Patience Across Payday: The Role of Scarcity in Commitment Decisions

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Abstract

Individuals often behave impatiently when making financial decisions for the future. This paper tests whether the timing of decisions relative to payday—which leads to temporary but recurring conditions of scarcity—influences their choice. In a large pre-registered experiment ($n = 1,229$), participants can adopt a commitment device that binds them to being patient. Participants who make this decision eight days before their payday, rather than one day after payday, are 34% more likely to take up commitment. This coincides with when individuals experience the most financial scarcity, and provides evidence that intertemporal decisions are affected by current psychological states. (*JEL* C91, D14, D15, D91)

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1 Introduction

People often face decisions that place their current desires in conflict with their long-term interests. They might choose higher spending today rather than saving for retirement,[1] or regularly borrow money through credit cards that they have to pay off at a high interest rate later.[2] These are choices that have an intertemporal dimension, or in other words, that have consequences spanning across different time periods. In many intertemporal choice scenarios, people behave impatiently—by preferring smaller earlier utility gains to larger later utility gains—a trait that is associated with worse long-run outcomes in household finance.

Impatient financial decision-making can be particularly harmful for lower-income households, whose daily consumption decisions represent a larger percentage of their disposable income—in other words, people who make financial decisions under conditions of scarcity. In addition to the mechanical relationship between the magnitude of consumption decisions and income, a growing literature has proposed that financial scarcity—defined as "having less than you feel you need"— also leads to psychological changes, including in attentional focus or cognitive function, that can affect decision-making (Mullainathan and Shafir, 2013; see also Haushofer and Fehr, 2014; Bartos et al., 2018; Ong, Theseira and Ng, 2019; O'Donnell et al., 2021).

In this paper, I study whether the regularly recurring but temporary scarcity induced by monthly payday cycles affects whether individuals make patient financial choices. Payday can lead to large intra-month fluctuations in liquidity.[3] Previous work documents sharp declines in both liquidity and consumption across payday cycles, as well as across food stamp and social security months; many people run low on cash towards the end of the month in a way that affects welfare (Stephenss, 2003; Huffman and Barenstein, 2005; Shapiro, 2005; Mastrobuoni and Weinberg, 2009).

[1] Households have high propensities to consume out of increases in liquid wealth (see, e.g., Shea, 1995; Gross and Souleles, 2002; Stephenss, 2003; Parker et al., 2013; Broda and Parker, 2014; Ganong and Noel, 2019). This may partly explain why one-quarter of Americans have nothing saved towards retirement, and fewer than 4 in 10 think their retirement savings are on track (Canilang et al., 2020).

[2] In any given month, half of households maintain a balance on their credit cards (Laibson, Repetto and Tobacman, 2007). With an average credit card balance of $6,501 and interest rate of 21.19%, these households make an average payment of $1,377.56 annually (Experian, 2023; Federal Reserve, 2023).

[3] A 2023 survey found that 55% of American workers report living paycheck to paycheck (MetLife, 2023).

In particular, I study whether timing around payday affects the take-up of a commitment device, a mechanism that allows someone who suspects they might be impatient in the future to create costs or restrict their choice set so as to encourage the more future-oriented decision (for a review, see Bryan, Karlan and Nelson, 2010). The commitment decision offers individuals the opportunity to delay a payment of $50 until later in their payday cycle, which can help mitigate the effects of running low on cash if they did not successfully smooth their consumption across that payday month, because of, for example, repeated instances of present bias causing over-consumption at the beginning of the payday cycle. The payout and likelihood of receipt is the same regardless of their choice, so that by choosing commitment, participants are simply preventing themselves from spending it in the first three weeks. If they predict that they will not behave impatiently with the money, *ceteris paribus*, they have no incentive to demand commitment.

I pre-registered the hypothesis that individuals would be more likely to take up commitment for the future when experiencing financial scarcity before payday than after payday. Most of the literature on impatient choices focuses on the role of current present bias—the tendency to prefer smaller rewards now over larger rewards anytime in the future—which is theoretically and empirically exacerbated during times of scarcity (Haushofer and Salicath, 2023). Current present bias would normally predict *lower* willingness to commit during the before-payday times of scarcity because participants would demand the money now. However, this study was motivated by the possibility that scarcity can also affect decision-makers by making them more aware of the possibility of scarcity in the future. This relates to strands of the behavioral economics and psychology literatures that connect decision-making to psychological states, including the literature on projection bias and that on affective hot and cold states (see, e.g., Loewenstein, O'Donoghue and Rabin, 2003; Loewenstein, 2005). In this way, I predicted that someone in a state of financial scarcity before payday would be more likely to recognize that the commitment device would be beneficial for them than if they were cash-flush after payday. To study this channel rather than the current level of present bias, participants make the commitment decision for a future payday cycle, at least one month in advance of when they receive the $50.

The experiment involves 1,229 individuals online across multiple periods around the timing

of their own monthly paydays. I randomize participants into five treatment groups that vary according to when in their payday cycle they make the commitment decision: one after payday and four before payday. I choose five treatment groups rather than just two (that is, one before payday and one after) because scarcity theory is about the subjective perception of scarcity and its psychological consequences, and previous work on the payday cycle does not predict when participants might perceive the most payday-induced scarcity. One possibility is that scarcity is experienced as highest the day before payday, when liquidity is objectively at its lowest. However, it is also possible that anticipatory relief is experienced as payday approaches (see Zhang and Sussman, 2018), and that scarcity is experienced more highly earlier, when the approaching payday still feels far away. In this way, an objective measure of liquidity may be only a crude proxy for scarcity (Mullainathan and Shafir, 2013). To accommodate these possibilities and measure when participants perceive the most financial scarcity, the four before-payday groups begin eleven days before payday and are spaced three days apart: eleven, eight, five, and two days before payday.

The results provide evidence for the latter scenario: that is, individuals feel more cash-strapped when they still have to stretch their money before payday arrives. While participants are always more likely to report being low on cash before payday than after payday ($p = 0.009$), this measure rises to its peak eight days before payday and falls again thereafter. While 57% report being low on cash the day after payday, 68% report being low on cash eight days before payday ($p = 0.005$). I therefore find evidence that the perception of financial scarcity does not follow in lockstep with actual liquidity.

Consistent with my pre-registered hypothesis, the main treatment results reflect a similar pattern to my findings on financial scarcity: commitment peaks eight days before payday, when participants are 11.8 percentage points more likely to commit than the day after payday, when 34.5% of participants commit ($p = 0.013$). This corresponds to a 34% increase in willingness to commit. The treatment effects are larger in magnitude for groups with fewer sources of income, who therefore have fewer outside opportunities to smooth their consumption: when restricting the sample to participants with one main source of income, commitment increases by 16.2 percentage points ($p = 0.004$). Even though the payday cycle happens every month, individuals making the decision during payday-induced scarcity rather

than after payday are more likely to recognize commitment as beneficial.

This paper contributes to the literature on how financial circumstances affect economic decision-making. Despite much evidence about how scarcity affects psychological states, there are few studies that examine how real-world sources of scarcity affect economic decisions, due largely to the difficulty in identifying scarcity in an unconfounded way (Kremer, Rao and Schilbach, 2019). This paper examines this question in a setting that affects many people—the monthly payday cycle—and finds that a few days within it can make a difference in what financial decision is made. It also relates to the literatures connecting psychological states to decision-making, as well as the emerging class of what I term "field-in-the-lab" studies. A more detailed review of these literatures can be found in Section 1.1.

1.1 Related Literature

This paper connects to three sets of literature. The first is the literature on how financial circumstances affect economic decision-making, where several strands of work have examined the relationship between poverty and impatience, finding a consistent connection between the two (Lawrance, 1991; Banerjee and Mullainathan, 2010; Tanaka, Camerer and Nguyen, 2010; Spears, 2011; Gloede, Menkhoff and Waibel, 2015; Bernheim, Ray and Yeltekin, 2015; Haushofer and Fehr, 2019). Research on the psychology of poverty provides evidence that financial scarcity uses up cognitive bandwidth and affects psychological states by examining its effects on measures of stress and cognitive function (Mullainathan and Shafir, 2013; Haushofer and Fehr, 2014; Ong, Theseira and Ng, 2019) and by examining economic decisions after inducing study participants to think about poverty (Mani et al., 2013; Bartos et al., 2018). However, a recent empirical audit and review paper that replicates a cross-section of this literature—specifically papers that either (1) ask people to consider a time they lacked resources, (2) restrict the supply of a resource inside an experiment, or (3) expose people to images consistent with the absence of resources—finds minimal results (O'Donnell et al., 2021). The authors conclude that "scarcity is a real and enduring societal problem, yet our results suggest that behavioral scientists have not fully identified the underlying psychology."

Consistent with this, there is little evidence so far on how real-world scarcity affects economic behavior (see the handbook chapter from Kremer, Rao and Schilbach, 2019). Kaur

et al. (2021) show that manufacturing workers in India with more cash on hand are more productive at work. Fehr, Fink and Jack (2022) study the effect of harvest-induced scarcity, finding that farmers in Zambia exhibit lower levels of the endowment effect when financially constrained before harvest, with evidence that this is because of greater attentional focus on the study's exchange decision when they are low on cash.

