Three Essays on a Scarcity Mindset and Procrastination in Consumer Decision-making

Dissertation

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By

George G. Rooney, M.S.

Graduate Program in Consumer Sciences

The Ohio State University

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Dissertation Committee

Dr. Cäzilia Loibl, Advisor

Dr. Robert Scharff

Dr. Anastasia Snyder

Dr. Tansel Yilmazer

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Abstract

Behavioral economics has sought to find explanations for *anomalous* behavior that deviates from the *rational* behavior predicted by the standard economic model (Mullainathan & Thaler, 2000). This dissertation presents three studies that explore such explanations for consumer behavior specifically the ownership of cryptocurrencies, the use of alternative financial services, and procrastination in relation to the delay or avoidance of dental health care.

The first study uses the scarcity mindset as put forth by Mullainathan and Shafir as the framework to analyze cryptocurrency holdings among a sample of U.S. investors (Mullainathan & Shafir, 2013). The study uses responses from the FINRA 2021 National Financial Capability Study (NFCS) and related Investor Survey (N=2,364). It uses a proxy for a scarcity mindset along with other predictor variables including financial literacy, investment literacy, subjective financial knowledge, and willingness to take financial risk, along with demographic and socioeconomic variables, to explain the holding of cryptocurrency. Results show a direct and positive association between cryptocurrency investing and a scarcity mindset, beyond established predictors of investment behavior (OR=1.140, SE=0.024, p<.001). The findings held for a sample of pre-COVID-19 survey data from FINRA's 2018 surveys (N=1,634). In the 2018 data, the scarcity mindset was significantly and positively associated with cryptocurrency investing (OR=1.156, SE=0.037, p<.001). The scarcity mindset associated with speculative behavior is both of societal concern and has practical implications as it relates to asset allocation, investments, and retirement planning.

The second study broadens the investigation of the scarcity mindset to the analysis of the use of alternative financial services (AFS), such as payday loans, among a broad sample of the U.S. population. The study uses responses from the FINRA 2021 State by State Survey (N=24,349). As the main predictor variable, the study uses again the proxy scarcity mindset variable along with established predictor variables of alternative financial services use, including financial literacy, subjective financial knowledge, willingness to take financial risk, and difficulties in meeting monthly household expenses, along with demographic and socioeconomic variables, to explain the use of alternative financial services. The empirical findings in this study show a positive association between alternative financial services usage and a strong scarcity mindset (OR=1.100, SE=0.007, p<.001), controlling for the other established predictor variables. The findings in this study suggest that behavioral mechanisms are significant in helping explain costly financial mistakes. An extension within the study shows that even after stratifying respondents by income, the scarcity mindset is significantly related to an increase in alternative financial services usage across income groups. Understanding the scarcity mindset in this broader context is important for consumer financial well-being, especially considering new products, such as buy now, pay later, being created and marketed to consumers.

The third study uses procrastination as a predisposing factor within the framework of Andersen's Behavioral Model for Health Services Utilization to analyze dental health care behavior (Andersen, 1968; Andersen, 1995). The study uses the 2020 Health and Retirement wave linked to responses by a subsample from the core survey in Experimental Module 2 – Long Term Health Care Procrastination (N=1,217) (Health & Study, 2020). The study uses a procrastination score derived from subsample survey questions that reflect Steel's Pure Procrastination Scale (Steel, 2010). The empirical findings show that procrastination is significantly and negatively associated in relation to having visited the dentist in the past two years from the time of the 2020 survey (Coefficient=-0.017, SE=0.006, p=.006), after controlling for having dental coverage as well as socioeconomic and demographic factors. As an extension, since the Health and Retirement survey is longitudinal, this study uses 2018 dental visit responses linked to the 2020 procrastination scores of the subsample respondents, and found temporal stability consistent with previous studies (Steel, 2007). As a robustness check, the study examined other 2020 health care behaviors, such as a flu shot and mammogram screening, and found that aversive tasks were significantly and negatively associated with procrastination. These findings are important to researchers and to policymakers as it pertains to healthy and proactive consumer decision-making.

Dedication

To Alison, Lexi, Lucas, and Nate

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1980	B.S. in Computing Science, Texas A&M		
	University		
1983	M.S. in Computer & Information Science,		
	Dartmouth College		
1987	Diploma in World and Comparative Politics,		
	the London School of Economics		

Vita

Fields of Study

Major Field: Consumer Sciences

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Chapter 1. Introduction

Behavioral economics has sought and continues to seek theoretical and experimental explanations for *anomalous* behavior that deviates from the *rational* behavior predicted by the standard economic model (Mullainathan & Thaler, 2000). Several scholars have been awarded Nobel Prizes in Economics for work in this arena, including Simon, Kahneman, and Thaler (Kahneman, 2002; Simon, 1979; Thaler, 2018). Anomalous behaviors, mistakes, and systematic errors -- such as failure of consumers to avail themselves to tax-advantaged retirement savings plans, failure to diversify savings and investment portfolios, home mortgage refinancing mistakes, and use of expensive forms of credit -- have been identified, described, researched, and explained (Campbell, 2006, 2016; Gomes et al., 2021). The research in this dissertation investigates behavioral explanations for anomalous behavior specifically the ownership of cryptocurrencies among a sample of the U.S. investor class, the use of alternative financial services, such as payday loans and auto title loans, among a broad sample of the U.S. population, and the delay or avoidance of health care maintenance behavior particularly dental health care among U.S. adults aged 50 years or older.

The first study examines the scarcity mindset as put forth by Mullainathan and Shafir as the framework to analyze cryptocurrency purchases and ownership among a sample of U.S. investors (Mullainathan & Shafir, 2013). The study links the survey responses from the FINRA 2021 National Financial Capability Study (NFCS) State by State to the corresponding responses from a follow-up Investor Survey. The Investor Survey is a subset of the larger survey consisting of respondents that held investment accounts outside traditional retirement plans such as a 401k or IRA (Judy T Lin, Christopher Bumcrot, Gary Mottola, Olivia Valdes, Robert Ganem, et al., 2022). The main predictor variable is a proxy for a scarcity mindset along with established predictor variables of cryptocurrency investing, including financial literacy, investment literacy, subjective financial knowledge, and willingness to take financial risk, and with demographic and socioeconomic variables, to explain investments in cryptocurrency. The empirical findings show that a strong scarcity mindset has a positive association with cryptocurrency use and investment, even after controlling for financial literacy, investment literacy, subjective financial knowledge, willingness to take financial risk, and demographic and socioeconomic attributes. This suggests that even among a more financially literate investment class of consumers, the feeling of not having enough may lead to risky financial behavior, such as cryptocurrency investments.

The second study in this dissertation broadens the use of the scarcity mindset as the framework to analyze the use of alternative financial services (AFS) -- payday loans, auto title loans, pawn shops, advance tax refund loans, and rent-to-own purchases – among a broad sample of the U.S. population. Using survey responses from the FINRA 2021 State by State Survey, the proxy scarcity mindset variable serves, along with other predictor variables including financial literacy, subjective financial knowledge, willingness to take financial risk, difficulties in covering monthly household expenses, and demographic and socioeconomic variables, to explain the use of alternative financial services. The empirical findings show a positive association between alternative financial services usage and a strong scarcity mindset, controlling for financial literacy, subjective financial knowledge, willingness to take financial risk, and tangible financial scarcity measured as difficulties in covering month-to-month household expenses. This suggests that beyond tangible economic scarcity, the feeling of not having enough can lead to financial mistakes and suboptimal financial decision-making.

The third study utilizes procrastination within the framework of Andersen's Behavioral Model for Health Services Utilization to analyze dental health care behavior (Andersen, 1968; Andersen, 1995). Data are from the 2020 wave of the Health and Retirement Study linked to follow-up responses by a subset of the larger sample in Experimental Module 2 – Long Term Care Insurance Procrastination (Health & Study, 2020). Procrastination tendency, as measured by an aggregated procrastination score, the holding of dental coverage, and controlling for demographic and socioeconomic variables, serve to explain the use of dental care. The empirical findings show that having dental coverage has the strongest association with whether a person has visited the dentist in the previous two years. However, a high procrastination score is negatively associated with having seen the dentist, even controlling for demographic and socioeconomic attributes. This finding suggests that certain rational health care behaviors can be thwarted by procrastination tendencies especially if the task, such as a visit to the dentist, is viewed as aversive, unpleasant and uncomfortable

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Taken together, these studies provide additional insights to anomalous individual behavior that diverges from expectations from a standard economic model. These insights can be used by researchers to better understand how behavioral factors – a scarcity mindset and procrastination – impact human decision-making and behavior that can be characterized best as suboptimal and risky, and at worst a fundamental mistake. Furthermore, these insights could help inform policymakers and service providers in their policy responses and product development. Chapter 2. Scarcity Mindset as a Predictor of High-Risk Investments

2.1 Introduction

Scarcity as a concept is long-standing in and central to the field of economics (Robbins, 2007) The scarcity mindset is a behavioral extension of this concept (Mullainathan & Shafir, 2013; Shah et al., 2012). Fundamental to the scarcity mindset is a core proposition, namely the subjective feeling of not having enough. It has a keen psychological effect on the individual, specifically taxing a person's mental capacity or "bandwidth" (Shah et al., 2015). This effect – the bandwidth tax – can lead to focus, or tunneling, on a particular problem, and this hyperfocus can benefit in attending to the matter at hand. However, this can also lead to mistakes in decision-making elsewhere (Mullainathan & Shafir, 2013).

The scarcity mindset has often been considered in the context of decision-making by those in poverty (De Bruijn & Antonides, 2022; Kalil et al., 2023). However, research into the scarcity mindset, as it pertains to consumers' longer-term financial decisionmaking, in particular among a broader population, is limited specifically as it relates to consumer savings and investment decisions. It has been shown that a scarcity mindset can lead to decision-making mistakes, which can severely impact the financial security of individuals with limited means (De Bruijn & Antonides, 2022; Schilbach et al., 2016; Shafir, 2017). The relationship between a scarcity mindset and risky financial behaviors among population groups that are able to save and invest, has only received limited attention.

Cryptocurrency prices display disperse and volatile financial returns and, as such, meet the well-accepted attributes of risky financial assets or instruments (Delfabbro et al., 2021; Malkiel, 2019; Taleb & Investments, 2021). Recently, asset diversification has been put forward as justification to include cryptocurrency in an investment portfolio (Harvey et al., 2022). As of 2024, cryptocurrency, as an investment, savings, and trading instrument, has been sanctioned by the U.S. Securities and Exchange Commission through the approval of cryptocurrency-linked exchange-traded products (Su, 2024). Industry reports document that the U.S. population participating in the cryptocurrency markets started to grow during the Covid-19 pandemic, from around 3% of individuals before 2020 to 13% in mid-2022, which provides robust sample size for data analysis. (Wheat & Eckerd, 2022). In 2024, cryptocurrency investing has provided a year to date investment return of 62% (Coinmetrics.io, 2024). Federal agencies have identified significant risks to the individual investor going beyond the market volatility of cryptocurrencies, such as theft, fraud, operational risks, and intermediary or counterparty risks (Consumer Financial Protection Bureau, 2022; Treasury, 2022). In this study, we ask whether the often lottery-like, speculative process of cryptocurrency investing (Grobys & Junttila, 2021) may be particularly attractive for investors with a scarcity mindset because the prospect of large gains can be attractive when financial resources are felt to be not adequate to satisfy needs or wants (Shah et al., 2012). Our specific research questions investigate, first, whether the scarcity mindset is associated with

cryptocurrency investing and, second, whether the association between a scarcity mindset and cryptocurrency investing is stable above and beyond established predictors of investment behavior.

2.1.1 Link between a scarcity mindset, and financial behavior and decision-making

A small number of research studies have examined the scarcity mindset and financial behavior and decision-making, but so far exclude investment behaviors. In a series of ten experiments in the U.S., with participants ranging from 74 to 604, and over 4,000 participants in total, Shah et al. (2015) found that a scarcity mindset -- related to a participant's income or experimentally imposed scarcity - was associated with trade-off thinking in valuing consumer items and less so with contextual factors, e.g., beer on the beach at a resort vs grocery store. A replication of several of the Shah et al. (2015) studies, with 3,342 U.S. participants recruited online during the COVID-19 pandemic, tested the effects of threat perceptions during the pandemic on participants along with the original effects of contextual factors in the presence of a scarcity mindset during experimental financial and resource scarcity, e.g., proportional thinking on discounts to computer purchases. The studies corroborated findings that contextual factors were weaker for individuals with a scarcity mindset during the time of COVID-19 and consequently made improved economic valuations when scarcity was salient (Isler et al., 2023).

The term "financial scarcity" is used in recent studies and refers to individuals' subjective feelings that their financial resources and standing are not adequate to satisfy

their needs or wants (Hilbert et al., 2022b; Madsen et al., 2023; Sarial-Abi et al., 2021). Van Dijk et al. (2022) developed the "Psychological Inventory of Financial Security" to be used to measure a person's subjective experience of financial scarcity across four factors: a perceived threat of having a shortage of money, a lack of control of one's financial situation, rumination and preoccupation with financial needs, and short- vs long-term focus and trade-offs. The inventory consists of twelve items presented as statements that participants respond to on a Likert scale (e.g., "I am constantly wondering whether I have enough money", with responses ranging from "strongly disagree" to "strongly agree"). The inventory was developed with data from the 2018 and 2020 waves of the Dutch Longitudinal Internet Studies for the Social Sciences (LISS), a general population survey in the Netherlands, and found a positive relationship between financial scarcity and financial avoidance. Financial avoidance was defined as not taking actions during a financial shortfall or stress, such as not making necessary decisions or ignoring financial obligations (Hilbert et al., 2022b). It is the opposite side of the same conceptual coin: a scarcity mindset leading to the avoidance of good or necessary financial decisions, the flip side of a scarcity mindset leading to the execution of risky or bad financial decisions. In a subsequent pilot study and 5 experiments among an online consumer panel in the U.K., ranging from 150 to 302 participants per study or experiment, the experience of a scarcity mindset in the experiments was formed with scenarios with scarcity using household-finance related conditions, for example, simulated household tasks, manipulating income, expenses, savings, and debt along with different one-time financial shocks, e.g., tax refund; late vs early income shocks. A scarcity of financial resources

was associated with increased discounting of gains and losses suggesting that in the presence of a scarcity mindset – created experimentally – participants showed significantly higher discount rates compared to those with induced sufficient financial resources (Hilbert et al., 2022a). Critics have reviewed scarcity-mindset theory specifically as it provides an explanation of economic decision-making and behavior among those in poverty; they acknowledge its explanatory power and applicability to other domains (e.g., food, time) but state that more theoretical work and model formulation is needed, as well as the mechanisms that are activated under financial scarcity (De Bruijn & Antonides, 2022).

Taken together, the available research on the scarcity mindset in the financial context points to an association with short-term decision-making, dominated by tunneling, focus on the source or manifestation of scarcity, attentional neglect of other needs and problems, and trade-offs (Mullainathan & Shafir, 2013; Shah et al., 2015). Our working hypothesis is that the scarcity mindset may be able to explain a larger number of risky financial decisions, such as cryptocurrency investments, above and beyond currently known factors, such as objective financial and investor literacy (Judy T Lin, Christopher Bumcrot, Gary Mottola, Olivia Valdes, & Gerri Walsh, 2022), subjective financial knowledge (Asaad, 2015; Kim et al., 2022), and willingness to take financial risk (Hayashi & Routh, 2024; Lusardi, 2023).

2.1.2 Explanations for cryptocurrency investments

A small but growing number of studies profile cryptocurrency investors (Aiello et al., 2023; Akana & Li, 2022; Ante et al., 2022; Auer & Tercero-Lucas, 2022; Bonaparte,

2021; Wheat & Eckerd, 2022). Consumer investment in cryptocurrencies can be considered a rational asset choice that could fit within investors' traditional portfolio (Harvey et al., 2022; Platanakis & Urquhart, 2020; Sepp, 2022). Cryptocurrency investments have been shown to be uncorrelated to traditional assets, such as equities and bonds which can add to their appeal (Sepp, 2022) and have been proposed in the context of inflation-hedging similar to gold and other precious metals (Conlon et al., 2021; Halaburda et al., 2020).

A growing number of studies have identified direct and indirect behavioral explanations for cryptocurrency investing, pointing to a strong influence of behavioral aspects among cryptocurrency investors. Data from publicly available cryptocurrency exchange price and volume time series of over 2,000 cryptocurrencies, from CoinCodex, a cryptocurrency data website, from January 2014 to December 2020 showed that financial activity in the cryptocurrency markets can be explained from a prospect theory perspective (Chen et al., 2022). Findings showed that investor behavior was not motivated by rational expected utility maximization but rather by overweighting low probability return outcomes and underweighting high probability return outcomes (Chen et al., 2022). Grobys and Junttila (2021) analyzed time-series price data from the cryptocurrency data website coinmarketcap.com for 20 cryptocurrency price movements, returns, and volatility from 2016 to 2019. Based on econometric methods from equity market analysis, results showed that cryptocurrencies exhibit price action in the price movement and volatility, that resemble patterns for lottery-like equities. Investors exhibited speculative, lottery-type behavior in these cryptocurrency markets with regard

to recent past price action and expectations for risky, low-probability outcomes (Grobys & Junttila, 2021). An analysis of the 2018 National Financial Capability Study Investor Survey, found that the likelihood of investing in cryptocurrencies is positively associated with overconfidence in investment literacy and subjective financial literacy, and negatively associated with objective investment literacy (Kim et al., 2022). Taken together, studies that examined cryptocurrency investors identified pursuit of lottery-like financial returns, myopic decision-making, and lower objective financial literacy as predictors of cryptocurrency investing. Financial market data point to the high volatility of the investment. Our working hypothesis is that a scarcity mindset is associated with cryptocurrency investments above and beyond the already identified behavioral and cognitive factors.

For completeness of this discussion, unconventional and idiosyncratic explanations for investing or participating in cryptocurrencies have also been put forth. One study analyzed Bitcoin transactions, using the public bitcoin blockchain, from 2009 to 2017, and found that almost one-quarter of bitcoin users and almost 50% of bitcoin transactions were related to illegal activity such as illegal drugs, account hacking and theft, and illegal pornography (Foley et al., 2019). Another study analyzed transactions in 2015 on a so-called darknet marketplace called AlphaBay and found that 20% of transactions were related to purchasing (presumably) illegal drugs (Dearden & Tucker, 2023). Finally, a study documented cryptocurrency investing and human-tracking and abuse in Cambodia (Faux, 2023).

2.1.3 Theoretical background

For this study, we use the Mullainathan and Shafir's scarcity mindset (Mullainathan & Shafir, 2013) as the framework to address the research questions. First, the framework fundamentally is a behavioral economics approach to helping explain consumer decisions and behavior, and although the research in the space has been predominantly around economic and financially oriented decisions especially, such as trade-offs on household purchases especially around lower income households, the framework is expansive and accommodates tangible and perceived scarcity (Cook & Sadeghein, 2018; Mullainathan & Shafir, 2013; Shah et al., 2015). Second, there are several studies that have attempted to formally conceptualize the framework into a theoretical model (Cook & Sadeghein, 2018; De Bruijn & Antonides, 2022), and in this study we are informed by the original framework and the formal conceptualizations. A simple version of this study's model framework is shown in Figure 2.1.



Figure 2.1 Conceptual investment decision-making model with scarcity mindset

2.2 Method

2.2.1 Data

The study examines survey data of the 2021 National Financial Capability Study (NFCS) State-by-State Survey and Investor Survey, collected from June to October 2021. These two cross-sectional survey efforts follow a tri-annual schedule (Judy T. Lin et al., 2022). The State-by-State Survey collected responses from 27,118 U.S. American adults in 2021. The Investor Survey is a follow-up survey of respondents who completed the Stateby-State Survey and indicated that they had investments outside of retirement accounts (Question B14 in the State-by-State Survey). It asks respondents questions related to how and why they make investment decisions. The main results are based on the 2021 survey administration. This data collection fell in the COVID-19 pandemic which saw a dramatic increase in cryptocurrency investing. In robustness tests, we use the 2018, pre-COVID survey administration to confirm the 2021 results. The survey questions are shown in Appendix A.

To analyze the data, we linked State-by-State and Investor surveys by respondent ID. The linked sample consists of n=2,824 respondents and all respondents answered the cryptocurrency investment question. The number of missing values at other variables due to non-response, prefer not to say, and don't know responses is at most 13.5%; we used listwise deletion. The final analytical sample in the data analysis consists of 2,364 responses (83.7%).

2.2.2 Variables

Dependent variable: Investments in cryptocurrencies was inquired with the question, "Have you invested in cryptocurrencies, either directly or through a fund that invests in cryptocurrencies?" Response option were yes (coded as 1), no (coded as 0). The mean was 0.201 (*SD*=0.401).

Predictor variables: Scarcity mindset was measured with a variable derived from the NFCS State-by-State dataset using a two-step approach. First, a group of seven experts with published expertise in the scarcity literature, consisting of five economists and two psychologists, were approached in Spring 2023 and asked to evaluate and rank a list of 10 questionnaire items regarding their fit as a scarcity mindset measure. The instructions to the experts and results of the expert input is summarized in Appendix B. Expert consensus was obtained for the three statements: (1) "Because of my money situation, I feel like I will never have the things I want in life"; (2) "I am just getting by financially"; (3) "I am concerned that the money I have or will save won't last." Responses to these statements were measured on a 5-point Likert-type scale: does not describe me at all (coded as 1), describes me very little (coded as 2), describes me somewhat (coded as 3), describes me very well (coded as 4), describes me completely (coded as 5). Cronbach's alpha was 0.87 in 2021 and 0.86 in 2018. The responses were summed, mean score=6.37 (*SD* = 3.35; range 3 to 15).

Financial literacy. Six widely used financial literacy questions were used to create a general financial literacy score. Example questions include, "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year,

how much would you be able to buy with the money in this account? More than today; exactly the same; less than today; don't know; prefer not to say". Another example, "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less. True / False / Don't know / Prefer not to say." Correct answers to the six questons were coded as 1 to create a score ranging from 0 (no correct answer) to 6 (all answers correct). Mean score=4.29 (SD = 1.45).

Investment literacy. Ten investment literacy questions were used to create an investment literacy score. Example questions include, "Over the last 20 years in the US, the best average returns have been generated by stocks; bonds; CDs; Money market accounts; precious metals; don't know; prefer not to say" and "The past performance of an investment is a good indicator of future results. True / False / Don't know / Prefer not to say." Correct answers to the 10 questions were coded as 1 to create a score ranging from 0 (no correct answer) to 10 (all answers correct). Mean score=5.19 (*SD* = 2.50).

Subjective financial knowledge was inquired with the question, "On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?". Response options ranged from very low (coded as 1) to very high (coded as 7); mean score=5.66 (*SD* = 0.96).

Willingness to take financial risk was inquired with the question, "When thinking of your financial investments, how willing are you to take risks? Please use a 10-point scale, where 1 means "Not At All Willing" and 10 means "Very Willing." Mean score=6.07 (*SD* = 2.24).

Demographic and socioeconomic control variables included gender (1 = male), race/ethnicity (1=White non-Hispanic (omitted), 2=Black non-Hispanic, 3=Hispanic, 4=Asian/Pacific Islander non-Hispanic, 5=Other non-Hispanic (American Indian, Other, 2+ethnicities)), age (continuous), marital status (1=married (omitted), 2=single, 3=separated, 4=divorced, 5=widowed/widower, number of dependent (continuous), employment status (1= self-employed, 2 = full-time with employer (omitted), 3=part-time with employer, 4 = not working (homemaker, full-time student, permanently unable to work, unemployed/temporarily laid off, and retired), annual household income (1 = less than \$25,000 2 = \$25,000 to \$49,999, 3 = \$50,000 to \$74,999 (omitted), 4 = \$75,000 to \$99,999, 5 = \$100,000 to \$149,999, and 6 = \$150,000 or more), education attainment (1=HS and less than HS (no high school diploma, high school diploma, high school diploma equivalent), 2=some college, 3=Associate's degree, 4=Bachelor's degree (omitted), 5=post-graduate studies)and military service (1=military service current member, 2=previous member, 3=never served (omitted)).

Sample characteristics of investors holding cryptocurrencies are shown in Table 2.1. Cryptocurrency investors were on average 43 years old, about 74% non-Hispanic White, and 76% male. About 59% were married or partnered and less than half, almost 44% had dependent children. Over half, 53 had a Bachelor's or post graduate degree. The largest income segment was in the \$100,000 to \$150,000 segment (21%). The majority of cryptocurrency holders, 62%, worked full time. Investors holding cryptocurrencies differed from investors without cryptocurrencies with regard to all predictor variables at p<0.05. Specifically, investors in cryptocurrencies report a stronger scarcity mindset

compared to non-holders (mean=8.4 vs 5.9), lower general financial literacy (mean=3.8 vs. 4.4), lower investment literacy (mean=4.9 vs. 5.3), higher subjective financial literacy (mean=5.7 vs. 5.6), greater willingness to take financial risk (mean=7.3 vs. 5.8).

	Total sample % or Mean (SD)	Investors, hold cryptocurrency % or Mean (SD)	Investors, no cryptocurrency % or Mean (SD)	Means comparison <i>p</i> value
Cryptocurrency investor (0/1)	20.09%	100.00%	0.00%	
Focal predictors:				
Scarcity score (3-15)	6.37 (3.35)	8.43 (3.64)	5.85 (3.06)	<i>p</i> <.001
Financial literacy (0-6)	4.29 (1.45)	3.82 (1.64)	4.41 (1.38)	<i>p</i> <.001
Investment literacy (0-10)	5.19 (2.50)	4.88 (2.42)	5.26 (2.51)	p = .003
Subjective financial knowledge	5.66 (0.96)	5.74 (1.02)	5.64 (0.94)	p=.042
(1-7)				
Willingness to take financial risk	6.07 (2.24)	7.34 (2.09)	5.75 (2.16)	<i>p</i> <.001
(1-10)				
N = 2,364 continued				

Table 2.1 Sample descriptive statistics, 2021 data collection.

