

Scarcity and Intertemporal Choice

Eesha Sharma¹, Stephanie M. Tully², and Xiang Wang³

¹ Department of Marketing, Fowler College of Business, San Diego State University

² Department of Marketing, Marshall School of Business, University of Southern California

³ Department of Marketing and International Business, Lingnan University

Scarcity often encourages decisions that favor the present over the future. While prevailing theories largely attribute these decisions to myopic, impulsive decision making, five studies find support for an alternative, less prevalent perspective. We introduce the time horizon of threatened needs as an important determinant of scarcity's effect on intertemporal choice, demonstrating that people's decisions under scarcity reflect attempts to address threatened needs. Data from the Federal Reserve Bank of Philadelphia (Study 1) and preregistered studies ($N = 10,297$) show that time horizon moderates intertemporal decisions under scarcity. Study 2 manipulates scarcity perceptions among people engaged to be married, leading to increased preferences for sooner outcomes when wedding dates have shorter time horizons and a significant reversal when wedding dates have longer time horizons. Study 3 demonstrates that time horizon predicts intertemporal choice only when the intertemporal choice can help address threatened needs. Study 4 holds expense salience constant and replicates the moderation by time horizon using a paradigm that manipulates both scarcity and time horizon. Study 5 introduces multiple needs that vary in time horizon and importance, finding that decisions under scarcity reflect consideration of both the importance and temporal proximity of needs. These findings align with the perspective that people facing scarcity attempt to make decisions that are contextually appropriate. This work underscores the importance of understanding contextual variation in experiences of scarcity, suggests that decision making under scarcity is less thoughtless than presumed by the impulsive, myopic account, and offers recommendations for interventions for changing behavior under scarcity.

Keywords: scarcity, myopia, intertemporal choice, financial decision making, economic psychology


Supplemental materials: <https://doi.org/10.1037/pspa0000353.supp>


Nearly everyone is acquainted with feelings of scarcity. Feelings of scarcity refer to subjective perceptions that resources are insufficient for one's needs or wants (e.g., Mattheaei, 1984; Raiklin & Uyar, 1996; Ruffin & Gregory, 1993). These feelings can be experienced by individuals across the income spectrum and influence a variety of consequential outcomes (Mullainathan & Shafir, 2013). In particular, scarcity is known to influence intertemporal decisions, which hold meaningful consequences for well-being (e.g., saving for retirement, incurring high interest debt, adopting crash diets). Existing research finds that when people feel that their resources are scarce, they make

decisions that prioritize shorter term outcomes over longer term outcomes (e.g., Carvalho et al., 2016; Gneezy et al., 2020; Shah et al., 2012), and this is thought to be linked to behaviors among the poor, including under saving and overborrowing (e.g., Bertrand & Morse, 2011; Fitzpatrick & Coleman-Jensen, 2014; Lawrance, 1991; Tanaka et al., 2010).

A prominent perspective on the effect of scarcity on intertemporal choice is based on the premise that intertemporal decisions under scarcity are a function of increased myopic, impulsive decision making (e.g., Mani et al., 2013; Mullainathan & Shafir, 2013; Ong et al., 2019;

Eesha Sharma  <https://orcid.org/0000-0002-7787-1803>

Stephanie M. Tully  <https://orcid.org/0000-0002-7179-7729>

Xiang Wang  <https://orcid.org/0000-0002-0913-3227>

The authors thank Adam Alter, Ayelet Gneezy, Hal Hershfield, Chris Janiszewski, Jonathan Levav, John Lynch, Ed O'Brien, Nicholas Reinholdt, Zak Tormala, Christian Wheeler, and Gal Zauberman for helpful feedback at various stages of the project. Eesha Sharma and Stephanie M. Tully are Visiting Scholars at the Federal Reserve Bank of Philadelphia's Consumer Finance Institute (CFI) and thank the CFI for sharing the data used in Study 1. All views expressed in this article are those of the authors and do not represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

All laboratory studies were preregistered. Experimental stimuli, Supplemental Data Analyses, Posttests, and Supplemental Studies are available in the online Supplemental Materials. Preregistrations, deidentified data, and analysis code are available on ResearchBox (<https://researchbox.org/543>).

Note, because the data set in Study 1 is proprietary, we are not authorized to share the data.

All authors share joint first authorship and are listed in alphabetical order. Eesha Sharma played a supporting role in formal analysis and an equal role in conceptualization, investigation, methodology, writing—original draft, and writing—review and editing. Stephanie M. Tully played an equal role in conceptualization, formal analysis, investigation, methodology, writing—original draft, and writing—review and editing. Xiang Wang played a supporting role in methodology and an equal role in conceptualization, formal analysis, investigation, writing—original draft, and writing—review and editing.

Correspondence concerning this article should be addressed to Eesha Sharma, Marketing Department, Fowler College of Business, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182, United States, or Stephanie M. Tully, Marketing Department, Marshall School of Business, University of Southern California, 3760 Trousdale Parkway, Los Angeles, CA 90089, United States. Email: esharma@sdsu.edu or tullyste@marshall.usc.edu

Zhao & Tumm, 2018). In contrast to this prevalent view, an alternative, less well-represented perspective is that scarcity leads to contextually appropriate responses given the circumstances of scarcity (Frankenhuis & Nettle, 2020; Pepper & Nettle, 2017). These two competing perspectives confer different views about the importance of understanding contextual variation in experiences of scarcity and recommendations for interventions aimed at changing behavior under scarcity. However, existing research seemingly cannot distinguish whether intertemporal choices under scarcity reflect increased impulsivity and myopia or a more deliberate attempt to maximize utility given the constraints imposed by scarcity.

In the current work, we differentiate between these competing explanations by investigating whether the time horizon of threatened needs moderates the relationship between scarcity and intertemporal choice. Although scarcity, particularly among the poor, often threatens imminent needs such as housing and food, many people experience scarcity that threatens needs across a broader time horizon (e.g., replacing a run-down car before it stops functioning, expenses for a wedding planned in the future). While the myopic, impulsive perspective of decision making under scarcity suggests that scarcity, of any kind, will result in more present-biased behavior, the contextually appropriate response perspective suggests that scarcity will be less likely to lead to a preference for smaller, sooner (vs. larger, later) outcomes when needs have longer time horizons.

Conceptual Background

Perceptions of Scarcity

Scarcity perceptions are ubiquitous (Daoud, 2010) and can influence people's psychological and physiological well-being (Mullainathan & Shafir, 2013). Scarcity is defined as a subjective sense of having more needs than resources (Mullainathan & Shafir, 2013, p. 86). Individuals can experience a sense of scarcity because they feel they cannot afford basic necessities or because they feel their finances are insufficient for desired expenses such as education costs, sustaining their lifestyle, or retirement (Blocker et al., 2022; Daoud, 2010; Raiklin & Uyar, 1996; Rossi, 2019; Tully & Sharma, 2022). Scarcity can be experienced among those with both lower and higher objective levels of resources (Hamilton et al., 2019; Schor, 1998), so long as resources are perceived to be insufficient for one's needs (e.g., Jachimowicz et al., 2017; Mani et al., 2013; Mankiw, 2007).

Because perceptions of scarcity are malleable and can be experienced across the income spectrum, it is possible to isolate their consequences from cultural and educational factors that typically differ across incomes. Indeed, perceptions of scarcity can be induced experimentally, by varying the level of resources available for the same underlying needs such as different amounts of "savings," while holding required expenses constant (Hilbert et al., 2022) or offering different amounts of "shots" in a game with a fixed number of targets (Shah et al., 2012). Experiments can also induce perceptions of scarcity by changing perceptions about the adequacy of resources for needs without varying the level of available resources (e.g., considering the demands on one's financial resources, see Jachimowicz et al., 2017; Mani et al., 2013, writing about why the amount of one's remaining time is short or long, see Kurtz, 2008). In sum, scarcity is a relative concept; differences in perceptions of scarcity can arise naturally or be induced experimentally.

Scarcity and Intertemporal Choice

Existing literature supports a relationship between scarcity perceptions and intertemporal choice. Intertemporal choices require individuals to indicate preferences or make tradeoffs between costs and benefits across time periods (e.g., Frederick et al., 2002). These choices are widespread and have important consequences for well-being (e.g., saving, spending, borrowing). Empirical investigations into intertemporal choices commonly examine preferences between sooner outcomes and later outcomes such as choosing a smaller amount of resources today versus a larger amount of resources at a future date (e.g., Frederick et al., 2002).

A predominant finding is that people make decisions that favor the present over the future when they feel their resources are scarce. Some of the findings used to support a relationship between inadequate resources and intertemporal choice comes from work on the effects of income or poverty on decision making (e.g., Bos et al., 2022; Lawrance, 1991). While people living in poverty often differ from those who do not live in poverty on dimensions other than perceived scarcity (e.g., education, cultural backgrounds), more direct evidence for the relationship between scarcity perceptions and intertemporal choice is found in experimental research. For instance, people have been shown to make more present-biased decisions when those decisions occur before (vs. after) their payday (Carvalho et al., 2016). In other research, participants making guesses in a game of Family Feud who experienced time scarcity were more likely to "borrow" time now at the expense of having a lesser amount of time in the future (Shah et al., 2012). In another context, participants who were induced to feel a sense of financial scarcity by considering the demands on their resources preferred smaller, sooner (vs. larger, later) options in an intertemporal discounting task (Jachimowicz et al., 2017). Together, a range of findings have shown that perceptions of scarcity cause people to make choices that favor the present over the future. There have been multiple explanations for why scarcity causes a preference for smaller, sooner options that can be distilled into two main perspectives on how scarcity changes approaches to decision making.

A Myopic, Impulsive Decision-Making Perspective of Scarcity

The leading perspective in the literature on scarcity suggests that people experiencing scarcity select smaller, sooner options due to impulsive, myopic decision making. Research has argued that "Scarcity, of any kind, will create a tendency to borrow, with insufficient attention to whether the benefits outweigh the costs" (Shah et al., 2012) and that "Scarcity causes myopic and impulsive behavior, prioritizing short-term gains over long-term gains" (Zhao & Tumm, 2018). According to this perspective, merely being placed in a situation where one has insufficient resources causes a scarcity mindset that results in less thoughtful decision making and greater present bias.

This stream of research argues that scarcity is cognitively consuming and depleting, leading to attentional focus on the present, and reduced ability to consider future consequences (e.g., Laran, 2020; Mani et al., 2013, 2020; Ong et al., 2019; Spears, 2011; Zhao & Tumm, 2018). Thus, insufficient resources constrict the time periods that individuals consider, and focus people more narrowly on the present (Bickel et al., 2016). Relatedly, scarcity has been said to

diminish self-control, leading to more myopic and impulsive behavior (e.g., Bernheim et al., 2015; Fan & Wang, 2022; Kirk & Logue, 1997; e.g., Liu et al., 2012). Thus, multiple theories contribute to the perspective that people experiencing scarcity cannot think through or do not care about the future consequences of their decisions, resulting in impulsive, myopic decision making.

A Contextually Appropriate Decision-Making Perspective of Scarcity

An alternative, albeit less well-represented perspective in the literature on scarcity suggests that people experiencing scarcity select smaller, sooner options because selecting immediate options is often contextually appropriate. That is, a preference for smaller, sooner outcomes could reflect a person's estimation of what provides the most benefits given their needs and circumstances. Indeed, marginal utility theory suggests that people with inadequate resources have increased preferences for smaller, sooner outcomes due to a rational desire to satisfy their present unmet needs (Fisher, 1930, p. 72). To the extent that people experiencing scarcity expect to have more spare resources in the future than they currently have, slack change theory, which is predicated on marginal utility theory, would suggest that preferences for smaller, sooner outcomes reflect purposeful attempts to receive resources in the time period when people believe they have the least amount of spare resources (Zauberman & Lynch, 2005).

Recent conceptual papers similarly argue that the effects of poverty on time preference may reflect reasonable estimations of what the "smart" decision is given the structure of the environment, rather than a lack of willpower (Frankenhuis & Nettle, 2020; Pepper & Nettle, 2017; Sheehy-Skeffington, 2020). For instance, people living in poverty often live in environments of greater risk and mortality, and thus may not be alive to benefit from future rewards (Frankenhuis & Nettle, 2020; Pepper & Nettle, 2017). Thus, several theoretical arguments contribute to an alternative albeit less prominent perspective for the relationship between scarcity and intertemporal choice: that decision making under scarcity is deliberate and intentional given the circumstances imposed by scarcity.

Distinguishing Between Competing Perspectives

If intertemporal decisions under scarcity result from myopic, impulsive decision making, it would suggest that effects of scarcity are largely similar across contexts such that the experience of scarcity for an average American before versus after their payday and the experience of scarcity for a farm worker in India before versus after their harvest should affect decision making similarly, and that findings in one setting should easily translate to implications for another setting. Furthermore, the myopic, impulsive perspective suggests that interventions should encourage individuals to be more deliberate in their decision making (e.g., by providing more time to make decisions or making the future consequences of one's actions salient). In contrast, if intertemporal decisions under scarcity result from contextually appropriate responses to the conditions of scarcity, researchers and policy makers would need to identify important contextual differences across experiences of scarcity. This perspective suggests that interventions should alter the perceived relative benefits of engaging in present- versus future-oriented behavior.