Finally, another paper that examines real-world scarcity—and the most related study within this literature to this paper—is Carvalho, Meier and Wang (2016), who also examine the financial scarcity caused by payday, looking at its effects on laboratory measures of cognitive function as well as risk and time preferences. They find few effects. This paper studies this question differently, with a different outcome measure—the take-up of a commitment device that could help participants who run low on cash in a future payday cycle—as well as different experimental design choices, including, importantly, (1) distinguishing between different before-payday days, and (2) differentiating by number of sources of income as a proxy for a general ability to smooth consumption.

Aside from the work on the effect of scarcity on behavior, there is a recent push to develop validated psychological measures of scarcity. These include the Perceived Scarcity Scale (DeSousa, Reeve and Peterman, 2020), the Psychological Inventory of Financial Scarcity (Van Dijk, van der Werf and van Dillen, 2022), and the Perceived Economic Scarcity Scale (Auger, Sommet and Normand, 2024). These survey tools make progress on measuring scarcity as something other than the objective amount of cash on hand, which this paper also contributes to.

This paper was motivated by work connecting psychological states to decision-making. In the projection bias literature, individuals underestimate the extent to which their state might change in the future, and instead imagine themselves in the same state they are now (Loewenstein, O'Donoghue and Rabin, 2003). Recent theoretical work by Zhang (2023) suggests that many behaviors that we perceive as time preferences are, in fact, driven by projection bias, which she calls projective misperceptions. In the literature on hot states, an individual's current affect influences their decision-making, with empirical examples of this including consumers purchasing more convertibles in unexpectedly sunny weather, buying more health insurance when air pollution is higher, and choosing to work less when they are

currently tired (Busse et al., 2015; Chang, Huang and Wang, 2018; Augenblick and Rabin, 2019).

Finally, this paper contributes methodologically to an emerging class of experimental studies in the economics literature that incorporate real-world conditions into laboratory experiments, which I term "field-in-the-lab" experiments (in contrast to lab-in-the-field experiments). While these studies allow decisions to be fully observable—like in lab experiments—they are more ecologically valid, often improving the external validity of the experiment. While the experiment in this paper is conducted in a lab environment, the exogenous variation does not come from inside the lab, but instead from participants' own paydays, and measures a financial decision that can affect their future month's finances. Other recent work that can be classified as field-in-the-lab include Kessler and Roth (2014), who study real organ donation registrations within a university lab connected to the Massachusetts Registry of Motor Vehicles database, and Grebe, Ivanova-Stenzel and Kröger (2021), who ask study participants to log into their eBay accounts inside their university lab to measure trading behavior.

2 Experimental Design

In this section, I describe the experimental design. Section 2.1 details the experimental protocol, while the sections following explain the motivation behind individual design choices. Section 2.2 provides the motivation for the timing of the commitment decision, Section 2.3 for the timing of treatment groups, Section 2.4 compares the commitment decision to others in the literature, and Section 2.5 provides details about the implementation.

2.1 Experimental Protocol

The experimental protocol involves two parts, which take place longitudinally on separate days on Amazon Mechanical Turk (MTurk). The first part elicits payday information and screens for participants who fit the selection criteria. The selection criteria are comprised of two requirements: participants must receive their paychecks monthly, and they must have a

main source of income that is not MTurk.[4]

All participants who fit these criteria are invited to participate in part two, the main experimental treatment, in which they are asked to make a commitment decision. Each participant is randomly assigned to take part on a particular day relative to their own payday d. There are five treatment days. One is the day after payday, and the other four are before payday. Each treatment day is spaced three days apart, up to eleven days before payday.

On their assigned treatment day, participants receive an email that informs them a task is available on MTurk and asks them to complete it within 24 hours. In this task, they are faced with the commitment decision, the opportunity to delay a $50 payment until later in a future payday cycle. This decision is probabilistically incentivized.[5] This is how the decision is first presented:

> You have the chance to receive a $50 cash payment as a bonus for taking part in this study. Out of all the MTurk workers taking this study, 1% will randomly be selected to receive this cash payment. Your decision in Part 1 is to choose when you want to receive this payment.

The likelihood of receiving the payment and the amount of money is the same regardless of what they choose; by choosing commitment, participants constrain their future choice set and lose out on the time value of money. Given this, why might they demand the later choice, rather than leaving themselves the option to spend it earlier? Following the previous literature on commitment, the decision framing highlights the possible benefit of the commitment option as follows:

[4]This was motivated by the existing evidence in household finance: first, many behavioral biases are exacerbated by the cognitively difficult task of developing a long-term budget and sticking to it. Having access to more frequent sources of income can make consumption smoothing across time periods easier, in which case budgeting across a monthly payday cycle might be more difficult than, say, a biweekly payday cycle (Stephens and Unayama, 2011; Aggarwal, Dizon-Ross and Zucker, 2020). Second, since MTurk workers get paid as they receive tasks, they have a higher ability to smooth their income across the payday cycle than the average worker. Selecting for MTurk workers who receive the bulk of their monthly income from a source other than MTurk mitigates this factor.

[5]Incentivizing the decision of a random subset of respondents follows previous work in the experimental economics literature; see Charness, Gneezy and Halladay (2016) for a review of this strategy, where they find little difference between this and implementing the decision for all participants for the estimation of treatment effects.

> Many people run low on cash toward the end of the month. Setting aside money to receive towards the end of your paycheck may help prevent this. This decision will ask whether, for your own reasons, you would like to receive this cash payment later in your pay period rather than at the beginning of your pay period.

Next, they are reminded of their payday dates, then faced with the commitment decision:

> In the pre-screen for this study, you indicated that you will receive your monthly paycheck on 09/01/2019 and on 10/01/2019.
>
> Today, you have the choice of receiving the $50 bonus payment at the beginning of your pay period on 10/01/2019, or later in your pay period on 10/21/2019. Your choice will not affect your chance of receiving the bonus payment.

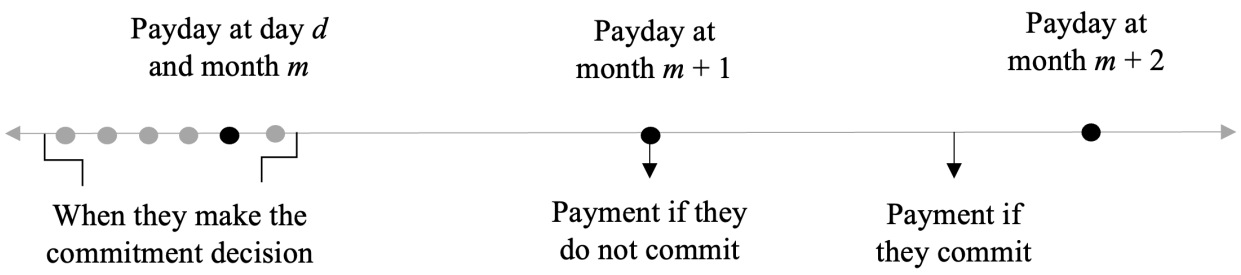
The underlined dates vary according to the study participant's own payday dates and treatment group. The example above imagines a participant taking the study in August who receives their paycheck on the first day of every month. If they were assigned to treatment group $d - 11$, they would be taking the study on August 21 and choosing when in their October payday cycle they would like to receive the payment.

After participants finish the main commitment decision, they continue to another page where they complete a set of sociodemographic and financial questions. For full screenshots of the experimental protocol, see Section 7.1 of the Appendix.

2.2 Why have participants choose between two future dates?

Figure 1 shows the timing of the payment options, both relative to payday and to when participants make their commitment decision. If a participant chooses not to commit, they receive the $50 on the payday of a future payday cycle, at least one month in the future. If they choose to commit, they receive it three weeks after that.

Figure 1: Treatment and Commitment Timeline



Note: This figure displays the timing of when participants are asked to make the commitment decision as well as the payment options available in the commitment decision. The black circles indicate paydays. The grey circles indicate the treatment days; each participant is asked to make the commitment decision on one of these days. The early payment option is paid out at m+1, and the commitment option is paid out three weeks later, before m+2.

