 2020). It can be concluded that CE research has focused on the outcomes that engagement has for firms or firm-customer relationships, and less on how engagement can impact customers and their well-being.

4. ENGAGEMENT IN THE RETIREMENT PLANNING CONTEXT

Next, we review the literature on retirement planning to study how the different elements of engagement conceptualization outlined in the previous section play out in a utilitarian context. To this end, the review focuses on communication and engagement approaches to retirement planning (see Table 2). It excludes literature from economics/finance on retirement planning that addresses structural approaches such as auto-enrollment (e.g., Benartzi & Thaler, 2013).

Table 2

Overview of Research on Retirement Engagement

Study	Research focus	Research method	Research setting	Customer drivers of engagement	Firm drivers of engagement	Engagement outcomes	Time
Augustus-Vonken et al. (2019)	Study when social norms can positively affect log-in rates	Experiment and field experiment	Pension fund participants	Gender	Social norms, communication content (norms, compliments, and example behaviors), availability of choice, tailoring of the reference group	Portal log-ins, views of payment specifications, contribution rate (CR) (hypothetical)	Cross-sectional
Beshears et al. (2015)	Study the possibly discouraging effects of peer information	Experiment	Low-saving employees of a manufacturer	Current contribution rate default	Peer information	CR, enrollment in a savings plan	Cross-sectional
Beshears et al. (2021)	Study how pre-commitment nudges may backfire, and how a “fresh-start” nudge can increase contributions	Experiment	University employees	N/A	Framing	CR	Cross-sectional
Blakstad et al. (2017)	Study whether (the use of) life events can increase the effectiveness of communication	Mixed methods: survey and interviews	Experts and pension plan participants	Occurrence of life events	Life-event-based communication	CR, attitude toward pensions	Cross-sectional
Brüggen et al. (2017)	Provide advice for the pension industry on how to design an engaging decision environment	Conceptual	Insights from behavioral economics	N/A	Choice architecture	N/A	N/A
Brüggen et al. (2019)	Study whether interactive planning tools can affect engagement with retirement planning	Experiment	Hypothetical	Gender	Level of interactivity in tool	Number of clicks, retirement planning intentions	Cross-sectional
Bryan and Hershfield (2013)	Study how an appeal based on obligations to one’s future self affects savings decisions	Experiment	University employees	Closeness to future self	Framing	CR	Cross-sectional

Study	Research focus	Research method	Research setting	Customer drivers of engagement	Firm drivers of engagement	Engagement outcomes	Time
Choi et al. (2017)	Study how contribution rate cues in communication affect saving decisions	Experiment	Technology firm employees	N/A	Saving rate cues	CR	Cross-sectional
Clark et al. (2019)	Study how an informational nudge affects retirement savings	Experiment	Older public employees	Current participation in a savings plan	Information about supplemental saving plans	CR, development of retirement plan, confidence about preparedness for retirement	Both
Collins and Urban (2016)	Study whether an information-based intervention increases retirement savings	Field experiment	Employees of credit unions	N/A	Online financial education course	CR, self-reported retirement knowledge	Both
Dinkova et al. (2018)	Study whether tailored information can increase the acquisition of pension information	Field experiment	Employees of A pension insurance company	Age	Tailoring information based on age	Time spent in a digital pension environment, clicks on age-relevant pension information	Cross-sectional
Dinkova et al. (2022)	Study whether tailored information can increase the acquisition of pension information	Field experiment	Employees of an insurance company	Gender, age	Tailoring information based on age and gender	Clicks on links, log-ins to pension checking tool, time spent in pension tool	Cross-sectional
Duflo and Saez (2003)	Study how information and social interactions affect the decision to enroll in a workplace retirement benefit plan	Field experiment	University employees	Social network with colleagues	Monetary reward, social spillover effects	Attendance at information fair, enrollment in retirement benefit plan	Both
Eberhardt et al. (2021)	Study how goal framing can affect retirement engagement behavior	Online, lab, and field experiments	General public	N/A	Framing	Clicking behavior, information acquisition intentions	Cross-sectional
Eberhardt et al. (2022)	Develop and validate a conceptual model of retirement engagement	Field survey	Members of pension fund	Perceived susceptibility, severity, benefits, barriers, self-efficacy, trust, and retirement anxiety	N/A	Intention to search for information about expected pension benefits	Cross-sectional
Finseraas et al. (2017)	Study whether the effects of information about a pension reform on knowledge last over time	Experiment	General public	N/A	Provision of information brochure	Knowledge about pension reform	Longitudinal

Study	Research focus	Research method	Research setting	Customer drivers of engagement	Firm drivers of engagement	Engagement outcomes	Time
Goda et al. (2014)	Study how income projections affect retirement savings	Experiment	University employees	Gender	Income projections with varying levels of detail	CR	Cross-sectional
Goldin et al. (2020)	Study whether decision complexity affects retirement plan participation	Field experiment	Army service members	N/A	Contribution rate suggestion	Retirement plan participation	Longitudinal
Hentzen et al. (2022)	Study adoption drivers of a mobile retirement app	Survey	General public	Financial self-efficacy, financial security, consideration of future, involvement, perceived usefulness and ease, mobile computing self-efficacy, prior use	N/A	App adoption intention, anticipated engagement	Cross-sectional
Hershfield et al. (2011)	Study how the vividness of the future self affects retirement savings	Experiment	Hypothetical	N/A	The vividness of future self	CR	Cross-sectional
Hoffmann and Plotkina (2020)	Study how and for whom information design affects retirement planning intentions, willingness to learn about retirement, and actual retirement preparation	Experiment	General public	Perceived financial security, construal level	Source, tone, and graphical elements in information	Retirement planning intentions, willingness to learn about retirement, retirement preparation	Longitudinal
Knoef et al. (2020)	Study how message framing and communication channels affect pension awareness	Experiment and quasi-experiment	General public	N/A	Message framing and communication channel (letter vs. Facebook)	Knowledge and log-ins to pension checking	Both
Krijnen et al. (2020)	Study how inaction inertia can be overcome by message framing	Experiment	Hypothetical (scenario)	N/A	Framing	Likelihood of enrolling in a hypothetical retirement plan	Cross-sectional
Montgomery et al. (2011)	Study how message framing can engage young workers with retirement savings	Experiment	General public	Age	Communication strategies (abstract vs. concrete, long vs. short term)	Saving intentions	Cross-sectional
Van Hekken and Das (2019)	Study a visual metaphor about pension accrual affects the understanding of pensions and attitudes toward retirement	Experiment	Participants in Dutch pension plans	N/A	Use of a visual metaphor	Understanding, attitudes toward retirement	Cross-sectional

4.1 Nature of Retirement Engagement

In analogy with the service literature, we conceptualize retirement engagement as the intensity and propensity of a customer's voluntary affective, cognitive, or behavioral resource contribution toward retirement planning. Forms of engagement may include whether the customer is aware of the policies offered by a retirement service provider, seeks information about retirement, or otherwise cognitively, affectively, or behaviorally engages with the topic of retirement planning itself and/or platforms or services offered by the provider. Although recent studies have started to investigate engagement with retirement planning (e.g., Eberhardt et al., 2021, 2022; Hentzen et al., 2022), the large majority either study cognitive dispositions (especially financial literacy; e.g., Lusardi and Mitchell 2014; van Rooij, et al., 2012) or behaviors at the very end of the retirement engagement funnel (e.g., increasing contribution rates, additional savings; Bryan & Hershfield, 2013; Choi et al., 2017; Goda et al., 2014).

4.2 Drivers of Retirement Engagement

Customer Drivers

A substantial research stream in economics, marketing, and finance seeks to explain why people do not engage in retirement planning (e.g., Brüggen et al., 2013), and it has identified bounded rationality as a key hurdle to engagement. For example, people find it difficult to trade off current gains/losses against future ones (Frederick et al., 2009), have biased beliefs about the availability of time and resources in the future (Zauberman & Lynch 2005), rely on habits that are hard to break (Wood et al., 2005), and have difficulty imagining the future or one's future self (Hershfield et al., 2011). Most people think very abstractly about the distant future and, therefore, do not consider the specific actions that are needed to achieve, for example, their desired retirement incomes (Trope & Liberman, 2003). As retirement savings accumulate over time, people often do not perceive a pressing need to take immediate action. Even if people understand that they should act, they often lack the self-control required to implement measures that demand immediate effort and costs, provide no immediate gratification, and promise only distant benefits (O'Donoghue & Rabin, 1999). Eberhardt et al. (2021) found that perceived susceptibility, severity, benefits, barriers, and self-efficacy explain people's search for retirement information. Many people prefer not to think about their retirement because of the "retirement anxiety" they experience, including negative images of themselves at retirement (Eberhardt et al., 2022).

Other individual characteristics that can act as drivers of retirement engagement are the occurrence of life events (Blakstad et al., 2017), closeness to one's future self (Bryan & Hershfield, 2013), and financial security (Hoffmann & Plotkina, 2020). Finally, basic characteristics, such as demographic differences in age and gender, are used as a basis for understanding individual differences in engagement (e.g., Dinkova et al., 2022; Montgomery et al., 2011). Overall, the individual differences that affect engagement with retirement planning often have a temporal element (e.g., closeness to one's future self), and individual differences in competence (e.g., self-efficacy or financial literacy) or capability (e.g., financial security) may be barriers to engagement.

Firm Drivers

The literature on retirement engagement predominantly describes the "firm" (i.e., pension fund, insurance company, bank, or government) as the initiator of engagement. An analysis of the literature reveals that nudges are frequently used to trigger engagement. Nudges are gentle attempts to influence people's behavior (Thaler & Sunstein, 2008). One example is the framing of information, whereby the style or wording but not the content of the communication is adjusted (e.g., Beshears et al., 2021; Bryan & Hershfield, 2013; Eberhardt et al., 2021; Knoef et al., 2020; Krijnen et al., 2020; Montgomery et al., 2011). Eberhardt et al. (2021) find that a prevention-oriented assurance frame is twice as effective as a promotion-oriented investment frame for increasing participants' engagement behavior. Other examples of nudging to increase engagement include the use of social norms (e.g., Augustus-Vonken et al., 2019), peer information (e.g., Beshears et al., 2015), and saving cues (e.g., Choi et al., 2017).

Additional drivers of engagement through communication are the message tone and source (Hoffmann & Plotkina, 2020), life-event-based communication (Blakstad et al., 2017), tailoring (Dinkova et al., 2018; 2022), and the use of visuals (Van Hekken & Das 2019). Moreover, the choice architecture can affect retirement engagement. In a conceptual paper, Brüggen and colleagues (2017) describe how choice architecture can enable customers to become more engaged with their retirement planning. Empirical evidence at the level of interactivity in a retirement income planning tool demonstrates that choice architecture can positively affect retirement planning intentions (Brüggen et al., 2019).

Moreover, an information-based approach is used to drive retirement engagement. The provision of information (Clark et al., 2019; Finseraas et al., 2017), the level of detail in

income projections (Goda et al., 2014), information fairs (Duflo & Saez 2003), and online education courses (Collins & Urban 2016) are among the strategies used in this approach. It appears to rely on the notion that if information is passed on to customers in an effective way, they will take action. Thus, this approach relies heavily on the cognitive side of engagement as it entails the effective transfer of knowledge and information. The firm drivers of engagement in the context of retirement planning generally involve communication – either through small subtle nudges and the design of choice architecture or through the transfer of information.

4.3 Outcomes of Retirement Engagement

A variety of outcomes that are related to engagement are presented in the retirement literature, but as described earlier, they are usually not labeled as engagement outcomes. The most frequently studied outcomes are behavioral ones, such as increases in retirement savings, enrollment in pension schemes, the obtainment of retirement products, and opt-out rates (e.g., Bryan & Hershfield, 2013; Choi et al., 2017; Goda et al., 2014). As shown in Table 2, other studied behavioral outcomes of engagement are online behavior (log-ins to portals that provide an overview of accumulated retirement income and the number of clicks, number of views, or time spent in such portals), retirement planning (e.g., the development of a retirement plan), and event attendance. The predominant outcomes of retirement engagement that are currently being studied are behavioral. As demonstrated in Table 2, cognitive engagement outcomes are less frequently studied, as are affective engagement outcomes to an even greater extent.

5. COMPARISON AND SYNTHESIS FOR AUGMENTING ENGAGEMENT RESEARCH

Our analyses of the literature on engagement and retirement planning lead to a range of observations. Service and marketing research and retirement research offer a different picture of the nature of engagement, the relevant customer and provider drivers, and the outcomes of engagement. Below we describe the assumptions that are held in CE research and how they can be criticized by evaluating their applicability in a utilitarian service context. This comparison leads to implications and conclusions for both literature streams and, therefore, provides novel insights into how both literature streams can be expanded (Table 3).

5.1 Nature of Engagement

Elements of the Engagement Construct

Our comparison of the CE and retirement engagement literature shows that in marketing and service research, engagement is approached as cognitive, emotional, and behavioral investments toward a firm or a brand. The engagement behaviors that are studied are based on high emotional and cognitive dispositions. This is in contrast to retirement planning studies, where engagement behaviors are often observed without pre-existing emotional or cognitive dispositions. As studies on retirement engagement research mostly focus on customer interaction with the "offering" (e.g., retirement planning tools, retirement contributions), they provide limited insights into indicators of affective or cognitive engagement that are of relevance.

In utilitarian contexts, the interplay between attitudinal, cognitive, and behavioral engagement elements may be different: individuals may have a negative attitude toward a utilitarian service provider but still engage behaviorally for their own benefit as they are not able to achieve the same through another service provider. Currently, it is not yet clear to what extent affective, cognitive, and behavioral engagement differs for utilitarian and hedonic service contexts. Studying which types of engagement are relevant for which service context could extend the engagement literature.

Time Perspective of Engagement

Our review shows that marketing and service research on CE often utilizes cross-sectional methodology, such as experiments or surveys, to measure the effects of engagement on certain outcome variables at a single point in time. Even when actual purchase or engagement data from service providers are used, they often focus on a short period of time, such as engagement before and after the implementation of an advertising campaign or a new customer relationship management (CRM) system. Studies generally only focus on one service encounter rather than looking at a time series of encounters, despite the latter representing what customers usually experience when interacting with a service provider (e.g., a customer usually goes to a hairdresser multiple times per year or takes a variety of classes at an educational institute).

The examination of retirement planning as an engagement context highlights that the outcomes of engagement need to be understood as a longitudinal process. Individuals build up retirement incomes over a long period of time, and their proximity to retirement and life

events (Blakstad et al., 2017) may affect their engagement with retirement planning. While this longitudinal perspective is well acknowledged in retirement research, studies in that domain also heavily focus on cross-sectional research and study the effect of one intervention at one moment in time. Our comparison of the literature demonstrates that a longitudinal perspective on engagement is currently underrepresented in both streams of literature, even though a consensus among academics acknowledges that engagement is an ongoing process consisting of multiple touch points and a magnitude that may change over time (Kumar & Pansari, 2016). We argue that to enhance engagement research, novel, and relevant insights can be gained by studying an engagement journey rather than measuring cross-sectional outcomes of one intervention. Research on such engagement can create insights into how engagement develops over time and to what extent the positive effects of engagement are lasting.

Role of Interaction and Connectedness

Marketing and service research highlights interaction and connectedness as key elements of CE. It is assumed that engagement occurs through interactive experiences and relationships with the focal firm or brand and other customers. Our review of the retirement engagement literature suggests that in utilitarian contexts, the role and value of interactions with other customers may be smaller as they may be perceived as private, or even taboo, conversation topics. Research shows that among married couples, money is a taboo topic (Atwood, 2012) and that even financial planning students do not discuss money openly (Alsemgeest, 2016). It would be insightful to study how interactions between customers affect engagement with utilitarian services. In utilitarian contexts, customer interactions are possibly less relevant as engagement is probably more private than social. To extend engagement research, it should be acknowledged that the role of interactions in engagement may depend on the nature of the offering (utilitarian vs. hedonic).

5.2 Customer Drivers of Engagement

Source of Motivation

Our review of the literature highlights that marketing and service research focuses primarily on customer-related drivers of engagement, such as participation, involvement, and satisfaction (Brodie et al., 2011; Vivek et al., 2012), activation (Hollebeek, 2013; Hollebeek et al., 2014), or emotional and affectional drivers (Groeger et al., 2016; Van Doorn et al., 2010; Verleye et al., 2014). While some research certainly addresses firm-related drivers (e.g.,

Alvarez-Milán et al., 2018), the majority sees engagement as coming from the focal customer. In contrast, in the retirement engagement literature, we find that the emphasis is on firm drivers of engagement. In utilitarian service contexts, where customers are generally not engaged and where relational drivers may be less relevant, it is problematic to assume that engagement is driven by satisfaction, emotional attachment, and commitment to the firm or brand.

Our review indicates that the source of motivation to engage differs between hedonic and utilitarian service contexts. In marketing and service research, it is assumed that customers have an intrinsic motivation to engage because it is fun, leisurely, and enables self-expression. Retirement research suggests that in utilitarian contexts, the motivation to engage may mostly be driven by exogenous triggers and functional goals. Engagement may be seen as necessary and not enjoyable. Individuals may engage to ensure security, adhere to guidelines or norms, or to be organized. These differences in the motivation for engagement between hedonic and utilitarian contexts may form a fundamentally different basis for CE to unfold.

Key Customer-Related Drivers

The type of customer-related drivers of engagement may differ significantly between hedonic and utilitarian engagement contexts. Whereas the CE literature highlights social drivers, the role of customer networks in spreading engagement appears to be minor in utilitarian contexts. As exemplified by the retirement context, customers may require specific knowledge and skills to engage with their service providers. For example, Farrell and colleagues (2016) show that financial self-efficacy is a strong predictor of financial behavior, and high levels of financial self-efficacy are associated with engagement with retirement investment and savings products. Low financial self-efficacy is a major barrier to engagement in low-engagement contexts, such as retirement planning (Eberhardt et al., 2022; Lim et al., 2014). In the CE context, skills are not directly required as a precondition for engagement. In utilitarian service contexts, some level of knowledge and skills may be a precondition before other personal predictors of engagement come into play. Future research should address which novel customer drivers and barriers to engagement can be identified and to what extent they are applicable in hedonic or utilitarian contexts.

5.3 Provider Drivers of Engagement

Approaches to Stimulating Engagement

The CE literature assumes that engagement can be triggered by stimulating emotional experiences, encouraging dialogue, incentivizing behaviors, and inviting customers to participate. However, in utilitarian contexts, providers often need to build up cognitive and emotional engagement from zero or counter negative engagement dispositions. For example, while creating emotionally stimulating content may be beneficial for engagement in a brand-relationship context, it may not be beneficial for retirement service providers, who frequently deal with negative feelings, such as worry, uncertainty, and skepticism (van Hekken et al., 2022). The current knowledge of how providers can stimulate engagement may not be valid in settings with low baseline levels of engagement, as the strategies for increasing engagement that are discussed in the CE literature assume that there is a willingness to engage. More research is needed to identify which engagement strategies are applicable in utilitarian contexts. For example, education may play an important role due to information asymmetry between providers and customers. Future research could focus on which strategies from the CE literature are applicable in a context where customers do not want to engage due to the nature of the service.

The Nature of Initiatives to Trigger Engagement

A comparison of the approaches service providers use to stimulate engagement demonstrates noticeable differences between the CE and retirement engagement literature. Whereas the CE literature includes affective and cognitive components, the retirement literature predominantly focuses on cognitive aspects. In CE research, it is assumed that fun and experiential benefits-based marketing initiatives trigger engagement. Service providers can leverage organically emerging engagement in hedonic contexts, whereas, in utilitarian contexts, the role of organic engagement is minor. In the retirement engagement literature, the research focus often entails one-way communication, in which communication is sent to customers, rather than a more bidirectional approach, in which customers and companies engage in dialogue or another form of participation or co-creation. In utilitarian contexts, the focus might be on countering negative dispositions rather than leveraging positive ones. Engagement research can be extended by assessing how hedonic triggers affect engagement in a utilitarian context, where the focus is on outcomes rather than experiences. This

mismatch between the triggers and context could be seen as either refreshing or inappropriate and is worth empirical investigation.

5.4 Customer Outcomes of Engagement

Nature of Customer Outcomes

It is striking to observe that the dependent variables in current CE research within the marketing and service domains rarely ever capture the benefits that customers gain from their own engagement activities. Studied customer outcomes include increased trust, affective commitment, loyalty, self-brand connections, and WOM intentions. Other benefits are seldom discussed. In retirement engagement research, there is a large focus on how engagement affects individual outcomes, rather than on which benefits the service provider gains from engagement. By not studying outcome variables that capture the outcomes of engagement for customers, engagement research loses some of its potential to advance well-being and value creation. The scope of customer outcomes should be expanded to include well-being and other outcomes relevant from a TSR perspective. Similarly, it would be valuable to assess to what extent customer outcomes studied in the CE context are relevant to utilitarian contexts. For example, cognitive outcomes may be more relevant than affective outcomes in utilitarian services. Furthermore, the specific customer outcomes that are relevant may differ: for example, in utilitarian contexts, behavioral outcomes may be less focused on other customers.

Finally, it is not clear what the optimum level of engagement is in either research context. An implicit assumption in CE research is that CE is positive for customers, and the more engagement, the better. This assumption does not necessarily hold in utilitarian contexts. Higher levels of engagement are not necessarily positive for customers. For example, if an individual checks the development of their pension capital daily, they could make suboptimal investment decisions that would not have occurred if they had engaged less frequently (e.g., Fellner & Sutter^, 2009). Similarly, the health context demonstrates that higher levels of engagement may be adverse: for example, if individuals are constantly thinking about possible negative health outcomes, it may lead to anxiety and reduce customer well-being (Asmundson et al., 2010). Over-engagement may thus lead to negative customer outcomes. The engagement literature can be enriched by studying the levels of engagement that are desirable in different service contexts.

Timing and Scope of Customer Outcomes

The benefits that a customer receives from engaging may differ between utilitarian and hedonic service contexts. Our analysis of the literature reveals that in CE research it is generally assumed that engagement benefits occur during the service process and relate to firm or brand relationships. In utilitarian contexts, the benefits from engaging occur mostly after the service since they are related to the outcomes rather than the process of engagement. Therefore, in utilitarian contexts, the benefits of engagement may be long-term rather than short-term. It is possible that in a utilitarian context, positive short-term outcomes, such as positive affective responses to an advertisement, do not translate into positive long-term benefits. For example, if customers perceive communication from their retirement service providers to be light, positive, and fun, they may not be triggered to take action to improve their retirement incomes, which may have negative long-term effects on their well-being. The engagement literature can be enriched by studying how the level, frequency, and timing of engagement and its benefits vary per context and over time.

Provider Outcomes of Engagement

CE research investigates how companies directly benefit affectively, cognitively, or behaviorally from engagement. One of the main outcomes of relevance for engagement in hedonic contexts is profit. In utilitarian contexts, the benefits of engagement for a firm or institution are less clear and are rarely the research focus, and some service providers may not be profit-driven. However, utilitarian service providers can also derive benefits from engagement, although it may be more indirect. Engagement enhances customer investments in the utilitarian service and, thereby, customer knowledge and goal achievement, facilitating customer satisfaction. For example, in the context of retirement planning, pension funds generally benefit when customers read their retirement information or log on to their portals, which provide an overview of one's accumulated retirement income since this allows the funds to fulfill their fiduciary duty of adequately informing their members. Utilitarian service providers may also benefit from lower costs if engagement causes customers to invest more. For example, in healthcare, customers may spend more time on their health if they are more engaged, which may aid prevention and reduce the chance of larger health problems over time. Different utilitarian settings may demand even more different relevant service provider outcomes from CE. The provider-related outcomes of engagement that are currently studied in CE research are not necessarily relevant for utilitarian service providers and vice versa.

Empirical research should address this question and distinguish how different service providers can benefit from a variety of service provider outcomes.

5.5 Contingency Factors

The sections above outline how engagement research can be extended by challenging the taken-for-granted assumptions in CE research and assessing their validity in a utilitarian context. Whereas we argue that a distinction between utilitarian and hedonic service research contexts exemplifies the possibilities for extending engagement research, we also note that findings that are applicable within one hedonic context are not directly transferable to other hedonic contexts. Our argumentation for utilitarian contexts is similar: for example, findings that are valid in a retirement context may not hold in a healthcare context. Therefore, we posit that contingency factors that specify what engagement depends on in a specific service setting should be considered. There is a wide range of contingency factors that may be the subject of research. For example, cultural and regulatory differences that apply to a specific service context may be important contingency factors for drivers and outcomes of engagement. Other factors that may be considered are the (social) desirability of engagement, the share-ability of engagement (e.g., through social media), or the time horizons of expected outcomes of engagement. Table 3 summarizes the assumptions in CE literature and the validity of these assumptions in utilitarian contexts, and posits conclusions and implications that we can draw from this comparison.

Table 3

Assumptions in Customer Engagement Literature and the Validity of These Assumptions in Utilitarian Contexts

Framework element	**Current assumptions in engagement research**	**Criticism of assumptions (*In utilitarian contexts …)***	**Conclusions and implications *(Differences in utilitarian vs. hedonic service settings)***
Nature of engagement			
Elements of the engagement construct	Engagement comprises cognitive, emotional, and behavioral investments toward a firm/brand.	Engagement behaviors often take place without pre-existing emotional or cognitive dispositions.	The relevance of affective, cognitive, and behavioral engagement differs.
	Engagement behaviors are based on high emotional and cognitive dispositions.		Research only measuring behavioral engagement may miss the role of psychological disposition.
			The engagement trajectories and the effectiveness of approaches for stimulating engagement could differ depending on the baseline level of engagement.
Role of interaction and connectedness	Engagement occurs through interactive experiences and relationships with the focal firm/brand and other customers.	The role and value of interactions with other customers may be smaller.	The role of interactions in engagement may depend on the nature of the offering (utilitarian vs. hedonic).
Customer drivers			
Source of motivation	Customers have an intrinsic motivation to engage because it is fun, leisurely, and enables self-expression.	The motivation to engage may mostly be driven by exogenous triggers and functional goals.	The differences in the motivation for engagement between contexts may form a fundamentally different basis for CE to unfold.
Key customer-related drivers	Engagement is driven by satisfaction, emotional attachment, and commitment to the firm/brand, assuming a pre-existing customer relationship.	Relational drivers may be less relevant, and the role of cognitive drivers, such as knowledge, may be pivotal.	Different contexts (utilitarian vs. hedonic) may be characterized by different customer drivers of engagement.
	Engagement spreads organically in customer networks.	The role of customer networks in spreading engagement is minor.	

Framework element	**Current assumptions in engagement research**	**Criticism of assumptions (*In utilitarian contexts …)***	**Conclusions and implications *(Differences in utilitarian vs. hedonic service settings)***
Provider drivers			
Approaches to stimulating engagement	Engagement can be triggered by stimulating emotional experiences, encouraging dialogue, incentivizing behaviors, and inviting customers to participate.	Providers often need to build up cognitive and emotional engagement from zero or counter negative engagement dispositions. Education is important due to information asymmetry between providers and customers.	The current knowledge of provider means to stimulate engagement may not be valid in settings with low baseline levels of engagement.
The nature of initiatives to trigger engagement	Fun and experiential benefit-based marketing initiatives trigger engagement. Providers can leverage organically emerging engagement.	There is less focus on the experience and more on the outcomes of engagement; therefore, engagement initiatives based on the "fun factor" might work less well. The role of organic engagement is minor.	It is unclear how the combination of a utilitarian context (focus on outcomes) and hedonic triggers affect engagement.
Customer outcomes			
Nature of customer outcomes	Engagement results in relational benefits, such as increased trust, affective commitment, loyalty, self-brand connections, and WOM intentions. Engagement results in positive outcomes for customers.	Engagement is more related to the outcome than the process, which makes individual outcomes more prominent. Cognitive outcomes may be more relevant than affective ones in utilitarian services. Behavioral outcomes may be less focused on other customers. Over-engagement may lead to negative customer outcomes.	Customer outcomes differ across contexts, but extant research has not addressed this. Most CE research investigates how companies can benefit from engagement; however, it is not clear to what extent customers benefit from engagement. We argue that it would be valuable to assess customer well-being as an outcome. It is not clear what the optimum level of engagement in different contexts is.
Timing and scope of customer outcomes	Engagement benefits occur during the service process and relate to firm/brand relationships.	Engagement benefits in utilitarian contexts occur mostly after the service since they are related to the outcomes rather than the process of engagement.	The level, frequency, and timing of engagement and its benefits vary per context and over time.
Provider outcomes			
Positive provider outcomes	Firms benefit from engagement as it facilitates repeat purchases, WOM, firm performance, and market value.	Firms can benefit from engagement as it enhances customer investments in the utilitarian service and, thereby, customer knowledge and goal achievement, facilitating customer satisfaction.	The provider-related outcomes of engagement that are currently studied in CE research are not necessarily relevant for utilitarian service providers.
Contingency factors	Every service setting has its own specific characteristics that are likely to affect the nature, drivers, and outcomes of engagement.		

6. CONCLUSIONS AND IMPLICATIONS

This article provides an overview of the engagement as well as retirement planning literature to synthesize extant understanding of the nature, antecedents, and outcomes of engagement. Our analysis reveals that certain taken-for-granted assumptions in the engagement literature do not necessarily hold in different settings. Specifically, we identify key differences in the nature of engagement, customer and provider drivers of engagement, and customer and provider outcomes of engagement. We conclude that the CE literature (as well as the retirement engagement literature) can benefit from critically reviewing the implicit assumptions that underlie the existing literature.

6.1 Theoretical Contributions

In line with theory adaptation (Jaakkola, 2020), we inform the existing engagement theory by contrasting it with retirement planning research, which can provide new insights in a utilitarian engagement context. This approach allows us to critically examine the scope of engagement theory without compromising the existing knowledge and definitions in this field. The main contribution and pursued impact of this paper consists of a roadmap for expanding the scope of engagement research. This is achieved through four specific contributions to current research knowledge.

First, this study highlights the importance of the context for engagement by demonstrating that the current assumptions regarding engagement may not be generalizable across contexts. Our analysis allowed us to pinpoint points of difference in the nature and nomological network of the engagement concept within hedonic versus utilitarian contexts, contributing to engagement research that has seldom addressed the issue of context.

Second, this study makes the current premises of engagement research visible and problematizes some of these extant assumptions. While many studies have analyzed the evolution of engagement research, few if any, previous studies have condensed or challenged its predominant assumptions. Through this analysis, the study provides a future research agenda that highlights questions that need to be addressed to expand the boundaries of engagement research.

Third, we shift the applicability domain of engagement research by arguing how the engagement literature can address customer well-being rather than firm-focused outcomes. The expansion of CE literature to include these settings would be in line with TSR (Anderson

& Ostrom 2015; Boenigk et al., 2021), in which customer well-being is a key outcome of interest.

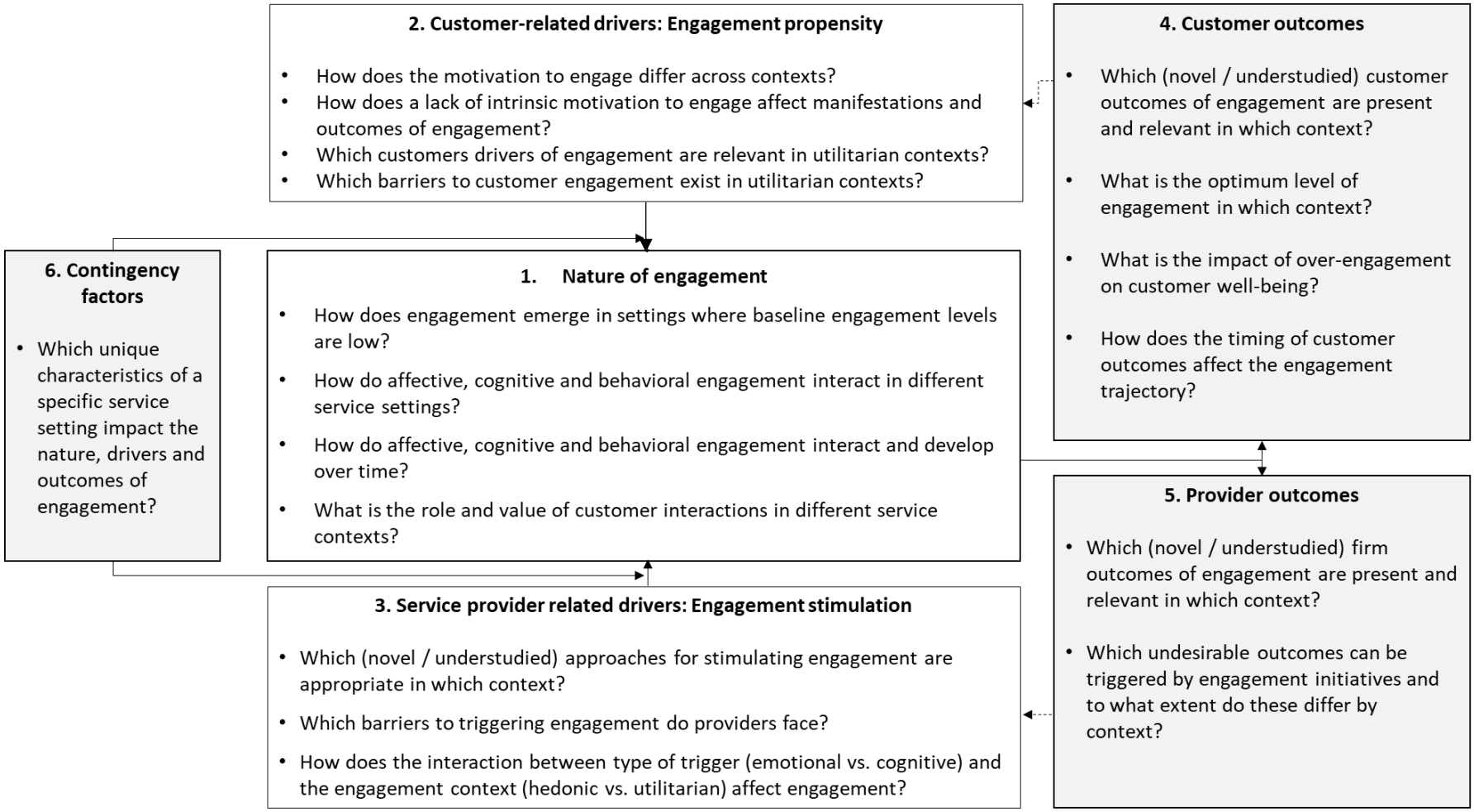
Fourth, our study contributes to research on retirement planning by highlighting current knowledge gaps in this domain. Our analysis highlights how learnings from the engagement literature can help to address the lack of engagement in utilitarian service contexts. Our analysis bridges these two domains and helps identify common denominators between them.

6.2 Agenda for Future Research

Based on our analyses, we develop exemplary research questions that show how engagement research can be expanded. The exemplary research questions in Figure 2 highlight questions that should be addressed to develop a broader and more holistic view of engagement. Whereas in this paper we take engagement with retirement planning as an example, we would like to emphasize that our reflections can be applied to many different domains and contexts, such as health, finance, or education. To increase engagement, the core variables that characterize a specific context should be identified, as they may require a different strategy regarding engagement.

Figure 2

Research Agenda for Augmenting Engagement Research



6.3 Practical Implications

Our comparison of the literature illustrates that there is a need for further research to fully understand the firm drivers and outcomes of engagement. However, the contrasts between extant literature on CE and retirement engagement already provide directly applicable insights for service providers in both utilitarian and hedonic service settings.

Utilitarian service providers, such as healthcare providers, utility providers, and financial institutes, who are aiming to improve CE based on empirical insights, should not simply accept findings from engagement literature. Utilitarian service providers should critically consider whether the empirically tested strategies for increasing engagement in hedonic contexts can be generalized to their specific service settings. This critical examination does not mean that utilitarian service providers cannot learn and take inspiration from CE research. In contrast, we believe that CE research can serve as a basis of inspiration for them. For example, utilitarian service providers may consider whether, in their specific service contexts, there are strategies that make customers enjoy the process of engagement rather than only the outcomes. Besides, they may expand their views on engagement to not only include behavioral but also cognitive and affective dispositions, as is already common practice in the hedonic service context. Thus, the starting point for increasing engagement should be to consider the context.