It is currently unclear whether intertemporal choices under scarcity reflect impulsive, myopic decision making or contextually appropriate decision making based on the perceived utility of outcomes due to the circumstances of scarcity. While cognitive deficits imposed by scarcity would reflect the myopic, impulsive perspective, attempts to examine the causal effect of scarcity on cognitive deficits are mixed. Some studies found that scarcity decreased cognitive performance (e.g., Mani et al., 2013; Shah et al., 2012), others found no effect (Carvalho et al., 2016; Shah et al., 2019), and one study found that scarcity led to increased cognitive performance (Dang et al., 2016). Moreover, many findings are plausibly explained by both perspectives. Findings such as poorer individuals being willing to take on loans with high interest rates (e.g., Melzer, 2011) could result from increased myopia and impulsivity (e.g., due to reduced cognitive capacity or willpower) or the loan's perceived marginal utility (e.g., borrowing to pay rent and keep one's apartment may offer greater utility than having less debt but unsafe shelter). Thus, to our knowledge, the present literature lacks empirical work that can clearly distinguish between the competing perspectives.

The Present Research

In the current work, we aim to distinguish between competing perspectives on the relationship between scarcity and intertemporal choice by examining the impact of *the time horizon of needs threatened by scarce resources* on intertemporal choice. Most needs have a time horizon, a term we use to refer to the time period in which resources are necessary to meet needs without negative consequences. Existing research has primarily examined situations in which scarcity threatens needs that require resources immediately such as food insecurity (Fitzpatrick & Coleman-Jensen, 2014; see summary table in Supplemental Materials, for additional examples). However, people can experience feelings of scarcity for needs across a broad time horizon. People may experience scarcity if they feel their resources are inadequate for a need that requires resources immediately (e.g., paying a bill that is currently due, buying concert tickets that are about to sell out), if they feel their resources are inadequate for a need that does not necessarily have a deadline (e.g., replacing a run-down car, spending time on a hobby), if they expect to deplete their resources before their resources are replenished (e.g., anticipating running out of money before next month's paycheck; expecting to run out of food or water before more is available), or if they feel their resources are inadequate for a need with a longer time horizon (e.g., a future wedding, future college tuition). While the first example, and most existing empirical work, pertain to threatened needs with unequivocally short time horizons, the latter examples refer to threatened needs with a broader range of time horizons.

Examining whether the time horizon of threatened needs moderates the relationship between scarcity and intertemporal preferences can differentiate whether responses to intertemporal choices under scarcity are more reflective of myopic, impulsive decision making or a deliberate attempt to meet important needs threatened by scarcity. In particular, the two theories make competing predictions about how people respond to intertemporal choices when scarcity primarily threatens needs with longer time horizons. According to the myopic, impulsive perspective, scarcity should exacerbate the natural tendency to prefer smaller, sooner outcomes regardless of the time horizon of threatened needs. In contrast, the contextually appropriate response perspective would

predict that the time horizon of threatened needs moderates the relationship between scarcity and intertemporal choice. That is, when perceptions of scarcity primarily threaten needs with longer time horizons, such that waiting for larger, later outcomes will not inherently worsen people's ability to address their threatened needs, perceptions of scarcity should be less likely to lead to a preference for smaller, sooner options. Further, when the larger, later option is perceived to be better able to help people meet their threatened need than the smaller, sooner option, people experiencing scarcity that primarily threatens needs with longer time horizons may be even more likely to prefer larger, later options compared to people who are not experiencing scarcity.

We suspect that the time horizon of threatened needs will moderate the relationship between scarcity and intertemporal choice, in line with the contextually appropriate decision-making perspective. Although most research examining the effect of scarcity on intertemporal choice has demonstrated preferences that favor the present, research in the areas of resource conservation and opportunity cost consideration suggests that perceptions of scarcity can encourage people to consider and make decisions that favor longer term benefits (e.g., Aisbett & Steinhauer, 2014; Spiller, 2011, Study 3; Tully et al., 2015). Differences between these seemingly conflicting findings likely result from differences in the time horizon of threatened needs. For example, the poor have been shown to make choices that favor the present such as taking on loans with high interest rates and under saving (e.g., Karlan et al., 2011; Melzer, 2011). Importantly, the poorest people in society are more likely to have their basic survival needs (e.g., food, water, shelter) threatened, and such needs typically have shorter time horizons. In contrast, research on resource conservation typically examines situations in which the time horizon of threatened needs is longer (e.g., there is enough water to drink now, but the water is likely to run out at a period in the future). Similarly, in the paradigm demonstrating increased consideration of opportunity costs among the financially constrained, participants had enough money for a current meal, but expected to run out of money before the day was complete and hence had a longer time horizon (Spiller, 2011). In sum, we speculate that the time horizon of threatened needs moderates the relationship between scarcity and intertemporal choice.

Overview of Studies

The current work tests the moderating role of the time horizon of threatened needs using diverse samples including a nationally representative sample of Americans surveyed by the Consumer Finance Institute (CFI) at the Federal Reserve Bank of Philadelphia, consumers planning an upcoming wedding recruited through Facebook, as well as participants recruited through online survey platforms. Thus, our samples include participants with a broad range of demographic and economic backgrounds. Across our studies, we provide evidence that the time horizon of threatened needs is an important moderator of the relationship between scarcity and intertemporal choice.

We first examine naturally occurring perceptions of scarcity in a nationally representative survey of Americans from the Federal Reserve Bank of Philadelphia's CFI. In Study 2, we use a writing task to manipulate perceptions of scarcity among individuals engaged to be married, and exploit natural differences in time horizon that are unrelated to individual differences in patience or impulsivity (i.e., participants' wedding dates). This design permits

us to examine a causal relationship while holding the needs threatened by scarcity (i.e., wedding expenses) constant across time horizon. In Study 3, we distinguish between two potential explanations: whether intertemporal preferences under scarcity reflect which outcome will better address participants' threatened needs or simply a greater focus on and attention to the time period associated with a threatened need. To do so, we manipulate scarcity among all participants but vary whether the resource that is perceived to be scarce is related (money) or unrelated (time) to the intertemporal choice (monetary titration task), such that intertemporal choices cannot address threatened needs when resources are unrelated. In Study 4, we employ a life simulation paradigm where we manipulate scarcity by holding participants' needs constant, and vary the amount of resources available. We also exogenously manipulate the time horizon of the need. This study differentiates the impact of scarcity from the impact of having a salient need that will require one's resources. Moreover, Study 4 measures potential process mechanisms through mediation analysis. In a final study, we again leverage the life simulation paradigm to explore the impact of scarcity on intertemporal preferences when scarcity threatens multiple needs that differ in time horizon as well as importance. This design permits us to test whether the time horizon of threatened needs impacts responses to scarcity because of the presence versus absence of a temporally proximate need or because people experiencing scarcity consider how to maximize utility across multiple threatened needs.

Transparency and Openness

Study 1 uses a data set obtained from the Federal Reserve Bank of Philadelphia's CFI. Because this data set is proprietary, we are not authorized to share the data. All remaining studies are preregistered, and data, analysis code, and research materials are publicly available at Research Box and can be accessed at <https://researchbox.org/543>. For these studies, our sample sizes and data exclusions were determined before data collection, and we report all attrition, conditions, measures, and data exclusions. We use a variety of methods to manipulate scarcity and measure intertemporal choice in our studies. Due to potential changes in effect sizes that could result from these variations, we aimed to exceed the minimum required sample size determined by our power calculations in all studies. All study randomizations were determined by Qualtrics' randomization function. Data were analyzed using SPSS, Version 28 or 29.

Study 1

The CFI, a unit within the Federal Reserve Bank of Philadelphia, began conducting a national survey of consumers to investigate the financial health and stability of consumers during the global pandemic. This survey, called the COVID-19 Survey of Consumers, ran in waves. Upon our request, in Wave 10, the CFI added a new question measuring intertemporal preferences. Using this data set, we examined whether the time horizon of people's needs moderates the effect of perceived scarcity on intertemporal choice. Note that the views expressed here are solely those of the author(s) and not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

Method

Participants

Data were obtained from the Federal Reserve Bank of Philadelphia's CFI. The data set included responses from 3,605 U.S. participants. A subset of 2,354 participants answered the intertemporal choice question and were thus available for analysis (Median age range = 36–55 years old; 1,212 women, 1,137 men, 5 “other”; Median income range = \$55,000–\$74,999). There were no data exclusions.

Procedure

The CFI created and distributed an online survey to U.S. participants asking a range of questions related to how COVID-19 was impacting their lives. Of relevance to the current research, the survey included an intertemporal choice question and two measures related to the sufficiency of participants' money and the relative time horizon of needs threatened by their insufficient financial resources.

The intertemporal choice question asked participants, “If you were offered an opportunity to postpone your [mortgage/rent] payments for the next three months but would have to increase your monthly payments going forward, how interested would you be?” (1 = not at all interested, 7 = very interested). Whether the question pertained to mortgage or rent was personalized based on a previous question asking participants about their housing situation.

The survey included two questions that could plausibly assess scarcity perceptions and the time horizon of threatened needs. The survey asked participants, “How concerned are you about your ability to make ends meet over these time periods, on a scale of 1 (not at all concerned) to 5 (very concerned)?” Participants answered this question about the next 3 months, 6 months, 9 months, and 12 months. These four questions allowed us to examine whether participants were relatively more concerned about needs with longer time horizons versus needs with shorter time horizons. Because the intertemporal choice pertained to a period of 3 months, we operationalized the time horizon of participants' needs as their relative concern about making ends meet for periods longer than 3 months (6, 9, or 12 months) versus their concern about making ends meet within the next 3 months. Specifically, we calculated the maximum concern participants had over making ends meet in future time periods (6 months, 9 months, and 12 months) less their concern over making ends meet in the next 3 months. As such, this variable ranged from –4 to 4, with higher numbers indicating longer time horizons. Following this question, the survey asked participants, “If you believe you will need to access additional resources, how soon do you believe that will be necessary?” (I already had to seek additional resources, 1–2 weeks, 2–4 weeks, 4–8 weeks, 2 or more months, or I do not anticipate needing to seek additional resources). None of the responses to this question could be clearly identified as having a “longer” time period, since all choice options pertained to periods that were shorter than the 3-month period used in the intertemporal choice question. Thus, we used this question to create a dummy-coded variable capturing perceptions of scarcity. We coded participants as experiencing scarcity if they indicated needing additional resources at any time period (scarcity = 1; 57.9% of the sample), and as not experiencing scarcity if they indicated not needing additional resources (no scarcity = 0; 42.1% of the sample).

Results

We regressed intertemporal preferences for housing payments (i.e., participants' interest in postponing housing payments at a cost of increased future payments) on the binary measure of perceived scarcity, the time horizon of participants' needs, and their interaction. There was an effect of scarcity, $B = 2.53$, 95% CI [2.36, 2.70], $SE = .09$, $t(2,350) = 28.92$, $p < .001$, $f^2 = .19$. There was no effect of time horizon, $B = 0.09$, 95% CI [–.05, .24], $SE = .07$, $t(2,350) = 1.30$, $p = .193$, $f^2 < .01$. However, there was a significant scarcity by time horizon interaction, $B = -0.38$, 95% CI [–.56, –.21], $SE = .09$, $t(2,350) = -4.31$, $p < .001$, $f^2 = .01$. Among participants with shorter time horizons, those experiencing scarcity (vs. not experiencing scarcity) were more interested in postponing housing payments in the present with an increased cost in the future. However, this difference was attenuated among participants with longer time horizons.

In a series of robustness checks that used different operationalizations of scarcity and time horizon of needs (e.g., using means instead of maximums, using the four “concern about making ends meet” questions as measures of both scarcity and time horizon of needs) and that controlled for demographic characteristics and bill payment history, we found that this moderation did not depend on the model specifications used (see Supplemental Study 1: Supplemental Analyses).

In a conceptual replication of this study (Supplemental Study 1), we use an incentive-compatible intertemporal titration task, and counterbalance whether intertemporal choices are elicited before or after participants indicate whether they are experiencing scarcity and the time horizon of their threatened needs. This study replicates the moderation found in Study 1. Interestingly, when accounting for differences in objective metrics such as demographics, we found a polarizing effect of scarcity. Perceptions of scarcity that threatened needs with shorter time horizons predicted a significantly increased preference for smaller, sooner outcomes, $B = 1.16$, 95% CI [.35, 1.98], $SE = 0.42$, $t(943) = 2.81$, $p = .005$, $f^2 = .01$, while perceptions of scarcity that threatened needs with longer time horizons predicted a significantly increased preference for larger, later outcomes, $B = -0.84$, 95% CI [–1.58, –0.11], $SE = 0.38$, $t(943) = -2.25$, $p = .025$, $f^2 = .01$; see Supplemental Materials, for study details and results). These results were unaffected by the order in which questions were asked.

Discussion

Study 1 provides initial correlational evidence that the effect of scarcity perceptions on intertemporal preferences is moderated by the time horizon of threatened needs. This moderation could not be explained by demographic differences and was robust to various operationalizations of perceived scarcity and the time horizon of threatened needs. Moreover, the conceptual replication of this study (Supplemental Study 1) suggests that, all else equal, subjective experiences of scarcity that threaten needs with longer time horizons may at times lead people to be more willing to wait for larger, later outcomes. Despite their external validity, the correlational nature of these studies limits the ability to infer causality. We thus build on these findings in the remaining studies where we manipulate perceptions of scarcity.

