The financial vulnerability trap: using latent transition analysis to explore the dynamics of consumers' financial vulnerability over time

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Abstract

Purpose – The purpose of the paper is to examine how psychological characteristics predict membership of and transitions between states of higher vs lower financial vulnerability – and vice versa – over time.

Design/methodology/approach – This research uses a dynamic latent class model (latent transition analysis) to explore the dynamics of consumers' financial vulnerability over time using longitudinal data obtained by repeatedly administering a measure of financial vulnerability.

Findings – This research finds that consumers in a state of lower vulnerability are "fragile" in having a relatively high likelihood of moving to a state of higher vulnerability, whereas those in a state of higher vulnerability are "entrenched" in having a relatively low likelihood of moving to a state of lower vulnerability. This pattern of results is called the "financial vulnerability trap." While financial self-efficacy explains state membership, the consideration of future consequences drives state transitions.

Research limitations/implications – Future research could follow consumers over a longer period and consider the role of alternative psychological characteristics besides those examined.

Practical implications – This research provides practitioners with actionable insights regarding the drivers of changes in consumers' financial vulnerability across time, showing the value of financial self-efficacy and the consideration of future consequences when developing strategies to prevent consumers from sliding from a state of lower to higher financial vulnerability over time.

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Originality/value – There is scant research on financial vulnerability. Further, prior research has not examined whether and how consumers' psychological characteristics help explain their membership of and transitions between states of different levels of financial vulnerability over time.

Keywords Consideration of future consequences, Consumer financial decision-making, Financial self-efficacy, Financial vulnerability, Public policy, Latent transition analysis

Paper type Research paper

Introduction

The Organization for Economic Cooperation and Development (2019) estimated that in 2016, 28% of all US households were financially vulnerable, while this number is expected to increase substantially as a result of the COVID-19 crisis (Organization for Economic Cooperation and Development, 2020). Financially vulnerable consumers are more likely to make poorer financial choices and suffer financially when service providers do not act with appropriate care (Personal Finance Research Centre, 2017). To help policymakers and business practitioners identify and support such "at-risk" consumers, recent work introduces a formative measure of financial vulnerability and finds that certain psychological characteristics of consumers – such as their personal savings orientation, consideration of future consequences, money management skills and financial self-efficacy – can act as a "buffer" that attenuates vulnerability's negative impact on key aspects of US households' financial outcomes (Hoffmann and McNair, 2019).

Prior research, however, leaves open an important research question: Do aforementioned psychological characteristics also help explain consumers' *membership of* and *transition between* states of higher vs lower financial vulnerability – and vice versa – over time? Answering this question is both timely and important, as it helps policymakers and business practitioners form a "psychological profile" of the kind of consumers who are most at risk of "sliding" from a state of lower to higher financial vulnerability over time and therefore need their support the most. Doing so also helps address recent calls urging these stakeholder groups to pay particular attention to the characteristics of consumers "trending toward vulnerability" (O'Connor *et al.*, 2019, p. 427).

In this paper, we start to answer this research question by examining a longitudinal data set obtained from repeatedly administering a validated measure of financial vulnerability across a nationally representative sample of US consumers across a three-month period. In doing so, our research contributes to the existing marketing literature in several ways. From a theoretical perspective, we add to the emerging, but still limited literature that investigates how important aspects of consumers' financial lives change over time (Shen *et al.*, 2014; Norvilitis, 2014). Importantly, the measure of financial vulnerability that we use is not just about being rich vs poor. Instead, income represents only 1 of 12 risk factors of financial vulnerability, which also include individuals' education, physical and mental health, debt, caring responsibilities, age, English language skills, impactful changes in personal circumstances, financial literacy and numeracy (Hoffmann and McNair, 2019). To the best of our knowledge, we are the first to adopt a dynamic perspective regarding financial vulnerability while exploring the role of individual psychological characteristics in explaining consumers' membership of and transitions between states of different levels of vulnerability over time. Doing so is important, as financial market regulators recognize that vulnerability is "a fluid state" which can be "temporary, sporadic or permanent in nature" (Financial Conduct Authority, 2015, p. 7), whereas consumer protection agencies stress the role of psychological factors in explaining issues around consumers' financial capability (Consumer Financial Protection Bureau, 2013). Knowledge of whether and how consumers'

psychological characteristics explain the dynamics of financial vulnerability also answers calls for more research in marketing on how psychological traits influence individuals' financial decision-making (Bertrand *et al.*, 2006; Lynch, 2011; Fernandes *et al.*, 2014).

From a methodological perspective, we extend the literature by adopting a dynamic latent class model in the form of a latent transition analysis (LTA). LTA is closely related to the general family of latent class models (Kamakura and Russell, 1989) by classifying individuals into a set of "latent states" or segments based on their specific circumstances or behavior. However, unlike traditional latent class models, LTA considers the membership of such states as *dynamic*, following a Markov process. Importantly, the Markov process allows for including covariates to predict transitions between states, rather than each state depending only on the previous state. While an emerging literature has begun to use traditional latent class models to better understand consumer financial decision-making (Gerhard *et al.*, 2018), dynamic latent class models have not yet been applied in this context, despite their potential for explaining the dynamics of consumers' financial vulnerability over time. Extending previous financial vulnerability literature, we demonstrate the value of LTA in identifying which psychological characteristics are critical in preventing consumers from trending from lower toward higher levels of financial vulnerability.

From a practical perspective, we offer policymakers and other practitioners actionable insights regarding the drivers of changes in consumers' financial vulnerability over time. Specifically, we show that these stakeholders can get a lot of traction from focusing on a few fundamental psychological characteristics of vulnerable consumers – such as their financial self-efficacy and consideration of future consequences – when developing strategies to prevent them from becoming or staying "trapped" in a situation of heightened financial vulnerability. Doing so is important, given the detrimental consequences of financial vulnerability (Hoffmann and McNair, 2019) and the ever-increasing self-responsibility for making consequential financial decisions affecting consumers' immediate and future financial well-being (Deetlefs *et al.*, 2019). Previous work highlights the negative psychological impact of financial difficulty on consumers (Bridges and Disney, 2010), with perceived financial well-being affecting overall well-being in orders comparable to other major characteristics such as physical health (Netemeyer *et al.*, 2018).