Hedonic service providers can also derive new insights from our analyses. Our analysis of the literature shows that in hedonic service research, there is a focus on firm outcomes rather than customer outcomes, whereas, in utilitarian service research, the reverse pattern is true. If hedonic service providers pay additional attention to customer rather than firm outcomes, they may gain a competitive advantage. For example, firms may want to explore how their services increase customer well-being. Regarding customer drivers of engagement, it may be worthwhile to consider how customer skills may affect engagement with hedonic services. In utilitarian service contexts, it is often clear that customers need specific skills (e.g., numeracy) to engage with a service, and firms target this lack of skill to increase engagement (e.g., through information provision or education). In hedonic service contexts, the skills that are needed to engage may be less salient; however, it may be worthwhile to explore how a lack of skill, knowledge, or efficacy in using mobile applications acts as a barrier to engagement. Hedonic service providers may take inspiration from retirement engagement research to understand how to reach unengaged customers. Whereas, on average, individuals

may be more engaged with hedonic services, some people are still unengaged. It is possible that approaches to trigger engagement that are commonly used in utilitarian contexts, such as information provision, may be more appropriate for engaging this specific customer segment.

Finally, we showed that the context in which engagement takes place is important and should be studied more broadly. Practitioners should study how their context impacts engagement and share these results so that researchers can learn about the context dependency of engagement.

7. LIMITATIONS

To challenge the existing assumptions in CE research, we differentiate utilitarian and hedonic service contexts. However, in practice, this distinction may not be dichotomous and may be more nuanced. For example, a hedonic service context, such as going to a theme park, may still have utilitarian elements, such as finding a parking spot. In addition, individual dispositions may affect whether individuals perceive a specific context as utilitarian or hedonic. Some individuals may derive joy from planning their retirement, and others may perceive a day at a theme park as a utilitarian activity. Next to this, our comparison of hedonic and utilitarian service contexts is based on one specific utilitarian context, namely retirement planning. We selected this context for three reasons: (1) it presents an example of a clear utilitarian context (we could not identify any literature that refers to hedonic aspects in retirement planning); (2) engagement with retirement planning is extremely low (Aegon 2015); and (3) improvements in engagement with retirement planning are of high societal relevance and impact current and future (financial) well-being. We believe that our analysis provides meaningful insights and allows us to exemplify the generalizability of assumptions that are held in CE research. However, if our unit of analysis had been different, distinct or additional insights could have possibly emerged from our literature review. Finally, we provide a theoretical comparison of the streams of literature, based on which we derive and criticize assumptions that are present in the existing literature. However, to solidify our claims that the nature, drivers, and outcomes of engagement differ between service contexts, future research should generate empirical evidence.

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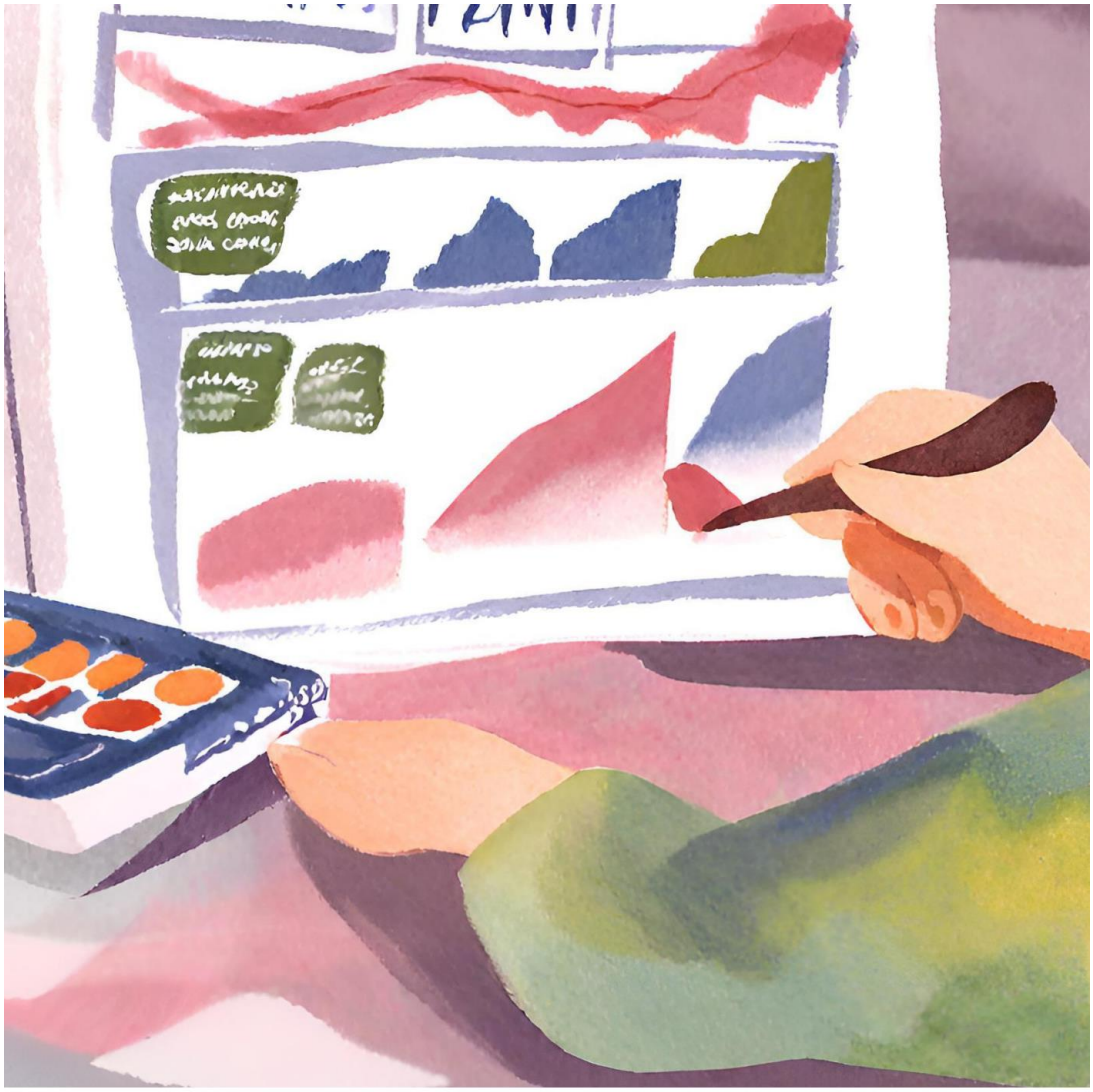
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CHAPTER 4

UNDERSTANDING THE FUNCTIONAL FORM OF THE RELATIONSHIP BETWEEN CHILDHOOD COGNITIVE ABILITY AND ADULT FINANCIAL WELL- BEING

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1. INTRODUCTION

The financial behaviors and outcomes of consumers exhibit significant variation. While some individuals are able to accumulate wealth and achieve financial success (Credit Suisse Research Institute, 2021), others struggle and become financially vulnerable (Federal Reserve Bank of New York, 2022). The increasing complexity of the financial landscape requires consumers to have a deep understanding of financial information to make decisions that promote their financial well-being (Angrisaniet al., 2020). As financial complexity continues to increase, cognitive ability emerges as a key individual difference factor in understanding the heterogeneity of financial decision making among consumers.

Cognitive ability, broadly defined as "the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience" (Gottfredson, 1997), is a strong predictor of knowledge acquisition (Ree & Carretta, 2022), which is crucial for making informed decisions in an increasingly complex financial system (Agarwal & Mazumder, 2013; Angrisani et al., 2020). Previous research has generally found positive associations between cognitive ability and financial well-being (e.g., Tang, 2021; Zagorsky, 2007; Furnham & Cheng, 2016). However, most research on the relationship between cognitive ability and financial well-being has assumed a linear relationship without testing alternative functional forms. Yet, there are no *a priori* reasons why linear relationships should be expected over non-linear ones, which represent a much larger set of all possible relationships. This assumption of linearity may result in biased point estimates and incorrect conclusions if the true relationship is non-linear. For example, Zagorsky (2007) found no significant association between cognitive ability and wealth, and argued that individuals with low cognitive ability can achieve financial success and that higher cognitive ability is not necessarily an advantage. However, it is also possible that the association between cognitive ability and wealth is present but non-linear. Without testing the functional form of the relationship, previous research may have underestimated the importance of cognitive ability in shaping financial well-being. This has important implications for interventions aimed at improving cognitive ability in childhood, which have the potential to improve financial literacy, knowledge and financial outcomes (Lin & Bates, 2022; Muñoz-Murillo et al., 2020). Therefore, it is crucial to examine the functional form of the relationship between cognitive ability and financial well-being to accurately capture the role of cognitive ability in shaping financial outcomes.

In addition to the theoretical implications, understanding the functional form of the relationship between cognitive ability and financial well-being has practical benefits for policymakers. Individuals with different levels of cognitive ability may have distinct strengths and challenges in achieving financial well-being. Current regulations, such as requiring banks to calculate and send appropriate credit card repayments alongside bills, aid consumers in making informed financial decisions (Stewart, 2009). However, if the relationship between cognitive ability and credit card debt is characterized by diminishing returns, targeted interventions aimed at reducing problematic debt for those with the lowest levels of cognitive ability would be more effective than interventions that apply to all consumers. Understanding the functional form of the relationship can help identify vulnerable groups and inform targeted policy interventions, with the goal of improving financial well-being for all individuals.

In this article we investigate the prospective effects of childhood cognitive ability on adult financial well-being. Specifically, we examine the effects of cognitive ability on debt, wealth, and subjective financial well-being. These financial outcomes represent the accumulation of consumer financial decisions over time, capturing whether consumers overspend (through credit) or sacrifice today by saving money for the future, and how these decisions translate into a subjective sense of financial well-being or distress. We use a unique longitudinal dataset, the British Cohort Study, in which cognitive ability is measured at age 10 and adult financial variables are measured over 35 years. Measuring cognitive ability in childhood allows for an accurate representation of cognitive ability as it is relatively stable over the life course (Deary et al., 2000; 2007). By measuring cognitive ability in childhood, we are able to control for childhood and parental economic relationships, which enables us to study the relationship between childhood cognitive ability and adult financial well-being with greater precision. The main objective of this study is to determine the functional form of the relationship between cognitive ability and financial well-being. This information can help us to better understand how cognitive ability influences financial outcomes, and can inform targeted interventions to improve financial well-being. One important exception is work by Zagorsky (2007) who documents a non-linear relationship between cognitive ability and three specific negative financial behaviors (i.e., being late paying bills, maxing-out a credit card and going bankrupt). Specifically, across all three outcomes, he finds a pattern where negative financial behaviors peak for those closer to average levels of cognitive ability and are more

positive for those with both higher and lower levels of cognitive ability. However, our study expands on this research by examining different financial outcomes and following the same group of individuals over their lifetimes, allowing us to use measures of cognitive ability from childhood and reduce the possibility of reverse causality.

Our second contribution is to test whether the effect of cognitive ability on adult financial outcomes is solely driven by differences in income. Given the positive relationship between cognitive ability and income (see Strenze, 2007 for a meta-analysis), any effect of cognitive ability on adult financial outcomes may simply reflect differences in income, as income is known to play an important role in increasing financial well-being (Brüggen et al., 2017). Thus, we assess whether there is an effect of cognitive ability beyond income to gain a more accurate estimate of its unique effect on financial outcomes. Controlling for income allows us to isolate the direct relationship between cognitive ability and financial outcomes and our results indicate that cognitive ability is indeed associated with financial well-being. This approach allows us to disentangle whether higher levels of cognitive ability are beneficial for financial well-being, or whether there is no advantage of higher cognitive ability beyond its effect on income.

1.1 Cognitive Ability and Financial Decision Making

The positive association between cognitive ability and financial decision making is well-established by past research. Studies have shown that higher cognitive ability is positively associated with financial outcomes such as greater wealth (Banks & Oldfield, 2007; Banks et al., 2010; Duckworth & Weir, 2010; Estrada-Meija et al., 2020; Furnham & Cheng, 2019), stock market participation (Christeliset al., 2010; Cole & Shastry, 2008), and financial planning (Chatterjee & Zahirovic-Herbert, 2010). Conversely, lower cognitive ability is associated with adverse financial behavior and outcomes, such as making more financial mistakes (Agarwal & Mazumder, 2013), having less financial knowledge (Banks 2007), being less likely to participate in market recovery (Bücher-Koenen & Ziegelmeyer, 2011), and being more likely to default on mortgages (Gerardi et al., 2013).

Research on the relationship between cognitive ability and debt accumulation is more limited and inconclusive, with mixed findings. For example, a recent laboratory experiment found individuals with lower cognitive ability were less averse to debt (Ahrens et al., 2022), and a neuroscientific study by Spinella and colleagues (2004) found that individuals with impaired executive functioning acquired more credit card debt. In contrast, another study

found that for elderly individuals in the United States, those with high cognitive ability were more likely to hold debt (Angrisani et al., 2020), possibly due to the complexity of credit products. Debt is a complex phenomenon that can have both positive and negative outcomes. Debt can be used to smooth consumption and to make financial (e.g., mortgages) and human capital (e.g., student loans) investments (Bialowolski & Weziak-Bialowolska, 2021). At the same time, excessive debt can lead to stress and financial instability (Brown et al., 2005). Therefore, as debt does not necessarily reflect an absence of financial well-being, in our study we focus on forms of debt that indicate suboptimal financial decision-making and exclude mortgage debt and credit card debt that is paid off monthly.

There are two main reasons why cognitive ability may lead to more positive financial decision making. First, cognitive ability aids the knowledge-acquisition and skills needed to make informed financial choices. People with higher cognitive ability are better at accessing and processing financial information, as they have a lower cost of acquiring such information (Bücher-Koenen & Ziegelmeyer, 2011; Shaffer, 2020; Tang, 2021). Additionally, cognitive ability is positively associated with financial literacy, as it helps individuals to understand basic financial concepts and make informed financial decisions (Murillo et al., 2020; Bucher-Koenen & Ziegelmeyer, 2011). Grasping basic financial concepts, such as the effect of compounded interest on the value of one‘s savings, is indispensable in understanding the importance of starting to save early for distant goals such as retirement. Similarly, knowledge about the costs of credit is invaluable in deciding whether to save for unexpected expenditures, such as those related to the breakdown of home appliances, or to take up credit to cover such costs. While financial literacy is essential for sound decision-making, many households lack an understanding of basic financial concepts (Lusardi & Mitchell, 2007). This poses a challenge, as financial literacy has been identified as a key variable to explain variation in a household's tendency to accumulate wealth (van Rooij et al., 2011). Although it is challenging to disentangle the effects of cognitive ability and financial literacy in adulthood, cognitive ability is typically thought to precede financial literacy (Delavande et al., 2008; Herd et al., 2012; Finke et al., 2017; Lin & Bates, 2022). As the knowledge required for good financial decision-making changes over time, general cognitive ability allows individuals to learn relevant financial skills when needed (Herd et al., 2012), and there is a large body that demonstrates the relevance of financial literacy for sound decision making (e.g., Lusardi & Mitchells, 2014; Goyal & Kumar, 2021).Second, the preferences of individuals with higher cognitive ability

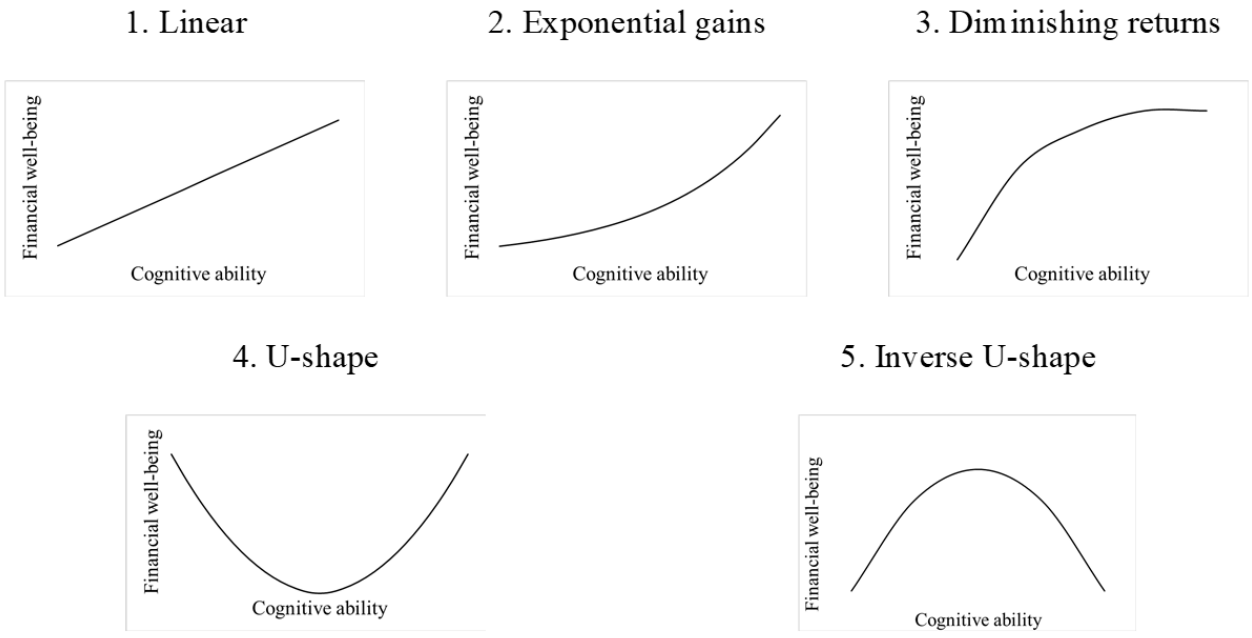
align more closely with sound financial behavior. For example, a meta-analysis by Shamosh and Gray (2008) found that higher cognitive ability is associated with less delay-discounting. On average, individuals with higher cognitive ability are more patient (e.g., Frederick, 2005), which can enable them to pursue education (Furnham & Cheng, 2019), succeed in employment (Vélez-Coto et al., 2021) and thus accumulate wealth. Furthermore, cognitive ability is associated with avoidance of negative risks such as substance abuse and approaching positive risks, such as stock market participation (Dohmen et al., 2018). However, while the evidence suggests that cognitive ability is associated with skills and preferences that precede positive financial outcomes, this does not imply that increased cognitive ability monotonically increases financial well-being.

1.2 The Functional Form of the Relationship between Cognitive Ability and Positive Financial Decision Making

The nature of the relationship between cognitive ability and financial well-being is currently unclear. We describe five possible types of relationships that may characterize the association between cognitive ability and measures of financial well-being (Figure 1).

Figure 1

Possible Functional Forms of the Relationship between Cognitive Ability and Financial Well-Being



Linear

Most previous literature on cognitive ability and financial well-being has modelled a positive linear relationship (Figure 1, panel 1), in which cognitive abilities are associated with more positive financial decision making, at all levels of cognitive ability (e.g., Banks et al., 2010). This assumption is partially based on findings in related domains, such as a meta-analysis by Coward and Sackett (1990) which found that non-linear relationships were only observed in 5-6% of studies on the relationship between cognitive ability and job performance. Similarly, Arneson et al. (2011) found that a linear relationship fits the relationship between cognitive ability and a variety of performance measures best. It is therefore also reasonable to expect a linear relationship between cognitive ability and financial well-being, as increases in cognitive abilities and related skills and preferences could consistently improve a person's financial decisions.

Exponential Gains

The relationship between cognitive ability and financial well-being may be characterized by exponential gains (Figure 1, panel 2). This means that a small increase in cognitive ability leads to a small increase in positive financial outcomes, but a large increase in cognitive ability results in disproportionately more positive financial outcomes. For example, Bergman et al. (2014) found that individuals in the 90^{th} percentile of cognitive ability outperform others on tasks beyond what would be expected from a linear relationship. Similarly, Lubinski (2009) reported that individuals in the 99^{th} percentile of cognitive ability are more likely to achieve exceptional outcomes such as securing patents. Given that cognitive ability is associated with an increased willingness to take risks and greater patience (Dohmen et al., 2010), the compounding effects of interest from investments and savings may result in disparities in financial outcomes between those with high versus low cognitive ability, indicating an exponential relationship.

Diminishing Returns

The relationship between cognitive ability and financial well-being could also exhibit diminishing returns, where the benefits of increased cognitive ability decline or even cease entirely after a certain point (Figure 1, panel 3). This hypothesis aligns with Spearman's law of diminishing returns, which argues that past a specific level of cognitive ability, differences in cognitive ability become less predictive of performance (McGill, 2015; Blum & Holling, 2017; Coyle & Rindermann, 2013). Additionally, some researchers have contended that the

benefits of cognitive ability reach a plateau at around an IQ score of 120 (i.e., those at the 90.9th percentile or greater) in terms of socially valuable characteristics such as creativity and academic achievement (Getzels & Jackson, 1962; Gignac et al., 2018). In the context of financial decision-making, a minimum level of cognitive ability may be necessary to understand and process complex financial information, but other (non-cognitive) factors may become more predictive of financial well-being after this initial threshold is met.

Curvilinear

Finally, the relationship between cognitive ability and financial well-being may be best described as curvilinear, reflecting either a U-shaped (Figure 1, panel 4) or inverted U-shaped relationship (Figure 1, panel 5). As demonstrated by Silver (2019), studies have found that the occurrence of negative behaviors such as delinquency peaks at average levels of cognitive ability and decreases for both individuals with high and low cognitive ability. This trend can be attributed to the availability of opportunities for individuals to engage in such behaviors. In the financial context, individuals with low cognitive ability may have limited access to financial products, leading to fewer opportunities for suboptimal financial decisions, such as taking out high interest loans. Conversely, those with high cognitive ability may have sufficient income to avoid the need for credit, as their incomes cover their expenses comfortably, and thus have fewer opportunities to engage in negative financial behavior. Additionally, an inverse U-shaped pattern may be present in stock-market behavior, where individuals with low cognitive ability may miss out on higher returns due to lack of participation (Christelis et al., 2010; Cole & Shastry, 2008), while high cognitive ability may lead to overconfidence and over-trading (Statman et al., 2006), resulting in adverse effects on returns.

In our study, we maintain an open-minded and exploratory approach towards analyzing the data. We acknowledge the possibility of both linear and non-linear relationships between cognitive ability, financial resources, and financial outcomes. Linear relationships imply that changes in cognitive ability or financial resources are proportional to changes in financial outcomes, while non-linear relationships suggest that these variables have a more complex effect on financial outcomes. Our aim is to avoid making assumptions and instead, objectively examine the data to determine the nature of the relationships that exist. A comprehensive understanding of these relationships can inform future research and policy decisions.

2. METHOD

2.1 Dataset

The study utilizes data from the 1970 British Cohort Study (BCS70)[4], which follows the lives of individuals born in England, Scotland and Wales in a single week of 1970. The BCS70 has collected a wide range of information on cognitive ability and economic circumstances throughout the cohort members' lives. The British Cohort Study (BCS70) datasets and documentation are available through the UK Data Service (beta.ukdataservice.ac.uk/datacatalogue/series/series?id=200001). For our analyses, we combine three datasets from the GN 33229 series. The data and analysis code used can be accessed at https://osf.io/8f6uv/?view_only=cc4eb85d081b453ebc6a2759aa08cb2e.

2.2 Participants

Our study utilizes data from the 2016 wave of the British Cohort Study and includes participants who have complete measures for cognitive ability and financial outcomes. A total of 5858 cohort members (48.33% of whom are male) were included in the sample. Table 1 presents an overview of the sample characteristics, while Table 2 shows the correlations between the measures used in the study. We chose to use data from the 2016 wave of the BCS because it is the most recent available. However, we also conducted additional analyses using data from the 2012 wave of the BCS to ensure the robustness of our findings (Appendix A).

2.3 Cognitive Ability Measures

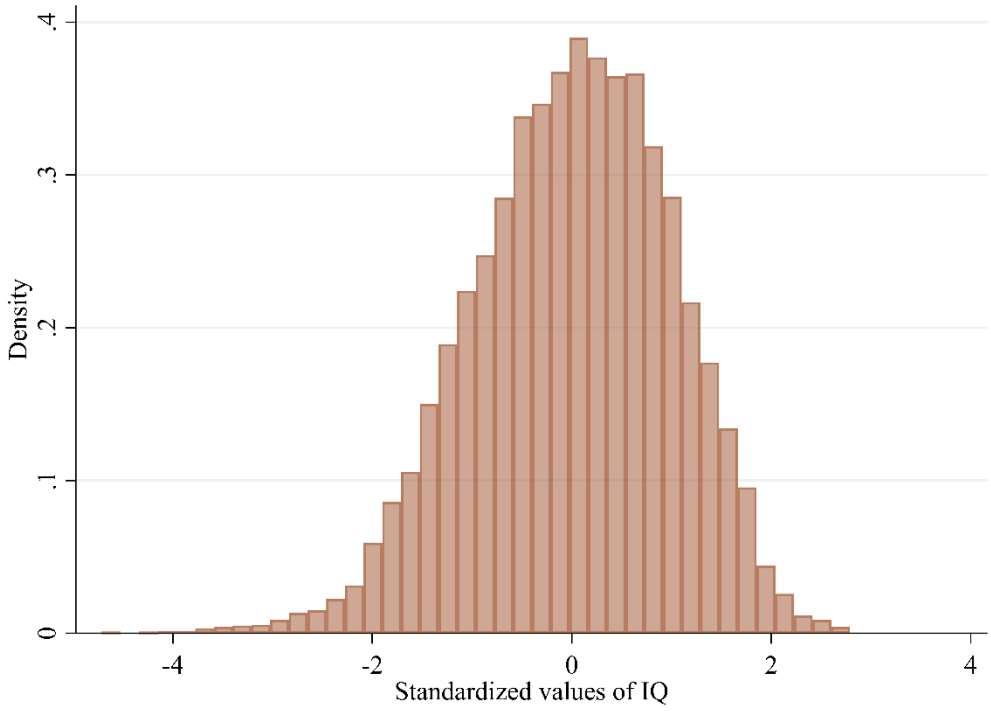
The British Cohort Study collected cognitive ability data by administering eight tests to participants at age 10 (Parsons 2014). These tests included the Shortened Edinburgh Reading Test (Godfrey Thompson Unit, 1978), the Friendly Maths Test (Parsons, 2014), the Pictorial Language Comprehension Test (Parsons, 2014), the Spelling Dictation task (Parsons, 2014), and four subscales of the British Ability Scales; Word Definitions, Word Similarities, Recall of Digits and Matrices (Elliott et al., 1978). A total of 12,885 participants completed at least one of the assessments, and 11,134 completed all eight (Parsons, 2014). Factor analysis was used to identify a general cognitive ability factor, which was used as a measure of cognitive ability

[4] We are grateful to the Centre for Longitudinal Studies (CLS), UCL Social Research Institute, for the use of these data and to the UK Data Service for making them available. However, neither CLS nor the UK Data Service bear any responsibility for the analysis or interpretation of these data.

in this study (Emerson et al., 2014, Parsons, 2014, Schoon et al., 2005, Totsika et al., 2014). This factor, known as "g," accounted for 56% of the variance in initial eigenvalues, and all tests loaded positively on the component. The cognitive ability scores were standardized and followed a normal distribution, as shown in Figure 2.

Figure 2

Histogram of Cognitive Ability Scores at Age 10



2.4 Measures of Financial Well-being

Household Debt Usage

To assess financial well-being, we employed a variety of measures. Debt usage was measured in three ways: total debt, debt-to-income ratio and revolving credit card usage. In the British Cohort Study, respondents were asked to indicate the types of debt they or their partner had. This measure included a variety of debt sources such as credit card debt, personal loans and catalogue or mail order purchases. Respondents were asked to exclude mortgage debt and credit card and bills that would be paid off fully in the current month. Respondents were then asked to report their total amount of debt. The total debt measure was collected on a continuous scale, and outliers were removed by winsorizing the measure

at the 1st and 99th percentiles. The average household debt of respondents in our sample at age 46 was £5342.62 (*SD* = 9185.90).

We also created a debt-to-income ratio by dividing the amount of debt by household income. A high debt-to-income ratio indicates that an individual may face difficulties in paying off their debts and making regular loan payments. In our sample, the average debt-to-income ratio was 0.26 (SD = 0.83), meaning that for every £1 of annual income, the individual owes 26 pence in debt.

Furthermore, we developed a binary variable to reflect whether respondents had revolving credit card debt, which refers to credit card debt that will not be paid off in full by the end of the month. The British Cohort Study elicits credit-card debt and store-card debt as separate categories, but as store cards are a specific type of credit card (i.e., a credit card that can only be used to make purchases at a specific store or chain of stores) we merge these into a single category for analyses. Revolving credit card debt is considered problematic as it may lead to overspending and subsequent over-indebtedness or bankruptcy (Bialowolski & Weziak-Bialowolska, 2021). Our results showed that 39.6% of respondents in our sample had credit card or store card debt at age 46.

Household Savings and Investments

In addition to the debt usage measures, we also assessed participants' level of savings. Using multiple measures of savings provides a more comprehensive understanding of an individual's financial situation. Therefore, savings and investments were measured in four ways: total household savings, asset-to-income ratio, retirement plan membership and investment account ownership. Total savings was measured continuously by self-report, with the average savings among in our sample was £36,926.63 (SD = 100,044.10). We winsorized this variable at the 1st and 99th percentile in our analyses to remove outliers.

To examine the relationship between a household's wealth and income, we calculated the asset-to-income ratio by dividing total savings by annual household income. The average ratio of total savings to annual income was 6.85 (SD = 157.76), indicating that the total savings of a household were on average almost seven times greater than the annual income of the household.

To measure participants' retirement plan membership, they were asked about their participation in various types of pension plans. If they indicated they were a member of any of these plans, their response was coded as 1. Conversely, if they indicated they were not a

member, their response was coded as 0. We found that 76.75% of participants in the sample were members of a pension plan.

Additionally, participants indicated whether they held a popular type of tax-free investment account called a Stocks and Shares ISA. They could also indicate they had a PEPS (Personal Equity Plan) which were a similar type of scheme replaced in 1999 by ISAs. 29.11% of participants indicated they held one of these accounts.

Subjective Financial Well-being

Subjective financial well-being was measured at age 46 by the question: "How well [respondent] is managing financially" on the following scale: 1 = Living comfortably, 2 = Doing all right, 3 = Just about getting by, 4 = Finding it quite difficult, 5 = Finding it very difficult (*M* = 1.93, *SD* = 0.92). Higher scores indicate greater levels of financial stress. We standardize this measure for the analyses.

2.5 Childhood Covariates

Mother's and Father's Education

At birth, the age that the mother and father were when they left education was recorded. (M_{mother} = 16.06, SD_{mother} = 1.95; M_{father} = 15.74, SD_{father} = 2.10).

Family Income at Age 10

In 1980, when participants were aged 10, the survey recorded their family income completed by the parents. These were recorded as weekly amounts in 7 categories: less than £35; £35 – £49; £50 – £99; £100 - £149; £150 - £199; £200 - £249; £250 or more. Respondents who indicated they did not know the amount or who did not answer the question were set to the average.

2.6 Adult Covariates

Income

The average household income of participants at age 46 was £19,992.59 (*SD* = 33,578.82). The income measure was collected on a continuous scale, and outliers were removed by winsorizing the measure at the 1st and 99th percentiles. We present the results in units of £1000 to ease interpretation.

Household Size

Household size was measured at age 46 (M = 3.20, SD = 1.29).

Marital Status

Marital status was recorded at age 46. Those who indicated they were legally married or in a civil partnership were coded as 1. Those with other forms of relationship status (single, legally separated, divorced, widowed etc.). Of the sample, 62.8% reported being married or in a civil partnership.

Table 1

Descriptive Statistics of Financial Well-Being Measures and Covariates

Variable	*M* (*SD*) / %	*p25*	*Median*	*p75*
Cognitive ability	0.19 (0.95)	-0.04	0.25	0.87
Financial well-being measures				
Total Debt	£5342.62 (9185.90)	£0.00	£900.00	£7000
Debt-to-income Ratio	0.26 (0.83)	0.00	0.03	0.20
Presence of Credit or Store Card Debt	39.60%	-	-	-
Savings	£36,926.63 (100,044.10)	£500.00	£6000.00	£28,000.00
Asset-to-income Ratio	6.85 (157.76)	0.02	0.19	0.75
Pension Plan Membership	76.75%	-	-	-
Investment Account	29.11%	-	-	-
Subjective Financial Well-being (Financial distress)	1.93 (0.92)	1.00	2.00	2.00
Childhood Covariates				
Mother's Age Left Education	16.06 (1.95)	15.00	16.00	16.00
Father's Age Left Education	15.74 (2.10)	15.00	15.00	16.00
Family Income at Age 10	4.10 (1.22)	3.00	4.00	5.00
Adult Covariates				
Household Income	£42,311.41 (37,054.78)	£19,200.00	£36,000.00	£54,000.00
Household Size	3.20 (1.29)	2.00	3.00	4.00
Married	62.84%	-	-	-

Note. Financial variables were measured when participants were aged 46, except for pension plan membership which was measured at age 42.

Table 2

Correlation Table of Financial Well-Being Measures as well as Childhood and Adult Covariates

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. CA	-													
2. Debt	.07***	-												
3. Debt-to-income Ratio	.01	.45***	-											
4. CC or SC Debt	.05***	.31***	.18***	--										
5. Savings	.13***	.01	-.04**	-.11***	-									
6. Asset-to-income Ratio	.08***	-.02*	.16***	-.08***	.48***	-								
7. Pension Membership	.23***	.05***	.00	.06***	.07***	.05***	-							
8. Investment Account	.22***	.00	-.04**	-.05***	.30***	.17***	.21***	-						
9. Financial Distress	-.15***	.08***	.12***	.13***	-.23***	-.12***	-.20***	-.27***	-					
10. Mother's Education	.19***	.04**	.02	-.02	.08***	.06***	.06*	.10***	-.03*	-				
11. Father's Education	.25***	.03**	.03*	-.01	.10***	.10***	.08***	.12***	-.06***	.49***	-			
12. Family Income Age 10	.26***	.04***	.00	.03*	.12***	.07***	.14***	.15***	-.11***	.22***	.28***	-		
13. HH income	.21***	.13***	-.19***	-.01	.38***	-.07***	.16***	.28***	-.33***	.09***	.12***	.19***	-	
14. HH size	.05***	.09***	-.01	.06***	.06***	-.02	.06***	.09***	-.06***	.06***	.06***	.06***	.19***	-
15. Married	.19***	.09***	-.02	.06***	.08***	.01	.18***	.16***	-.20***	.05***	.06***	.10***	.25***	.43***

2.7 Analyses

Our main interest is to investigate whether childhood cognitive ability affects later financial outcomes, and to understand the shape of this relationship. To appropriately characterize the relationship between childhood cognitive ability and adult financial well-being (e.g., as linear, or curvilinear), we employed polynomial models using a backward elimination procedure. We entered cognitive ability as a cubic term, as well as a quadratic and linear term, in all models, and then deleted the highest-order term one at a time until the highest order remaining term had a significant *t*-statistic. It is recommended to keep the degree of a polynomial as low as possible and avoid using high-order polynomials unless they can be justified for reasons outside the data (Montgomery, 2017). As interpreting polynomial terms is complex, we plot the predicted value of financial outcomes across cognitive ability in Figures 3-8, to provide a visualization of the relationship including 95% confidence intervals. These figures depict the shape of this relationship without the inclusion of covariates.

We also aimed to determine whether the effect of childhood cognitive ability on adult financial outcomes was solely driven by income. As income is positively correlated with cognitive ability (Strenze, 2007), differences in income may account for any association between cognitive ability and financial well-being. Given the crucial role of income in enhancing financial well-being (Brüggen, et al., 2017), we run an additional regression model to assess the unique effect of cognitive ability beyond income. This approach allows for a more accurate estimation of the independent effect of cognitive ability on financial outcomes.

Our selection of covariates was based on prior research indicating their association with financial well-being, as well as their potential confounding effect on the relationship between cognitive ability and financial well-being. Specifically, we included childhood socio-economic status variables in our models – family income at age 10, father's education, and mother's education – based on research showing that the impact of cognitive ability on financial outcomes may be biased upward without controlling for parental circumstances (Cole & Shastry, 2008). We included adult covariates – gender, marital status and household size – because these have been consistently associated with financial well-being (Brüggen et al., 2017; Joo & Grable, 2004; Netemeyer et al., 2018; Porter & Garman, 1993; Xiao et al., 2014). By including these covariates, we aim to reduce potential confounding effects and improve the precision and accuracy of our estimates of the relationship between cognitive ability and financial well-being.

We chose not to control for adult education or employment in our analyses because these variables may be considered intermediate variables or part of the causal mechanism that links cognitive ability with financial outcomes later in life. That is, education and employment may be viewed as the mechanisms through which cognitive ability affects financial outcomes. By controlling for these variables, we may be inadvertently removing the effect of cognitive ability on financial outcomes. Our primary aim was to assess the direct effect of cognitive ability on financial outcomes by excluding variables that may act as mediators in the causal pathway. We also do not control for age as the cohort study includes participants born in the same week of the year 1970, and therefore all participants were the same age at each time point.