Study 2

Existing research has shown that considering major financial expenditures induces a sense of financial scarcity (e.g., Jachimowicz et al., 2017). Thus, in Study 2, we manipulated perceived scarcity by having some participants write about important expenditures for which they currently lack sufficient financial resources. We selected a major financial expenditure for which individuals commonly experience financial scarcity: paying for a wedding. Indeed, the majority of couples commonly plan to incur debt or delay their wedding due to financial concerns (Kirkham, 2018). Importantly, the time horizon of participants' wedding expenses is a function of their wedding date, and thus unrelated to individual differences in time preference for money. Indeed, a separate study among online participants who had been married found no relationship between the date of the person's wedding and their intertemporal preferences for money, self-reported patience, or demographic characteristics (see Supplemental Posttest 1).

We expected perceived scarcity to increase preferences for smaller, sooner options when the threatened needs had a shorter time horizon (required resources before the timing of the larger, later payout). However, in line with the results of Supplemental Study 1, we explored whether perceived scarcity would increase choices of larger, later options when the needs threatened by scarcity had a longer time horizon (required resources after the timing of the larger, later payout).

Method

This incentive-compatible study was preregistered on Aspredicted.org (<https://aspredicted.org/z39yh.pdf>). The study followed a 2 (scarcity: scarcity vs. control) \times 2 (time horizon: shorter vs. longer) between-subjects design, with time horizon based on participants' self-reported wedding date. Shorter (longer) time horizons were operationalized as wedding dates occurring before (after) the date of the larger, later payout.

Participants

We aimed to recruit U.S. participants who were getting married over the summer of 2019 and who were financially responsible for the majority of their wedding. To do so, we posted advertisements through Facebook's "Ads Manager" in April 2019. We selected an "audience" of people who matched the following criteria: 18–40 years old, location = "United States," and relationship status = "engaged." We used Facebook's automatic advertisement placement function, which maximizes click throughs across all available placements according to where the ad is likely to perform best. The advertisement was an image of a bride and groom that read, "Getting married this summer? Answer 5 quick questions for a chance to win!" The words above this image read "SUMMER 2019 WEDDING? Take a short survey for FREE expert planning tips and a chance to win \$200!" (see Supplemental Study 2: Complete Study Details). No demographic information was collected in this study.

Whether participants' wedding dates were scheduled before or after the date of the later payout determined participants' time horizon assignment. Since this measure was collected at the end of the survey and because we did not know, a priori, the proportion of participants whose wedding dates would fall before or after the date of the later payout, we preregistered that we would recruit

participants until we reached at least 100 participants in each of the four conditions, excluding participants who did not find the survey organically or who indicated that they were not financially responsible for their wedding. Because a greater proportion of participants had weddings after (vs. before) the date of the larger, later payout, our stopping rule (at least 100 participants per condition) was met at 1,033 responses, at which point the Facebook ads were deactivated and data was downloaded for analysis. Of these participants, two participants were excluded because they did not provide the year of their wedding (i.e., "05/30," "June"), and it was unclear whether the month of their wedding would occur before or after the date of the larger, later payout. Thus, these two participants could not be assigned to a wedding timing condition. Seven participants were excluded for finding the survey through friends or family, and an additional 272 participants were excluded for indicating that they were not financially responsible for the majority of their wedding. The final sample included 100 participants in the "scarcity/shorter time horizon" condition, 105 participants in the "control/shorter time horizon" condition, 296 participants in the "scarcity/longer time horizon" condition, and 251 participants in the "control/longer time horizon" condition, for a total of 752 participants.¹ Note that for this study, an a priori power analysis was not conducted, as it was the first experiment testing an interaction using a binary dependent measure. A post hoc sensitivity analysis using Demidenko's (2007) sample size calculator, with *power* = 80% and α = .05, revealed that a sample size of $N = 752$ was sensitive enough to detect a small-to-moderate effect size (odds ratio = 2.64; inverted odds ratio = .38).

Although these exclusion criteria were preregistered and determined when we stopped collecting data, we unexpectedly observed differential exclusions by condition upon data analysis. More participants in the financial scarcity condition indicated being financially responsible for the majority of their wedding compared to those in the control condition, $p = .001$. In addition, although the Facebook ads were deactivated when our stopping rule was triggered, and the data set was immediately downloaded, a recent download of the data from Qualtrics revealed that 50 additional responses were recorded after our stopping rule was met. To be consistent with our preregistration, the following analyses use the data based on our preregistered stopping rule. However, all results remain significant without exclusions, and when using the more recently downloaded data set (See Supplemental Study 2: Supplemental Analyses).

Procedure

People who clicked on the Facebook advertisement were randomly assigned to either the scarcity or control condition. Participants in the scarcity condition were asked whether planning their wedding ever made them feel as though they do not have enough money and what they plan to have or wish to have at their wedding that they feel they do not have enough money for (open-ended). They then saw a list of potential wedding costs (e.g., venue, food and drinks, rehearsal) and indicated which factor was the primary source of their financial concerns. Participants in the control condition also reflected on their

¹ To be compliant with the preregistered stopping rule, data was periodically downloaded to determine the number of participants in each condition (coding time horizon based on wedding dates). Although the data set was downloaded for this purpose, data analysis on the dependent variable was not performed until data collection was complete.

upcoming wedding but were instead asked what they were most excited about doing at their wedding (open-ended). They saw a similar list of wedding aspects (e.g., venue, food and drinks, rehearsal) and indicated which of the aspects they were most excited about.

To provide variation in whether participants' weddings would occur before or after the payout date, July 1st was selected as the date of the larger, later payout because most weddings occur over the summer. The dependent measure read, "When you submit your answers, you will be entered into a lottery to win \$200. We're interested in whether you would prefer to get \$200 to spend now or get \$300 on July 1st." Participants chose whether they preferred getting the advertised lottery amount now, or the larger amount in 3 months (binary choice).

Next, to assess the time horizon of the need (i.e., wedding), we asked participants to specify the expected date of their wedding (month and year). Participants then completed a scarcity manipulation check by indicating the extent to which they felt their finances were scarce, limited, or inadequate (1 = *not at all*, 7 = *very much*). They next indicated whether they and their fiancé were personally responsible for paying for the majority of their wedding (yes or no). In addition, participants were asked how they found the survey (through Facebook ads or sponsored posts vs. through friends and family). This was done to help ensure that those who took the survey received it through a targeted Facebook ad (served only to those with an "engaged" status). Finally, participants had the option of providing their email address to receive their money in case they won the lottery. All participants received expert planning tips based on behavioral research insights, and one participant was selected to win the lottery.

Results

Time horizon was determined by coding participants' wedding dates based on whether their wedding date was scheduled before or after the larger, later payout. In total, there were 205 weddings before July 1 (shorter time horizon) and 547 weddings after July 1 (longer time horizon).

Manipulation Check

There were 25 missing values on the manipulation check measure. Participants in the scarcity condition rated their finances as more scarce ($M = 5.19$, 95% CI [5.00, 5.39], $SD = 1.51$) than did participants in the control condition, $M = 4.82$, 95% CI [4.63, 5.01], $SD = 1.79$, $F(1, 723) = 7.36$, $p = .007$, $\eta_p^2 = .010$. There was neither an effect of time horizon nor an interaction on this measure, both $F < 1$, $\eta_p^2 \leq .001$. These results suggest that the scarcity writing task successfully manipulated scarcity perceptions.

Intertemporal Choice

We first examined whether there was an effect of scarcity perceptions on intertemporal choice. A binary logistic regression testing only the effect of scarcity (control = 0, scarcity = 1) on intertemporal choice (smaller, sooner outcome = 1, larger, later outcome = 0) did not reveal a significant effect, $B = -.21$, 95% CI [-0.54, 0.11], $SE = .17$, Wald $\chi^2(1, N = 752) = 1.65$, $p = .199$, odds ratio = 0.81; see Figure 1.

Next, we incorporated the time horizon of the need. A binary logistic regression including scarcity (control = 0, scarcity = 1), time horizon (shorter time horizon = 0, longer time horizon = 1), and their interaction as independent variables revealed a marginally significant effect of scarcity condition, $B = .55$, 95% CI [-0.01, 1.11], $SE = .28$, Wald $\chi^2(1, N = 752) = 3.75$, $p = .053$, odds ratio = 1.73; a significant effect of time horizon, $B = -1.40$, 95% CI [-1.89, -0.90], $SE = .25$, Wald $\chi^2(1, N = 752) = 30.77$, $p < .001$, odds ratio = 0.25; and a significant scarcity by time horizon interaction, $B = -1.21$, 95% CI [-1.95, -0.48], $SE = .37$, Wald $\chi^2(1, N = 752) = 10.43$, $p = .001$, odds ratio = 0.30. Follow-up contrasts showed that when participants' wedding dates were before the payout of the larger, later outcome (shorter time horizon), scarcity increased choices of the smaller, sooner option, Mean difference = .13, 95% CI [.00, .27], Wald $\chi^2(1, N = 752) = 3.85$, $p = .050$, odds ratio = 1.73. However, we found a significant reversal when participants' weddings were after the payout of the larger later option (longer time horizon). Under these circumstances, scarcity decreased choices of the smaller, sooner option, Mean difference = -.08, 95% CI [-.14, -.02], Wald $\chi^2(1, N = 752) = 7.30$, $p = .007$, odds ratio = .52. Results are shown in Figure 1.

Discussion

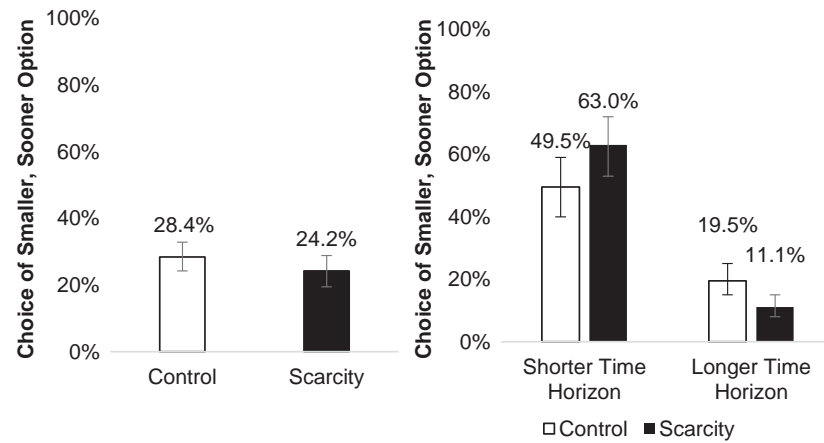
In Study 2, we manipulated perceptions of scarcity and did not find an overall effect of scarcity on intertemporal choice. At first glance, this result appears to indicate that the scarcity manipulation did not impact intertemporal preferences. However, by incorporating the time horizon of needs threatened by scarcity, we both replicated and reversed the effect found in existing research on scarcity and intertemporal choice, demonstrating a polarizing effect of scarcity perceptions on intertemporal choice based on the time horizon of threatened needs. Among participants whose weddings had shorter time horizons (were scheduled to occur before the larger, later payout), scarcity perceptions increased choice of the smaller, sooner option. However, among participants whose weddings had longer time horizons (were scheduled to occur after the larger, later payout), scarcity perceptions increased choice of the larger, later option. Notably, our results cannot be explained by participants in the shorter (vs. longer) time horizon condition considering systematically more necessary aspects of their wedding (e.g., venue; see Supplemental Posttest 2, for details).

Study 3

Study 3 was designed to disentangle whether the moderating role of time horizon on intertemporal preferences is the result of attempts to make contextually appropriate decisions given the conditions of scarcity, or increased attention to anything occurring in the time period of threatened needs. That is, an alternative possibility is that scarcity leads people to hyperfocus on their threatened need(s), and thus anything occurring in the time period of their threatened need(s) becomes more focal and desirable.

In Study 3, all participants were induced to feel a sense of scarcity, but we manipulated whether the scarce resource was related or unrelated to the intertemporal choice. If the time horizon of threatened needs increases focus on (and thus preference for) any outcome occurring in the same time period as threatened needs, the time horizon of threatened needs should predict intertemporal

Figure 1
Intertemporal Choice in Study 2



Note. Left Panel: The effect of perceived scarcity on intertemporal choice. Right Panel: The effect of perceived scarcity on intertemporal choice as a function of time horizon. Error bars represent 95% confidence intervals.

preferences similarly, regardless of whether the intertemporal choice is related or unrelated to one's scarce resources. This account thus predicts only a main effect of time horizon. In contrast, if the time horizon of threatened needs influences intertemporal decision making by changing perceptions of the relative utility provided by different options with respect to addressing threatened needs, the time horizon of threatened needs should only predict intertemporal preferences when the scarce resource is related to the intertemporal tradeoff. This latter account thus predicts an interaction between scarcity type and the time horizon of threatened needs.

Method

This incentive-compatible study was preregistered (<https://aspre-dicted.org/ms5am.pdf>).