The remainder of this paper is organized as follows. We first present background statistics and findings about financial vulnerability. We then develop theoretical predictions about the role of psychological characteristics in explaining the dynamics of consumers' financial vulnerability. Afterward, we present the data and method used to explore these predictions and present results. We then discuss the results and their implications for practice. Finally, we conclude the paper.

Financial vulnerability

Financial vulnerability is a specific instance of the more general notion of consumer vulnerability, which has been conceptualized as a state of powerlessness or limited ability to engage effectively in the marketplace, arising from an interaction of individual characteristics (e.g. cognitive capacity), individual states (e.g. life transitions) and external conditions (e.g. discrimination) (Baker *et al.*, 2005). Vulnerable consumers are often referred to as "at-risk consumers," who may be harmed by marketers' practices or may be unable or unwilling to take full advantage of marketplace opportunities (Pechmann *et al.*, 2011). Financial vulnerability refers to the likelihood that an individual will experience financial hardship (O'Connor *et al.*, 2019) and is driven by such risk factors as low numeracy or financial literacy, high debt, low income or impactful changes in personal circumstances (Financial Conduct Authority, 2015).

Financial vulnerability is a pernicious issue affecting many consumers. In the USA alone, the Consumer Financial Protection Bureau (Consumer Financial Protection Bureau, 2013) estimates that the low-income and financially vulnerable population includes 100 million people. Previous work has found that a majority of consumers appear to experience at least some degree of financial vulnerability in their lives (Anderloni *et al.*, 2012). These findings are in line with broader evidence of financial fragility among average households. For example, as many as 46% of Americans say they could not come up with $2,000 in a month's time if an unexpected shock occurred (Lusardi *et al.*, 2011). Further, only 57% of consumers understand basic personal finance concepts (Klapper *et al.*, 2015).

To improve consumers' financial resilience, measures aiming to increase objective financial literacy are a necessary, but not sufficient, policy ingredient (Fernandes *et al.*, 2014). Subjective financial literacy, or financial self-efficacy, is deemed equally important to stimulate healthier financial behavior (Allgood and Walstad, 2016). Financial self-efficacy captures how adequate consumers feel their financial knowledge is to make financial decisions (Lown, 2011). More generally, both academics (Gerhard *et al.*, 2018; Dholakia *et al.*, 2016) and practitioners (Consumer Financial Protection Bureau, 2013; Money Advice Service, 2015) recognize that psychological factors are essential to understand financial capability. Recent work finds that psychological characteristics are also vital to explain the link between financial vulnerability and financial outcomes. In particular, consumers' personal savings orientation (Dholakia *et al.*, 2016), consideration of future consequences (Strathman *et al.*, 1994), money management skills (Garðarsdóttir and Dittmar, 2012) and financial self-efficacy (Lown, 2011) mediate the relationship between financial vulnerability and experiencing positive financial outcomes (e.g. savings and investments levels; paying credit card balances in full each month) and negative financial outcomes (e.g. being in arrears on critical payments; being in receipt of welfare) (Hoffmann and McNair, 2019).

What is missing in the literature so far, however, is an understanding of whether and how these individual psychological characteristics may also explain potential heterogeneity among consumers in terms of their membership of states of higher vs lower financial vulnerability, and the associated dynamics in terms of transitions between these states – in either direction – over time. Hence, in the following, we discuss aforementioned psychological characteristics in more detail and develop theoretical predictions as to their expected effect on state membership and transitions.

Theoretical predictions

Motivated by aforementioned research which finds that the consideration of future consequences, financial self-efficacy, personal savings orientation and money management skills are influential in "buffering" financially vulnerable consumers from experiencing detrimental financial outcomes (Hoffmann and McNair, 2019), we expect that these psychological characteristics will also be instrumental in "shielding" consumers from being in a state of higher financial vulnerability in the first place or transitioning from a state of lower to higher financial vulnerability over time.

Consideration of future consequences

Individuals' consideration of future consequences describes their attitude toward distant as opposed to immediate consequences of engaging in potential behaviors (Strathman *et al.*, 1994). In particular, individuals with a lower level of consideration of future consequences focus on the immediate consequences of their actions, whereas those with a higher level of consideration of future consequences assign more importance to the far-reaching consequences of their actions. Accordingly, prior research finds that the consideration of

future consequences is positively related with being conscientiousness and displaying financially responsible behavior (Joireman *et al.*, 2005). Indeed, Howlett *et al.* (2008) demonstrate how more future-oriented individuals are more likely to participate in a retirement plan, while they are less likely to invest in a high-risk, but moderate return, plan. Based on these previous findings, we expect that consumers with a higher level of consideration of future consequences are:

- more likely to be in a state of lower instead of higher financial vulnerability; and
- less likely to transition from a state of lower to higher financial vulnerability over time.

Financial self-efficacy

Financial self-efficacy refers to individuals' perceived ability to succeed in managing their financial affairs (Lown, 2011). A growing literature indicates the importance of self-efficacy for effectively managing household finances, finding that it helps explain financial attitudes (Farrell *et al.*, 2016), financial planning (Hoffmann and Plotkina, 2020), financial outcomes (Hoffmann and McNair, 2019) and financial satisfaction (Asebedo and Payne, 2019). Of particular importance in the financial vulnerability context is that individuals with higher self-efficacy are typically more successful in coping with stressful situations (Park and Folkman, 1997), and the more consumers believe in their financial capability, the more responsible their financial behavior (Hadar *et al.*, 2013). Hence, we expect that consumers with a higher level of financial self-efficacy are:

- more likely to be in a state of lower instead of higher financial vulnerability; and
- less likely to transition from a state of lower to higher financial vulnerability over time.

Personal savings orientation

Personal savings orientation reflects the "ongoing action control that individuals need to cultivate and sustain to make saving money an ingrained part of their lifestyle" (Dholakia *et al.*, 2016, p. 151). It can be understood as the chronic tendency to attach value to saving money in a consistent manner and explains such beneficial financial behaviors as an increased ability to delay gratification, less discounting of future gains and higher savings levels (Dholakia *et al.*, 2016). The positive habit formation which is central to a strong personal savings orientation helps prevent problematic financial behaviors such as payment delinquency (Letkiewicz and Heckman, 2019), which is one of the risk factors of financial vulnerability (Hoffmann and McNair, 2019). Individuals' personal savings orientation also has a positive relationship with their expected future financial security (Ponchio *et al.*, 2019). Hence, we expect that consumers with a stronger personal savings orientation are:

- more likely to be in a state of lower instead of higher financial vulnerability; and
- less likely to transition from a state of lower to higher financial vulnerability over time.