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
% or Mean (SD)% or Mean (SD)% or Mean (SD) p valueCryptocurrency investor (0/1) Control variables: Age (18-92)20.09%100.00%0.00%Male (0/1) Race/Ethnicity57.56 (15.70)43.40 (14.29)61.12 (13.93) (15.70) $p<.001$ Male (0/1) Race/Ethnicity61.51% (15.70)76.00%57.86% (15.70) $p<.001$ Male (0/1) Race/Ethnicity81.35% (15.70)73.89% (15.70)83.22% (15.70) $p<.001$ Black non-Hispanic (0/1) Hispanic (0/1)5.08% (10.09%)8.21% (12.58%)4.29% (13.37%) $p<.001$ Marial Status Marial Status65.48% (15.70%)50.52% (10.75%) $(7.20%)$ (10.75%) $(2.20%)$ (10.75%) $(2.20%)$ (10.75%)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $
Cryptocurrency investor $(0/1)$ 20.09%100.00%0.00%Control variables: Age (18-92)57.5643.40 (14.29)61.12 (13.93 $p<.001$ (15.70)Male $(0/1)$ 61.51%76.00%57.86% $p<.001$ Race/Ethnicity81.35%73.89%83.22% $p<.001$ White non-Hispanic $(0/1)$ 81.35%73.89%83.22% $p<.001$ Black non-Hispanic $(0/1)$ 4.91%9.26%3.81% $p<.001$ Hispanic $(0/1)$ 5.08%8.21%4.29% $p<.001$ Asia/Pacific Islander $(0/1)$ 6.09%5.26%6.30% $p=.399$ Other non-Hispanic $(0/1)$ 2.58%3.37%2.38% $p=.226$
Control variables: Age (18-92) 57.56 (15.70) $43.40 (14.29)$ $61.12 (13.93)$ $p<.001$ Male (0/1) 61.51% 76.00% 57.86% $p<.001$ Race/Ethnicity 81.35% 73.89% 83.22% $p<.001$ White non-Hispanic (0/1) 81.35% 73.89% 83.22% $p<.001$ Black non-Hispanic (0/1) 4.91% 9.26% 3.81% $p<.001$ Hispanic (0/1) 5.08% 8.21% 4.29% $p<.001$ Asia/Pacific Islander (0/1) 6.09% 5.26% 6.30% $p=.399$ Other non-Hispanic (0/1) 2.58% 3.37% 2.38% $p=.226$ Marital StatusMarital Status 59.52% 50.52% 50.52% 50.52%
Age (18-92) 57.56 (15.70) $43.40 (14.29)$ $61.12 (13.93)$ $p < .001Male (0/1)61.51\%76.00\%57.86\%p < .001$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$
Male $(0/1)$ 61.51% 76.00% 57.86% $p<.001$ Race/EthnicityWhite non-Hispanic $(0/1)$ 81.35% 73.89% 83.22% $p<.001$ Black non-Hispanic $(0/1)$ 4.91% 9.26% 3.81% $p<.001$ Hispanic $(0/1)$ 5.08% 8.21% 4.29% $p<.001$ Asia/Pacific Islander $(0/1)$ 6.09% 5.26% 6.30% $p=.399$ Other non-Hispanic $(0/1)$ 2.58% 3.37% 2.38% $p=.226$
Race/Ethnicity81.35%73.89%83.22% $p < .001$ Black non-Hispanic (0/1)4.91%9.26%3.81% $p < .001$ Hispanic (0/1)5.08%8.21%4.29% $p < .001$ Asia/Pacific Islander (0/1)6.09%5.26%6.30% $p = .399$ Other non-Hispanic (0/1)2.58%3.37%2.38% $p = .226$
White non-Hispanic (0/1) 81.35% 73.89% 83.22% $p<.001$ Black non-Hispanic (0/1) 4.91% 9.26% 3.81% $p<.001$ Hispanic (0/1) 5.08% 8.21% 4.29% $p<.001$ Asia/Pacific Islander (0/1) 6.09% 5.26% 6.30% $p=.399$ Other non-Hispanic (0/1) 2.58% 3.37% 2.38% $p=.226$ Marital StatusMarital Status
Black non-Hispanic (0/1) 4.91% 9.26% 3.81% $p<.001$ Hispanic (0/1) 5.08% 8.21% 4.29% $p<.001$ Asia/Pacific Islander (0/1) 6.09% 5.26% 6.30% $p=.399$ Other non-Hispanic (0/1) 2.58% 3.37% 2.38% $p=.226$ Marital Status (52.52%) (52.52%) (52.22%) (52.22%)
Hispanic $(0/1)$ 5.08%8.21%4.29% $p<.001$ Asia/Pacific Islander $(0/1)$ 6.09%5.26%6.30% $p=.399$ Other non-Hispanic $(0/1)$ 2.58%3.37%2.38% $p=.226$ Marital StatusMarried U ising spitch systems (54.8%) 59.52% (72.22%) (20.22%)
Asia/Pacific Islander $(0/1)$ 6.09% 5.26% 6.30% $p=.399$ Other non-Hispanic $(0/1)$ 2.58% 3.37% 2.38% $p=.226$ Marital Status (5.48% 50.52% (7.22%) (201)
Other non-Hispanic (0/1) 2.58% 3.37% 2.38% $p=.226$ Marital Status Married University systems (54.8%) 59.52% (72.22%) (20.12%)
Marital Status
Marital Status
Married/Living with partner 05.48% 58.55% 07.25% $p<.001$ Sincle 10.04\% 21.16\% 15.00\% $n < 001$
Single 19.04% 31.16% 15.99% $p<.001$
Separated 0.68% 1.05% 0.58% $p=.264$
Divorced 9.39% 8.21% 9.09% $p=.324$
widowed/widower 5.41% 1.05% 6.51%
Number dependent children (0-4) $0.43 (0.86) 0.82 (1.08) 0.33 (0.76) p < .001$
Educational Attainment
High School, equivalent of less 9.94% 12.63% 9.26% $p=.028$
$\begin{array}{c} (0/1) \\ \text{Some college } (0/1) \\ \text{m} = 040 \\ \text{m}$
Some conege $(0/1)$ 18.13% 21.20% 17.30% $p=.049$
Associate's degree $(0/1)$ 10.70% 12.05% 10.22% $p=.128$
Bachelor's degree $(0/1)$ 55.85% 54.74% 59.86% $p=.041$ Dest are due to $(0/1)$ 22.28% 18.74% 22.20% $p=.022$
Post graduate $(0/1)$ 22.38% 18.74% 23.29% $p=.055$
Employment Status Solf employed $(0/1)$ $8.120'$ $11.160'$ $7.260'$ $n=007$
Self-elliptoyed $(0/1)$ 8.12% 11.10% 7.30% $p=.007$ Work for amployer full time $(0/1)$ 27.86% 62.22% 21.71% $p<0.01$
Work for employer run time $(0/1)$ 57.00% 02.52% 51.71% $p<.001$ Work for employer part time 6.60% 5.69% 6.92% $p=.260$
(0/1) (0/1)
(0.1) Not working $(0/1)$ 47.40% 20.84% 54.10% $n < 0.01$
Annual Income
Less than \$25,000 (0/1) 5,46% 8,21% 4,76% $n=0.03$
p=.003 \$25,000 to \$49,999 (0/1) 15,90% 19,79% 14,93% $p=.003$
p=.010 \$50 000 to \$74 999 (0/1) 19.46% 17.05% 20.06% $p=.139$
50,000 to $509,000$ (0/1) 19.40% 17.05% 20.00% $p=.15$
p=.040 p=.040 p=.040 p=.040
p=+70 \$150,000 or more (0/1) 16.79% 17.05% 16.73% $p=+70$
Armed Services
Current member $(0/1)$ 1 35% 5 47% 0 32% <i>n</i> < 001
Previous member $(0/1)$ 16.24% 14.32% 16.73% $n=203$
Never member $(0/1)$ 82.40% 80.21% 82.95% $n=.161$

N = 2,364

Table 2.1 continued

2.2.3 Empirical Model

To investigate Research Questions 1 and 2, we use a binary logistic regression framework with owning or having owned cryptocurrency as the dependent variable. For Research Question 1, a reduced-form regression is used to establish the relationship between cryptocurrency investments and scarcity mindset for respondent i in the 2021 survey data collection:

$$\log(\frac{P(Own \ cryptocurrency=1)}{1-P(Own \ cryptocurrency=1)}) = \beta_0 + \beta_1 * Scarcity \ mindset + \varepsilon \ (1)$$

For Research Question 2, we regress cryptocurrency investments on scarcity mindset, four established predictors and a vector of socio-demographic control variables.

$$\log(\frac{P(Own \, cryptocurrency=1)}{1-P(Own \, cryptocurrency=1)}) = \beta_0 + \beta_1 * Scarcity \, mindset + \beta_2 *$$

Financial literacy + $\beta_3 *$ Investment literacy + $\beta_4 *$

Subjective financial knowledge + $\beta_5 *$ Willingness to take financial risk + Vector of sociodemographic controls $*\beta_6 + \varepsilon$ (2)

In both regressions, the coefficient of interest is β_1 . We calculate and interpret the odds ratios from the coefficients.

2.3 Results

2.3.1 Association of cryptocurrency investing and scarcity mindset in 2021

Pearson's correlation coefficient among the dependent and focal predictor variables is shown in Table 2.2. Cryptocurrency ownership is strongly and positively correlated r=0.31 with our focal measure, scarcity mindset at p<0.001. The measure is also positively correlated with a higher willingness to take financial risk, r=0.28, and slightly correlated with greater subjective financial knowledge, r=0.04. The data show an inverse correlation with financial and investor knowledge, r=-0.16 and -0.06.

	Crypto- currency investor	Scarcity mindset	Financial literacy	Investment literacy	Willingness to take financial
					risk
Scarcity mindset	0.309^{***}				
Financial literacy	-0.162***	-0.286***			
Investment literacy	-0.062*	-0.244***	0.555***		
Subjective financial	0.042*	-0.277***	0.154***	0.217***	
knowledge					
Willingness to take financial	0.284***	0.038	0.030	0.149***	0.290***
risk					
Notes: ***p <0.001 **p<0	.01 *p<0.05				

Table 2.2 Pearson's r correlation coefficients for focal predictor variables

To examines the role of the scarcity mindset for cryptocurrency investing, we use a stepwise binary logistic regression approach and report odd ratios, see Table 2.3. Model 1 is a reduced-form regression of cryptocurrency investing on scarcity mindset. The odds ratio of 1.2 indicates a strong and positive association, p<0.001. Model 2 adds financial literacy, investment literacy, subjective financial knowledge, and willingness to take financial risk. The association of cryptocurrency investing and the scarcity mindset remains unchanged at OR=1.2, p<0.001. Model 3, the full specification, adds the demographic controls. The association of cryptocurrency investing and the scarcity mindset is associated with 14% higher odds of cryptocurrency investments. Higher levels of

subjective financial knowledge and financial risk taking are strongly and positively associated with cryptocurrency investments, while financial and investment literacy are not related with holding cryptocurrency.

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Scarcity mindset	1.237***(0.019)	1.241*** (0.022)	1.140*** (0.024)
-	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Financial literacy		0.838*** (0.039)	0.928(0.048) p=.144
		<i>p</i> <0.001	
Investment literacy		1.022 (0.029) p=.442	1.055 (0.033) <i>p</i> =.091
Subjective financial knowledge		1.121 (0.073)	1.208** (0.088)
		p=.080	p=.009
Willingness to take financial risk		1.434*** (0.045)	1.241*** (0.042)
Demographic controls:			
Age			0.942*** (0.005)
			p < .001
Male			2.025*** (0.306)
			<i>p</i> <.001
Race/Ethnicity			
White non-Hispanic (omitted)			
Black non-Hispanic			1.170 (0.315) <i>p</i> =.560
Hispanic (alone/comb)			1.029 (0.263) <i>p</i> =.910
Asia/Pacific Islander			1.084 (0.283) <i>p</i> =.757
Other non-Hispanic			1.047 (0.379) <i>p</i> =.899
Marital Status			
Married (omitted)			
Single			0.945 (0.173) <i>p</i> =.756
Separated			1.200(0.853)p=.798
Divorced			1.635* (0.374)
			<i>p</i> =.031
Widowed/widower			0.514(0.277) p=.217
			continued

Table 2.3 Odds ratios of binary logistic regression of cryptocurrency investing on scarcity mindset and other predictors – 2021 data collection.

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Dependent Children			1.093 (0.078) <i>p</i> =.211
Educational Attainment			· · · •
High School, equivalent or less			2.016** (0.464)
			p=.002
Some college			1.961 (0.363)
			<i>p</i> <.001
Associate's degree			1.632* (0.348)
-			p=.021
Bachelor's degree (omitted)			
Post graduate			0.982 (0.174) <i>p</i> =.917
Employment Status			· · · •
Self-employed			1.111 (0.245) <i>p</i> =.633
Work for employer full time			
(omitted)			
Work for employer part time			0.635 (0.180) <i>p</i> =.110
Not working			0.762 (0.137) <i>p</i> =.131
Annual Income			
Less than \$25,000			1.001 (0.304) <i>p</i> =.996
\$25,000 to \$49,999			1.612* (0.342)
			p=.024
\$50,000 to \$74,999 (omitted)			
\$75,000 to \$99,999			0.850 (0.183) <i>p</i> =.449
\$100,000 to \$149,999			1.165 (0.246) <i>p</i> =.469
\$150,000 or more			1.280 (0.298) <i>p</i> =.290
Armed Services			
Current member			1.393 (0.698) <i>p</i> =.509
Previous member			1.180 (0.217) <i>p</i> =.369
Never member (omitted)			
Constant	0.056*** (0.007)	0.005*** (0.002)	0.082*** (0.050)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <.001
Log likelihood	-1081.480	-971.470	-832.486
Pseudo R2	0.088	0.181	0.298

Notes: N=2,364; ****p*<0.001 ***p*< 0.01 **p*<0.05 Table 2.3 continued

2.3.2 Robustness: Association of cryptocurrency investing and scarcity mindset in pre-COVID 2018

We repeat the empirical analysis for the pre-COVID 2018 survey year, n=1,634.

Regression results are shown in Table 2.4; descriptive sample characteristics and

correlation results are in Tables 2.5 and 2.6. Sample descriptive statistics show that the

prevalence of cryptocurrency ownership among the investor class was at 9.1% in pre-COVID-19 2018, compared to 20.1% three years later in the 2021 COVID-19 era. Correlation results for the 2018 variables indicate similar directions as in 2021. The correlation coefficient for scarcity mindset is smaller at 0.26 (vs 0.31 in 2021). Noteworthy is a stronger negative association of cryptocurrency ownership with the two literacy measures, especially for investment literacy at -0.13, *p*<0.001 (vs -0.06, *p*=.003, in 2021), but also financial literacy at -0.23, *p*<0.001 (vs -0.16, p<0.001, in 2021). Subjective financial knowledge was not correlated with cryptocurrency ownership in 2018 (*p*=.544 vs *p*=.042 in 2021). The correlation results point to a greater role of knowledge vs psychological decision factors for cryptocurrency ownership.

Similar to the 2021 results, the 2018 data confirm a strong and positive association of cryptocurrency investing and scarcity mindset. The odds ratios are almost identical to the main results in Table 2.3. A one-unit increase in scarcity mindset is associated with 16% higher odds of cryptocurrency investments in the full specification. As in 2021, financial risk taking is positively associated with cryptocurrency investing. In 2018, subjective financial knowledge is not related to cryptocurrency investing, confirming the correlation results. Instead, financial literacy is inversely associated with cryptocurrency investing, p<0.05, also confirming the greater role of literacy observed in the correlation results for the 2018 data.
Variable	Model 1	Model 2	Model 3
Scarcity mindsat	UK (SE)	<u>UK (SE)</u> 1 208*** (0.022)	UK (SE)
Scarcity minuset	$1.2/0^{+++}(0.052)$	$1.208^{+++}(0.052)$	$1.130^{n} (0.057)$
Financial literacy	p<0.001	p<0.001 0.710*** (0.040)	p < .001 0.818* (0.064)
Thancial includy		$0.710^{-10} (0.049)$	$0.018^{-1}(0.004)$
Investment literacy		p < 0.001 0.927 (0.043)	p=.010 0.077 (0.052)
investment incracy		n = 104	(0.977(0.052)) n=657
Subjective financial knowledge		p=.104	p=.057 1 1/3 (0 123)
Subjective infancial knowledge		n = 756	n=214
Willingness to take financial risk		p=.750 1 202*** (0.062)	p=.214 1 153* (0 064)
winnighess to take infancial fisk		$1.292 \cdots (0.002)$	$1.133^{\circ}(0.004)$
Demographic controls:		p < 0.001	p010
Δ σe			0 030*** (0 000)
Age			n < 0.009
Mala			p < .001 1 245 (0 281)
Wate			n=331
Race/Ethnicity			p = .551
White non-Hispanic (omitted)			
Black non-Hispanic			1 351 (0 432)
Diack non mispanie			n-346
Hispanic (alone/comb)			p=.5+0 0.692 (0.275)
Inspane (alone/comb)			n=354
Asia/Pacific Islander			p = .55 + 1.148 (0.450)
A sha/1 defile Islander			n = 726
Other non-Hispanic			p=.720 2 665 (1 495)
Suler non ruspane			n=0.81
Marital Status			P=.001
Married (omitted)			
Single			0.587 (0.164)
B			p=.057
Separated			3.810 (2.988)
Parates			p=.088
Divorced			0.630(0.260)
			p=.262
Widowed/widower			0.230(0.246)
			p=.169
			continu

Table 2.4 Odds ratios of binary logistic regression of cryptocurrency investing on scarcity mindset and other predictors – 2018 data collection.

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Dependent Children			1.134 (0.115)
			<i>p</i> =.216
Educational Attainment			1 279 (0 420)
High School, equivalent or			1.278 (0.429)
Some college			p=.404
Some college			0.907(0.285)
A ; _ 4 - ?			p=./50
Associate's degree			1.373(0.302)
Bachelor's degree (omitted)			<i>p</i> =.387
Post graduate			1 122 (0 328)
1 ost graduate			n = 694
Employment Status			<i>p</i> =.071
Self-employed			1.026 (0.342)
Sen employed			p=.938
Work for employer full time			r
(omitted)			
Work for employer part time			1.241 (0.451)
			p=.552
Not working			0.478* (0.146)
C			<i>p</i> =.015
Annual Income			-
Less than \$25,000			2.000 (0.803)
			p=.084
\$25,000 to \$49,999			1.009 (0.334)
			p=.978
\$50,000 to \$74,999 (omitted)			
\$75,000 to \$99,999			1.055 (0.332)
			<i>p</i> =.866
\$100,000 to \$149,999			0.955 (0.304)
			p=.884
\$150,000 or more			0.847 (0.356)
			<i>p</i> =.692
Armed Services			
Current member			0.583 (0.259)
			<i>p</i> =.225
Previous member			1.614 (0.522)
			<i>p</i> =.139
Never member (omitted)	0.015*** (0.004)	0.020*** (0.012)	0 200+++ (0 246
Constant	$0.015^{***} (0.004)$	$0.020^{***} (0.013)$	0.289*** (0.246
Log likelihood	p < 0.001	p < 0.001	p < 0.001
Log likelinood	-440.921	-400.098	-343.249
rseudo K2	0.100	0.182	0.305

	Total sample % or Mean (SD)	Investors, hold cryptocurrency % or Mean (SD)	Investors, no cryptocurrency % or Mean (SD)	Means comparison P value
Cryptocurrency investor (0/1)	9.06%			
Focal predictors:				
Scarcity score (3-15)	6.65 (3.26)	9.34 (3.62)	6.38 (3.10)	<i>p</i> <.001
Financial literacy (0-6)	4.28 (1.38)	3.29 (1.60)	4.38 (1.32)	<i>p</i> <.001
Investment literacy (0-10)	5.28 (2.35)	4.34 (2.24)	5.38 (2.34)	<i>p</i> <.001
Subjective financial knowledge	5.76 (0.97)	5.71 (1.15)	5.76 (0.96)	p=.544
(1-7)				
Willingness to take financial risk (1-10)	6.13 (2.20)	7.32 (2.10)	6.01 (2.17)	<i>p</i> <.001

continued

Table 2.5 Sample descriptive statistics -2018 data collection.

	Total	Investors, hold	Investors, no	Means
	sample	cryptocurrency	cryptocurrency	comparison
	% or Mean	% or Mean	% or Mean	P value
	(SD)	(SD)	(SD)	
Control variables:				
Age (18-92)	57.01	39.17 (14.46)	58.78 (14.24)	<i>p</i> <.001
	(15.33)			-
Male (0/1)	58.51%	64.86%	57.87%	<i>p</i> =.099
Race/Ethnicity				-
White non-Hispanic (0/1)	81.95%	63.51%	83.78%	<i>p</i> <.001
Black non-Hispanic (0/1)	5.63%	16.89%	4.51%	<i>p</i> <.001
Hispanic (0/1)	5.08%	7.43%	4.85%	p=.172
Asia/Pacific Islander (0/1)	5.57%	8.11%	5.32%	p=.158
Other non-Hispanic (0/1)	1.77%	4.05%	1.55%	p=.028
Marital Status				-
Married/Living with partner	63.89%	60.14%	64.27%	<i>p</i> =.319
Single	18.54%	31.08%	17.29%	-
Separated	0.61%	2.03%	0.47%	p = .021
Divorced	11.08%	6.08%	11.57%	p=.042
Widowed/widower	5.88%	0.68%	6.39%	p=.005
Number dependent children (0-4)	0.44 (.89)	1.03 (1.20)	0.38 (0.89)	p<.001
Educational Attainment				-
High School, equivalent or less	13.83%	16.22%	13.59%	<i>p</i> =.378
(0/1)				-
Some college $(0/1)$	18.30%	20.27%	18.10%	<i>p</i> =.516
Associate's degree $(0/1)$	8.38%	10.81%	8.14%	p=.264
Bachelor's degree $(0/1)$	34.03%	33.11%	34.12%	p = .805
Post graduate $(0/1)$	25.46%	19.59%	26.04%	<i>p</i> =.086
Employment Status				
Self-employed (0/1)	9.06%	11.49%	8.82%	p=.281
Work for employer full time $(0/1)$	35.19%	64.19%	32.30%	p<.001
Work for employer part time	7.16%	10.14%	6.86%	p=.142
(0/1)				
Not working (0/1)	48.59%	14.19%	52.02%	p<.001
Annual Income				<u>^</u>
Less than \$25,000 (0/1)	6.00%	11.49%	5.45%	<i>p</i> =.003
\$25,000 to \$49,999 (0/1)	16.95%	17.57%	16.89%	p=.834
\$50,000 to \$74,999 (0/1)	22.52%	24.32%	22.34%	p=.582
\$75,000 to \$99,999 (0/1)	19.52%	20.95%	19.38%	p = .647
\$100,000 to \$149,999 (0/1)	21.05%	17.57%	21.40%	p=.276
\$150,000 or more (0/1)	13.95%	8.11%	14.54%	p=.031
Armed Services				-
Current member $(0/1)$	2.39%	10.14%	1.62%	<i>p</i> <.001
Previous member (0/1)	17.75%	12.84%	18.24%	p=.101
Never member (0/1)	79.87%	77.03%	80.15%	<i>p</i> =.367

N = 1,634Table 2.5 continued

	Crypto- currency ownership	Scarcity mindset	Financial literacy	Investment literacy	Willingness to take financial risk
Scarcity mindset	0.261***				
Financial literacy	-0.227***	-0.233***			
Investment literacy	-0.126***	-0.147***	0.454***		
Subjective financial knowledge	-0.015	-0.265***	0.176	0.192	0.253
Willingness to take financial	0.172***	0.033	0.001	0.087***	
risk					

Notes: ****p* <0.001 ***p*< 0.01 **p*<0.05

Table 2.6 Pearson's r correlation coefficients for focal predictor variables – 2018 data collection

2.4 Discussion

This study contributes new knowledge for the understanding of high-risk financial behaviors. Specifically, we identify the scarcity mindset as a direct and positive predictor of cryptocurrency investing that is stable above and beyond established predictors of investment behavior. Investors who score a single unit higher on the scarcity mindset scale have 14% higher odds of holding cryptocurrency investments. The finding holds for COVID-19 as well as pre-COVID-19 data and when accounting for financial and investor literacy, subjective financial knowledge, willingness to take risk, as well as demographic characteristics.

From a theoretical perspective, this study extends the understanding of the scarcity mindset to the context of risky financial decisions, specifically the individual investor context. In the financial context, scarcity mindset has been linked to myopic decision-making (Shah et al., 2012), higher temporal discount rates (Hilbert et al., 2022a), and

financial avoidance (Hilbert et al., 2022b). The current research documents that the scarcity mindset's subjective feeling of not having enough can also be observed in the high-risk, volatile context of cryptocurrency investing. In 2018 and 2021, the scarcity mindset variable is significant and with a high odds ratio among the independent variables (1.16 and 1.14, respectively), suggesting that a strong scarcity mindset is related to a higher likelihood to own cryptocurrency. In the 2021 and 2018 data, demographic and socioeconomic variables are mixed as explanations for cryptocurrency purchases and investing. In 2018, financial literacy was a significant predictor of cryptocurrency purchases to take financial risk was a significant predictor variable of cryptocurrency investment, but subjective financial knowledge was a significant predictor variable only in COVID-19 2021. Investment literacy was not a significant predictor in either survey year.

These findings suggest that behavioral mechanisms are significant in helping explain risky financial decisions such as investment in cryptocurrency. If this phenomenon was associated with a well-recognized form of speculative behavior – such as the playing the lottery or horserace betting – this might be a societal concern, but it would not necessarily be a concern related to asset allocation, investments, and retirement planning. Yet, as of this writing, horserace betting and lottery participation, as examples, were not offered in employee retirement plans, but starting in 2022, Fidelity introduced Bitcoin as an option in 401(k) plans, and as of January 2024 the U.S. Securities and Exchange Commission (SEC) approved a handful of spot bitcoin exchange traded products for listing and

trading. This suggests close attention to who is investing in cryptocurrencies and why they are doing it is warranted.

The study has several limitations. First, the scarcity mindset questions used in this study is based on feedback from experts in economic and psychological research whose evaluation was used to validate the use of the three questions as proxies for a scarcity mindset. While the internal validity of the construct was robust at alpha=0.8, future research should employ an enhanced measurement tool to fully capture underlying psychological mechanisms that are at play. For example, the Psychological Inventory of Financial Scarcity (PIFS), the financial scarcity measure recently developed by Van Dijk et al. (2022), has been shown to fit a four-factor underlying structure of financial scarcity that captures objective scarcity, perceived lack of control over finances, rumination and worry about financial matters, and present bias (Van Dijk et al., 2022). This enhanced measurement, ideally, could be captured with experimental data. Second, the cryptocurrency ownership questions were collected only from the FINRA National Financial Capability Study's 2021 Investor Survey, thus providing a more limited population sample, i.e., among an investor class that holds invests beyond a traditional retirement savings account such as a 401(k). In the future, this data could be collected and analyzed across among the full sample of U.S. households.

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Chapter 3. A Scarcity Mindset and the Use of Alternative Financial Services

3.1 Introduction

The scarcity mindset, defined as an individual not having what they feel that they need (Mullainathan & Shafir, 2013) has been considered in the context of decisionmaking among low-income individuals (De Bruijn & Antonides, 2022; Kalil et al., 2023). A scarcity mindset can lead to decision-making mistakes, which can severely impact the financial security of individuals with limited means (De Bruijn & Antonides, 2022; Schilbach et al., 2016; Shafir, 2017). This outcome has been documented from different angles in studies that examined the scarcity mindset and economic decision-making and behavior among those in poverty (De Bruijn & Antonides, 2022). Specifically, in the European context by studying the relationship between the scarcity mindset and problemsolving and financial well-being among social welfare recipients in Denmark (Madsen et al., 2023), in the developing countries context by studying financial decisions and tradeoffs of low-income farmers (Duflo & Banerjee, 2011), and in the U.S. context through a series of small-scale experiments studying the relationship of a scarcity mindset with trade-offs and valuation (Shah et al., 2015). Less attention, however, has been paid to investigating whether a link exists between a scarcity mindset and decisions about which financial products and services to engage with. This perspective is important because the costs and risks associated with financial products and services, especially those outside

the financial mainstream, have been linked to individual financial well-being (Chen et al., 2022).