We split the results into three groups: debt usage, savings and wealth, and subjective perceptions of finances.

3. RESULTS

3.1 Debt Usage Results

To investigate the relationship between cognitive ability and debt, we use the total amount of debt participants held at age 46, their total debt as a ratio of household income and whether they held revolving debt on a credit card.

Total Debt

We present our first set of analyses in Table 3. We find that the relationship between cognitive ability and debt follows a cubic polynomial form, with the cubic term Cognitive Ability^3 significantly predicting total debt in model 1 and 2 (Model 1 - without controls, b^3 = -123.22, *se* = 52.83, $t(6,147) = -2.33$, $p = .020$, Model 2 – with adult controls, b^3 = -130.36, *se* = 52.49, $t(6,144) = -2.48$, $p = .013$). After controlling for childhood covariates and income, we no longer find a significant cubic term (b^3 = -113.06, *se* = 68.74, $t(4,357) = -1.64$, $p = .100$) but we do find that the squared term of cognitive ability predicts total debt (Model 4 – all controls, b^2 = -529.94, *se* = 121.09, $t(4,357) = -4.38$, $p < .001$).

Table 3

OLS Regression Model for Relationship between Cognitive Ability on Debt Usage

VARIABLES	(1) Total debt (Age 46)	(2) Total debt (Age 46)	(3) Total debt (Age 46)	(4) Total debt (Age 46)
Cognitive ability	960.41***	876.23***	796.87***	634.30**
	(188.58)	(188.00)	(232.37)	(243.70)
Cognitive ability^2	-436.13***	-462.59***	-501.05***	-529.94***
	(96.53)	(96.04)	(115.45)	(121.09)
Cognitive ability^3	-123.22*	-130.36*	-117.60	-113.06
	(52.83)	(52.50)	(66.35)	(68.74)
Female		-1,113.53***	-1,310.46***	-1,196.78***
		(229.52)	(268.54)	(280.91)
Married		990.79***	1,242.92***	986.51**
		(262.12)	(305.79)	(325.45)
Household size		471.99***	412.92***	355.45**
		(98.34)	(115.60)	(121.30)
Father's education			1.10	4.59
			(74.48)	(79.37)
Mother's education			165.07*	176.72*
			(77.90)	(82.09)
Family income at age 10			-1.90	-105.06
			(119.20)	(125.67)
Household income (Per £1000)				23.96***
				(3.90)
Constant	5,440.09***	3,933.04***	1,581.89	1,252.70
	(145.03)	(340.35)	(1,284.55)	(1,360.71)
Observations	6,151	6,151	4,666	4,368
R^2	.008	.021	.024	.032

Standard errors in parentheses

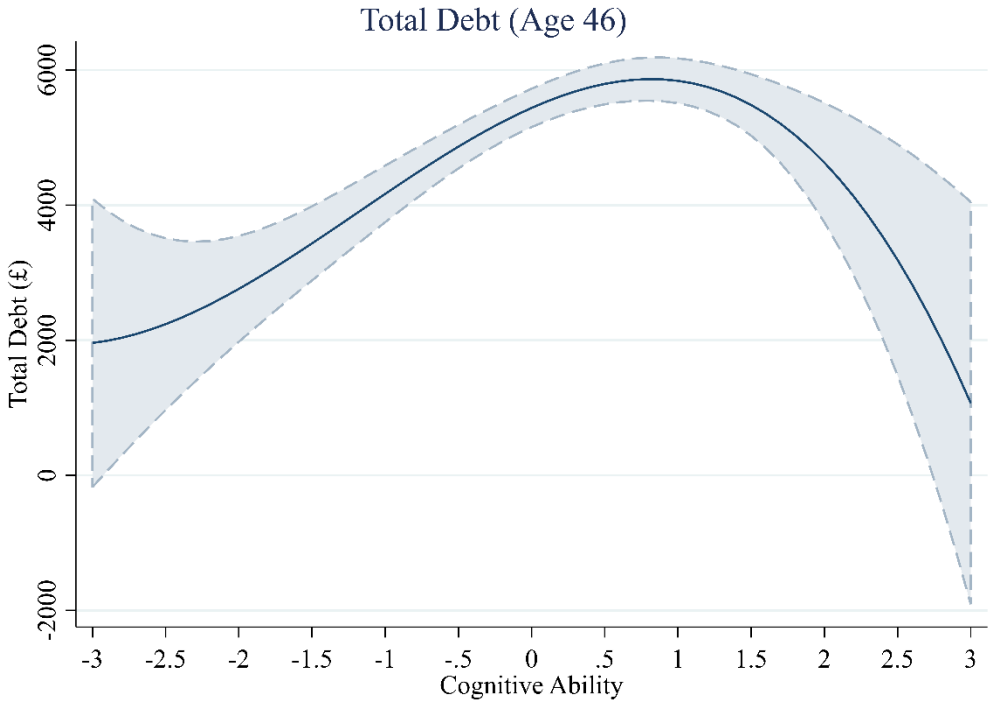
*** $p < .001$, ** $p < .01$, * $p < .05$

We plot the model predicted levels of debt across cognitive ability in Figure 3 to assess the shape of this relationship. The figure shows a non-linear pattern; an inverted-U shape. At lower levels and higher levels of cognitive ability, people hold lower amounts of debt. However, a significant quadratic or cubic term in our regression is necessary but not sufficient evidence for an inverted U-shaped relationship (Lind & Mehlum, 2010; Simonsohn, 2018). We follow the approach advocated by Simonsohn (2018) to test for the presence of a U-shaped

relationship by running two separate linear regressions on the data, one for low values of cognitive ability, and one for high values, and verifying that one slope is positive and the other negative. The highest level of debt is held by those with a cognitive ability score 0.8 SDs above the mean (£5,866.21 in debt). We split the data at this point and run separate linear regression models on these two samples. The effect of cognitive ability on debt is positive and significant for those with cognitive ability levels below .8 (b = 1061.21, se = 175.37, t(4,463)) = 6.05, p < .001) and the effect is negative and significant for those with cognitive ability levels above 0.8 (b = -1321.56, se = 651.45, t(1,684)) = -2.03, p = .043). This supports our proposition of an inverted U-shaped relationship.

Figure 3

Total Debt across Levels of Cognitive Ability



Debt-to-income Ratio

Next, we test the relationship between cognitive ability and a household's debt-to-income ratio and present these results in Table 4. As the dependent variable includes a measure of income, we do not run our fourth model that includes income as a covariate. Initial analyses demonstrate that the cubic term Cognitive Ability^3 does not predict the debt-to-income ratio (b^3 = -00.00, se = 0.00, t(5,689) = -0.12, p = .903). However, we find that the quadratic term of cognitive ability significantly predicts the debt-to-income ratio, and this result is consistent

with our findings for total debt (Model 1 – without controls, Model 1 - without controls, b^2 = -0.02, *se* = 0.01, *t*(5,690) = -2.10, *p* = .036, Model 3 – childhood and adult controls, b^2 = -0.03, *se* = 0.01, *t*(4,326) = -2.37, *p* = .018). Although the relationship between cognitive ability and debt-to-income ratio follows an inverse-U shape, it is difficult to determine the exact functional form due to the large confidence intervals at the extreme levels of cognitive ability (Figure 4).

Using Simonsohn's (2018) approach to test for the presence of a U-shaped relationship supports the notion that the evidence for an inverse-u shape relationship is inconclusive. We find that the highest debt-to-income ratio is found at a cognitive ability score 0.4 SDs above the mean. We conduct separate linear regression models on the data split at this point and find that the effect of cognitive ability on the debt-to-income ratio is positive but not significant for those with cognitive ability levels below 0.4 (*b* = 0.04, *se* = 0.02, *t*(3,180)) = 1.77, *p* = .078), and the negative effect of cognitive ability on the debt-to-income ratio for those with cognitive ability levels above 0.4 is also not significant (*b* = -0.05, *se* = 0.04, *t*(2,510)) = -1.28, *p* = .199).

Table 4

OLS Regression Model for Relationship between Cognitive Ability on Debt-To-Income Ratio

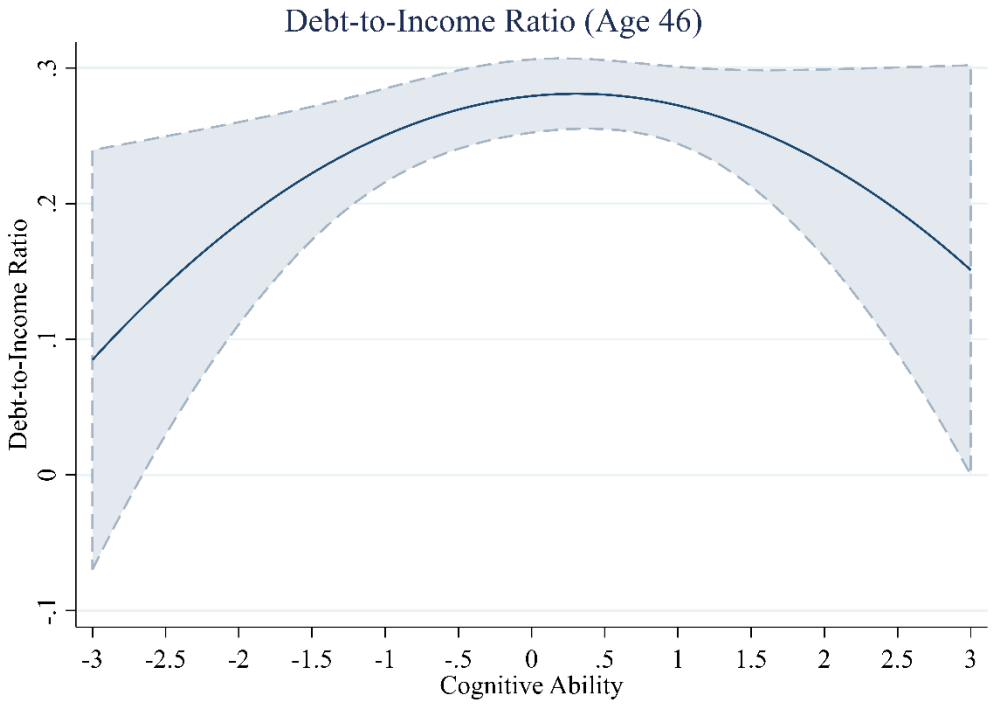
VARIABLES	(1) Debt-to-income ratio (Age 46)	(2) Debt-to-income ratio (Age 46)	(3) Debt-to-income ratio (Age 46)
Cognitive ability	0.01	0.01	0.01
	(0.01)	(0.01)	(0.02)
Cognitive ability^2	-0.02*	-0.02*	-0.03*
	(0.01)	(0.01)	(0.01)
Cognitive ability^3	-	-	-
Female		-0.02	-0.02
		(0.02)	(0.03)
Married		-0.03	-0.02
		(0.03)	(0.03)
Household size		0.00	-0.00
		(0.01)	(0.01)
Father's education			0.02*
			(0.01)
Mother's education			-0.00
			(0.01)
Family income at age 10			-0.01
			(0.01)
Household income (Per £1000)			
Constant	0.28***	0.31***	0.13
	(0.01)	(0.03)	(0.12)
Observations	5,693	5,693	4,335
R-squared	.001	.001	.003

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Figure 4

Debt-to-income Ratio across Levels of Cognitive Ability



Credit Card Debt

We next investigated the relationship between cognitive ability and whether participants held revolving credit card or store card debt. As the outcome is binary, we use logistic regression models and present these analyses in Table 5. We first tested the cubic term for cognitive ability, and found that, while close, the coefficient did not reach the 5% threshold of statistical significance (b^3 = -0.03, *se* = 0.01, *z* = -1.95, *p* = .051). We therefore tested the squared term in the reported models. We find that in each model specification, the relationship between cognitive ability and debt follows a quadratic polynomial form, with the squared term Cognitive Ability^2 significantly predicting the outcome in these models (Model 1 - without controls, b^2 = -0.14, *se* = 0.02, *z* = -5.85, *p* < .001; Model 4 – all controls, b^2 = -0.15, *se* = 0.03, *z* = -4.98, *p* < .001).

Table 5

Logistic Regression Model for Relationship between Cognitive Ability on Having Credit or Store Card Debt

VARIABLES	(1) Credit debt (Age 46)	(2) Credit debt (Age 46)	(3) Credit debt (Age 46)	(4) Credit debt (Age 46)
Cognitive ability	0.13***	0.11***	0.11**	0.12**
	(0.03)	(0.03)	(0.04)	(0.04)
Cognitive ability^2	-0.14***	-0.14***	-0.16***	-0.15***
	(0.02)	(0.02)	(0.03)	(0.03)
Cognitive ability^3	-	-	-	-
Female		0.03	-0.01	-0.01
		(0.05)	(0.06)	(0.06)
Married		0.20**	0.23**	0.26***
		(0.06)	(0.07)	(0.07)
Household size		0.07**	0.08**	0.09***
		(0.02)	(0.03)	(0.03)
Father's education			-0.03	-0.03
			(0.02)	(0.02)
Mother's education			0.00	0.00
			(0.02)	(0.02)
Family income at age 10			0.01	0.01
			(0.03)	(0.04)
Household income (Per £1000)				-0.00
				(0.00)
Constant	-0.36***	-0.71***	-0.39	-0.37
	(0.03)	(0.08)	(0.29)	(0.31)
Observations	6,328	6,328	4,796	4,450
Pseudo R^2	.006	.011	.011	.013

We plot the probability of holding credit or store card debt across cognitive ability in Figure 5 to assess the shape of this relationship. We see a similar U-shaped pattern as we found for total debt. Participants were less likely to hold revolving credit card debt when they were either low or high in cognitive ability, and more likely at more average levels of cognitive ability. Specifically, the model estimates that someone with a cognitive ability score 2 SDs below the mean would have a 23.8% probability of holding credit or store card debt, while

the average person (0 SD score) has a 41.1% probability and someone high in cognitive ability (+2 SD) a 34.2% probability.

The highest level of predicted credit card debt is for those with cognitive ability scores of 0.5, which is again similar to the 0.8 level found for total debt. Repeating the approach advocated by Simonsohn (2018) again provides evidence in favor of an inverted U-shaped relationship (< 0.5, b = .08, se = 0.01, t(3,861)) = 6.80, p < .001; => 0.5, b = -0.07, se = 0.02, t(2,463)) = -3.01, p = .003).

Figure 5

Proportion Who Hold Credit or Store Card Debt across Levels of Cognitive Ability



3.2 Savings and Wealth Results

Total Savings

We tested whether cognitive ability significantly predicts the amount of savings participants accumulated at age 46, and present these analyses in Table 6. We first tested the cubic term for cognitive ability, which was NS (b^3 = 337.12, se = 639.74, t(5,337) = - 0.53, p = .598). We therefore tested the squared term in the reported models. We find that in the first two model specifications, the relationship between cognitive ability and savings follows a quadratic polynomial form, with the squared term Cognitive Ability^2 significantly predicting savings in these models (e.g., Model 1 - without controls, b^2 = 3557.47, se = 1085.31, t(5,338)

= 3.28, p = .001). However, after controlling for childhood socio-economic status and adult income, the squared term was no longer statistically significant (e.g., Model 4 - all controls, b^2 = 2,301.53, *se* = 1,307.24, $t(3,884) = 1.76$, p = .078).

Table 6

OLS Regression Model for Relationship between Cognitive Ability on Total Savings

VARIABLES	(1) Total savings (Age 46)	(2) Total savings (Age 46)	(3) Total savings (Age 46)	(4) Total savings (Age 46)
Cognitive ability	13,506.97***	12,875.73***	11,307.20***	6,232.01***
	(1,454.71)	(1,457.22)	(1,842.84)	(1,798.54)
Cognitive ability^2	3,557.47**	3,326.91**	3,179.35*	2,301.53
	(1,085.31)	(1,084.35)	(1,353.84)	(1,307.24)
Cognitive ability^3	-	-	-	-
Female		-9,988.11***	-10,294.01**	-5,684.56
		(2,719.51)	(3,199.59)	(3,087.37)
Married		11,265.08***	9,702.48**	-942.61
		(3,130.32)	(3,670.22)	(3,589.15)
Household size		946.80	361.68	-2,767.80*
		(1,174.68)	(1,391.18)	(1,349.08)
Father's education			838.34	430.49
			(877.63)	(857.02)
Mother's education			1,204.84	1,439.29
			(901.08)	(878.49)
Family income at age 10			6,436.41***	2,719.27*
			(1,426.19)	(1,384.21)
Household income (Per £1000)				879.71***
				(42.66)
Constant	30,289.40***	25,550.43***	-28,681.21	-32,924.53*
	(1,709.25)	(4,049.99)	(15,135.49)	(14,748.31)
Observations	5,341	5,341	4,072	3,894
R^2	.018	.025	.034	.128

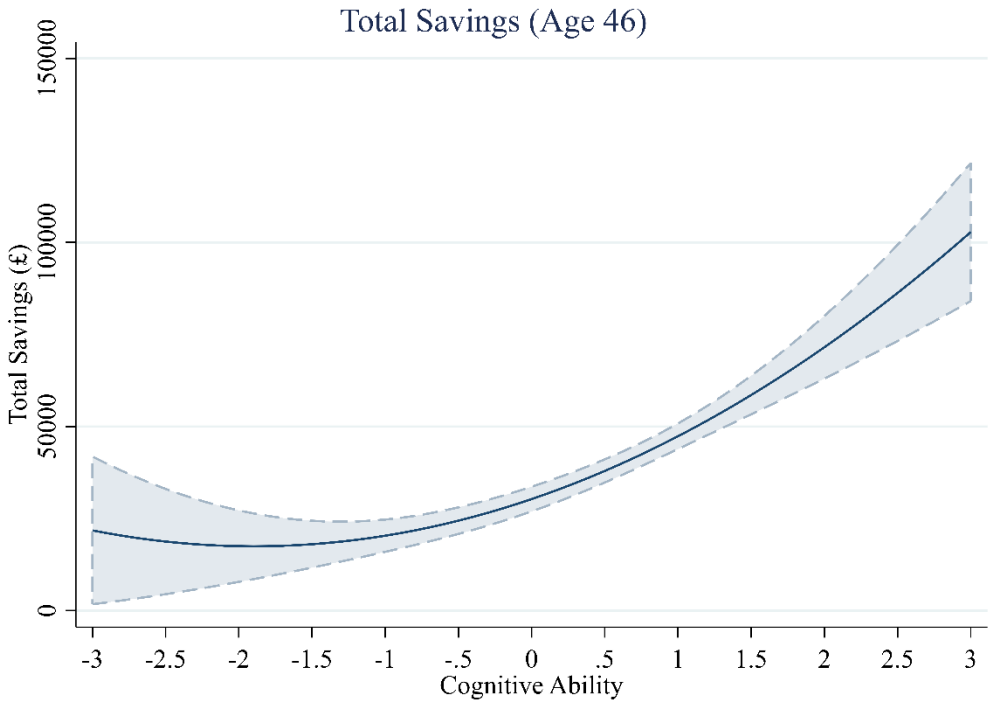
Standard errors in parentheses
*** p < .001, ** p < .01, * p < .05

The results without covariates are visualized in Figure 6. We find that the relationship between cognitive ability and savings displays a trend of exponential growth, indicating that

greater levels of cognitive ability are associated with even greater accumulation of savings. However, this non-linear effect is no longer significant after controlling for income.

Figure 6

Total Savings across Levels of Cognitive Ability



Asset-to-income Ratio

We next assess the functional form of the relationship between cognitive ability and a household's asset-to-income ratio as an additional indicator of wealth accumulation. We find that the cubic term of cognitive ability does not significantly predict the asset-to-income ratio (b^3 = 0.03, *se* = 0.04, *t*(5,059) = 0.84, *p* = .399). We therefore tested the squared term in the reported models (Table 7). Following our approach used for the debt-to-income ratio, we do not report a model that controls for household income, as this variable is a component of the dependent variable. Consistent with the findings for total savings, we find that the relationship between cognitive ability and the asset-to income follows a quadratic polynomial form (Figure 7), with the squared term Cognitive Ability^2 significantly predicting the asset-to-income ratio in the first two models (e.g., Model 1 - without controls, b^2 = 0.16, *se* = 0.07, *t*(5,060) = 2.35, *p* = .019). However, the squared term is no longer significant at the 5% level when controlling for adult covariates and childhood socio-economic status (Model 3 – adult and childhood controls, b^2 = 0.16, *se* = 0.09, *t*(3,860) = 1.92, *p* = .055). The findings suggest

that the quadratic term of cognitive ability may have a curvilinear relationship with the asset-to-income ratio, but the effect is dependent on other factors.

Table 7

OLS Regression Model for Relationship between Cognitive Ability on the Asset-To-Income Ratio

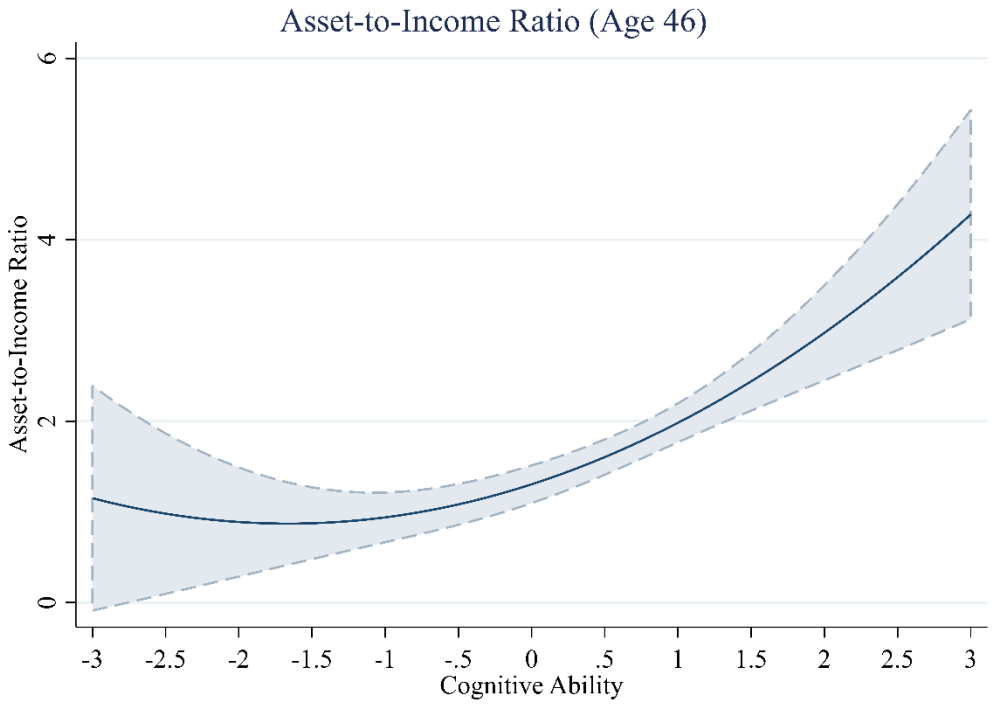
VARIABLES	(1) Asset-to-income ratio (Age 46)	(2) Asset-to-income ratio (Age 46)	(3) Asset-to-income ratio (Age 46)
Cognitive ability	0.52***	0.53***	0.50***
	-0.09	(0.091)	(0.12)
Cognitive ability^2	0.16*	0.15*	0.16
	-0.07	(0.067)	(0.09)
Cognitive ability^3	-	-	-
Female		-0.40*	-0.44*
		(0.17)	(0.20)
Married		0.05	0.08
		(0.20)	(0.23)
Household size		-0.14	-0.25**
		(0.07)	(0.09)
Father's education			0.11
			(0.06)
Mother's education			0.03
			(0.06)
Family income at age 10			0.16
			(0.09)
Household income (Per £1000)			
Constant	1.30***	1.93***	-0.57
	-0.11	(0.25)	(0.97)
Observations	5,063	5,063	3,869
R^2	.008	.010	.017

Standard errors in parentheses

*** $p < .001$, ** $p < .01$, * $p < .05$

Figure 7

Asset-to-income across Levels of Cognitive Ability



Pension Scheme Membership

Next, we assess to what extent cognitive ability predicts whether an individual is a member of a pension scheme. Data on pension scheme membership was only gathered in the 2012 wave of the British Cohort Study, so the results reported indicate pension scheme membership at age 42. We present these analyses in Table 8.

We find that for the first three model specifications, the relationship between cognitive ability and pension scheme membership follows a cubic polynomial form, with the cubic term Cognitive Ability^3 significantly predicting total debt in these models (e.g., Model 1 - without controls, b^3 = -0.04, *se* = 0.01, *z* = -2.83, *p* = .005). However, the cubic term of cognitive ability is no longer significant once we control for childhood socioeconomic status and household income (Model 4 – all controls, b^3 = -0.03, *se* = 0.02, *z* = -1.52, *p* = .128). We do still find a significant positive association between cognitive ability and pension scheme membership, beyond the effect of income.

Table 6

OLS Regression Model for Relationship between Cognitive Ability on Pension Scheme Membership

VARIABLES	(1) Has pension scheme (Age 42)	(2) Has pension scheme (Age 42)	(3) Has pension scheme (Age 42)	(4) Has pension scheme (Age 42)
Cognitive ability	0.69***	0.65***	0.52***	0.36***
	(0.05)	(0.05)	(0.06)	(0.06)
Cognitive ability^2	-0.01	-0.02	-0.00	-0.00
	(0.03)	(0.03)	(0.03)	(0.04)
Cognitive ability^3	-0.04**	-0.04**	-0.02	-0.01
	(0.01)	(0.01)	(0.02)	(0.02)
Female		-0.35***	-0.34***	-0.16*
		(0.06)	(0.07)	(0.07)
Married		0.62***	0.58***	0.28***
		(0.06)	(0.08)	(0.08)
Household size		-0.07**	-0.07**	-0.06*
		(0.02)	(0.03)	(0.03)
Father's education			0.05	0.05
			(0.02)	(0.02)
Mother's education			0.00	-0.01
			(0.02)	(0.03)
Family income at age 10			0.18***	0.14***
			(0.03)	(0.03)
Household income (Per £1000)				0.04***
				(0.00)
Constant	1.20***	1.26***	-0.09	-0.55
	(0.04)	(0.09)	(0.41)	(0.43)
Observations	7,145	7,145	5,363	5,363
Pseudo R^2	.052	.069	.069	.144

Standard errors in parentheses

*** p <. 001, ** p <. 01, * p < .05

The results are visualized in Figure 8. We find that the relationship between cognitive ability and membership of a pension scheme is characterized by a strong positive relationship (above ~ -2 SD), followed by diminishing returns, where the effect levels off at high levels of

cognitive ability. However, this non-linear effect is no longer significant after controlling for income.

Figure 8

Probability of Pension Membership across Levels of Financial Stress across Levels of Cognitive Ability



Holds Investment Account

The relationship between cognitive ability and holding an investment account shows a similar pattern as that between cognitive ability and being a member of a pension scheme (Table 9). Whereas we find initial evidence of a non-linear relationship between cognitive ability and holding an investment account (Model 1 - without controls, b^3 = -0.03, *se* = 0.01, *z* = -2.06, *p* = .039), the cubic term of cognitive ability is no longer significant when controlling for income (Model 4 – all controls, b^3 = -0.03, *se* = 0.02, *z* = -1.42, *p* = .155). However, we do find that individuals with greater cognitive ability remain more likely to hold an investment account (Model 4 – all controls, *b* = 0.42, *se* = 0.06, *z* = 6.48, *p* < .001).

Table 9

Logistic Regression Model for Relationship between Cognitive Ability on Holding an Investment

VARIABLES	(1) Investment account (Age 46)	(2) Investment account (Age 46)	(3) Investment account (Age 46)	(4) Investment account (Age 46)
Cognitive ability	0.63***	0.60***	0.44***	0.42***
	(0.05)	(0.05)	(0.06)	(0.06)
Cognitive ability^2	0.02	0.02	-0.01	-0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Cognitive ability^3	-0.03*	-0.03*	-0.02	-0.03
	(0.01)	(0.01)	(0.02)	(0.019)
Female		-0.24***	-0.24***	-0.25***
		(0.06)	(0.07)	(0.07)
Married		0.69***	0.69***	0.53***
		(0.07)	(0.08)	(0.08)
Household size		0.03	0.01	-0.02
		(0.03)	(0.03)	(0.03)
Father's education			0.01	0.01
			(0.02)	(0.02)
Mother's education			0.03	0.04
			(0.02)	(0.02)
Family income at age 10			0.19***	0.13***
			(0.03)	(0.03)
Household income (Per £1000)				0.01***
				(0.00)
Constant	-1.08***	-1.50***	-2.74***	-2.91***
	(0.04)	(0.09)	(0.30)	(0.32)
Observations	6,328	6,328	4,796	4,450
Pseudo R^2	.043	.063	.065	.090

Standard errors in parentheses

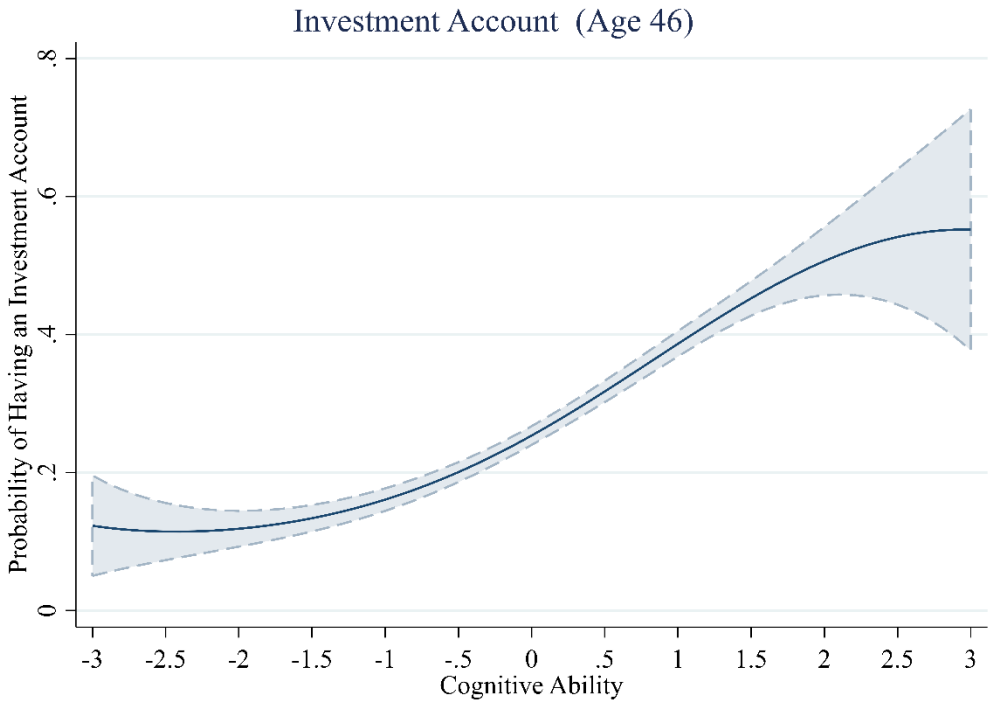
*** $p < .001$, ** $p < .01$, * $p < .05$

The results are visualized in Figure 9. We find that the relationship between cognitive ability and holding an investment account is characterized by a strong positive relationship (above ~ -1 SD), followed by diminishing returns at the highest levels of cognitive ability

(above ~ 1.5 SD). However, this non-linear effect is no longer significant after controlling for childhood SES or income.

Figure 9

Probability of Holding an Investment Account across Levels of Cognitive Ability



3.3 Subjective Financial Well-Being Results

Next, we describe the results for individual's subjective assessments of their financial well-being. We do not find evidence of non-linear relationships between cognitive ability and financial distress (Table 10, Figure 10). However, we do find that those higher in cognitive ability tend to worry less about money than those lower in cognitive ability – even after controlling for income. In Model 4, each additional SD unit increase in cognitive ability is associated with a -0.06 SD reduction in financial stress (b = -0.06, se = .02, t(4,441) = -4.05, p < .001).

Table 10

OLS Regression Model for Relationship between Cognitive Ability on Financial Stress

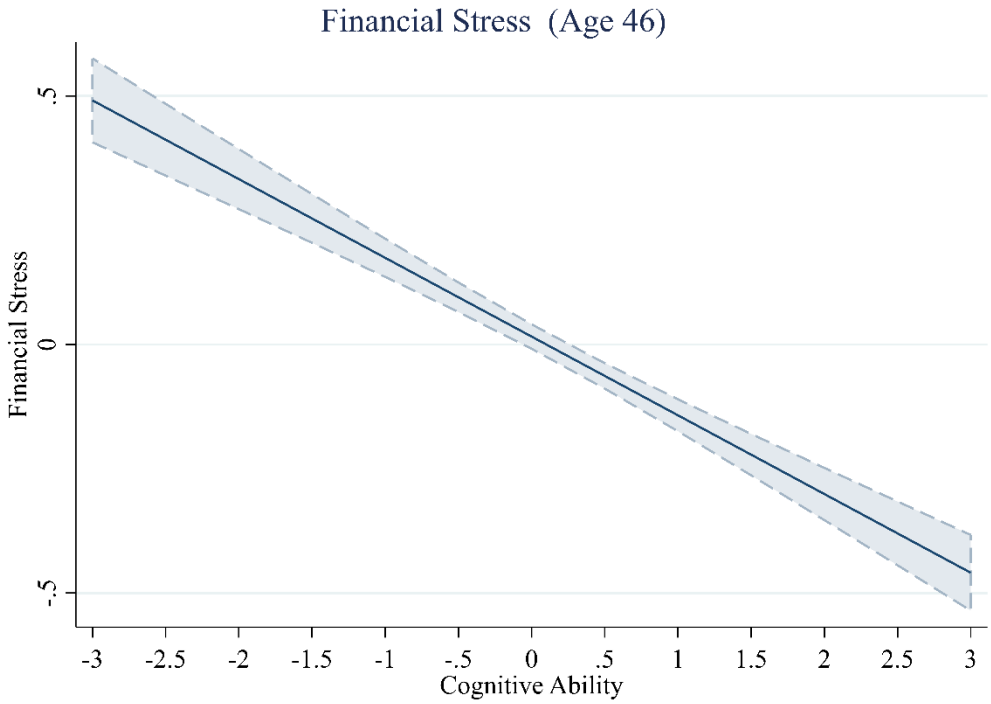
VARIABLES	(1) Financial stress (Age 46)	(2) Financial stress (Age 46)	(3) Financial stress (Age 46)	(4) Financial stress (Age 46)
Cognitive ability	-0.16***	-0.14***	-0.10***	-0.06***
	(0.01)	(0.01)	(0.02)	(0.02)
Cognitive ability^2	-	-	-	-
Cognitive ability^3	-	-	-	-
Female		0.01	0.01	0.00
		(0.02)	(0.03)	(0.03)
Married		-0.40***	-0.35***	-0.25***
		(0.03)	(0.03)	(0.032)
Household size		0.02	0.03*	0.05***
		(0.01)	(0.01)	(0.01)
Father's education			-0.01	-0.01
			(0.01)	(0.01)
Mother's education			0.02*	0.02*
			(0.01)	(0.01)
Family income at age 10			-0.07***	-0.04**
			(0.01)	(0.01)
Household income (Per £1000)				-0.01***
				(0.00)
Constant	0.02	0.19***	0.31*	0.30*
	(0.01)	(0.04)	(0.13)	(0.13)
Observations	6,321	6,321	4,791	4,450
R^2	.023	.057	.054	.124

Standard errors in parentheses

*** $p < .001$, ** $p < .01$, * $p < .05$

Figure 10

Financial Stress across Levels of Cognitive Ability



4. GENERAL DISCUSSION

This study aimed to examine the shape of the relationship between childhood cognitive ability and various indicators of financial well-being later in life. In contrast to previous studies, we explicitly tested the functional form of these relationships and found that it varies across different indicators of financial well-being. Most notably, we found an inverse U-shaped relationship between cognitive ability and debt, with those who are both low and high in cognitive ability having the lowest total debt and probability of holding revolving credit card debts, and those with average levels of cognitive ability having the highest debt. We also found an exponential relationship with the amount of money participants saved. However, the non-linear relationship between cognitive ability and the indicators of wealth was mostly seen at the extreme ends of the cognitive ability distribution, whereas a linear trend was seen for most people. Similarly, despite our efforts to test for potential non-linearities, the data revealed that a linear trend provides the most accurate description of the relationship between cognitive ability and financial stress.