Money management skills

Money management skills refer to individuals' self-reported skills in managing money and is negatively related with harmful financial behaviors such as overspending and compulsive

buying (Garðarsdóttir and Dittmar, 2012). Money management skills are also negatively related with various forms of indebtedness (Garðarsdóttir and Dittmar, 2012; Donnelly *et al.*, 2012), which again constitutes one of the risk factors of financial vulnerability (Hoffmann and McNair, 2019). Money management skills can reduce individuals' vulnerability to financial exploitation (Elbogen *et al.*, 2011) and are essential in supporting financially at-risk populations (Chen and Lemieux, 2016). Against this background, we expect that consumers with better developed money management skills are:

- more likely to be in a state of lower instead of higher financial vulnerability; and
- less likely to transition from a state of lower to higher financial vulnerability over time.

Data and method

Participants

We recruited participants from a nationally representative online panel of Americans which is maintained by Qualtrics, who pays participants to complete surveys and ensures a consistent panel quality. In our analyses, we examine $N = 237$ participants that provided longitudinal data on their sociodemographics, financial vulnerability and individual psychological characteristics. In particular, these participants completed an initial survey in November 2017 and a follow-up survey in February 2018. At the start of the survey, we briefed participants that we aimed to "understand individual financial decisions that consumers make." Participants ranged from 20 to 87 years old ($M_{age} = 54.75$, SD = 13.46), 50.2% were males, and 51.5% were educated to university level. To enhance the interpretation of the results and acknowledge prior research suggesting generational differences in financial fragility (West and Friedline, 2016; Luukkanen and Uusitalo, 2019), we grouped participants into three age categories: "Millennials" (18–38 years old, 12.2% of sample), "Gen X" (39–54, 32.5% of sample) and "Baby Boomers" (54+, 55.3% of sample).

Measurement

Beyond the sociodemographics described above, we collected information on participants' financial vulnerability and psychological characteristics as described below (details in Table 1).

Financial vulnerability. We measured participants' financial vulnerability regarding the risk factors included in Hoffmann and McNair's (2019) formative measure of financial vulnerability. Participants' overall financial vulnerability score represents the unweighted sum of the number of risk factors for which their survey responses suggested vulnerability. As some risk factors comprise subissues, participants' overall financial vulnerability score can range from 0 to 12. Table 1 specifies for each risk factor which survey response indicates vulnerability.

Psychological characteristics. Given their established relationship with consumers' financial vulnerability (Hoffmann and McNair, 2019), we assessed four psychological characteristics.

Consideration of future consequences. We used seven items from Strathman *et al.*'s (1994) scale, which measures individual differences in the extent to which consumers consider distant versus immediate consequences of behaviors. Higher scores indicate a greater consideration of future consequences. Construct reliability is good, with a Cronbach's alpha of 0.78.

Table 1. Variable and scale definitions for financial vulnerability and psychological characteristics

Risk factors for financial vulnerability	Variable/scale	Item wording	Min.	Max.	Mean	SD
	High-school education	*Non-high-school education 1.3%* *High-school education 98.7%* → not completing high school: +1 on financial vulnerability scale				
	Physical and mental health (University of Michigan's Health and Retirement Study)	Do you have any longstanding physical or mental impairment, illness or disability? By long-standing we mean anything that has affected you over a period of 12 months, or that is likely to affect you over a period of 12 months *Yes (1) 36.3%* *No (2) 63.7%* → any such health issues: +1 on financial vulnerability scale				
	Monthly income (Ohio State University's Consumer Finance Survey)	What is the current MONTHLY net income of your household? Here we mean your "take-home pay," that is, your final income after any deductions are made for tax, social security, union dues, alimony, etc. Your income can include wages/salary, commissions, bonuses, tips, interest, dividends, income from rental properties owned, royalties, child support/alimony, VA payments, income from estates/trusts, etc. Please include all household members in this estimate. If you don't have the exact numbers at hand, please give us your best guess. *(Open response)* → income below US Federal Poverty Guideline: +1 on financial vulnerability scale	$100	$150,000	$8455.14	$16,393.15
	Monthly debt (Ohio State University's Consumer Finance Survey)	How high are the MONTHLY debt repayment obligations of your household? Please include your monthly mortgage (principal, interest, taxes, and insurance) and home equity loan payments as well as monthly payments for car loans, student loans, loans from family or friends, your minimum monthly payments on credit card debt, and on any other loans that you have. *(Open response)* → debt-to-income ratio over 36%: +1 on financial vulnerability scale	$0	$15,000	$1681.18	$2,025.32
	Caring responsibilities (AARP Public Policy	Do you currently have any dependents over the age of 18 that you care for? This may be because they have long-term physical or mental ill-health or disability, or problems relating to old age				

(*continued*)

Table 1.

Risk factors for financial vulnerability	Variable/scale	Item wording	Min.	Max.	Mean	SD
	Institute and National Alliance for Caregiving)	*Yes (1) 13.5%* *No (2) 86.5%* → any such caring responsibilities: +1 on financial vulnerability scale				
	Age	Being "younger" (18–34 years) or "old" (80+ years) (9.7%) → being either "younger" or "old": +1 on financial vulnerability scale				
	English speaker	Is English your native language? *Yes (1) 95.4%* *No (2) 4.6%* → English not native language: +1 on financial vulnerability scale				
	Change in circumstances	Have you experienced any of the following major changes in life circumstances in the past 12 months? Please select all that apply *Death of a spouse 11.8%* *Separation or divorce from spouse 3%* *Redundancy or job loss 5.1%* → any change in circumstances: +1 on financial vulnerability scale	0	3	0.20	0.49
	Financial literacy van Rooij *et al.* (2011)	Financial numeracy: Suppose you had $100 in a savings account and the interest rate was 2% per year. After five years, how much do you think you would have in the account if you left the money to grow? ***More than $102*** *(1) 81.4%* *Exactly $102 (2)* *Less than $102 (3)* *Do not know (4)* Compound interest: Suppose you had $100 in a savings account and the interest rate was 20% per year and you never withdraw money or interest payments. After five years, how much would you have in this account in total? ***More than $200*** *(1) 70.5%* *Exactly $200 (2)*	0	4	2.93	1.09