Alternative Financial Services (AFS) represent financial products and services typically offered outside of the traditional banking sector. Alternative financial services include payday loans, car title loans, pawn shop loans/transactions, rent-to-own transactions, and nonbank check cashing services (Fulford et al., 2022; Sherraden, 2013). Alternative financial services are of interest to researchers, policymakers, and practitioners because they are less regulated, inefficient, costly, potentially riskier than products and services provided by the traditional banking sector, and targeted at low-income and financially vulnerable consumers (Sherraden, 2013). Their use in the United States is widespread and persistent. In 2022, 26.5% of households used overdrafting and insufficient funding services, 4.7% payday loans, 3.7% pawn shops, 3.7% auto title loans, and (Fulford et al., 2023).

Users of alternative financial services typically do not access traditional banking products and services and are considered unbanked. A number of studies have attributed use of alternative financial services to lack or limitations around financial capability, financial education, financial literacy, and economic socialization (Sherraden, 2010, 2013). Less information is available about psychological factors that can explain the use of alternative financial services. Studies have pointed to financial anxiety (Kim et al., 2023) and impulsivity (Mahoney & Lawyer, 2016).

In this study, we test the scarcity mindset as a behavioral economics framework that can explain the use of alternative financial services. This perspective will contribute to a new perspective to the understanding of population groups that are susceptible to alternative financial services, to inform financial literacy education and outreach. Additionally, we test along income brackets, to identify potential susceptibility to the scarcity mindset among low, mid, and high-income groups, following reports about the growth of alternative financial services use among lower income households (Fulford et al., 2023).

3.1.1 Link between a scarcity mindset and financial behaviors among financially vulnerable population groups

Scarcity mindset is defined as the belief that one has less than one needs (Shah et al., 2015). In the financial context, it refers to individuals' subjective feelings that their financial resources and standing are not adequate to satisfy their needs or wants (Hilbert et al., 2022b; Madsen et al., 2023; Sarial-Abi et al., 2021). There is a small number of research studies related to the scarcity mindset and financial behaviors, typically situated among financially vulnerable population groups.

Shah et al. (2012) conducted a series of five small-scale experiments in which conditions of scarcity or abundance of resources, borrowing allowances, and cognitive load were induced. In each experiment some form of scarcity was created with participants being randomly assigned to a poor or rich budget and being randomly assigned the ability to borrow or not. Also, in each of the experiments some measure of attention and focus was added, meant to represent cognitive load. Each experiment was a fun game – Wheel of Fortune, n = 60; Angry Blueberries, n = 68; Family Feud without Debt, n = 143; Family Feud with Debt, n = 118; and, Family Feud with Previews, n =137. Four of the experiments used participants recruited using Amazon Mechanical Turk (MTurk), and one experiment used participants recruited among undergraduates. The results, which foreshadowed findings presented in the book "Scarcity" (Mullainathan & Shafir, 2013), show that scarcity results in greater focus and engagement with a problem at hand but can result in neglectful behavior or mistakes, in this case overborrowing. The study also found that scarcity created cognitive load by shifting attention to the scarcity at hand and less attention beyond this.

Next, Shah et al. (2015) reported on a series of ten experiments in the U.S., with participants ranging from 74 to 604, and over 4,000 participants in total. In these experiments, participant demographic data was collected including income, and conditions of scarcity were created. Scarcity, as related to a participant's income or experimental imposed scarcity, was associated with trade-off thinking in valuing items (e.g., electronic tablet) but less so with contextual factors (e.g., willingness of price to pay for beer at a resort or a grocery store). A replication of several of the Shah et al. (2015) studies, with 3,342 U.S. participants recruited on-line during the COVID-19 pandemic, tested the effects of threat perceptions during the pandemic on participants' along with the original effects of contextual factors during financial scarcity. The studies corroborated findings that contextual factors were weaker for individuals with a scarcity mindset during the time of COVID-19 (Isler et al., 2023). These studies confirmed, however, a stronger tendency for financial and other decision-making mistakes related to trade-offs as a result of a scarcity mindset.

Focusing solely on the financial context, Cook and Sadeghein (2018) conducted a series of five studies to examine the effect of perceived scarcity on a person's financial

decision-making. Controlled situations were created that varied around liquidity availability, urgency of need, borrowing options, and framing of losses or gains. Four of the studies were experiments with online adult participants, ranging from 199 to 263 individuals to measure the effects of perceived scarcity on payday loan analysis, borrowing behavior, perceptions of risk, and ego effects. The study manipulated participants' perceived scarcity situation using, for example, liquidity constraints, criticality of need, loss consequences, and borrowing options including loan size. In a fifth study, they used "content analysis" of the Consumer Financial Protection Bureau's complaint data to help inform their findings in the experiments. They found a negative relationship between perceived scarcity and sound financial analysis and decision-making in this context with better decisions corresponding to less perceived financial scarcity (Cook & Sadeghein, 2018).

Going a step further, the term "financial scarcity" was coined in recent studies, referring to individuals' subjective feelings that their financial resources and standing are not adequate to satisfy their needs or wants (Hilbert et al., 2022b; Madsen et al., 2023; Sarial-Abi et al., 2021). Van Dijk et al. (2022) developed the "Psychological Inventory of Financial Scarcity" to measure a person's subjective experience of financial scarcity across four factors: a perceived threat of having a shortage of money, a lack of control of one's financial situation, rumination and preoccupation with financial needs, and short-vs long-term focus and trade-offs. The inventory consists of twelve items presented as statements that participants respond to on a Likert scale (e.g., "I am constantly wondering whether I have enough money", with responses ranging from "strongly disagree" to

"strongly agree"). The Inventory includes components of another scale, the Perceived Scarcity Scale (DeSousa et al., 2020), tying it to economic vulnerability (Auger et al., 2024). The Perceived Scarcity Scale tests for a needs- and wants-based interaction among material, time, and psychological resource scarcity to explain how stress and health are related to socio-economic status (De Sousa et al., 2018).

The Psychological Inventory of Financial Scarcity was tested in nine studies among Dutch university students, entrepreneurs, online panel surveys, and emerged as a statistically valid and reliable tool for measuring an individual's subjective feeling of financial scarcity. Data from the 2018 and 2020 waves of the Dutch Longitudinal Internet Studies for the Social Sciences (LISS), a general population survey in the Netherlands, showed among 837 respondents that there was a positive relationship between financial scarcity and financial avoidance, defined as not taking actions during a financial shortfall or stress, such as not making necessary decisions or ignoring financial obligations (Hilbert et al., 2022b). In a subsequent pilot study and five experiments among online participants in the U.K., ranging from 150 to 302 participants per study or experiment. The experience of a scarcity mindset in the experiments was created using household finance related conditions (simulated household tasks), manipulating income, expenses, savings, and debt along with different one-time financial shocks (e.g., tax refund; late vs early income shocks). A scarcity of financial resources was associated with increased discounting of gains and losses. For example, participants in an induced debt situation showed a significantly higher discount rate compared to those with induced sufficient financial resources (Hilbert et al., 2022a).

Critics have reviewed scarcity theory specifically as it provides an explanation of economic decision-making and behavior among those in poverty; they acknowledge its explanatory power and applicability to other domains (e.g., food, time) but state that more theoretical work and model formulation is needed, as well as the mechanisms that are activated under financial scarcity (De Bruijn & Antonides, 2022). Taken together, the available research on the scarcity mindset in the financial context points to an association with short-term decision-making, focus on the source or manifestation of scarcity, attentional neglect of other needs and problems, and trade-offs (Mullainathan & Shafir, 2013; Shah et al., 2015). For the current study, our working hypothesis is that the scarcity mindset may be associated with the use of risky financial products and services, such as alternative financial services, especially among financially stressed individuals and households.

3.1.2 Psychological and cognitive predictors of Alternative Financial Services (AFS) use

Much of the research into the use of alternative financial services has been conducted in the context of the financial capability framework, among those with financial challenges (Sherraden, 2010, 2013). This framework is broad in scope and touches on the features that help determine whether a person can manage his or her finances and financial situation, and participate in the financial system. These features include knowledge and literacy; financial and economic socialization; access to financial education and advice; and financial inclusion (Sherraden, 2010, 2013). A small number of studies provides insights about psychological factors that are associated with alternative financial services use. A groundbreaking survey by (Elliehausen, 2009) of payday loan customers, was the first to provide an extensive review and analysis of consumer use of payday loans (N=1,173). The study gathered extensive information on spending habits; credit activities; payday loan usage; decisionmaking around payday loan and other financial decisions; and feedback on user experience with the borrowing process. The data confirmed that payday loan users tended to be low-to-moderate income, using payday loans mostly as a transitional product as they evolved through the economic life cycle. When faced with liquidity shortfalls and/or unexpected expenses and the reality or perception of few alternatives, consumers relied on payday loans to meet the shortfalls (Elliehausen, 2009).

Lusardi et al. (2010) used a U.S. subsample (N=1,353) of the thirteen-country TNS Global Economic Crisis survey to analyze coping strategies used by consumers when faced with financial risks, and these strategies included using alternative financial services. Results showed significant relationships of alternative financial services use with higher financial education (positive, p<.01), having gambled (positive, p<.01), reviewing retirement statements and accounts (negative, p<.001), calculating household balance sheet (positive, p<.05), assessment of insurance coverage (positive, p<.10), assessment of change potential to financial holdings (negative, p<.01); psychological factors were not evaluated (Lusardi et al., 2010).

Several studies have used data of the National Financial Capability Study to identify psychological and cognitive correlates of alternative financial services use. Lusardi and de Bassa Scheresberg (2013) use the 2009 National Financial Capability Study data to show that financial literacy, measured with the "Big 3" questions, was significant and negatively related to usage of alternative financial services, after controlling for socio-demographic variables, risk preferences, financial fragility, and financial inclusion (N = 22,464, p < .001) (Lusardi & de Bassa Scheresberg, 2013). Harvey (2019) examined the impact of financial education mandates in the U.S. on young adults' usage of alternative financial services using 2009, 2012, and 2015 National Financial Capability Study data. Results show that taking a personal finance course in high school lowered their likelihood of using a payday loan by 4 percentage points (Harvey, 2019). Robb et al. (2015) analyzed the combined 2009 and 2012 State-by-State Survey (combined n = 53,655). Respondents high on the subjective financial knowledge scale (i.e., unjustifiably self-confident, or overconfident) were most likely to use alternative financial services; the reverse was found for objective financial knowledge. Multiple analyses with different strata of respondents' financial situation (e.g., owning a home; having health insurance) further documented bounded rationality as linked to alternative financial services use (Robb et al., 2015). In an analysis of the 2018 FINRA National Financial Capability Study (n=20,644), Kim et al. (2023) used financial anxiety as the outcome variable and alternative financial services – along with objective and subjective financial knowledge, financial education, income drop, banking status, and sociodemographic variables – as predictor variables. Results show that financial anxiety is related to greater use of alternative financial services and a higher number used (p < .001). Car title loans, payday loans, pawnshops, and rent-to-own arrangements were

related to greater financial anxiety (p<.001) (Kim et al., 2023). An analysis of the 2021 FINRA National Financial Capability Study data showed for two different measures of present bias, significant relationships with the use of payday loans (p<.001) and frequency of payday loan usage (p<.001). Other significant psychological factors associated with payday loan use were risk preference, financial distress, and financial literacy. Frequency of use was associated with risk preference and financial distress (Wang & St John).

Despite a focus on psychological and behavioral factors, the role of a scarcity mindset has not been examined in the alternative financial services literature. The positive association of alternative financial services use with greater anxiety and risk preference, higher financial distress, lower financial literacy and knowledge is well documented. Greater present-focused bias, bounded rationality, and cognitive load in the reality or perception of few alternatives, which have been linked to alternative financial services use, has also been linked to a scarcity mindset (Shah et al., 2012). As a result, we expect to find a positive association of a scarcity mindset with alternative financial services use.

3.1.3 Socio-demographic predictors of Alternative Financial Services (AFS) use

The association of sociodemographic characteristics and alternative financial services use is well studied, and the findings have been mostly consistent. In a comprehensive review study, higher likelihood of using alternative services has been associated with lower income, lower educational attainment, including financial education, male gender, ages in the 18-34 age bracket, non-White race/ethnic identity, living with a partner marital status, and being a renter (Birkenmaier & Fu, 2016). Some differences have been noted depending on the actual type of alternative financial service. For example, a survey found that payday loan borrowers were 52% women, 55% White, and 58% renters, whereas automobile title loan borrowers were 57% male, 65% White, and evenly split among renters and homeowners (Pew Research Center, 2012, 2015).

3.1.4 Theoretical background

As in Chapter 2, we use the Mullainathan and Shafir's scarcity mindset (Mullainathan & Shafir, 2013) as the framework to address the research questions. First, the framework in its original presentation is slanted towards tangible, objective scarcity, i.e., "physical limits" (Mullainathan & Shafir, 2013). Second, as previously discussed, the framework is a behavioral economics approach to helping explain consumer decisions and behavior, capturing both tangible, objective scarcity and perceived, subjective scarcity (Cook & Sadeghein, 2018; Mullainathan & Shafir, 2013; Shah et al., 2015). The original framework presented by Mullainathan and Shafir (Mullainathan & Shafir, 2013), along with studies by De Bruijn and Antonides (De Bruijn & Antonides, 2022), and Cook and Sadeghin (Cook & Sadeghein, 2018) inform our study, and are presented as a simple version of this study's model framework and shown in Figure 3.1.



Figure 3.1 Conceptual financial decision-making model with scarcity mindset

3.1.5 The current study

Our research questions investigate whether the scarcity mindset is associated with alternative financial services use, whether the association between a scarcity mindset and alternative financial services usage is stable above and beyond established predictors of alternative financial services, and whether the findings hold across income groups. Our specific research questions are:

(1) Is the scarcity mindset associated with the use of alternative financial services? We use binary logistic regression to predict usage with a specifically developed scarcity mindset score for a 2021 sample of U.S. Americans.
(2) Is the association between a scarcity mindset and alternative financial services usage stable above and beyond established predictors of the use of alternative financial services? We control for financial literacy, subjective financial knowledge, willingness to take risk, and real difficulties in meeting household expenses.

(3) Is the association of scarcity mindset and use of alternative financial services stronger for adults living in lower-income households, compared to adults living in mid- and higher-income households.

3.2. Method

3.2.1 Data

The study examines survey data of the 2021 National Financial Capability Study (NFCS) State-by-State Survey. This cross-sectional, online survey effort is funded by the

Financial Industry Regulatory Authority, a government-authorized not-for-profit organization that regulates broker-dealers in the United States. (Judy T. Lin et al., 2022). The State-by-State Survey was first conducted in 2009 and subsequently in 2012, 2015, 2018, and 2021, following a tri-annual schedule. The survey questionnaire remains in most parts the same across survey administrations. The State-by-State Survey collected responses from 27,118 U.S. American adults in 2021. Within each state, the sample size was set to approximate Census distributions for age by gender, ethnicity, education level, and income based on data from the Census Bureau's American Community Survey (Judy T. Lin et al., 2022). The final analytical sample in the data analysis consists of 24,349 responses in the 2021 survey.

3.2.2 Variables

Dependent variable

Used Alternative Financial Services (AFS). Respondents were asked to indicate their usage of five different AFS, "In the past 5 years, how many times have you…". Response options included: "1" ("Never"), "2" or "1 time", "3" or "2 times", "4" or "3 times", "5" or "4 or more times", "98" or "Don't know", and "99" or "Prefer not to say". The questions were: (1) "Taken out an auto title loan? Auto title loans are where a car title is used to borrow money for a short period of time. They are NOT loans used to purchase an automobile."; (2) "Taken out a short term 'payday' loan?"; (3) "Gotten an advance on your tax refund? This is sometimes called a 'refund anticipation check' or 'Rapid Refund' (Not the same as e-filing); (4) "Used a pawn shop?"; and (5) "Used a rent-to-

own store?" We created a dichotomous variable that is coded as "1" if the respondent has used any alternative financial services at all and "0" if he or she had not

Main predictor variable

Scarcity mindset. A scarcity mindset variable was derived from the NFCS State-by-State dataset using a two-step approach. First, a group of seven experts with published expertise in the scarcity literature, consisting of five economists and two psychologists, were approached by email in Spring 2023 and asked to evaluate and rank a list of 10 NFCS questionnaire items regarding their fit as a scarcity mindset measure. The instructions to the experts and results of the expert input is summarized in Appendix A. Expert consensus was obtained for the three statements: (1) "Because of my money situation, I feel like I will never have the things I want in life"; (2) "I am just getting by financially"; (3) "I am concerned that the money I have or will save won't last." Responses to these statements were measured on a 5-point Likert-type scale: does not describe me at all (coded as 1), describes me very little (coded as 2), describes me somewhat (coded as 3), describes me very well (coded as 4), describes me completely (coded as 5). Cronbach's alpha was 0.87 in 2021 (and 0.86 in 2018). The responses were summed, resulting in a value between 3 and 15. For 2021, the mean score was 8.78 (SD =3.67).

Other established predictor variables

Financial literacy. Six widely-used financial literacy questions were used to create a general financial literacy score. For example, respondents were asked, "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?" with possible content responses: "More than \$102"; "Exactly \$102"; "Less than \$102". As another example, respondents were asked, "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less." Correct answers were coded as 1 to create a score ranging from 0 (no correct answer) to 6 (all answers correct). For 2021, the mean score was 3.10 (*SD* = 1.67), and for 2018 the mean score was 3.26 (*SD* = 1.63).

Subjective financial knowledge was inquired with the question, "On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?". Response options ranged from very low (coded as 1) to very high (coded as 7). For 2021, the mean score was 5.10 (SD = 1.32)

Willingness to take financial risk. Respondents of the State-by-State Survey were asked, "When thinking of your financial investments, how willing are you to take risks? Please use a 10-point scale, where 1 means "Not At All Willing" and 10 means "Very Willing." For 2021, the mean score was 5.08 (*SD* = 2.69).

Difficulties in covering monthly expenses. Respondents of the State-by-State Survey were asked "In a typical month, how difficult is it for you to cover your expenses and pay all your bills?". The responses provided were "1 Very difficult", "2 Somewhat difficult",

and "3 Not at all difficult". In 2021, 43.6% of respondents report this being very or somewhat difficult.

Demographic and socioeconomic control variables include gender (1 = male), race/ethnicity (1 = White non-Hispanic (omitted), 2 = Black non-Hispanic, = 3 Hispanic,4 = Asian/Pacific Islander non-Hispanic, 5 = Other non-Hispanic (American Indian, Other, 2+ethnicities)), age (continuous), marital status (1 = married/living with partner (omitted), 2 = single, 3 = separated, 4 = divorced, 5 = widowed/widower), number of dependent children (continuous, 0 to 4), employment status (1 = self-employed, 2 = fulltime with employer (omitted), 3 = part-time with employer, 4 = not working (homemaker, full-time student, permanently unable to work, unemployed/temporarily laid off, and retired), annual household income (1 = less than $$25,000 \ 2 = $25,000$ to 49,999, 3 = 50,000 to 74,999 (omitted), 4 = 75,000 to 99,999, 5 = 100,000 to \$149,999, and 6 = \$150,000 or more), education attainment (1=HS and less than HS (no high school diploma, high school diploma, high school diploma equivalent), 2=some college, 3=Associate's degree, 4=Bachelor's degree (omitted), 5=post-graduate studies) and military service (1 = military service current member, 2 = previous member,3 = never served (omitted)).

All questionnaire items are presented in Appendix C.

Sample characteristics of individuals using alternative financial services in 2021 are shown in Tables 3.1 and 3.2. In 2021, alternative financial services users were on average 40 years old, about 67% non-Hispanic White, and 48% were male. About 40% were

married and less than half, 49% had dependent children. About 25%% had a Bachelor's or post graduate degree. The largest represented annual income segment was less than \$25,000, at about 31%. The majority of alternative financial services users worked full-time, at close to 43%. The majority, or about 85%, of AFS users had never served in the U.S. Armed Services.

In 2021, individuals using alternative financial services differ from individuals not using alternative financial services with regard to all predictor variables at p<0.001. Specifically, alternative financial services users report a higher scarcity score (M = 10.58, SD = 3.17) compared to non-users (M = 7.95, SD = 3.60); lower general financial literacy, with a mean score out of 6 of of 2.40 (SD = 1.48) vs. 3.42 (SD = 1.66); lower subjective financial knowledge, with a mean score out of 7 of 4.94 (SD = 1.47) vs. 5.17 (SD = 1.24); greater willingness to take financial risk, with a mean score out of 10 of 5.58 (*SD* = 2.85) vs. 4.84 (*SD* = 2.58); difficulties meeting monthly expenses with 31.50% of alternative financial services users reporting not at all difficult vs. 67.88% of non-users of alternative financial services, 47.74% of alternative financial services users reporting somewhat difficult vs. 26.72% of non-users of alternative financial services, and 20.77% of alternative financial services users reporting very difficult vs. 5.40% of non-users of alternative financial services users reporting very difficult vs. 5.40% of non-users of alternative financial services.

	Total	AFS Usage	AFS No	Means
	sample	Past 5 years	Usage Past 5	comparison
			years	
	% or Mean	% or Mean	% or Mean	P value
	(SD)	(SD)	(SD)	
AFS Usage Past 5 years (0/1)	31.66%			
Focal predictors:				
Scarcity score (3-15)	8.78 (3.67)	10.58 (3.17)	7.95 (3.60)	<i>p</i> <.001
Financial literacy (0-6)	3.10 (1.67)	2.40 (1.48)	3.42 (1.66)	<i>p</i> <.001
Subjective financial knowledge	5.10 (1.32)	4.94 (1.47)	5.17 (1.24)	<i>p</i> <.001
(1-7)				
Difficulties meeting monthly				
expenses				
- Not at all difficult (0/1)	56.36%	31.50%	67.88%	<i>p</i> <.001
- Somewhat difficult (0/1)	33.37%	47.74%	26.72%	<i>p</i> <.001
- Very difficult (0/1)	10.27%	20.77%	5.40%	<i>p</i> <.001
Willingness to take financial risk	5.08 (2.69)	5.58 (2.85)	4.84 (2.58)	<i>p</i> <.001
(1-10)				
Ν	24,349	7,709	16,640	

 Table 3.1 Sample descriptive statistics of focal variables, 2021 data collection.

Control variables	Total	AFS Usage	AFS No	Means
Control variables	sample	Past 5 years	Lisage Past 5	comparison
	sample	i asi 5 years	Usage Fast J	comparison
	% or Mean	% or Mean	% or Mean	P value
	(SD)	(SD)	(SD)	1 value
	(5D)	(5D)	(5D)	
Age (18-96)	47 89	39 97 (14 20)	52 03 (16 78)	n < 0.01
Age (10-70)	(17.12)	57.77 (14.20)	52.05 (10.70)	p < .001
Male $(0/1)$	46 57%	47 58%	46 11%	n = 0.32
Race/Ethnicity	+0.5770	+7.5070	40.1170	<i>p</i> =.032
White non-Hispanic $(0/1)$	74 84%	66.83%	78 55%	n < 0.01
Black non-Hispanic (0/1)	9.47%	15 75%	6 56%	p < .001
Hispanic $(0/1)$	2.47% 8.20%	10.69%	7.05%	p < .001
A sia/Pacific Islander $(0/1)$	4 30%	2 60%	5.05%	p < .001
Other non-Hispanic $(0/1)$	4.30%	2.09%	2 79%	p < .001
Other non-rinspanie (0/1)	5.1970	4.0570	2.1970	<i>p</i> <.001
Marital Status				
Married/Living with partner	49 92%	39.97%	54 54%	<i>n</i> < 001
Single	32 39%	42 53%	27 69%	p < 0.001
Senarated	1 72%	3 24%	1 01%	p < .001
Divorced	11 44%	11 30%	11 51%	<i>p</i> <.001
Widowed/widower	4 53%	2 96%	5 25%	n < 0.01
Number dependent children (0-4)	0.64(1.039)	0.95(1.89)	0.49(0.93)	p < .001
Educational Attainment	0.04 (1.037)	0.95 (1.69)	0.49(0.93)	p < .001
High School equivalent or less	25 83%	36 23%	21.02%	n < 0.01
(0/1)	25.0570	50.2570	21.0270	<i>p</i> <.001
Some college $(0/1)$	26 17%	28 51%	25.08%	<i>n</i> < 001
Associate's degree $(0/1)$	11.01%	10 14%	11 42%	p < .001 p = 0.03
Bachelor's degree $(0/1)$	25 57%	17 75%	29 19%	p = .003 n < 001
Post graduate $(0/1)$	5 93%	7 37%	13 29%	p < 0.001
Fmployment Status	5.7570	1.5170	13.2770	<i>p</i> <
Self-employed (0/1)	7 92%	9 98%	6 97%	n < 0.01
Work for employer full time $(0/1)$	39.61%	43 21%	37 94%	p < 0.001
Work for employer part time $(0/1)$	8 52%	10.16%	7 76%	p < .001
Not working $(0/1)$	13 95%	36 66%	17 33%	p < .001
Annual Income	+3.7570	50.0070	+7.3370	p < .001
Less than $$25,000,(0/1)$	21 36%	31 42%	16 70%	n < 0.01
\$25,000 (0/1)	21.50%	29.02%	23.03%	p < .001
\$29,000 to \$74,999 (0/1)	18 96%	15 61%	20.52%	p < 0.001
\$75,000 to \$99,999 (0/1)	13 52%	9 77%	15 26%	p < .001
\$100 000 to \$1/9 999 (0/1)	13.32%	9.37%	15.16%	p < .001
\$150,000 to \$149,999 (0/1) \$150,000 or more (0/1)	7 91%	1.83%	Q 33%	p < .001
Armed Services	7.9170	4.0570	9.3370	<i>p</i> <.001
Current member $(0/1)$	2 13%	5 46%	0 58%	n < 0.01
D ravious member $(0/1)$	2.1370	0 5704	10 78%	p < .001 n = 0.04
Never member $(0/1)$	10.40% 87 /7%	9.3770 8/1070/	88 640%	p = .004 n < 0.01
N	37.4770	7 700	16 6/0	p<.001
11	24,349	1,109	10,040	

 Table 3.2 Sample descriptive statistics of control variables, 2021 data collection.