Participants

We aimed to recruit 500 U.S. participants on Cloud Research. Five hundred twenty-nine people opened the survey, and 504 participants completed the study in exchange for monetary payment. Attrition did not vary by condition (time = -1, money = 1), $B = .09$, 95% CI [-.72, .89], $SE = .41$, Wald $\chi^2(1) = .05$, $p = .830$. We could not calculate a valid dependent measure for 68 participants due to inconsistent switching points. An additional 19 participants failed the instructional manipulation check (Oppenheimer et al., 2009) and were thus excluded. Two additional participants were identified as providing nonsensical responses when asked to write about a need (e.g., "6") and were thus excluded. All exclusions were preregistered, and the exclusion rate did not vary by condition, $B = .18$, 95% CI [-.05, .41], $SE = .12$, Wald $\chi^2(1) = 2.42$, $p = .120$. The final sample included 415 participants ($M_{\text{age}} = 39.58$, $SD = 13.00$; 271 women, 144 men; Median income range = 50–60 K). A power analysis using G*Power 3.1 (Faul et al., 2007) assuming a small effect size with $f^2 = .02$, $\alpha = .05$, and $\text{power} = 80\%$ suggests a required sample of

395 participants; thus, our sample was adequate to detect a significant interaction effect under these assumptions.

Procedure

Participants were asked to list one important need that they felt they did not have enough money (financial scarcity condition) or time (time scarcity condition) for and to describe why this need was important to them. Then they completed an incentive-compatible titration task, making 15 choices between getting \$30 now and a different amount (\$X) 45 days later, where \$X ranged from \$30 to \$60. Participants were informed that at least one person would be chosen to receive one of their choices as a bonus payment at the end of the study.

Next, we reminded participants of the important need they wrote about and asked them to indicate the extent to which they needed additional money (financial scarcity condition) or time (time scarcity condition) within the next 45 days to meet that need on a 7-point scale (1 = *Definitely needs to be before 45 days*, 7 = *Definitely can be after 45 days*). We also measured how much money/time was required for the need. Participants then completed two manipulation checks, indicating the extent to which they thought about their money as being insufficient, inadequate, or scarce, as well as the extent to which they thought about their time as being insufficient, inadequate, or scarce (both 7-point scales; 1 = *not at all*, 7 = *very much*). Finally, they completed an instructional manipulation check and demographic information including age, gender, and household income. At the experiment's end, one participant was chosen and received one of their selected choices from the titration task as a bonus (see Supplemental Materials, for complete study details).

Results

Manipulation Checks

Regressing each of the manipulation checks on scarcity type (time = -1, money = 1) revealed that both the time and financial scarcity

manipulations were successful. Participants in the financial scarcity condition ($M = 5.73$, 95% CI [5.54, 5.92], $SD = 1.35$) rated their money as more scarce than did those in the time scarcity condition ($M = 3.93$, 95% CI [3.64, 4.22], $SD = 2.13$), $B = .90$, 95% CI [.73, 1.07], $SE = .09$, $t(413) = 10.19$, $p < .001$, $f^2 = .25$. Participants in the time scarcity condition ($M = 5.65$, 95% CI [5.42, 5.88], $SD = 1.47$) rated their time as more scarce than did those in the financial scarcity condition ($M = 3.74$, 95% CI [3.50, 3.98], $SD = 1.96$), $B = -.96$, 95% CI [-1.12, -.79], $SE = .08$, $t(413) = -11.28$, $p < .001$, $f^2 = .31$. Moreover, to assess whether participants in both scarcity conditions were experiencing similar levels of scarcity, we calculated the maximum scarcity score across the resources. Participants in the financial scarcity condition ($M = 5.88$, 95% CI [5.71, 6.05], $SD = 1.25$) experienced similar levels of scarcity as did participants in the time scarcity condition ($M = 5.99$, 95% CI [5.83, 6.15], $SD = 1.19$), $B = -.06$, 95% CI [-.17, .06], $SE = .06$, $|t| < 1$, $p = .355$, $f^2 < .01$.

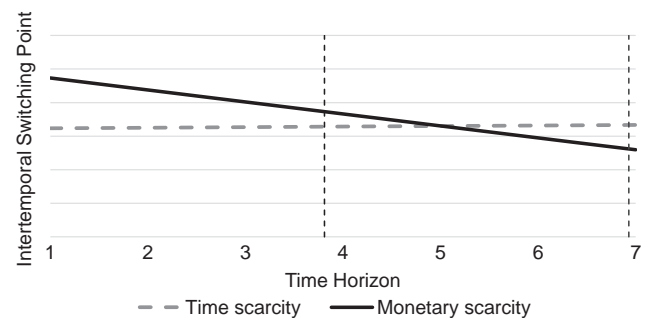
Intertemporal Choice

We first calculated a switching point. The switching point was coded as the first choice pair at which participants switched from choosing the sooner option to the later option, ranging from 0 if they always chose the later option to 15 (always preferring the sooner option) if they never switched. Participants who switched between sooner options and later options multiple times were identified as having an inconsistent switching point.

Regressing this switching point on scarcity type (time = -1, money = 1) was not significant, $B = .09$, 95% CI [-.35, .52], $SE = .22$, $|t| < 1$, $p = .697$, $f^2 < .01$, suggesting that experiencing financial scarcity did not increase preference for smaller, sooner options overall. We then incorporated the time horizon of participants' needs by regressing intertemporal choice on scarcity type (time = -1, money = 1), the extent to which participants stated needing additional resources within 45 days (mean-centered), and their interaction. The analysis revealed a significant effect of time horizon, $B = -.34$, 95% CI [-.54, -.15], $SE = .10$, $t(411) = -3.46$, $p < .001$, $f^2 = .03$; and a nonsignificant effect of scarcity type, $B = .36$, 95% CI [-.09, .80], $SE = .23$, $t(411) = 1.59$, $p = .113$, $f^2 < .01$. Importantly, as predicted, there was a significant scarcity type by time horizon interaction, $B = -.37$, 95% CI [-.57, -.18], $SE = .10$, $t(411) = -3.77$, $p < .001$, $f^2 = .03$; as depicted in Figure 2. Specifically, in the financial scarcity condition, having a shorter time horizon was associated with later switching points (increased preferences for smaller, sooner outcomes), $B = -.72$, 95% CI [-0.998, -0.445], $SE = .143$, $t(411) = -5.37$, $p < .001$, $f^2 = .06$; but in the time scarcity condition, time horizon was unrelated to intertemporal choice, $B = .03$, 95% CI [-.25, .31], $SE = .145$, $t(411) < 1$, $f^2 < .01$.

Next, we used Hayes' Process macro in SPSS (Template 1, Hayes, 2013) to identify the Johnson–Neyman regions of significance for the effect of scarcity type across the time horizon (Spiller et al., 2013). As shown in Figure 2, when time horizon was shorter (less than 3.81, representing 40.5% of participants), financial scarcity was associated with later switching points (increased preferences for smaller, sooner outcomes). However, when time horizon was longer (greater than 6.93, representing 25.3% of participants), the pattern reversed, and financial scarcity led to earlier switching points (increased preferences for larger, later outcomes). Results are robust to converting participants' switching

Figure 2
Intertemporal Preferences in Study 3



Note. Participants' switching point on the titration task, as a function of time horizon across the financial and time scarcity conditions. Higher responses indicate increased preference for sooner options. Vertical dotted lines refer to the Johnson–Neyman points.

point to an intertemporal discount rate and are also largely unchanged when controlling for demographic information.

Discussion

Study 3 induced perceived scarcity among all participants. However, time horizon only affected intertemporal preferences when the choice outcomes could help address the needs threatened by the scarce resource, in line with the contextually appropriate perspective of decision making under scarcity.

Study 4

Study 4 was designed with three key objectives. First, we orthogonally manipulate both scarcity and the time horizon of needs to further isolate time horizon as a causal determinant of scarcity's effects on intertemporal choice.

Second, Study 4 investigates an alternative possibility that the interaction effect we observe occurs because simply having a salient expense encourages people to prefer to match the timing of receiving money with the timing of their expenses (i.e., a mental accounting explanation). To disentangle perceptions of scarcity for an expense (i.e., inadequacy for expenses) from the mere salience of an expense, in Study 4, we designed a life simulation task that holds expenses constant and equally salient across the control and scarcity conditions.

Third, this study directly assesses people's beliefs about which outcome will better help them address their spending needs (perceptions of marginal utility given the circumstances of scarcity) and perceptions of slack change over time. Evidence for either or both of these processes would support the perspective that the effect of scarcity on intertemporal choice results from attempts to make contextually appropriate decisions given the conditions of scarcity.

Method

Study 4 followed a 2 (scarcity: scarcity vs. no scarcity) \times 2 (time horizon: shorter vs. longer) between-subjects design and was preregistered (<https://aspredicted.org/r8p7b.pdf>).

Participants

Because Study 4 has a similar design to Study 2, we calculated the sample size using Demidenko's (2007) sample size calculator based on an effect size with an *odds ratio* = 0.30, $\alpha = .05$, *power* = 80%. This analysis suggested a sample size of 390 participants. We preregistered posting the study for 700 participants, which exceeds this necessary sample size. Seven hundred three U.S. participants completed the study on Cloud Research in exchange for monetary payment. Sixty-five additional participants started but did not complete the study, and of these participants, 32 exited the study before they were assigned to an experimental condition. The dropout rate among the remaining 33 participants did not vary by condition (all Wald $\chi^2 < .75$, $p > .387$). In addition, 18 participants failed the instructional manipulation check and were excluded from the analysis. This failure rate also did not vary by condition, all Wald $\chi^2 < .79$, $p > .374$. Thus, the final sample size included 685 participants ($M_{\text{age}} = 41.43$, $SD = 13.00$; 363 women; 321 men, 1 other; Median education = bachelor's degree; Median income = 60–69 K).

Procedure

Study 4 was conducted in July 2022. Participants engaged in a mini life simulation task in which they were guided through a set of situations and asked to make decisions that were unrelated to the experiment's manipulations (e.g., selecting the color of a purchase, deciding how to search for a part-time job over the summer to earn extra money). As part of this simulation, participants were informed that they had wanted an e-bike for a long time and have been on a waitlist for a year to purchase it for \$1,400. To manipulate the time horizon of this need, the e-bike was described as out-of-stock but becoming available for purchase either at the end of the week (shorter time horizon) or at the beginning of September (longer time horizon). Participants were told that if they did not purchase the e-bike when it became available, they would lose their spot on the waitlist. To manipulate scarcity perceptions, participants were informed that they had either \$350 (scarcity) or \$5,000 (no scarcity) in savings. Later in the simulation, all participants learned that they secured an additional part-time remote job to earn extra money over the summer. For the dependent intertemporal choice measure, they learned that the new job had two payment options. They could get paid a smaller amount if they wanted to get paid during their onboarding meeting in the current week (\$1,000) or a larger amount if they waited until the work was completed in mid-August (\$1,150). See the Supplemental Materials (Study 4: Complete Study Details) for complete details about the life simulation task.

After finishing the life simulation task, participants answered a question designed to capture perceptions of marginal utility of the intertemporal choice outcomes: "In the life simulation, you were given a tradeoff between getting paid \$1,000 this week or \$1,150 in mid-August. How would obtaining the different payouts impact your ability to meet your spending needs?" (7-point scale; 1 = The \$1,000 this week would *BETTER* help me meet my spending needs, 4 = The two payouts would help me meet my spending needs to a *SIMILAR EXTENT*, 7 = The \$1,150 in mid-August would *BETTER* help me meet my spending needs). Thus, higher scores on the marginal utility measure indicated that larger, later options provided greater marginal utility. Participants also answered two questions designed to capture perceptions of slack change over time (7-point

scale, 1 = *very little spare money*, 7 = *very much spare money*): (a) "In the life simulation, without the extra money you could potentially get from the additional summer employment, how would you rate your spare money *this week*?" and (b) "In the life simulation, without the extra money you could potentially obtain from the additional summer employment, how would you rate your spare money *in mid-August*?" The order of the marginal utility question and the slack change questions was counterbalanced. Next, participants completed a scarcity manipulation check, an attention check, and demographic information including age, gender, education, and income.

Results

Manipulation Checks

We submitted the scarcity manipulation check to an analysis of variance (ANOVA) with the scarcity and time horizon conditions entered as factors. As expected, there was a significant effect of scarcity whereby participants in the scarcity condition ($M = 5.86$, 95% CI [5.69, 6.03], $SD = 1.47$) reported perceiving their savings as more scarce than did participants in the control condition ($M = 3.39$, 95% CI [3.22, 3.56], $SD = 1.73$), $F(1, 681) = 404.19$, $p < .001$, $\eta_p^2 = .372$. There was no effect of time horizon and no interaction between scarcity and time horizon, both $F < 1$, $p \geq .446$, $\eta_p^2 \leq .001$.