(*continued*)

Risk factors for financial vulnerability	Variable/scale	Item wording	Min.	Max.	Mean	SD
		Less than $200 (3) *Do not know (4)* Inflation: Suppose that in the year 2017 your income has doubled and the prices of all goods have doubled too. In 2017, how much will you be able to buy with your income? *More than today (1)* ***The same** (2) 70%* *Less than today (3)* *Do not know (4)* Risk diversification: When an investor spreads their money among different assets, does the risk of losing money: *increase (1)* ***decrease** (2) 71.3%* *Stay the same (3)* *Do not know (4)* → fewer than three out of four financial literacy questions correct: +1 on financial vulnerability scale				
	Numeracy Cokely *et al.* (2012)	Imagine we are throwing a five-sided die 50 times. On average out of these 50 throws, how often would the five-sided die show an odd number (i.e. a 1, 3 or 5)? *(Open response)* **Correct Answer: 30** *(78.5%)* → incorrect answer: +1 on financial vulnerability scale				
Psychological characteristics	Variable/scale	Item wording	Min.	Max.	Mean	SD
	Consideration of future consequences Strathman *et al.* (1994)	For each of the statements below, please indicate whether or not the statement describes you on the scale from 1 "Does not describe me at all" to 7 "Describes me very well." *Often I engage in a particular behavior to achieve outcomes that may not result for many years.* *I act only to satisfy immediate concerns, figuring the future will take care of itself (RC).*	1.75	7	4.83	1.18

(*continued*)

Table 1.

Table 1.

Risk factors for financial vulnerability	Variable/scale	Item wording	Min.	Max.	Mean	SD
		My behavior is only influenced by the immediate (i.e. a matter of days or weeks) outcomes of my actions (RC). *I generally ignore warnings about possible future outcomes because I think the problems will be resolved before they reach crisis levels (RC).* *I think that sacrificing now is usually unnecessary as future outcomes can be dealt with at a later time (RC).* *I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date (RC).* *As my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes (RC)*				
	Financial self-efficacy Lown (2011)	Please read the following statements and choose one answer for each statement to indicate how well the statement describes you on the scale from 1 "Does not describe me at all" to 7 "Describes me very well." *It is hard to stick to my spending plan when unexpected expenses arise (RC).* *It is challenging to make progress toward my goals (RC).* *When unexpected costs arise I usually have to use credit (RC).* *When faced with a financial challenge I have a hard time figuring out a solution (RC).* *I lack confidence in my ability to manage my finances (RC).* *I worry about running out of money in retirement (RC).*	1	7	4.56	1.65
	Money management skills Garðarsdóttir and Dittmar (2012)	Please read the following statements and choose one answer for each statement to indicate how well the statement describes you on the scale from 1 "Does not describe me at all" to 7 "Describes me very well." *I put away money in advance to be able to pay my bills.* *I always repay my credit card bills in time.* *I monitor my financial statements.* *I keep an eye on my cash flow.* *I make detailed budgets for my expenses.* *I stay within my budgets.*	1.60	6.40	5.39	0.82

(*continued*)

Table 1.

Risk factors for financial vulnerability	Variable/scale	Item wording	Min.	Max.	Mean	SD
		I always know exactly how much money I owe. *I am good at handling money.* *My finances are in chaos (RC).*				
	Personal savings orientation Dholakia *et al.* (2016)	To what extent do you agree with the following statements? (1-Strongly Disagree, 7-Strongly Agree) *I keep a careful watch over my spending on a daily basis.* *I do not spend money thoughtlessly, I would rather save it for a rainy day.* *Putting money into personal savings is a habit for me.* *I actively consider the steps I need to take to achieve my personal savings goals.* *I like to discuss the topic of saving money with my friends and family.* *I usually save money without having a specific goal in mind.* *The goal of saving money is always at the back of my mind.* *Saving money on a regular basis should be an important part of one's life.* *Saving money is like a lifestyle: you have to keep at it.*	1	7	4.83	1.18

Notes: Percentage values after item responses indicate the proportion of the sample that gave that response. Bold text in the Item wording column indicates correct responses for objective scales. For instruments involving Likert-scaled responses (money management skills; financial self-efficacy; consideration of future consequences; propensity to plan) mean scores represent the average Likert rating across all items on the scale

Financial self-efficacy. We used Lown's (2011) six-item scale, which measures personal agency regarding financial matters or the belief one can succeed at a given financial task. Higher scores indicate a stronger financial self-efficacy. Cronbach's alpha is very good at 0.89.

Personal savings orientation. We used Dholakia *et al.*'s (2016) nine-item scale, which assesses the merit that consumers attribute to being a proactive saver. Higher scores indicate a stronger personal savings orientation. A Cronbach's alpha of 0.88 indicates high reliability.

Money management skills. We used Garðarsdóttir and Dittmar's (2012) nine-item scale, which measures proactivity regarding managing one's money. Higher scores indicate stronger money management skills. Construct reliability is good, with a Cronbach's alpha of 0.74.

Latent transition analysis

We use LTA to address our study's objective of investigating how consumers' financial vulnerability evolves over time. LTA uses longitudinal data to examine how individuals change over time (Collins and Lanza, 2010). It is closely related to latent class analysis (LCA), which has become a popular technique for identifying latent groups within a population (Konuş *et al.*, 2008). The key difference between LTA and LCA is that LTA assumes that these groups or "latent states" are *time-dependent*, meaning that individuals may change groups from one time to another. Typically, a single-order Markov chain is assumed, which suggests that state membership at any given time (t) is dependent on state membership in the previous time period ($t-1$). The value of this assumption is that the probability of movements between states can be calculated, which are formally referred to as "transition probabilities."

Another positive feature of LTA is the ability to include covariates in two ways (Collins and Lanza, 2010). First, covariates may be included to predict state membership at $t-1$, which equates to testing the determinants of each individual's "starting state." Second, covariates can be included in the estimation of transition probabilities, resulting in a test of factors which either increase or decrease the likelihood of each possible movement between states from $t-1$ to t.

The combination of these features makes LTA an appealing method to explore our research question about the evolution of consumers' financial vulnerability over time and the explanatory role of psychological characteristics therein. By using measured financial vulnerability as the indicator variable for the model, the latent states described by the model highlight subgroups of financial vulnerability among the population sample. The transition probabilities highlight the relative likelihood of changes to an individual's financial vulnerability state over time, whereas the inclusion of psychological characteristics allows for identifying the key determinants of these changes.