This design of the payment options was primarily made to remove their current present bias—their inclination to prefer a smaller present reward to a larger later reward—as a possible factor in their decision. Present bias is usually implicated when people have difficulty consumption smoothing, including across the payday cycle (see, e.g., Shapiro, 2005); valuing current consumption more highly than future consumption gives rise to repeated cases of "over"-consumption in the moment, which can lead to a cash- and credit-constrained person running low on money by the end of their payday cycle.[6] If people were choosing between now and the future, running low on cash now would likely cause fewer people to choose commitment. However, current present bias would not predict a difference in treatment effect in this study aside from the effects of standard long-term discounting; both payment options are at least one month in advance, well beyond when present bias, a behavioral bias about "now," is thought to act (see, e.g., Balakrishnan, Haushofer and Jakiela, 2020). While people

[6]I include the quotation marks around "over" to acknowledge the normative quality of this statement. Contrary to the budget-smoothing rational actor in traditional theory, it may be the case that (some) people prefer to consume more earlier in the payday cycle, even from the perspective of an agent who takes all time periods into account. For example, as included in Thakral and Tô (2020)'s model, someone may receive a burst of utility from unexpected consumption. However, the fact that some participants in this study make different choices depending on timing in the payday cycle suggests that at least some people do not engage in their preferred budget smoothing.

may be taking up commitment because of their expected future present bias—they recognize that they will be present biased in the future and that therefore the commitment device may be useful to them—their current present bias, by which I mean their current desire for smaller rewards now over larger rewards in the future, is removed as a factor.

With the current present bias channel closed as a determinant of choosing commitment, the experimental design leaves open the possibility that changes in financial scarcity will affect choices. This is motivated by the set of behavioral economics and psychology literatures on how psychological states affect decision-making, including those on sophistication, projection bias, and hot states (see Section 1.1 for a discussion).

2.3 Why elicit decisions at many points in the payday cycle?

The timing of treatment days was motivated by the hypothesis that the perception of scarcity in the payday cycle might be sensitive to the specific day around payday, and chosen to cover the full range of days when the hypothesized effect might exist: when participants might perceive the most payday-induced scarcity, which in turn would affect their decision to take up the commitment device. Scarcity theory builds on the perception of scarcity and its psychological consequences; the original definition by Mullainathan and Shafir (2013) is "having less than you feel you need." In this way, the perception of current cash on hand is what matters more than actual available liquidity, and as Mullainathan and Shafir (2013) also note, these can differ, so that income is at best a proxy for scarcity.[7] Despite this, however, there is no widely accepted method of measuring scarcity, and most previous work measures it in a way that neglects this subjective dimension (see the review paper by De Bruijn and Antonides, 2022, who also make this point).

However, there is little prior evidence on when people might experience scarcity most acutely during the payday cycle. Liquidity increases sharply at payday for many people, so it could be the case that individuals feel the most cash-strapped the day before payday, when their financial resources are lowest. However, another possibility is that people experience

[7]Recent work shows that even wealthy people experience financial scarcity. Kaplan, Violante and Weidner (2014) describe the"wealthy hand-to-mouth," households with sizeable amounts of illiquid assets who nonetheless live paycheck-to-paycheck.

relief when their paycheck is about to arrive.[8] In that case, people who draw down their paycheck throughout the month might start worrying about their ability to make it to the next payday some time before the end of their payday cycle. To accommodate this possibility, I test a range of dates starting eleven days before payday. Based on power calculations, I chose five treatment days, each spaced three days apart.

2.4 How does this commitment decision compare to other commitment decisions in the literature?

Bai et al. (2021) define a commitment device as a method to tackle impatience that "allow[s] individuals to voluntarily restrict their future choice set or increase the costs of certain potential future actions." Here, the commitment decision involves delaying a $50 payment by three weeks into their payday cycle, when individuals might be running low on cash if they did not successfully smooth their consumption. The payout and likelihood of receiving the payment is the same regardless of their choice, so that by choosing commitment, participants are (1) losing out on the time value of money and (2) constraining their future choice set by preventing them from spending it in the first three weeks. In this way, individuals have no incentive to demand commitment unless they suspect they might be impatient and want to encourage the more future-oriented decision; otherwise, they could receive the money at the beginning of their payday cycle and simply wait three weeks to spend it, leaving the option open in case, for example, an emergency arises.[9]

Previous work has documented demand for a variety of kinds of commitment devices. These can generally be categorized into soft and hard commitment devices (for a comprehensive review, see Bryan, Karlan and Nelson, 2010). Soft commitment devices involve psychological barriers that encourage individuals towards the more patient choice, like a promise to oneself or a public pledge that risks reputational costs among others (see, e.g., Bénabou and Tirole, 2004 or Savani, 2019). Soft commitment can also include examples where individuals pay a

[8]This would be consistent with evidence from the literature on mental accounting, which indicates that people group their finances into categories (for a review, see Zhang and Sussman, 2018). In this way, individuals might incorporate an upcoming paycheck into the mental snapshot they have of their finances.

[9]To see the reasons that study participants give for their choice—which often refer to these kinds of considerations—see Section 3.2.1.

cost upfront to encourage follow-through, like paying an annual membership fee to a gym (DellaVigna and Malmendier, 2006).

Hard commitment devices create external restrictions, such as penalties for future impatient actions or the complete removal of such options. An example of a penalty-based commitment device includes Beshears et al. (2020), which documents demand for savings accounts that charge penalties for early withdrawals. Other examples of this kind of hard commitment involve choosing to forfeit money if one does not follow through on a goal, such as passing a nicotine or alcohol test (Giné, Karlan and Zinman, 2010; Schilbach, 2019). Examples of commitment devices that completely restrict future choice sets include Sadoff and Samek (2019), who provide individuals the option to choose food delivery from a menu that excludes unhealthy food. Another example involves bank accounts that completely prevent withdrawals, often until a certain date is reached (see Ashraf, Karlan and Yin, 2006 or Beshears et al., 2020). The commitment device in this setting is most similar to this last set, as individuals choosing to commit are preventing themselves from spending their earnings until three weeks into their payday cycle.

2.5 Implementation

Pre-registration. I follow a pre-analysis plan that was submitted on AsPredicted on June 1st, 2019, which can be found in Appendix Section 7.3. This was registered prior to data collection and specified the hypothesis, the treatment and treatment groups, and the sample size determination, as well as the primary outcome, key independent variables, and statistical models for the main analyses.

MTurk Details. Study participants for this experiment were recruited on MTurk in June and July 2019 and participated through August. In order to participate in the study, participants were required to have an IP address in the United States, to have completed at least 100 tasks on MTurk, and to have received an 85% or better approval rating on average.

Those that passed the screening criteria described in Section 2.1 were invited to participate in part two, receiving an email on their assigned treatment day asking them to complete the task within 24 hours.[10] The contents of this email can be found in Appendix Section 7.1.2.

[10] 90% of subjects made the commitment decision on their assigned treatment day. However, the task

In part two, participants were required to pass an attention check. This attention check question was located in a section that asked participants how often a particular statement applied to them. The attention check question asked them to select "Sometimes." Two individuals were dropped as a result of this check.

3 Results

I collect data from 1,229 individuals. The sample is 63% female and the median participant is between 35-44 years of age, has a bachelor's degree, and has an annual household income between $50,000 and $59,999.[11] Only 33% of the sample said they could easily raise $2,000 in an emergency; 19% do not think they could raise it at all. Those making less than $50,000 in household income are significantly less likely to be able to raise $2,000 in an emergency: 31% cannot, while this number falls to 8% for those making over $50,000 ($p \approx 0.000$).

See Appendix Section 7.2.1 for more descriptive statistics and Appendix Section 7.2.2 for a balance table that shows that observable characteristics were balanced across treatment groups. See Section 4.3 for information about attrition, which was similar across treatment groups and uncorrelated with treatment day.

3.1 When do participants feel cash-strapped?

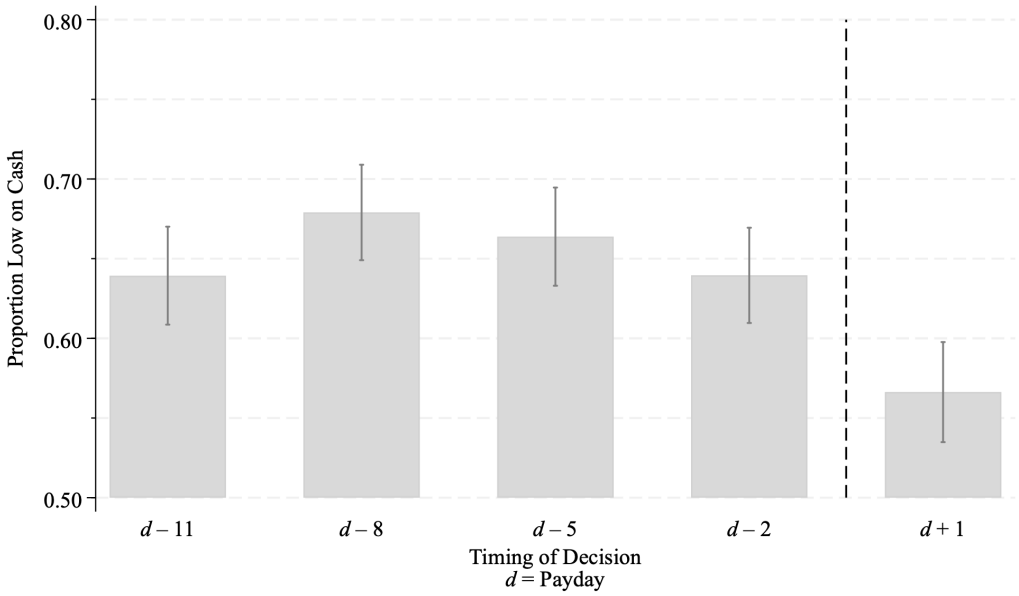
To investigate whether participants are currently experiencing financial scarcity, I ask the question, "Are you low on cash right now?" Results are shown in Figure 2.

remained open for the three days from their assigned treatment group before the following treatment group began. Results are robust to restricting to only those who took the survey on their assigned treatment day.