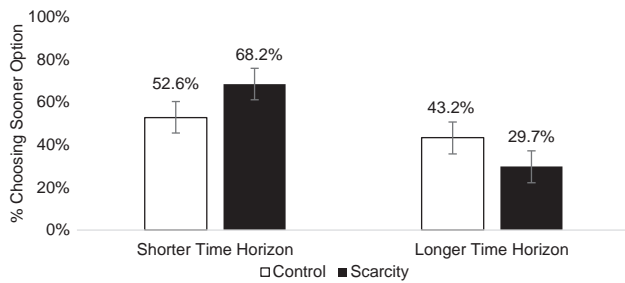
Intertemporal Choice

We first assessed the overall effect of scarcity on intertemporal choice using a binary logistic regression, entering only scarcity as an independent variable (control = 0, scarcity = 1), and found no effect of scarcity condition, $B = .030$, 95% CI [-0.27, 0.33], $SE = .15$, Wald $\chi^2(1) < 1$. We then performed a binary logistic regression on participants' selection of the smaller, sooner monetary payment, entering scarcity (control = 0, scarcity = 1), time horizon (0 = shorter, 1 = longer), and their interaction into the model. There was a significant effect of scarcity, $B = .66$, 95% CI [0.22, 1.10], $SE = .22$, Wald $\chi^2(1, N = 685) = 8.59$, $p = .003$, odds ratio = 1.93; a marginally significant effect of time horizon, $B = -.38$, 95% CI [-.81, .05], $SE = .22$, Wald $\chi^2(1, N = 685) = 3.02$, $p = .082$, odds ratio = .68; and a significant scarcity by time horizon interaction, $B = -1.25$, 95% CI [-1.87, -0.62], $SE = .32$, Wald $\chi^2(1, N = 685) = 15.22$, $p < .001$, odds ratio = 0.29. Follow-up contrasts revealed that scarcity increased choices of the smaller, sooner option when the time horizon was shorter, Mean difference = .16, 95% CI [0.05, 0.26], Wald $\chi^2(1, N = 685) = 8.91$, $p = .003$, odds ratio = 1.93. However, when the time horizon was longer, this effect reversed such that scarcity significantly decreased choices of the smaller, sooner option, Mean difference = -0.13, 95% CI [-0.24, -0.03], Wald $\chi^2(1, N = 685) = 6.87$, $p = .009$, odds ratio = 0.56. These results are depicted in Figure 3.

Perceived Marginal Utility

To reiterate, higher scores on the marginal utility measure indicated that participants perceived the larger, later options as providing greater marginal utility. There were two missing values for the marginal utility question. Using linear regression, we found a significant effect of scarcity, $B = -.82$, 95% CI [-1.25, -.40], $SE = .22$, Wald $\chi^2(1, N = 683) = 14.50$, $p < .001$, $f^2 = .02$; a significant

Figure 3
Intertemporal Preferences by Condition in Study 4



Note. Percentages are estimated marginal means. Error bars indicate 95% confidence intervals.

effect of time horizon, $B = .47$, 95% CI [.04, .89], $SE = .22$, Wald $\chi^2(1, N = 683) = 4.67$, $p = .031$, $f^2 = .01$; and a significant scarcity by time horizon interaction, $B = 1.55$, 95% CI [.95, 2.14], $SE = .31$, Wald $\chi^2(1, N = 683) = 25.62$, $p < .001$, $f^2 = .04$. Follow-up contrasts within the shorter time horizon conditions revealed that participants in the scarcity (vs. control) condition were more likely to view the smaller, sooner option as providing greater marginal utility, Mean difference = $-.82$, 95% CI $[-1.25, -.40]$, Wald $\chi^2(1, N = 683) = 14.50$, $p < .001$, $f^2 = .02$. However, within the longer time horizon conditions, participants in the scarcity (vs. control) condition were more likely to view the larger, later option as providing greater marginal utility, Mean difference = $.72$, 95% CI [.30, 1.15], Wald $\chi^2(1, N = 683) = 11.22$, $p < .001$, $f^2 = .02$. See Figure 4. Moreover, using Hayes' (2022) PROCESS macro, Model 7, with 10,000 bootstrap samples, we found evidence that the interaction effect of scarcity and time horizon on intertemporal choice was explained by marginal utility (95% CI [1.18, 2.87]).² Marginal utility mediated the effect of scarcity on intertemporal choice in both the shorter time horizon (95% CI $[-1.70, -.47]$) and longer time horizon (95% CI [0.41, 1.49]) conditions. These results indicate that scarcity increased the relative marginal utility of the smaller, sooner intertemporal choice outcome in the shorter time horizon condition and decreased the relative marginal utility of the smaller, sooner outcome in the longer time horizon condition, which, in turn, influenced intertemporal choice.

Slack Change Over Time

There were also two missing values for the slack change questions. We calculated slack change over time by subtracting current perceived slack from future perceived slack. Thus, higher scores reflected perceptions of positive slack change over time (belief of having more money in the future). Using linear regression, we found a significant effect of scarcity, $B = .56$, 95% CI [.24, .89], $SE = .17$, Wald $\chi^2(1, N = 683) = 11.44$, $p = .001$, $f^2 = .02$; no effect of time horizon, $B = .01$, 95% CI $[-.32, .34]$, $SE = .17$, Wald $\chi^2(1, N = 683) < 1$, $f^2 < .01$; and no scarcity by time horizon interaction, $B = -.09$, 95% CI $[-.55, .37]$, $SE = .24$, Wald $\chi^2(1, N = 683) < 1$, $f^2 < .01$. Regardless of time horizon, participants experiencing scarcity ($M = .64$, $SE = .08$, 95% CI [.47, .80]) expected to have greater slack in the future relative to those not experiencing scarcity ($M = .12$, $SE = .08$, 95% CI $[-.05, .28]$). See Figure 4. Thus, slack change did not explain the reversal observed in the longer time horizon condition because time horizon

had no impact on slack change perceptions. Indeed, in contrast to the marginal utility results, the index of mediated moderation for slack change was not significant (95% CI $[-0.10, 0.08]$; Hayes, 2022, PROCESS macro, Model 7, with 10,000 bootstrap samples).

Discussion

In Study 4, we replicated the interaction between scarcity and time horizon using a paradigm that allowed us to manipulate both scarcity and the time horizon of needs. In addition, we directly tested the contextually appropriate response perspective by measuring marginal utility and slack change perceptions. Differences in intertemporal choice were explained by perceptions of marginal utility. Results were not explained by perceptions of slack, which were perceived to be greater in the future (vs. now), regardless of whether participants' need had a longer or shorter time horizon. Thus, while in theory both marginal utility and slack change predict an interaction of scarcity and the time horizon of needs, for slack change to explain the interaction between scarcity and time horizon on intertemporal choice, the time horizon of needs among those experiencing scarcity (vs. those not experiencing scarcity) must result in a polarization of slack change perceptions. That is, among those experiencing scarcity (vs. those not experiencing scarcity), needs with shorter time horizons must result in positive slack change perceptions over time, and needs with longer time horizons must result in negative slack change perceptions over time. Empirically, we fail to find evidence for this polarization. We continue to measure both marginal utility and slack change in Study 5 and discuss when and why time horizon may not affect slack change perceptions in the Supplemental Materials.

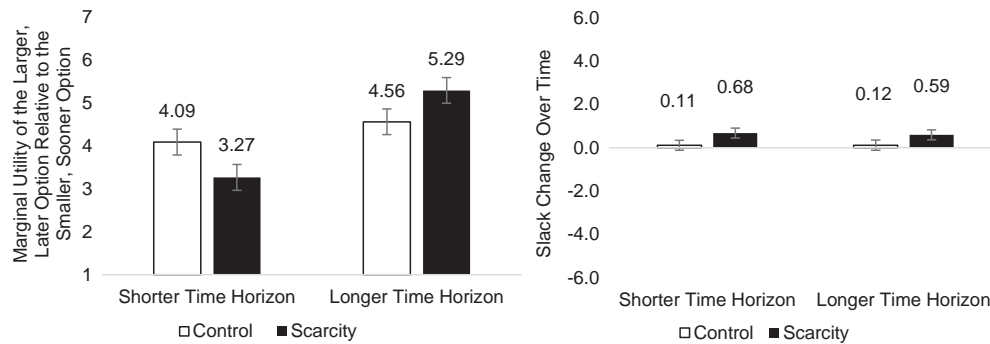
Study 5

Study 5 tested the possibility that myopic, impulsive behavior occurs in the presence of a temporally proximal need, and only results in contextually appropriate responses when no temporally proximal need exists. If the presence of a temporally proximal need leads to myopic, impulsive decision making, scarcity that threatens multiple needs should result in intertemporal choices that favor the present, so long as any need has a shorter time horizon. However, if responses to scarcity reflect contextually appropriate decisions reflecting differential perceived utility given the circumstances of scarcity, responses to scarcity threatening multiple needs should incorporate the temporal proximity and relative importance of competing needs. In Study 5, all participants considered two needs that varied in time horizon and relative importance. Thus, participants had a (more/less) important need with a shorter time horizon and a (less/more) important need with a longer time horizon. In addition to varying the timing of the more important need, this study orthogonally manipulated scarcity.

When the more important need had a shorter time horizon, we expected participants facing scarcity to be more likely to select the smaller, sooner outcome compared to those with resource sufficiency. However, when the more important need had a longer

² Note: this confidence interval refers to the index of moderated mediation. Per Hayes (2022), this is equivalent to the indirect effect of a product in a mediated moderation model. Note also that we find evidence of mediated moderation if we instead use a linear regression approach to test for mediated moderation (Muller et al., 2005).

Figure 4
Marginal Utility and Slack Change by Condition in Study 4



Note. Numbers are estimated marginal means. Error bars indicate 95% confidence intervals.

time horizon, we expected participants to weigh both the temporal proximity and relative importance of their needs, and thus be less likely to prefer the smaller, sooner option compared to people experiencing scarcity whose more important need had a shorter time horizon. Thus, in line with the contextually appropriate response perspective, we predicted that the timing of the more important need would moderate the effect of scarcity on intertemporal choice.

Method

Study 5 followed a 2 (scarcity: scarcity vs. no scarcity) \times 2 (time horizon of more important need: shorter time horizon vs. longer time horizon) between-subjects design and was preregistered (<https://aspredicted.org/cn7c3.pdf>).

Participants

Because Study 5 has a similar design as Study 2 and Study 4, we calculated the sample size using Demidenko's (2007) sample size calculator based on an effect size (for the interaction) of *odds ratio* = 0.30 (the smaller of the effect sizes in Study 2 and Study 4), $\alpha = .05$, *power* = 80%. This analysis suggested a minimum sample size of 390 participants. We aimed to recruit 1,200 U.S. individuals on Cloud Research in exchange for monetary payment, which exceeded this minimum sample size. Twelve hundred eighty-one participants opened the study, and 1,213 participants completed the study. Of the 68 people who did not complete the study, 37 did not complete enough of the study to get assigned to a condition. The remaining 31 participants did not vary by condition, all Wald $\chi^2 < .99$, $p > .320$. There were 95 people who failed the instructional manipulation check and were excluded from analysis, leaving a final sample of 1,118 participants ($M_{\text{age}} = 41.85$, $SD = 12.82$; 597 women, 511 men, 6 other, Median income = 50–59 K, Median education = bachelor's degree). This exclusion did not vary by condition, all Wald $\chi^2 < 1.75$, $p > .187$.

Procedure

Participants engaged in a mini life simulation. Similar to Study 4, in this mini life simulation, participants made a series of unrelated choices (what to watch on television, which apartment to move into, how to search for summer employment) before the intertemporal

choice. Critically, throughout this simulation, participants learned about two needs that varied in importance, as operationalized by the potential consequences of not meeting the need. The less important need was buying a new television to replace their television that was glitchy (\$800), and the more important need was putting down a deposit on a new apartment that they needed to move into (\$2,100). In all conditions, participants had one need that required money later that week and another need that required money approximately 1.5 months later. However, across the time horizon conditions, we varied which need required money in the shorter versus longer term. Participants in the "more important need with a shorter time horizon" condition read that the deposit for their new apartment was due later that week, and that the television they really wanted to buy was going to be on sale for Labor Day at the beginning of September. Participants in the "more important need with a longer time horizon" condition read that the television they really wanted to buy was on sale for Amazon Prime day later that week, and that the deposit for their new apartment was due at the beginning of September. Note that this study was run in mid-July, during the week of Amazon Prime day.

In addition to varying which need required money sooner rather than later, we also manipulated perceptions of scarcity. In the control condition, participants had \$5,000 in savings (an adequate amount of money for both needs). In the scarcity condition, participants had \$500 in savings (an inadequate amount of money for both needs). As in Study 4, all participants in this simulation acquired additional part-time summer employment for extra money, and the dependent measure was an intertemporal choice in which participants decided whether to get paid a lesser amount upfront this week (\$1,500) or a larger amount at the end of August when the work was complete (\$1,650). Full details of the simulation are available in the Supplemental Materials (Study 5: Complete Study Details).

After completing the simulation, participants rated the perceived marginal utility of the two different payouts and their slack change perceptions using the same measures from Study 4 (amounts and time periods tailored to the current simulation). The order of these questions was randomized. As a manipulation check for scarcity, participants indicated the extent to which it seemed like the amount they had in savings was scarce, limited, or inadequate (7-point scale: 1 = *Not at all*, 7 = *Very much so*). To ensure that the need we intended to be more important was perceived as such, participants

also indicated whether paying the rental deposit or purchasing the new television set was more important to them (7-point scale: 1 = *Definitely paying the rental deposit*, 7 = *Definitely purchasing the new TV set*). Participants also completed an attention check, described in the Supplemental Materials (Study 5: Complete Study Details). Last, participants completed demographic information including age, gender, education, and income.

Results

Manipulation Checks

The scarcity manipulation check was submitted to an ANOVA with scarcity condition and time horizon of the more important need entered as factors. As intended, there was a significant effect of resource scarcity. Participants in the scarcity condition ($M = 5.86$, 95% CI [5.74, 5.98], $SD = 1.28$) reported perceiving their savings as more scarce than did participants in the control condition ($M = 3.64$, 95% CI [3.52, 3.76], $SD = 1.63$), $F(1, 1114) = 635.76$, $p < .001$, $\eta_p^2 = .363$. There was no effect of time horizon of the more important need, and no interaction between scarcity and time horizon, both $F < 1$, $p \geq .816$, $\eta_p^2 < .001$.