3.3. Results

3.3.1 Correlations of dependent and predictor variables

The Pearson's correlation coefficients of alternative financial services use and the focal predictor variables is shown in Table 3.3. The correlation coefficient between alternative financial services use and the scarcity mindset score is strong and positive at 0.3, p<0.001. As expected, we find an inverse relationship of alternative financial services use and financial literacy as well as alternative financial services use and subjective financial knowledge, both p<0.001. Alternative financial services use is positively associated with willingness to take risk, p<0.001

	AFS usage, past 5 years (1=Y,0=N)	Scarcity Score (3 to 15)	Financial Literacy (0 to 6)	Subjective financial knowledge (1 to 7)	Willingness to take financial risk (1 to 10)
Scarcity	0.332***				
Score					
Financial	-0.283***	-0.295***			
Literacy					
Subjective	-0.081***	-0.313***	0.255***		
financial					
knowledge					
Willingness	0.127***	-0.087***	0.118***	0.282	
to take					
financial risk					
Difficulties	0.357***	0.612***	-0.259***	-0.250***	070***
in covering					
monthly					
expenses					

Notes: ***p <0.001 **p< 0.01 *p<0.05

Table 3.3 Pearson's Correlation coefficient of alternative financial services use and focal predictor variables, 2021 data collection of the National Financial Capability Study

3.3.2 Scarcity mindset and use of alternative financial services

To examine Research Question 1 and 2, the association of alternative financial services use and the scarcity minds, we use a stepwise binary logistic regression approach, see Table 3.4, and report odds ratios. In Step 1, we regressed alternative financial services use on the scarcity mindset (RQ 1). In Step 2, we regressed alternative financial services use on the scarcity mindset and the established predictor variables of alternative financial services use, financial literacy, subjective financial knowledge, willingness to take financial risk, and difficulties in covering monthly household expenses (RQ 2). In Step 3, for the full model, we regressed alternative financial services use on the scarcity mindset, the established predictor variables, and sociodemographic controls (RQ 2).

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Scarcity mindset	1.235***(0.005)	1.121***	1.100*** (0.007)
	<i>p</i> <0.001	(0.006)	<i>p</i> <0.001
	•	<i>p</i> <0.001	•
Financial literacy		0.722***	0.811*** (0.009)
		(0.007)	<i>p</i> <0.001
		p<0.001	*
Subjective financial knowledge		1.049***	1.087*** (0.015)
		(0.013)	<i>p</i> <0.001
		p<0.001	
Willingness to take financial risk		1.184***	1.099*** (0.008)
C		(0.007)	p<0.001
		p<0.001	X
Difficulties in meeting monthly expenses		Ĩ	
Not at all difficult (omitted)			
Somewhat difficult		2.473***(0.095)	2.052*** (0.084)
		p<0.001	p<0.001
Very difficult		4.228***(0.242)	3.245*** (0.198)
,		p<0.001	p<0.001
Demographic controls:		Ĩ	
Age			0.967*** (0.001)
C			p<.001
Male			1.281*** (0.047)
			p<.001
Race/Ethnicity			*
White non-Hispanic			Omitted
Black non-Hispanic			1.814*** (0.099)
-			<i>p</i> <0.001
Hispanic (alone/comb)			1.120* (0.063)
			p=.044
Asia/Pacific Islander			0.722*** (0.066)
			<i>p</i> <0.001
Other non-Hispanic			1.263**(0.111)
-			p=.008

continued

Table 3.4 Full specification, odds ratios of binary logistic regression of AFS any usage in past 5 years on scarcity mindset and other predictors, 2021 data collection.

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Marital Status			
Married			omitted
Single			0.835*** (0.038)
			<i>p</i> <0.001
Separated			$2.025^{***}(0.242)$
			<i>p</i> <0.001
Divorced			1.319*** (0.075)
			<i>p</i> <.001
Widowed/widower			1.411*** (0.131)
5 · · · · · · · · · · · · · · · · · · ·			<i>p</i> <0.001
Dependent Children			1.276***(0.021)
			<i>p</i> <0.001
Educational Attainment			1 (0.1444
High School, equivalent or less			1.694***
			(0.085)
Some college			p < .001 1 427*** (0.060)
Some conege			n < 0.00
Associate's degree			1.221 ** (0.075)
Absociate 5 degree			n = 001
Bachelor's degree			omitted
Post graduate			1.004 (0.068)
6			p=.950
Employment Status			X
Self-employed			1.060 (0.066)
			<i>p</i> =.346
Work for employer full time			Omitted
Work for employer part time			0.941 (0.057)
			<i>p</i> =.316
Not working			0.839*** (0.036)
			<i>p</i> <0.001
Annual Income			1 222*** (0.075)
Less than \$25,000			$1.333^{***}(0.075)$
\$25,000 to \$40,000			p < 0.001 1 260*** (0.064)
\$23,000 10 \$49,999			n < 0.01
\$50 000 to \$74 999			p > .001
\$75 000 to \$99 999			0.917 (0.057)
ψ , ω , ω , ψ , ω , ψ , ω , ω , ψ , ω			n = 167
\$100.000 to \$149.999			0.952(0.062)
· · · · · · · · · · · · · · · · · · ·			p=.457
\$150,000 or more			0.926 (0.077)
			<i>p</i> =.356

Table 3.4 continued

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Armed Services			
Current member			3.488*** (0.449) <i>p</i> <0.001
Previous member			1.539*** (0.090) <i>p</i> <0.001
Never member (omitted)			
Constant	0.065***	0.080***	0.650*** (0.094)
	(0.003) <i>p</i> <.001	(0.007) <i>p</i> <.001	<i>p</i> <.001
Log likelihood	-13,803.180	-12,437.118	-11,425.446
Pseudo R2	0.092	0.182	0.248

Notes: N=24,349; ***p<0.001 **p< 0.01 *p<0.05; Demographic controls include age, race/ethnic identity, gender, marital status, child dependency status, educational attainment, income, work status, and US armed services experience. Table 3.4 continued

In the first step, the reduced-form specification for Research Question 1 indicates a strong and positive association of alternative financial services use and the scarcity mindset. For investors with a one-unit stronger scarcity mindset, the odds of holding cryptocurrency investments increases by a factor of 1.235 or 23.5%.

For Research Question 2, we find that the association of alternative financial services use and scarcity mindset is highly robust to the addition of established factors and socioeconomic controls. In Model 3, scarcity mindset score is significant at p<0.001 and an odds ratio of 1.100 implying that a one-point scale increase in scarcity mindset increases the odds of using alternative financial services by about 10%. This is particularly noteworthy because the established predictors are are strongly associated with increased odds of alternative financial services use by 9% for a one-point higher subjective financial knowledge score, by 10% for a one-point scale increase in willingness to take financial risk, and by 328% for high difficulties in covering monthly

expenses. In contrast, the odds of alternative financial services use are lower by 19% for a one-point scale increase in financial literacy.

3.3.3 Robustness: Scarcity mindset and use of alternative financial services in pre-COVID 2018

We repeat the analyses for robustness with the pre-COVID 2018 survey year. Descriptive statistics for 2018 are shown in Table 3.5 and 3.6. The usage of alternative financial services in 2018, at 27.4%, was lower as a percentage of the population than in 2021, at 31.7%, based on these samples which were stratified by age, gender, ethnicity, education level, and income. The scarcity mindset score in 2018 was almost identical to 2021, as a percentage of the population that used alternative financial services. In 2018, financial literacy scores and subjective financial knowledge were on average slightly higher than in 2021. In 2018, willingness to take financial risk was slightly lower than in 2021. In 2018, difficulties in meeting monthly expenses were slightly greater than in 2021.

	Total	AFS Usage	AFS Usage	Means
	sample	Past 5 years	Past 4 years	comparison
	% or Mean	% or Mean	% or Mean	p value
	(SD)	(SD)	(SD)	
AFS Usage Past 5 years (0/1)	27.37%			
Focal predictors:				
Scarcity score (3-15)	8.79 (3.69)	10.69 (3.26)	8.08 (3.58)	<i>p</i> <.001
Financial literacy (0-6)	3.26 (1.63)	2.55 (1.46)	3.53 (1.62)	<i>p</i> <.001
Subjective financial knowledge (1-	5.17 (1.32)	4.96 (1.52)	5.25 (1.22)	<i>p</i> <.001
7)				
Difficulties meeting monthly				
expenses				
- Not at all difficult (0/1)	54.11%	29.67%	63.31%	<i>p</i> <.001
- Somewhat difficult (0/1)	34.68%	46.91%	30.08%	<i>p</i> <.001
- Very difficult (0/1)	11.21%	23.42%	6.61%	<i>p</i> <.001
Willingness to take financial risk	4.95 (2.65)	5.36 (2.95)	4.80 (2.51)	<i>p</i> <.001
(1-10)				
Ν	24,103	6,596	17,507	

 Table 3.5
 Sample descriptive statistics of focal variables, 2018 data collection.

	Total	AFS Usage	AFS Usage	Means
	sample	Past 5 years	Past 4 years	comparison
	% or Mean	% or Mean	% or Mean	<i>p</i> value
	(SD)	(SD)	(SD)	1
Control variables:	· · ·	· · · · ·	. ,	
Age (18-92)	48.13	39.48 (14.07)	51.39 (16.51)	<i>p</i> <.001
	(16.75)	· · · ·	× /	1
Male (0/1)	44.82%	45.62%	44.51%	p=.124
Race/Ethnicity				1
White non-Hispanic $(0/1)$	75.15%	62.48%	79.93%	<i>p</i> <.001
Black non-Hispanic (0/1)	9.07%	17.31%	5.96%	p < .001
Hispanic (0/1)	8.38%	12.02%	7.01%	p < .001
Asia/Pacific Islander (0/1)	4.33%	4.38%	4.31%	p=.815
Other non-Hispanic $(0/1)$	3.07%	3.81%	2.79%	p < .001
	210770	010170		P 4001
Marital Status				
Married/Living with partner	54.42%	45.06%	57.94%	<i>p</i> <.001
Single	28.59%	38.05%	25.02%	p<.001
Separated	1.46%	2.47%	1.09%	p < .001
Divorced	11.21%	11.40%	11.13%	p = .556
Widowed/widower	4.33%	3.02%	4.82%	p < .001
Number dependent children (0-4)	0.66 (1.05)	1.02 (1.22)	0.52 (0.95)	<i>p</i> <.001
Educational Attainment	0.00 (1.00)	1.02 (1.22)	0102 (0190)	P 4001
High School, equivalent or less	25.98%	34.20%	22.88%	<i>p</i> <.001
(0/1)				P
Some college $(0/1)$	26.83%	32.06%	24.86%	<i>p</i> <.001
Associate's degree $(0/1)$	10.70%	10.76%	10.68%	P
Bachelor's degree $(0/1)$	22.62%	15.65%	25.25%	<i>p</i> <.001
Post graduate $(0/1)$	13.87%	7.32%	16.33%	p < .001
Employment Status	1010770	1.0270	1010070	P
Self-employed (0/1)	7.37%	8.61%	6.91%	<i>p</i> <.001
Work for employer full time $(0/1)$	41.02%	44.45%	39.73%	<i>p</i> <.001
Work for employer part time $(0/1)$	8.62%	10.14%	8.04%	p < .001
Not working $(0/1)$	42.99%	36.80%	45.32%	<i>p</i> <.001
Annual Income				P
Less than $$25,000(0/1)$	19.55%	29.06%	15.97%	<i>p</i> <.001
\$25,000 to \$49,999 (0/1)	25.12%	30.52%	23.08%	<i>p</i> <.001
\$50,000 to \$74,999 (0/1)	19.92%	17.07%	21.00%	<i>p</i> <.001
\$75.000 to \$99.999 (0/1)	14.80%	13.16%	15.42%	p < .001
\$100.000 to \$149.999 (0/1)	13.40%	7.60%	15.58%	<i>p</i> <.001
\$150,000 or more (0/1)	6.36%	2.59%	8.96%	p < .001
Armed Services	0.0070		0.9070	P 4001
Current member $(0/1)$	2.80%	8.38%	0.70%	<i>p</i> <.001
Previous member $(0/1)$	11.75%	10.82%	12.10%	p = .006
Never member $(0/1)$	85.45%	80.79%	87.21%	p < .001
N	24.103	6.596	17.507	r

 Table 3.6 Sample descriptive statistics of control variables, 2018 data collection.

The Pearson's correlation coefficients of alternative financial services use and the focal predictor variables are shown in Table 3.7. The correlation coefficient between alternative financial services use and the scarcity mindset score is strong and positive at 0.3, p<.001. Similar to 2021, we find an inverse relationship of alternative financial services use and financial literacy as well as alternative financial services use and subjective financial knowledge, both p<.001. Alternative financial services use is positively associated with having difficulties meeting monthly expenses, p<.001.

	Used	Scarcity	Financial	Subjective	Willingness		
	AFS past	mindset	Literacy	financial	to take		
	5 years			knowledge	financial		
					risk		
Scarcity mindset	0.316***						
Financial Literacy	-0.269***	-					
		0.293***					
Subjective financial	-0.096***	-	0.261***				
knowledge		0.314***					
Willingness to take	0.094***	-	0.151***	0.302***			
financial risk		0.127***					
Difficulties meeting	0.328***	0.629***	-	-0.267***	-0.110***		
monthly expenses			0.274***				

Notes: ****p*<0.001 ***p*<0.01 **p*<0.05

Table 3.7 Pearson's r correlation coefficients for focal predictor variables, 2018 data collection.

Results for the binary logistics regression are shown in Table 3.8. Again, we find a strong and positive association of alternative financial services use and scarcity mindset. The coefficients are almost identical to the 2021 data. Similarly, the association of established
predictors and alternative financial services use is stable and reflects the same directions and similar magnitudes in the 2018 and 2021 data.

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Scarcity mindset	1.230***(0.005)	1.126*** (0.006)	1.102*** (0.007)
-	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Financial literacy		0.731*** (0.008)	0.833*** (0.010)
2		p<0.001	p<0.001
Subjective financial knowledge		0.998 (0.013)	1.029* (0.014)
5		× ,	p=.038
Willingness to take financial risk		1.172*** (0.007)	$1.105^{***}(0.008)$
		<i>p</i> <0.001	<i>p</i> <0.001
Difficulties in meeting monthly		PROPOSI	p toroor
expenses			
Not at all difficult (omitted)			
Somewhat difficult		2,054***(0,083)	1 709*** (0 073)
Some what diffedit		n < 0.001	n < 0.001
Very difficult		$3407^{***}(0194)$	2.420^{***} (0.149)
very announ		n < 0.001	n < 0.001
Demographic controls:		<i>p</i> <0.001	<i>p</i> <0.001
Age			0 968*** (0 001)
1.60			n < 0.01
Male			1 2725 *** (0.049)
Male			n < 001
Race/Ethnicity			<i>p</i> <.001
White non-Hispanic (omitted)			
Black non-Hispanic			2 159*** (0 121)
Black non Inspanie			n < 0.001
Hispanic (alone/comb)			1 331 * * * (0.075)
mspanie (arone/comb)			n < 0.001
Asia/Pacific Islander			p < 0.001 1 198* (0.010)
			n = 0.029
Other non-Hispanic			p=.027 1 305**(0 118)
Outer non-mspanie			n = 0.03
			<i>p</i> =.003

Continued

Table 3.8 Full specification, odds ratios of binary logistic regression of AFS any usage in past 5 years on scarcity mindset and other predictors -2018 data collection.