The inverse U-shape relationship between cognitive ability and debt accumulation that we report may reconcile seemingly inconsistent prior findings on the association

between cognitive ability and debt. On the one hand, there is evidence that individuals with higher cognitive ability are more debt averse (Ahrens et al., 2022), while on the other, research has found that those with high cognitive ability are more likely to hold debt (Angrisani et al., 2020). By moving beyond the assumption that the association between cognitive ability and debt is linear, these seemingly contradictory findings can be better understood. While cognitive ability may be associated with greater debt aversion, individuals with low cognitive ability may lack access to credit (Salisbury et al., 2023). This would result in limited debt accumulation by those with low cognitive ability, even if they would prefer greater credit access. Whereas we may have expected those with higher cognitive ability to be more likely to hold debt, as they more easily navigate and understand complex financial products (Angrisani et al., 2020), it may instead be the case that at the highest levels of cognitive ability, debt accumulation is lower because individuals have less desire to take out credit.

Our findings on the relationship between cognitive ability and debt accumulation differ from previous research, which has reported that individuals with lower cognitive ability are more likely to hold credit card debt (Spinella et al., 2004). This discrepancy may be explained by the fact that we measure general cognitive ability, while Spinella and colleagues use a measure of executive functioning, a specific form of cognitive ability. However, our results show similar patterns to those found by Zagorsky (2007), who used data from the National Longitudinal Survey of Youth (NLSY79) to test for non-linear relationships between cognitive ability and negative financial behaviors such as being late paying bills and going bankrupt. Zagorsky (2007) found that the highest rates of these behaviors occur in the middle of the cognitive ability distribution, which aligns with our findings on debt amount and revolving credit card debt. However, this pattern is not reflected in our measures of savings or subjective financial well-being.

Our findings demonstrate a positive correlation between cognitive ability and financial well-being as measured by various indicators of wealth accumulation. High cognitive ability individuals generally have higher savings balances, a larger asset-to-income ratio, a greater likelihood of being enrolled in a pension plan and are more likely to hold an investment account. This may reflect their ability to navigate and understand complex financial products. However, it is important to note that the relationship between cognitive ability and wealth accumulation may be confounded by income. Our analysis suggests that income plays a

potentially influential role in this relationship, as the inclusion of income as a covariate reduces the strength of the effect of cognitive ability on savings balances and pension scheme membership. Furthermore, after including income, the initial non-linear relationships found (e.g., exponential for total savings and asset-to-income ratio, diminishing returns for pension scheme membership) became non-significant. Controlling for income allowed us to isolate the direct relationship between cognitive ability and savings, and we find that this relationship is best described by a linear trend.

Our study also finds that individuals with greater cognitive ability report lower levels of financial stress. We observed a linear trend in this relationship, indicating that even for individuals with high cognitive ability, an increase in their cognitive ability scores would be associated with a decrease in financial stress. However, it is important to acknowledge that financial stress is only one aspect of financial well-being, and incorporating objective indicators is crucial to obtain a comprehensive understanding. Previous literature has shown that individuals' subjective assessment of their financial situation may not always align with their actual financial status (Tully & Sharma, 2022). Simply lacking financial stress does not necessarily indicate financial well-being, as it could result from avoidance of financial responsibilities (Hilbert et al., 2022). Overall, we contribute to the rich literature on subjective financial well-being (e.g., Brüggen et al., 2017; Netemeyer et al., 2018) by demonstrating that cognitive ability predicts not only objective measures but also *subjective* assessments of one's financial situation. This is especially important given the detrimental consequence of financial stress on health and overall well-being (Sturgeon et al., 2016). Our study highlights the importance of cognitive ability as a potential protective factor against financial stress, and underscores the need for a holistic approach to understanding financial well-being. Our research shows that cognitive ability plays a distinct role in financial well-being, beyond the influence of income. We provide evidence of this by illustrating that cognitive ability has unique explanatory power in predicting financial outcomes, even when controlling for income. In the Appendix B, we provide supplementary analyses showing that cognitive ability is positively related to income, consistent with previous research (e.g., Strenze, 2007). Specifically, our findings reveal a non-linear relationship between cognitive ability and income, with diminishing returns at lower levels of cognitive ability and an exponential trend at higher levels. While higher levels of income is likely one route through which cognitive ability leads to increased financial well-being, these findings underscore the importance of

considering cognitive ability as a separate predictor of financial well-being, rather than solely relying on income as an explanation.

Finally, our study demonstrates that, in addition to cognitive ability and income, family background plays a crucial role in shaping an individual's financial outcomes. We observe that family income at age 10 is a significant predictor of savings, pension plan membership, investment account holding, and financial stress at age 46. Our findings are consistent with previous research on the intergenerational transmission of wealth (e.g., Adermon et al., 2019), which describes how financial well-being is passed down from one generation to the next, as well as research on financial socialization (LeBaron & Kelley, 2021). These results emphasize the importance of considering the impact of family background on financial well-being, in addition to cognitive ability and income, when designing interventions or policies aimed at improving financial outcomes.

4.1 Theoretical and Policy Implications

Theoretically, our results suggest that cognitive ability plays an important role in financial decision-making, enabling individuals to navigate and understand complex financial products. As the complexity of financial products that consumers are exposed to increases (Angrisani et al., 2020), cognitive ability is generally a valuable resource that can enable positive financial decision-making. Additionally, our findings imply that the relationship between cognitive ability and financial well-being may depend on access to financial products and opportunities. We emphasize that our results do not imply that individuals with lower cognitive ability cannot achieve financial well-being.

Our research contributes to prior research on the association between cognitive ability and financial well-being in several ways. First, we study possible non-linear relationships between cognitive ability and financial well-being. Our work expands the robustness of prior work by Zagorsky (2007) by studying non-linear effects for a broader range of indicators of financial well-being, including subjective perceptions of financial well-being in another cohort and another country. Second, we provide a novel perspective on the association between cognitive ability and financial outcomes by controlling for the effect of income. Our work demonstrates that cognitive ability is associated with financial outcomes when controlling for the well-documented effect of cognitive ability on income (Strenze, 2007). A specific strength of our paper is that we use a high-quality measure of cognitive ability to estimate the impact of cognitive ability more precisely in childhood on adult financial outcomes. Previous research

has often used proxies of cognitive ability, such as the cognitive reflection test (Frederick, 2005; Bücher-Koenen & Ziegelmeyer, 2011; Ahrens et al., 2022). Using a high-quality measure of cognitive ability, measured before school streaming occurred (Bergman et al., 2014), allows us to estimate the impact of cognitive ability more precisely in childhood on adult financial outcomes. Whereas prior research has measured cognitive ability in adulthood, or uses proxy measures of cognitive ability, we demonstrate how a measure of cognitive ability at childhood, which is not confounded by financial experience, is associated with financial outcomes in adulthood.

Our study reveals that cognitive ability is a reliable predictor of financial well-being; however, we acknowledge that other unmeasured characteristics may also influence financial outcomes. The modest R^2 values of our regression models suggest that there are other significant factors that we did not account for. To identify such factors, future studies may use a data-driven approach like LASSO (least absolute shrinkage and selection operator) analysis, a method that performs variable selection to enhance the prediction accuracy and interpretability of the resulting model (Tibshirani, 1996). One such unmeasured factor that may influence financial well-being is financial experience, which has been shown to compensate for cognitive decline due to aging (Li et al., 2015). Another factor is financial literacy, which is known to predict financial well-being and reduce financial errors (Bücher-Koenen & Ziegelmeyer, 2011; Lusardi & Mitchell, 2014). Measuring financial literacy separately may explain financial decision making and financial outcomes beyond the general measure of cognitive ability used in this study. Thus, understanding the interplay between cognitive ability, financial experience and financial literacy is crucial in promoting sound financial decision-making and, ultimately, achieving financial well-being.

Our findings on the relationship between cognitive ability and financial well-being have significant policy implications. By identifying the functional form of these relationships, we gain insights into which individuals may benefit the most from interventions aimed at improving financial well-being. For instance, our results suggest that policies aimed at limiting overexposure to credit should focus on individuals with average cognitive abilities. These individuals are more likely to have access to debt than those with the lowest cognitive abilities, and they may have a greater need to access debt than those with the highest cognitive abilities. This highlights the importance of targeting interventions to specific

subgroups of the population, rather than applying a one-size-fits-all approach (Gerhard et al., 2018).

The positive effect of cognitive ability on financial outcomes highlights the need for interventions to address the financial literacy and decision-making skills of individuals with lower cognitive ability. Such interventions may include financial education programs, as well as policies that increase access to financial products and opportunities for those with lower cognitive ability. Additionally, our findings call for further research to better understand the non-linear relationship between cognitive ability and financial well-being, to inform the design of more effective policies and interventions.

While our research does not investigate the specific mechanisms underlying the non-linear relationship between cognitive ability and financial well-being, gaining such insight is essential for informing interventions and applying our findings to improve financial outcomes. The causal mechanisms through which cognitive ability impacts financial decision-making are complex and multifaceted. Cognitive ability and the time preferences associated with cognitive ability are closely linked to educational and occupational attainment (Cole & Shastry, 2008), which in turn can influence the accumulation of wealth (as reviewed by Malanchini et al., 2020). Furthermore, cognitive ability may affect an individual's access to financial products via multiple routes. First, through its effect on income, cognitive ability may increase an individual's eligibility for specific financial products such as loans. Second, the cost of information acquisition is lower for individuals with higher cognitive abilities, which lowers the cost of taking on novel financial products such as stocks. Individuals who have more access to financial products such as investments, have a stronger incentive to gain knowledge about these topics, which in turn may increase their financial literacy (Bucher-Koenen & Ziegelmeyer, 2011). While access to financial resources can be a positive factor, it may also have negative consequences if it leads to overexposure to credit or exposure to detrimental financial products (Salisbury et al., 2023). Calvet et al. (2007) argue that individuals at lower level of financial literacy may be aware of the insufficiency of their financial knowledge, and therefore attempt to avoid financial mistakes. Through this process, cognitive ability can have a positive effect on financial well-being as it reduces the barriers for the take-up of wealth-building products, while simultaneously, the lower barrier may simultaneously explain higher levels of debt through an increased take-up of bad sources of debt at average levels of

cognitive ability. Further research which includes measures to isolate these individual components can help elucidate these complex mechanisms.

Our research also highlights the importance of considering multiple indicators of financial well-being when examining the relationship between cognitive ability and financial outcomes. While traditional measures such as debt accumulation may suggest that individuals with lower cognitive abilities have more favorable financial circumstances, our findings on indicators such as savings and subjective financial well-being suggest otherwise. This highlights the importance of considering both objective and subjective measures of financial well-being to fully understand the complex relationship between cognitive ability and financial outcomes. As subjective financial well-being is strongly associated with overall well-being (Netemeyer et al., 2018; Ruberton et al., 2016), the role of subjective perceptions of financial well-being should not be underestimated. Additionally, our findings suggest that different interventions may be necessary for individuals at different levels of cognitive ability to improve financial well-being. Therefore, it is crucial for policymakers to consider the functional form of the relationship between cognitive ability and financial well-being when designing interventions to improve financial outcomes for all individuals.

In practice, it may not be feasible to individually assess the cognitive ability of all members of society to determine which individuals would benefit most from a policy intervention. However, this challenge can be addressed by utilizing proxies for cognitive ability, such as education level (Batty et al., 2009), or by utilizing digital footprints, such as online behavior or transaction histories, to predict cognitive ability at scale (Gladstone et al., 2019; Kosinski et al., 2013; Tovanich et al., 2021).

4.2 Limitations and Future Research

Some limitations should be kept in mind when interpreting the current findings. Due to the nature of the dataset, we only have information on the cognitive ability of one individual in the household. Whereas we find positive associations between cognitive ability and individual financial outcomes such as whether an individual is member of a pension plan, some of the financial well-being measures such as income, wealth and debt are measured at the household level. However, we do not believe this invalidates our results as there is generally a strong correlation between the cognitive ability of partners (Gignac & Zajenkowski, 2019).

To gain a more complete understanding of the factors contributing to the inverted U-shaped relationship between cognitive ability and debt, it is important for future research to utilize a more nuanced approach to measuring debt. While our study focused on revolving debts and excluded mortgage debts, with the aim of identifying the debt associated with suboptimal financial decision-making, debt may not always signify poor financial decision-making. In Appendix C we report additional analyses that demonstrate that in our study, debt is associated with financial stress and that the inverse u-shape relationship between cognitive ability is robust when excluding student debt, which can be seen as a positive use of debt. Therefore, it is essential to consider the type and purpose of debt, as well as an individual's overall financial resources. Although our study considered the debt-to-income ratio, more detailed measures of debt, such as those used in the Household, Income, and Labor Dynamics in Australia (HILDA) survey (Summerfield et al., 2020), which include information about credit card repayment frequency, could offer more insight into the relationship between debt and financial well-being. Such an analysis would provide a more nuanced understanding of how the purpose and frequency of debt repayment can affect an individual's financial well-being.

In interpreting our findings, it is also important to consider the limitations of our measurement. The continuous indicators of financial well-being that we measured, such as debt, debt-to-income ratio, savings, and asset-to-income ratio, have a non-Gaussian distribution, which can lead to outliers that may bias our analysis. To address this issue, we used a winsorizing approach that reduces the impact of outliers (i.e., the top 1%) on the results while preserving the distribution of the data. However, this approach assumes that extreme values are indeed outliers, which is a matter of contention (Ghosh & Vogt, 2012). Future research using registry data instead of self-reported financial data could provide a more accurate measure of financial outcomes and shed light on whether the functional forms of the relationship between cognitive ability and financial outcomes hold when measurement error is minimized.

A further limitation is that it is unclear the extent to which our findings are generalizable to populations beyond the British sample studied. In particular, cross-country variation in the level of state intervention in the financial lives of citizens, such as through the generosity of welfare systems and the degree of regulation of the financial system, are likely to impact the patterns of associations found between cognitive abilities and financial well-being. For example, in the United States, welfare is less generous and conditional on

employment to a greater extent than in Europe (Alber, 2010). We study the association between cognitive abilities and financial well-being in the United Kingdom, a European-style welfare system. A high level of state intervention may reduce the strength of the relationship, as policies such as mandatory auto-enrolment in retirement plans (e.g., the 2008 Pensions act) may reduce inequalities across groups. Thus, the strength and direction of the association between cognitive ability and financial well-being may be contingent on the welfare system of a given country.

The present study does not explore the impact of personality on financial outcomes, despite a broad literature demonstrating the important role of personality on shaping both consumption (Ebert et al., 2021; Garbinski et al., 2020; Gladstone et al., 2022; Kappes et al., 2021; Landis & Gladstone, 2017; Matz et al., 2016; Weston et al., 2019) and personal finance behaviors (Brown & Taylor, 2014; Gerhard et al., 2018; Gladstone et al., 2021; Matz & Gladstone, 2020; Mosca & McCrory 2016; Nyhus & Webley 2001). Practically, limitations in the available data limited our ability to include measures of personality in its analysis. Personality has been measured in childhood, but just as a proxy from other measures. Theoretically, our study was driven by the belief that cognitive ability plays a more proximal role in financial decision-making and outcomes, and it is challenging to identify which specific personality traits to measure and how to interpret the data meaningfully. However, research has shown that personality traits have unique explanatory power beyond the role of intelligence. For example, Gensowski (2018) reports that in a high-IQ sample, conscientiousness and extraversion positively predict men's lifetime earnings, whereas agreeableness and earnings are negatively related. Trait conscientiousness is also a determinant of wealth (Duckworth & Weir, 2010; Furnham & Cheng, 2019), controlling for differences in cognitive ability. Although there is academic debate about the relative importance of cognitive ability and personality in predicting life outcomes (see Zisman & Ganzach, 2022 and Golsteyn et al., 2022), little is known about how cognitive and non-cognitive factors interact to achieve financial well-being. Future research could explore how specific personality traits, such as conscientiousness, extraversion, and agreeableness, enhance or attenuate the positive effect of cognitive ability on financial well-being.

5. CONCLUSION

In conclusion, our study provides new insights into the relationship between childhood cognitive ability, financial resources, and financial outcomes in adulthood. Our findings suggest that childhood cognitive ability is a significant predictor of financial outcomes in adulthood, and this relationship is not solely driven by differences in income. We further find that these relationships are not consistently characterized by linearity, with debt characterized by an inverse U-shape. The functional form of the relationship between cognitive ability and financial well-being depends on the type of outcome that is studied. These results have important implications for policymakers and financial advisors who seek to improve financial well-being and reduce financial inequality. By understanding the complex interplay between cognitive ability, financial resources, and financial outcomes, targeted interventions can be developed to help those who are at the greatest risk of experiencing financial hardship. Our study also highlights the need for further research in this area, including exploring the underlying mechanisms that explain the relationship between cognitive ability and financial outcomes, and examining the role of other factors such as financial literacy and risk attitudes. By doing so, we can obtain a more complete understanding of the links between these variables, and advance our understanding of how to enhance financial well-being across the lifespan.

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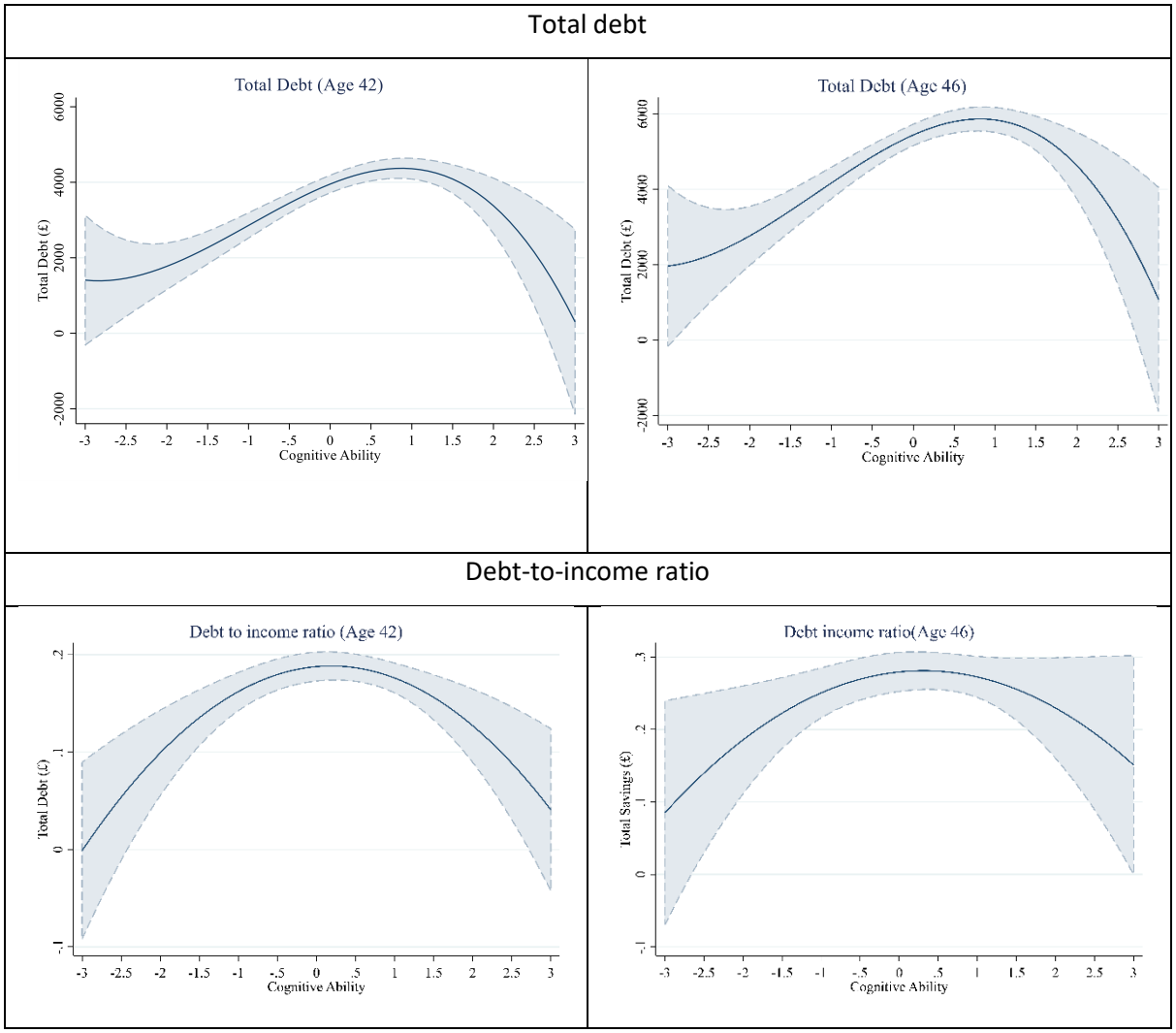
APPENDIX A. RESULTS FOR 2012 WAVE

Our main analyses focus on the most recent wave of the British Cohort Study, which was conducted in 2016. To demonstrate the robustness of our results we report similar analyses for the 2012 below. We do not report findings for having a retirement plan, as this data is only available for the 2012 wave.

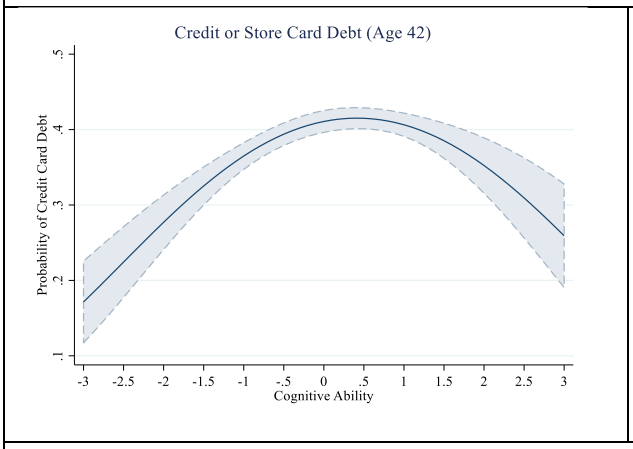
As demonstrated in Figure A1, we find similar trends for the association between cognitive ability and adult financial well-being is robust over time across all financial outcomes measured. Whereas the functional form of the association between cognitive ability and the debt-to-income ratio was difficult to derive from the analyses for the 2016 wave due to the large confidence intervals at extreme ends of the cognitive ability distribution, the analyses from the 2012 replicate the inverse u-shape that we find across all other debt measurements. The only notable difference in patterns across the waves can be found for financial stress. Whereas this pattern was negatively linear in 2016, we find non-linear effects in 2012 (Table A1, column 5). However, after adding adult demographic characteristics, childhood socioeconomic status and income, the cubic effect becomes non-significant. Therefore, our conclusions based on the analyses of the 2016 wave remain robust.

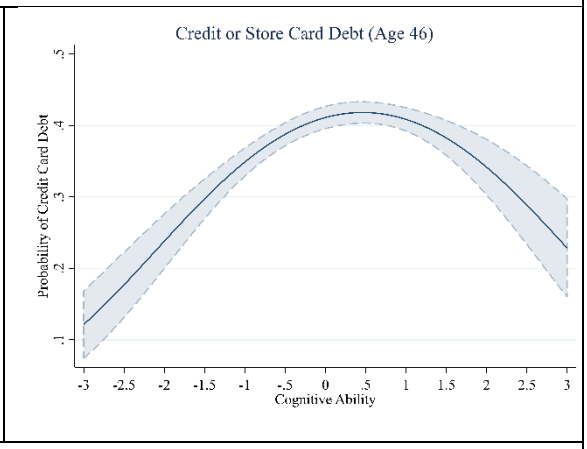
Figure A1

Comparison of Financial Outcomes over Levels of Cognitive Ability for 2012 (Age 42) and 2016 (Age 46)

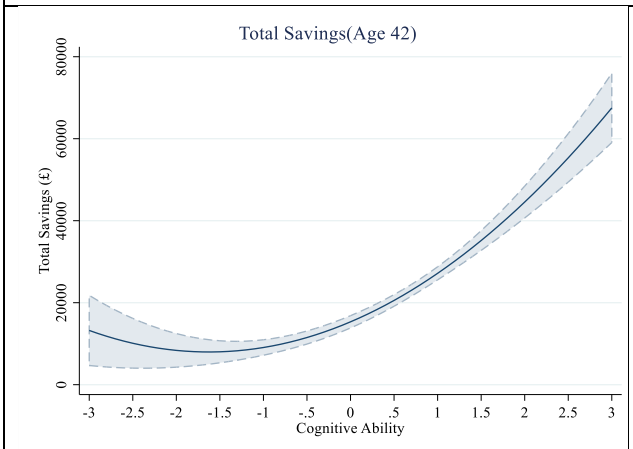


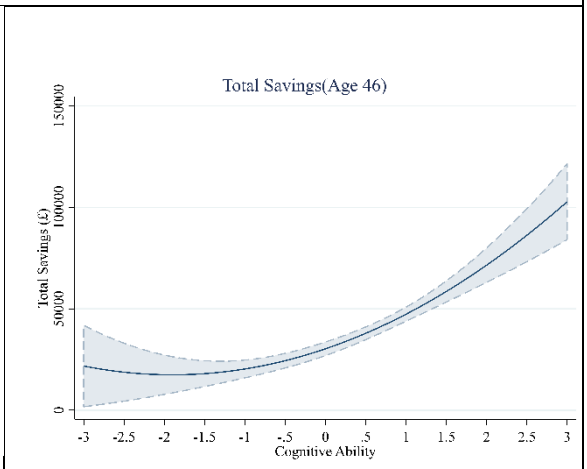
Credit card / store card debt



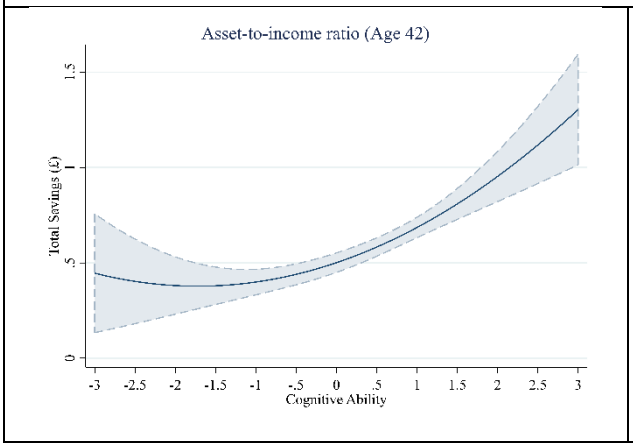


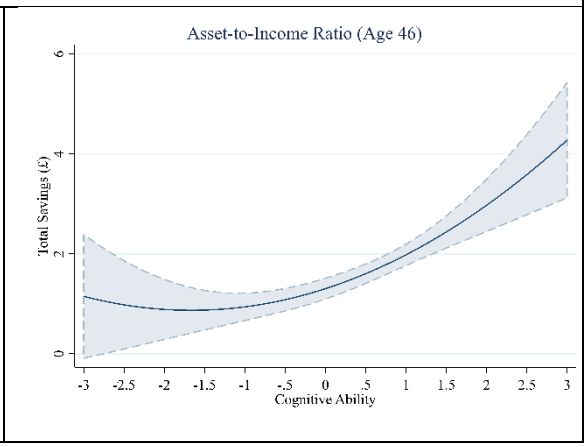
Total savings



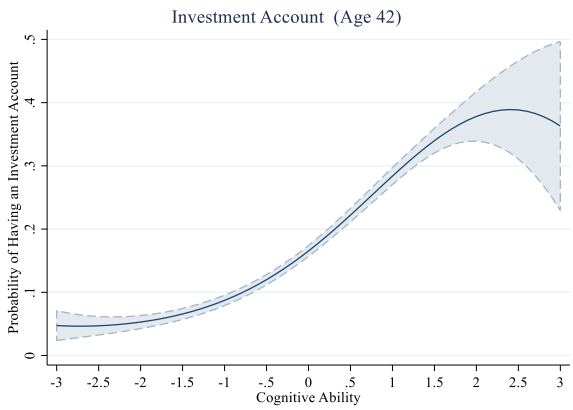


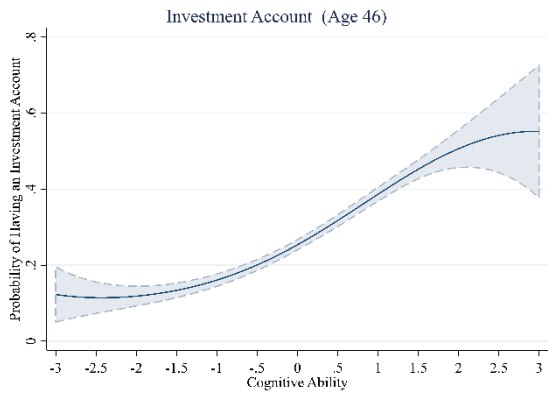
Asset-to-income ratio



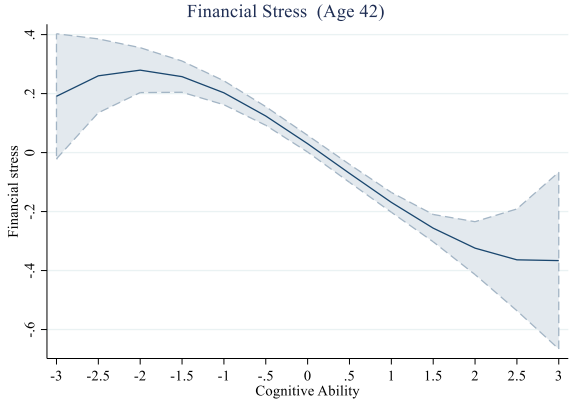


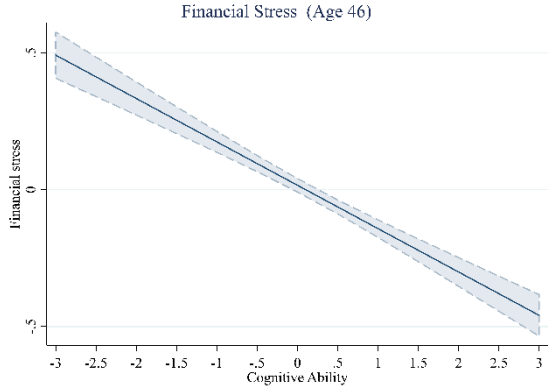
Investment account



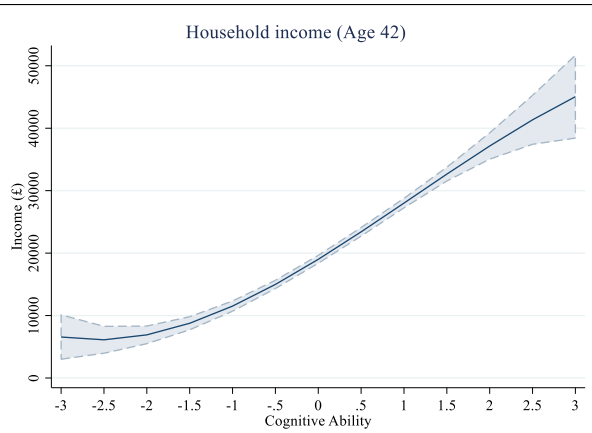


Financial stress





Income



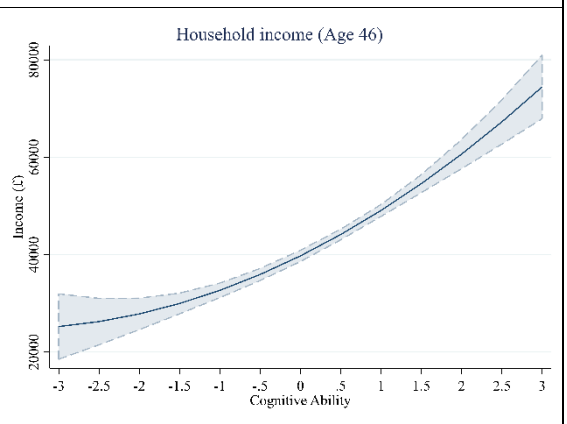


Table A1

OLS Regression and Logistic Models for Relationship between Cognitive Ability on Financial Outcomes at Age 42 – Without Controls

VARIABLES	(1) Total debt	(2) Debt-to-income ratio	(3) Credit card debt	(4) Total savings	(5) Asset-to-income ratio	(6) Investment account	(7) Financial stress	(8) Income
Cognitive ability	983.87***	0.01	0.09***	9,046.69***	0.14***	0.75***	-0.20***	8,476.88***
	(186.95)	(0.01)	(0.03)	(640.23)	(0.02)	(0.04)	(0.02)	(379.31)
Cognitive ability^2	-404.79***	-0.02***	-0.11***	2,782.21***	0.04*	-0.02	-0.01	755.81***
	(95.68)	(0.01)	(0.02)	(475.94)	(0.02)	(0.02)	(0.01)	(213.42)
Cognitive ability^3	-132.26*	-	-	-	-	-0.04***	0.01*	-229.08*
	(51.71)	-			-	(0.01)	(0.01)	(102.25)
Constant	4,824.13***	0.19***	-0.36***	15,333.62***	0.50***	-1.62***	0.03*	19,005.09***
	(144.95)	(0.01)	(0.03)	(763.42)	(0.03)	(0.03)	(0.01)	(321.90)
Observations	5,687	4,368	7,240	5,966	4,931	11,611	7,229	11,611
R^2	.008	.004	.004	.037	.010	.056	.027	.074

Standard errors in parentheses

*** $p < .001$, ** $p < .01$, * $p < .05$

Table A2

OLS regression and logistic models for relationship between cognitive ability on financial outcomes – with controls

VARIABLES	(1) Total debt	(2) Debt-to-income ratio	(3) Credit card debt	(4) Total savings	(5) Asset-to-income ratio	(6) Investment account	(7) Financial stress	(8) Income
Cognitive ability	800.19***	0.02	0.08*	4,223.16***	0.10***	0.41***	-0.09***	7,783.91***
	(236.31)	(0.01)	(0.03)	(803.26)	(0.028)	(0.06)	(0.02)	(654.44)
Cognitive ability^2	-453.76***	-0.02**	-0.09***	1,607.99**	0.02	0.01	-0.00	510.00
	(116.89)	(0.01)	(0.03)	(567.24)	(0.02)	(0.03)	(0.01)	(329.80)
Cognitive ability^3	-112.37		-	-		-0.03	0.01	-461.53*
	(65.96)					(0.02)	(0.01)	(185.77)
Female	-928.73***	-0.01	-0.09	-3,360.40*	-0.04	-0.09	-0.08**	-8,091.86***
	(276.88)	(0.01)	(0.06)	(1,418.74)	(0.05)	(0.06)	(0.03)	(772.76)
Married	930.95**	-0.01	0.12	2,239.00	0.11	0.35***	-0.22***	12,012.47***
	(318.90)	(0.02)	(0.07)	(1,630.65)	(0.06)	(0.08)	(0.03)	(879.53)
Household size	332.03**	0.02**	0.04	-733.39	-0.01	-0.00	0.05***	-125.64
	(113.67)	(0.01)	(0.02)	(574.23)	(0.02)	(0.03)	(0.01)	(317.14)
Father's education	-5.43	-0.01	-0.03	985.87*	0.03*	0.03*	-0.00	199.22
	(71.10)	(0.00)	(0.02)	(386.30)	(0.01)	(0.02)	(0.01)	(206.88)
Mother's education	66.51	0.01	-0.00	354.28	-0.01	-0.00	0.00	504.07*
	(78.30)	(0.00)	(0.02)	(401.56)	(0.01)	(0.02)	(0.01)	(229.22)
Family income at age 10	-135.93	-0.02**	-0.03	2,188.70***	0.04	0.17***	-0.04***	2,480.22***
	(123.46)	(0.01)	(0.03)	(632.58)	(0.02)	(0.03)	(0.01)	(344.56)
Household income (Per £1000)	19.47***	-	0.00**	321.38***	-	0.02***	-0.01***	
	(4.75)		(0.00)	(24.61)		(0.00)	(0.000)	
Constant	2,561.27*	0.223***	-0.06	-20,694.05**	0.06	-2.81***	0.45***	7,057.47
	(1,291.47)	(0.066)	(0.28)	(6,930.08)	(0.24)	(0.30)	(0.12)	(3,787.317)
Observations	4,146	3,394	5,435	4,501	3,779	5,436	5,426	5,436
R^2	.025	.009	.007	.083	.011	.101	.129	.139

Standard errors in parentheses, *** $p < .001$, ** $p < .01$, * $p < .05$

APPENDIX B. INCOME

The relationship between cognitive ability and income has been studied at length in past research. Therefore, we did not focus on income as a dependent variable in the main manuscript. We report these analyses here in Table B1 and Figure B1. After controlling for indicators of childhood SES as well as gender, marital status and household size at age 46, we find a positive association between cognitive ability and income – those with greater cognitive ability generally earn a higher income. The relationship appears to be characterized by diminishing returns at lower levels of cognitive ability and by an exponential trend at higher levels of cognitive ability.