We estimate the LTA using the popular software package *LatentGold* (Version 5). We include a single indicator variable which measures *financial vulnerability*. As covariates, we include measures of the psychological characteristics *consideration of future consequences, financial self-efficacy, personal savings orientation* and *money management skills*. We include age, gender and education level as additional covariates to act as control variables. We include all covariates in both the model for the starting states and the transition probabilities, to test for potentially different effects. To reduce the likelihood of the model converging on a local, rather than a global, optimal solution, we follow the literature and estimate each potential model with 100 random starting sets of parameters and retain only the best solutions (Hipp and Bauer, 2006).

Results

Descriptive results. We first examine participants' financial vulnerability at the time of the initial as well as the follow-up survey to get a better understanding of the extent to which their financial vulnerability changes over time. In the initial survey, participants were, on average, deemed vulnerable in 1.89 areas (SD = 1.29) which increased significantly to 2.45 areas (SD = 1.30) in the follow-up survey ($t(236) = 6.68$, $p < 0.001$). Further inspection of the distribution of changes in financial vulnerability scores indicated a range of −3 to +4, with 24.1% of participants' scores remaining unchanged. Participants in the top decile of the degree of change distribution saw their vulnerability score increase by 2 or more between the initial and follow-up survey, whereas those in the bottom decile saw their scores decrease by 1 or more. These descriptive results indicate both significant changes in participants' financial vulnerability over time as well as considerable heterogeneity in the direction of these changes, thereby providing face validity for our ensuing investigation of the dynamics of consumers' financial vulnerability over time.

States of financial vulnerability. As the states estimated by the LTA are latent, we must first identify how many states exist, and what the profile of each state is. To achieve this objective, we estimate model solutions ranging from one to five states, and compare their relative model fit using the Bayesian information criterion (BIC), which is based on the model's log-likelihood. Table 2 shows that the BIC is lowest for a two-state model, indicating that this solution provides the best relative model fit while accounting for model complexity (Collins and Lanza, 2010).

Table 3 describes the size of each latent state, as well as the state profiles based on the included indicator variable *financial vulnerability*. The impact of each covariate on the likelihood of membership in each state as an individual's "starting state" is also displayed. For the covariates, a positive (and significant) coefficient suggests that the likelihood of an individual belonging to that state is positively associated (i.e. a higher likelihood) with that covariate, whereas a negative coefficient signifies a negative relationship (i.e. a lower likelihood).

State 1 (50.8% of participants) includes individuals with an average *financial vulnerability* of 1.22. We label this state *lower vulnerability*. The likelihood of belonging to this state as a starting state is higher among Gen X and university-educated individuals, and lower among millennials and females. A positive association is also found for *financial self-efficacy*, meaning that *lower vulnerability* individuals are likely to have higher levels of *financial self-efficacy*.

In State 2 (49.2% of participants), average *financial vulnerability* is 3.13, which is notably higher than that of State 1. Hence, we label this state *higher vulnerability*. The opposite effects are found for the covariates, with the likelihood of membership in this state being higher among millennials and females, and lower among Gen X and university-educated individuals. Members of the *higher vulnerability* state are also likely to have lower levels of *financial self-efficacy*.

No. of states	Log-likelihood	Bayesian information criterion
1 state	−787.66	1,608.14
2 states	−703.73	*1,593.37*
3 states	−648.67	1,734.78
4 states	−589.61	1,966.62
5 states	−551.48	2,338.73

Table 2. Model fit for latent transition analysis solutions

	State 1 (lower vulnerability)	State 2 (higher vulnerability)
State size (% of study participants)	50.8%	49.2%
State profile		
Financial vulnerability (mean)	1.22	3.13
Starting-state covariates		
Age (Millennial)	−0.55**	0.55**
Age (Gen X)	0.41**	−0.41**
Age (Boomers)	0.15	0.15
Gender (Female)	−0.19*	0.19*
Education (University)	0.18*	−0.18*
CFC	0.08	−0.08
FSE	0.22***	−0.22***
PSO	0.09	−0.09
MMS	−0.12	0.12

Notes: CFC = Consideration of future consequences, FSE = Financial self-efficacy, PSO = Personal savings orientation, MMS = Money management skills. * = $p < 0.10$, ** = $p < 0.05$, and *** = $p < 0.01$

Table 3.
Latent state profiles and starting-state covariates

Aforementioned results are consistent with prior research which finds that millennials are particularly financially fragile when compared with earlier generations, as a result of struggling with high rates of housing and student loan debt, and an increasingly unstable labor market (West and Friedline, 2016). Our results also extend previous research which consistently documents that higher levels of educational attainment are related to lower rates of financial fragility (West and Mottola, 2016). The results also build on prior research which argues that the combination of lower earnings, lower savings, longer life spans and higher risk aversion when investing makes it challenging for women to become and remain financially independent throughout their lives (Fisher, 2010). Finally, the results provide empirical support for our theoretical prediction about the "protective value" of financial self-efficacy (cf. Hoffmann and McNair, 2019) in terms of consumers with higher financial self-efficacy being more (less) likely to be in a state of lower (higher) financial vulnerability.

Transitions between latent states. We next examine the way in which individuals transition between these states over time. Each row in Table 4 refers to an individual's previous state (state at $t-1$), whereas the columns refer to the future states (state at t). Hence, the top row refers to individuals who were in the *lower vulnerability* state at $t-1$ and estimates their likelihood of remaining in the same state (first column) relative to becoming a member of the *higher vulnerability* state at t (second column). Table 4 also displays the impact of the covariates on these transition probabilities. A positive (negative) coefficient indicates that a transition is more (less) likely as a result of that covariate. Note that the impact of the covariates on the transitions is calculated relative to the probability of remaining in the same state. For this reason, the covariate coefficients are blank on the diagonals, as these are the reference points for the analysis.