OR (SE) OR (SE) OR (SE) OR (SE) Marital Status Married (omitted) $p<0.001$ $p<0.001$ Single $p<0.001$ $p<0.001$ $p<0.001$ Divorced $1.557*(0.198)$ $p<0.01$ Divorced $p<0.01$ $p<0.01$ Widowed/widower $1.419***(0.136)$ $p<0.001$ Dependent Children $1.266***(0.021)$ $p<0.001$ Educational Attainment $p<0.001$ $p<0.001$ High School, equivalent or less $1.806***$ (0.096) Some college $1.485***(0.076)$ $p<0.001$ Associate's degree $1.310***(0.084)$ $p<0.01$ Bachelor's degree (omitted) $p<0.01$ $p<0.01$ Post graduate $0.968 (0.067)$ $p=.642$ Employed $1.063 (0.071)$ $p=.364$ Work for employer full time $p=.364$ $p=.209$ Not working $0.974 (0.042)$ $p<.001$ \$25,000 to \$49,999 $1.358*** (0.075)$ $p<.001$ \$25,000 to \$44,999 (omitted) $p<001$ s	Variable	Model 1	Model 2	Model 3
Marial Status Married (omitted) Single 0.844*** (0.039) $p<0.001$ separated 1.557**(0.198) $p<0.01$ Divorced 1.361*** (0.079) Widowed/widower 1.419*** (0.136) Dependent Children 1.266*** (0.021) Educational Attainment $p<0.001$ High School, equivalent or less 1.806*** 0.096) $p<.001$ Associate's degree 1.310*** (0.084) $p<.001$ Associate's degree Bachelor's degree (omitted) $p<.001$ Post graduate 0.968 (0.067) $p=.642$ $p=.642$ Employment Status $p=.364$ Work for employer part time 0.934 (0.058) $p=.269$ 0.974 (0.042) $p=.540$ $p<.001$ Annual Income $p<.001$ Less than \$25,000 1.300*** (0.075) $p<.001$ \$25,000 to \$49,999 \$25,000 to \$49,999 0.358*** (0.069) $p<.001$ \$55,000 to \$49,999 \$25,000 to \$49,999 0.936 (0.052) $p<.001$ \$55,000 to \$149,999 (omitted)		OR (SE)	OR (SE)	OR (SE)
Marred (omitted) 0.844*** (0.039) Single 0.844*** (0.039) Separated 1.557**(0.0198) Divorced 1.361*** (0.079) $p < 0.01$ 1.419*** (0.136) Widowed/widower 1.419*** (0.136) Dependent Children 1.266***(0.021) Educational Attainment $p < 0.001$ Educational Attainment $p < 0.001$ Bigs School, equivalent or less (0.096) Some college $p < .001$ Associate's degree 1.310*** (0.084) $p < .001$ Bachelor's degree (omitted) Post graduate 0.968 (0.067) $p = .642$ Employment Status Self-employed 1.063 (0.071) $p = .642$ $p = .364$ Work for employer full time (omitted) $p = .269$ Not working $0.974 (0.042)$ $p = .540$ $p < .001$ \$25,000 to \$49,999 1.358*** (0.069) $p < .001$ \$25,000 to \$49,999 \$25,000 to \$49,999 0.358(0.059) $p < .001$ \$50,000 to \$49,999 \$25,000 to \$49,999 0.936 (0.059) \$25,000	Marital Status			
Single $p.0.001$ Separated $1.557*(0.198)$ $p<0.01$ $p<0.01$ Divorced $1.361^{***}(0.079)$ $p<.001$ $p<.001$ Widowed/widower $1.419^{***}(0.136)$ $p<0.001$ $p<.001$ Divorced $1.266^{***}(0.021)$ $p<0.001$ $p<.001$ Educational Attainment $p<0.001$ High School, equivalent or less 1.806^{***} (0.096) $p<.001$ Some college $1.485^{***}(0.076)$ Some college $1.485^{**}(0.076)$ $p<.001$ $p<.001$ Associate's degree $p<.001$ Bachelor's degree (omitted) $p<.001$ Post graduate $0.968 (0.067)$ $p=.642$ $p=.642$ Employment Status $p=.642$ Self-employed $1.063 (0.071)$ Work for employer part time $p=.269$ Not working $0.974 (0.042)$ $p=.540$ $p=.540$ Annual Income $p<.001$ \$25,000 to \$49,999 $1.358^{***} (0.059)$ \$25,000 to \$49,999	Married (omitted)			0.044555 (0.020)
separated $p<0.001$ Divorced $1.361***(0.079)$ $p<0.01$ $p<0.01$ Widowed/widower $1.419***(0.136)$ $p<0.001$ $p<0.001$ Dependent Children $1.266***(0.021)$ $p<0.001$ $p<0.001$ Educational Attainment $p<0.001$ High School, equivalent or less (0.096) $p<.001$ $p<0.001$ Some college $1.485***(0.076)$ $p<.001$ Associate's degree Bachelor's degree (omitted) $p<.001$ Post graduate $0.968 (0.067)$ $p=.642$ $p=.642$ Employment Status $p=.364$ Work for employer full time $p=.364$ (omitted) $p=.364$ Work for employer part time $0.934 (0.058)$ $p=.269$ $Not working$ $0.974 (0.042)$ Annual Income $p<.001$ Less than \$25,000 $1.30*** (0.059)$ \$25,000 to \$49,999 $1.35*** (0.059)$ \$25,000 to \$49,999 $p<.001$ \$25,000 to \$74,999 (omitted)<	Single			0.844*** (0.039)
Separated $p < 0.01$ Divorced $p < 0.01$ Widowed/widower $1.419^{\text{sex}}(0.079)$ $p < 0.01$ $p < 0.001$ Dependent Children $1.266^{\text{sex}}(0.021)$ Educational Attainment $p < 0.001$ High School, equivalent or less 1.806^{sex} Some college $1.485^{\text{sex}}(0.076)$ Some college $1.310^{\text{sex}}(0.084)$ Post graduate $p < .001$ Bachelor's degree (omitted) $p = .642$ Employment Status $p = .642$ Self-employed $1.063(0.071)$ $p = .269$ $p = .642$ Work for employer part time $0.934(0.058)$ $p = .269$ $p < .001$ Annual Income $p = .364$ Less than \$25,000 to \$49,999 $1.358^{\text{sex} (0.075)}$ $p < .001$ \$25,000 to \$49,999 $p < $	Compared a 1			<i>p</i> <0.001
Divorced $p < 0.01$ Widowed/widower $1.361***(0.079)$ $p < 0.01$ $p < 0.01$ Widowed/widower $1.419**(0.136)$ $p < 0.001$ $p < 0.001$ Dependent Children $1.266***(0.021)$ $p < 0.001$ $p < 0.001$ Educational Attainment $p < 0.001$ High School, equivalent or less $1.806***$ (0.096) $p < 0.01$ Associate's degree $1.310***(0.084)$ $p < .001$ Associate's degree (omitted) Post graduate $0.968(0.067)$ $p = .642$ $p = .642$ Employment Status $p = .642$ Self-employed $1.063(0.071)$ $p = .364$ $p = .364$ Work for employer part time $0.934(0.058)$ $p = .269$ Not working $p = .540$ $p = .540$ Annual Income $p < .001$ Less than \$25,000 \$49,999 $1.358***(0.069)$ $p < .001$ \$550,000 to \$449,999 $0.936(0.059)$ \$75,000 to \$499,999 $0.936(0.059)$	Separated			1.55/**(0.198)
$\begin{array}{cccc} 1.361^{\circ \circ \circ} (0.079) \\ p<.001 \\ p<.001 \\ 1.419^{\ast \ast \circ} (0.136) \\ p<0.001 \\ 1.266^{\ast \ast \ast} (0.021) \\ p<0.001 \\ 1.266^{\ast \ast \ast} (0.021) \\ p<0.001 \\ 1.266^{\ast \ast \ast} (0.021) \\ p<0.001 \\ 1.806^{\ast \ast \ast} (0.076) \\ p<.001 \\ 1.310^{\ast \ast \ast} (0.076) \\ p<.001 \\ 1.310^{\ast \ast \ast} (0.076) \\ p<.001 \\ 1.310^{\ast \ast \ast} (0.084) \\ p<.001 \\ 1.310^{\ast \ast \ast} (0.084) \\ p<.001 \\ 1.310^{\ast \ast \ast} (0.084) \\ p<.001 \\ 1.063 (0.071) \\ p=.642 \\ 1.063 (0.071) \\ p=.364 \\ Work for employer full time \\ (omitted) \\ Work for employer part time \\ 0.934 (0.058) \\ p=.269 \\ Not working \\ 0.974 (0.042) \\ p=.540 \\ 1.300^{\ast \ast} (0.075) \\ p<.001 \\ 1.358^{\ast \ast} (0.069) \\ p<.001 \\ 525,000 \ to \ 574,999 (omitted) \\ $75,000 \ to \ 599,999 \\ $75,000 \ to \ 599,999 \\ 1.059 \\ p=.291 \\ $100,000 \ to \ $149,999 \\ 0.749^{\ast \ast} (0.052) \\ p<.001 \\ 1.300^{\ast \ast} (0.059) \\ p=.291 \\ $100,000 \ to \ $149,999 \\ 0.749^{\ast \ast} (0.052) \\ p<.001 \\ \end{array}$	Diversed			p < 0.01 1 261*** (0 070)
Widowed/widower $p^{-5,001}_{-4}$ Widowed/widower 1.419**** (0.136) Dependent Children 1.266*** (0.021) Dependent Children $p < 0.001$ Educational Attainment $p < 0.001$ Educational Attainment $p < 0.001$ High School, equivalent or less 1.806^{***} (0.096) $p < .001$ Some college 1.485^{***} (0.076) $p < .001$ Associate's degree Bachelor's degree (omitted) $p < .001$ Bachelor's degree (omitted) $p = .642$ Employment Status $p = .364$ Self-employed $1.063 (0.071)$ $p = .364$ $p = .364$ Work for employer full time $p = .364$ (omitted) $p = .540$ Annual Income $p = .540$ Less than \$25,000 $1.300^{***} (0.075)$ $p < .001$ \$25,000 to \$49,999 \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p < .001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $p = .291$ \$100,000 to \$149,999 (omitted)	Divorced			$1.501^{+++}(0.079)$
Whowed whowed 1.410 $p < 0.01$ Dependent Children 1.266***(0.021) $p < 0.001$ Educational Attainment 1.806*** (0.096) High School, equivalent or less 1.806*** (0.096) Some college 1.485*** (0.076) Associate's degree 1.310*** (0.084) $p < .001$ Bachelor's degree (omitted) $p < .001$ $p < .001$ Bachelor's degree (omitted) $p < .001$ $p = .642$ Employment Status Self-employed $1.063 (0.071)$ Self-employed 1.063 (0.071) $p = .364$ Work for employer full time $p = .269$ $p = .269$ Not working $0.974 (0.042)$ $p = .540$ Annual Income $p < .001$ $1.358*** (0.069)$ Less than \$25,000 \$1.308*** (0.075) $p < .001$ \$25,000 to \$49,999 1.358*** (0.069) $p < .001$ \$25,000 to \$49,999 $p = .291$ $p < .001$ \$50,000 to \$74,999 (omitted) $p < .001$ $p < .001$ \$51,0000 to \$49,999 $p = .291$ $p < .001$ \$51,0000 to \$974,999 (omitted) $p < .001$	Widowed/widower			p < .001 1 /10*** (0 136)
Dependent Children $p_{0.001}$ Educational Attainment $p_{0.001}$ High School, equivalent or less 1.806^{***} (0.096) $p_{0.001}$ Some college $1.485^{***}(0.076)$ Associate's degree $p_{0.001}$ Bachelor's degree (omitted) $p_{0.001}$ Post graduate 0.968 $p_{0.001}$ $p_{0.001}$ Bachelor's degree (omitted) $p_{0.001}$ Post graduate 0.968 0.968 0.067 $p_{0.001}$ $p_{0.001}$ Bachelor's degree (omitted) $p_{0.001}$ Post graduate 0.968 0.067 $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ Work for employer full time $p_{0.934}$ (0.078) $p_{-2.69}$ 0.974 (0.042) $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ Annual Income $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ $p_{0.001}$ $p_{0.001}$	widowed/widowei			n < 0.001
Dependent clinited $p < 0.001$ Educational Attainment $p < 0.001$ High School, equivalent or less 1.806^{***} (0.096) $p < .001$ Some college 1.485^{***} (0.076) Associate's degree 1.310^{***} (0.084) Bachelor's degree (omitted) $p < .001$ Post graduate 0.968 (0.067) P=.642 $p = .642$ Employment Status $p = .642$ Self-employed 1.063 (0.071) $p = .364$ $p = .364$ Work for employer full time $p = .269$ Not working 0.974 (0.042) $p = .540$ $p < .001$ Annual Income $p < .001$ Less than \$25,000 1.300^{***} (0.075) $p < .001$ \$25,000 to \$49,999 1.358^{***} (0.069) $p < .001$ \$50,000 to \$74,999 (omitted) $p < .001$ \$75,000 to \$99,999 0.936 (0.059) $p = .291$ \$100,000 to \$149,999 0.749^{***} (0.052) $p < .001$	Dependent Children			p < 0.001 1 266***(0 021)
Educational Attainment 1.806*** High School, equivalent or less 1.806*** (0.096) $p < .001$ Some college 1.485*** Associate's degree 1.310*** Bachelor's degree (omitted) $p < .001$ Post graduate 0.968 Post graduate 0.968 Self-employed 1.063 Work for employer full time $p = .642$ (omitted) $p = .364$ Work for employer part time 0.934 (onitted) $p = .540$ Annual Income $p = .540$ Less than \$25,000 1.300*** \$25,000 to \$49,999 1.358**** \$50,000 to \$74,999 (omitted) $p < .001$ \$75,000 to \$99,999 0.936 \$75,000 to \$99,999 0.936 \$75,000 to \$149,999 0.749*** \$75,000 to \$149,999 0.749***	Dependent enharen			n < 0.001
High School, equivalent or less 1.806^{***} High School, equivalent or less 1.806^{***} (0.096) $p<.001$ Some college 1.485^{***} Associate's degree 1.310^{***} Bachelor's degree (omitted) $p<.001$ Post graduate 0.968 Post graduate 0.968 Self-employed 1.063 Work for employer full time $p=.364$ (omitted) $p=.269$ Not working 0.934 $p=.540$ $2.5,000$ Annual Income $p=.540$ Less than \$25,000 1.300^{***} \$25,000 to \$49,999 1.358^{***} \$50,000 to \$74,999 (omitted) $p<.001$ \$75,000 to \$149,999 0.936 0.052) $p=.291$ 0.749^{***} 0.052) $p=.201$ 0.749^{***} 0.052)	Educational Attainment			p (0.001
$ \begin{array}{c} (0.096) & p<.001 \\ p<.001 \\ 1.485^{***} (0.076) & p<.001 \\ Associate's degree & 1.485^{***} (0.076) & p<.001 \\ Associate's degree & 1.310^{***} (0.084) & p<.001 \\ Bachelor's degree (omitted) & p<.001 \\ Post graduate & 0.968 (0.067) & p=.642 \\ \\ Employment Status & 1.063 (0.071) & p=.642 \\ \\ Employed & 1.063 (0.071) & p=.364 \\ \\ Work for employer full time & 0.934 (0.058) & p=.269 \\ Not working & 0.974 (0.042) & p=.540 \\ \\ Annual Income & p=.540 \\ \\ Annual Income & 1.300^{***} (0.075) & p<0.001 \\ \\ \$25,000 to \$49,999 & 1.358^{***} (0.069) & p<.001 \\ \\ \$550,000 to \$74,999 (omitted) & s75,000 to \$99,999 & 0.936 (0.059) & p=.291 \\ \\ \$100,000 to \$149,999 & 0.749^{***} (0.052) & p<0.01 \\ \end{array}$	High School, equivalent or less			1.806***
$p<.001$ Some college $1.485^{***}(0.076)$ $p<.001$ Associate's degree $1.310^{***}(0.084)$ Bachelor's degree (omitted) $p<.001$ Post graduate 0.968 (0.067) $p=.642$ $p=.642$ Employment Status 1.063 (0.071) $p=.642$ $p=.364$ Work for employer full time (omitted) $p=.364$ Work for employer part time 0.934 (0.058) $p=.269$ Not working 0.974 (0.042) Annual Income 1.300^{***} (0.075) $p<.001$ \$25,000 to \$49,999 1.358^{***} (0.069) $p<.001$ \$25,000 to \$49,999 0.936 (0.059) $p=.291$ 0.749^{***} (0.052) $p<.001$ $p=.291$ $p<.0001$ to \$149,999 0.749^{***} (0.052)				(0.096)
Some college $1.485^{***} (0.076)$ Associate's degree $p<.001$ Associate's degree (omitted) $p<.001$ Bachelor's degree (omitted) $p<.001$ Post graduate $0.968 (0.067)$ $p=.642$ $p=.642$ Employment Status $p=.364$ Work for employer full time $p=.364$ Work for employer part time $0.934 (0.058)$ $p=.269$ $p=.540$ Annual Income $p=.300$ Less than \$25,000 $1.300^{***} (0.075)$ $p<0.001$ $p<001$ \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p<.001$ $p<.001$ \$50,000 to \$74,999 (omitted) $p<.001$ \$75,000 to \$99,999 $0.936 (0.059)$ $p=.291$ $p<.001$				p<.001
$p < .001$ Associate's degree $1.310^{***} (0.084)$ $p < .001$ Bachelor's degree (omitted) Post graduate $0.968 (0.067)$ $p = .642$ Employment Status Self-employed $1.063 (0.071)$ $p = .364$ Work for employer full time (omitted) $p = .269$ Not working $0.974 (0.058)$ $p = .540$ Annual Income $p < .001$ Less than \$25,000 $1.300^{***} (0.075)$ $p < 0.001$ $$25,000$ to \$49,999 \$50,000 to \$74,999 (omitted) $p < .001$ \$75,000 to \$99,999 $0.936 (0.059)$ $p = .291$ $p < .001$ \$100,000 to \$149,999 $0.749^{***} (0.052)$	Some college			1.485*** (0.076)
Associate's degree $1.310^{***} (0.084)$ Bachelor's degree (omitted) $p < .001$ Bachelor's degree (omitted) $0.968 (0.067)$ Post graduate $0.968 (0.067)$ Employment Status $p = .642$ Self-employed $1.063 (0.071)$ Work for employer full time $p = .364$ (omitted) $p = .364$ Work for employer part time $0.934 (0.058)$ $p = .269$ $0.974 (0.042)$ $p = .540$ $p = .540$ Annual Income $1.300^{***} (0.075)$ $p < .0001$ $$25,000$ to \$49,999 $1.358^{***} (0.069)$ $$50,000$ to \$74,999 (omitted) $p = .291$ \$100,000 to \$149,999 $0.749^{***} (0.052)$ $p < .001$ $p = .201$	-			<i>p</i> <.001
$\begin{array}{c} p<.001\\ Bachelor's degree (omitted)\\ Post graduate & 0.968 (0.067)\\ p=.642\\ \hline \\ Employment Status\\ Self-employed & 1.063 (0.071)\\ p=.364\\ \hline \\ Work for employer full time & 0.934 (0.058)\\ p=.269\\ Not working & 0.974 (0.042)\\ p=.540\\ \hline \\ Annual Income\\ Less than $25,000 to $49,999 & 1.358*** (0.069)\\ p<.001\\ \$25,000 to $74,999 (omitted)\\ \$75,000 to $74,999 (omitted)\\ \$75,000 to $149,999 & 0.936 (0.059)\\ p=.291\\ \$100,000 to \$149,999 & 0.749*** (0.052)\\ \hline \\ p<0.001\\ \$25,000 to \$149,999 & 0.936 (0.059)\\ p=.291\\ \$100,000 to \$149,999 & 0.936 (0.059)\\ p<.001\\ \hline \\ \end{array}$	Associate's degree			1.310*** (0.084)
Bachelor's degree (omitted) 0.968 (0.067) Post graduate $p=.642$ Employment Status 1.063 (0.071) Self-employed 1.063 (0.071) Work for employer full time $p=.364$ Work for employer part time 0.934 (0.058) $p=.269$ Not working Not working 0.974 (0.042) $p=.540$ $p=.540$ Annual Income $p<<0.001$ \$25,000 to \$49,999 1.308*** (0.075) $p < 0.001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p = .291$ $0.749*** (0.052)$ $p = .291$ $0.749*** (0.052)$				<i>p</i> <.001
Post graduate $0.968 (0.067)$ $p=.642$ Employment Status Self-employed 1.063 (0.071) $p=.364$ Work for employer full time (omitted) Work for employer part time 0.934 (0.058) $p=.269$ Not working Annual Income Less than \$25,000 \$25,000 to \$49,999 \$25,000 to \$49,999 \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 \$100,000 to \$149,999 \$100,000 to \$149,999	Bachelor's degree (omitted)			
$p=.642$ Employment Status Self-employed $1.063 (0.071)$ $p=.364$ Work for employer full time (omitted) Work for employer part time $0.934 (0.058)$ $p=.269$ Not working $0.974 (0.042)$ $p=.540$ Annual Income Less than \$25,000 $1.300^{***} (0.075)$ $p<0.001$ \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p<.001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p=.291$ \$100,000 to \$149,999 $0.749^{**} (0.052)$ $p<001$	Post graduate			0.968 (0.067)
Employment Status 1.063 (0.071) Self-employed 1.063 (0.071) $p=.364$ Work for employer full time (omitted) 0.934 (0.058) Work for employer part time 0.934 (0.058) $p=.269$ Not working Not working 0.974 (0.042) $p=.540$ $p=.540$ Annual Income $p<<0.001$ \$25,000 to \$49,999 1.300^{***} (0.075) $p < 0.001$ $p < .001$ \$50,000 to \$74,999 (omitted) $p = .291$ \$100,000 to \$149,999 0.749^{***} (0.052) $p < 0.001$ $p < 0.001$				p = .642
Self-employed $1.063 (0.071)$ $p=.364$ Work for employer full time (omitted) Work for employer part time $0.934 (0.058)$ $p=.269$ Not working Annual Income Less than \$25,000 \$25,000 to \$49,999 \$25,000 to \$49,999 \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 \$100,000 to \$149,999 \$100,000 to \$149,999	Employment Status			1.0(2.(0.071)
Work for employer full time $p=.364$ (omitted) 0.934 (0.058) Work for employer part time 0.934 (0.058) $p=.269$ $p=.269$ Not working 0.974 (0.042) $p=.540$ $p=.540$ Annual Income $p<0.001$ \$25,000 to \$49,999 1.300^{***} (0.075) $p < 0.001$ $p < .001$ \$50,000 to \$74,999 (omitted) $p < .001$ \$75,000 to \$99,999 0.936 (0.059) $p=.291$ 0.749^{***} (0.052) $p < 0.001$ $p < 0.001$	Self-employed			1.063(0.071)
work for employer full thite(omitted) $0.934 (0.058)$ Work for employer part time $p=.269$ Not working $0.974 (0.042)$ $p=.540$ $p=.540$ Annual Income $1.300^{***} (0.075)$ Less than \$25,000 to \$49,999 $1.358^{***} (0.069)$ \$50,000 to \$74,999 (omitted) $p<.001$ \$50,000 to \$74,999 (omitted) $p=.291$ \$100,000 to \$149,999 $0.749^{***} (0.052)$ $p < 0.001$	Work for employer full time			<i>p</i> =.304
Work for employer part time $0.934 (0.058)$ $p=.269$ $0.974 (0.042)$ $p=.540$ Annual Income $p=.540$ Less than \$25,000 $1.300^{***} (0.075)$ $p<0.001$ \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p<.001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p=.291$ $0.749^{***} (0.052)$ $p<0.001$	(omitted)			
Not working $p=.269$ $p=.269$ Not working $0.974 (0.042)$ $p=.540$ Annual Income Less than \$25,000 $1.300^{***} (0.075)$ $p<0.001$ \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p<.001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p=.291$ $0.749^{***} (0.052)$ $p<0.001$	Work for employer part time			0 934 (0 058)
Not working $0.974 (0.042)$ $p=.540$ Annual Income $1.300^{***} (0.075)$ $p<0.001$ Less than \$25,000 to \$49,999 $1.358^{***} (0.069)$ $p<.001$ \$25,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p=.291$ \$100,000 to \$149,999 $0.749^{***} (0.052)$ $p<0.001$	wonk for employer part and			p=.269
$p=.540$ Annual Income Less than \$25,000 \$25,000 to \$49,999 \$25,000 to \$49,999 \$50,000 to \$74,999 (omitted) \$75,000 to \$74,999 (omitted) \$75,000 to \$99,999 $p=.291$ \$100,000 to \$149,999 0.749^{***} (0.052) $p<0.001$	Not working			0.974 (0.042)
Annual Income $1.300^{***}(0.075)$ Less than \$25,000 $1.300^{***}(0.075)$ $p < 0.001$ $p < 0.001$ \$25,000 to \$49,999 $1.358^{***}(0.069)$ $p < .001$ $p < .001$ \$50,000 to \$74,999 (omitted) $p = .291$ \$75,000 to \$99,999 $0.749^{***}(0.052)$ $p < 0.001$ $p < 0.001$	e			p=.540
Less than \$25,000 $1.300^{***}(0.075)$ $p < 0.001$ \$25,000 to \$49,999 $1.358^{***}(0.069)$ $p < .001$ \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 $0.936 (0.059)$ $p = .291$ \$100,000 to \$149,999 $0.749^{***} (0.052)$ $p < 0.001$	Annual Income			
$\begin{array}{c} p < 0.001 \\ 1.358^{***} (0.069) \\ p < .001 \\ 1.358^{***} (0.069) \\ p < .001 \\ 1.358^{***} (0.069) \\ p = .291 \\ 100,000 \text{ to } $149,999 \\ 10.749^{***} (0.052) \\ p < 0.001 \\ 1.358^{***} (0.059) \\ p = .291 \\ 0.749^{***} (0.052) \\ p < 0.001 \\ 1.358^{***} (0.059) \\ p = .291 \\ 0.749^{***} (0.052) \\ p < 0.001 \\ 1.358^{***} (0.052) \\ p < 0.001 \\ 1.358^{**} (0.052) \\ p < 0.001 \\ 1.358^{***} (0.052) \\ p < 0.001 \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358^{**} (0.052) \\ 1.358$	Less than \$25,000			1.300*** (0.075)
\$25,000 to \$49,999 1.358^{***} (0.069) \$50,000 to \$74,999 (omitted) $p<.001$ \$75,000 to \$99,999 0.936 (0.059) $p=.291$ $p<.001$ \$100,000 to \$149,999 0.749^{***} (0.052) $p<0.001$ $p<0.001$				<i>p</i> <0.001
p < .001 \$50,000 to \$74,999 (omitted) \$75,000 to \$99,999 0.936 (0.059) $p=.291$ \$100,000 to \$149,999 0.749*** (0.052) $p < 0.001$	\$25,000 to \$49,999			1.358*** (0.069)
\$50,000 to \$74,999 (omitted) $0.936 (0.059)$ \$75,000 to \$99,999 $p=.291$ \$100,000 to \$149,999 $0.749^{***} (0.052)$ $p < 0.001$				<i>p</i> <.001
\$75,000 to \$99,999 $0.936 (0.059)$ p=.291 \$100,000 to \$149,999 $0.749^{***} (0.052)$ p<0.001	\$50,000 to \$74,999 (omitted)			0.026 (0.050)
\$100,000 to \$149,999 $0.749^{***} (0.052)$ p < 0.001	\$/5,000 to \$99,999			0.930(0.059)
$\phi_{100,000} \approx \phi_{149,999} = 0.749^{++++} (0.052)$	\$100 000 to \$140 000			p=.291 0.740*** (0.052)
	\$100,000 to \$149,999			$0.749 \cdots (0.032)$ n < 0.001
\$150,000 or more 0.621*** (0.062)	\$150,000 or more			0.621 *** (0.067)
p<0.001				p<0.001

Table 3.8 continued

Variable	Model 1	Model 2	Model 3
	OR (SE)	OR (SE)	OR (SE)
Armed Services			
Current member			4.587*** (0.548) <i>p</i> <0.001
Previous member			$1.732^{***}(0.101)$ p<0.001
Never member (omitted)			
Constant	0.054^{***} (0.003)	0.092^{***} (0.008)	0.172^{***} (0.023)
Loglikalihood	p < .001	p < .001	p < .001
Log likelillood	-12,901.201	-11,834.087	-10,795.550
Pseudo R2	0.088	0.162	0.237

Notes: N=24,103; ***p<0.001 **p<0.01 *p<0.05; Demographic controls include age, race/ethnic identity, gender, marital status, child dependency status, educational attainment, income, work status, and US armed services experience. Table 3.8 continued

3.3.4 Extension: Scarcity mindset and use of alternative financial services by household income

For Research Question 3, as an extension to the focal analysis, the analytical sample was divided into three subsamples of low income respondents, or less than \$50,000 annual income, middle income respondents, or \$50,000 to less than \$100,000 annual income, and high income, or more than \$100,000 annual income. Results for the binary logistics regression are shown in Table 3.9. We find that in each subsample, there is a significant association of alternative financial services use and the scarcity mindset. In the low income subsample, the scarcity mindset score is significant at p<0.001 and an odds ratio of 1.068 implying that a one-point scale increase in scarcity mindset increases the odds of using alternative financial services by about 7%. In the middle income subsample, the scarcity mindset score is significant at p<0.001 and an odds ratio of 1.101 implying that a one-point scale increase in scarcity mindset at one subsample, the scarcity mindset score is significant at p<0.001 and an odds ratio of 1.101

alternative financial services by about 10%. In the high income subsample, the scarcity mindset score is significant at p<0.001 and an odds ratio of 1.156 implying that a one-point scale increase in scarcity mindset increases the odds of using alternative financial services by about 16% for the high income subsample. These findings are important. Although the high income respondent are relative smaller users of alternative financial services compared to their share of the population – 19.8% of the population sample but 10.2% of the users of alternative financial services – the scarcity mindset transcends their income status and plays a significant role as it relates to alternative financial services use.

Variable	Full Model – Low	Full Model –	Full Model – High
	Income subsample	Middle Income	Income subsample
		subsample	
	OR (SE)	OR (SE)	OR (SE)
Scarcity mindset	1.068***(0.009)	1.101*** (0.012)	1.156*** (0.018)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Financial literacy	0.900*** (0.014)	0.788*** (0.017)	0.658*** (0.020)
-	<i>p</i> <0.001	p<0.001	<i>p</i> <0.001
Subjective financial knowledge	1.050** (0.017)	1.064* (0.029)	1.211 ***(0.054)
5	<i>p</i> =.003	p=.023	<i>p</i> <0.001
Willingness to take financial risk	1.090*** (0.010)	1.098*** (0.015)	1.120*** (0.024)
6	p<0.001	p<0.001	p<0.001
Difficulties in meeting monthly	*	*	*
expenses			
Not at all difficult (omitted)			
Somewhat difficult	2.024*** (0.112)	2.229***(0.163)	1.831*** (0.202)
	<i>p</i> <0.001	p<0.001	p<0.001
Very difficult	3.259*** (0.241)	3.433***(0.484)	3.353*** (0.855)
-	p<0.001	<i>p</i> <0.001	p<0.001
Demographic controls:	1	1	1
Age	0.972*** (0.002)	0.964*** (0.003)	0.962*** (0.004)
-	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <.001
Male	1.141** (0.056)	1.349*** (0.093)	1.621*** (0.162)
	<i>p</i> =.007	<i>p</i> <0.001	<i>p</i> <.001
Race/Ethnicity	*		×
White non-Hispanic (omitted)			
Black non-Hispanic	1.951*** (0.135)	1.748*** (0.187)	1.588** (0.264)
-	<i>p</i> <0.001	<i>p</i> <0.001	p = .005
Hispanic (alone/comb)	1.113 (0.082)	1.272* (0.130)	1.026 (0.171)
	p=.149	<i>p</i> =.019	p=0.878
Asia/Pacific Islander	0.707* (0.099)	0.863 (0.131)	0.615* (0.130)
	<i>p</i> =.013	p=.332	<i>p</i> =.022
Other non-Hispanic	1.387** (0.153)	1.310 (0.224)	0.725 (0.219)
-	. ,	. ,	. ,

Continued

Table 3.9 Odds ratios of binary logistic regression of AFS any usage in past 5 years on scarcity mindset and other predictors, by income subsamples -2021 data collection.

Variable	Full Model – Low	Full Model –	Full Model – High
	Income subsample	Middle Income	Income subsample
	ine onne ou obamipre	subsample	intoinit succumpit
	OR (SE)	OR (SE)	OR (SE)
Marital Status			
Married (omitted)			
Single	0.752*** (0.046)	0.947 (0.078)	1.108 (0.154)
	<i>p</i> <0.001	p = .505	p = 0.459
Separated	1.984*** (0.280)	1.754* (0.465)	0.588 (0.382)
	<i>p</i> <0.001	p=.034	<i>p</i> =.413
Divorced	1.158* (0.084)	1.383** (0.153)	1.459 (0.303)
	p=.042	<i>p</i> =.003	<i>p</i> =.069
Widowed/widower	1.119 (0.122)	1.918** (0.385)	1.147 (0.599)
	<i>p</i> =.300	p = .001	p=.793
Dependent Children	1.346*** (0.032)	1.180*** (0.034)	1.267***(0.051)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Educational Attainment			
High School, equivalent or less	2.085*** (0.151)	1.687*** (0.153)	0.955 (0.159)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> =.781
Some college	1.690*** (0.124)	1.437*** (0.120)	1.070 (0.137)
	<i>p</i> <0.001	<i>p</i> <0.001	p=.596
Associate's degree	1.497*** (0.136)	1.234* (0.128)	0.806 (0.132)
	<i>p</i> <0.001	p=.042	p=.189
Bachelor's degree (omitted)			
Post graduate	0.909 (0.134)	0.969 (0.113)	0.920 (0.104)
	p = .518	p=.787	p=.460
Employment Status			
Self-employed	1.033 (0.089)	1.034 (0.119)	1.210 (0.196)
	<i>p</i> =.703	<i>p</i> =.769	p=.238
Work for employer full time			
(omitted)			
Work for employer part time	0.909 (0.071)	1.082 (0.125)	0.786 (0.175)
	<i>p</i> =.219	<i>p</i> =.497	p=.280
Not working	0.793*** (0.046)	0.859 (0.067)	0.893 (0.120)
	<i>p</i> <0.001	p=.051	<i>p</i> =.403
Annual Income			
Less than \$25,000	1.149** (0.056)	N/A	N/A
	<i>p</i> =.004		
\$25,000 to \$49,999	omitted	N/A	N/A
\$50,000 to \$74,999	N/A	omitted	N/A
\$75,000 to \$99,999	N/A	0.956 (0.061)	N/A
		<i>p</i> =.481	
\$100,000 to \$149,999	N/A	N/A	1.002 (0.094)
¢1.50.000		NT ()	<i>p</i> =.981
\$150,000 or more	N/A	N/A	omitted

Table 3.9 continued

Variable	Full Model – Low	Full Model –	Full Model – High
	Income subsample	Middle Income	Income subsample
	L	subsample	Ĩ
	OR (SE)	OR (SE)	OR (SE)
Armed Services			
Current member	2.217*** (0.437)	4.015*** (0.948)	4.290*** (1.157)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Previous member	1.467*** (0.129)	1.669*** (0.170)	1.496** (0.198)
	<i>p</i> <0.001	<i>p</i> <0.001	p = .002
Never member (omitted)	-	-	-
Constant	0.254*** (0.043)	0.254*** (0.060)	0.161*** (0.059)
	<i>p</i> <0.001	<i>p</i> <0.001	<i>p</i> <0.001
Log likelihood	-6194.925	-3355.951	-1734.438
Pseudo R2	0.189	0.242	0.350
N (subsample)	11,270	7,910	5,169

Notes: N=24,349 (full sample); ***p<0.001 **p<0.01 *p<0.05; Demographic controls include age, race/ethnic identity, gender, marital status, child dependency status, educational attainment, income, work status, and US armed services experience; Low income: less than \$50,000; Middle income: \$50,000 to \$99,999; High income: \$100,000 or more.

Table 3.9 continued

3.4. Discussion

This study uses a behavioral economic framework – the scarcity mindset framework – to contribute new insights into the mechanisms underlying alternative financial services usage. We use recent survey data from the 2021, and then by extension 2018, National Financial Capability Study State-by-State Survey Instruments. Specifically, the study explores differences, using comparison *t*-tests and Chi-Square tests, between respondents that have and have not used alternative financial services within the previous 5 years of the respective survey. Previous research explored the scarcity mindset and its relationship to financial avoidance (Hilbert et al., 2022b) and temporal discount rates, for example (Hilbert et al., 2022a); however, this research expands current knowledge to address the scarcity mindset and its relationship to risky consumer financial decision-making.

Historically, alternative financial services usage, understandably, has been analyzed from the standpoint of those that are low- and moderate-income individuals and it is well documented that these individuals, tend to be the dominant users of these products and services: one study shows that about 5.5% of all adult Americans have borrowed money using a payday loan, but usage is skewed toward lower income, less educated people with, for example, 11% alternative financial services usage among those earning between \$15,000 and \$25,000 vs. 3% alternative financial services usage among those earning between \$75,000 and \$100,000 (Pew Research Center, 2012). The profile is similar for those using car title loans (Pew Research Center, 2015). Real financial challenges are significantly related to usage of alternative financial services, and in this study respondents' difficulties around meeting monthly expenses, was a strong predictor of alternative financial services usage.

However, much research has been done around the profiles and characteristics of alternative financial services users, less attention has been focused on the behavioral and psychological predictors and explanatory variables. The analysis of a national sample found that even after controlling for the objective need for money and liquidity, individuals with low objective knowledge measured by the financial literacy score and at the same time high subjective financial knowledge measured by the individual's self-assessment, are significantly more likely to use alternative financial services (Robb et al., 2015). Other factors besides socio-demographics are also significantly related to usage, such as financial literacy (Lusardi & de Bassa Scheresberg, 2013) and financial education (Harvey, 2019).

This study shows that even controlling for difficulties in meeting monthly household expenses and other factors, such as income, in 2021, the presence of the scarcity mindset is significantly related to an increase in alternative financial services usage. In the 2021 data analysis, demographic and socioeconomic variables provide a mix of explanations for alternative financial services usage. These findings suggest that behavioral mechanisms are significant in helping explain irrational and imprudent financial mistakes. Understandably, much of the emphasis on alternative financial services usage revolves around the poor; however, the explanatory significance of the scarcity mindset suggests that other mechanisms are at play independent and in addition to objective financial scarcity.