Table B1

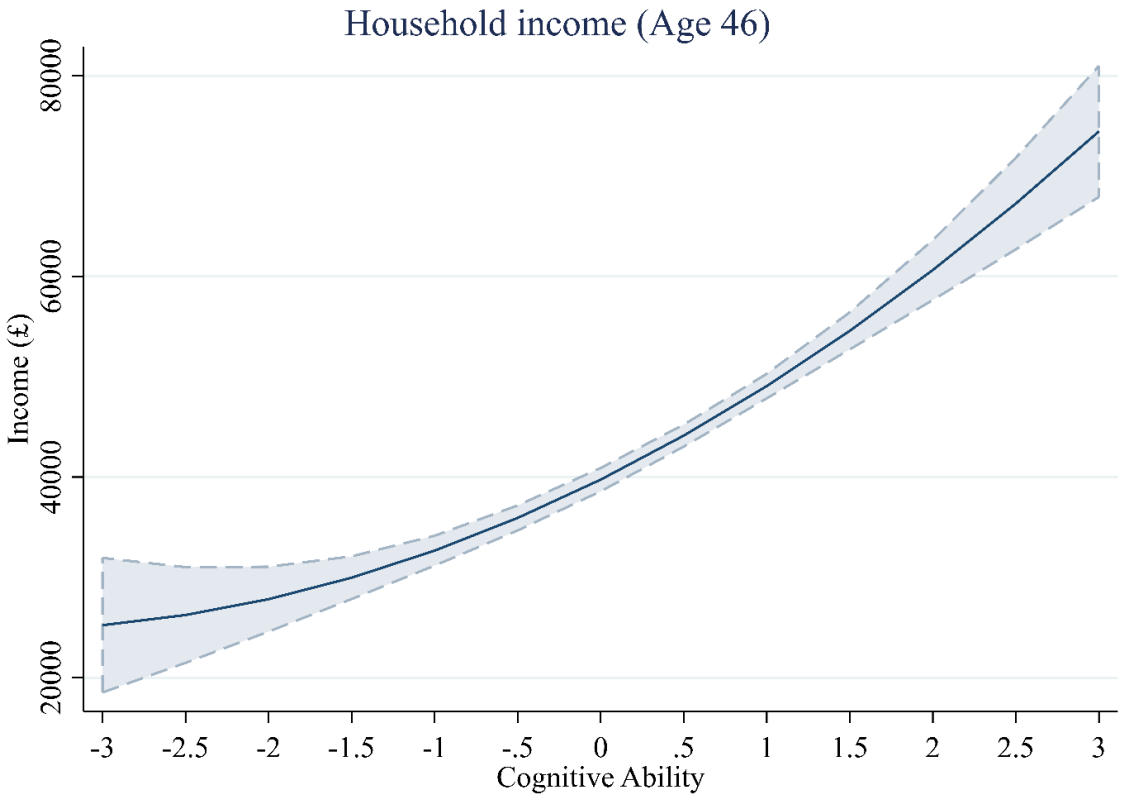
OLS Regression Models for Relationship between Cognitive Ability on Income

	(1)	(2)	(3)
	Income (£)	Income (£)	Income (£)
VARIABLES	(Age 46)	(Age 46)	(Age 46)
Cognitive ability	7,575.84***	6,487.38***	4,669.04***
	(777.27)	(754.89)	(934.67)
Cognitive ability^2	1,274.82**	1,221.19**	1,151.41*
	(397.40)	(385.27)	(465.03)
Cognitive ability^3	228.08	220.52	333.50
	(215.87)	(208.99)	(264.95)
Female		-3,318.82***	-3,524.44**
		(918.35)	(1,076.48)
Married		14,645.07***	14,167.37***
		(1,052.64)	(1,229.62)
Household size		2,640.95***	2,583.20***
		(393.60)	(463.97)
Father's education			395.01
			(304.28)
Mother's education			-7.79
			(316.66)
Family income at age 10			3,866.98***
			(478.08)
Constant	39,678.95***	24,004.82***	3,535.92
	(595.41)	(1,359.77)	(5,243.62)
Observations	5,858	5,858	4,450
R^2	.046	.107	.116

Standard errors in parentheses, *** $p < .001$, ** $p < .01$, * $p < .05$

Figure B1.

Household Income Across Levels of Cognitive Ability



APPENDIX C. DEBT

The relationship between debt and financial well-being may depend on the nature of debt. Debt is a complex phenomenon that can have both positive and negative outcomes. In our manuscript we argue that we focus on problematic debt – by excluding credit card debt that is paid off monthly and by excluding mortgage debt. In this appendix we further test the notion of whether our measure of debt is indeed indicative of problematic debt.

First, to strengthen the evidence that our debt measure reflects problematic debt, we conducted further regression analyses to examine whether debt predicts financial stress. Our findings indicate that debt is positively associated with financial stress in both the 2012 and 2016 waves, even after controlling for gender, marital status, household size, and income (Table C1 and C2). We also found that these results remain significant when we include additional financial characteristics, such as assets and investments, as controls (Column 2 and 4). Moreover, our analyses revealed that both total debt and credit card/store card debt are significant predictors of financial stress. These results suggest that debt is a negative financial outcome in our study.

Table C1

OLS Regression Models for Relationship between Debt on Financial Stress in the 2016 Wave of the British Cohort Study

VARIABLES	(1) Financial stress (2016)	(2) Financial stress (2016)	(3) Financial stress (2016)	(4) Financial stress (2016)
Total debt (per £1000)	0.01***	0.01***	-	-
	(0.00)	(0.00)		
Credit or store card debt			0.27***	0.25***
			(0.02)	(0.02)
Female	0.01	-0.01	-0.01	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Married	-0.31***	-0.25***	-0.32***	-0.25***
	(0.03)	(0.03)	(0.03)	(0.03)
Household size	0.04***	0.05***	0.04***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Household income (per £1000)	-0.01***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Household has investments		-0.29***		-0.29***
		(0.02)		(0.02)
Total savings		-0.00***		-0.00***
		(0.00)		(0.00)
Constant	0.33***	0.25***	0.30***	0.22***
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	7,187	6,246	7,322	6,341
R^2	0.144	0.165	0.145	0.168

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table C2

OLS Regression Models for Relationship between Debt on Financial Stress in the 2012 Wave of the British Cohort Study

VARIABLES	(1) Financial stress (2012)	(2) Financial stress (2012)	(3) Financial stress (2012)	(4) Financial stress (2012)
Total debt (per £1000)	0.02***	0.01***	-	-
	(0.00)	(0.00)		
Credit or store card debt			0.25***	0.18***
			(0.02)	(0.02)
Female	-0.06**	-0.07**	-0.07***	-0.07**
	(0.02)	(0.02)	(0.02)	(0.02)
Married	-0.22***	-0.16***	-0.24***	-0.18***
	(0.03)	(0.03)	(0.02)	(0.02)
Household size	0.04***	0.05***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Household income (per £1000)	-0.01***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Household has investments		-0.24***		-0.27***
		(0.03)		(0.02)
Total savings		-0.00***		-0.00***
		(0.00)		(0.00)
Constant	0.25***	0.29***	0.26***	0.32***
	(0.03)	(0.04)	(0.03)	(0.03)
Observations	6,818	5,679	9,049	7,422
R^2	0.137	0.196	0.135	0.198

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Second, we test the robustness of our findings for the inverse u-shape relationship between cognitive ability and debt by taking a more strict classification of debt. In our study, we excluded sources of "good" debt, such as mortgages and credit card debt that will be paid off by the end of the month, to ensure that our measure of debt truly reflects problematic debt. However, one category of debt that may be considered "good" is student loans, which only 3.74% of respondents in our sample reported as a source of debt in the 2016 wave of the British Cohort Study. To further confirm that our findings are not driven by "good" debt, we

conducted additional analyses excluding respondents who reported student loans as a source of debt. As reported in Table C3, we find that after excluding this group, we still observed an inverse-U-shaped relationship between cognitive ability and total debt, and the cubic term of cognitive ability remains statistically significant.

Table C3

OLS Regression Models for Relationship between Cognitive Ability on Debt

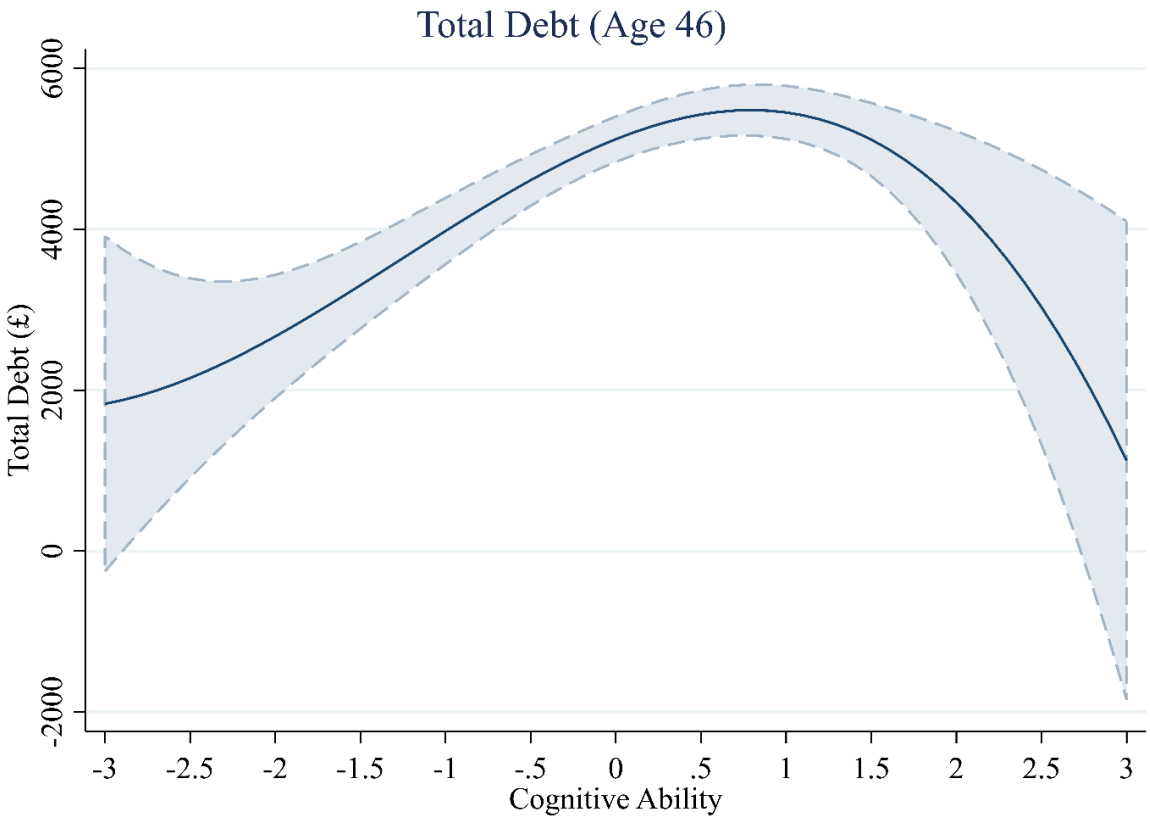
	(1)	(2)	(3)	(4)
	Total debt	Total debt	Total debt	Total debt
VARIABLES	2016	2016	2016	2016
Cognitive ability				
	844.55***	756.97***	689.06**	515.56*
Cognitive ability^2	(186.27)	(185.42)	(230.19)	(241.36)
	-404.86***	-432.17***	-457.45***	-493.15***
Cognitive ability^3	(95.93)	(95.31)	(115.01)	(120.69)
	-106.93*	-114.79*	-107.35	-104.69
Female	(52.22)	(51.81)	(65.90)	(68.29)
		-1,174.50***	-1,369.47***	-1,243.70***
Married		(227.15)	(266.56)	(278.66)
		1,059.12***	1,280.55***	969.96**
Household size		(259.46)	(303.41)	(322.83)
		512.47***	454.40***	394.05**
Father's education		(97.22)	(114.66)	(120.25)
			-51.03	-60.19
Mother's education			(75.31)	(80.51)
			163.18*	179.96*
Family income at age 10			(78.63)	(82.99)
Cognitive ability			57.28	-49.37
			(118.43)	(124.84)
Household income (per £1000)				25.98***
				(3.84)
Constant	5,121.05***	3,473.40***	1,753.07	1,508.59
	(143.73)	(336.16)	(1,286.72)	(1,364.77)
Observations	5,937	5,937	4,510	4,221
R^2	.007	.023	.025	.036

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Figure C1

Total Debt across Levels of Cognitive Ability, Excluding Student Debt





CHAPTER 5

WHEN, HOW, AND FOR WHOM EVALUATIVE LABELS AND CONSUMPTION BASKETS INCREASE SAVINGS

CO-AUTHORS: ELISABETH C. BRÜGGEN, PEIRAN JIAO AND THOMAS POST
FUNDING: PRIMARY DATA COLLECTION GRANT, GRADUATE SCHOOL OF BUSINESS AND ECONOMICS, MAASTRICHT UNIVERSITY.

1. INTRODUCTION

Numerous studies have shown that a significant proportion of consumers in do not save enough for retirement and face a shortfall in their retirement income. For example, the national retirement risk index (NRRI) shows that half of American households risk not being able to maintain their living standard during retirement (Munnell, Chen, and Siliciano, 2021) and the UK Pension and Lifetime Savings Association (2018) reports that about half of the UK population will not reach an adequate retirement income. To help consumers prepare for their future financial security, the development and implementation of effective interventions is required.

The literature on assistance in financial decision-making describes that, depending on style and implementation, certain interventions can increase savings, but others are ineffective or counterproductive. For example, highlighting the exponential growth of savings (e.g., McKenzie and Liersch, 2011), earmarking and partitioning money (e.g., Soman and Cheema 2011), visualizing the future self (Hershfield et al., 2011), or using fresh starts (e.g., Beshears et al., 2021) can increase savings. In contrast, peer saving norms may be deemed unrealistic and demotivating (Choi et al., 2017), and the timing of a saving intervention may discourage the perceived urgency of saving (Reiff et al. 2023).

However, several important issues are not addressed by existing interventions. First, existing interventions do not aim to align the increase of savings with one's desired future lifestyle. A mere increase in savings may thus not lead to financial well-being, if this increase is insufficient to achieve one's desired future outcomes. Second, existing interventions do not vary the tangibility of future outcomes. Whereas visualizations of the future self can increase savings (Hershfield et al., 2011), it is unclear which interventions with more or less detail (e.g. specific consumption possibilities) diminish or strengthen saving intentions. This knowledge is particularly relevant for financial service providers for whom simpler interventions may be easier to scale. Third, existing interventions such as those highlighting exponential growth (McKenzie and Liersch, 2011) require numerical comprehension, whereas many consumers lack the numeracy that enables them to make future-oriented decisions. We overcome these issues by presenting a novel strategy to increase saving rates through evaluative structures that describe future outcomes.

To increase the tangibility of future saving outcomes, pension associations in the UK and Australia have developed evaluative structures for describing retirement living standards.

These evaluative structures, similar to nutritional labelling, express retirement living standards as “minimum” or “comfortable” or even accompany such labels with specific consumption baskets (see Table 1 for an example). While prior research has demonstrated the effectiveness of providing an evaluative structure in nutrition (Hieke and Wilcynski, 2011), health (Peters, 2012), and investments (Becker, Martin, and Walter, 2022), their effectiveness in the domain of long-term financial decision making is neither established nor evident.

Previous results on evaluative structures in other domains do not necessarily generalize to saving decisions. First, the literature on evaluative labels generally maps the *features* of a product, (e.g., calories or daily values of macronutrients) service, or option onto a scale (e.g., low risk – high risk) to facilitate informed choice (e.g., Dieckmann, 2012; Ikonen et al., 2020; Pachali et al., 2023). In contrast, we study the evaluative labelling of *consequences* of a long-term financial decision (e.g., minimum to comfortable future lifestyle at retirement) to facilitate choice when facing a trade-off between current and future consumption. Second, the literature on evaluative labels studies the effect of verbal labels that often leave room for subjective interpretations (e.g., the interpretation of “high” risk may be different for each individual). While we also use labels that are open to interpretation (“comfortable” lifestyle may also have different meanings for different people), we additionally study evaluative labels in combination with concrete consumption possibilities associated with each label. The tangibility that the consumption baskets provide could either enhance or reduce the impact of evaluative labels on decision-making.

We examine the potential positive and negative impacts of evaluative labels and consumption baskets on saving rates. We conjecture that on the one hand, they may increase retirement savings if they make retirement outcomes more vivid or stimulate a heuristic decision to save more. On the other hand, they may not affect or even reduce saving rates, for instance, when a decision-maker finds the labelled consumption opportunities unattractive, when the next upward category is perceived as too far away and thus unachievable, or when those already in the highest category are demotivated from saving even more. Research in other domains has shown that evaluative structures can act as a heuristic and are not processed deeply (Dieckmann et al., 2012) which may have unintended consequences such as overeating (Wansink and Chandon, 2006). To assess whether evaluative structures create a pure heuristic effect or rather increase savings based on the actual consideration of future outcomes, we study the role of mental imagery in mediating the effect

of evaluative structures on savings. Furthermore, we study possible heterogeneous responses to this intervention by studying the moderating role of financial literacy, trust, and patience. To this end, we conduct three studies, including one incentivized experiment, to test our predictions.

Our experiments show that evaluative labels and consumption baskets can increase saving rates. Their effectiveness is not moderated by trust and patience, but does depend on financial literacy and the starting saving rate. The presence of evaluative structures leads to anchoring on the saving rates associated with reaching the next upward lifestyle. For consumption baskets, the effect on savings is mediated through mental imagery. Furthermore, we see that the effect of evaluative labels is attenuated when the impact of additional savings on disposable income is displayed, but this effect does not occur for consumption baskets. Our findings show that the content of the consumption baskets must be something that the decision-maker finds attractive for the intervention to be effective. Thus, the implementation of these tools in financial services must be done carefully.

We contribute to the literature on assistance in financial decision-making by testing the applicability and boundary conditions of a saving intervention aimed to increase savings. As a part of this, we examine the psychological process that underlies the effectiveness of evaluative structures—i.e., the mediating role of mental imagery for future financial outcomes. Furthermore, we contribute to the literature on evaluative structures by extending its applicability to long-term financial decision-making. In addition, we examine the impact of three consumer characteristics (financial literacy, trust, and patience) on the effectiveness of evaluative structures to see whether there exist differences between consumer segments (Mrkva et al., 2021). Our research addresses a gap in the literature, as prior research has not fully investigated the underlying processes of how evaluative structures affect financial decision-making and who they are most effective for. Filling this gap can inform the development of more targeted interventions.

2. CONCEPTUAL BACKGROUND AND HYPOTHESES

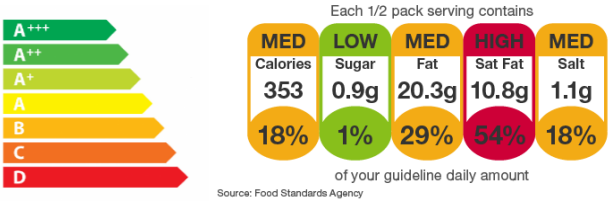
2.1 Evaluative Structures

When information is presented in a numerical format, many consumers are not able to derive sufficient meaning from this information (Peters, 2012). To process large quantities of complex information, decision-makers reduce complexity by processing at a simplified level, for example, by thinking in categories (e.g., Bhui & Jiao, 2023). Several research streams

have identified that adding evaluative labels, i.e., a form of an evaluative structure in which an outcome is mapped onto a verbal scale (e.g., good / bad, low / high), affects decision-making (e.g., Dieckmann et al., 2012; Peters et al., 2009). For instance in nutritional labelling, evaluative labels, such as the traffic light system with green, orange, and red labels, provide an indication of the quality of a product (Hieke & Wilcynski, 2011). Table 1 contains the definition of evaluative structures and shows our experimental materials as two specific types of evaluative structures: evaluative labels and consumption baskets.

Table 1

Definitions and Examples of Evaluative Structures

<table>
<tr><th>Term</th><th>Definition</th><th>Example</th></tr>
<tr><td>Evaluative structure</td><td>Evaluative structures are a collective term for any type of communication format in which outcomes are mapped on an evaluative scale.</td><td>
</td></tr>
<tr><td>Evaluative label</td><td>A type of an evaluative structure in which a textual description categorizes an objective numerical outcome (e.g., future retirement income / calories / risk) onto a verbal scale (e.g., minimum / comfortable, low / high, bad / good).

The example on the right shows the implementation of evaluative labels in this paper.</td><td>
<table>
<tr><th>Retirement saving rate</th><th>Expected retirement income</th><th>Living standard during retirement</th></tr>
<tr><td>1%</td><td>€874</td><td rowspan="7">Minimum</td></tr>
<tr><td>2%</td><td>€990</td></tr>
<tr><td>3%</td><td>€1105</td></tr>
<tr><td>4%</td><td>€1220</td></tr>
<tr><td>5%</td><td>€1335</td></tr>
<tr><td>6%</td><td>€1450</td></tr>
<tr><td>7%</td><td>€1565</td></tr>
<tr><td>8%</td><td>€1681</td><td rowspan="8">Moderate</td></tr>
<tr><td>9%</td><td>€1796</td></tr>
<tr><td>10%</td><td>€1911</td></tr>
<tr><td>11%</td><td>€2026</td></tr>
<tr><td>12%</td><td>€2141</td></tr>
<tr><td>13%</td><td>€2256</td></tr>
<tr><td>14%</td><td>€2372</td></tr>
<tr><td>15%</td><td>€2487</td></tr>
<tr><td>16%</td><td>€2602</td><td rowspan="5">Comfortable</td></tr>
<tr><td>17%</td><td>€2717</td></tr>
<tr><td>18%</td><td>€2832</td></tr>
<tr><td>19%</td><td>€2947</td></tr>
<tr><td>20%</td><td>€3062</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Term</th><th>Definition</th><th>Example</th></tr>
<tr><td>Consumption baskets</td><td>A type of evaluative structure in which a textual description specifies the consumption possibilities associated with a specific outcome.

In this paper, we use consumption baskets per retirement living standard, for example, how much a consumer will be able to spend on gifts, travel, and housing.</td><td>
<table>
<tr><th>Living standard during retirement</th><th>Holidays & leisure</th><th>Helping others</th></tr>
<tr><td>Minimum</td><td>A week and long weekend in the country you live in every year</td><td>€10 for each birthday present</td></tr>
<tr><td>Moderate</td><td>2 weeks in Europe and a long weekend in the country you live in every year</td><td>€30 for each birthday present</td></tr>
<tr><td>Comfortable</td><td>3 weeks in Europe every year</td><td>€50 for each birthday present</td></tr>
</table>
</td></tr>
</table>

Complementing numerical information with evaluative structures makes it easier for individuals to use and interpret the numerical information presented (Peters et al., 2009). Evaluative structures may thus help consumers without sufficient knowledge to make complex judgements. Talati et al. (2016) report that consumers find evaluative product labels easier to interpret than purely numeric information. However, the presence of evaluative structures may be a double-edged sword: Consumers tend to heavily rely on evaluative structures when these are present and may base their decisions on the structure more than the numerical information the label accompanies (Dieckmann et al., 2012). Therefore, evaluative structures may have unintended consequences. For example, low-fat labels may lead to over-eating (Wansink & Chandon, 2006) and front-of-package nutrition labels may distract attention from other nutritional qualities (Roe et al., 1999). On the one hand, evaluative structures may thus be beneficial for informed decision-making, as they highlight information such as caloric content, risk of financial products, or complications of medical procedures, which could otherwise be overlooked or misunderstood (Dieckmann et al., 2012; Peters et al., 2009). On the other hand, the salience of these evaluative structures may lead to incorrect conclusions or value-inconsistent choices if consumers base their decision solely on the evaluative

structure and ignore or underweight the numbers the structure accompanies (Dieckmann, 2012; Roe et al., 1999).

The mere presence of an evaluative structure can impact decision-making. Urminsky and Goswami (2019) argue that the salience of labels may cue consumers to be more reflective of their decision. For instance, when consumers are confronted with an evaluative structure describing nutrition, this may shift their attention toward the nutritional aspect of food choices. Similarly, when consumers see an evaluative structure of future outcomes, this may cue their attention toward the future, whereas without this label they would focus on the present or on a trade-off between current and future preferences. According to Bartels and Urminsky (2015), a reduction in current spending in favor of future outcomes requires a combination of valuing the future and being aware of future outcomes. Following this argumentation, evaluative structures can increase savings (and reduce current spending) as the evaluative structure could help consumers to value future outcomes more and create awareness of future outcomes (Bartels & Urminsky, 2015).

Based on the insights on evaluative structures in other domains, we posit that evaluative structures assist consumers in making future-oriented saving decisions, as they aid in the interpretation of numerical information by providing a reference point. As consumers heavily rely on the information that is communicated through evaluative structures (Dieckmann et al., 2012), we expect that they will make more future-oriented decisions when an evaluative structure about future outcomes is present. Formally:

H1: Saving rates are higher when an evaluative structure about future outcomes (i.e., evaluative labels or evaluative labels with consumption baskets) is present compared to when it is not.

2.2 Mental Imagery

Consumers have the capability to create mental images of objects, situations, past events, and future outcomes. The ease and vividness of mental imagery can vary across consumers and per modality, and it can be manipulated by experimental treatments (Andrade et al., 2014). Mental imagery is frequently studied in marketing research (e.g., Babin and Burns, 1998; Bone and Ellen, 1992; Yoo and Kim, 2014). There, the focus lies mostly on how communication and advertising affect mental imagery of consumers making purchase decisions. For example, early research by Bone and Ellen (1992) shows that mental imagery can have a positive impact on attitudes toward advertisements. Similarly, Ha, Huang, and Park

(2019) show that mental imagery plays a key role in the persuasiveness of advertisements and is associated with more favorable attitudes toward advertisements on social networks. The wording of price promotions can also trigger mental imagery and consequent favorable product and brand attitudes (Aydinoglu and Krishna, 2019). In the context of online shopping, the use of backgrounds that are associated with product use can increase the ease of mental imagery, which in turn leads to higher liking and larger purchase intentions (Maier and Dost 2018). Mental imagery also positively affects purchase intentions in the context of mobile advertising through SMS or MMS (Gavilan, Avello, and Abril, 2014).

In the current study, we focus on prospective mental imagery. This means consumers imagine what future outcomes may look like (Morina et al., 2011). There is little research that addresses whether the ease of imagery can affect decisions made in intertemporal choice. An exception is the research by Hershfield, John, and Reiff (2018) who describe several studies in which increasing the vividness of one's future self, i.e., the clarity of mental imagery, leads to greater saving intentions. They find that the vividness of the future self can be enhanced either by written exercises describing the future or by digitally altered pictures that show an older version of the self.

Based on the findings of Hershfield et al. (2018), we argue that an increase in saving rates is more likely to occur when consumers have mental imagery of how increased saving would affect their future lifestyle. We expect evaluative structures to trigger mental imagery of future consumption possibilities–individuals will find it easier to imagine enjoying a "comfortable" lifestyle in retirement than having a retirement income of, for example, €2,602. This mental image of what the future may look like could prompt consumers to increase their saving rates to achieve this outcome.

H2: The positive impact of an evaluative structure on saving rates is mediated through increased mental imagery of one's future outcomes

2.3 Salience of Disposable Income

The choice for future financial outcomes is impacted by the decision's implications for one's current financial situation. An increase in saving rates has a direct impact on one's current spending opportunities. In the context of evaluative structures, a choice architect must balance the focus on how additional savings affect one's future lifestyle and the negative impact of additional savings on one's current disposable income. The decision to display the impact of additional savings on one's current income may be impacted by legal or ethical

concerns. For example, financial regulations may require pension funds to be transparent in their information provision and show the trade-offs involved with financial decisions, so consumers can make a well-informed decision about their saving rates. Ethically, nudging consumers to increase saving rates without making them aware of the consequences for their current spending power may be undesirable.

When the trade-off between current and future outcomes is made salient, consumers may not be motivated to save for the future as much as when only the future is made salient. In the context of retirement savings, Hershfield et al. (2011) demonstrate that showing consumers a picture of their future selves looking happier as their future spending power increases, makes consumers more future-oriented compared to when only a picture reflecting happiness according to current spending power is shown. We hypothesize that when the trade-off between current and future outcomes is made salient (i.e., additional pension saving rates reduce current disposable income), consumers will focus more on the reduction in current income and will be less likely to give up current income for a higher expected future income. If consumers focus more on current income, then evaluative labels about future financial outcomes will have less impact on saving rates. Formally:

H3: The positive effect of an evaluative structure on saving rates is smaller when the consequences of increased savings for one's current disposable income are displayed.

2.4 Moderating Factors for the Effectiveness of an Evaluative Structure

Whereas we hypothesize that complementing savings tables with an evaluative structure will increase savings, the way that consumers process these evaluative labels may depend on individual characteristics. In the following section, we describe how the effect of evaluative structures may be moderated by three key predictors of financial decision-making involving savings: financial literacy, trust in financial (pension) institutions, and patience.

Financial Literacy

Financial literacy is a key predictor of planning for one's financial future (Lusardi & Mitchell, 2017). Therefore, we argue the effect of evaluative structures on saving rates may be moderated by financial literacy. Lusardi and Mitchell (2017) describe that consumers with low financial literacy do not have the capability to perform simple calculations and lack the knowledge to comprehend or use financial information. As consumers with low financial literacy have difficulties to perform basic numerical calculations (Hastings et al., 2013), they may not be able to comprehend numerical information about saving rates. However, when

the numerical information is accompanied by evaluative categories, they may be more capable to distil meaning from these numbers. This notion is in line with a theoretical model proposed by Delavande et al. (2008) who argue that thinking about retirement is more costly for consumers with low financial literacy. The presence of an evaluative structure could potentially lower these costs, as this guides the decision-making process and, thus, reduces barriers to knowledge acquisition. Similarly, Mrkva et al. (2021) argue that consumers with low financial literacy feel more anxiety when making financial decisions and will rely more heavily on strategies that reduce the effort of deciding. In contrast, for consumers with high levels of financial literacy, a ceiling effect may emerge; these individuals are able to grasp the meaning of financial information without assistance, so the additional guidance of evaluative structures will not further improve their understanding of the financial decision at hand.

H4: The positive impact of an evaluative structure on saving rates will be larger for consumers with lower financial literacy.

Trust

Trust in pension institutions is an important predictor of pension savings and pension planning (Casey, 2012; Ricci & Caratelli, 2017). Perceptions of integrity, competence, and stability of pension providers can affect the level of trust in pension institutions (Van Dalen & Henkens, 2022). The effectiveness of interventions to increase savings may thus be moderated by trust in the institutions that carry out the saving scheme (Deetlefs et al., 2018; Eberhardt et al., 2022; Kabadayi & Certain, 2016; Ricci & Caratelli, 2017). We focus on narrow-scope trust, which is defined as ‘‘the expectation held by the consumer that the service provider [i.e., the specific financial institution] is dependable and can be relied on to deliver on its promises’’ (Sirdeshmuk et al., 2002, p. 17). We argue that narrow-scope trust plays an important role for the effectiveness of saving interventions. If an intervention stimulates the need to save more, but a consumer does not trust institutions to handle the savings in a responsible manner, there is no strong incentive to increase savings. In essence, this would provide a type of floor effect–the savings rate of low-trust consumers will remain low, despite interventions that illustrate the advantages of saving.

H5: The positive impact of an evaluative structure on saving rates will be larger for consumers with higher trust in the saving scheme provider.

Patience

Consumers differ in their levels of patience, i.e., the extent to which they are able to give up immediate gratifications for long-term benefits (Vischer et al., 2013). Patient individuals tend to prefer larger-later options over smaller-immediate benefits, which results in positive outcomes, such as the accumulation of wealth and savings (Epper et al., 2020; Sutter et al., 2013). In general, impatient consumers do not place as much value on results achieved in the future as more patient consumers (Chen et al., 2005). However, research has demonstrated that external factors can affect the valuation of future outcomes (Romero et al., 2019). For example, shifting attention to attractive attributes in a larger-later option increases patient decision-making (Fisher, 2021). As evaluative structures highlight positive results in the future, we hypothesize that they can also affect the appreciation of these outcomes. Furthermore, as individuals with lower levels of patience have larger room for improvement in the valuation of future outcomes (Bulley & Schacter, 2020; Chen et al., 2005; Frederick et al., 2002; Loewenstein, 1987), we argue that the presence of an evaluative structure will be especially beneficial for consumers with low patience. In contrast, we expect the effect of evaluative structures on savings to be less pronounced for patient consumers, who already value long-term benefits over short-term gains.

H6: The impact of an evaluative structure on saving rates will be larger for consumers with lower patience.

2.5 Starting Saving rate

When studying the effect of evaluative structures, the position of the starting saving rate relative to the thresholds of the labels may be of great importance. Evaluative structures require switching points: the point where the evaluative structure goes from one level to the next (e.g., in the American grading system, the 93rd percentile is the switching point from an "A" to an "A+"). One may worry that evaluative structures possibly disincentivize people, who are close to a switching point or who have relatively higher saving rates, to save more. If the saving rate that is associated with the next upward lifestyle level (e.g., 8% = moderate; 16% = comfortable as in Table 1) is perceived as a cue, the effectiveness of labels may be contingent on the distance between the starting saving rate and the cutoffs between labelled categories. If the starting saving rate is far away from this threshold, consumers will move upward (toward the anchor) more compared to when no labels are present. However, when consumers are close to the next upward lifestyle level, they may anchor on this value and not be inclined to

move further upward, whereas when no labels are present, consumers may move upward more as they are not restricted by an anchor. Evidence from other domains shows that individuals are motivated to meet arbitrary marks, such as a 4-hour completion time for a marathon (Allen et al., 2017) and that people anchor on end-targets as goals (Gunasti & Ozcan, 2019). Arbitrary cut-offs and standards can thus act as a motivating, cognitive reference point that people anchor on (Allen et al., 2017). Applying this reasoning to the saving context, we would expect that consumers focus on achieving the highest lifestyle category. Once consumers have reached the highest lifestyle level, the presence of evaluative structures may reduce the motivation to increase savings further. In contrast, when no such structure is present, consumers may still consider additional savings, as they consider the full range of possible outcomes rather than the large categories presented in an evaluative structure. Thus, it is important to investigate possible negative effects of evaluative structures by examining whether they indeed lead to lower increases in saving rates depending on the starting saving rates.

H7a: When an evaluative structure is present and the starting saving rate is near the next upward evaluative category, individuals will increase their saving rates less than when there is no evaluative structure present.

H7b: Satiation Effect: When an evaluative structure is present and the starting saving rate falls in the highest evaluative category, the increase of the saving rate will be lower compared to when no evaluative structure is present.

3. OVERVIEW OF STUDIES

We conduct three experimental studies to assess the effect of evaluative structures on saving rates. Study 1 tests whether evaluative labels and consumption baskets increase saving rates, and whether this effect is mediated by mental imagery. In addition, we analyze how the salience of current disposable income affects saving decisions and whether the effect of evaluative structures is moderated influenced by financial literacy and trust. Study 2 investigates whether the effectiveness of evaluative labels and consumption baskets depends on the positioning of the starting saving rate relative to the next upward lifestyle switching point and whether patience moderates the effect of evaluative structures. Study 3 assesses whether consumption baskets increase savings in personal saving decisions in an incentivized savings task and tests financial literacy, trust, and patience as moderators of this effect.

4. STUDY 1

Study 1 tests whether consumers are more likely to choose higher pension saving rates when evaluative labels or labels accompanied by information specifying the consumption possibilities per lifestyle label (consumption baskets) are added to numerical saving rates (H1). We base the labels and consumption baskets on the Retirement Living Standards developed by the British Pension and Lifetime Savings Association (PLSA)[5]. We assess mental imagery as a potential mediator for these effects (H2). Furthermore, we test if the evaluative structures are effective when consumers see how increased saving rates would reduce current disposable income (H3). Additionally, we test whether the effectiveness of evaluative structures is moderated by one's level of financial literacy and trust as the two most likely moderators based on the current knowledge of the literature (H4, H5).