[11] MTurk workers have annual household incomes that are on average slightly lower than that of the U.S. population. The participants in this study reflect an income distribution similar to those found in demographic surveys of the MTurk population (Difallah, Filatova and Ipeirotis, 2018; Moss et al., 2023).

p

Figure 2: Low on Cash by Day Relative to Payday



This graph show the proportion of participants who answered "Yes" or "Somewhat" to the question, "Are you low on cash right now?". d refers to the day they receive their paycheck. Error bars indicate standard errors.

Participants are more likely to report they are low on cash at all points before payday ($p = 0.009$), and most likely to do so at $d - 8$. While 57% are low on cash the day after payday—notably, the majority of the sample—this proportion rises slowly in the days before payday, peaking eight days before at 68% ($p = 0.010$). $d - 5$ is also significantly different from $d + 1$, with 66% reporting being low on cash. ($p = 0.028$).

Why does this happen at $d-8$ rather than $d-2$, when liquid resources are most likely to be at their lowest? As described in Section 2.3, I designed the study with several treatment days in the before-payday period because the subjective experience of financial scarcity does not need to correspond one-to-one with the objective amount of liquidity on hand. In particular, a person might feel the relief of an upcoming payday as it approaches and experience scarcity more acutely when they still have to stretch their resources for some time. In this way, these results indicate that study participants experienced financial scarcity most acutely around eight days before payday.

3.2 Does the timing of the decision matter?

To test whether the decision to adopt a commitment device varies based on timing around payday, I run an OLS regression with the binary choice to commit as the dependent variable, comparing those who make the decision after payday to the before-payday treatment groups. These results are presented in Table 1. All columns include time controls to ensure that the results are driven by day relative to payday rather than other time-related effects.[12] Without any controls, the full sample average willingness to commit is 33.8%. Columns (1) - (3) use data from the full sample, while columns (4) - (6) restrict to those with only one source of income other than MTurk.

Commitment rises slowly from the day after payday through two and five days before payday, but not in a way distinguishable from zero. It peaks at eight days before payday, when individuals are 11.8 percentage points more likely to commit ($p = 0.013$), representing a 34% increase in willingness to commit compared to $d + 1$. The level falls again further out from payday. These results reflect the same pattern as the low on cash data, with the time of highest commitment coinciding with the time of most financial scarcity, and is consistent with my pre-specified hypothesis that commitment would non-monotonically increase at the end of the payday cycle when financial resources are low.

In columns (2) and (3), I test whether the results are robust to a durable measure of financial well-being as well as demographic characteristics, as laid out in the pre-registration. For overall financial well-being, I use the Consumer Financial Protection Bureau's (CFPB) Financial Well-Being Scale, which is a ten–question survey that yields a measure ranging from 0 to 100, with a higher score indicating better financial-wellbeing. Results showing heterogeneity by age, gender, income, education, and ability to raise $2,000 in an emergency can be found in Section 4.2.

Columns (4) - (6) look at the same results in a restricted sample that includes only those participants with one source of income aside from MTurk income, who make up 69% of the sample. This analysis was not pre-specified and should therefore be regarded as

[12] Due to a shortcoming in the pre-analysis plan, I did not pre-specify using time controls; however, the results without them are extremely similar, with the general size and significance of the estimates unchanged. These can be found in Table 6 in Appendix Section 7.2.3. In fact, payday dates were quite heterogeneous: the most common payday date included only 6.5% of the sample.

Table 1: Commitment by Day Relative to Payday

	Full Sample			One Source of Income		
	(1)	(2)	(3)	(4)	(5)	(6)
$d - 11$	0.060	0.055	0.064	0.103	0.099	0.111
	(0.047)	(0.047)	(0.047)	(0.054)	(0.053)	(0.053)
$d - 8$	0.118	0.115	0.102	0.162	0.161	0.156
	(0.047)	(0.047)	(0.048)	(0.056)	(0.057)	(0.058)
$d - 5$	0.038	0.034	0.029	0.041	0.040	0.040
	(0.048)	(0.047)	(0.048)	(0.056)	(0.056)	(0.056)
$d - 2$	0.001	-0.001	-0.008	0.013	0.018	0.028
	(0.046)	(0.045)	(0.046)	(0.054)	(0.053)	(0.054)
Financial Well-Being		-0.048	-0.058		-0.056	-0.071
		(0.013)	(0.016)		(0.016)	(0.019)
Constant	0.345	0.344	0.328	0.311	0.288	0.178
	(0.073)	(0.071)	(0.094)	(0.094)	(0.091)	(0.123)
Demographic Controls			X			X
Observations	1229	1229	1229	842	842	842

Standard errors in parentheses

Note: Standard errors are heteroskedasticity robust. Results are from OLS models with the binary decision to adopt a commitment device as the dependent variable. All columns include time controls for day of the week, week, and month. The first three columns include the full sample, while the last three columns restrict the sample to only those participants who have one source of income aside from MTurk income. *Financial well-being* indicates the CFPB Financial Well-Being Scale score, standardized to have a mean of 0 and a standard deviation of 1. *Demographic controls* includes indicator variables for gender, age, income, race, marital status, and education level.

exploratory. As discussed in Section 1.1, this is the group of participants with the fewest outside consumption smoothing options in their payday cycle, who might therefore experience the highest payday-related liquidity shocks. Consistent with this, the treatment effect is larger in magnitude for this group: individuals who make the decision eight days before payday are 16.2 percentage points more likely to adopt the commitment device ($p = 0.004$) than those at $d - 2$.

Additional robustness checks can be found in Appendix Section 7.2.3. Results look similar using the raw data without any controls (Table 6) and hold using equality of proportions tests comparing each group before payday to the group after payday (Table 7). Since I test multiple treatments at once—four treatment groups before payday against the treatment group after payday—I run an F-test of joint significance and reject the hypothesis that all treatment groups are equal at $\alpha = 0.05$ for four tests ($p = 0.004$). Using a Bonferroni correction for the four comparisons, the main result at $d - 8$ is just above the adjusted significance threshold $\alpha = 0.0125$ with a p-value of 0.0127. Finally, I re-run these results using a randomization inference procedure, finding the same levels of statistical significance (Table 8)(Young, 2019).

3.2.1 What reasons do participants give for their choice?

After participants made the commitment decision, I gave them the opportunity to explain how they made their decision in a free-text box on the next page. Even though this question was optional, 81% of respondents wrote a response. Out of those who responded, many made clear they understood the costs to waiting longer for money: 55% of those who chose not to commit expressed some kind of a pure preference for money sooner, including some who mentioned the time value of money; respondents who chose not to commit also mentioned their regular expenses happening at this time (23%), a budget they follow (19%), or a variety of other reasons, like a pressing need or a one-time item.[13] Those who did choose to commit overwhelmingly appreciated that receiving the money later might help them, with 93% of those who wrote a response explicitly indicating that the timing would be beneficial to them. Some provided additional reasons why this might be the case, most of which indicated that

[13]I developed the coding scheme iteratively based on a reading of a sample of responses. ChatGPT 3.5 Turbo then coded each response as belonging to one or more of these categories, with a random sample check by me for accuracy. See Appendix Section 7.2.4 for more detail.

they run low on cash later in their payday cycle, including 38% of those writing a response expressly mentioning struggling towards the end, 14% describing their budget, and 10% stating that this is when unexpected events tend to crop up. 2.5% of all respondents said that the timing did not matter or they chose randomly.

Taken as a whole, these responses indicate that participants understood the decision and considered their choice carefully. To see the full set of categories, as well as examples of each type of response and the percent of responses classified into each, see Appendix Section 7.2.4.

4 Discussion

4.1 How might the sample of MTurk workers affect the results?

As predicted in the pre-registration, I find that the likelihood of adopting a commitment device is highest in the before-payday period and is sensitive to the specific day the decision is made, coinciding with when study participants experience the most financial scarcity.

However, in the pre-registration, I also predicted that this effect would be more pronounced for households with low household income or credit constraints, which I do not find. This could be because the sample is comprised of MTurk workers, who are a self-selected group of workers doing online tasks for additional income, making them more likely to be cash-strapped than the general population; additional evidence for this is the large proportion of people reporting being low on cash and the low number who would easily be able to raise $2,000 in an emergency. Future work could examine how this result changes in a more socioeconomically diverse sample.

Finally, a relevant feature of this sample population is that MTurk workers inherently have access to a consumption smoothing mechanism, because they get paid as they complete tasks on MTurk. Therefore, we would expect that results for other populations would be different; in particular, since the commitment device in this study provides a mechanism for consumption smoothing, estimates from this study would be more conservative compared to a similar group of workers who do not have access to additional income in the middle of their payday cycle. In this study, the results in Table 1 show treatment effects that are larger in

magnitude for participants with only one main source of income, but these differences are not statistically significant from the rest of the sample.