The study has several limitations. First, the scarcity mindset questions used in this study were not couched in the surveys as being about *scarcity*. We used feedback from other important economic and social science researchers to validate the use of the three NFCS questions as proxies for a scarcity mindset. In the future, data could be collected and analyzed experimentally with more explicit scarcity mindset questions, such as using the Psychological Inventory of Financial Scarcity (PIFS) which has been evaluated to be a valid and reliable measurement instrument that captures underlying components of the scarcity mindset, such as objective financial scarcity, perceived lack of control over financial affairs, ruminations and worries about finances, and short-term focus (Van Dijk et al., 2022). Second, The financial scarcity mindset and objective financial scarcity – measured by difficulties in covering monthly expenses -- are indeed strongly correlated (r = -0.629, p = .000). Third, the survey questions about alternative financial services usage was based on any activities as far as 5 years back from the survey, yet the scarcity questions were inferred to be contemporaneous which can create some distortion in the findings.

There are numerous opportunities for future research. For example, there is a wave of relatively new instruments to enhance the measurement of the scarcity mindset that could be used in surveys and experiments, including the Psychological Inventory of Financial Scarcity (PFIS) (Van Dijk et al., 2022), the Perceived Scarcity Scale (DeSousa et al., 2020), and the Perceived Economic Scarcity Scale (PESS) (Auger et al., 2024).

Also, the development of alternative financial services is not static. For example, in 1994, Caskey documented the use of fringe banking services – pawn shops and check-cashing outlets – especially on those in poverty, and subsequently he documented and analyzed the slowdown in pawn shop activities in concert with the rise in payday lending (Caskey, 2005). Since 2019, another alternative financial service has grown in popularity: the buy now, pay later product. Demographically, there are similarities with other users of alternative financial services with the dominant users being 18 to 35 years of age, income of more than \$70,000, and Black or Hispanic. Despite that the fact that users tend to make payments on time, compared to non-users they were more likely to have experienced a financial disruption (60.1% vs. 48.1%), more likely to have used a financial strategy to cope with monthly expenses (79.2% vs. 66.2%), more likely to have concerns about covering monthly expenses in the coming 7 to 12 months (48.1% vs. 31.5%), and more likely to take on debt or sell a personal item to cover a \$400 expense (52.0% vs. 30.5%) (Akana & Li, 2022). Perhaps an interesting application for the scarcity mindset.

Chapter 4. Procrastination and Oral Health

4.1 Introduction

Studies have shown that many people in the U.S. do not engage in healthy behaviors such as eating a healthy diet and getting regular medical and dental checkups. In the case of oral health care behaviors, this has occurred despite individuals being aware of associated risks, such as heart disease, Type II diabetes, and edentulism (Liu Yong et al., 2016). Research has been conducted and models created on a range of related aspects, from models to explain the utilization of health care (Andersen, 1968; Lederle et al., 2021) to psychological explanations such as self-regulatory process models (Schwarzer). Within this spectrum lies procrastination which is often defined as the voluntary delay by a person of actions - activities, chores, and or tasks – *even* in recognition of costs and deleterious consequences sometime in the future (Akerlof, 1991; Pychyl, 2013; Sirois & Pychyl, 2016).

While these delays are behavioral, in the literature the perspective on these delays – procrastination -- takes on a mostly psychological explanation -- such as the failure of self-regulation with the present self being given preference over the future self especially in the context of tasks that are viewed aversively (Pychyl, 2013; Sirois & Pychyl, 2016). Procrastination is also explained using the economic concept of time preference (also referred to as temporal discounting) where there is a mismatch between salient present

costs and future benefits (Akerlof, 1991); this economic explanation is rooted in the discounted utility model and the determination of individual personal discount rates (Frederick et al., 2002) From both perspectives, there is a temporal or time inconsistency component, and the consequences have been documented in many domains such as diet, exercise, health care, savings, and retirement planning (Akerlof, 1991; Brown & Previtero, 2014; O'Donoghue & Rabin, 1999; Sirois & Pychyl, 2016).

Health care behavior in general has been analyzed through the lens of rational theory, such as the Grossman Model (Grossman, 1972), the Health Belief Model, and the Theory of Planned Behavior (Chapman, 2019). Health care behavior has also been analyzed using a psychological model, and it is the approach taken for this study.

It is well established that globally and, of relevance to this study, in the United States, oral diseases are widespread across income levels. Worldwide oral disease affects nearly 3.5 billion people, but treatment is expensive and usually not part of universal health care coverage. This situation exists despite the fact that many risk factors are modifiable such as sugar consumption, tobacco usage, alcohol consumption, and poor hygiene (Satcher & Nottingham, 2017).

In the U.S., "nonreceipt of needed care [dental] during the past 12 months due to cost" has gone up in aggregate (8.6% in 1997 to 14.7% in 2019), adults 18 to 65 (10.6% to 18.6%), adults 65 and older (3.5% to 13.3%), White only (10.6% to 17.4%), Black or African American only (10.8% to 22.5%), Hispanic or Latino (11.5% to 26.1%), to name a few categories. These have gone down for those 18 or younger (6% to 4.1%) (Statistics, 2023).

Social determinants of Health (SDoH) negatively and disproportionately affect the poor and the vulnerable, and in the case of oral health these SDoH include lack of access to dental care and services as well as poor living conditions that affect this population, such as access to fluoridated water (Health, 2021). Compared to medical health insurance access, access to dental health care insurance varies more widely in the U.S. For example, basic Medicare does not generally cover oral/dental care for adults 65 years or older (Government, 2024), and Medicaid covers oral/dental care for low-income Americans on a state-by-state basis (3 states offer no coverage, 28 offer limited and/or emergency coverage, the rest offer extensive coverage) (Statistics, 2023).

Much of the work to date around procrastination in the health care and maintenance behavior space, including dental care, has relied on small-scale experiments often in a university setting, outside the United States. There is limited research that analyzes and compares procrastination in the context of dental care and other health maintenance behaviors. In this paper we use Health and Retirement Study (HRS) health care behavioral data to examine the role that procrastination plays in older Americans' decisions about dental care and whether these decisions are consistent with those for other health behaviors.

4.1.1 Procrastination and health care and maintenance behaviors (including oral health) Research work has been done on the connection between overall health and procrastination and has shown that procrastination can be a risk factor for developing poor health (Sirois & Pychyl, 2016). Less work, however, has been done on the connection between oral/dental health care and procrastination.

There is extensive research in the psychology literature about procrastination which resulted in different scales to measure procrastination. Early work by Lay resulted the Decisional Procrastination Questionnaire (DPQ), the General Procrastination Scale (GPS), the Adult Inventory of Procrastination (AIP), the Procrastination Assessment Scale – Student (PASS), the Tuckman Procrastination Sale, and, more recently, the Pure Procrastination Scale (PPS) (Steel, 2010). This research that resulted in the PPS sought to distill the essence of procrastination and to create, validate and test a scale informed by research into earlier scales. Furthermore, in this research Steel corroborated that procrastination was a dysfunctional, irrational phenomenon (Steel, 2010).

Two research studies by Tice & Baumeister examined the costs and benefits of procrastination in the context of academic performance and health. In their first study, health psychology students (n = 44) were administered Lay's General Procrastination Scale early in the semester, and students tracked their daily stress levels. At the end of the semester, students' decision to delay or not on the submission of a term paper (which was allowed) were analyzed in the context of their procrastination tendencies and stress. They found that procrastinators had significantly lower grades than non-procrastinators. They also found that procrastinators experienced significantly more stress than non-procrastinators. In the second study, they replicated and administered Study 1 to another group of students (n = 57) as Study 2 and, additionally, re-administered questionnaires closer to the end of the semester and asked about actual visits to the student health care

center. As with Study 1, the relationship between being a procrastinator and turning in the paper late and having lower grades was significant. Most interestingly (according to the authors), procrastinators had benign reports of stress and health visits early in the semester, but more stress and health care center visits at the end of the semester (Tice & Baumeister, 1997).

In one early study, researchers conducted a survey with university students (n =122) to assess the mediation of stress, treatment delays, and wellness health care behaviors between procrastination and illness. They administered Lay's General Procrastination Scale, the Hassles Scale, the Wellness Behavior Checklist, a Brief Medical Treatment and History questionnaire, and the NEO Personality Inventory to measure the Five Factor Model of Personality. They used a "process analysis" to study the mediation effects of stress, treatment delays, and wellness health care behavior. They found that procrastinators were found to experience more stress which was associated with higher experiences of illness. They found that procrastinators delaying treatment was not associated with stress, but found that procrastinators were associated with performing fewer health care wellness behaviors (Sirois et al., 2003). In a follow-up to this study, researchers replicated the 2003 study using adults from the local community around Windsor, Ontario and the internet (n = 254). Similar to the previous study, using a structured equation model (SEM) the study showed that procrastinators had higher stress, more health problems, and engaged in fewer wellness health care behaviors, and that stress was a mediator in the procrastination – health connection (Sirois, 2007).

In another study at the University of Western Ontario, researchers explored how procrastination and stress can predict mental health care behaviors. They drew participants from undergraduates (n = 200), and they administered the following scales: Lay's General Procrastination Scale, Solomon & Rothblum's Procrastination Assessment Scale for Students, Holm & Holroyd's Daily Hassles Scale-Revised, and Veit & Ware's Mental Health Inventory. They performed "canonical" correlation analysis to measure the relationships, and found strong relationships between procrastination and poorer mental health, greater procrastination with fewer mental health care behaviors, and higher stress and poorer mental health; they did not find a significant relationship between greater stress and fewer mental health care behaviors (Stead et al., 2010).

There is limited research connecting procrastination and oral/dental health care behaviors, and most of the studies that have been done used small, non-diverse samples. This research includes the following works. In one study, researchers in Germany conducted an on-line survey among Germans 18 years of age and older (n = 341) to examine the relationship between procrastination and oral/dental health behavior and to explore the effects of dental anxiety and self-compassion . They used multiple scale instruments: Klingsieck and Fries' General Procrastination Scale, Neff's Self-Compassion Scale, and the Kleinknecht et al Dental Fear Survey. Using hierarchical multiple regression, they found that dental anxiety had a statistically significant negative relationship with dental attendance, and found that including procrastination had a negative relationship to dental attendance and was statistically significant , but selfcompassion was not (Rapoport et al., 2023). In another study among first-year undergraduates (n = 164) at the UiT The Arctic University of Norway, a team of researchers recorded information about dental care habits, anxiety over going to the dentist, procrastination, and oral health efficacy. They administered the following instruments: the Irrational Procrastination Scale, the Modified Dental Anxiety Scale, the Perceived Stress Scale, and the Oral Health Self-Efficacy Scale, Using correlation and logistics regression analysis, they found significant explanatory relationships between oral/dental care behavior and dental anxiety, perceived stress, and oral health self-efficacy, but they did not find a significant relationship with procrastination (Steinvik et al., 2023).

Researchers at the University of Latvia conducted a survey using snowball inperson sampling and interviews (n = 48) to study of relationship between procrastination and health care behaviors – including dental visits -- among men aged 35 to 44 years old. They conducted "thematic analyses" to explore underlying explanations for procrastination. They found in reviewing the results that there were three categories of explanation for procrastination: the nature of the task itself (such as effort required and unpleasantness), their personality traits (such as being impulsive or conscientious), and discounting/time perception (Silkane & Austers, 2017).

A group of researchers at Kyushu Dental University (Japan) performed a study to examine the relationships between a person's personality traits and procrastination tendencies with the person's timing on seeking oral/dental care. They recruited 599 undergraduate students across four universities in two Japanese cities (ultimately n =549). Among the students recruited, there were health science students including students who were studying dentistry. They administered Lay's General Procrastination Scale and the Ten Item Personality Inventory. In their analysis, the researchers used a "kernel density estimation" to classify participants as either procrastinators or nonprocrastinators, and they used "Bayesian network analysis" to examine relationships between personality traits and procrastination with delays to visiting the dentist. They found that procrastination tendencies are associated with oral/dental care delays, and found that agreeableness (as a personality trait) was associated with (acute) dental care delays (Hoshino et al., 2023).

Lastly, a group of researchers conducted a systematic worldwide literature review on procrastination during the COVID-19 pandemic and lockdown. Using their search criteria around four areas of procrastination – academic, work, daily life, and health behavior – they narrowed their detailed analysis to thirteen papers. These papers mostly covered academic, and some daily life, procrastination, and the relationship to individual mental and emotional states. One paper did show that adult individuals across a host of countries (not the U.S.) that did not keep a regular schedule and engaged in procrastinating behaviors experienced more distress than those individuals that did not engage in procrastinating behaviors (Unda-López et al., 2022).

4.1.2 Time preference and health care and maintenance behaviors (including oral health)

Time preference is often analyzed in terms of temporal inconsistency (or time discounting) which in economic terms refers to the valuation of present versus future activities or goods or behaviors inconsistently comparatively as opposed to consistently,

and it is rooted is discounted utility theory (Frederick et al., 2002). The literature is rich and extensive, and in this section, we will focus on time preference and temporal inconsistency and health care and maintenance behaviors.

In an early study researchers used a questionnaire among a company's employees (N = 412) to examine the relationship between time preferences (monetary and nonmonetary) and acceptance of a flu vaccine offered at the company's site. They found that time preferences were weakly related to vaccination acceptance, with monetary time preference showing the strongest relationship. Other predictor variables (such as selfevaluation of vaccine effectiveness and having previously received the vaccine) had much higher explanatory value (Chapman & Coups, 1999).

In another study, researchers conducted two experiments among college undergraduates (N = 70 and N = 34, respectively) to examine and compare subjective discount rates implied for health outcomes and money looking at domain implications, magnitude effect or size of the item being discounted (i.e., amount of money, health matter), and dynamic inconsistency or the duration and attributes of the delay. They used ANOVA to analyze the results. They found that the magnitude effect and dynamic inconsistency held across the domains of health and money, although the discount rates were higher albeit internally consistent between domains, suggesting a domain effect.(Chapman & Elstein, 1995).

In another study, Chapman conducted a similar study among undergraduate students and non-students conducting two experiments. In Experiment 1 there were 122 students and 103 community residents (N = 225), and it was conducted to determine if

tradability for medical treatment resulted in discount rates that were correlated to money discount rates. In Experiment 2 there were 179 students and 191 individuals at a local airport (N = 370), and it was a replication of the first experiment except that it was conducted to determine if the participant were put in the role of a policymaker (i.e., making a determination for a group) affected discount rates and relationships. They found that discount rates were more highly correlated and significant when the health outcome, similar to money, was viewed as tradable, unrelated to whether the individual took on a policy perspective, but they also found that tradability resulted in lower discount rates and higher matching discount rates between health and money. These were not significantly correlated to the individual being in the policymaker role (Chapman, 2002).

Bradford (2010) used the 2004 Health and Retirement Study Survey and Experimental Module 2 – Annuities, to examine the relationship between a person's individual discount rate and preventative health care behaviors including: dental visit, flu shot, regular vigorous exercise program, cholesterol test, prostate exam (men), pap smear, mammogram, and clinical breast examination (last three, women). It should be noted that there were three time-preference questions (presented as prize-winning scenarios), and he made inferences using these three responses. Further, he used a "two-stage regression" with a "two-stage residual inclusion technique" and "probit". He found that individuals with a high discount rate – which he calculated to be 33.5% in the upper 20th percentile -were significantly less likely to have had a mammogram and pap smear (women), prostrate exam (men), dental visit, cholesterol test, flu shot, and be a regular vigorous exerciser in the past two years or since the previous HRS wave (Bradford, 2010).

4.1.3 The importance of oral health

According to the 2021 report released by the National Institutes of Health (NIH), "oral health is essential to overall health and well-being" (National Institutes of Health, 2021). However, the state of oral health, in the United States and across the globe, is uneven, and according to the World Health Organization, "oral diseases are a major public health problem for countries and populations worldwide, although they often are not publicly recognized as such" (WHO, 2022). The direct risks and impacts of oral disease – such as, caries of deciduous and permanent teeth, periodontal disease, edentulism, lip cancer and oral cavity cancer – include pain and discomfort, functional limitations, missed work/school, cost of treatment, lost work productivity, reduced selfesteem, and social isolation (WHO, 2022). In addition, research has shown interrelationships (although not necessarily causality) between oral health and general health, such as an association between: "severe periodontal disease and diabetes mellitus"; "severe periodontal disease and cardiovascular disease", "cerebrovascular disease and chronic obstructive pulmonary disease" (WHO, 2022).

In the United States, oral health care spending is significant. In 2021, spending on dental services were close to \$162 billion out of total US health care spending of \$4.3 trillion, or approximately 4%. Notably, whereas 2021 out-of-pocket expenditures for medical goods and services represented about 10% of medical expenditures -- and this is likely overstated by dental services (CMM, 2021) -- 2021 out-of-pocket expenditures for dental services represented about 39% of total dental service expenditures.

Predicting oral health care decisions has been linked to a range of factors. In a recent study, the researchers used the Behavioral Model of Health Services Use framework in a dental care application, to estimate predictors of U.S. adults having a dental visit within 5 years and having lost teeth. It used the 2018 U.S. Behavioral Risk Factor Surveillance System (BRFSS) and, after removing incomplete records, ended up with a sample of 155,060 adults. The study focused on selected predisposing and enabling factors, with no behavioral factors, as well as derived Medicaid state dental coverage. They found that age and gender were the strongest predictor of reported dental visits in the past five years (Gaskin et al., 2022).

4.1.4 Theoretical background

Many models have been put forth to help explain health care behavior. These include: the health belief model, the theory of planned behavior, the theory of reasoned action, protection motivation theory, and expected utility theory (EUT) (Chapman & Elstein, 1995; Weinstein, 2007). Other than EUT, these are rooted in psychology. In her experiments around time preferences and health care behaviors, Chapman measured her findings against discounted utility theory, although she approaches this as a psychologist. Others have used a behavioral framework to analyze health care mistakes (Stefanescu Schmidt et al., 2017). Yet another psychological model is the health action process approach (Schwarzer, 1999). Related specifically to procrastination, the procrastinationhealth model describes the direct path between procrastination and stress and health outcomes, and an indirect path between procrastination and health care behaviors (such as delay of treatment) and health outcomes (Sirois et al., 2003).

For this study, we use a psychological framework to address research questions, specifically Andersen's Behavioral Model of Health Services Use (BMHSU). The original form of BMHSU, developed in 1968, is a three stage model in which a family's use of health services¹ is predicted by predisposing factors (such as age, gender, family size, social structure, and beliefs about health care), enabling factors (such as income, health insurance, and availability of services), and need (i.e., a perceived/recognized need for health care services) (Andersen, 1968). The model has been developed and has evolved over time and is still well cited as a health care use model; the main components are still in place with a recent version displayed further down in the second figure; this model was expanded to include contextual characteristics, individual characteristics, individual health care behaviors, and outcomes (Andersen, 1995; Lederle et al., 2021). This framework was selected for three reasons. First, it focuses on behavior and decisions, not necessarily on a health outcome itself which corresponds to going to the dentist or not as opposed to long-term dental health outcomes. Second, earlier research on the model noted psychological factors as candidates for inclusion as predisposing factors (Andersen, 1995), and given the psychological nature of procrastination, it fits within the Andersen Behavioral Model as a predisposing factor. Third, Gaskin's approach serves as a example using the Behavioral Model of Health Services Use framework specifically to estimate a dental visit. (Gaskin et al., 2022). A simple version of this study's model

¹ Anderson's 1968 PhD Dissertation at Purdue used the family as the decision-making unit.

framework, using the Andersen framework informed by Gaskin's study, is shown in Figure 4.1. As is shown, within Andersen's behavioral framework, the individual exists within a particular environment that affects behaviors and outcomes, such as the country (or state's) health care system. This study does not address these macro factors. Within the population, individuals' behaviors and outcomes are affected by enabling factors – such having dental insurance coverage, or not - and by predisposing factors such as gender, race, and education. As Andersen contemplated, psychological factors – such as procrastination – fit within predisposing factors. The environment and population attributes help determine an individual's health care behaviors, such as practices (e.g., flossing) and use of health care services (e.g., going to the dentist). These all in turn contribute toward an individual's health outcomes, such as their actual or perceived status and satisfaction as patients (or even, customers). Included are feedback loops where outcomes affect population attributes like predisposing factors and actual health behaviors. This study's model does not have access to data to adequately test for outcomes and satisfaction, but it is posited that certain aversive tasks – such as going to the dentist – could explain the variation in the effect of procrastination on the actual health care maintenance behavior.

We test the model by analyzing data from the 2020 Health and Retirement Study and Experimental Module 2 – Long Term Care Insurance Procrastination, which includes specific procrastination questions related to how people make decisions; the questions were sourced from the Pure Procrastination Scale (Health & Study, 2020; Steel, 2010). The core hypothesis is: H1: Procrastination as measured by the total procrastination score decreases the likelihood that an individual will have visited the dentist in the previous 2 years or since the last survey wave.

As a follow-on, we use the model to examine the effect of procrastination on other health

care maintenance behaviors (e.g., mammograms), and test the following hypothesis:

H2: Procrastination as measured by the individual's total procrastination score decreases the likelihood that an individual will have engaged in task aversive health care maintenance behaviors (e.g., engage in regular vigorous exercise) in the previous 2 years or since the last survey wave.



Figure 4.1 Proposed model for dental visit

4.2 Method

4.2.1 The HRS data

In this study, we used the University of Michigan's Health and Retirement Study

(HRS) by accessing datasets created by the Rand Center for the Study of Aging. The

HRS survey is a longitudinal survey that began in in 1992, and it is a representative sample of approximately 20,000 people in the United States. It surveys people over the age of 50 and is conducted every two years. (It should be noted that the HRS contains respondents of age 50 year or younger because the household is treated as a unit, and an age-eligible respondent's spouse or cohabitation partner are included and may be younger.) Its main survey collects information related to physical and mental health, insurance, financial status, family systems, work status, and retirement planning. In addition to the main panel of survey questions, the survey also includes experimental modules. These modules are administered to respondents at the end of the main interview, designed to be only several minutes in length, and cover topics that can be new or topics that elaborate on or probe more deeply into topics from the main survey. Each experimental module is targeted to be a 10% random sample of the core survey although the range varies. In a particular survey wave, a respondent only receives one experimental module.

This study uses the Rand HRS 2020 Longitudinal file which contains 42,406 observations collected from surveys dating back to 1992. In 2020 there were a total of 15,723 respondents, and in addition to the main set of questions, the 2020 survey year includes additional experimental modules. This study uses information from the 2020 Long term care insurance procrastination experimental module (for HRS 2020 Module 2 questions, see Appendix D) which contains data from 1,227 respondents. This module is divided into two sections. The first section contains five questions that cover the respondent's experience with long term care insurance. The second section poses

questions meant to measure procrastination, identical to Steel's Pure Procrastination Scale (PPS). To arrive at the final sample set, using unique respondent identifiers (HHIDPN) we merged the 2020 Rand HRS Longitudinal file containing current and previous survey individual responses, with the 2020 HRS Fat file containing experimental module responses in 2020. Furthermore, The sample used the longitudinal respondent data (e.g., saw dentist in 2020? Saw dentist in 2018?) and data from the 2020 Core Survey and Experimental Module (e.g., procrastination survey responses). We used listwise deletion for respondents that did not provide a substantive response (e.g., don't know, or refused to answer), and this resulted in a main analytical sample size of 1,217.

4.2.2 Outcome variables

Main outcome variable

Saw dentist. This question is contained in the 2020 Core Survey. Respondents were asked whether since the last wave or in the last two years "have you seen a dentist for dental care, including dentures?" Response options were "1" or "Yes" or "5" or "No". This exact question is contained in the 2018 Core Survey and was used for subsequent analysis.

Alternative outcome variables

These variables represent responses to questions contained in the 2020 Core Survey. *Preventative flu shot*. Respondents were asked whether since the last wave or in the last two years "did you have flu shot?" Response options were "1" or "Yes" or "5" or "No". *Cholesterol test.* Respondents were asked whether since the last wave or in the last two years "did you have a blood test for cholesterol?" Response options were "1" or "Yes" or "5" or "No".

Vigorous exercise. Respondents were asked "How often do you take part in sports or activities that are vigorous, such as running or jogging, swimming, cycling, aerobics or gym workout, tennis, or digging with a spade or shovel? Respondents were provided several responses from "more than once a week" to "hardly ever or never." For this study, we created a dichotomous variable with "1" for any vigorous activity during the month and "0" for all others.

Mammogram/breast x-ray. Respondents were asked whether since the last wave or in the last two years "did you have a mammogram or x-ray of the breast, to search for cancer?" Response options were "1" or "Yes" or "5" or "No".

Prostate exam. Respondents were asked whether since the last wave or in the last two years "have you had a PSA blood test or other examination to for cancer?" Response options were "1" or "Yes" or "5" or "No".

Lost permanent teeth. Respondents were asked whether or not since the last wave or in the last two years "Have you lost all of your upper and lower natural permanent teeth?" Response options were "1" or "Yes" or "5" or "No". This variable is viewed in context of the respondent's historical health record which tracks loss of permanent teeth.

4.2.3 Predictor variables

Procrastination Measures. These include twelve statements/questions contained in the 2020 Module 2 Long term care insurance procrastination survey. For each of the twelve statements respondent were asked "Do you strongly disagree, tend to disagree, neither agree nor disagree, tend to agree, strongly agree?" The statements were: (1) "I delay making decisions until it's too late." (2) "Even after I make a decision, I delay acting upon it." (3) "I waste a lot of time on trivial matters before getting to the final decisions." (4) "In preparation for some deadlines, I often waste time by doing other things." (5) "Even with jobs that require little else except sitting down and doing them, I find that they seldom get done for days." (6) "I often find myself performing tasks that I had intended to do days before." (7) "I am continually saying 'I'll do it tomorrow."" (8) "I generally delay before starting on work I have to do." (9) "I find myself running out of time." (10) "I don't get things done on time." (11) "I am not very good at meeting deadlines." (12) Putting things off until the last minute has cost me money in the past." A procrastination score was determined by adding all responses for the twelve questions resulting in an aggregate procrastination score between 12 and 60 (with a higher score corresponding to greater procrastination tendencies). Each of the twelve questions has its own procrastination score.

Dental coverage. Respondents were asked, "Do you have any insurance that covers dental bills?" Response options were "1" or "yes" or "5" or "no". The 2020 and 2018 responses were used.

The following variable was switched with *Dental coverage* for alternative health care behaviors:

Has medical insurance coverage. This dichotomous variable was computed based on those respondents that responded that they held at least one private plan and/or Medicare coverage (yes/no).

4.2.4 Control variables

Sociodemographic variables. These 2020 variables include age, gender (dichotomous - male, female), race/ethnicity (categorical - white/Caucasian, black/African American, other), age, log income, and education (categorical - less than high school, GED, high school graduate, some college, college and above). 2018 survey data was used for age and log income.