With respect to the focal needs, a test against the midpoint demonstrated that participants believed paying the rental deposit was more important than buying the new television ($M = 1.40$, $SD = 1.02$), $t(1,117) = -85.12$, $p < .001$, 95% CI of the difference [-2.66, -2.54], Cohen's $d = -2.55$. The relative importance of the needs did not vary by condition, all $F(1, 1114) \leq 2.24$, $p \geq .135$, $\eta_p^2 \leq .002$. Thus, the manipulation of the time horizon of the more important need was successful.

Intertemporal Choice

A binary logistic regression on intertemporal choice entering only scarcity condition (control = 0, scarcity = 1) found a significant effect of scarcity condition, $B = .456$, 95% CI [.22, .69], $SE = .12$, Wald $\chi^2(1) = 14.29$, $p < .001$, odds ratio = 1.58, such that scarcity increased participants' likelihood of selecting the smaller, sooner option. We then conducted a binary logistic regression on participants' selection of the smaller, sooner option as a function of scarcity (0 = control, 1 = scarcity), time horizon of the more important need (0 = shorter time horizon, 1 = longer time horizon), and their interaction. There was a significant effect of scarcity, $B = .75$, 95% CI [0.41, 1.10], $SE = .17$, Wald $\chi^2(1, N = 1,118) = 18.55$, $p < .001$, odds ratio = 2.12; no significant effect of time horizon of the more important need, $B = -0.10$, 95% CI [-0.43, 0.24], $SE = .17$, Wald $\chi^2(1, N = 1,118) < 1$, $p = .568$, odds ratio = 0.91; and a significant interaction, $B = -0.58$, 95% CI [-1.06, -0.11], $SE = .24$, Wald $\chi^2(1, N = 1,118) = 5.75$, $p = .017$, odds ratio = 0.56. Follow-up contrasts showed that when the more important need had a shorter time horizon, scarcity increased choice of the smaller, sooner option, Mean difference = .18, 95% CI [.10, .26], Wald $\chi^2(1, N = 1,118) = 19.41$, $p < .001$, odds ratio = 2.12. However, this difference was attenuated when the more important need had a longer time horizon. Specifically, participants in the scarcity (vs. control) condition were no more likely to select the smaller, sooner

option, Mean difference = .04, 95% CI [-.04, .13], Wald $\chi^2(1, N = 1,118) = 1.00$, $p = .317$, odds ratio = 1.18. Results are shown in Figure 5.

Perceived Marginal Utility

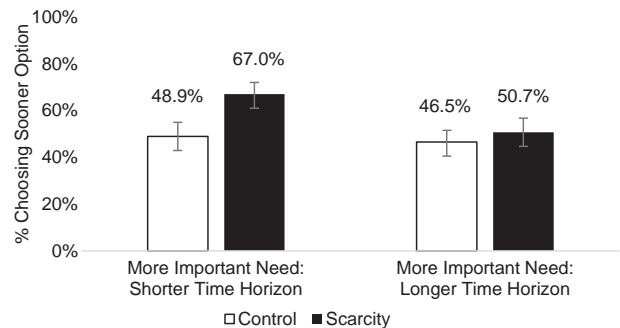
A linear regression on marginal utility found a significant effect of scarcity condition, $B = -1.25$, 95% CI [-1.58, -0.91], $SE = .17$, Wald $\chi^2(1, N = 1,118) = 53.07$, $p < .001$, $f^2 = .05$; no significant effect of time horizon of the more important need, $B = -0.16$, 95% CI [-0.49, 0.17], $SE = .17$, Wald $\chi^2(1, N = 1,118) < 1$, $p = .349$, $f^2 < .01$; and a significant interaction, $B = 1.17$, 95% CI [0.70, 1.64], $SE = .24$, Wald $\chi^2(1, N = 1,118) = 23.42$, $p < .001$, $f^2 = .02$. Follow-up contrasts showed that when the more important need had a shorter time horizon, participants in the scarcity condition were more likely to see the smaller, sooner option as providing greater marginal utility than participants in the control condition, Mean difference = -1.24, 95% CI [-1.58, -0.91], Wald $\chi^2(1, N = 1,118) = 53.06$, $p < .001$, $f^2 = .05$. However, when the more important need had a longer time horizon, there were no differences in perceived marginal utility across conditions, Mean difference = -.08, 95% CI [-.41, .26], Wald $\chi^2(1, N = 1,118) = .20$, $p = .655$, $f^2 < .01$. We found support for mediated moderation using PROCESS macro, Model 7 (95% CI [-2.04, -0.84], Hayes, 2022). When the more important need had a shorter time horizon, marginal utility mediated the significant effect of scarcity on intertemporal choice (95% CI [1.09, 1.98]). However, when the more important need had a longer time horizon, there was no significant indirect effect given that there was no significant effect of scarcity on marginal utility or intertemporal choice (95% CI [-.31, .51]). See Figure 6. These results, along with those shown in Study 4, indicate that differences in marginal utility perceptions explain whether, and in what direction, scarcity impacts intertemporal choice.

Slack Change Over Time

Slack change was calculated by subtracting perceived slack in the current period from perceived slack in the later period such that positive numbers indicate beliefs of positive slack change over time.

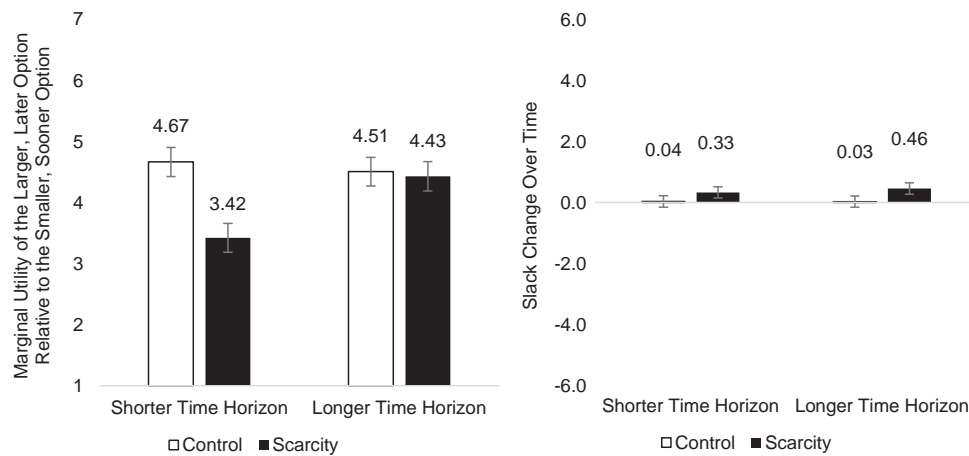
Figure 5

Intertemporal Preferences by Condition in Study 5



Note. Percentages are estimated marginal means. Error bars indicate 95% confidence intervals.

Figure 6
Marginal Utility by Condition in Study 5



Note. Numbers are estimated marginal means. Error bars indicate 95% confidence intervals.

A linear regression on slack change found a significant effect of scarcity condition, $B = 0.29$, 95% CI [0.30, 0.56], $SE = .13$, Wald $\chi^2(1, N = 1,118) = 4.77$, $p = .029$, $f^2 < .01$. There was neither a significant effect of time horizon of the more important need, $B = -0.01$, 95% CI [-0.27, 0.25], $SE = .13$, Wald $\chi^2(1, N = 1,118) < 1$, $p = .950$, $f^2 < .01$; nor an interaction, $B = 0.14$, 95% CI [-0.23, 0.51], $SE = .19$, Wald $\chi^2(1, N = 1,118) < 1$, $p = .466$, $f^2 < .01$. See Figure 6. Thus, those experiencing scarcity expected greater relative slack in the future than in the present, regardless of the time horizon of the more important need, and we did not find evidence for mediated moderation (95% CI [-0.07, 0.03]; Hayes, 2022, PROCESS macro, Model 7, with 10,000 bootstrap samples).

Discussion

Study 5 found that both the temporal proximity and relative importance of needs influenced intertemporal decisions under scarcity. When the more important need required resources in the shorter term, scarcity increased preference for the smaller, sooner option. However, there was no effect of scarcity on intertemporal choice when the more important need required resources in the longer term, even though a temporally proximate need was threatened. Differences in perceptions of marginal utility mediated the interaction between scarcity and the time horizon of the more important need. Similar to Study 4, Study 5 did not find empirical evidence for the role of slack change perceptions, which is discussed in more detail in the Supplemental Materials.

We note that in this study, as often is the case in life, the more important need differed in type (i.e., television vs. rent deposit) as well as cost (\$800 vs. \$2,100), and thus each of these factors may have exerted an influence on the perceived utility of intertemporal choice outcomes. We suspect, however, that the type of need is more influential than the cost (e.g., people facing scarcity are unlikely to prioritize a more costly cable bill over a less costly electric bill).

General Discussion

Understanding experiences of scarcity is critical, particularly as factors in society—climate change affecting water and food supplies, inflation impacting cost-of-living, and more targeted forms of advertising increasingly manufacturing perceived needs—produce never ending triggers of perceived scarcity. Numerous findings demonstrate that people make decisions that favor shorter term outcomes over longer term outcomes when they feel their resources are scarce (e.g., Mullainathan & Shafir, 2013; Zhao & Tumm, 2018). The current work distinguishes between two competing perspectives for why this effect occurs by examining whether the time horizon of needs threatened by scarce resources moderates the effect of scarcity on intertemporal choice. Our results demonstrate that the time horizon of threatened needs is an important determinant of the effect of scarcity on intertemporal choice, suggesting that responses to scarcity are more aligned with the contextually appropriate response perspective, rather than the impulsive, myopic perspective. This distinction underscores the importance of understanding contextual variation among experiences of scarcity, suggests that decision-making approaches under scarcity are less thoughtless than assumed by the impulsive, myopic account, and offers recommendations for interventions aimed at changing behavior under scarcity.

Summary of Findings

Five studies demonstrated that the time horizon of needs threatened by scarcity is an important determinant of how perceptions of scarcity affect intertemporal choice. Study 1 leveraged archival data and found that the relationship between naturally occurring perceptions of scarcity and increased preferences for smaller, sooner outcomes was attenuated when threatened needs had a longer time horizon. Study 2 manipulated perceived scarcity, used exogenously determined time horizons (i.e., wedding dates), and found that perceived scarcity

increased (decreased) preference for larger, later outcomes when time horizons were longer (shorter). Study 3 provided evidence that this polarization was not due to heightened focus on needs leading to greater attention to and preference for any outcome occurring in the same time period of threatened needs. The time horizon of threatened needs only impacted intertemporal choices under scarcity when the intertemporal choice outcomes could help address threatened needs.

Study 4 replicated the polarizing effect of time horizon on the relationship between scarcity on intertemporal choice in a life simulation paradigm where both scarcity and time horizon were exogenously manipulated. Moreover, Study 4 measured potential process mechanisms, finding that perceptions of marginal utility explained the polarizing effect of scarcity on intertemporal choice. Finally, Study 5 found that the moderating effect of time horizon was not due to the presence versus absence of a temporally proximate need. When people had multiple needs that differed in both time horizon and importance, and the more important need had a longer (vs. shorter) time horizon, perceived scarcity did not increase selection of the smaller, sooner option. Moreover, in line with Study 4, Study 5 showed that this moderation was mediated by perceptions of marginal utility, suggesting that participants with scarce resources aimed to maximize utility across their threatened needs.

All our results are consistent with the perspective that responses to scarcity reflect differences in the perceived utility of intertemporal choice outcomes given the needs threatened by scarcity. In the two studies (Studies 1 and 5) that found an attenuation rather than a reversal of the relationship between scarcity and intertemporal choice, the larger, later option was not perceived as providing greater marginal utility than the smaller, sooner option when the time horizon was longer. In Study 5, we measured marginal utility perceptions directly within the study and found support for mediation. Because the Federal Reserve Bank of Philadelphia did not collect marginal utility perceptions (Study 1), we measured perceived marginal utility in this paradigm using a posttest. We assigned participants to a control condition (i.e., plenty of money) or one of two scarcity conditions (i.e., concern over making ends meet) that differed in time horizon (i.e., 3 vs. 12 months), and measured the perceived marginal utility of the intertemporal choice options from Study 1. Mirroring the intertemporal preferences found in Study 1, participants in the scarcity (vs. control) condition perceived the smaller, sooner option as providing more marginal utility than the larger, later option when the time horizon was shorter, and this effect was attenuated but not reversed when the time horizon was longer (see Supplemental Posttest 3). In Supplemental Study 2, we provide further evidence for the role of marginal utility perceptions by varying the perceived marginal utility of the choice options while holding constant the time horizon of the need threatened by scarcity. Our results consistently demonstrate that perceptions of scarcity encourage people to select options that they believe will maximize their utility given the conditions of scarcity, in line with the contextually appropriate response perspective of scarcity.

Implications: Scarcity

By incorporating the time horizon of threatened needs, our results integrate seemingly contradictory findings regarding the effects of

inadequate resources. For instance, the poorest people in society are more likely to have needs with shorter time horizons (e.g., food and shelter). Thus, increased preferences among the poor for smaller, sooner outcomes such as high interest rate loans is consistent with poor people trying to meet their shorter term survival needs, which does not require impulsivity. In contrast, increased resource conservation efforts among individuals experiencing scarcity is typically exhibited in contexts in which the time horizon of threatened needs is longer. For instance, water conservation is typically a concern when there is sufficient water for immediate needs, but insufficient water for the future if consumed at the same rate. Thus, preference for and concern about the future can be explained by the longer time horizon of needs in these contexts.