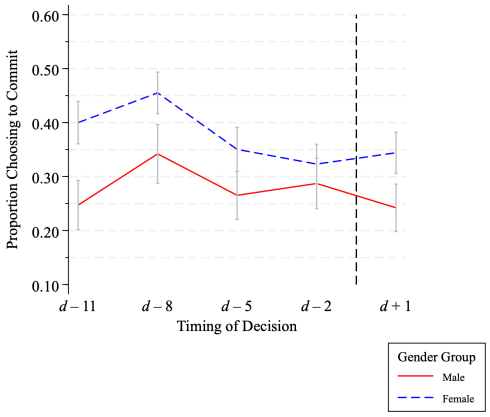
4.2 Is there heterogeneity in willingness to commit?

While this study was not powered to investigate the heterogeneity of the treatment effect—and thus, these results should be considered exploratory—an important question for policy is how willingness to commit varies by demographic group. Figure 3 presents these results by gender, age, education level, income, and ability to raise $2,000 in an emergency. Table 11 with these results can be found in Appendix Section Section 7.2.5.

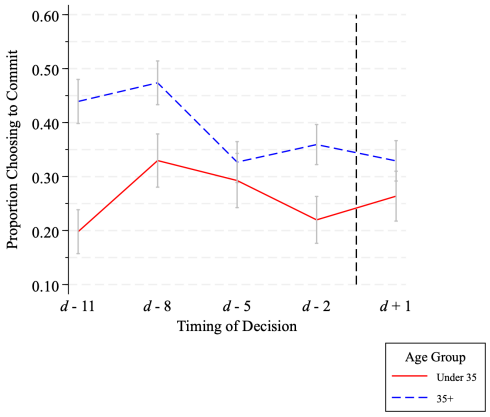
Willingness to commit is significantly higher for women, who take up commitment at a rate that is on average 10.0 percentage points higher than men ($p \approx 0.000$). Commitment also increases with age, with individuals over 35 years old 13.1 percentage points on average more likely to commit than those younger than 35 ($p \approx 0.000$). Both of these results reflect similar findings in prior research, which generally show that women and older individuals exhibit more patience in decision-making (e.g., Green, Myerson and Ostaszewski, 1999; Dittrich, Knabe and Leipold, 2014). The treatment effect is more pronounced for those with a high school education or less, with commitment rising from 8.7% at $d + 1$ for this group to 57.9% at $d - 8$ ($p = 0.001$). This also follows past work that shows that a variety of behavioral biases are exacerbated for those with lower education or cognitive ability (e.g., Benjamin, Brown and Shapiro, 2013).

Finally, there is no relationship between income and willingness to commit, which contrasts with my pre-registered hypothesis that individuals with lower incomes would be more likely to experience an effect from timing across the payday cycle. As described in Section 4.1, this could be due to the sample being comprised of MTurk workers, who are a self-selected group of people more likely to be cash-strapped than the general population, regardless of their household income. Other related but non-preregistered evidence on the relationship between financial health and commitment show a directional but non-significant increase in commitment for those who cannot raise $2,000 in an emergency (6.4 percentage points at $p = 0.067$) and an increase in commitment with lower financial well-being, where a one standard deviation decrease in the CFPB financial well-being score relates to a 4.8 percentage

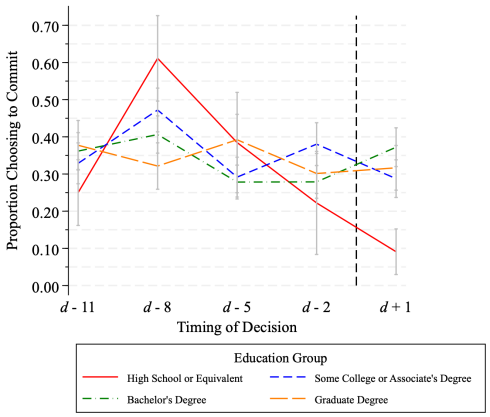
Figure 3: Commitment by Demographic Characteristic



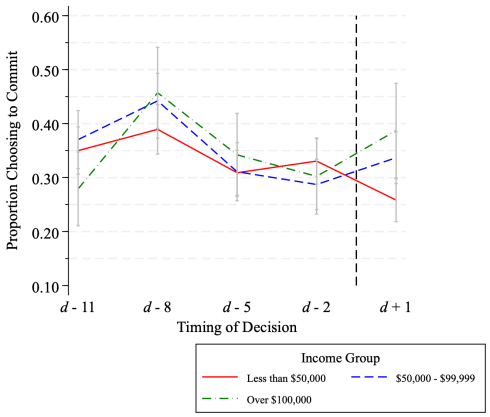
(a) Gender



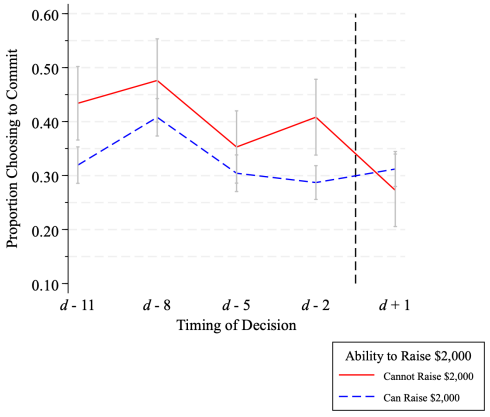
(b) Age



(c) Education



(d) Income



(e) Ability to Raise $2,000

Note: These graphs show the proportion of participants who choose to adopt a commitment device on each day by the indicated demographic group, with bars representing standard errors. Note that the y-axis for the Education graph spans a wider range than the other graphs. Participants are U.S. workers on MTurk who receive monthly paychecks as their main source of income. d refers to the day they receive their paycheck.

point higher take-up ($p \approx 0.000$).

4.3 Was there differential attrition across treatment groups?

In total, 12,414 MTurk workers completed the part one pre-screen. Out of these, 1,690 met the screening qualifications and were randomized into treatment groups. From this group, 1,229 returned and completed the main experimental task, leading to a 27.3% attrition rate from part one to part two. See Table 2 for the number of participants assigned to each treatment group versus the number who completed treatment. Table 3 shows that attrition was uncorrelated with treatment day, for both the full sample and the sample of participants with one main source of income, including when using time controls for the date the participant was invited to return (these do not include demographic controls because this data was only collected when participants returned in part two). Finally, observable characteristics were balanced across treatment groups, which can be seen on Table 5 in Appendix Section 7.2.2.

Table 2: Attrition by Treatment Day

Treatment Day	Number Assigned	Number Completed	% Completed
$d+1$	339	249	0.73
$d-2$	340	258	0.76
$d-5$	336	235	0.70
$d-8$	338	243	0.72
$d-11$	337	244	0.72

Table 3: OLS Regression of Attrition by Treatment Day

	Full Sample		One Source of Income	
	(1)	(2)	(3)	(4)
$d-11$	-0.010	-0.042	0.040	-0.010
	(0.034)	(0.034)	(0.040)	(0.040)
$d-8$	-0.016	-0.055	-0.013	-0.053
	(0.034)	(0.034)	(0.042)	(0.042)
$d-5$	-0.035	-0.068	-0.029	-0.079
	(0.035)	(0.036)	(0.042)	(0.045)
$d-2$	0.024	-0.015	0.023	-0.020
	(0.033)	(0.035)	(0.041)	(0.043)
Constant	0.735	0.816	0.715	0.774
	(0.024)	(0.052)	(0.029)	(0.068)
Return date controls		X		X
Observations	1690	1690	1170	1170

Standard errors in parentheses

Note: Standard errors are heteroskedasticity robust. Results are from OLS models with the binary variable of having completed the main experimental task as the dependent variable. The first two columns include the full sample, while the last two columns restrict the sample to only those participants who have one source of income aside from MTurk income. *Return date controls* includes indicator variables for the day of the week, week, and month the participant was invited to return.

4.4 What intertemporal phenomena could be driving these results?

There are several possible interpretations of these results. The first is that scarcity increases someone's awareness of their expected future present bias. In this interpretation, an individual consistently runs low on cash by the end of the payday cycle because of repeated instances of present bias during the earlier part of their cycle; this causes them to overspend when they have cash available, while neglecting the effect this has on their future self at the end of the cycle. By catching them at the right moment, when they are experiencing scarcity because of their past present bias, they recognize that they might be present biased in the future. In other words, they are temporarily *sophisticated*, and this makes it possible for them to demand a commitment device.