4.2.5 Empirical Model

Main model – Saw dentist

Using an approach like Gaskin's, we used logistic regression with having seen the dentist as the dependent or outcome variable. In this paper's analysis, the following regression in general logistic regression form is used:

$$\log(\frac{P(Saw \ Dentist=1)}{1-P(Saw \ Dentist=1)}) = \beta_0 + \beta_1 Sociodemographic \ Controls + \beta_1 Sociodemograp$$

β_2 Dental Coverage + β_3 Procrastination + ε

Three formulations of the regression were tested. In the first stage, the respondent's total procrastination score was used as the sole predictor variable. sociodemographic controls were used. In the second stage we added the dichotomous dental coverage variable as

another predictor. sociodemographic controls and dental coverage were used. In the third stage, sociodemographic control variables were included.

Comparison model with alternative predictor variable and various individual

alternative outcome variables

As a comparison to other health care maintenance behaviors, we used identical logistic regression approach alternative outcome variables in place of the saw dentist variable. These included: flu shot, cholesterol test, mammogram (women), prostate exam (men), and vigorous exercise. In this paper's analysis, the following regression in general logistic regression form is used:

$$\log(\frac{P(Alt \ Outcome=1)}{1-P(Alt \ Outcome=1)}) = \beta_0 + \beta_1 Sociodemographic \ Controls + \beta_1 Sociodemograp$$

β_2 Medical Insurance + β_3 Procrastination + ε

These alternative scenarios were run for the full model and included total procrastination score, medical insurance coverage (in place of dental coverage), and sociodemographic control variables.

Full model for 2018

As a robustness check, the full model was run using the respondents' 2020 procrastination scores as well as 2020 gender, race/ethic identity, and education to estimate the probability of having seen the dentist in 2018 as captured in the 2018 Core Survey. Survey wave-specific variables were also used: for 2018, age, log income, and dental coverage.

Extension: Full model with health outcome for 2020

As depicted in the proposed conceptual health behavior model in Figure 1, the Andersen model includes actual health outcomes along with health behaviors. Gaskin et al study and logistic included *having lost at least one permanent tooth* as a health outcome variable. For our study Models 1 - 3 were run with lost all permanent teeth as the dichotomous outcome variable.

4.3 Results

Table 4.1 displays descriptive statistics for the main and alternative outcome variables, procrastination score (the focal predictor variable), and other predictor variable, for the 2020 Module 2 subset and the entire 2020 core survey (except for the procrastination score which is not applicable). The core survey and Module 2 samples are very similar with some slight differences. For example, 63.7% of the core survey sample saw the dentist in the previous 2 years or since the last wave, compared to 67.5% in the Module 2 smaller sample.

The comparison of mean procrastination scores among predictor variables are shown in Table 4.2. For the main predictor variable, *Saw Dentist*, the mean procrastination score was significantly lower among those that saw the dentist compared to those that did not see the dentist (M = 27.269, SE = 0.381 vs M = 31.174, SE = 0.617, p < .001). For the alternative predictor variables, the mean procrastination scores were significantly lower among those that had a cholesterol test (M = 28.180, SE = 0.362, vs M = 29.859, SE = 0.812), p < .05), those that participated in vigorous exercise anytime during the month (M

= 26.259, SE = 0.441 vs M = 30.519, SE = 0.472, p < .001), and women who had a

mammogram (M = 27.955, SE = 0.489 vs M = 30.733, SE = 0.846, *p* < .01).

Variable	HRS Core Sample 2020	HRS Module 2 Subsample
	Frequency(%) or Mean (SD)	Frequency(%) or Mean (SD)
N 2020 (2018)	15,723 (14,124)	1,217
Gender		
Male	6,389 (40.6%)	456 (37.5%)
Female	9,334 (59.4%)	761 (62.5%)
Race/Ethnic identity	, , , ,	
White/Caucasian	10,288 (65.7%)	837 (68.8%)
Black/African American	3,466 (22.1%)	271 (22.3%)
Other	1,905 (12.2%)	109 (9.0%)
Education attainment		
Less than high school	2,429 (15.5%)	160 (13.1%)
GED	823 (5.2%)	56 (4.6%)
High school graduate	4,083 (26.0%)	312 (25.6%)
Some college	4,265 (27.1%)	343 (28.2%)
College and above	4,119 (26.2%)	346 (28.4%)
Age 2020	68.09 (10.85)	67.54 (10.29)
Age 2018	66.34 (10.80)	65.88 (10.16)
Log Income 2020	10.74 (1.11)	10.82 (1.08)
Log Income 2018	10.70 (1.19)	10.80 (1.18)
Dental coverage 2020		
No	7,242 (46.9%)	555 (45.6%)
Yes	8,188 (53.1%)	662 (54.4%)
Dental coverage 2018		
No	6,897 (48.8%)	533 (48.1%)
Yes	7,227 (51.2%)	576 (51.9%)
Medical insurance 2020		
Yes	1,309 (8.5%)	99 (8.1%)
No	14,168 (91.5%)	1,116 (91.9%)
Medical insurance 2018		
Yes	1,201 (8.5%)	85 (7.7%)
No	12,941 (91.5%)	1,020 (92.3%)
Saw dentist 2020/prev 2 years		
No	5,640 (36.3%)	396 (32.5%)
Yes	9,906 (63.7%)	821 (67.5%)
Saw dentist 2018/prev 2 years		
No	4,928 (34.7%)	353 (31.7%)
Yes	9,266 (65.3%)	760 (68.3%)
Lost natural permanent teeth 2020		
No	13,142 (85.5%)	1,029 (86.4%)
Yes	2,234 (14.5%	162 (13.6%)
Flu shot 2020		
No	4,955 (31.6%)	377 (31.1%)
Yes	10,728 (68.4%)	837 (68.9%)
		Continued

Table 4.1 Descriptive statistics.

Variable	HRS Core Sample 2020 HRS Module 2 Subsa	
	Frequency(%) or Mean (SD)	Frequency(%) or Mean (SD)
N 2020 (2018)	15,723 (14,124)	1,217
Cholesterol 2020		
No	3,124 (20.1%)	227 (18.8%)
Yes	12,414 (79.9%)	979 (81.2%)
Vigorous exercise at all during		
month		
No	8,663 (55.5%)	640 (53.0%)
Yes	6,951 (44.5%)	567 (47.0%)
Mammogram		
No	3,045 (32.7%)	225 (29.6%)
Yes	6,255 (67.3%)	535 (70.4%)
Prostate exam		
No	2,402 (38.4%)	163 (36.3%)
Yes	3,860 (61.6%)	286 (63.7%)
Procrastination score (12-60,low-	N/A	28.54 (11.52)
high)		

Table 4.1 Cor	um	iea
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Tables 4.3 and 4.4 show correlations among having seen the dentist in 2020 and procrastination score and having dental coverage, and among the alternative outcome variables and procrastination score and having medical coverage, respectively. Having seen the dentist is significantly correlated with the procrastination score (r = -0.159, p < .001) and dental coverage (r = 0.223, p < .001). Having received a flu shot is significantly correlated with having medical coverage (r = 0.206, p < .001). Having had a cholesterol test is significantly correlated with the procrastination score (r = -0.057, p < .05) and having medical coverage (r = 0.155, p < .001). Having engaged in vigorous exercise during the month is significantly correlated with procrastination score (r = -0.057, p < .001) and having medical coverage (r = -0.090, p < .01). Having had a mammogram exam was significantly correlated with procrastination score (r = -0.185, p < .001).

p<.001). Having had a prostate exam was significantly with having medical coverage (r = 0.142, p<.01).

Variables	Ν	Procrastination Score Mean (SE)		
		Yes	No	Significance
Saw dentist	1,217	27.269 (0.381)	31.174 (0.617)	***
Flu shot	1,214	28.318 (0.395)	28.944 (0.602)	
Cholesterol test	1,206	28.180 (0.362)	29.859 (0.812)	*
Vigorous exercise	1,207	26.259 (0.441)	30.519 (0.472)	***
during month				
Mammogram	760	27.955 (0.489)	30.733 (0.846)	**
(females)				
Prostate exam	449	27.395 (0.682)	29.485 (0.910)	
(males)				
Lost permanent	1,191	31.260 (0.976)	28.215 (0.347)	**
natural teeth				

Notes: ****p*<0.001 ***p*< 0.01 **p*<0.05

Table 4.2 Comparison of mean procrastination scores by outcome variable.

As shown in Table 4.5, Models 1 - 3 use logistic regression to analyze procrastination as an estimator for an HRS respondent having seen the dentist over the previous 2 years or since the last 2018 HRS wave (as applicable). Model 1 includes the focal predictor variable, procrastination score. Model 2 includes procrastination score and a dichotomous variable indicating whether a respondent had dental coverage in 2020. Model 3 includes sociodemographic variables, the dichotomous dental coverage variable, and the respondent's procrastination score (12, or low, to 60, or high). Among the
sociodemographic variables gender (being a female vs male), education (more

education), and income (higher income bracket) significantly increased the likelihood of

	Saw dentist (1=Y,0=N)	Has dental coverage (1=Y,0=N)	Procrastination score (5 to 60)								
Saw dentist 2020	1.000										
Has dental coverage 2020	0.223***	1.000									
Procrastination score	-0.159***	-0.035	1.000								
Notes: ***p<0.001 **p< 0.01 *p<0.05											

Table 4.3 Correlations 2020 dental visits/coverage and procrastination score.

	Saw Dentist (1=Y,0=N)	Cholesterol test (1=Y,0=N)	Flu shot (1=Y,0=N)	Mammogram (females, 1=Y,0=N)	Prostate exam (males, 1=Y,0=N)	Vigorous exercise during month (1=Y,0=N)	Medical coverage (1=Y,0=N)	Procrastinat ion score (5 to 60)
Saw Dentist	1.00							
Cholesterol test	0.104***	1.000						
Flu shot	0.127***	0.295***	1.000					
Mammogram	0.215***	0.176***	0.061	1.000				
Prostate exam	0.215***	0.243***	0.038	N/A	1.000			
Vigorous exercise during month	0.086**	-0.036	-0.057	0.030	0.023	1.000		
Medical coverage	0.083**	0.155***	0.206***	0.061	0.142**	090**	1.000	
Procrastinatio n score	-0.159***	-0.057*	-0.025	-0.108**	-0.091	-0.185***	-0.014	1.000

Notes: ****p* <0.001 ***p*< 0.01 **p*<0.05

Table 4.4 Correlations 2020 Main/Alternative outcome variables.

Variable	Model 1	Model 2	Model 3
	Coef (SE)	Coef (SE)	Coef (SE)
Dependent variable	Saw dentist	Saw dentist	Saw dentist
Procrastination Score	-0.029^{***}	$-0.029^{***}(0.005)$	-0.017** (0.006)
	(0.003) p < .001	<i>p</i> <.001	<i>p</i> =.000
Dentel Courses 2020		0.066*** (0.129)	0.992***(0.141) = -0.01
Dental Coverage 2020		p < .001	$0.885^{+++}(0.141) p < .001$
Demographic controls			
Gender			
Male(omitted)			
Female			0.596***(0.142) <i>p</i> <.001
Race/ethnic identity			
Black/African American			-0.6/13***(0.165)
Diack/Affican Afficican			p<.001
Other			-0.159(0.245) p=.515
Education			
Less than high school(omitted)			
GED			0.258 (0.335) p=.441
High school graduate			0.418 (0.218) p=.055
Some conege			n < 0.01
College and above			1.388*** (0.243)
6			<i>p</i> <.001
Age 2020 (years)			0.008 (0.070) <i>p</i> =.235
Log Income 2020			0.279*** (0.074)
Constant	1 591***	1 000*** (0 192)	<i>p<</i> .001 3 707*** (1 039)
Constant	$(0.170) \ n < 0.01$	n < 0.182	$-5.707 \cdots (1.058)$ n < 001
Log likelihood	-752.540	-722.977	-659.142
Pseudo R2	0.02	0.058	0.142
Ν	1,217	1,217	1,217

Notes: ***p <0.001 **p< 0.01 *p<0.05

Table 4.5 Logistic regression results 2020, Main outcome variable, Saw Dentist 2020.

having seen a dentist in the previous two years. African Americans were significantly less likely to have seen a dentist compared to Whites/Caucasians. Unsurprisingly, having dental coverage significantly increased the likelihood of having seen a dentist in the previous two years. Including the procrastination scores shows a significant negative relationship between procrastination and having seen the dentist (*Pseudo R*² = 0.142, p = .006) with each model showing additional explanatory power.

As shown in Table 4.6, Models 4 - 8 (along with Model 3 for comparison) show the full logistic regression model using the identical sociodemographic variables, a dichotomous medical insurance coverage in place of dental coverage, and total procrastination score as predictor variables. The alternative dichotomous outcome variables include flu shot, cholesterol test, vigorous exercise at all during the month, mammogram (females), and prostate examination (males). As with a dental visit, the procrastination score was significantly and negatively related to vigorous exercise during the month (p = .007) and to having had a mammogram (p = .04). The procrastination score was not significantly related to a flu shot, cholesterol test, and a prostate exam. . Having medical insurance coverage was positive and significant in relationship to having a flu shot (p = .000), cholesterol test (p = .001), a mammogram (p = .013), and a prostate exam (p = .027). The relationship with vigorous physical exercise was negative but significant (p = .001). Task aversiveness is a component of the psychological explanations for procrastination, and each of these activities are considered to be uncomfortable, even painful, with a pay-off in the future.

Variable	Model 3 Coef (SE)	Model 4 Coef (SE)	Model 5 Coef (SE)	Model 6 Coef (SE)	Model 7 Coef (SE)	Model 8 Coef (SE)
Dependent variable	Saw dentist	Flu shot	Cholesterol test	Vigorous exercise monthly	Mammogram	Prostate exam
Procrastination Score	-0.017** (0.006) <i>p</i> =.006	-0.001 (0.006) <i>p</i> =.810	-0.004 (0.007) <i>p</i> =.602	-0.029*** (0.006) <i>p</i> <.001	-0.015* (0.007) <i>p</i> =.04	-0.004 (0.010) <i>p</i> =.683
Dental Coverage/ Medical Coverage	0.883*** (0.141) <i>p</i> <.001	0.912*** (0.231) <i>p</i> <.001	0.775** (0.240) <i>p</i> =.01	-0.790**(0.244) p=.001	0.818* (0.330) <i>p</i> =.013	0.752* (0.340) <i>p</i> =.027
Demographic controls						
Gender						
Male (omitted) Female	0.596^{***} (0.142) n < 001	 0.154 (0.139) <i>p</i> =.267	0.223 (0.161) <i>p</i> =.166	 -0.786*** (0.130) <i>p</i> <.001		
Race/Ethnic identity	<i>p</i> <.001					
2						
White/Caucasian						
(omitted)		0.041.04.00	0.400.4	0.004+ (0.4.50)		
Black/African	-0.643***	-0.341* (0.159)	-0.400*	-0.324* (0.158)	0.319 (0.215)	0.268 (0.267)
American	(0.105)	<i>p</i> =.032	(0.181) n=0.27	<i>p</i> =.040	<i>p</i> =.138	<i>p</i> =.313
Other	p < .001 -0.159 (0.245) p = 515	0.273 (0.241) <i>p</i> =.258	-0.222 (0.258) p=.388	-0.062 (0.230) p=.789	0.120 (0.304) <i>p</i> =.692	-0.292 (0.369) p=.429
Education	<i>p</i> =.515					
Less than high						
school						
GED	0.258 (0.335) n=441	-0.095 (0.341) p=.782	0.591 (0.399) <i>p</i> =.138	-0.0003 (0.346) p=.999	-1.046* (0.418) p=012	0.908 (0.589) p=.124
High school	0.418 (0.218)	0.188 (0.226) <i>p</i> =.406	0.407 (0.246) <i>p</i> =.098	0.098 (0.228) <i>p</i> =.667	-0.384 (0.283)	0.076 (0.347) <i>p</i> =.826
Some college	p=.055 0.946^{***} (0.226)	0.491*(0.230) p=.033	0.565* (0.251)	0.507*(0.228) p=.026	p=.174 -0.187 (0.288)	0.763*(0.371) p=.040
Collago and	<i>p</i> <.001	0 751** (0 242)	p=.024	0 772** (0 726)	p=.516	0 220 (0 265)
above	(0.243)	$0.731^{mm}(0.243)$ n=0.02	0.555* (0.264)	$0.725^{\text{max}}(0.250)$ n=0.02	-0.032	0.329 (0.303) n=366
0000	p < .001	P^{002}	p=.036	p = .002	p=.919	p = .500
Age 2020 (years)	0.008	0.053***	0.035***	-0.018** (0.007)	-0.020*	0.027* (0.011)
	(0.007)	(0.007) <i>p</i> <.001	(0.008)	<i>p</i> =.008	(0.009)	<i>p</i> =.017
	p=.235		<i>p</i> <.001		<i>p</i> =.021	
					Continu	ed

Table 4.6 2020, Dental full model and alternative outcome variables.

Variable	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Coef (SE)	Coef (SE)	Coef (SE)	Coef (SE)	Coef (SE)	Coef (SE)
Log income 2020	0.279***	-0.016 (0.067)	0.208**	0.109 (0.067)	0.360***	0.385**
	(0.074)	p=.810	(0.076)	p = .102	(0.086)	(0.126) p=.002
	<i>p</i> <.001		p = .006		<i>p</i> <.001	
Constant	-3.707***	-3.912***	-4.356***	2.393* (1.020)	-1.792	-6.458***
	(1.086)	(1.046) <i>p</i> <.001	(1.171)	p = .019	(1.181)	(1.821) <i>p</i> <.001
	<i>p</i> <.001		<i>p</i> <.001		p=.129	
Log likelihood	-659.142	-687.365	-544.134	-758.283	-433.862	-274.226
Pseudo R2	0.142	0.084	0.064	0.090	0.058	0.065
Ν	1,217	1,212	1,204	1,205	759	448
Goodness of Fit:						
Pearson's Chi2	1213.50	1213.49	1218.73	1210.22	766.93	447.16
Prob > Chi2	0.426	0.387	0.289	0.358	0.308	0.358

Notes: ***p <0.001 **p< 0.01 *p<0.05

Table 4.6 continued

Table 4.7 shows the full model applied to the 2018 dental visit response with survey year-specific responses made for dental coverage, age, and income. The results are almost identical to 2020 - procrastination and dental coverage (2018) are significant at p < .001 as well as the results for gender, race/ethnic identity, and log income. Table 4.8 shows the average marginal effects of the procrastination score on the main outcome variable (Saw dentist in 2020 and 2018) and on the alternative outcome variables. These values, consistent with the main model, show that the procrastination score, a continuous variable from 12 to 60, is a small but significant predictor variable for a dental visit in 2020 and 2018, vigorous exercise during a given month, and a mammogram examination.

Table 4.9 shows Models 1-3 applied to the 2020 variable that tracks the loss of permanent teeth. For Model 1, the procrastination score was a significant estimator (p=.003, *Pseudo R*²=0.009). For Model 2, both the procrastination score and having

Variable	2020 Model 3	2018Model 3
	Coef (SE)	Coef (SE)
Dependent variable	Saw dentist	Saw dentist 2018
Procrastination Score 2020	0.017 ** (0.006) p = .006	-0.023***(0.006) <i>p</i> <.001
Dental Coverage 2018	$0.883^{***}(0.141) p < .001$	$1.110^{***}(0.158) p < .001$
U		
Demographic controls		
Gender		
Male(omitted)		
Female	0.596*** (0.142) p<.001	0.452**(0.151)
		p=.003
Race/ethnic identity		
White/Caucasian(omitted)		
Black/African American	-0.643*** (0.165) <i>p</i> <.001	-0.816***(0.178) p<.001
Other	-0.159 (0.245) <i>p</i> =.515	-0.486 (0.259) <i>p</i> =.060
Education		
Less than high school(omitted)		
GED	0.258 (0.335) <i>p</i> =.441	0.285 (0.370) <i>p</i> =.441
High school	0.418 (0.218) <i>p</i> =.055	-0.065 (0.236) <i>p</i> =.784
Some college	0.946*** (0.226) p<.001	0.495*(0.242)
		p=.041
College and above	1.388*** (0.243) <i>p</i> <.001	1.165***(0.267) <i>p</i> <.001
Age (years)	0.008 (0.007) <i>p</i> =.235	0.013 (0.008) <i>p</i> =.075
Log income	0.279*** (0.074) p<.001	0.229**(0.073)
		p=.002
Constant	-3.707*** (1.038) <i>p</i> <.001	-3.321**(1.076)
		p=.002
Log likelihood	-659.142	-578.898
Pseudo R2	0.142	0.158
Ν	1,217	1,101
Goodness of Fit:		
Pearson's Chi2	1213.50	1110.54
Proh > Chi2	0.426	0.318
$1100 \times CIII2$	0.420	0.310

Notes: ****p* <0.001 ***p*< 0.01 **p*<0.05

Table 4.7 Logistic regression 2018, Full model with 2020 procrastination score. dental coverage were significant estimators (procrastination score p = .005; dental coverage, p < .001, *Pseudo* $R^2 = 0.037$). For Model 3, the procrastination score was not significant (p=.347), having dental coverage was significant (p<.001), and log income was significant (p<.001) with model *Pseudo* R^2 =0.090. Table 4.9 also shows Model 3A which was the full model applied to the 2020 variable that tracks the loss of permanent

teeth, and it included the *Saw Dentist* 2020 as a *predictor* variable. For this model, the procrastination score was not significant (p=.663), having dental coverage was significant (p=.008), log income was significant (p=.004), and having seen the dentist in 2020 was significant (p<.001) with model *Pseudo* R^2 =0.124.

	Delta-method								
Procrastination	dy/dx	SE	Z	P> z	95%	6 CI			
score									
Dental visit	-0.003	0.001	-2.78	.005	-0.005	-0.001			
2020									
Dental visit	-0.004	0.001	-3.60	.000	-0.006	-0.002			
2018									
Flu shot 2020	-0.000	0.001	-0.16	.877	-0.002	0.002			
Cholesterol	-0.001	0.001	-0.52	.602	-0.002	0.001			
test 2020									
Vigorous	-0.006	0.001	-5.14	.000	-0.009	-0.004			
exercise									
month 2020									
Mammogram	-0.003	0.001	-2.08	.038	-0.006	-0.0001			
2020									
Prostate exam	-0.001	0.002	-0.41	.683	-0.005	0.003			
2020									

Table 4.8 Average marginal effects of procrastination score on outcome variables.

Variable	Model 1	Model 2	Model 3	Model 3A
	Coef (SE)	Coef (SE)	Coef (SE)	Coef (SE)
Dependent variable	Lost permanent teeth	Lost permanent teeth	Lost permanent teeth	Lost permanent teeth
Procrastination Score	0.021*** (0.007) <i>p</i> <.001	0.020** (0.007) <i>p</i> =.005	0.007 (0.008) p=0.347	0.003 (0.008) <i>p</i> =.663
Dental Coverage 2020		-0.865*** (0.176) <i>p</i> <.001	-0.699**(*0.188) <i>p</i> <.001	-0.515** (0.193) <i>p</i> =.008
Saw Dentist 2020				-1.092*** (0.194) <i>p</i> <.001
Demographic controls				
Gender				
Male(omitted)				
Female			-0.110(0.186) p=.554	0.035 (0.191) p = .854
Race/ethnic identity				
Rlack/African American			0.227 (0.212) = 283	0.008 (0.215) n = 648
Other			-0.351(0.340) p=302	-0.380(0.213)p=.048
Education			0.551(0.540)p=.502	0.500 (0.544) <i>p</i> =.20)
Less than high school(omitted)				
GED			-0.472 (0.423) <i>p</i> =.265	-0.407 (0.428) p=.342
High school graduate			-0.343 (0.255) <i>p</i> =.178	-0.261 (0.259) <i>p</i> =.315
Some college			-0.714** (0.273)	-0.469 (0.281) <i>p</i> =.095
College and above			p=.009 -1.327*** (0.325) p<.001	$-1.009^{**}(0.333)$ p=.003
Age 2020 (years)			-0.004 (0.009) p = .653	-0.002 (0.009) p = .817
Log Income 2020			-0.316*** (0.091)	-0.266** (0.092)
Constant	-2.468^{***}	-2.036^{***} (0.244)	<i>p</i> <.001 2.515* (1.256) <i>p</i> =.046	<i>p</i> =.004 2.197 (1.261) <i>p</i> =.081
Log likelihood	-469.352	-456.775	-430.830	-417,790
Pseudo R2	0.009	0.036	0.090	0.125
Ν	1,191	1,191	1,191	1,205

Notes: ***p <0.001 **p< 0.01 *p<0.05

Table 4.9 Logistic regression results 2020, Main outcome variable, lost permanent natural teeth.

4.4 Discussion

Poor oral health is associated with higher risk of serious health problems such as heart disease, Type II diabetes, and losing one's teeth (Liu Yong et al., 2016). Despite these increased risks, in 2021 about 43% of people in the U.S. visited a dentist, and among the population about 50% of seniors and children saw a dentist and about 39% of the population in the 19 to 64 age range saw a dentist (Health Policy Institute, 2024). Income, cost, and having dental insurance figure prominently in (Health Policy Institute, 2024) an individual's decision-making related to dental health care. In addition to these and sociodemographic attributes, this study looks at the relationship between procrastination and dental care usage using the 2020 Health and Retirement Study's (HRS) core survey combined with a smaller subsample using the 2020 HRS Experimental Module 2: Long Term Care Insurance Procrastination. In addition, as a robustness check we regressed 2018 dental care usage for the same 2020 subsample using the same predictor variables replaced with year specific data (i.e., age and log income).

Consistent with other small-scale studies we found that procrastination was significant and negative in relation to having visited the dentist in the past (Rapoport et al., 2023; Steinvik et al., 2023). Moreover, unlike these small scale studies, we included Andersen's enabling factors (e.g., log income, dental coverage) and predisposing factors (e.g., age, gender) and found consistent effects (Gaskin et al., 2022). These relationships held during the robustness check using 2018 HRS survey data which is consistent with work that found procrastination has temporal stability (Steel, 2007).

In addition to robustness, we regressed other 2020 health care behaviors (e.g., flu shot, mammogram) on procrastination score and sociodemographic variables (however using medical insurance coverage instead of dental care coverage). Research on procrastination has found that task aversiveness is associated with procrastination (Steel, 2007), and dental care has been shown to be related to fear, anxiety, and avoidance (Calladine et al., 2022; Silveira et al., 2021). Task aversiveness to mammograms and a regular exercise program, as examples, has been identified as a barrier to these beneficial health care behaviors (Feldstein et al., 2011; Herazo-Beltrán et al., 2017), and we found that procrastination was significantly negatively related to having had a mammogram in the past 2 years and also to engaging in regular vigorous exercise.

How procrastination affects a person's execution of basic health care behaviors, such as going to the dentist can better inform researchers and health care policymakers, especially in understanding and overcoming the barriers to individual health. The findings suggest that costly (money and/or discomfort) health care maintenance behaviors whose outcomes likely will play out in the future can become victim to procrastination. Interestingly, the outcomes are not only future-oriented but also deal with protecting against loss (i.e., dental problems, breast cancer, diabetes, etc.) that might not be reversible in the future which is an argument for future research on the connection between gains, losses, procrastination and health care maintenance. Designing, testing and implementing incentives (or nudges) around these health care behaviors that are susceptible to procrastination merits further research. Also, as discussed in the body of the paper, the HRS Module 2 experimental survey used the 12 questions from the Pure Procrastination Scale but there are other scales that are still widely used (e.g., Lay's General Procrastination Scale). Future research could help further refine a valid and reliable procrastination scale. Future research could also explore the relationship between procrastination and health care tasks where an aversiveness valence could be determined for different tasks.