4.1 Methodology

Participants

Participants were recruited at a Western European University and were rewarded with course credit (n = 478, 53.6% = female). The sample age ranged from 18 to 30 years (M_{age} = 21.27, SD = 2.10). Initially, 638 participants completed the survey online. Based on the experiment's pre-registered exclusion criteria, we removed participants who failed an attention check (n = 126)[6] and outliers who spent more time than 3 standard deviations on the materials page (n = 4). Inspection of the data showed that some participants selected unrealistic saving rates (e.g., 100% of income). To avoid the choice for an arbitrary cut-off point for outliers, we decided to only analyze the responses that fell in the range of the available saving rates in the study stimuli (i.e., 1-20%), which led to the removal of 30 respondents. This decision was not pre-registered in Study 1, but was pre-registered in the follow-up studies. The pre-registration of this study can be found at https://aspredicted.org/blind.php?x=at34jv

[5] https://www.retirementlivingstandards.org.uk/

[6] Our attention check asked consumers to indicate which saving rates were present in the table. It can be argued that this was a memory rather than attention check, which may explain the high rate of incorrect responses.

Materials and Procedure

We conducted a between-subjects experiment with five experimental conditions. All participants first read a vignette:[7]

"Suppose you have a friend named Alex, who is 25 years old and is just starting a new job, with a monthly disposable income of €3,330. Alex wants to start planning for retirement. On the next page you will see a pension table. This table comes from Alex's pension provider and indicates the expected income in retirement, based on the saving rate that is chosen. The expected retirement income that is displayed is the net, monthly amount."

After reading the vignette, participants were presented with a table that displays starting saving rates of the hypothetical person (in percentages) and the corresponding future retirement income (in euro values).[8] Participants were randomly assigned to one of the following experimental conditions (see Appendix A for details about the experimental material):

- *Condition 1 – Control*: baseline table with saving rates and corresponding retirement income.
- *Condition 2 – Evaluative labels:* the future retirement incomes in the table are classified into a specific category of future living standard as indicated by the accompanying evaluative label next to the future retirement income (minimum / moderate / comfortable lifestyle).
- *Condition 3 – Evaluative labels + consumption baskets:* evaluative labels accompanied by detailed descriptions of future consumption possibilities that correspond to each specific evaluative label (e.g., consumption possibilities for housing, transport, holidays, and leisure).
- *Condition 4 – Evaluative labels + disposable income:* evaluative labels accompanied by an indication of how one's current disposable income would decrease as saving rates increase.
- *Condition 5 – Evaluative labels + consumption baskets + disposable income:* evaluative labels with consumption baskets accompanied by an indication of how one's current disposable income would change as saving rates increase.

7 The name Alex was selected as it is gender-neutral. The income of €3,330 was selected by increasing the average UK income in 2019 with increments of 100 until all retirement lifestyles were possible outcomes in the retirement savings table with contribution rates from 1-20%.

8 These numbers are based on a UK based projection tool for pension income (https://www.moneyhelper.org.uk/en/pensions-and-retirement/pensions-basics/use-our-pension-calculator). Whereas the tool provides pound estimates, we set the currency to euro in the present study to match the currency a predominantly European sample is most familiar with.

After viewing the material, participants were asked to indicate which pension saving rate they would recommend for Alex by entering a number between 0-100 percent. After choosing a saving rate, participants were asked to indicate on a 7-point scale (Keller & Block, 1997) how easy it was for them to imagine what the lifestyle in retirement would look like (very difficult to picture or imagine – very easy to picture or imagine). Participants also completed a five-item measure of financial literacy (Hastings et al., 2013) and an adapted version of the three-item trust-in-financial-services measure by Hansen (2012) that specifically measured trust in pension institutions ($\alpha = .83$).

4.2 Results

We conducted a one-way between-subjects ANOVA to test the effect of the experimental condition on pension saving rates.[9] The overall effect was significant, (F (4, 473) = 3.474, p = .008, η_p^2 = .029), indicating that the selected saving rate differed between the experimental conditions.

Table 2 displays the means and standard deviations for the saving rate by experimental condition, and Figure 1 displays a violin plot of the chosen saving rates per experimental condition. In the control condition, the mean saving rate was 13.60%. In support of Hypothesis 1, post hoc comparisons with a Bonferroni correction indicated a positive effect on saving rates when evaluative labels were present (Condition 2) compared to the control group that only saw the baseline table (M_{labels} = 15.30, p = .053). However, this effect did not reach significance at the 5% level after controlling for multiple comparisons. When inspecting the consumption basket condition (Condition 3), we found higher saving rates compared to the control condition ($M_{baskets}$ = 15.41, p = .041), thereby supporting Hypothesis 1. Next, Bonferroni's post-hoc test showed that when the effect of additional pension saving rates on current disposable income was made salient (Condition 4), we no longer observed a difference in saving rates in comparison to Condition 1 ($M_{labels+disposable}$ = 14.29, $p > .999$). When the effect of additional saving rates on current disposable income was made salient and evaluative labels as well as consumption baskets were present (Condition 5), we still found a positive effect on saving rates ($M_{baskets+disposable}$ = 15.39, p = .043), These findings support Hypothesis 3 for the

[9] We also measured affect, processing fluency, time spent looking at the materials, decision confidence, and perception of information quantity per our pre-registration. We do not find effects of experimental condition on decision confidence, affect, or processing fluency. We do find positive effects on perceived information quantity and time spent comparing the experimental conditions to the control condition. For brevity, these variables are not discussed in detail.

labels condition, which posited that the effect of evaluative labels on saving rates is attenuated when the impact of increasing pension saving rates on one's current disposable income is displayed. Hypothesis 3 is not supported for the consumption basket condition, as in these conditions (3 and 5) the selected saving rate is similar, regardless of when disposable income was not shown.

Furthermore, exploratory analyses showed evidence of anchoring on the lifestyle switching points. In the saving tables, the saving rates of 8% and 16% were associated with the next upward lifestyle level. A logistic regression analysis showed that consumers were more likely to select such a lifestyle switching point in the experimental conditions than in the control condition (See Table 3).

Figure 1

Violin Plot of Distributions of Saving Rates by Experimental Conditions (Study 1)

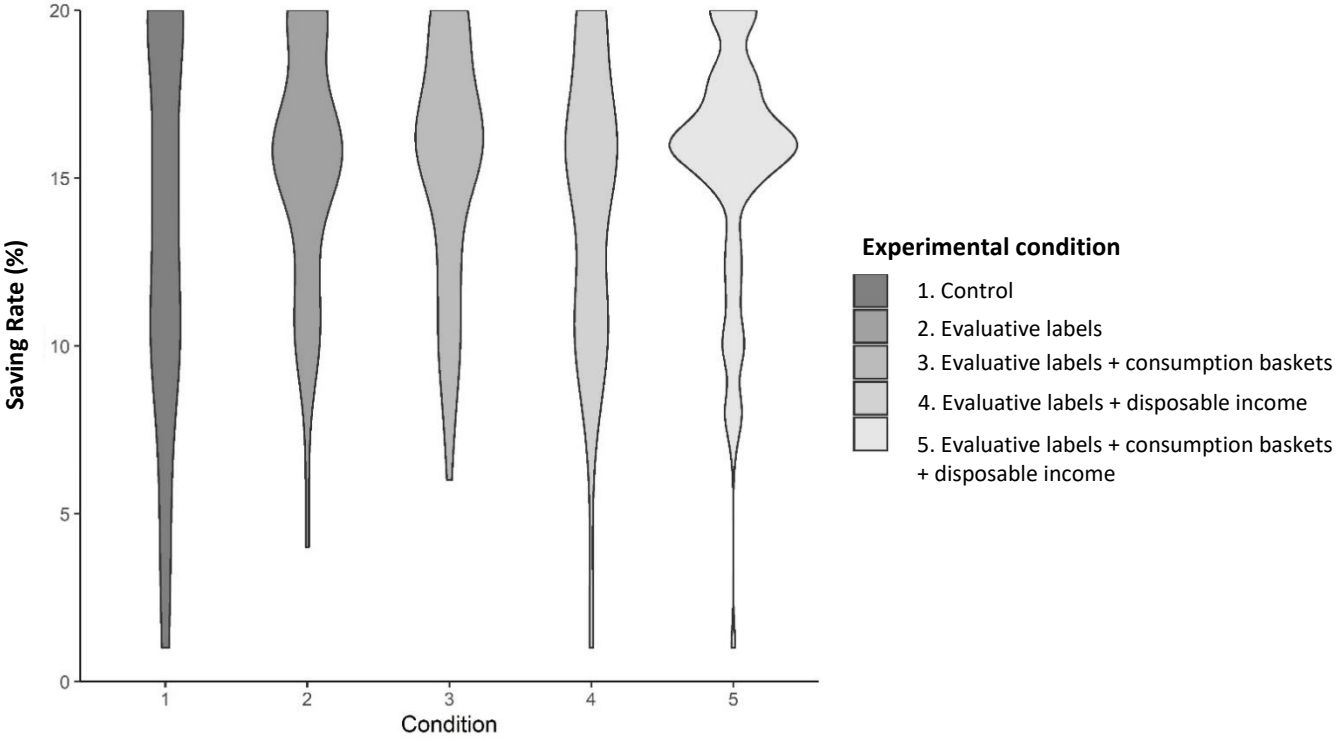


Table 2

Means and Standard Deviations for Saving Rates by Experimental Condition

Experimental condition	*n*	Mean (S.D.)
Control	95	13.60 (5.75)
Evaluative labels	103	15.30 (3.66)
Evaluative labels + consumption baskets	91	15.41 (3.58)
Evaluative labels + disposable income	97	14.29 (4.40)
Evaluative labels + consumption baskets + disposable income	92	15.55 (3.55)

Table 3

Logistic Regression Predicting the Choice of a Lifestyle Switching Point by Experimental Condition (N = 478)

Effect	*B*	*SE*	*Exp(B)*	*Wald*	*p*
Intercept	-3.42	0.59	0.03	34.04	<.001***
Evaluative labels	2.23	0.63	9.32	12.50	<.001***
Evaluative labels + consumption baskets	2.40	0.63	10.99	14.33	<.001***
Evaluative labels + disposable income	2.26	0.63	9.53	12.67	<.001***
Evaluative labels + consumption baskets + disposable income	2.84	0.63	17.15	20.64	<.001***

X^2 = 38.519 (*df* = 4), *p* = <.001, Pseudo R^2 (Cox and Snell) = .077

Note. – The dependent variable is a dummy-coded variable that is marked as 1 when the participants selects a saving rate that is associated with a lifestyle switching point (i.e., 8% or 16).

Mediation

To test Hypothesis 2, which stated that the ease of imagining future retirement lifestyle mediates the positive effect of labels and baskets on pension saving rates, we used Hayes (2017) SPSS process macro for mediation. The results showed a positive effect of ease of mental imagery on pension saving rates (B = 0.56, p < .001). We did not find an association between the evaluative label conditions (Condition 2 and 4) and ease of mental imagery, which impeded us from inspecting these results further.

However, there was a positive association between the consumption basket conditions (Condition 3 & 5) and ease of mental imagery ($B_{baskets}$ = 0.618, p = .010; $B_{basketsdis}$ = 0.942, p < .001). Further analyses showed that for both basket conditions the direct effect on the pension saving rates got smaller but remained significant when ease of mental imagery was included in the model. Bootstrapping procedures were used to test the significance of the indirect effect of ease of imagination (5,000 bootstrapped samples). The indirect effects of consumption baskets on pension saving rates via ease of imagination were significant ($B_{baskets}$ = 0.312, *CI* [0.062; 0.645]; $B_{basketsdis}$ = 0.475, *CI* [0.184; 0.859]). These results indicate that ease of imagination partially mediated the relationship between the basket conditions and pension saving rates.

Moderation

We conducted linear regressions to test the effect of the experimental condition[10], financial literacy, and trust on pension saving rates (Table 4). There was a positive main effect of financial literacy on the saving rate (B = 0.50, p = .003), indicating that higher financial literacy is associated with higher saving rates. No significant association between trust and pension saving rates was found. Our results are robust when controlling for age and gender. Further regression analyses, interacting the experimental conditions with financial literacy and with trust in pension institutions, showed that the effect of neither of the experimental treatments was moderated by financial literacy or trust in pension institutions. Therefore, Hypothesis 4 and Hypothesis 5 were not supported.

[10] Whereas we pre-registered that we would dummy code the presence of labels, baskets, or disposable income, we have reported the results with dummy-coding per experimental condition, to ease the interpretation of the results. The pre-registered analyses, which led to similar conclusions, are presented in Appendix B.

Table 4

Stepwise Regressions Predicting Saving Rates in Study 1 with Condition Dummies, Financial Literacy, Trust, and Demographics; and Interaction Effects (N = 478)

	1	2	3
Constant	13.60***	10.85***	9.09**
	(0.438)	(2.312)	(2.912)
Evaluative labels	1.70**	1.79**	5.35
	(0.608)	(0.605)	(2.999)
Evaluative labels + consumption baskets	1.81**	1.97**	1.44
	(0.627)	(0.623)	(3.142)
Evaluative labels + disposable income	0.69	0.66	3.99
	(0.617)	(0.610)	(2.932)
Evaluative labels + consumption baskets +	1.79**	1.66**	3.10
disposable income	(0.625)	(0.622)	(3.166)
Financial literacy		0.48**	0.90*
		(0.172)	(0.366)
Trust		0.07	0.10
		(0.190)	(0.382)
Evaluative labels x Financial literacy			-0.89
			(0.525)
Evaluative labels x Trust			-0.09
			(0.542)
Evaluative labels + consumption baskets x			-0.05
Financial literacy			(0.539)
Evaluative labels + consumption baskets x			0.20
Trust			(0.604)
Evaluative labels + disposable income x			-0.41
Financial literacy			(0.511)
Evaluative labels + disposable income x			-0.47
Trust			(0.567)
Evaluative labels + consumption baskets +			-0.75
disposable income x Financial literacy			(0.530)
Evaluative labels + consumption baskets +			0.35
disposable income x Trust			(0.619)
Gender (male)		0.18	0.24
		(0.403)	(0.406)
Age		0.03	0.04
		(0.094)	(0.094)

Model 1 $F(4, 473) = 3.474$, $p = .008$, $R^2 = .029$, adjusted $R^2 = .020$. Model 2 $F(8, 466) = 3.119$, $p = .002$, $R^2 = .051$, adjusted $R^2 = .035$. Model 3 $F(16, 458) = 1.951$, $p = .015$, $R^2 = .064$, adjusted $R^2 = .031$

4.3 Discussion

Adding an evaluative structure to pension saving rate tables has a positive effect on pension saving rates. The effectiveness of evaluative labels (without consumption baskets) on pension saving rates depends on whether the effect of additional pension saving rates on current disposable income is made salient or not. We find that financially literate participants select higher pension saving rates, but the effectiveness of our experimental treatments is not moderated by one's level of financial literacy. Additionally, the effects found are not moderated by one's trust in pension institutions. Whereas we posited that individuals with lower trust would be less susceptible to evaluative structures, we do not observe such effects. The absence of a trust-effect also rules out the possibility that saving interventions are less effective for high-trust individuals, who may increase savings regardless of the presence of an evaluative structure.

When consumption baskets are added to a pension table, consumers find it easier to imagine what their lifestyle might look like. This increased ease of imagery, in turn, leads to increased pension saving rates. Whereas a combination of evaluative labels and consumption baskets evokes mental imagery, the presence of evaluative labels only, without accompanying consumption baskets, is not sufficient to trigger mental imagery of retirement. If only evaluative labels are present, the increase in pension saving rates is not due to increased mental imagery but due to the choice of specific saving rates. The presence of an evaluative structure makes it more likely that consumers choose a lifestyle switching point. In addition, evaluative structures make it more likely that consumers choose a more comfortable lifestyle level. The findings of this study support the notion that evaluative structures outperform standard numerical information as a strategy to increase pension saving rates. Moreover, the presence of consumptions baskets has greater impact than the mere presence of evaluative labels. This is the case because consumption baskets do not only change the choice of a saving rate regardless of the salience of the trade-off between current and future income, but they also evoke mental imagery and make it more likely that consumers choose a comfortable lifestyle.

5. STUDY 2

Study 2 tests whether the effect of evaluative labels and consumption baskets on pension saving rates depends on the starting saving rate and how the starting saving rate is positioned relative to the lifestyle labels. In Study 1, we did not provide information about the

starting saving rate to participants. However, this information may play a key role in the effectiveness of evaluative pension labels and consumption baskets. Evaluative structures may motivate consumers to reach the next lifestyle level (H1), but they may also reduce motivation once one threshold is met and the next threshold appears too far to reach (H7a) or when the highest lifestyle category is already achieved (H7b).

5.1 Methodology

We use the same materials as described in Study 1 with varying starting saving rates. We display the current disposable income in all experimental conditions, as Study 1 indicated that the effectiveness of evaluative structures may be reduced when the effect of increased retirement savings on one's current disposable income is made salient. By including current disposable income in Study 2, we thus conduct a conservative test of the effectiveness of evaluative structures. Additionally, we test whether patience moderates the effect of evaluative structures on pension saving rates (H6). The hypotheses and analyses of this study were pre-registered: https://aspredicted.org/blind.php?x=mq27wh.

Participants

Participants were recruited through an online research recruitment platform (Prolific) and were paid for their participation (n = 361, 49.1% = female). Initially, 363 participants completed the survey. However, we removed participants who failed an attention check (n = 2). The sample age ranged from 18 to 55 years (M_{age} = 37.00, SD = 9.84).

Materials and Procedure

We conducted a mixed-design experiment with one between-subjects factor with 3 levels (Control / Evaluative labels / Evaluative labels + consumption baskets) and a within-subjects factor of starting saving rates (7 rounds). After having been randomly assigned to a condition, all participants first read a vignette.

"Company X recently gave a group of 7 employees a promotion. As this promotion comes with a payment increase, all of these consumers are asked to review their retirement planning decisions, and to consider whether they may want to increase their pension saving rate. You will be shown the current saving rates of all 7 employees, and are asked to recommend a saving rate for them based on their personal circumstances. Due to the promotion, all 7 consumers have a similar disposable income of £3330 per month. All employees are single, and are of a similar age."

After reading the vignette, participants were presented seven consecutive saving rate decision rounds. In each round, the participant is shown a different starting saving rate. The starting saving rates used were 1%, 3%, 6%, 9%, 11%, 14%, and 16%. These saving rates were highlighted in the table that was presented to participants and were presented in a random order for each participant. The lifestyle switching points are fixed at 8% (start of moderate) and 16% (start of comfortable).

Participants were randomly assigned to the control (Condition 1), evaluative labels (Condition 2), or evaluative labels with consumption baskets (Condition 3) condition.

In each round, participants were asked to indicate which pension saving rate they would recommend for the hypothetical employee in each round by clicking on its value in the table. After all 7 rounds were completed, participants completed a validated one-item measure of patience (Falk et al., 2018). The survey concluded with a section on participant demographics.

5.2 Results

To test the effect of evaluative structures on pension saving rates, we conducted a multilevel linear regression analysis using the r-package "lme4" (Bates et al., 2015). The difference between the recommended rate by subjects and the starting rate per condition is plotted in Figure 2. For example, we can see that at the starting saving rate of 1%, the subject recommends a saving rate of 9.86 on average in the control condition. Overall, we see an increase of saving rates across conditions from left to right; this means that individuals select higher saving rates when the starting saving rate is higher (B = 1.16, p < .001). A main effect of the presence of an evaluative structure on saving rates could not be found (B_{label} = 0.68, p = .087, B_{basket} = 0.20, p = .612; Table 6). Instead, we observe that the impact of an evaluative structure on saving rates depended on the starting saving rate.

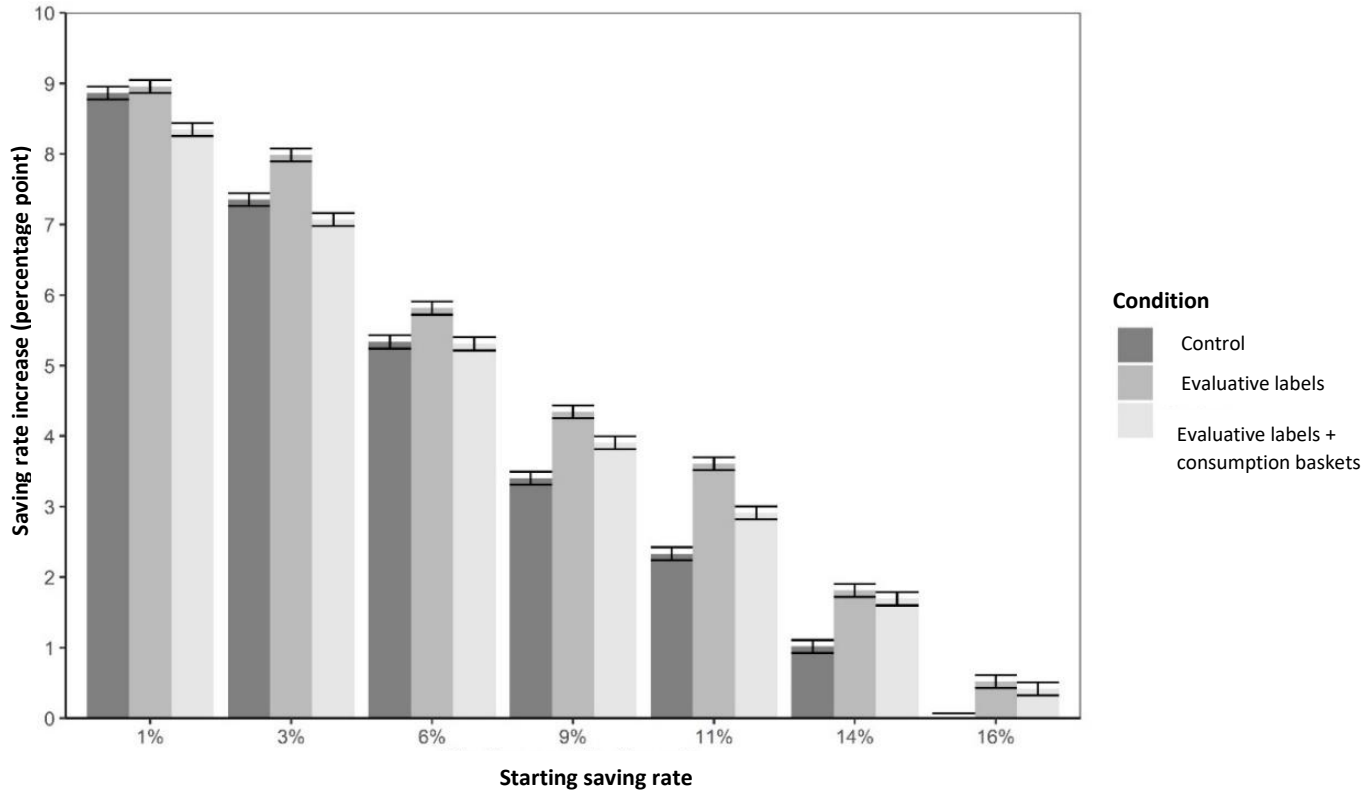
Table 5

Means and Standard Deviations for Saving Rates by Experimental Condition

	Mean (S.D.)							
Starting saving rate	*1%*	*3%*	*6%*	*9%*	*11%*	*14%*	*16%*	*Total*
Control	9.86	10.35	11.33	12.40	13.33	15.02	15.97	12.61
	(5.22)	(4.67)	(4.11)	(3.71)	(3.45)	(3.31)	(3.49)	(3.47)
Evaluative labels	9.96	10.98	11.81	13.34	14.61	15.81	16.52	13.28
	(4.46)	(3.92)	(3.71)	(3.36)	(2.97)	(2.87)	(2.98)	(2.81)
Evaluative labels with consumption baskets	9.35	10.07	11.31	12.91	13.91	15.69	16.42	12.81
	(4.50)	(4.11)	(3.61)	(3.23)	(3.10)	(2.34)	(2.90)	(2.80)

Figure 2

Mean Saving Rate Increase by Starting Saving Rate (Study 2)



To test Hypothesis 7a, i.e., the increase in saving rates will be smaller when the starting saving rates are near the next upward lifestyle switching point, we specifically focused on whether there is an interaction effect at the saving rates of 6% (just below the next upward lifestyle of moderate at 8%) and at the saving rate of 14% (just below the next upward lifestyle of comfortable at 16%). To test hypothesis 7b, which stated a satiation effect, i.e., the increase in saving rates will be lower when an evaluative structure is present and the starting saving

rate falls in the highest lifestyle level (16%), we assess whether there was an interaction between experimental treatment and the saving rate of 16%.[11]

Contrary to our hypotheses, we did not find demotivating effects of evaluative structures— in other words, evaluative structures do not crowd out the motivation to save more. Specifically, the effect of evaluative structures was not less when the starting saving rate is near the next upward lifestyle level (Table 7). The results did not show the hypothesized negative effect of evaluative labels or evaluative labels with consumption baskets at a saving rate of 6% (B_{labels} = 0.38, p = .354; $B_{baskets}$ = 0.49, p = .229), 14% (B_{labels} = 0.70, p = .092; $B_{baskets}$ = 1.19, p = .003), or 16% (B_{labels} = 0.45, p = .276; $B_{baskets}$ = 0.96, p = .019).

To further understand how the starting saving rate affects the effectiveness of evaluative structures, we compared the effect of evaluative labels and evaluative labels with consumption baskets per starting saving rate. In general, we find that the increase in saving rates was smaller when the starting saving rate was higher–i.e., if individuals have higher saving rates, participants recommended smaller increases in saving rates than for individuals with low saving rates. However, when zooming in on specific saving rates, our results indicate that the presence of an evaluative structure affects which increase in saving rates participants recommend. While we do not find differences in saving rates when the starting saving rates are low (i.e., 1%, 3%, or 6%), we find positive effects of evaluative structures at the higher end of the saving rate spectrum. When the starting saving rate was 9% or 11%, the increase in saving rates was larger when evaluative labels are present (Condition 2) compared to when they were not ($B_{labels9}$ = 0.85, p = 0.042; $B_{labels11}$ = 1.18, p = .005). The evaluative labels with consumption baskets condition (Condition 3) was more effective in increasing saving rates than the control condition when the starting saving rate was 9% (B = 1.02, p = .012), 11% (B = 1.10, p = .007), 14% (B = 1.19, p = .003), or 16% (B = 0.96, p = .019).Whereas we hypothesized that evaluative structures could have a negative impact on savings at specific starting saving rates, for example, because the distance to the next upward lifestyle level is large or because the highest lifestyle level has already been reached, we did not find negative effects of evaluative labels or evaluative labels with consumption baskets for any starting saving rate,

[11] Whereas we pre-registered that we would dummy-code the predictors' distance to next upward switching and next upward lifestyle level, we report results for specific saving rates to ease the interpretation of results. The pre-registered analyses can be found in Appendix C.

thereby disconfirming hypothesis 7a. Similarly, we do not support Hypothesis 7b, which stated that the increase in saving rates will be lower when an evaluative structure is present and the starting saving rate falls in the highest lifestyle level (16%).

Table 6

Stepwise Multilevel Regressions Predicting Saving Rate Increases in Study 2 with Condition and Starting Saving Rate (n = 361)

Variable	*B*	*B*	*B*
Constant	8.42***	8.86***	7.95**
	(0.30)	(0.34)	(0.88)
Evaluative labels	0.68	0.09	0.08
	(0.40)	(0.48)	(0.48)
Evaluative labels + consumption baskets	0.20	-0.52	-0.49
	(0.39)	(0.47)	(0.47)
Saving rate 3%	-1.25***	-1.51***	-1.51***
	(0.17)	(0.29)	(0.29)
Saving rate 6%	-3.23***	-3.53***	-3.53***
	(0.17)	(0.29)	(0.29)
Saving rate 9%	-4.83***	-5.46***	-5.46***
	(0.17)	(0.29)	(0.29)
Saving rate 11%	-5.76***	-6.53***	-6.53***
	(0.17)	(0.29)	(0.29)
Saving rate 14%	-7.20***	-7.85***	-7.85***
	(0.17)	(0.29)	(0.29)
Saving rate 16%	-8.40***	-8.89***	-8.89***
	(0.17)	(0.29)	(0.29)
Evaluative labels x Saving rate 3%		0.54	0.56
		(0.42)	(0.42)
Evaluative labels x Saving rate 6%		0.38	0.32
		(0.42)	(0.42)
Evaluative labels x Saving rate 9%		0.85*	0.91*
		(0.42)	(0.42)
Evaluative labels x Saving rate 11%		1.18**`	1.26**
		(0.42)	(0.42)
Evaluative labels x Saving rate 14%		0.70	0.80
		(0.42)	(0.42)
Evaluative labels x Saving rate 16%		0.45	0.57
		(0.42)	(0.42)
Evaluative labels + consumption baskets x Saving rate 3%		0.24	0.24
		(0.41)	(0.41)
Evaluative labels + consumption baskets x Saving rate 6%		0.49	0.49
		(0.41)	(0.41)
Evaluative labels + consumption baskets x Saving rate 9%		1.02*	1.02*
		(0.41)	(0.41)
Evaluative labels + consumption baskets x Saving rate 11%		1.10**	1.10**
		(0.41)	(0.41)
Evaluative labels + consumption baskets x Saving rate 14%		1.19**	1.19**
		(0.41)	(0.41)
Evaluative labels + consumption baskets x Saving rate 16%		0.96*	0.96*
		(0.41)	(0.41)
Age			0.03
			(0.02)
Gender (Male)			-0.55
			(0.02)
Income			-0.01
			(0.06)
Education			0.07
			(0.20)
Column 1 R^2marginal = .376, Column 2 R^2marginal = .377, Column 3 R^2marginal = . 384			

Finally, we tested whether patience affects the choice of pension saving rates. We find that consumers who are more patient selected higher pension saving rates (B = 0.54, p <.001). There was no support for our hypothesis that the effectiveness of evaluative structures is moderated by patience (Table 7).

Table 7

Stepwise Multilevel Regressions Predicting Saving Rates in Study 2 with Condition and Patience (n = 361)

Variable	*B*	*B*	*B*
Constant	8.79***	8.30***	7.72***
	(0.69)	(1.00)	(1.19)
Evaluative labels	0.09	3.50	3.17
	(0.39)	(1.97)	(1.91)
Evaluative labels + consumption baskets	-0.07	-0.22	-0.38
	(0.38)	(1.45)	(1.40)
Patience	0.54***	0.61***	0.65***
	(0.09)	(0.14)	(0.13)
Evaluative labels x Patience		-0.44	-0.40
		(0.25)	(0.24)
Evaluative labels + consumption baskets x Patience		0.02	0.04
		(0.19)	(0.19)
Age			0.04**
			(0.02)
Gender (Male)			-1.04***
			(0.31)
Income			-0.09
			(0.06)
Education			-0.10
			(0.19)
Column 1 R^2marginal = .051, Column 2 R^2marginal ^{2} = .055, Column 3 R^2marginal = .080			

5.3 Discussion

Study 2 demonstrates that the effectiveness of evaluative structures depends on one's starting saving rate. Whereas in Study 1 we observed a positive main effect of evaluative labels and evaluative labels with consumption baskets, this effect was not present in Study 2, which shows that the starting saving rate affects the effectiveness of labels. Specifically, we find that evaluative labels only increase savings at higher but not at lower starting saving rates. This may indicate that at the lowest saving rates, the need to increase savings is apparent regardless of the presence of an evaluative structure. At higher saving rates, which are still insufficient to reach a comfortable lifestyle during retirement, this need is only apparent when an evaluative structure is present. Across conditions, saving rates increase as the starting saving rate is higher, indicating that consumers generally recommend increased savings.

The effect of evaluative structures was not moderated by whether the starting saving rate is near the next upward lifestyle level. We hypothesized that when consumers were close to the next upward lifestyle level they would only increase to the switching point but not consider increases that surpass the next upward lifestyle level. However, we did not discover evidence for this effect. This finding implies that the effectiveness of evaluative structures is not reduced at saving rates that are close to switching points. Also, there is no evidence for discouragement at saving rates that are far away from the lifestyle switching points. This finding alleviates the possible concern of financial service providers about the possibility that evaluative structures hinder a consumer's motivation to save.

Finally, we find that patient consumers select higher saving rates, regardless of the evaluative structure they were presented with. Contrary to our hypothesis, labels do not help less patient consumers more than their patient counterparts. However, this may also be regarded as a positive outcome; the positive effects of complementing numerical information with an evaluative structure is not limited to a specific subgroup of the population. To conclude, the results showed that evaluative structures do not have demotivating or satiation effects and that they are more effective in increasing savings than standard numerical information for specific starting saving rates. Thus, we recommend that evaluative structures should may be used as an intervention to increase pension saving rates.

6. STUDY 3

In Study 1 and 2, participants were asked to make choices for hypothetical others. Whereas we find that evaluative labels and consumption baskets can increase saving

intentions, it could be argued that these effects are driven by the fact that participants were asked to make hypothetical decisions with no real monetary consequences for themselves. Therefore, Study 3 assesses whether evaluative labels can be used as an intervention to increase savings when consumers make personal decisions in an incentivized savings task. As the retirement context we used in Study 1 and 2 cannot be used for incentivized decision-making, since the timing of pay-outs would be unrealistically far away in the future (years), we developed a novel savings task. In this study, we assess whether evaluative labels with consumption baskets increase savings (H1), whether this is mediated through increased mental imagery (H2), and whether the effectiveness of evaluative labels and consumption baskets is moderated by financial literacy, trust in saving institutions, or patience (H4, H5, H6).

Task Development

To design a feasible incentivized choice task that had similar realistic features as a pension savings decision, we developed a novel savings task. The pension savings task used in Study 1 and Study 2 has three key features that are replicated in our personal savings task. First, in both savings tasks participants were asked to decide which percentage of a monetary endowment they would set aside into a savings scheme. Second, participants had to trade-off amounts received now compared to amounts received in the future. The future payments are associated with an additional monetary reward—i.e., participants will receive a higher total amount if they delay the payment. Third, evaluative labels with consumption baskets describe the consumption possibilities participants would have with their accumulated savings. Based on the findings from Study 1 and 2, we only included the combination of evaluative labels and consumption baskets.

In our personal savings task, participants were asked to allocate an endowment of €333 between a payment now and a payment in 6 months. They were able to select a saving percentage between 5% and 95% with increments of 5% (e.g., if participants chose to save 5%, they would receive €316.35 now and €22.31 in 6 months, if they chose 50% these amounts would be €166.50 and €223.13, if they chose 95% these amounts would be €16.65 and €423.94). We purposely did not include the option to save 0% or 100% as this could reveal preferences for convenience (e.g., just receiving one payment) rather than saving preferences. The evaluative labels and consumption baskets in this experiment were created to fit university students' interest. For example, the "Travel" category in the consumption possibilities showed the option of having a weekend trip in the country you are in (minimum),

a weekend trip in Europe (moderate) or a one-week trip in Europe (comfortable). The full materials can be found in the Appendix D. A pilot study with a student sample on Prolific Academic (n = 200, M_{age} = 23.81, SD = 4.56, 49.5% female) demonstrated that, on average, the manipulation was successful and participants found the "comfortable" consumption possibility more attractive than "moderate", and the "moderate" possibility more attractive than "minimum". However, our pilot data indicated that this was not the case for all participants (Appendix E).

As the perception of the attractiveness of the basket content is likely to affect how participants decide in the savings task, we will separate participants in the evaluative consumption baskets group into two, mutually exclusive, subgroups in the main study: those who find the basket content increasingly attractive (i.e., attractiveness comfortable > attractiveness moderate; attractiveness moderate > attractiveness minimum) and those who do not. The hypotheses and analyses of this study were pre-registered: https://aspredicted.org/GD8_DRX

6.1 Methodology

Participants

Participants were recruited at a Western European university and were compensated for their participation through course credit (n = 437, 52.9% = female) and the chance to win additional monetary payoffs of up to €440.59. Initially, 441 participants completed the experiment. However, we removed participants who failed two attention checks (n = 4), in line with our pre-registration. The sample age ranged from 18 to 32 years (M_{age} = 21.05, SD = 2.16).

Materials and Procedure

The study took place at the university's behavioral and experimental economics lab. Participants were placed in individual cubicles with a computer, and participated in the incentivized experiment on Qualtrics. The experiment lasted approximately 15 minutes and was part of a larger testing session that lasted 1 hour. We conducted a between-subjects experiment with two experimental conditions (control vs. evaluative labels with consumption baskets). After being randomly assigned to a condition, participants were informed that their decisions may have real monetary consequences, as two participants would be randomly selected to receive the payments they chose in the task. After data collection was complete, two participants were randomly drawn from the dataset and informed per e-mail about the

payments they would receive, based on their decision in the saving task. Pay-outs were processed in compliance with ethical and legal requirements at the local university. Participants received their first payment through bank transfer as soon as possible after they provided their payment details and received their second payment 6 months after data collection. Participants viewed the savings table and selected a saving rate. The lifestyle switching points were at 40% and 85%. After the savings decision, participants completed a post-experimental survey.