Other interpretations do not necessarily involve sophistication, and indeed, there is

previous evidence that factors other than sophistication can affect the take up of commitment (e.g., Exley and Naecker, 2017; Carrera et al., 2022). A person might be *projection biased*, imagining themselves to be in the same state as they are in now and therefore demanding commitment during times of scarcity because they would choose cash now (see Loewenstein, O'Donoghue and Rabin, 2003 and more specifically, Zhang, 2023 who describes how projective misperceptions can be misperceived as time preferences). It could also be that scarcity acts as a *hot state*, a visceral state that influences behavior or preferences, causing them to make decisions in an otherwise different way than they normally do (see, e.g., Busse et al., 2015).

Why is there an effect at $d - 8$ and not $d - 2$, even though people also experience substantially scarcity at $d - 2$? There are two competing forces happening simultaneously across the payday cycle: liquidity is weakly monotonically falling, while the nearness of the future payday is monotonically increasing. While these effects may be combining in this setup—participants may be more likely to report they are low on cash when they are both experiencing scarcity and they are far from payday—the nearness of the future payday affects whether the commitment device appears beneficial to them. Individuals making the decision two days from payday know that money is coming soon, whereas the prospect of eight days without money is more difficult. This is consistent with my pre-registered hypothesis that commitment would non-monotonically increase at the end of the payday cycle when financial resources are low. Future work should narrow in on the psychology of these two effects and the relative importance of each.

Finally, aside from the intertemporal phenomena described above, there are three other main intertemporal phenomena that can also resemble impatience: habit formation, news utility, and anticipatory utility (see O'Donoghue and Rabin, 2015 for a discussion). However, these hypotheses either do not make a prediction in this setting or are inconsistent with the study results.

Habit formation or, similarly, a preference for consistency, suggests that consumption utility depends on past consumption, so that an agent only gradually adjusts consumption to income shocks. In the payday cycle, this would suggest more consumption smoothing across the payday cycle, so that we would not expect changes before and after payday, and the commitment device would not be helpful.

News utility suggests that people experience gain-loss utility when they receive information that changes their beliefs about future consumption (Kőszegi and Rabin, 2009). Participants in this study may experience an immediate utility gain from the prospect of a payment. Theory suggests this would affect their current consumption like present bias, with a higher propensity to consume out of current cash, which would also not explain a difference between treatment groups in this setting.

Anticipatory utility formalizes the idea that individuals care about future utility flows. In this setting, individuals may derive anticipatory utility from the prospect of a payment. While the impact of anticipatory utility on intertemporal choice is relatively unexplored, Thakral and Tô (2022) present a model where agents who receive a windfall will experience more anticipatory utility the longer they wait for it, which has an acclimatization effect that results in more patient decisions. This, however, is inconsistent with the results in this study: while the before-payday agents—who must wait longer for the payment—are more patient on average, they are not monotonically more patient.

5 Conclusion

This paper shows that timing relative to payday affects patience about the future, and in particular, that individuals are more likely to take up a commitment device when they are currently experiencing financial scarcity. In this way, offering the chance to make a future-oriented decision at the right moment leads study participants to the insight that it would be useful to delay a payment in order to benefit their future self.

This result has policy implications. Many people experience monthly swings in liquidity during the payday cycle, and the passing of a few days can make the difference between someone making a patient or an impatient financial choice. This could especially have consequences for major one-off decisions, like choosing a retirement savings rate or deciding on a loan repayment plan. Individuals and policymakers should pay attention to how changes in financial scarcity, even temporary ones, might affect their valuation of the future, and timing relative to payday is an important factor to consider. In addition, these results indicate there is demand for a consumption smoothing mechanism across the payday cycle.

However, it is also important to consider the long-run effects of changing regular payment schedules, because individuals may become accustomed to being paid at a different time in their payday cycle. This could diminish the effectiveness of such a policy and create new financial instability.

A limitation of this study is that it was run in a stylized environment, making it difficult to understand what the magnitude of this effect might be in other settings. The commitment device in this study provided a mechanism for those who experience scarcity during the payday cycle to smooth their consumption; however, the study sample involved MTurk workers, who—though selected for receiving the majority of their income through a monthly paycheck—nonetheless had access to a consumption smoothing device through the MTurk platform, on which they can be paid by task. The effect might therefore be larger in a similar setting without access to consumption smoothing, and, of course, different in other contexts. Future work can investigate how the payday cycle affects decisions in more natural settings, such as banking environments. It can also measure scarcity in a more detailed way to capture the underlying psychology of scarcity across the payday cycle.

Finally, these results suggest that harnessing current financial scarcity might be a useful tool for individuals and policymakers to use to promote future-oriented decision-making. Financial planners already use results from the psychology and economics literature to design such interventions: Merrill Lynch, for example, used a "Face Retirement" tool that displayed an aged rendering of users' faces in order to encourage them to better imagine their future selves. Likewise, this study suggests that experiencing current scarcity helps people better imagine and, therefore, better prepare for future scarcity.

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7 Appendix

Contents

7.1 Experimental Instructions

Participants were recruited between June 1st and July 31st 2019 on Amazon Mechanical Turk (MTurk) as laid out in the pre-registration. Participants continued to participate in the second part of the study through August 5, 2019. This section describes the study instructions in detail. Section 7.1.1 describes the pre-screen and section 7.1.3 describes the main experimental task in which participants make a commitment decision.

7.1.1 Pre-Screen

The study pool is restricted to applicants who live in the United States, have more than 100 approved Human Intelligence Tasks (HITs), and have a greater than 85% HIT approval rating. The pre-screen additionally narrows the study pool to individuals who do not make most of their income on MTurk and who receive paychecks monthly. Figure 4 and Figure 5 shows how the income questions are asked. Figure 6 and Figure 7 show how the paycheck questions are asked. The calendar display in Figure 7 is shown as many times as they indicate they would receive a paycheck in that month. The pre-screen questions are worded so as to not reveal the screening criteria.