For individuals who are in the *lower vulnerability* state at $t-1$, there is a 54.3% probability that they will remain in that state at t, compared to a 45.7% probability that they will transition to the *higher vulnerability* state. In contrast, among individuals who are already in the *higher vulnerability* state at $t-1$, there is an 88.4% probability that they will remain in that state at t, and only an 11.6% probability that they will transition to the *lower vulnerability* state. These transition probabilities have two key implications. The first implication is that the likelihood of becoming more vulnerable over time is quite high. This

	State ($t-1$)	State (t) Lower Vulnerability	State (t) Higher Vulnerability
Transition probabilities	Lower vulnerability	54.3%	45.7%
	Higher vulnerability	11.6%	88.4%
Covariates			
Age (millennial)	Lower vulnerability		4.56
	Higher Vulnerability	−4.33	
Age (Gen X)	Lower vulnerability		−2.53
	Higher vulnerability	−1.09	
Age (boomer)	Lower vulnerability		−2.03
	Higher vulnerability	5.42	
Gender (female)	Lower vulnerability		0.65
	Higher vulnerability	1.79	
Education (university)	Lower vulnerability		−1.33**
	Higher vulnerability	−0.12	
CFC	Lower vulnerability		−1.08**
	Higher vulnerability	−4.91	
FSE	Lower vulnerability		−0.37
	Higher vulnerability	3.85	
PSO	Lower vulnerability		0.45
	Higher vulnerability	1.97	
MMS	Lower vulnerability		0.18
	Higher vulnerability	−1.59	

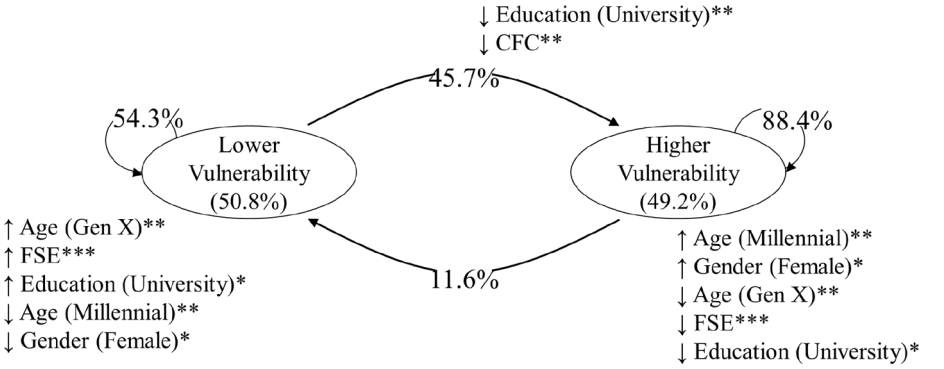
Notes: CFC = Consideration of future consequences, FSE = Financial self-efficacy, PSO = Personal savings orientation, MMS = Money management skills. ** = $p < 0.05$

Table 4. Transition probabilities and impact of covariates

indicates that there is a general trend of increasing financial vulnerability over time, which is in line with the descriptive results described previously. In other words, individuals seem "fragile" with respect to transitioning into a more vulnerable state. The second implication is that the *higher vulnerability* state is quite "sticky," in that once individuals are in this state, it is relatively unlikely that they will improve their financial vulnerability over a three-month period. In other words, these individuals seem "entrenched".

Considering the covariates, the likelihood of transitioning from the *lower vulnerability* to the *higher vulnerability* state is negatively associated with having a university education or a higher level of *consideration of future consequences*. That is, individuals who are more highly educated or those having a greater concern for the future are less likely to become more vulnerable over time. These results are consistent with previous research which finds that an individual's educational attainment is negatively related to their financial fragility (West and Mottola, 2016). Moreover, these results provide empirical support for our theoretical prediction about the importance of the consideration of future consequences as a "protective buffer" (Joireman *et al.*, 2005) which makes it less likely for consumers to transition from a state of lower to higher financial vulnerability over time.

The results of our LTA are summarized in Figure 1. The ovals represent the two latent states as described by the model. The curved lines connecting the states represent possible transitions, with the arrows indicating the direction of the transition, and the percentages on these lines representing the transition probabilities. Finally, significant covariates predicting membership of starting states are presented next to the relevant states, whereas significant covariates for transitions are presented next to the transition probabilities. For the covariates, a significant negative coefficient is illustrated by ↓, with ↑ indicating a significant positive coefficient.



Notes: CFC = Consideration of Future Consequences, FSE = Financial Self-Efficacy.
↓ = covariate has a statistically significant negative impact on the likelihood of membership in a particular latent state or transition probability between the latent states, respectively.
↑ = covariate has a statistically significant positive impact on the likelihood of membership in a particular latent state or transition probability between the latent states, respectively.
* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Figure 1.
Summary of latent transition analysis results

Discussion and implications

Our analysis examined how a sample of US consumers' financial vulnerability fluctuated over a three-month period. In particular, we applied the LTA method to do the following:

- assess how four key psychological characteristics explain participants' baseline state of vulnerability (lower vs higher); and
- determine their likelihood of transitioning between states of lower vs higher vulnerability – and vice versa – over time, as well as understand how aforementioned psychological characteristics affect the likelihood of moving between these states of financial vulnerability.

Below, we discuss our key results, starting with explaining what we will call the "financial vulnerability trap" and then elaborating on the factors that could spare a consumer from becoming (or staying) trapped. In turn, we will provide a set of recommendations for policymakers and business practitioners.

Financial vulnerability trap

Most individuals experiencing higher financial vulnerability (88.4%) remained at a higher level of vulnerability three months later, whereas a substantial portion of those experiencing lower financial vulnerability (45.7%) experienced higher vulnerability after three months. These findings suggest that experiencing even low levels of financial vulnerability can lead to a subsequent worsening in one's exposure to vulnerability risk factors from which it is difficult to recover. We label these dynamic tendencies of financial vulnerability the "financial vulnerability trap." In this regard, it is important to keep in mind that being in a state of lower versus higher vulnerability is not the same as being rich vs poor: income is only 1 of 12 risk factors of financial vulnerability.

Notably, several of the assessed risk factors for financial vulnerability are relatively intractable. For instance, a lower education, not being a native English speaker, or having

carer responsibilities are factors for which individuals are likely to remain at risk for over an indefinite period. While only small proportions of our sample were deemed to be at risk for these concerns (Table 1), factors such as having a long-standing medical issue (36.3%) or having a high debt-to-income ratio (43%) were most prevalent, and also likely immune to acute policy interventions. Given the possible long-term health impairments and associated loss of income earning capacity for consumers even after recovering from COVID-19 – as well as the high number of job losses related to the recent COVID-19 crisis in general – the latter risk factors are likely to become even more pervasive in the future (US Department of Health and Human Services, 2020a).