Measures

Firstly, we assessed the mental imagery that was triggered by the savings information with an adapted version of the sensory simulation scale by Larson, Redden, and Elder (2014) that measures the amount, ease, and vividness of mental imagery. Whereas the original scale measures imagery related to food, we asked participants to report the imagery that was triggered by their future payout consumption possibilities. This scale provides a more elaborate measure of mental imagery than the 1-item measure used in Study 1. Next to reporting the mental imagery of future payouts and consumption possibilities, participants answered the same set of questions about the imagery of their immediate payout and the associated consumption possibilities. After this, participants in the label and basket condition were asked to indicate on a five-point scale (not attractive at all – extremely attractive) how attractive the future consumption possibilities in each category (minimum, moderate, comfortable) were. We also assessed financial literacy (Hastings et al., 2013), patience (Falk et al., 2018), and trust in the experimenters (adapted from Hansen, 2012). Whereas in Study 1 we assessed trust in pension institutions, these questions were now adapted to reflect trust in the experimenters, as the experimenters, rather than a pension institution, would be responsible for the savings scheme described in the study. The survey concluded with a section collecting participant demographics.

6.2 Results

As our pilot study indicated that the perception of the attractiveness of the basket content affected how participants decide in the savings task, we separated participants in the evaluative consumption baskets group into two, mutually exclusive, subgroups: those who found the three baskets increasingly attractive (i.e., participants who indicated in our manipulation check question that the attractiveness of the comfortable category > attractiveness of the moderate category > the attractiveness of the minimum category) and

those who did not. In total, 51.7% of participants in the baskets conditions deemed the baskets increasingly attractive. A regression analysis indicated that when participants found the consumption baskets increasingly attractive, they saved more in the evaluative labels with consumption baskets condition than the control condition (B = 10.57, p < .001). On the other hand, individuals who did not deem the consumption basket content increasingly attractive saved less than individuals in the control condition (B = - 8.46, p = .003). These findings thus provide partial evidence for Hypothesis 1. Whereas evaluative structures can increase savings in an incentivized savings decision, this positive effect only shows when participants deem the consumption baskets as increasingly attractive. Our findings are robust when controlling for age, gender, and income (Table 8, column 2). Furthermore, we find that individuals with a higher income saved more (B = 0.65, p = .005). Analyses of individual differences (Table 8, column 3) show that individuals with higher levels of patience saved more (B = 1.03, p < .001).

We replicate the choice of switching points when consumption baskets are presented. A logistic regression analysis shows that individuals are more likely to select a switching point in the baskets condition, regardless of whether they find the baskets increasingly attractive or not ($B_{baskets_attractive}$ = 2.30, p < .001; $B_{baskets_not_attractive}$ = 1.921, p = .001). Furthering on this finding, exploratory analyses show that individuals who do not find the baskets increasingly attractive are more likely to choose the moderate switching point, set at 40% ($B_{baskets_not_attractive}$ = 1.99, p = .002). In contrast, individuals who find the baskets increasingly attractive are more likely to choose the comfortable switching point, set at 85% ($B_{baskets_attractive}$ = 3.59, p < .001).

To test Hypothesis 4-6, that described the potential moderating effects of financial literacy, trust, and patience, further regression analyses were conducted (Table 8, column 4). Whereas there was no evidence for an effect of patience or trust, we observed a significant positive interaction effect between the group who finds the consumption baskets increasingly attractive and financial literacy (B = 8.15, p = .002). This effect indicates that the positive impact of the evaluative structure for those who find the consumption basket increasingly attractive was stronger for individuals with higher levels of financial literacy.

Table 8

Stepwise regressions predicting saving rates in Study 3 with condition, financial literacy, trust, patience, and demographics (n = 437)

	1	2	3	4
Constant	70.50***	70.57***	41.26**	65.99***
	(2.04)	(13.48)	(15.26)	(18.51)
Evaluative labels + consumption baskets increasingly attractive (Group 1)	10.57***	11.36***	8.97**	-25.43
	(2.82)	(2.82)	(2.71)	(19.40)
Evaluative labels + consumption baskets not increasingly attractive (Group 2)	-8.46**	-7.68**	-6.69*	-46.09*
	(2.86)	(2.88)	(2.76)	(18.10)
Financial Literacy			0.40	-3.52
			(1.12)	(1.80)
Trust			1.51	-0.39
			(1.10)	(1.90)
Patience			1.03***	0.98***
			(0.15)	(0.27)
Group 1 x Financial literacy				8.15**
				(2.62)
Group 1 x Trust				1.65
				(2.75)
Group 1 x Patience				-0.28
				(0.38)
Group 2 x Financial literacy				4.16
				(2.59)
Group 2 x Trust				3.23
				(2.63)
Group 2 x Patience				0.41
				(0.37)
Gender (male)		-3.81	-4.07	-4.44
		(2.33)	(2.32)	(2.30)
Age		-0.24	0.01	0.08
		(0.57)	(0.55)	(0.55)
Income		0.65**	0.55*	0.52*
		(0.23)	(0.22)	(0.22)
Receives financial support from parents		0.51	1.39	0.55
		(4.36)	(4.15)	(4.15)
Lives independently		3.94	1.69	2.55
		(3.19)	(3.06)	(3.08)

Model 1 $F(2, 436) = 23.36$, $p < .001$, $R^2 = .097$, adjusted $R^2 = .093$. Model 2 $F(7, 434) = 8.35$, $p < .001$, $R^2 = .120$, adjusted $R^2 = .106$. Model 3 $F(10, 434) = 11.264$, $p < .001$, $R^2 = .210$, adjusted $R^2 = .191$. Model 4 $F(16, 434) = 8.076$, $p < .001$, $R^2 = .236$, adjusted $R^2 = .207$

Mediation

To test Hypothesis 2, which stated that the increase in saving rates would be mediated through mental imagery of future consumption possibilities, we used Hayes's (2017) SPSS process macro for mediation. However, we did not find differences in mental imagery of the future between our experimental groups and the control condition ($B_{baskets_attractive}$ = 0.28, p = .170, $B_{baskets_not_attractive}$ = -0.149, p = .478), which impeded us to test our mediation hypothesis further. It is possible that due to the relatively short term of the future pay-out (6 months), mental imagery of the future is also high in the control condition.

Exploratory analyses showed that the difference between imagery of current and imagery of future consumption possibilities does differ significantly between our experimental groups and the control condition. Specifically, we demonstrate that the difference between future and current imagery is larger when participants find the consumption baskets increasingly attractive (B = 0.53, p = .013). The difference between future and current imagery is, in turn, associated with increased saving rates (B = 3.58, p < .001). Bootstrapping procedures were used to test the significance of the indirect effect of ease of imagination (5,000 bootstrapped samples). The indirect effect on saving rates for those who found the consumption baskets increasingly attractive, via difference between future and current imagery, was significant ($B_{baskets_attractive}$ = 1.50, *CI* [0.198; 2.876]. When we included the effect of the difference in future and current imagery, the main effect on saving rates of the group that finds the consumption baskets increasingly attractive remains significant (B = 9.06, p = .001), indicating partial mediation.

7. GENERAL DISCUSSION

In three experimental studies, we demonstrate that evaluative structures are effective as an intervention to increase savings. Study 1 shows that evaluative labels alone and evaluative labels with consumption baskets increase pension saving rates, regardless of one's level of financial literacy or trust in pension institutions. We also find that the positive effect of evaluative labels is no longer present when the negative impact of additional pension saving rates on the current disposable income is made salient. However, pension saving rates are still increased by evaluative labels with consumption baskets, even when their impact on current income is made salient. Finally, this study shows that evaluative labels with consumption baskets lead to higher pension saving rates by increasing mental imagery. Study 2 demonstrates that the effectiveness of evaluative structures depends on the starting saving

rate. Here, evaluative labels and consumption baskets do not always lead to higher saving rates than a numerical table, but for specific saving rates, they do. When saving rates are low, consumers increase saving rates regardless of whether an evaluative structure is present. However, evaluative structures trigger consumers to increase savings at moderate saving rates more than numerical tables. In this sense, evaluative structures can increase financial well-being in retirement, as they motivate consumers to improve their future outcomes. Evaluative structures do not demotivate or discourage consumers, as our results indicate that they do not lead to lower saving rates than a numerical table without an evaluative structure. In addition, we find that the effectiveness of evaluative structures does not depend on one's level of patience. Finally, Study 3 demonstrates that the positive effects of evaluative labels are also present when consumers make personal decisions with real monetary consequences in a general savings context. We demonstrate that in a shorter-term saving context, evaluative structures increase savings as they augment the difference between mental imagery of future and current consumption. Further, the perceived attractiveness of the categorical ordering of the evaluative structure is a boundary condition for the effectiveness of evaluative structures in increasing savings.

Prior research in the United States as well as the United Kingdom has shown that retirement plan members often stick to the (default) minimum saving rate, whereas this may not be sufficient to achieve the desired retirement income (Beshears et al., 2009; PLSA, 2018). Thus, evaluative labels could be added to future outcomes to motivate consumers to choose a higher saving rate, as consumers are more likely to choose a lifestyle switching point. The finding that labels act as anchor is in line with earlier findings in pension research (e.g., Benartzi & Thaler, 2007; Choi et al., 2017). When labels are present, consumers might use them as a cue to base their decision on. This evaluative cue overrides other heuristics that they would have otherwise based their pension saving rate decisions on.

The provision of evaluative labels combined with consumption baskets has additional advantages. The presence of consumption baskets creates mental imagery of one's retirement, which increases the amount of money a consumer wants to set aside for their future. In addition, the effects of evaluative labels combined with consumption baskets we find in our studies are stronger and more persistent.

Overall, we find that in general, evaluative structures are effective across groups and not limited to segments with lower financial literacy and patience and higher trust.

Specifically, we generally do not find evidence for our hypotheses that individual characteristics that are key predictors of long-term financial decision making, moderate the effectiveness of evaluative structures. There is no apparent effect in regard to individual differences in trust and patience. Furthermore, the role of financial literacy is only apparent in Study 3, where we find stronger effects of evaluative structures for individuals with higher levels of financial literacy. Thus, based on the current findings, we expect that evaluative structures have the potential to increase pension saving rates for all consumers.

7.1 Theoretical Implications

Our study uses insights from both the literature on intertemporal financial decision-making and the literature on evaluative structures. Firstly, we contribute new findings to the literature on financial decision-making and intertemporal choice by demonstrating how evaluative structures can be implemented to increase saving rates. Concrete future consumption baskets make it is easier for consumers to imagine their future lifestyle, which motivates them to increase their savings. This novel approach extends prior research on retirement saving interventions, such as highlighting the exponential growth of savings (McKenzie & Liersch, 2011), earmarking and partitioning money (e.g., Soman & Cheema, 2011), or using fresh starts to increase retirement savings (Beshears et al., 2021).

Moreover, we contribute to the literature on financial decision-making by assessing the psychological process that underlies the effectiveness of evaluative structures, namely the mental imagery of future financial outcomes. Prior research used two main approaches for interventions to increase future-self imagery in financial decision-making. The first approach are aged renditions of one's face or writing tasks about the aged self to imagine the future self in retirement (Hershfield et al., 2011; 2018). Even though aged renditions of the future self may increase retirement savings, they may not be applicable in a shorter-term saving context, as an aged rendition of one's future self in, for example, 6 months is not visually impactful. However, increased savings are relevant in a broader range of contexts than merely retirement savings – such as saving for holidays, or other short-term goals. The second approach is a reminder of one's future self. Whereas this intervention is more broadly applicable, a recent study (Stockdale & Sanders, 2020) shows that these reminders of the future self are insufficient to affect long-term financial decision-making. In contrast to these mere reminders, our evaluative structure intervention is effective in changing saving decisions. Our results show that describing future consumption possibilities can create

positive imagery of the future, which, in turn, can affect financial decision-making across domains and time periods. We also examine the impact of three consumer characteristics (financial literacy, trust, and patience), but generally find no differences in the effectiveness of evaluative structures. Hence, evaluative structures can be used across customer groups and are not limited to specific segments.

Thirdly, we contribute to the literature on evaluative structures by shifting the applicability domain of evaluative structures. Our research demonstrates that the implementation of evaluative structures is not limited to describing the features of a product or service in the context of medical decision-making or food choice (e.g., Dieckmann, 2012; Ikonen et al., 2020). In addition, evaluative structures can impact decision-making by describing the future *consequences* of a decision. However, highlighting future benefits does not come without risks. We find evidence of opportunity cost neglect (Frederick et al., 2009) in Study 1. When consumers are exposed to evaluative labels, but are not explicitly reminded that increased savings reduce their current disposable income, they make different choices compared to when this cost is made salient.

7.2 Managerial Implications

Our findings show that for consumers who have not yet selected a saving rate, it is beneficial to present evaluative structures, as it makes them choose higher saving rates. If managers aim to provide a comprehensive overview of the consequences of saving decisions by showing the effect of additional savings on the current disposable income, we recommend to combine evaluative labels with consumption baskets. The design and content of the evaluative structure should be carefully selected. If consumers deem the mapped future outcomes unattractive, the evaluative structure may lead to oppositional effects. At a minimum, the content of the consumption baskets should be designed and improved through pilot tests. To optimize the attractiveness of the consumption baskets, an individualized approach in which consumers can adjust and improve the content of the consumption baskets to more closely match their needs and desires may be beneficial.

When consumers have already selected a saving rate (or were given by default), evaluative structures can be used in communication materials to motivate the choice for a more comfortable lifestyle. In the current studies, evaluative structures do not appear to backfire and can thus be used to provide richer pension information. When saving rates are low, consumers recognize the need for higher saving rates to reach a sufficient retirement

income, regardless of the presentation format used. However, increases in saving rates can be beneficial at all levels, if there exists a discrepancy between one's expected and one's desired future lifestyle. Therefore, especially for consumers who are not saving at the very minimum level, evaluative structures can be used to create a motivation to save more.

Given that evaluative structures lead consumers to anchor on the values that are associated with the next upward lifestyle level, the implementation of pension lifestyle labels requires great care. In line with prior applications of interventions in the financial domain (e.g., Choi et al., 2017; Mrkva et al., 2021; Thaler & Sunstein, 2008), our evaluative structure nudges, but does not force, consumers to make a specific financial decisions. Whereas evaluative structures increase savings, it is not clear whether this is a welfare improving decision for all consumers. It is thus important to understand whether evaluative structures aid consumers in selecting the right saving rate that fits their needs, or whether it only triggers saving more. The latter would be adverse for specific segments of consumers. Firstly, consumers who are struggling to make ends meet, may not benefit from increasing their saving rates if it would mean they are not able to afford to pay their bills in the present. Secondly, consumers who are already on track to reach a sufficient pension income may be triggered to over-save, and would save more than they are able to spend during their retirement. Whereas these groups should be kept in mind when implementing evaluative structures in saving contexts, we believe that for a large proportion of the population, additional savings would contribute to their financial well-being, for example, by improving their pension adequacy (Munnell et al., 2021; PLSA, 2018; Shin et al., 2019).

Financial service providers may implement the use of evaluative structures in their communication strategies. However, the content of the evaluative structure should be carefully assessed before its implementation. Consumers should agree with the categorical ordering of outcomes for the evaluative structure to be an effective intervention to increase savings. One specific application of these carefully designed evaluative structures might be in annual pension statements. Currently, pension funds often project the impact of additional savings on the expected retirement in annual statements as numeric information. These statements can be enriched with information on the amount of savings required to achieve the next upward lifestyle level. Based on our results, the use of evaluative structures in pension communication can trigger higher saving rates, especially for consumers who are already contributing a sufficient amount but would want to achieve a more luxurious lifestyle

in retirement. Maybe segmentation would be required, so only consumers who have the financial means to meet the next lifestyle level are encouraged to save more.

7.3 Limitations and Future Research

Based on our research, several recommendations for future studies can be made. In two studies, we ask consumers to report a saving rate for a hypothetical individual. Whereas this choice can be seen as a limitation for the validity of the results, we argue that our current studies provide a valid test of the potential effects of evaluative structures. Asking consumers to make choices for a hypothetical individual enables us to test the effect of labels before testing the actual impact of implementation of these structures. Study 3 demonstrates that labels are effective in increasing saving rates in individual, incentivized decision-making, but it does not consider actual pension decision-making. One potential limitation of the setup of Study 3 is that the money may be perceived as an additional bonus payment rather than an income. Therefore, to prove the generalizability of our results, future research should address how evaluative labels and consumption baskets affect actual pension saving rate decisions in a field experiment.

In the current studies, the main outcome of interest is the saving rate that consumers select. However, evaluative structures may also affect other financial outcomes. Future research should assess whether evaluative labels can be used to trigger positive pension behaviors, such as checking one's saving balance more often or acquiring more information about one's retirement plan. Besides that, it would be valuable to assess whether evaluative structures increase the confidence that consumers have in their financial decisions. In addition, it would be interesting to examine whether evaluative structures can be used to trigger positive behavior in other long-term (financial) decision-making. For example, evaluative labels could be used to aid students in selecting which amount of student loans they would want to take out.

Future research may analyze whether the impact of evaluative structures on financial decision-making depends on the characteristics of the evaluative structure. For example, the wording, layout, or number of evaluative labels used may affect financial decision-making. Currently, we have only tested one format of evaluative structuring. Many formats of evaluative structures are possible and deserve attention in future research. For example, it could be studied whether using visual rather than verbal labelling can enhance the mental imagery of future outcomes. Another relevant avenue of future research would be the role of

joint financial outcomes. In the current study, we focused on individual decision-making. However, in practice, financial decision-making may be a dyadic or household process. Another practically relevant future research question is whether risk and uncertainty impact the effectiveness of evaluative structures for increasing pension saving rates. Whereas we provided participants with specific numbers that represented the expected future financial outcomes, in reality, financial service providers may need to communicate these values with a range of uncertainty. This may have distinct implications for the saving rates that consumers select. Other relevant moderators may include the distance of an individual to their retirement or the features of an individual's current retirement plan. Finally, in the current studies the interest rates were set, whereas, in reality, these may vary. The effect of varying interest rates on the role that evaluative structures play for saving rate decisions is another interesting topic for future research.

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APPENDIX A. STIMULI STUDY 1

Control

Table 1:
Contribution rates and expected retirement income

Contribution rate	Expected retirement income
1%	€874
2%	€990
3%	€1105
4%	€1220
5%	€1335
6%	€1450
7%	€1565
8%	€1681
9%	€1796
10%	€1911
11%	€2026
12%	€2141
13%	€2256
14%	€2372
15%	€2487
16%	€2602
17%	€2717
18%	€2832
19%	€2947
20%	€3062

Table + labels

Table 1:
Contribution rates, expected retirement income and expected living standard

Contribution rate	Expected retirement income	Living standard during retirement
1%	€874	Mininum
2%	€990	Mininum
3%	€1105	Mininum
4%	€1220	Mininum
5%	€1335	Mininum
6%	€1450	Mininum
7%	€1565	Mininum
8%	€1681	Moderate
9%	€1796	Moderate
10%	€1911	Moderate
11%	€2026	Moderate
12%	€2141	Moderate
13%	€2256	Moderate
14%	€2372	Moderate
15%	€2487	Moderate
16%	€2602	Comfortable
17%	€2717	Comfortable
18%	€2832	Comfortable
19%	€2947	Comfortable
20%	€3062	Comfortable

Table + labels + disposable

Table 1:
Contribution rates, expected retirement income, expected retirement living standard and income kept for now

Contribution rate	Income kept for spending now	Expected retirement income	Living standard during retirement
1%	€3297	€874	Mininum
2%	€3263	€990	Mininum
3%	€3230	€1105	Mininum
4%	€3197	€1220	Mininum
5%	€3164	€1335	Mininum
6%	€3130	€1450	Mininum
7%	€3097	€1565	Mininum
8%	€3064	€1681	Moderate
9%	€3030	€1796	Moderate
10%	€2997	€1911	Moderate
11%	€2964	€2026	Moderate
12%	€2930	€2141	Moderate
13%	€2897	€2256	Moderate
14%	€2864	€2372	Moderate
15%	€2831	€2487	Moderate
16%	€2797	€2602	Comfortable
17%	€2764	€2717	Comfortable
18%	€2731	€2832	Comfortable
19%	€2697	€2947	Comfortable
20%	€2664	€3062	Comfortable

Table + labels + baskets

Table 1:
Contribution rates, expected retirement income and expected living standard

Contribution rate	Expected retirement income	Living standard during retirement
1%	€874	Mininum
2%	€990	Mininum
3%	€1105	Mininum
4%	€1220	Mininum
5%	€1335	Mininum
6%	€1450	Mininum
7%	€1565	Mininum
8%	€1681	Moderate
9%	€1796	Moderate
10%	€1911	Moderate
11%	€2026	Moderate
12%	€2141	Moderate
13%	€2256	Moderate
14%	€2372	Moderate
15%	€2487	Moderate
16%	€2602	Comfortable
17%	€2717	Comfortable
18%	€2832	Comfortable
19%	€2947	Comfortable
20%	€3062	Comfortable

Table 2:
Consumption possibilities per retirement living standard

Retirement living standard	House	Food and drink	Transport	Holidays & Leisure	Clothing & personal	Helping others
Minimum	DIY maintenance and decorating one room a year	A €38 weekly food shop	No car	A week and long weekend in the country you live in every year	€460 for clothing and footwear each year	€10 for each birthday present
Moderate	Some help with maintenance and decorating each year	A €46 weekly food shop	3 year old car replaced every 10 years	2 weeks in Europe and a long weekend in the country you live in every year	€750 for clothing and footwear each year	€30 for each birthday present
Comfortable	Replace kitchen and bathroom every 10/15 years	A €56 weekly food shop	2 year old car replaced every 5 years	3 weeks in Europe every year	€1000-1500 for clothing and footwear each year	€50 for each birthday present

Table + labels + baskets + disposable income

Table 1:
Contribution rates, expected retirement income, expected retirement living standard and income kept for now

Contribution rate	Income kept for spending now	Expected retirement income	Living standard during retirement
1%	€3297	€874	Mininum
2%	€3263	€990	Mininum
3%	€3230	€1105	Mininum
4%	€3197	€1220	Mininum
5%	€3164	€1335	Mininum
6%	€3130	€1450	Mininum
7%	€3097	€1565	Mininum
8%	€3064	€1681	Moderate
9%	€3030	€1796	Moderate
10%	€2997	€1911	Moderate
11%	€2964	€2026	Moderate
12%	€2930	€2141	Moderate
13%	€2897	€2256	Moderate
14%	€2864	€2372	Moderate
15%	€2831	€2487	Moderate
16%	€2797	€2602	Comfortable
17%	€2764	€2717	Comfortable
18%	€2731	€2832	Comfortable
19%	€2697	€2947	Comfortable
20%	€2664	€3062	Comfortable

Table 2:
Consumption possibilities per retirement living standard

Retirement living standard	House	Food and drink	Transport	Holidays & Leisure	Clothing & personal	Helping others
Minimum	DIY maintenance and decorating one room a year	A €38 weekly food shop	No car	A week and long weekend in the country you live in every year	€460 for clothing and footwear each year	€10 for each birthday present
Moderate	Some help with maintenance and decorating each year	A €46 weekly food shop	3 year old car replaced every 10 years	2 weeks in Europe and a long weekend in the country you live in every year	€750 for clothing and footwear each year	€30 for each birthday present
Comfortable	Replace kitchen and bathroom every 10/15 years	A €56 weekly food shop	2 year old car replaced every 5 years	3 weeks in Europe every year	€1000-1500 for clothing and footwear each year	€50 for each birthday present

APPENDIX B. ANALYSES WITH ALTERNATIVE CODING OF TREATEMENT STUDY 1

Table B1

OLS Regression Analysis Predicting Contribution Rates in Study 1

	B (SD)
Constant	15.91 (3.77)
Evaluative labels	-4.41 (2.81)
Consumption baskets	-2.10 (2.89)
Disposable income	-0.22 (2.22)
Financial literacy	-.11 (0.53)
Trust	0.10 (0.58)
Evaluative labels * Financial literacy	0.60 (0.49)
Evaluative labels * Trust	0.16 (0.52)
Consumption baskets * Financial literacy	0.33 (0.50)
Consumption baskets * Trust	-0.33 (0.55)
Disposable income * Financial literacy	0.08 (0.38)
Disposable income * Trust	0.17 (0.44)
Gender (male)	0.22 (0.41)
Age	0.03 (0.09)
Model $F(13, 461) = 2.115$, $p = .012$, $R^2 = .056$, adjusted $R^2 = .030$.	

APPENDIX C. ANALYES WITH ALTERNATIVE CODING OF ROUNDS STUDY 2

Table C1

Stepwise Regressions Predicting Contribution Rates Increases in Study 2 with Condition, Distance to Switching Point and Next Upward Lifestyle

	Model 1a				Model 1b				Model 1c				Model 1d			
Variable	*B*	*SE B*	*t*	*p*	*B*	*SE B*	*t*	*p*	*B*	*SE B*	*t*	*p*	*B*	*SE B*	*t*	*p*
Treatment effects																
Intercept	12.61	0.28	44.96	<.001***	5.42	0.29	18.48	<.001***	5.64	0.32	17.72	<.001***	4.72	0.88	5.40	<.001***
Labels	0.68	0.40	1.71	.087	0.68	0.40	1.71	0.087	0.34	0.45	0.75	0.456	0.35	0.45	0.78	.433
Labels_baskets	0.20	0.39	0.51	.612	0.20	0.39	0.51	.612	-0.11	0.44	-0.24	.811	-0.08	0.44	-0.19	.853
Round parameters																
Medium distance					1.71	0.12	14.37	<.001***	1.67	0.21	8.01	<.001***	1.67	0.21	8.01	<.001***
Far distance					2.80	0.12	23.57	<.001***	2.96	0.21	14.20	<.001***	2.96	0.21	14.21	<.001***
No distance					-5.41	0.15	-35.22	<.001***	-5.67	0.27	-21.08	<.001***	-5.67	0.27	-21.10	<.001***
Comfortable					-4.43	0.10	-45.68	<.001***	-4.93	0.17	-29.01	<.001***	-4.93	0.17	-29.03	<.001***
Interaction treatment & round parameters																
Labels * Medium									0.32	0.29	1.07	.282	0.30	0.30	1.01	.313
Labels * Far									-0.12	0.30	-0.41	.685	-0.16	0.30	-0.53	.595
Labels * No distance									0.21	0.38	0.56	.579	0.29	0.38	0.76	.448
Labels * Comfortable									0.60	0.24	2.50	.012*	0.66	0.24	2.76	.006**
Baskets * Medium									-0.17	0.29	-0.61	.545	-0.17	0.29	-0.61	.545
Baskets * Far									-0.33	0.29	-1.15	.251	-0.33	0.29	-1.15	.251
Baskets * No distance									0.55	0.37	1.47	.141	0.55	0.37	1.47	.141
Baskets * Comfortable									0.86	0.24	3.65	<.001***	0.86	0.24	3.66	<.001***
Demographics																
Age													0.03	0.02	1.80	.071
Gender (Male)													-0.55	0.32	-1.73	.084
Income													-0.01	0.06	-0.223	.823
Education													0.07	0.20	0.34	.732

Model 1a R^2 = .004, Model 1b R^2 = .375, Model 1c R^2 = 0.376., Model 1d R^2 = .383

APPENDIX D. STIMULI STUDY 3

Control condition

Savings decision

Savings rate	Payment now	Payment in 6 months
5%	€316,35	€22,31
10%	€299,70	€44,63
15%	€283,05	€66,94
20%	€266,40	€89,25
25%	€249,75	€111,56
30%	€233,10	€133,88
35%	€216,45	€156,19
40%	€199,80	€178,50
45%	€183,15	€200,81
50%	€166,50	€223,13
55%	€149,85	€245,44
60%	€133,20	€267,75
65%	€116,55	€290,06
70%	€99,90	€312,38
75%	€83,25	€334,69
80%	€66,60	€357,00
85%	€49,95	€379,31
90%	€33,30	€401,63
95%	€16,65	€423,94

Evaluative labels and consumption baskets condition

Savings decision

Savings rate	Payment now	Payment in 6 months	Future consumption possibilties
5%	€316,35	€22,31	Minimum
10%	€299,70	€44,63	
15%	€283,05	€66,94	
20%	€266,40	€89,25	
25%	€249,75	€111,56	
30%	€233,10	€133,88	
35%	€216,45	€156,19	
40%	€199,80	€178,50	Moderate
45%	€183,15	€200,81	
50%	€166,50	€223,13	
55%	€149,85	€245,44	
60%	€133,20	€267,75	
65%	€116,55	€290,06	
70%	€99,90	€312,38	
75%	€83,25	€334,69	
80%	€66,60	€357,00	
85%	€49,95	€379,31	Comfortable
90%	€33,30	€401,63	
95%	€16,65	€423,94	

Examples of future consumption possibilities

					
Some home decorations (e.g. plants / posters)	A weekend trip in the country you are in	A new accessory (e.g., speakers)	3-4 workshop lessons (e.g., driving, language)	2 festival or concert tickets	Or... what do you see yourself doing with this amount in the future?
A new piece of furniture	A weekend trip away in Europe	A new device (e.g. phone, basic tablet)	10-12 workshop lessons (e.g., driving, language)	4 festival or concert tickets	Or... what do you see yourself doing with this amount in the future?
A new piece of furniture from a high-end shop	A one-week trip in Europe	A luxurious new device (e.g. phone, iPad, laptop)	17-18 workshop lessons (e.g., driving, language)	6 festival or concert tickets	Or... what do you see yourself doing with this amount in the future?

APPENDIX E. PILOT STUDY FOR CONSEQUENTIAL DECISION TASK (STUDY 3)

We conducted a pilot study to test whether the materials developed for the incentive-compatible, consequential study were deemed attractive by students, before implementing them as materials in the main study.

Participants. Participants were recruited on Prolific Academic and received a financial compensation for participation. Only participants with an active student status were able to participate in the study, as the materials were designed to be relevant student sample. In total, 200 participants completed the survey (M_{age} = 23.81, SD = 4.56, 49.5% female).

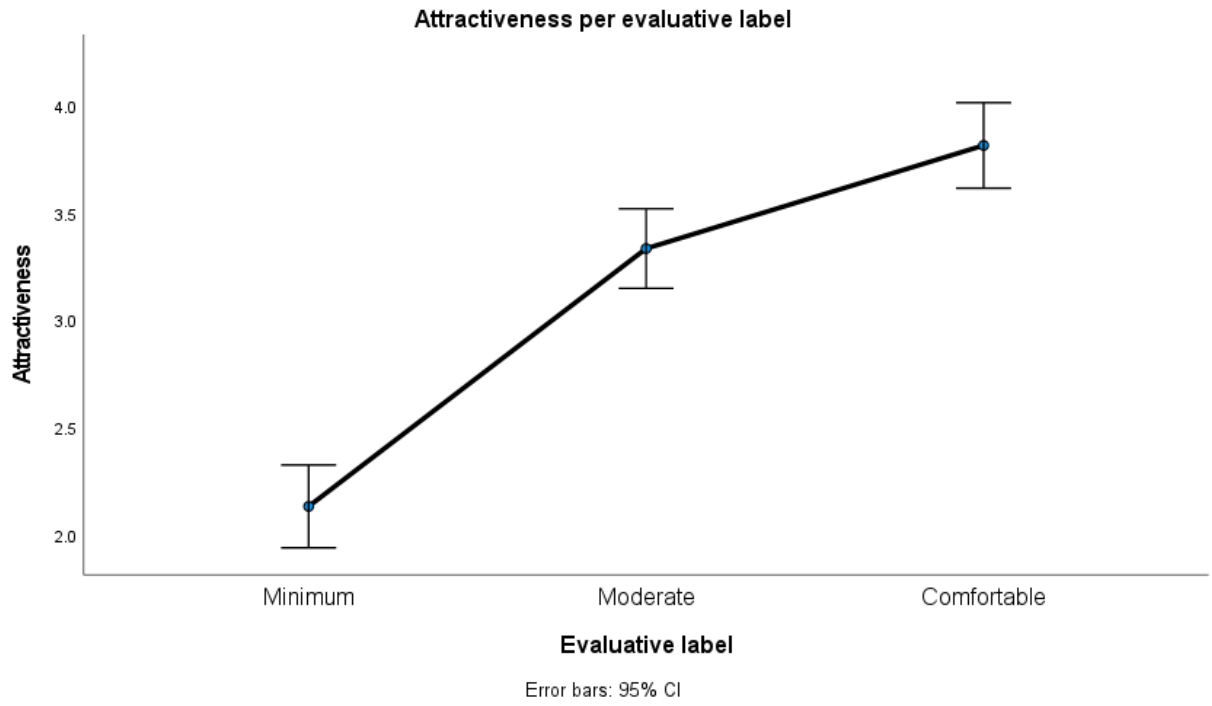
Materials and procedure. We conducted a between-subjects experiment with three experimental conditions (Control vs. Evaluative labels vs. Evaluative labels with consumption baskets). Participants viewed the savings table and selected a savings rate. The categorical switching points were at 40% and 85%. Participants in the label and basket condition were asked to indicate on a five-point scale (not attractive at all – extremely attractive) how attractive the future consumption possibilities in each category (minimum, moderate, comfortable) were.

Results

To test whether the evaluative labels and associated consumption baskets were increasingly attractive, we conducted a repeated measures ANOVA. As the sphericity assumption was not met, a repeated measures ANOVA with a Huynh-Feldt correction was conducted ($F(1.81, 178.94 = 94.09$, $p < .001$) The results demonstrate that participants perceive the comfortable consumption possibilities as more attractive (M = 3.81, SE = .10) than the moderate consumption possibilities (M = 3.33, SE = .09), and the moderate lifestyle as more attractive than the minimum consumption possibilities (M = 2.13, SE = .10). All differences are significant with $p < .001$. On average, the manipulation was thus successful and participants found the “comfortable” consumption possibility more attractive than “moderate”, and the “moderate” possibility more attractive than “minimum”.

Figure E1

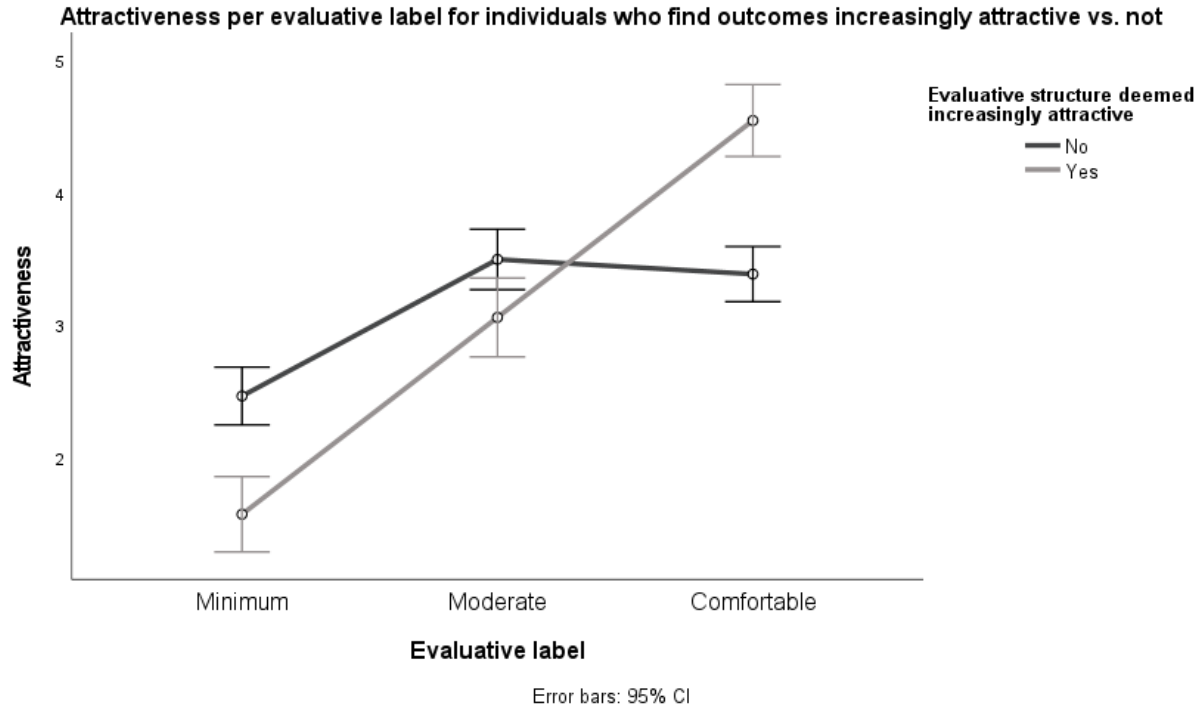
Attractiveness of Evaluative Labels (Pilot Study)



However, further analyses indicated that the manipulation was not successful for all respondents. Following up on this insight, we separated participants in the evaluative consumption baskets group into two, mutually exclusive, subgroups: those who found the evaluative structure increasingly attractive (i.e. participants who indicated in our manipulation check question that the attractiveness of the comfortable category > attractiveness of the moderate category & the attractiveness moderate category > the attractiveness of the minimum category) and those who did not. Figure E2 demonstrates that for the group who do not find the evaluative structure increasingly attractive, there is no difference between the attractiveness of the “moderate” and the “comfortable” lifestyle. Due to the limited sample size in the pilot study, splitting up the data according to this rule impedes us from further interpreting the results (e.g., for saving decisions) due to the resulting small sample size per cell.