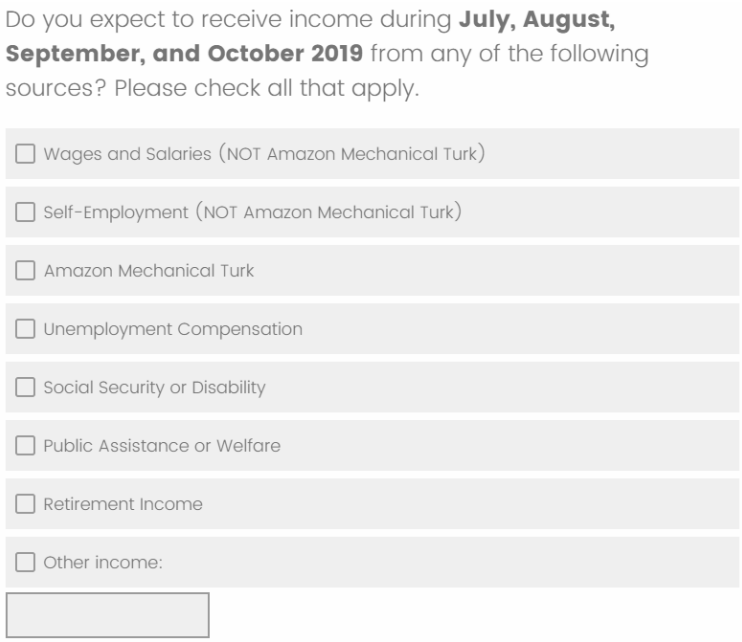

Figure 4: Pre-Screen Question #1

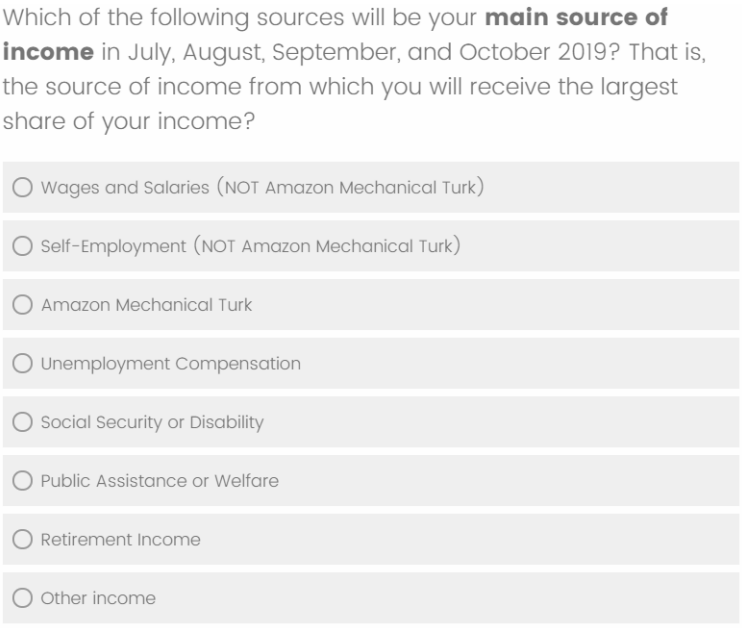

Figure 5: Pre-Screen Question #2

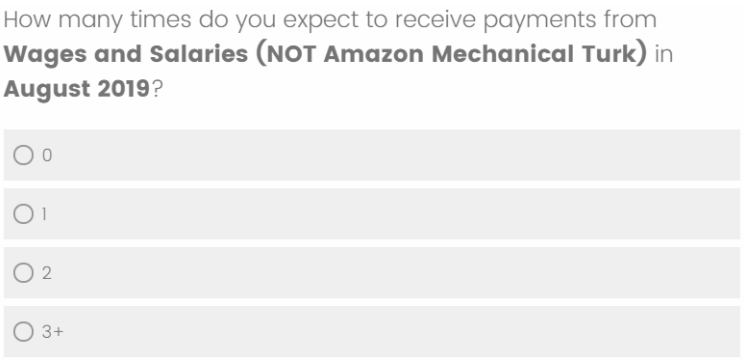

Figure 6: Pre-Screen Question #3

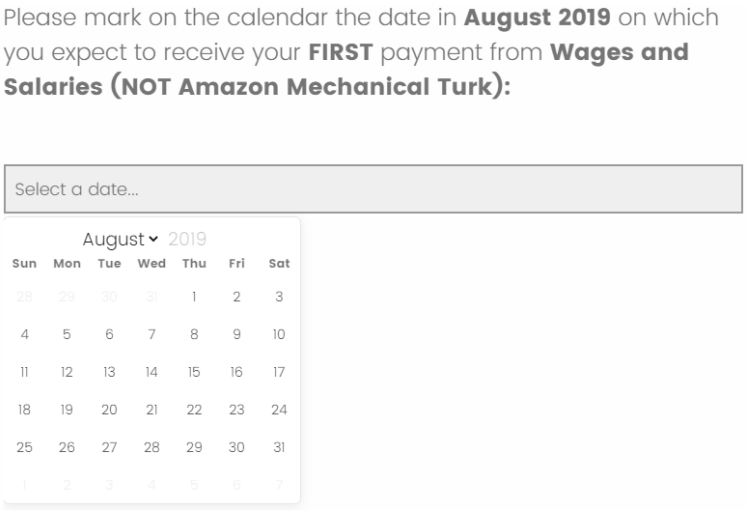

Figure 7: Pre-Screen Question #4

7.1.2 Invitation Email

Subject: Harvard Financial Decisions Study! $2 for 7 minutes plus chance of bonus

Body: The academic survey you qualified for through a pre-screen is now up on MTurk. You can search for it using the title "Harvard Financial Decisions Study" or the requester name "Holly." It takes on average 7 minutes and has a guaranteed payment of $2. In addition, you have a chance of receiving a bonus of $50.

It is important for our study that you take this within 24 hours of now. Every single person is valuable to our study, so we strongly thank you for your participation!

Please contact me if you have any questions: Holly at dykstra@g.harvard.edu.

7.1.3 Main Experimental Task

The main experimental task appears for each participant on their assigned treatment day. They also receive an email reminder through MTurk that the second part is available for them to complete. The email text states:

> The academic survey you qualified for through a pre-screen is now up on MTurk. The title is "Harvard Financial Decisions Study" and the requester name is "Holly". It takes on average 7 minutes and has a guaranteed payment of $2. In addition, you have a chance of receiving a bonus of $50. It is important for our study that you take this within 24 hours of now. Every single person is valuable to our study so we strongly thank you for your participation! Please contact me if you have any questions: Holly at dykstra@g.harvard.edu.

Once participants navigate to the survey, they are presented with the introductory screen shown in Figure 8. Next, they face the commitment decision shown in Figure 9. In the study, the dates are filled in with the paycheck information each person supplied during the pre-screen.

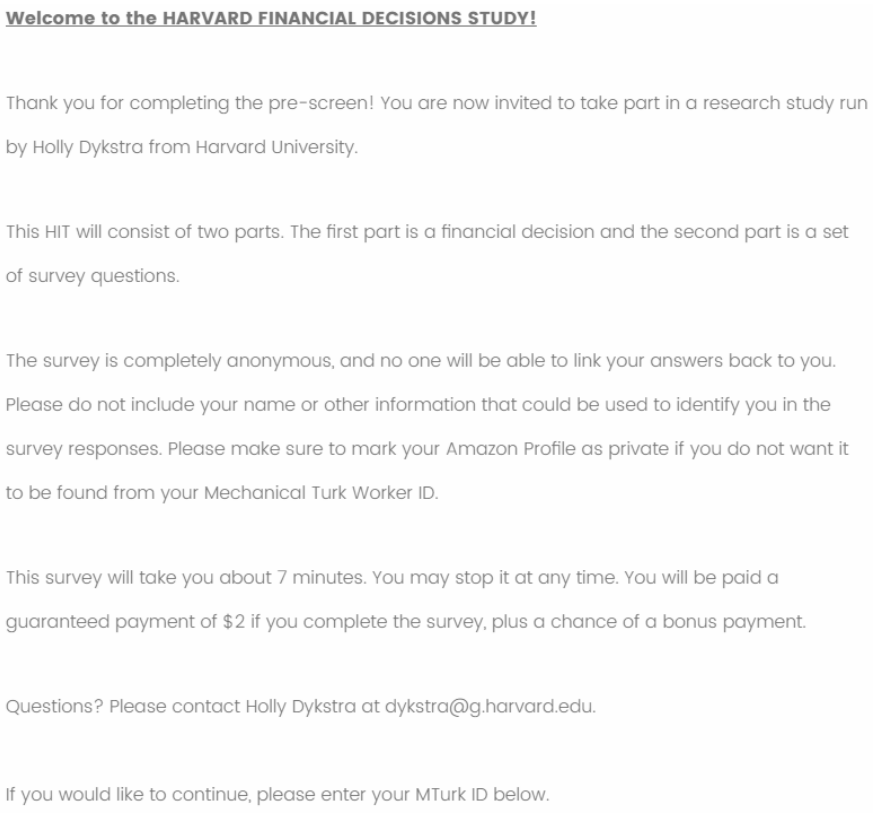

Figure 8: Introductory Screen

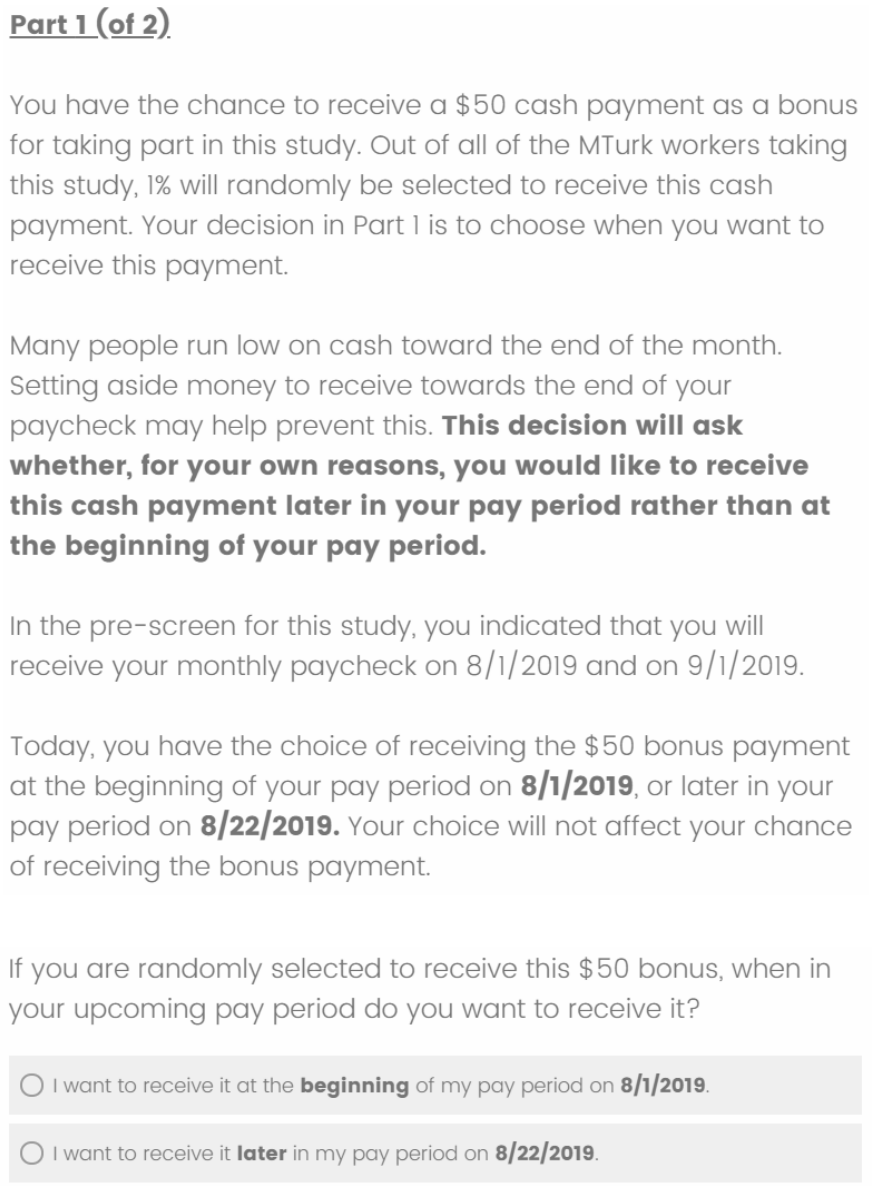

Figure 9: Commitment Decision

On the next page, participants have the option of filling out a text box to explain how they made the commitment decision. Then, on the final page, they complete the survey by filling out a series of sociodemographic questions.