The model's results for the actual health outcome, having lost permanent teeth, was significant with procrastination score alone and with procrastination score and dental coverage but not with the full model. This can perhaps be partly explained due to the nature of the outcome variable, whereby having lost permanent teeth is dichotomous, all or none. In Gaskin et al's study, for example, which used the 2018 Behavioral Risk Factor Surveillance System (BRFSS), used a richer variable which asked respondents to report on the number permanent teeth that had been removed due to tooth decay and/or gum disease with the response categories being none, between 1 and 5, 6 or greater but not all, and all (Gaskin et al., 2022). In the future, more research could be done with richer and more detailed health outcome data. Also, when including having seen the dentist as a predictor variable of having lost permanent teeth, there was a further deterioration of significance for the procrastination score. This can be explained due to the interplay of procrastination, health care behavior, and health outcomes and satisfaction, with task aversiveness associated with a dental visit showing up primarily and dominantly by having seen the dentist recently. Furthermore, research has shown that loss of permanent natural teeth is a multifactorial outcome strongly related to being or

having been a smoker and having diabetes, as well as having private insurance, having been to a dentist in the past 6 months, and sociodemographic attributes (Lee et al., 2022).

In this study, there is potential endogeneity that could result in bias that challenges the internal validity of the respective research questions, in particular omitted variable bias and reverse causality. Regarding omitted variable bias, the survey dataset has limitations to identifying and testing other variables that might be missing. More so than medical insurance, dental insurance is less widely used or available in the U.S. For example, the Affordable Care Act mandates dental health care benefits for children but not for adults (Vujicic, Bernabé, et al., 2016). Our study accounts for dental insurance coverage, however, even with private dental insurance coverage cost is a barrier to care due in great part to the variability across the country and cost structure of private insurance (Vujicic, Buchmueller, et al., 2016). In the public sector, in addition to Medicare not covering dental care under the basic offering, Medicaid is a patchwork of availability and costs across states so even having a dental coverage variable misses important details. The instrument used for this study was based on the questions from Steel's Pure Procrastination Scale which has been shown to capture accepted underlying features of procrastination, namely that it is considered an irrational delay of a task (Steel, 2010). However, a different instrument could be used experimentally along with the Pure Procrastination Scale, to measure other underlying psychological mechanisms such as dental fear and anxiety which have been identified in a systematic literature review and estimated to be over 15% globally (Silveira et al., 2021).

Reverse causality between procrastination score and the outcome variable(s), in visiting the dentist, could be present. However, research has shown that procrastination can be viewed as a personality trait (Sirois, 2021), and can be considered as a stable personal attribute (Steel, 2007), which we corroborated by analyzing 2018 dental visits with the 2020 procrastination score.

There are also aspects of the proposed research that can challenge the external validity of the results and its applicability to a wider population. Regarding procrastination, the HRS is a survey of individuals older than 50 (although spouses and cohabitation partners who may be 50 or younger are included), so the presence of procrastination was analyzed only in relationship to individuals in this age range. Lastly, the HRS 2020 survey was conducted between March 2020 and May 2021 during some early parts of the COVID-19 pandemic which could distort the responses; however, the outcome variables referred to activities carried out in the previous 2 years, and we included 2018 data as a robustness check.

With the accelerating pace of modern life and an ever-increasing number of distractions, better understanding the part that procrastination plays in delaying and deferring a trip to the dentist, not to mention women having mammograms and people becoming and staying fit, is in the best interest of people in the U.S., and all over the world.

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Chapter 5. Conclusion

This dissertation examines two behavioral constructs to better understand consumer decision-making. Each of the three studies included in this dissertation were informed by previous research in behavioral economics and decision-making that helps explain the mismatch often seen between theoretical rational behavior and real-life consumer decisions that are often at odds, or at least tangential, to rational behavior predicted by the standard economic model.

The first study uses the scarcity mindset as put forth by Mullainathan and Shafir as the framework to analyze cryptocurrency purchases and ownership among a sample of U.S. investors (Mullainathan & Shafir, 2013). Findings show a direct and positive association between cryptocurrency investing and a scarcity mindset, beyond established predictors of investment behavior. These findings held for the 2020 early COVID-19 era as well as pre-COVID-19 data, and when accounting for financial and investor literacy, subjective financial knowledge, willingness to take risk, as well as demographic characteristics. From a theoretical perspective, this study extends the understanding of the scarcity mindset to the context of risky financial decisions. It also shows that the scarcity mindset's subjective feeling of not having enough can also be observed in the high-risk, volatile context of cryptocurrency trading. This phenomenon associated with speculative behavior is both of societal concern and practically as it could relate to asset allocation, investments, and retirement planning. Its importance is heightened as cryptocurrency products become more mainstream, evidenced by large investment firms, such as Fidelity and Blackrock, including them in retirement accounts.

The second study broadens the use of the scarcity mindset as the framework to analyze the use of alternative financial among a broad sample of the U.S. population. The empirical findings in this study show a positive association between alternative financial services usage and a strong scarcity mindset, controlling for established predictors of alternative financial services. The findings suggest that behavioral mechanisms are significant in helping explain irrational and imprudent financial mistakes. In addition, an extension within the study shows that even after stratifying respondents as low-, middle-, and high-income, the scarcity mindset is significantly related to an increase in alternative financial services usage across income groups. This suggests that in addition to objective financial scarcity, other mechanisms are at play. Understanding the scarcity mindset in this broader context is important for consumer financial well-being, especially considering new products, such as buy now, pay later, being created and marketed to consumers.

The third study uses procrastination as a predisposing factor within the framework of Andersen's Behavioral Model for Health Services Utilization to analyze dental health care behavior (Andersen, 1968; Andersen, 1995). The empirical findings in this study showed that procrastination is significantly and negatively associated in relation to having visited the dentist in the past two years, after controlling for having dental coverage as well as socioeconomic and demographic factors. The study found that

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aversive tasks – visiting the dentist as well as other health behaviors such mammogram screening and regularly engaging in vigorous exercise – were significantly and negatively associated with procrastination. These findings are important to researchers and to policymakers as it pertains to healthy and proactive consumer decision-making.

The findings in these three studies, taken together, provide additional insights to anomalous individual behavior that diverges from expectations from a standard economic model. These insights can be used by researchers to better understand how behavioral factors – a scarcity mindset and procrastination – impact human decision-making and behavior that can be characterized best as suboptimal and risky, and at worst a fundamental mistake. Furthermore, these insights could help inform policymakers and service providers in their policy responses and product development.

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Appendix A. National Financial Capability Study (NFCS) Survey Questions

Sources:

- Overview page: <u>https://finrafoundation.org/knowledge-we-gain-share/nfcs/data-and-downloads</u>
- State-by-State survey questionnaire: <u>https://finrafoundation.org/sites/finrafoundation/files/NFCS-2021-State-by-State-Questionnaire.pdf</u>
- Investor Survey questionnaire: https://finrafoundation.org/sites/finrafoundation/files/NFCS-2021-Inv-Quest.pdf

1. Outcome measure: Cryptocurrency investing, NFCS Investor Survey Instrument

B25) Have you invested in cryptocurrencies, either directly or through a fund that invests in cryptocurrencies?

1 Yes

2 No

98 Don't know

99 Prefer not to say

2. Focal predictor: Scarcity Mindset, NFCS State-by-State Survey Instrument

J41) How well do these statements describe you or your situation?

J41_1) Because of my money situation, I feel like I will never have the things I want in life

J41_2) I am just getting by financially

J41_3) I am concerned that the money I have or will save won't last

<u>Response options:</u> 1 = Does not describe me at all, 2 = Describes me very little, 3 = Describes me somewhat, 4 = Describes me very well, 5 = Describes me completely, 98 = Don't know, 99 = Prefer not to say

3. Other predictors:

Financial literacy questions, NFCS State-by-State Survey Instrument

M6) Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

1 More than \$102

2 Exactly \$1023 Less than \$10298 Don't know99 Prefer not to say

M7) Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account

- 1 More than today
- 2 Exactly the same
- 3 Less than today
- 98 Don't know
- 99 Prefer not to say

The exact question is: *"If interest rates rise, what will typically happen to bond prices?"* The answers of the respondent are:

- 1 They will rise
- 2 They will fall
- 3 They will stay the same
- 4 There is no relationship between bond prices and the interest rate
- 98 Don't know
- 99 Prefer not to say

The exact question is: "Suppose you owe \$1,000 on a loan and interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double?" The answers of the respondent are:

- 1 Less than 2 years
- 2 At least 2 years but less than 5 years
- 3 At least 5 years but less than 10 years
- 4 At least 10 years
- 98 Don't know
- 99 Prefer not to say

The exact question is "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less." The answers of the respondent are:

- 1 True
- 2 False
- 98 Don't know
- 99 Prefer not to say

The exact question is "Buying a single company's stock usually provides a safer return than a stock mutual fund." The answers of the respondent are:

- 1 True
- 2 False
- 98 Don't know
- 99 Prefer not to say

Financial risk question, NFCS State-by-State Instrument

The exact question is *"When thinking about financial investments, how willing are you to take risks?"* The answers of the respondent are given on a 10-point scale: 1 means "Not At All Willing" and 10 means "Very Willing"; 98 is "Don't know" and 99 is "Prefer not to say".

A.1.3 Investing questions, Investor Survey Instrument

The exact question is *"If you buy a company's stock..."* The answers of the respondent are:

- 1 You own a part of the company
- 2 You have lent money to the company
- 3 You are liable for the company's debts
- 4 The company will return your original investment to you with interest
- 98 Don't know
- 99 Prefer not to say

The exact question is *"If you buy a company's bond..."* The answers of the respondent are:

- 1 You own a part of the company
- 2 You have lent money to the company
- 3 You are liable for the company's debts
- 4 You can vote on shareholder resolutions
- 98 Don't know
- 99 Prefer not to say

The exact question is "If a company files for bankruptcy, which of the following securities is most a risk of becoming virtually worthless?" The answers of the respondent are:

- 1 The company's preferred stock
- 2 The company's common stock
- 3 The company's bonds
- 98 Don't know
- 99 Prefer not to say

The exact question is "In general, investments that are riskier tent to provide higher returns over time than investments with less risk." The answers of the respondent are:

- 1 True
- 2 False

- 98 Don't know
- 99 Prefer not to say

The exact question is *"The past performance of an investment is a good indicator of future results."* The answers of the respondent are:

- 1 True
- 2 False
- 98 Don't know
- 99 Prefer not to say

The exact question is "Over the last 20 years in the US, the best average returns have been generated by:" The answers of the respondent are:

- 1 Stocks
- 2 Bonds
- 3 CDs
- 4 Money market accounts
- 5 Precious metals
- 98 Don't know
- 99 Prefer not to say

The exact question is "What is the main advantage that index funds have when compared to actively managed funds?" The answers of the respondent are:

- 1 Index funds are generally less risky in the short term
- 2 Index funds generally have lower fees and expenses
- 3 Index funds are generally less likely to decline in value
- 98 Don't know
- 99 Prefer not to say

The exact question is "Which of the following best explains whyt many municipal bonds pay lower yields than other government bonds?" The answers of the respondent are:

- 1 Municipal bonds are lower risk
- 2 There is a greater demand for municipal bonds
- 3 Municipal bonds can be tax-free
- 98 Don't know
- 99 Prefer not to say

The exact question is "You invest \$500 to buy \$1,000 worth of stock on margin. The value of the stock drops by 50%. You sell it. Approximately how much of your original \$500 investment are you left with in the end?" The answers of the respondent are:

- 1 \$500
- 2 \$250
- 3 \$0
- 98 Don't know

99 Prefer not to say

The exact question is *"Which is the best definition of 'selling short'?"* The answers of the respondent are:

- 1 Selling shares of a stock shortly after buying it
- 2 Selling shares of a stock before it has reached its peak
- 3 Selling shares of a stock at a loss
- 4 Selling borrowed shares of a stock
- 98 Don't know
- 99 Prefer not to say

The exact question is "If you own a call option with a strike price of \$50 on a security that is priced at \$40, and the option is expiring today, which of the following is closest to the value of that option?" The answers of the respondent are:

- 1 \$10
- 2 \$0
- 3 -\$10
- 98 Don't know
- 99 Prefer not to say

A.1.6 Investment confidence questions, Investor Survey Instrument

The exact question is *"How comfortable are you when it comes to making investment decisions?"* The answers of the respondent are given on a 10-point scale: 1 means "Not At All Comfortable" and 10 means "Extremely Comfortable"; 98 is "Don't know" and 99 is "Prefer not to say".

A.1.7. Objective financial scarcity question, NFCS State-by-State Survey Instrument

The exact question is "In a typical month, how difficult is it for you to cover your expenses and pay all your bills?" The answers of the respondent are:

- 1 Very difficult
- 2 Somewhat difficult
- 3 Not at all difficult
- 98 Don't know
- 99 Prefer not to say

Appendix B. Expert Survey for Assessment of Scarcity Concept

Date of outreach to experts: 3/1/2023

Instructions to experts:

In the book *Scarcity: the New Science of Having Less and How it Defines our Lives*, Mullainathan and Shafir (2013) put forth the framework that scarcity is a mindset that can be summarized as "having less than you feel you need". According to the authors, scarcity captures attention and "changes the way we think" and behave.

The scarcity-mindset framework has particular attributes:

- Tunnelling (defined as "singlemindedness" that can lead to neglect)
- "bandwidth tax" (defined as limitations to "cognitive capacity" and "executive control")
- myopia (defined as neglect planning and of the future)

In the absence of a survey instrument that measures an individual's scarcity mindset, I propose to use specific questions from FINRA's National Financial Capability Study as proxies for measuring the "scarcity mindset".

In the table, I am listing specific questions I selected to measure the scarcity mindset. I would like to ask you to rate and comment on their potential fit.

	6- Peych	7, olgists						
Statement	Response Scale	Exper t 1	Expert 2	Expert 3	Exper t 4	Expert 5	Exper t 6	Exper t 7
Overall, thinking about your assets, debts and savings, how satisfied are you with your current personal financial condition?	1 Not at all satisfied to 10 Extremely satisfied	No	No	Maybe	Yes	No	Yes	Mayb e
How often to you think about your personal	1 Never to 6 More than once a day	No	No	Maybe	Mayb e	Maybe	Yes	Mayb e

Options presented to experts and their responses

financial condition?								
Because of my money situation, I feel like I will never have the things I want in life	1 Does not describe me at all to 5 Defines me completel	Yes	Yes	Maybe	Yes	Yes	Yes	Mayt e
I am concerned that the money I have or will save won't last.	y 1 Does not describe me at all to 5 Defines me completel	Yes	Yes	Maybe	Yes	Yes	Yes	Mayt e
I am just getting by financially.	y 1 Does not describe me at all to 5 Defines me completel y	Yes	Yes	Maybe	Yes	Yes	Yes	Mayt e
I have too much debt right now.	1 Strongly agree to 7 strongly disagree	No	No	Maybe	Yes	Yes	Mayb e	Mayt e
Are you concerned that you might not be able to pay off your student loans?	Yes or No	No	Yes	Maybe	Mayb e	No	Mayb e	Mayb e
Do you currently owe more on your home than you think you could sell it for today?	Yes/owe more, or No	No	No	Maybe	Mayb e	No	Mayb e	Mayt e
If you were to set a financial goal for yourself	1 Not all confident to 4 Very confident	No	Yes	Maybe	Mayb e	No	No	Mayt e

how confident are you in your ability to achieve it?								
How confident are	1 I am certain I	No	Yes	Maybe	Yes	No	Mayb e	Mayb e
you that you could come	could							
up with	with the							
\$2,000 if an	full							
unexpected	\$2,000 to							
need arose	4 I am							
next month?	could not							
next month.	come up							
	with							
	\$2,000							

Appendix C. Questions - NFCS State-by-State Survey Instrument

Alternative financial services questions, NFCS State-by-State Survey Instrument

The exact introducing question is: "In the past 5 years, how many times have you:" followed by five questions:

- (1) "Taken out an auto title loan? Auto title loans are loans where a car title is used to borrow money for a short period of time. They are NOT loans used to purchase an automobile."
- (2) *"Taken out a short term 'payday' loan?"*
- (3) "Gotten an advance on your tax refund? This is sometimes called a 'refund anticipation check' or 'Rapid Refund' (Not the same as e-filing)"
- (4) *"Used a pawn shop?"*
- (5) *"Used a rent-to-own store?"*

The answers of the respondents are:

- 1 Never
- 2 1 time
- 3 2 times
- 4 3 times
- 5 4 or more times
- 98 Don't know
- 99 Prefer not to say

Scarcity questions, NFCS State-by-State Survey Instrument

The exact introducing question is: "How well do these statements describe you or your situation?" followed by three statements:

- (1) "Because of my money situation, I feel like I will never have the things I want in life."
- (2) "I am just getting by financially."
- (3) "I am concerned that the money I have or will save won't last."

The answers of the respondents are:

- 1 Does not describe me at all
- 2 Describes me very little
- 3 Describes me somewhat
- 4 Describes me very well

- 5 Describes me completely
- 98 Don't know
- 99 Prefer not to say

Financial literacy questions, NFCS State-by-State Survey Instrument

The exact question is: "Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?" The answers of the respondent are:

- 1 More than \$102
- 2 Exactly \$102
- 3 Less than \$102
- 98 Don't know
- 99 Prefer not to say

The exact question is: "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?" The answers of the respondent are:

- 4 More than today
- 5 Exactly the same
- 6 Less than today
- 98 Don't know
- 99 Prefer not to say

The exact question is: "*If interest rates rise, what will typically happen to bond prices*?" The answers of the respondent are:

- 5 They will rise
- 6 They will fall
- 7 They will stay the same
- 8 There is no relationship between bond prices and the interest rate
- 98 Don't know
- 99 Prefer not to say

The exact question is: "Suppose you owe \$1,000 on a loan and interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double?" The answers of the respondent are:

- 5 Less than 2 years
- 6 At least 2 years but less than 5 years
- 7 At least 5 years but less than 10 years
- 8 At least 10 years
- 98 Don't know
- 99 Prefer not to say

The exact question is "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less." The answers of the respondent are:

- 3 True
- 4 False
- 98 Don't know
- 99 Prefer not to say

The exact question is *"Buying a single company's stock usually provides a safer return than a stock mutual fund."* The answers of the respondent are:

- 3 True
- 4 False
- 98 Don't know
- 99 Prefer not to say

Willingness to take financial risk, NFCS State-by-State Instrument

The exact question is "When thinking about financial investments, how willing are you to take risks?" The answers of the respondent are given on a 10-point scale: 1 means "Not At All Willing" and 10 means "Very Willing"; 98 is "Don't know" and 99 is "Prefer not to say".

Subjective financial knowledge, NFCS State-by-State Instrument

The exact question is: "On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?"

Objective financial scarcity question, NFCS State-by-State Survey Instrument

The exact question is "In <u>a typical month</u>, how difficult is it for you to cover your expenses and pay all your bills?" The answers of the respondent are:

- 4 Very difficult
- 5 Somewhat difficult
- 6 Not at all difficult
- 98 Don't know
- 99 Prefer not to say

Appendix D. HRS 2020 - Module 2: Long Term Care Insurance Procrastination

FINAL VERSION -- 05/01/2020

**

NOTE ABOUT BRANCHPOINTS:

Where there is more than one jump within a branchpoint box, the jumps are to be applied

in

order from the top.

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NOTE ABOUT COLORS AND MODE:

All question text in black is for the core interview (except if CAPI and CAWI text is the same).

Question text and codes in teal denotes CAWI (Web). The CAWI text will always be

directly

after the CAPI text. If wording is the same in both CAPI (Iwer Administered) and CAWI (Web),

the text is black.

Otherwise, black text for codeframes, interviewer instructions, jumps and branchpoints, etc.,

which can apply to both the CAPI and the CAWI interview unless specified otherwise or there

is a CAWI alternative.

On a black-and-white hard copy of the document, the TEAL text will appear somewhat

lighter than the original black.

MAJOR FLOW CONTROL, CONDITION AND FILL VARIABLES

If X009 (RANDOM 1-10) = 2

N071 = 5

A009 = 1

V000 BRANCHPOINT: ASK IF THIS IS A SELF INTERVIEW (A009 =1)

ELSE, GO TO END OF MODULE

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Although we have finished the interview, we would like to ask you just a few new questions.

Some questions may be similar to questions we have already asked, but we are interested

in

how people respond when

the questions are changed just a little. This will only take a few minutes.
[INSTR: IF R REFUSED BEFORE STARTING A MODULE, ENTER 9. IF R

STARTED TO DO A MODULE

AND THEN CHANGED HIS/HER MIND, ENTER 99.]

Although we have finished the interview, we would like to ask you a few new questions.

Some

questions may be similar to questions we have already asked you, but the researchers are interested in how people respond when the questions are changed just a little.

1. R IS WILLING

9. R REFUSED AT MODULE INTRO

99. R REFUSED AFTER STARTING A MODULE

1. CONTINUE

NOTE: IF R LEAVES V000 EMPTY IN CAWI IT WILL BE TREATED AS A

REFUSAL AND SKIP R OUT

OF MODULES

V150 BRANCHPOINT: ASK IF X009 = 2 AND THIS IS A SELF INTERVIEW (A009

=1), ELSE GO TO

END OF MODULE

ASK IF R ANSWERED NO, DK OR RF AT N071 (N071 <> 1)

ELSE, GO TO V155

V150_

Although you previously mentioned that you do not currently have Long Term Care Insurance,

have you ever had it in the past?

1. YES GO TO V153

5. NO

8. DK

9. RF

V151_

Have you ever applied for Long Term Care Insurance?

1. YES

5. NO GO TO V153

8. DK

9. RF

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V152_

Was your application accepted?

1. YES

5. NO

8. DK

9. RF

V153_

Have you ever considered purchasing Long Term Care Insurance [again]?

1. YES

5. NO

8. DK

9. RF

V154_

What are the reasons you have not purchased it [again]?

[INSTR: SELECT ALL THAT APPLY.]

1. TOO EARLY IN LIFE TO DECIDE

2. NEED TO THINK ABOUT IT MORE CAREFULLY

3. I AM NOT THE FINANCIAL DECISION MAKER

4. TOO EXPENSIVE

5. I WAS ADVISED NOT TO APPLY

6. OTHER

8. DK

9. RF

V155_

Next we have a few statements that are true for the way some people make decisions, and

not

true for others. Please indicate how much you agree or disagree with each of the

following

statements.

1. CONTINUE

V156_

I delay making decision until it's too late. Do you strongly disagree, tend to disagree,

neither

agree nor disagree, tend to agree, or strongly agree?

I delay making decision until it's too late.

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1. STRONGLY DISAGREE

- 2. TEND TO DISAGREE
- **3. NEITHER AGREE NOR DISAGREE**
- 4. TEND TO AGREE
- **5. STRONGLY AGREE**
- 8. DK
- 9. RF
- V157_

Even after I make a decision, I delay acting upon it. (Do you strongly disagree, tend to disagree,

neither agree nor disagree, tend to agree, or strongly agree?)

Even after I make a decision, I delay acting upon it.

- 1. STRONGLY DISAGREE
- 2. TEND TO DISAGREE
- **3. NEITHER AGREE NOR DISAGREE**
- 4. TEND TO AGREE
- **5. STRONGLY AGREE**

8. DK

9. RF

V158_

I waste a lot of time on trivial matters before getting to the final decisions. (Do you

strongly

disagree, tend to disagree, neither agree nor disagree, tend to agree, or strongly agree?) I waste a lot of time on trivial matters before getting to the final decisions.

1. STRONGLY DISAGREE

2. TEND TO DISAGREE

3. NEITHER AGREE NOR DISAGREE

- 4. TEND TO AGREE
- 5. STRONGLY AGREE
- 8. DK
- 9. RF
- V159_

In preparation for some deadlines, I often waste time by doing other things. Do you strongly

disagree, tend to disagree, neither agree nor disagree, tend to agree, or strongly agree?

In preparation for some deadlines, I often waste time by doing other things.

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- 1. STRONGLY DISAGREE
- 2. TEND TO DISAGREE

3. NEITHER AGREE NOR DISAGREE

4. TEND TO AGREE

5. STRONGLY AGREE

8. DK

9. RF

V160_

Even with jobs that require little else except sitting down and doing them, I find that they seldom get done for days. (Do you strongly disagree, tend to disagree, neither agree nor disagree, tend to agree, or strongly agree?)

Even jobs that require little else except sitting down and doing them. I find that they

seldom

get done for days.

1. STRONGLY DISAGREE

2. TEND TO DISAGREE

3. NEITHER AGREE NOR DISAGREE

4. TEND TO AGREE

5. STRONGLY AGREE

8. DK

9. RF

V161_

I often find myself performing tasks that I had intended to do days before. (Do you strongly

disagree, tend to disagree, neither agree nor disagree, tend to agree, or strongly agree?)

I often find myself performing tasks that I had intended to do days before.

1. STRONGLY DISAGREE

- 2. TEND TO DISAGREE
- 3. NEITHER AGREE NOR DISAGREE
- 4. TEND TO AGREE
- 5. STRONGLY AGREE
- 8. DK
- 9. RF
- V162_

I am continually saying "I'll do it tomorrow." Do you strongly disagree, tend to disagree,

neither agree nor disagree, tend to agree, or strongly agree?

I am continually saying "I'll do it tomorrow."

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- 1. STRONGLY DISAGREE
- 2. TEND TO DISAGREE
- 3. NEITHER AGREE NOR DISAGREE
- 4. TEND TO AGREE
- 5. STRONGLY AGREE
- 8. DK
- 9. RF

V163_

I generally delay before starting on work I have to do. (Do you strongly disagree, tend to disagree, neither agree nor disagree, tend to agree, or strongly agree?)

I generally delay before starting on work I have to do.

1. STRONGLY DISAGREE

2. TEND TO DISAGREE

3. NEITHER AGREE NOR DISAGREE

- 4. TEND TO AGREE
- 5. STRONGLY AGREE
- 8. DK
- 9. RF
- V164_

I find myself running out of time. (Do you strongly disagree, tend to disagree, neither

agree

nor disagree, tend to agree, or strongly agree?)

I find myself running out of time.

- 1. STRONGLY DISAGREE
- 2. TEND TO DISAGREE

3. NEITHER AGREE NOR DISAGREE

- 4. TEND TO AGREE
- 5. STRONGLY AGREE
- 8. DK
- 9. RF

V165_

I don't get things done on time. Do you strongly disagree, tend to disagree, neither agree nor

disagree, tend to agree, or strongly agree?

I don't get things done on time