Financial literacy (32 % of sample at risk) would appear to be the risk factor lending itself most readily to direct intervention attempts. While Anderloni *et al.* (2012) also report a negative relationship between financial literacy and current financial vulnerability, further research is needed to assess whether improving the financial literacy of already vulnerable consumers would yield acute reductions in their financial vulnerability. Recent work finds that financial education may not improve financial behavior by improving financial literacy for low-income consumers (Son and Park, 2019); hence, alternative interventions might be required for more vulnerable individuals. In the following, we propose such alternative interventions based on individuals' psychological characteristics, several of which we found to play an important role in predicting either state membership in terms of lower vs higher financial vulnerability or transitions between these states.

Financial self-efficacy

Our results indicate that higher financial self-efficacy is associated with lower financial vulnerability. Financial self-efficacy (Lown, 2011) concerns self-perceptions of how capable one is at achieving a financial task or goal, and has been associated with more favorable outcomes concerning credit use (Tokunaga, 1993), savings (Engelberg, 2007) and investments (Dulebohn and Murray, 2007). The broad range of financial behaviors and outcomes to which financial self-efficacy contributes is also highlighted by Hoffmann and McNair (2019), who identify financial self-efficacy as a mediator of the impact of financial vulnerability, mitigating its negative effect across several positive and negative financial outcomes (e.g. savings levels, being in arrears). We add to these findings by showing that financial self-efficacy is also important in "buffering" consumers against the possibility of experiencing financial vulnerability in the first place.

Indeed, our findings suggest that financial self-efficacy is one means of offering resilience against financial vulnerability, which speaks to ongoing efforts by consumer stakeholder groups to better understand which psychological factors are key to improving consumers' financial capability (Consumer Financial Protection Bureau, 2013; Money Advice Service, 2015). Kuhnen and Melzer (2018) note that those higher in self-efficacy are less likely to experience detriment because of financial shocks on account of being more likely to take preventative steps to mitigate such possibilities, such as having emergency savings. With Goode and Waring (2011) observing that even a relatively low level of readily available savings can offset unexpected financial shocks, our results add to an emerging picture suggesting that facilitating consumers to develop financial self-efficacy likely has considerable financially protective value. Indeed, supporting consumers lacking confidence in their financial abilities is a key policy issue in the UK, where one in four consumers now feels anxious at the prospect of engaging with their bank, leading to calls for developing new approaches to support vulnerable consumers (Money and Mental Health Policy Institute, 2019b). Indeed, there have been calls for UK banks and the financial regulator to do more with the data available to them, identifying where harm may be occurring and

proactively intervening to support vulnerable consumers (Money and Mental Health Policy Institute, 2019a). Importantly, as many as 51% of surveyed consumers agree that doing so could benefit them. A proactive approach by financial service providers will be essential, however, as prior research indicates that those with low financial self-efficacy are less likely to seek financial help themselves (Lim *et al.*, 2014).

Given that financial vulnerability can often occur acutely because of unexpected income shocks – as highlighted by the recent COVID-19 crisis – it is important at such times that we help individuals feel capable to mentally navigate these financially distressing events, which requires having sufficient financial self-efficacy. Developing core self-efficacy depends on factors such as drawing on relevant past experience, vicarious learning and emotion regulation (Bandura, 1977). Programs aimed at younger audiences – such as those in high school – could yield significant value in terms of helping people develop the skills and experience to buffer financial self-efficacy (cf. Heckman *et al.*, 2013) throughout their lives. Indeed, positive coping strategies for dealing with emotionally stressful events are teachable (Romano, 1992).

However, besides incorporating such programs to increase consumers' financial self-efficacy through formal education – which by itself is also an important factor reducing the likelihood of being financially vulnerable – previous research points to the importance of using "teachable moments" (Loke *et al.*, 2015) and "just-in-time" interventions (Fernandes *et al.*, 2014) to improve consumers' financial behavior. In practical terms, this could mean that policymakers could set up programs designed to lift individuals' feelings of financial self-efficacy when this matters the most – for example, by stimulating business practitioners to offer financial as well as psychological coaching during exit interviews with staff. As part of their 2020–2030 financial capability strategy for the UK, for example, the Money and Pensions Service (2020) (formerly the Money Advice Service, cited elsewhere in this paper), announced a pilot "Financial First Aider" scheme for the workplace. This initiative will see trained employees act as workplace financial guidance providers, and signpost toward further support. Indeed, losing one's job can be a demoralizing experience and negatively affect individuals' perceived ability to successfully manage their personal financial affairs (Snyder and Nowak, 1984), thereby exacerbating their risk of financial vulnerability. Importantly, however, individuals who give external causal attributions for their unemployment display higher self-esteem and less hopelessness than individuals who give internal causal attributions for losing their job (Winefield *et al.*, 1992).

It is thus important for policymakers and human resources managers to remind laid-off staff that it is not their fault if they lose their jobs because of unforeseen external circumstances such as those related to the recent COVID-19 crisis. Moreover, (financial) coaching could remind individuals to think back about how they have previously managed difficult financial situations, because such enactive mastery protocols have the potential to increase individuals' self-efficacy (Gist and Mitchell, 1992). Technology can also help in this regard, for example, by offering helpful and supportive text messages at times consumers need a "boost," similar to the SmokefreeTXT program delivered by the US Department of Health and Human Services (2020b). Indeed, the UK's Behavioural Insights Team has used similar approaches to improve educative attainment in college students, and is currently trialing a "Savings Supporter" initiative involving supportive text messages from trusted individuals (Behavioural Insights Team, 2018).

Finally, apart from aforementioned measures to boost consumers' mental state of mind, interventions should also provide them with "hands-on" financial advice to avoid an impactful change in personal circumstances such as losing one's job having disastrous

outcomes. For example, consumers could be advised to contact their bank in such circumstances, to negotiate a mortgage payment holiday to avoid foreclosure on the family home, as has been the case more recently in the UK during the current COVID-19 crisis (Financial Conduct Authority, 2020).When presented in simple terms, such financial education also boosts financial self-efficacy (Hadar *et al.*, 2013).