Our work also advances a more formal theory of when and why the poor will at times display future-oriented behavior. The poor can value a broader range of unmet needs that go beyond food and shelter (Schroeder & Epley, 2020), and research finds that the poor do save money in some situations, such as when they have a specific expense in mind compared to when they do not (e.g., A. V. Banerjee & Duflo, 2007). Indeed, although some findings from Shah et al. (2012) are suggestive of the myopic, impulsive perspective (i.e., decreased cognitive functioning), the authors suggest that the poor may save in some situations because they are focused on addressing their problems. Thus, savings among the poor likely reflects the prioritization of needs perceived as having longer time horizons.

The current work has implications for what types of interventions are likely to be effective. The myopic, impulsive perspective of scarcity implies that asking people to think about the consequences of their decisions or reminding them about potential consequences will encourage more future-oriented behavior. In contrast, our research suggests that reminders about the future may be effective, but only to the extent that they change the perceived utility of the intertemporal options. In line with this proposition, field experiments testing the effectiveness of reminders on savings rates in less developed countries found that reminders were not always effective, and were effective only when the reminder changed the perceived current or future benefits of the savings behavior (e.g., provided a financial incentive to save money; Karlan et al., 2016). Our research further suggests that interventions that change the relative importance of needs over time (e.g., making retirement more important; Bartels & Rips, 2010; Herschfield et al., 2011) or provide alternative means to meet threatened needs (e.g., cash transfers; Fiszbein & Schady, 2009) are likely to be particularly effective among people experiencing scarcity.

The current research offers predictions about how effects of scarcity may differ across situations or across time. For example, feelings of scarcity are believed to increase with economic development, prompted by a broader range of needs and wants that go beyond food and shelter (Raiklin & Uyar, 1996, p. 54). Indeed, research on poverty in more developed countries identifies those in poverty by the inability to afford a much broader range of consumption needs (e.g., indoor toilet, a washing machine, a hobby or leisure activity, celebrations on special occasions; e.g., Callan et al., 1993; Mack & Lansley, 1985). Importantly, these needs have more variation with respect to time horizon. Our findings suggest that effects of scarcity may be less consistent in more developed countries, and that the effects of perceived scarcity may become less

predictable over time as globalization and technological advancements further increase variation in consumption needs.

Differences in needs and the cost of obtaining those needs (e.g., cost of living differences) may help explain why income is not a good indicator of perceptions of financial scarcity (e.g., Gasiorowska, 2014; Smith, 2018). Indeed, in the data we received from the Federal Reserve Bank of Philadelphia's CFI, income was more strongly correlated with demographic variables such as being older (age; $r = .16$), female (gender; $r = -.33$), and more educated (education; $r = .53$) than with scarcity perceptions ($r = -.10$; for greater explication of why objective financial measures often differ from subjective assessments, see Tully & Sharma, 2022). Thus, rather than using the sheer number of available resources (e.g., income) as a proxy for scarcity, we examined scarcity perceptions specifically, and did so by measuring perceptions of scarcity, increasing the salience of needs for which people did not have sufficient resources, and reducing the level of participants' resources to an insufficient amount while holding constant the same underlying demands. We speculate, however, that income may be a more reasonable proxy for scarcity perceptions within societies or populations with relatively homogeneous needs.

Statement of Limitations

The current research demonstrated that time horizon of threatened needs is an important determinant of the effect of scarcity on intertemporal choice, suggesting that intertemporal decisions under scarcity reflect contextually appropriate attempts to maximize perceived utility of the choice rather than impulsive, myopic behavior. Our conclusions about the moderating role of time horizon of threatened needs achieved high statistical power across a variety of operationalizations of scarcity and measurements of intertemporal choice and should be generalizable across populations with different demographic and geographic characteristics. However, whether the effect of scarcity on intertemporal choice when the time horizon was longer resulted in a significant reversal was not observed in all studies. Although marginal utility perceptions mirrored the result of the intertemporal choices participants made, which is in line with the contextually appropriate response perspective of scarcity, we did not systematically study how individual and situational factors impact marginal utility perceptions. In addition, we did not incorporate other potential factors that may accompany experiences of scarcity and contribute to the effect of scarcity on intertemporal choice (e.g., visceral states, feelings of uncertainty or stress, and childhood experiences). See Table of Limitations for summarized limitations (Table 1).

Future Research

Our results demonstrate the moderating role of the time horizon of needs across a variety of operationalizations of scarcity and measurements of need timing. Conceptual replications in the Supplemental Materials rule out additional alternative explanations such as the effect being a function of having participants think of one specific need (Supplemental Study 4) or greater systematic thinking due to an induced negative mood (Supplemental Study 5). Despite these results, it is possible that perceived scarcity results in more myopic, impulsive decision making in some contexts. For example,

people experiencing more acute instances of perceived scarcity may be more likely to experience visceral states (e.g., extreme hunger, thirst, or drug withdrawal), which have been shown to lead to short-sighted decisions (e.g., Loewenstein, 1996). Moreover, uncertainty, stress, or negative affect may exert independent effects on cognitive functioning or intertemporal choice, and be more likely to arise in some situations of scarcity (Adamkovič & Martončík, 2017; Mani et al., 2020). Finally, it is possible that people who grow up in poverty react more impulsively when faced with scarcity due to differences in stress or perceived control (Griskevicius et al., 2013; Mittal & Griskevicius, 2014), or because they are surrounded by people making more present-focused decisions and aim to be more similar to them for social connectedness (Stephens et al., 2007). Integrating these findings with those presented in the current research suggests the need to distinguish effects of scarcity perceptions from effects of other factors that may be likely to occur in some situations of scarcity, and to further explore heterogeneity in responses to scarcity that may arise due to variation across threatened needs, contexts, or individual differences.

The identification of moderators is crucial for understanding scarcity effects, particularly given the concerns over replication in this research area (e.g., Camerer et al., 2018; O'Donnell et al., 2021). Our work shows that if critical moderators are not identified, replications can be misinterpreted. Indeed, in many of our studies (Studies 2–4 and Supplemental Study 2), we failed to find an overall effect of perceived scarcity on intertemporal choice. In our studies, only when we included the time horizon of threatened needs and examined situations in which scarcity threatened needs with shorter time horizons, did we replicate previous research. Our research thus suggests that identifying moderators is an important direction for future work on scarcity.

Future research ought to consider how people prioritize threatened needs. All else equal, imminence is likely to influence prioritization—for instance, eating today is likely more important than eating tomorrow. However, other potential factors, such as how needs are framed (e.g., as a means or a goal; Shaddy & Fishbach, 2018), have been shown to impact people's willingness to invest in outcomes. Future research may examine other differences across needs and how individual and situational factors impact the prioritization of needs.

Concluding Remarks

The current research demonstrates that intertemporal decisions under scarcity depend critically on the needs threatened by scarce resources. By incorporating the time horizon of threatened needs as a factor influencing intertemporal choices under scarcity, we distinguish between two perspectives on the relationship between scarcity and intertemporal choice. Our findings suggest that intertemporal decisions under scarcity reflect contextually appropriate attempts to maximize perceived utility given the needs threatened by scarcity rather than myopic, impulsive decision making resulting from impaired cognitive functioning or lacking willpower. The current work highlights the importance of understanding differences across experiences of scarcity into investigations of scarcity, and contributes to the ongoing debate regarding why scarcity perceptions affect intertemporal choice.

Table 1
Limitations

Dimension	Assessment
Internal validity	
Is the phenomenon diagnosed with experimental methods?	Yes
Is the phenomenon diagnosed with longitudinal methods?	No
Were the manipulations validated with manipulation checks, pretest data, or outcome data?	Manipulation checks in Study 2, Study 3, Study 4, and Study 5.
What possible artifacts were ruled out?	We ruled out the possibility that our results were due to individual differences in patience of impulsivity (Study 2), a mere focus on the time period associated with a threatened need (Study 3), mere salience of a need that requires resources (Study 4), and the presence versus absence of a temporally proximal need (Study 5). Our Supplemental Studies also showed that our results were not a function of having participants think of a specific need (Supplemental Study 4) or a negative mood induced by the scarcity manipulation (Supplemental Study 5).
Statistical validity	
Was the statistical power at least 80%?	It was for all interactions.
Was the reliability of the dependent measure established in this publication or elsewhere in the literature?	Yes, our intertemporal choice measures were similar to those in the literature.
If covariates are used, have the researchers ensured they are not affected by the experimental manipulation before including them in comparisons across experimental groups?	Not applicable
Were the distributional properties of the variables examined and did the variables have sufficient variability to verify effects?	Yes
Generalizability to different methods	
Were different experimental manipulations used?	Yes. We manipulated scarcity perceptions by having participants consider the demand on their resources (Study 2), by varying the type of resources participants experienced scarcity for (Study 3), and by changing the amount of available resources while holding constant the demands on the resources (Study 4 and Study 5).
Generalizability to field settings	
Was the phenomenon assessed in a field setting?	Yes. Study 1 used correlational survey data from the Consumer Finance Institute at the Federal Reserve Bank of Philadelphia. Study 2 examined the phenomenon among consumers planning an upcoming wedding recruited through Facebook.
Are the methods artificial?	Except for Study 4 and Study 5 which use an immersive life simulation task, all studies examined scarcity perceptions associated with participants' real needs in their life (e.g., wedding expenses among those engaged to be married). In addition, the intertemporal choices in Study 2 and Study 3 were incentive-compatible. Thus, the methods we used are not artificial.
Generalizability to times and populations	
Are the results generalizable to different years and historic periods?	This was not tested, but we believe our results are likely generalizable because the processes we examined are not likely to be sensitive to different years or historic periods.
Are the results generalizable across populations (e.g., different ages, cultures, or nationalities)?	We used U.S. samples only, but we believe our results are likely generalizable across different populations because the processes we examined are not likely to be subject to cultural or demographic differences.
Theoretical limitations	
What are the main theoretical limitations?	Our studies distinguished between two competing perspectives on the relationship between scarcity and intertemporal choice by examining the moderating role of the time horizon of threatened needs. However, limitations include (a) the lack of consideration of additional factors that may contribute to the effect of scarcity on intertemporal choice in some contexts such as visceral states, feelings of uncertainty or stress accompanied by scarcity perceptions, and childhood experiences, and (b) the lack of a more systematic investigation of the situational and individual factors, other than need importance and need imminence, that may influence marginal utility perceptions, especially when multiple needs are threatened. Finally, we primarily examined monetary scarcity. Potential differences across resources (e.g., time, water, food, energy, money) that are scarce could impact findings. For example, Supplemental Study 3 suggests the fungibility of resources may affect considerations of slack change over time.