Figure E2

Attractiveness of Evaluative Labels by Whether Participants Found Evaluative Outcomes Increasingly Attractive (Pilot Study)





SUMMARY AND GENERAL DISCUSSION

The objective of this dissertation was to enhance the understanding of financial well-being and present novel routes that can improve financial well-being. While policymakers and companies are increasingly interested in improving financial well-being, there is a lack of knowledge on how financial well-being should be defined and measured. In this dissertation, I employed a multidisciplinary and multi-method approach to understanding and improving financial well-being. This approach has enabled me to provide novel insights that contribute to our understanding of financial well-being, how it can be measured, and how it can be improved. In this chapter, I first provide a summary of the main findings per chapter. Next, I reflect on the aggregate theoretical and managerial implications of my dissertation. Finally, I provide directions for future research on understanding and improving financial well-being.

1. SUMMARY OF CHAPTERS

Chapter 1 reexamines the understanding of financial well-being by disentangling objective financial indicators and subjective financial well-being. Because consumer finances directly impact spending and choice, understanding consumer financial well-being is relevant for research and practice. Academic research increasingly deems financial well-being as a subjective perception that is only moderately linked to objective indicators of a consumer's financial situation. If this assumption holds, it is problematic for companies and organizations who aim to improve financial well-being and who generally have data reflecting objective indicators of financial well-being but cannot directly assess their customers' subjective sense of financial well-being. I challenge the assumption that objective and subjective financial well-being are only moderately correlated and argue that the current measures and data sources are insufficient to study the influence of an individual's objective financial situation on their subjective sense of financial well-being. In this chapter, I use Dutch tax registry data to measure objective financial indicators (e.g., income, wealth, and debt). I enrich these data with survey data collected by the LISS panel, a nationally representative and randomly recruited sample. I find that, depending on the objective measure used, the association between objective and subjective financial well-being is stronger than the prior consensus in the literature on financial well-being suggests.

In Chapter 2, I focus on consumers for whom objective financial indicators and subjective financial well-being are misaligned. An important assumption in financial well-being research is that subjective perceptions reflect the objective reality of people's financial situations. However, subjective perceptions and objective realities may not necessarily align,

and individuals who experience misalignment may be overlooked in current approaches to studying and improving financial well-being. This chapter conceptualizes and measures the correspondence between objective and subjective financial well-being. Subjective financial well-being is measured using self-report scales on current and future financial well-being, and the objective financial situation is operationalized as the cumulative share of assets and income of a household relative to the population. For 72.3% of individuals, their objective financial situation and assessment of subjective financial well-being remain within one standard deviation from each other. Individual differences can explain for whom non-correspondence is more likely to occur. Materialistic individuals, older individuals, and larger households are likely to have lower subjective financial well-being relative to their objective financial situations. Conversely, optimistic individuals, individuals with greater financial skills, and individuals with lower education levels are likely to have high subjective financial well-being relative to their objective financial situations. The finding that objective and subjective financial well-being do not correspond for specific individuals demonstrates the importance of assessing financial well-being correspondence. This approach enhances our understanding of financial well-being, as it provides insight into consumer heterogeneity in the relationship between objective financial circumstances and subjective perceptions of those circumstances. Furthermore, the chapter provides insights into potential routes for improving financial well-being correspondence.

In Chapter 3, I bridge the customer and retirement engagement literature to understand how to improve engagement with complex and utilitarian services that are relevant to long-term financial well-being. In the last decade, customer engagement has become a key concept in service research. While the engagement literature has gained significant traction and is maturing, studies have predominantly focused on hedonic consumption contexts, such as social media platforms or brand communities. Therefore, existing research knowledge on engagement does not necessarily hold in more utilitarian settings, such as banking, investing, or retirement planning, where greater customer engagement could increase societal and individual well-being. To expand the engagement research coverage to utilitarian settings, this chapter a) identifies assumptions in engagement research that need revising and b) provides systematic guidelines for future research. I contrast existing engagement research with empirical findings from the retirement planning literature—an example of a typical utilitarian service setting. As its main contribution, this

chapter problematizes engagement research's current premises and demonstrates that engagement assumptions are not necessarily generalizable across contexts. This chapter offers guidelines for moving the engagement field forward and shifts its applicability domain, arguing that the engagement literature should address customer well-being rather than firm-focused outcomes. The chapter also advances retirement planning research by demonstrating how the lack of engagement in utilitarian service contexts could be alleviated.

Chapter 4 studies differences in adult financial well-being based on variations in childhood cognitive ability. This chapter challenges the traditional view of the relationship between cognitive ability and financial well-being by empirically analyzing the functional form of this relationship in a large longitudinal study (the British Cohort Study). In this chapter, I investigate the extent to which cognitive ability is associated with financial well-being over time. Specifically, I look at debt, wealth, and subjective financial well-being. Previous research has established a correlation between cognitive ability and financial well-being but implicitly assumes a linear relationship. My analyses indicate that most relationships between cognitive ability and financial variables are indeed monotonic. However, I also observe non-monotonic relationships, particularly for credit usage, which suggests a curvilinear relationship that follows an inverse U-shape. This means that individuals with lower and higher cognitive abilities have less debt than do individuals with average cognitive abilities. The inverse U-shape pattern is consistent for total debt, credit- and store-card debt, and debt after excluding student loans. Whereas I am not able to assess the mechanism behind this pattern, I suggest that differences in a lack of access to resources on the one hand, and a lack of a need for resources on the other hand, may explain this shape. Using childhood cognitive ability as a measure facilitates an accurate representation of cognitive ability as it is relatively stable over the life course. By measuring childhood cognitive ability, I can control for childhood and parental economic characteristics, which enables me to study the relationship more precisely between childhood cognitive ability and adult financial well-being. I provide a more accurate estimate of the unique impact of cognitive ability by testing whether the effect of cognitive ability on adult financial outcomes is driven merely by income differences. I not only assess to what extent cognitive ability explains adult financial outcomes but I also show that cognitive ability has explanatory power beyond income. This chapter's findings show that assessing heterogeneity in financial outcomes is important because the functional form of the

relationship between cognitive ability and financial well-being depends on the type of studied outcome.

Chapter 5 uses experimental research methods to develop an intervention to increase saving rates, which are an important determinant of future financial well-being. Many individuals face saving deficiencies despite existing saving interventions. Financial service providers now employ interventions with evaluative structures—which have previously been successfully used in medical and nutrition domains—to aid in saving decisions, such as selecting a pension contribution rate. However, so far, it is unclear whether the use of evaluative structures in the savings domain helps or hinders saving. In a series of three experiments, I assess how evaluative labels describing expected future financial outcomes (e.g., moderate or comfortable lifestyles) and consumption baskets (consumption possibilities per expected future financial outcome) affect saving decisions. I find that both types of evaluative structures increase saving rates and that mental imagery mediates consumption baskets' effects on saving rates. However, evaluative structures are only effective when the decision-maker finds the described future possibilities attractive, and they come with the side effect of anchoring to the saving rates associated with reaching the next upward category. Additionally, their effectiveness is not moderated by trust in pension institutions or patience; rather, it depends on people's starting saving rates and financial literacy. Overall, evaluative structures are helpful in reaching higher savings rates, and my results generate implications for their implementation in field settings.

2. AGGREGATE THEORETICAL IMPLICATIONS

This dissertation contributes to the financial well-being literature in three main ways. First, it shows the complex interplay between objective indicators and subjective perceptions of financial well-being. Whereas objective indicators, such as income and wealth, contribute to a sense of financial well-being, understanding an individual's objective financial situation is insufficient to understand their subjective experience of financial well-being. For example, individual differences, such as optimism and materialism, can change perceptions of subjective financial well-being, keeping people's objective financial situations constant. A holistic approach in which both objective indicators and subjective perceptions of financial well-being are considered should be encouraged. Shifting away from a purely economic or purely psychological approach to individuals' and households' financial situations allows for a more intricate understanding of individual differences in financial well-being. This intricate

understanding can help scholars, policymakers and organizations to better understand financial decision-making.

Second, this dissertation underscores the complexity of financial well-being. Financial decisions are generally utilitarian—they are made as a means to an end rather than out of enjoyment. Contrary to hedonic contexts, long-term financial decisions are complex and require information processing, cognitive ability, and attention. The complex nature of these decisions, which often have consequences that play out after long time intervals, makes it difficult to engage with financial services and may lead to decision avoidance or financial mistakes (Tinghög et al., 2022). A lack of engagement with financial decision-making can have detrimental consequences for long-term financial well-being. Existing engagement research lacks the insights required to foster engagement in utilitarian contexts. For example, in utilitarian financial contexts, individual differences, such as cognitive ability, contribute to the ease of making the right decision. In my dissertation, I provide insight into the role of context for engagement and show how individual differences in cognitive ability are associated with financial outcomes over time.

Third, I contribute to the behavioral economics and decision assistance literature on long-term financial decision-making. The design of a choice environment impacts the type of decisions individuals make and the factors they consider. The presentation format of complex financial decisions is often numerical, which is complex, not engaging, and makes imagining the impacts of small financial changes over time difficult. I show that evaluative structures, in which numerical outcomes are mapped onto an evaluative scale, work not only in a health or nutrition context but also in financial decision-making. A specific contribution I make to this literature is showing that merely increasing the tangibility of future outcomes is insufficient to make individuals future oriented. Rather, the portrayed future outcomes should be deemed attractive. A caveat of restructuring numerical decisions into simpler evaluative structures is that individuals may rely on heuristic processes when making decisions, making their decisions less deliberate. It is unclear whether these heuristic-based decisions for long-term outcomes, such as pension adequacy, help or hinder the achievement of financial well-being over time.

3. PRACTICAL IMPLICATIONS

In this section, I provide four directions that policymakers and financial service providers can use to improve financial well-being. Each direction relies on the premise that financial well-being must be understood to improve it. Governmental institutions, financial service

providers, and policymakers aiming to improve financial well-being should clarify their policy goals and financial well-being definitions, for example, by specifying whether they focus on objective indicators or subjective perceptions of financial well-being. Additionally, they should specify how they measure improvements in financial well-being.

Financial well-being can be improved by strengthening objective financial circumstances. My research shows that objective financial circumstances, such as a household's income and wealth position, are related to a subjective sense of financial well-being. While improving objective financial circumstances may seem self-evident to strengthen financial well-being, the academic focus on individual differences and comparative processes that shape financial well-being may reduce attention to how objective financial circumstances affect perceptions of financial well-being. Governments can play a crucial role in improving citizens' financial circumstances by enacting policies that either boost income or reduce the cost of living, for example, through taxes, social security, employment regulations, and retirement scheme design. The recent cost-of-living crisis has underscored how financial shocks, such as inflation, can cause financial stress (Agarwal et al., 2023). Governmental interventions that increase citizens' purchasing power may provide a buffer against the negative consequences of financial shocks.

Financial well-being can be improved by taking lessons from the engagement literature. However, the engagement literature findings should be critically reviewed to assess whether they are appropriate in a utilitarian service context, such as financial services. Financial service providers should begin by mapping the factors that contribute to a lack of engagement with a specific service they are offering. In a retirement planning engagement example, many factors play into the lack of engagement. For example, the temporal distance between customers' present and future selves makes it easy to delay decision-making and make present- rather than future-focused decisions. Another factor is retirement planning's perceived complexity. Each factor may require a different approach. The mental imagery of future outcomes can be improved by mapping numerical future outcomes onto an evaluative structure, for example, by showing consumption baskets for future lifestyles. Perceived complexity can be reduced by providing financial advice, which reduces the need for individual decision-makers to have high levels of cognitive ability (Harrison et al., 2006). Thus, financial service engagement should be fostered in different ways for various consumer segments. These interventions' effectiveness can be evaluated by assessing how an intervention changes

customers' objective financial circumstances (e.g., the replacement rate of a retirement income relative to current income) and/or by assessing changes in subjective financial well-being (e.g., a person's belief that they are on track to achieve the goals they have set for their financial future).

Education is another method for improving financial well-being. As society's financial systems grow increasingly complex, individuals require cognitive skills to process and understand new financial decisions and systems. Policymakers and financial service providers should understand the importance of cognitive skills in achieving financial well-being. Early educational interventions have a significant impact on the development of cognitive ability (Hegelund et al., 2020). In addition to interventions focusing on childhood cognitive ability, just-in-time financial education can enable individuals to make good financial decisions (Fernandes et al., 2014). Technological advances make it possible to personalize the information given to consumers, which enables them to receive feedback on their financial behavior and decisions (Kim et al., 2017). My dissertation shows that the relationship between cognitive ability and financial outcomes differs depending on the financial outcome studied. Therefore, the best approach to improve financial decision-making should be determined based on the features of the decision-making context. The skills required to make sound saving decisions may differ from those required to avoid problematic debt.

Changing decision environments is another route to improving financial well-being. Translating the numerical consequences of financial decisions into tangible consumption possibilities eases the mental imagery of people's futures, which makes them willing to trade off current consumption for future consumption. Increasing the tangibility of future outcomes in financial decision environments can be applied at scale as consumers must make numerous decisions in which they trade off current spending against future outcomes. Visualizing future financial outcomes can help consumers understand the consequences of taking out credit card loans or obtaining other financial products that reduce financial well-being.

4. DIRECTIONS FOR FUTURE RESEARCH

The financial outcomes that are studied in in this dissertation summarize the accumulation of financial events and decisions over time. These summaries provide insight into a household's current financial situation and can be used to make inferences about the decision-making processes that led to it; however, there are still many unanswered questions about how differences in financial well-being emerge. A particularly relevant direction for future research

is to explore when and for whom a lack of financial well-being triggers the motivation to improve a financial situation. Furthermore, it would be relevant to investigate which characteristics are associated with resilience against financial shocks. After financial shocks, some individuals can quickly bounce back and maintain their financial well-being, whereas others are permanently set back. Identifying the protective factors that enable resilience would help in designing effective interventions to help people cope with financial adversity.

Numerous interventions and policies can affect people's financial well-being. Generally, studies have investigated the consequences of these interventions on a specific outcome variable, for example, whether a saving intervention increases savings. However, financial decisions always involve trade-offs. An improvement in one component of financial well-being that comes at the cost of another component may not improve overall financial well-being. For example, an increase in retirement savings driven by a reduction in a person's emergency savings buffer may not improve their financial well-being. It is especially relevant to consider vulnerable consumer groups here, such as groups with a minimum income level. Establishing how the allocation of money to different types of saving accounts affects subjective financial well-being is a promising route for future research. Furthermore, longitudinal studies that track how an individual's financial situation and well-being develop over time provide unique insights into the temporal dimension of financial well-being. While it is generally assumed that having high levels of savings is beneficial, there is also evidence that some individuals accumulate more savings than they are able or willing to spend during retirement (Shu & Shu, 2018). Understanding how individuals accumulate and decumulate savings over their lifetimes is a relevant direction for future research.

Future research can also further the understanding of financial well-being by investigating the social networks that shape financial well-being. The presence of others impacts people's behavior and decisions (Turner, 1991). The existing literature has established the importance of financial socialization, for example, during an individual's upbringing (Gudmunson & Danes, 2011). However, the social environment extends beyond family ties. Future research may address when individuals ask others for advice and when they decide to make financial decisions in isolation. The extent to which social interactions, either via social media or in person, affect financial behavior is a relevant direction for future research. Understanding how the presence and closeness helps or hinders individuals' achievement of financial well-being is a relevant direction for future research.

Government support and interventions may be insufficient to improve financial well-being. Shame, stigma, and distrust can act as barriers to the uptake of financial help (Simonse et al., 2023). Understanding how to overcome these barriers is key to improving the financial well-being and thus provides an important yet challenging direction for future research. Consumer heterogeneity should be considered in the design of effective support programs and interventions to improve financial well-being. Barriers that prevent some groups from participating in governmental support programs may be irrelevant to others. Next to social factors, such as stigma and shame, consumers' digital skills should be considered. Individuals who do not participate in governmental support programs due to mistrust may require different support than individuals who refrain from participating due to a lack of digital skills and knowledge.

Finally, studying the temporal development of financial well-being is a fruitful direction for future research. Deeper insights into the temporal and dynamic development of objective indicators and subjective financial well-being are relevant to understanding how individuals manage fluctuations in their financial situations. It would be relevant to explore how the stability versus volatility of an individual's objective financial circumstances affect spending, investing, saving, and the subjective sense of financial well-being. Establishing how changes in our objective financial circumstances affect subjective financial well-being over time, and vice versa, would provide further insight into how our finances shape our experiences and how our experiences shape our finances.

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NEDERLANDSE SAMENVATTING

Het doel van dit proefschrift was om het begrip van financieel welzijn te vergroten en om nieuwe manieren te presenteren die gebruikt kunnen worden om financieel welzijn te verbeteren. Hoewel er een toenemende interesse is van beleidsmakers en bedrijven om financieel welzijn te verbeteren, is er een gebrek aan kennis over hoe financieel welzijn gedefinieerd en gemeten kan worden. In dit proefschrift heb ik gekozen voor een multidisciplinaire benadering waarin ik verschillende methodes gebruik om financieel welzijn te begrijpen en verbeteren. Deze aanpak heeft mij in staat gesteld om nieuwe inzichten te verschaffen die bijdragen aan ons begrip van wat financieel welzijn is, hoe het gemeten kan worden en hoe het verbeterd kan worden.

In hoofdstuk 1 wordt het begrip van financieel welzijn verdiept door een onderscheid te maken tussen objectieve financiële indicatoren en subjectief financieel welzijn. Omdat de financiën van consumenten een directe invloed hebben op bestedingen en keuzes, is inzicht in financieel welzijn van consumenten van groot belang voor onderzoek en praktijk. Academisch onderzoek beschouwt financieel welzijn steeds meer als een subjectieve perceptie die slechts matig samenhangt met objectieve indicatoren van de financiële situatie van een consument. Als deze aanname klopt, dan is dat problematisch voor bedrijven en organisaties die financieel welzijn willen verbeteren. Organisaties hebben over het algemeen wel gegevens over de objectieve financiële situatie van individuen, maar kunnen vaak niet direct het subjectieve gevoel van financieel welzijn van hun klanten beoordelen. Ik betwist de aanname dat objectief en subjectief financieel welzijn slechts matig gecorreleerd zijn en ik stel dat de huidige metingen en data ontoereikend zijn om de invloed van de objectieve financiële situatie van individuen op hun subjectieve gevoel van financieel welzijn te bestuderen. In dit hoofdstuk gebruik ik de gegevens uit het Nederlandse belastingregister om objectieve financiële indicatoren te meten (bijv. inkomen, vermogen, schulden). Ik verrijk deze gegevens met enquêtegegevens verzameld in het LISS-panel, een nationaal representatieve en willekeurig geworven steekproef. Ik laat zien dat, afhankelijk van de objectieve indicator die wordt gebruikt, de associatie tussen objectief en subjectief financieel welzijn sterker is dan dat de eerdere consensus in de literatuur over financieel welzijn suggereert.

In hoofdstuk 2 richt ik me op consumenten voor wie objectieve financiële indicatoren en subjectief financieel welzijn niet samenhangen. Een belangrijke aanname in onderzoek naar financieel welzijn is dat subjectieve percepties de objectieve financiële situatie weerspiegelen. Het is echter mogelijk dat subjectieve percepties en objectieve realiteiten niet

noodzakelijkerwijs op één lijn liggen. Hierdoor zouden consumenten waarbij objectief en subjectief financieel welzijn niet overeenkomen, over het hoofd kunnen worden gezien in de huidige benaderingen om financieel welzijn te bestuderen en te verbeteren. In dit artikel wordt de overeenstemming tussen objectief en subjectief financieel welzijn gedefinieerd en gemeten. Subjectief financieel welzijn wordt gemeten met zelfrapportageschalen over huidig en toekomstig financieel welzijn en de objectieve financiële situatie wordt geoperationaliseerd als het cumulatieve aandeel van vermogen en inkomen van een huishouden ten opzichte van de bevolking. Mijn resultaten laten zien dat voor 72,3% van de individuen, de objectieve financiële situatie en de beoordeling van subjectief financieel welzijn niet meer dan 1 standaardafwijking van elkaar afwijken. Individuele verschillen kunnen worden gebruikt om te verklaren bij wie de kans op een gebrek aan overeenkomst tussen objectief en subjectief financieel welzijn groter is. Materialistische individuen, oudere individuen en grotere huishoudens hebben een *lager* subjectief financieel welzijn ten opzichte van hun objectieve financiële situatie. Daarentegen hebben optimistische individuen, individuen met meer financiële vaardigheden en individuen met een lager opleidingsniveau een *hoger* subjectief financieel welzijn ten opzichte van hun objectieve financiële situatie. De bevinding dat objectief en subjectief financieel welzijn niet overeenkomen voor specifieke consumenten, toont het belang aan van het beoordelen van de overeenkomst van objectieve en subjectieve indicatoren. Deze methode vergroot ons begrip van financieel welzijn, omdat het inzicht geeft in de heterogeniteit van consumenten in termen van de relatie tussen objectieve financiële omstandigheden en subjectieve percepties. Bovendien biedt het onderzoek inzicht in mogelijke manieren om de overeenstemming van financieel welzijn te verbeteren.

In hoofdstuk 3 sla ik een brug tussen de literatuur over customer engagement (klantbetrokkenheid) en pensioen-betrokkenheid om te begrijpen hoe de betrokkenheid bij complexe en utilitaire diensten die relevant zijn voor het financiële welzijn op de lange termijn kan worden verbeterd. In de afgelopen tien jaar is klantbetrokkenheid een sleutelbegrip geworden in academisch onderzoek. Klantbetrokkenheid is een term waarmee de connectie tussen een klant en een bedrijf of merk wordt uitgedrukt. Hoewel de literatuur betreffende betrokkenheid veel aandacht heeft gekregen, hebben studies zich voornamelijk gericht op hedonistische consumptiecontexten, zoals sociale media of merken. Daarom is de bestaande kennis over klantbetrokkenheid niet noodzakelijkerwijs van toepassing op meer utilitaire

contexten, zoals bankieren, beleggen of pensioenplanning, waar een grotere betrokkenheid van de klant het maatschappelijk en individueel welzijn zou kunnen verhogen. Om het bereik van dit onderzoeksgebied uit te breiden naar utilitaire diensten, identificeert dit artikel aannames in die herzien moeten worden. Daarnaast ontwikkel ik systematische richtlijnen voor toekomstig onderzoek. Ik contrasteer bestaand onderzoek naar klantbetrokkenheid met empirische bevindingen uit de literatuur over pensioenplanning, die als voorbeeld dient van een typische utilitaire dienstensetting. Als belangrijkste bijdrage problematiseert dit artikel de huidige premissen van betrokkenheidsonderzoek en toont het aan dat aannames over betrokkenheid niet noodzakelijkerwijs generaliseren naar andere contexten. De studie biedt richtlijnen om ons begrip van klantbetrokkenheid te verbeteren. De studie brengt ook vooruitgang in het onderzoek naar pensioenplanning door aan te tonen hoe het gebrek aan betrokkenheid in utilitaire dienstverleningscontexten kan worden verminderd.

Hoofdstuk 4 bestudeert verschillen in financieel welzijn op volwassen leeftijd op basis van variatie in cognitief vermogen in de kindertijd. Dit hoofdstuk daagt de traditionele kijk op de relatie tussen cognitief vermogen en financieel welzijn uit door de functionele vorm van deze relatie empirisch te analyseren in een groot, longitudinaal onderzoek (British Cohort Study). Specifiek kijk ik naar schulden, vermogen en subjectief financieel welzijn. Het meten van cognitief vermogen in de kindertijd (op een leeftijd van 10 jaar) maakt het mogelijk om een nauwkeurigere schatting van de relatie tussen deze variabelen te verkrijgen. Eerder onderzoek heeft een correlatie aangetoond tussen cognitieve vaardigheden en financieel welzijn, maar ging impliciet uit van een lineair verband. De analyses geven aan dat de meeste relaties tussen cognitieve vaardigheden en financiële variabelen inderdaad monotoon zijn. Er zijn echter ook niet-monotone verbanden, vooral voor schulden. De meest opmerkelijke bevinding is dat de relatie tussen cognitieve vaardigheden en schulden een omgekeerde-u-vorm heeft. Dit betekent dat zowel individuen met lagere als individuen met hogere cognitieve vaardigheden lagere schulden hebben dan individuen met gemiddelde cognitieve vaardigheden. Hoewel ik niet in staat ben om het mechanisme achter dit patroon te beoordelen, suggereer ik dat verschillen in een gebrek aan toegang tot middelen enerzijds, en een gebrek aan behoefte aan middelen anderzijds, deze vorm kunnen verklaren. Verder laat ik zien dat het cognitief vermogen een uniek effect heeft op vermogen, schulden en subjectief financieel welzijn, en dat het effect van cognitief vermogen op de financiële situatie niet enkel gedreven wordt door verschillen in inkomsten. De bevindingen van dit hoofdstuk laten zien

dat het belangrijk is om heterogeniteit in indicatoren van de financiële situatie van een huishouden te beoordelen, omdat de functionele vorm van de relatie tussen cognitief vermogen en financieel welzijn afhangt van het type uitkomst dat wordt bestudeerd.

Hoofdstuk 5 gebruikt experimentele onderzoeksmethoden om een interventie te ontwikkelen die gericht is op het verhogen van de het percentage van inkomen dat iemand spaart voor zijn pensioen. Dit percentage is een belangrijke determinant van toekomstig financieel welzijn. Veel consumenten sparen niet genoeg voor hun pensioen. Financiële dienstverleners proberen dit te verminderen door het gebruik van evaluatieve structuren. Dit zijn structuren die numerieke uitkomsten vertalen naar een tekstuele evaluatie. Bijvoorbeeld, in plaats van het benoemen dat een kans 1% is, zou dit een evaluatief label “laag” kunnen krijgen. Dit soort evaluatieve structuren werden voorheen met succes gebruikt in de medische sector en bij het evalueren van energiewaardes in voeding. Tot nu toe is het echter onduidelijk of het gebruik van evaluatieve structuren behulpzaam zijn of een belemmering vormen bij het maken van spaarbeslissingen. In een serie van drie experimenten ga ik na hoe evaluatieve labels die verwachte toekomstige financiële uitkomsten beschrijven (bijv. "gematigde" of "comfortabele" levensstijl) en consumptiemanden (consumptiemogelijkheden per verwachte toekomstige financiële uitkomst) spaarbeslissingen beïnvloeden. Ik laat zien dat beide soorten evaluatieve structuren het spaarpercentage verhogen. Wanneer je consumptiemanden aan consumenten laat zien, kunnen zij zich een beter mentaal beeld vormen van hun toekomst, waardoor het spaarpercentage omhoog gaat. Evaluatieve structuren zijn echter alleen effectief als de besluitvormer de beschreven toekomstige mogelijkheden aantrekkelijk vindt. De effectiviteit van evaluatieve structuren wordt niet verminderd door laag vertrouwen in pensioeninstellingen of geduld, maar deze is afhankelijk van iemands huidige spaarpercentage en financiële geletterdheid. In het algemeen zijn evaluatieve structuren een effectieve interventie om spaarpercentages te verhogen.



IMPACT PARAGRAPH

In my dissertation, I address financial well-being from a multidisciplinary, multi-method perspective. Improving the understanding of financial well-being is important, as financial well-being positively contributes to individual outcomes, such as health (O'Neill et al., 2005; Sturgeon et al., 2016) and happiness (Netemeyer et al., 2018; Ng & Diener, 2014), as well as to societal outcomes, such as economic development (Jorda et al., 2016; Mian et al., 2017). Currently, there is a global lack of financial well-being, which manifests as a variety of financial problems, such as a lack of engagement with financial services, poor financial decision-making, indebtedness, insufficient savings for people's financial futures, and financial worries. In this thesis, I explore objective and subjective financial outcomes to strengthen the understanding of how financial well-being can be improved. First, I will describe how my research contributes to current scientific knowledge on financial well-being.

My dissertation contributes to the financial well-being literature by demonstrating the importance of sound measurements for deriving meaningful conclusions about the association between objective indicators and subjective financial well-being. If either component is measured erroneously, solid claims about the strength of the association between these components cannot be made. I resolve this issue by using a nationally representative sample survey (LISS panel) to measure subjective financial well-being and link these data to administrative tax registry data. I show that the association between objective financial indicators and subjective financial well-being is stronger than previously assumed. Furthermore, I define and quantify financial well-being correspondence. This approach transcends current financial well-being knowledge, which generally assesses objective financial indicators and subjective financial well-being in isolation.

Furthermore, my research contributes to the customer engagement literature. Specifically, I further the understanding of ways to engage individuals with retirement planning. I show why promoting engagement in a utilitarian, outcome-oriented service setting requires unique insights that cannot be derived from knowledge of customer engagement with hedonic services. This insight contributes to the customer engagement and retirement planning literature by identifying the importance of context for engagement's nature, drivers, and outcomes. This chapter impacts engagement research by triggering a shift in focus. By explicating the assumptions held in engagement research and contrasting them against the reality of utilitarian service settings, this article triggers future research to investigate the context in which engagement unfolds.

Next, I provide a novel perspective on approaching financial well-being predictors by allowing the relationship between cognitive ability and financial well-being to take different functional forms rather than assuming a linear relationship. This perspective contributes to the financial well-being literature by showing that the relationships between cognitive ability and financial outcomes are heterogeneous and that do not follow the same shape for all outcomes. My research impacts future research that seeks to establish the relationship between an individual predictor—such as ability, personality, or beliefs—and financial outcomes. Nonlinear relationships should be explicitly considered when seeking to establish the association between an individual difference and a financial outcome.

I contribute to the decision assistance in the financial decision-making literature by developing a novel intervention to increase savings. While evaluative structures have previously been used in the nutrition domain, they have yet to be applied to financial decision assistance. Extending the applicability of evaluative structures to financial decision-making contributes to the knowledge of how to increase savings. Evaluative structures help guide consumers to specific saving rates rather than mere increases. This is beneficial because mere increases may be insufficient for consumers to reach their desired future outcomes. My research impacts the literature by providing a novel application domain for evaluative outcomes. Future research may consider this intervention as a starting point to develop novel saving interventions that enhance the mental imagery of future financial outcomes.

In addition to its scientific impacts, my research has direct implications for financial services, policymakers, and marketers. Financial decisions do not occur in isolation; rather, they happen in a complicated ecosystem in which consumers, financial service providers, policymakers, regulators, and researchers interact. For example, consumers engage with many financial service providers, such as banks, insurance companies, and retirement scheme providers. Policymakers and regulators oversee this ever-changing, complex financial landscape to protect consumers and improve consumer financial outcomes. Governmental policy is in turn often informed by academic research that seeks to systematically establish how to help individuals improve their financial outcomes. All these actors play a role in improving financial well-being. In the following paragraphs, I reflect on the implications of my findings in practice.

Chapter 1 quantifies the importance of objective financial indicators for subjective financial well-being. Policymakers and companies often only have access to objective data and

cannot continuously monitor whether individuals feel financially well. This is problematic if perceptions of financial well-being are shaped by individual differences and comparative processes rather than objective financial conditions. The findings show that objective financial indicators are associated with subjective financial well-being and can thus be used as a basis for policymaking and studying consumer behavior.

Chapter 2 provides practical insights for financial advisors and counselors. I describe how individuals may experience a mismatch between their objective financial situation and their subjective financial well-being. For these individuals, looking at either the objective financial situation or their subjective financial well-being may lead to incorrect conclusions and erroneous advice. Financial service providers should consider subjective financial well-being and objective financial situation alignment to provide effective financial advice. Individuals who feel as though they are doing well financially while they are objectively in a poor financial state require different financial advice than individuals who are feeling and objectively doing well financially. Considering the alignment between objective financial indicators and subjective financial well-being can aid in the creation of a holistic assessment of a person's financial situation.

In Chapter 3, I identify customer engagement as a route to improved financial well-being. Individuals find it difficult to direct time and attention in the present to uncertain future outcomes, such as retirement (Trope & Liberman, 2003). A lack of engagement can be seen as an individual responsibility, but it is important to question whether systems can be redesigned to reduce the need for engagement to achieve financial well-being. The retirement planning journey figure in my research on customer engagement illustrates financial planning's complexity and shows that life events are crucial touchpoints that require action. However, life events may reduce the availability of the required resources for engagement with complex activities (Blakstad et al., 2017). It is important to consider whether financial services can be designed in such a way as to remove the need to engage to receive benefits, for example, by using defaults (Beshears et al., 2009). For example, if consumers invest in stocks that are inappropriate for their retirement goals, pension funds could automatically rebalance these portfolios while offering participants the opportunity to opt out.

Chapter 4 shows that childhood cognitive ability is associated with financial well-being in adulthood. Individuals require cognitive ability, literacy, numeracy, and digital literacy to make sound financial decisions. This chapter underscores the importance of education in

fostering cognitive ability. As society's financial environment becomes increasingly complex, the importance of early interventions to overcome background disadvantages is apparent. Financial service providers should consider the connection between cognitive ability and financial outcomes when designing their services. Offering financial products and services may be insufficient if individuals do not use these services due to a lack of ability. To overcome this, financial service providers can consider presenting financial service information in a simplified (yet transparent) way. Furthermore, offering financial advice or counseling can help customers make better-informed financial decisions contribute to their financial well-being.

In Chapter 5, I demonstrate that showing people the consequences of their saving rates in words and consumption possibilities, rather than numbers, changes the saving decisions they make. Going beyond mapping the numerical outcomes of financial decisions over time enables individuals to effectively consider the future. Furthermore, specifying the concrete consumption possibilities that individuals will have in the future makes it easier for them to understand how their financial decisions in the present will affect their future lifestyles. Evaluative structures that map numerical outcomes onto evaluative scales are an easy-to-implement, scalable intervention to motivate savings and promote future financial well-being. Financial service providers can implement this chapter's findings. The main premise of the findings is that individuals become more future oriented when the consequences of their financial decisions are expressed in words rather than numbers. This premise has direct implications for motivating retirement savings beyond the minimum required savings rate and can be applied broadly. For example, showing students how higher monthly student loan payments affect their future mortgage options in terms of the type of house they could afford instead of the maximum mortgage may help make the consequences of the present decision for an individual's future self tangible. Financial service providers should consider how the presentation format of their decision environment impacts individuals' decisions. The findings of this chapter are intended to inform policymakers and financial service providers that a seemingly neutral, objective environment that only shows exact numbers and percentages may have the unintended consequence of making individuals neglect the future consequences of their current financial decisions.

Overall, my dissertation contributes to the developing research field on financial well-being. Financial well-being profoundly impacts individuals and society at large, so further research that facilitates an understanding of how it can be enhanced is of critical importance.

Financial well-being is complex and multifaceted, and the ways in which we approach it should reflect this. Specifically, I argue that improving the understanding of financial well-being and how to strengthen it requires (1) carefully choosing and using specific definitions, (2) using high-quality data, (3) considering non-linear relationships between individual differences and financial outcomes, (4) considering the context in which studies occur, and (5) designing interventions that make numeric financial decisions meaningful. I hope that this dissertation will serve as a catalyst for future research on financial well-being that can be used to inform policymakers and financial service providers in an empirical, evidence-based manner.

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Jenna Adriana Maeve Barrett was born on October 30th, 1996 in Tilburg, the Netherlands. She obtained her VWO diploma with a cum laude qualification at the Theresialyceum in Tilburg in 2014. She continued her education by pursuing a bachelor's degree in psychology, which she obtained cum laude in 2017. After graduation, she continued with a two-year research master's in social and behavioral sciences with a specialization in social psychology from 2017-2019. She graduated from this program with distinction.

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Jenna has taught and coordinated the Consumer Psychology Course that is part of the master's Program in International Business. She has received a departmental award for teaching excellence. Furthermore, Jenna served on multiple committees and task forces; she was part of the Behavioral and Experimental Economics Lab management team, was Ph.D. representative in department council meetings, and was a member of the Scientific Integrity taskforce of the Marketing and Supply Chain Management department.

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