Consideration of future consequences

Our results show that transitioning from a state of lower to higher financial vulnerability can to some extent be offset by psychologically placing a higher emphasis on future consequences (i.e. consideration of future consequences). In relation to the "financially squeezed," the Money Advice Service (2016) notes that a distinct characteristic of this group is their relative emphasis on managing money on a daily basis, which may reflect a narrowing of cognitive bandwidth that can be experienced during times of financial constraint (cf. Mullainathan and Shafir, 2013). More generally, those scoring lower in consideration of future consequences discount the future more (Joireman *et al.*, 2005), and are more likely to accrue (credit card) debt (Joireman *et al.*, 2010).

Disrupting the narrowed temporal focus that is associated with financial vulnerability might thus be one mechanism by which to impede worsening vulnerability. Although reduced cognitive resources might make maintaining a more future-oriented financial outlook difficult as consumers may struggle to see beyond more immediate financial concerns, previous research by Tam and Dholakia (2014) suggests that increased saving can be instigated by leveraging present bias to focus on the *act* of saving (i.e. present behavior) rather than on the *goal* of saving (i.e. future outcome), with similar findings having been reported by Ülkümen and Cheema (2011). Financial incentives may also offer some promise. In this regard, the UK Government's ongoing "Help to Save" scheme (Gov.uk, 2019) – which offers low-income individuals a 50p bonus on each £1 they save – is a pioneering attempt to promote regular saving in economically disadvantaged groups. An equivalent product exists in the USA – the "Individual Development Account" (Sherraden, 2000).

Moreover, at the point of financial vulnerability, individuals could benefit from additional encouragement to maintain a future orientation. Practitioners could, for instance, assess the individual's current extent of future orientation to inform judgments about the risk of escalating financial vulnerability. Indeed, "plan[ning] ahead for expenses" is an important indicator of the FinHealthScore measurement instrument that the US Center for Financial Services Innovation (2016) recommends practitioners to adopt and administer regularly among their client base in an effort to shift the financial services industry toward a focus on improving consumers' lives.

Besides prior evidence that individuals who have received general education in making judgments and decisions also display a longer-term time perspective (Bernheim *et al.*, 2001), there are also other – and very practical – ways to try and increase consumers' consideration of future consequences. For example, Hershfield *et al.* (2011) demonstrate how confronting individuals with age-progressed renderings of themselves increases the connection between their present and future self, stimulating future-oriented behavior such as allocating income to retirement savings. Financial services providers could potentially use this technology during financial advice sessions with consumers, or incorporate it on their websites for consumers to experiment with.

An alternative policy intervention could focus on empowering individuals to shape and clarify their future, which is expected to stimulate a stronger future orientation (Moss *et al.*, 2017). In practice, consumers could be asked to imagine a desirable future financial situation

and identify how their strengths or resources could make this situation attainable, thus stimulating their perceived control (Gist and Mitchell, 1992), which in turn fosters planning for the future (Prenda and Lachman, 2001).

Finally, for consumers experiencing more acute financial vulnerability who also demonstrate lower consideration of future consequences, Joireman *et al.* (2005) suggest that attempts should be made to focus the individual on more positive short-term behaviors. One issue they observe is that lower consideration of future consequences is associated with impulsive buying tendencies. Hence, pragmatic advice on how to disable such tendencies in the short term (e.g. by not carrying cards or having lower daily payment limits on them) may be key intervention tools.

Conclusion

Americans are facing increased economic risk, with declining financial security and fraying social safety nets, leaving many individuals financially vulnerable (McCloud and Dwyer, 2011). Indeed, according to a report by the Organization for Economic Cooperation and Development (2020), recent developments such as the COVID-19 crisis have led many mainstream consumers to now be financially and psychologically vulnerable, and intensified the existing vulnerability of, for instance, the elderly or low-income consumers. While academics stress the importance of studying consumers' tendency to trend toward (higher) vulnerability (O'Connor *et al.*, 2019), and policymakers note that vulnerability is "a fluid state" which can be "temporary, sporadic or permanent" (Financial Conduct Authority, 2015, p. 7), research on the dynamics of consumers' financial vulnerability over time is still missing. Our research addresses this gap in our understanding and is the first to apply a dynamic latent class model in the realm of financial vulnerability. Doing so allows for an analysis of the factors upon which states of vulnerability may be predicated, and helps elucidate factors driving the transition between states of lower vs higher vulnerability – and vice versa – over time. Our findings indicate that financial vulnerability is likely characterized by an escalating exposure to risk factors, and seems entrenched in that it might be difficult to transition from higher to lower financial vulnerability. Importantly, however, we also find that financial self-efficacy and the consideration of future consequences can help reduce consumers' likelihood of being financially vulnerable in the first place, and reduce their likelihood of "sliding" from lower to higher vulnerability over time. These results have various practical implications, which were discussed in the previous section.

As with any research, we recognize some limitations of our work, which offer promising avenues for future research. First, although the time frame during which we study changes in consumers' financial vulnerability is consistent with that used when examining, for example, the effectiveness of financial planning programs (Danes, 2005; Boyce and Danes, 1998), it is still relatively short at three months. Longer time frames could offer more insight with respect to the extent of how entrenched financial vulnerability may be, and whether psychological factors may improve longer-term rates of recovery from financially vulnerable states. Moreover, our data collection in November 2017 and February 2018 straddles the Christmas period, which is a known period of psychological and financial pressure (McNair *et al.*, 2016). It would be interesting to examine the dynamics of consumers' financial vulnerability during less stressful times as well. Second, although drawn from a nationally representative Qualtrics panel of US consumers, our sample has a limited size at $N = 237$. Future research might want to follow up with larger sample sizes. Third, while our selection of assessed psychological factors is based on prior research (Hoffmann and McNair, 2019), it is not exhaustive. Several other factors may be relevant, such as impulsivity (Wang *et al.*, 2010) and psychological coping strategies in stressful situations

(McNair *et al.*, 2016). Future research could include such additional psychological factors to shed further light on the mental nuances of financial vulnerability. Finally, while the COVID-19 crisis will certainly have made many consumers (more) financially vulnerable (Organization for Economic Cooperation and Development, 2020), the pandemic constitutes a sudden and unexpected "shock." We acknowledge that our results regarding the role of psychological factors such as financial self-efficacy and the consideration of future consequences in "shielding" consumers from being financially vulnerable in the first place or transitioning from a state of lower to higher financial vulnerability over time might not apply to "forced" events such as the COVID-19 pandemic. Despite these limitations, our research contributes to the emerging, but still limited, literature on consumers' financial vulnerability.

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