References

- Adamkovič, M., & Martončík, M. (2017). A review of consequences of poverty on economic decision-making: A hypothesized model of a cognitive mechanism. *Frontiers in Psychology*, 8, Article 1784. <https://doi.org/10.3389/fpsyg.2017.01784>
- Aisbett, E., & Steinhauser, R. (2014). Maintaining the common pool: Voluntary water conservation in response to varying scarcity. *Environmental and Resource Economics*, 59(2), 167–185. <https://doi.org/10.1007/s10640-013-9722-3>
- Banerjee, A. V., & Duflo, E. (2007). The economic lives of the poor. *The Journal of Economic Perspectives*, 21(1), 141–167. <https://doi.org/10.1257/jep.21.1.141>
- Bartels, D. M., & Rips, L. J. (2010). Psychological connectedness and intertemporal choice. *Journal of Experimental Psychology: General*, 139(1), 49–69. <https://doi.org/10.1037/a0018062>
- Bernheim, B. D., Ray, D., & Yeltekin, Ş. (2015). Poverty and self-control. *Econometrica*, 83(5), 1877–1911. <https://doi.org/10.3982/ECTA11374>
- Bertrand, M., & Morse, A. (2011). Information disclosure, cognitive biases, and payday borrowing. *The Journal of Finance*, 66(6), 1865–1893. <https://doi.org/10.1111/j.1540-6261.2011.01698.x>
- Bickel, W. K., Wilson, A. G., Chen, C., Koffarnus, M. N., & Franck, C. T. (2016). Stuck in time: Negative income shock constricts the temporal window of valuation spanning the future and the past. *PLOS ONE*, 11(9), Article e0163051. <https://doi.org/10.1371/journal.pone.0163051>
- Blocker, C., Zhang, J. Z., Hill, R. P., Roux, C., Corus, C., Hutton, M., Dorsey, J., & Minton, E. (2022). Rethinking scarcity and poverty: Building bridges for shared insight and impact. *Journal of Consumer Psychology*, 33(3), 489–509. <https://doi.org/10.1002/jcpsy.1323>
- Bos, M., Le Coq, C., & van Santen, P. (2022). Scarcity and consumers' credit choices. *Theory and Decision*, 92(1), 105–139. <https://doi.org/10.1007/s11238-021-09815-2>
- Callan, T., Nolan, B., & Whelan, C. T. (1993). Resources, deprivation and the measurement of poverty. *Journal of Social Policy*, 22(2), 141–172. <https://doi.org/10.1017/S0047279400019280>
- Camerer, C. F., Dreber, A., Holzmeister, F., Ho, T. H., Huber, J., Johannesson, M., Kirchler, M., Nave, G., Nosek, B. A., Pfeiffer, T., Altmejd, A., Buttrick, N., Chan, T., Chen, Y., Forsell, E., Gampa, A., Heikensten, E., Hummer, L., Imai, T., ... Wu, H. (2018). Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015. *Nature Human Behaviour*, 2(9), 637–644. <https://doi.org/10.1038/s41562-018-0399-z>
- Carvalho, L. S., Meier, S., & Wang, S. W. (2016). Poverty and economic decision-making: Evidence from changes in financial resources at payday. *The American Economic Review*, 106(2), 260–284. <https://doi.org/10.1257/aer.20140481>
- Dang, J., Xiao, S., Zhang, T., Liu, Y., Jiang, B., & Mao, L. (2016). When the poor excel: Poverty facilitates procedural learning. *Scandinavian Journal of Psychology*, 57(4), 288–291. <https://doi.org/10.1111/sjop.12292>
- Daoud, A. (2010). Robbins and Malthus on scarcity, abundance, and sufficiency: The missing sociocultural element. *American Journal of Economics and Sociology*, 69(4), 1206–1229. <https://doi.org/10.1111/j.1536-7150.2010.00741.x>
- Demidenko, E. (2007). Sample size determination for logistic regression revisited. *Statistics in Medicine*, 26(18), 3385–3397. <https://doi.org/10.1002/sim.2771>
- Fan, L., & Wang, Y. (2022). Healthy eating behaviors and self-control in scarcity: The protective effects of self-compassion. *Appetite*, 169, Article 105860. <https://doi.org/10.1016/j.appet.2021.105860>
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Fisher, I. (1930). *Theory of interest: As determined by impatience to spend income and opportunity to invest it*. Augustusm Kelly Publishers.
- Fiszbein, A., & Schady, N. R. (2009). *Conditional cash transfers: Reducing present and future poverty*. World Bank Publications. <https://doi.org/10.1596/978-0-8213-7352-1>
- Fitzpatrick, K., & Coleman-Jensen, A. (2014). Food on the fringe: Food insecurity and the use of payday loans. *The Social Service Review*, 88(4), 553–593. <https://doi.org/10.1086/679388>
- Frankenhuis, W. E., & Nettle, D. (2020). The strengths of people in poverty. *Current Directions in Psychological Science*, 29(1), 16–21. <https://doi.org/10.1177/0963721419881154>
- Frederick, S., Loewenstein, G., & O'donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, 40(2), 351–401. <https://doi.org/10.1257/jel.40.2.351>
- Gasiorowska, A. (2014). The relationship between objective and subjective wealth is moderated by financial control and mediated by money anxiety. *Journal of Economic Psychology*, 43, 64–74. <https://doi.org/10.1016/j.joep.2014.04.007>
- Gneezy, A., Imas, A., & Jaroszewicz, A. (2020). The impact of agency on time and risk preferences. *Nature Communications*, 11(1), Article 2665. <https://doi.org/10.1038/s41467-020-16440-0>
- Griskevicius, V., Ackerman, J. M., Cantú, S. M., Delton, A. W., Robertson, T. E., Simpson, J. A., Thompson, M. E., & Tybur, J. M. (2013). When the economy falters, do people spend or save? Responses to resource scarcity depend on childhood environments. *Psychological Science*, 24(2), 197–205. <https://doi.org/10.1177/0956797612451471>
- Hamilton, R. W., Mittal, C., Shah, A., Thompson, D. V., & Griskevicius, V. (2019). How financial constraints influence consumer behavior: An integrative framework. *Journal of Consumer Psychology*, 29(2), 285–305. <https://doi.org/10.1002/jcpsy.1074>
- Hayes, A. F. (2013). *Introduction to mediation, moderation and conditional process analysis*. Guilford Press.
- Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (3rd ed.). Guilford Press.
- Hershfield, H. E., Goldstein, D. G., Sharpe, W. F., Fox, J., Yeykelis, L., Carstensen, L. L., & Bailenson, J. N. (2011). Increasing saving behavior through age-progressed renderings of the future self. *Journal of Marketing Research*, 48(SPL), S23–S37. <https://doi.org/10.1509/jmkr.48.SPL.S23>
- Hilbert, L. P., Noordewier, M. K., & van Dijk, W. W. (2022). The prospective associations between financial scarcity and financial avoidance. *Journal of Economic Psychology*, 88, Article 102459. <https://doi.org/10.1016/j.joep.2021.102459>
- Jachimowicz, J. M., Chafik, S., Munrat, S., Prabhu, J. C., & Weber, E. U. (2017). Community trust reduces myopic decisions of low-income individuals. *Proceedings of the National Academy of Sciences of the United States of America*, 114(21), 5401–5406. <https://doi.org/10.1073/pnas.1617395114>
- Karlan, D., Kutsoati, E., McMillan, M., & Udry, C. (2011). Crop price indemnified loans for farmers: A pilot experiment in rural Ghana. *The Journal of Risk and Insurance*, 78(1), 37–55. <https://doi.org/10.1111/j.1539-6975.2010.01406.x>
- Karlan, D., McConnell, M., Mullainathan, S., & Zinman, J. (2016). Getting to the top of mind: How reminders increase saving. *Management Science*, 62(12), 3393–3411. <https://doi.org/10.1287/mnsc.2015.2296>
- Kirk, J. M., & Logue, A. W. (1997). Effects of deprivation level on humans' self-control for food reinforcers. *Appetite*, 28(3), 215–226. <https://doi.org/10.1006/appe.1996.0071>
- Kirkham, E. (2018). *Wedding costs survey: 74% of couples will take on debt to get married*. <https://studentloanhero.com/featured/wedding-costs-survey-couples-take-debt-married>
- Kurtz, J. L. (2008). Looking to the future to appreciate the present: The benefits of perceived temporal scarcity. *Psychological Science*, 19(12), 1238–1241. <https://doi.org/10.1111/j.1467-9280.2008.02231.x>
- Laran, J. (2020). Self-control: Information, priorities, and resources. *Consumer Psychology Review*, 3(1), 91–107. <https://doi.org/10.1002/arcp.1058>

- Lawrance, E. C. (1991). Poverty and the rate of time preference: Evidence from panel data. *Journal of Political Economy*, 99(1), 54–77. <https://doi.org/10.1086/261740>
- Liu, L., Feng, T., Suo, T., Lee, K., & Li, H. (2012). Adapting to the destitute situations: Poverty cues lead to short-term choice. *PLOS ONE*, 7(4), Article e33950. <https://doi.org/10.1371/journal.pone.0033950>
- Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes*, 65(3), 272–292. <https://doi.org/10.1006/obhd.1996.0028>
- Mack, J., & Lansley, S. (1985). *Poor Britain*. G. Allen & Unwin.
- Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. *Science*, 341(6149), 976–980. <https://doi.org/10.1126/science.1238041>
- Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2020). Scarcity and cognitive function around payday. *Journal of the Association for Consumer Research*, 5(4), 365–376. <https://doi.org/10.1086/709885>
- Mankiw, N. G. (Ed.). (2007). *Monetary policy* (Vol. 29). University of Chicago Press.
- Matthaei, J. (1984). Rethinking scarcity: Neoclassicism, neomalthusianism, and neomanism. *The Review of Radical Political Economics*, 16(2–3), 81–94. <https://doi.org/10.1177/048661348401600204>
- Melzer, B. T. (2011). The real costs of credit access: Evidence from the payday lending market. *The Quarterly Journal of Economics*, 126(1), 517–555. <https://doi.org/10.1093/qje/qjq009>
- Mittal, C., & Griskevicius, V. (2014). Sense of control under uncertainty depends on people's childhood environment: A life history theory approach. *Journal of Personality and Social Psychology*, 107(4), 621–637. <https://doi.org/10.1037/a0037398>
- Mullainathan, S., & Shafir, E. (2013). *Scarcity: Why having too little means so much*. Macmillan.
- Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, 89(6), 852–863. <https://doi.org/10.1037/0022-3514.89.6.852>
- O'Donnell, M., Dev, A. S., Antonoplis, S., Baum, S. M., Benedetti, A. H., Brown, N. D., Carrillo, B., Choi, A. L., Connor, P., Donnelly, K., Ellwood-Lowe, M. E., Foushee, R., Jansen, R., Jarvis, S. N., Lundell-Creagh, R., Ocampo, J. M., Okafor, G. N., Azad, Z. R., Rosenblum, M., ... Nelson, L. D. (2021). Empirical audit and review and an assessment of evidentiary value in research on the psychological consequences of scarcity. *Proceedings of the National Academy of Sciences of the United States of America*, 118(44), Article e2103313118. <https://doi.org/10.1073/pnas.2103313118>
- Ong, Q., Theseira, W., & Ng, I. Y. H. (2019). Reducing debt improves psychological functioning and changes decision-making in the poor. *Proceedings of the National Academy of Sciences of the United States of America*, 116(15), 7244–7249. <https://doi.org/10.1073/pnas.1810901116>
- Oppenheimer, D. M., Meyvis, T., & Davidenko, N. (2009). Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*, 45(4), 867–872. <https://doi.org/10.1016/j.jesp.2009.03.009>
- Pepper, G. V., & Nettle, D. (2017). The behavioural constellation of deprivation: Causes and consequences. *Behavioral and Brain Sciences*, 40, Article e314. <https://doi.org/10.1017/S0140525X1600234X>
- Raiklin, E., & Uyar, B. (1996). On the relativity of the concepts of needs, wants, scarcity and opportunity cost. *International Journal of Social Economics*, 23(7), 49–56. <https://doi.org/10.1108/03068299610122416>
- Rossi, K. (2019). *Why you may never feel like you have enough money*. <https://www.nj.com/times/2019/03/why-you-may-never-feel-like-you-have-enough-money.html>
- Ruffin, R. J., & Gregory, P. R. (1993). *Principles of microeconomics* (5th ed.). Harper Collins.
- Schor, J. B. (1998). *The overspent American: Upscaling, downshifting, and the new consumer*. Basic Books.
- Schroeder, J., & Epley, N. (2020). Demeaning: Dehumanizing others by minimizing the importance of their psychological needs. *Journal of Personality and Social Psychology*, 119(4), 765–791. <https://doi.org/10.1037/pspa0000199>
- Shaddy, F., & Fishbach, A. (2018). Eyes on the prize: The preference to invest resources in goals over means. *Journal of Personality and Social Psychology*, 115(4), 624–637. <https://doi.org/10.1037/pspa0000127>
- Shah, A. K., Mullainathan, S., & Shafir, E. (2012). Some consequences of having too little. *Science*, 338(6107), 682–685. <https://doi.org/10.1126/science.1222426>
- Shah, A. K., Mullainathan, S., & Shafir, E. (2019). An exercise in self-replication: Replicating Shah, Mullainathan, and Shafir (2012). *Journal of Economic Psychology*, 75, Article 102127. <https://doi.org/10.1016/j.joep.2018.12.001>
- Sheehy-Skeffington, J. (2020). The effects of low socioeconomic status on decision-making processes. *Current Opinion in Psychology*, 33, 183–188. <https://doi.org/10.1016/j.copsyc.2019.07.043>
- Smith, T. W. (2018). *General social surveys, 1972–2018* (machine-readable data file)/Principal investigator, Smith, Tom W.; Co-principal investigators, Michael Davern, Jeremy Freese, and Stephen Morgan; Sponsored by National Science Foundation). NORC, 7990–7995.
- Spears, D. (2011). Economic decision-making in poverty depletes behavioral control. *The B.E. Journal of Economic Analysis & Policy*, 11(1), 72. <https://doi.org/10.2202/1935-1682.2973>
- Spiller, S. A. (2011). Opportunity cost consideration. *The Journal of Consumer Research*, 38(4), 595–610. <https://doi.org/10.1086/660045>
- Spiller, S. A., Fitzsimons, G. J., Lynch, J. G., Jr., & McClelland, G. H. (2013). Spotlights, floodlights, and the magic number zero: Simple effects tests in moderated regression. *Journal of Marketing Research*, 50(2), 277–288. <https://doi.org/10.1509/jmr.12.0420>
- Stephens, N. M., Markus, H. R., & Townsend, S. S. (2007). Choice as an act of meaning: The case of social class. *Journal of Personality and Social Psychology*, 93(5), 814–830. <https://doi.org/10.1037/0022-3514.93.5.814>
- Tanaka, T., Camerer, C. F., & Nguyen, Q. (2010). Risk and time preferences: Linking experimental and household survey data from Vietnam. *The American Economic Review*, 100(1), 557–571. <https://doi.org/10.1257/aer.100.1.557>
- Tully, S. M., Hershfield, H. E., & Meyvis, T. (2015). Seeking lasting enjoyment with limited money: Financial constraints increase preference for material goods over experiences. *The Journal of Consumer Research*, 42(1), 59–75. <https://doi.org/10.1093/jcr/ucv007>
- Tully, S. M., & Sharma, E. (2022). Consumer wealth. *Consumer Psychology Review*, 5(1), 125–143. <https://doi.org/10.1002/arcp.1073>
- Zauberman, G., & Lynch, J. G., Jr. (2005). Resource slack and propensity to discount delayed investments of time versus money. *Journal of Experimental Psychology: General*, 134(1), 23–37. <https://doi.org/10.1037/0096-3445.134.1.23>
- Zhao, J., & Tumm, B. M. (2018). *Psychological responses to scarcity*. Oxford Research Encyclopedia of Psychology. <https://doi.org/10.1093/acrefore/9780190236557.013.41>

Received October 21, 2020

Revision received June 14, 2023

Accepted June 30, 2023 ■