7.2 Additional Tables

7.2.1 Descriptive Statistics

Table 4: Descriptive Statistics

Gender		*Income*	
Male	0.37	Less than $25,000	0.21
Female	0.63	$25,000 – $49,999	0.28
		$50,000 – $74,999	0.23
Age		$75,000 – $99,999	0.13
18-24	0.07	$100,000 – $249,999	0.15
25-34	0.30	$250,000 – $499,999	0.00
35–44	0.24	Over $500,000	0.00
45–54	0.13		
55–64	0.15	*Employment*	
65+	0.12	Employed Full Time	0.44
		Employed Part Time	0.14
Race and/or Ethnic Group		Unemployed and Looking	0.03
Caucasian	0.78	Unemployed and Not Looking	0.01
Hispanic, Latino, or Spanish origin	0.04	Student	0.03
Black or African American	0.09	Retired	0.14
American Indian or Alaska Native	0.01	Homemaker	0.03
Asian	0.06	Self-employed	0.11
Native Hawaiian or Pacific Islander	0.00	Unable to Work	0.07
Other	0.02		
Education		*Raise $2,000 in an emergency*	
Less than a high school diploma	0.00	Could raise easily	0.33
High school degree or equivalent	0.07	Would involve some sacrifices	0.31
Some college, no degree	0.20	Require something drastic	0.17
Associate's degree	0.10	Don't think I could raise it	0.19
Bachelor's degree	0.39		
Master's degree	0.19	*Available Credit*	
Professional degree	0.01	Median number of credit cards	3
Doctorate	0.03	Median total line of credit	$10,000
Marital Status			
Single	0.34		
Married or Domestic Partnership	0.51		
Widowed	0.03		
Divorced	0.12		
Separated	0.01		

Note: This table shows the mean of each demographic characteristic for the full sample ($n = 1,229$).

Table 5: Balance Table by Treatment Day

Variable	(1) $d-11$ Mean/(SE)	(2) $d-8$ Mean/(SE)	(3) $d-5$ Mean/(SE)	(4) $d-2$ Mean/(SE)	(5) $d+1$ Mean/(SE)	F-test for balance across all groups F-stat/P-value
Female	0.635	0.687	0.583	0.636	0.618	1.461
	(0.031)	(0.030)	(0.032)	(0.030)	(0.031)	0.212
Age	42.180	42.366	42.579	43.264	42.237	0.253
	(0.905)	(0.880)	(0.906)	(0.868)	(0.895)	0.908
Caucasian	0.775	0.811	0.779	0.771	0.767	0.433
	(0.027)	(0.025)	(0.027)	(0.026)	(0.027)	0.785
Bachelor's degree	0.385	0.395	0.413	0.403	0.345	0.703
	(0.031)	(0.031)	(0.032)	(0.031)	(0.030)	0.590
Married	0.500	0.490	0.498	0.519	0.518	0.170
	(0.032)	(0.032)	(0.033)	(0.031)	(0.032)	0.954
Income $25,000-$49,000	0.238	0.276	0.285	0.279	0.301	0.672
	(0.027)	(0.029)	(0.030)	(0.028)	(0.029)	0.611
Works full-time	0.422	0.453	0.438	0.473	0.418	0.525
	(0.032)	(0.032)	(0.032)	(0.031)	(0.031)	0.717
Number of observations	244	243	235	258	249	1229

Note: This table shows the mean and standard error of each variable by treatment day. The last column shows the p-values of an F-test for joint orthogonality of each variable across all treatment arms.

7.2.3 Robustness Checks

Table 6: Commitment by Day Relative to Payday without Time Controls

	Full Sample			One Source of Income		
	(1)	(2)	(3)	(4)	(5)	(6)
$d-11$	0.039	0.036	0.037	0.083	0.081	0.088
	(0.042)	(0.042)	(0.042)	(0.049)	(0.048)	(0.049)
$d-8$	0.115	0.110	0.098	0.160	0.156	0.150
	(0.043)	(0.043)	(0.044)	(0.051)	(0.051)	(0.053)
$d-5$	0.010	0.005	0.001	0.043	0.039	0.040
	(0.042)	(0.042)	(0.042)	(0.049)	(0.049)	(0.050)
$d-2$	0.005	0.004	-0.002	0.050	0.055	0.064
	(0.041)	(0.041)	(0.041)	(0.049)	(0.049)	(0.050)
Financial Well-Being		-0.048	-0.058		-0.054	-0.069
		(0.013)	(0.016)		(0.016)	(0.019)
Constant	0.305	0.308	0.291	0.257	0.257	0.138
	(0.029)	(0.029)	(0.067)	(0.034)	(0.033)	(0.088)
Demographic Controls			X			X
Observations	1229	1229	1229	842	842	842

Standard errors in parentheses

Note: Standard errors are heteroskedasticity robust. Results are from OLS models with the binary decision to adopt a commitment device as the dependent variable. The first three columns include the full sample, while the last three columns restrict the sample to only those participants who have one source of income aside from MTurk income. *Financial well-being* indicates the CFPB Financial Well-Being Scale, standardized to have a mean of 0 and a standard deviation of 1. *Demographic controls* includes indicator variables for gender, age, income, race, marital status, and education level.

Table 7: Proportion Choosing to Commit by Day

	(1) $d+1$	(2) $d-2$	(3) $d-5$	(4) $d-8$	(5) $d-11$
Proportion Choosing to Commit	0.305	0.310	0.315	0.420	0.344
Difference from $d+1$	-	0.005	0.010	0.115	0.039
		(0.041)	(0.042)	(0.043)	(0.042)
Observations	249	258	235	243	244

Standard errors in parentheses

Note: Each column denotes the day relative to payday that participants make the commitment decision. *Proportion Choosing to Commit* describes the proportion of participants who choose to adopt a commitment device on that day. *Difference from d + 1* shows the difference in willingness to commit between that day and $d+1$. Standard errors indicate the results of an equality of proportions test comparing each group before payday to $d+1$.

Table 8: Randomization Inference Results: Proportion Choosing to Commit by Day

	(1) $d+1$	(2) $d-2$	(3) $d-5$	(4) $d-8$	(5) $d-11$
Without controls					
Proportion Choosing to Commit	0.305	0.310	0.315	0.420	0.344
Difference from $d+1$	-	0.005	0.010	0.115	0.039
Randomization-t p-values		(0.896)	(0.823)	(0.008)	(0.351)
With time controls					
Proportion Choosing to Commit	0.345	0.345	0.382	0.462	0.405
Difference from $d+1$	-	0.001	0.038	0.118	0.060
Randomization-t p-values		(0.985)	(0.438)	(0.012)	(0.194)
Observations	249	258	235	243	244

Note: Each column denotes the day relative to payday that participants make the commitment decision. *Proportion Choosing to Commit* describes the proportion of participants who choose to adopt a commitment device on that day. *Difference from d + 1* shows the difference in willingness to commit between that day and $d+1$. *Randomization-t p-values* shows the randomization inference p-values of a t-test comparing each treatment day to $d+1$ based on 10,000 draws (using the procedure from Young, 2019). The first set of results includes no controls, while the second set includes time controls for day of the week, week, and month.

7.2.4 Classification of Free-Text Responses

After making the commitment decision, participants had the option to explain how they made their decision in a free-text box on the next page. Although this question was optional, 81% of participants provided a response.

Table 9 and Table 10 classify these responses into categories. I developed the coding scheme iteratively based on a reading of a sample of responses. ChatGPT 3.5 Turbo then coded each response as belonging to one or more of these categories, with a random sample check by me for accuracy.

Table 9: Classification of Responses: Did Not Choose Commitment

Category	Description	Example	Percent
Money Sooner	They prefer money sooner or mention the time value of money	"Who wouldn't want the money earlier? Worst case scenario, it can sit in my account and earn interest."	54.7%
Regular Expenses	They have regular bills and expenses that happen at this time	"I chose the beginning of the pay period due to most of my rent and bills being clustered around the start of each month, and the extra $50 would help cover for it."	22.9%
Budget	They like to budget in advance or are good at managing their funds	"Having the money at the beginning of the month helps me budget for the month as a whole."	19.3%
One-Time Expenses	There is a specific one-time expense happening at this time	"I had a large, unexpected expense recently involving replacement of my broken eyeglasses ($400). Because I live solely on a monthly Social Security check of only $1256.00 there is no room for such a huge unplanned expenditure. I need the $50.00 as soon as possible!"	14.1%
Need	They are struggling or need money	"Because I am way behind on my bills. We had a slab leak under the house and the AC broke and cost $1,000 to repair."	13.0%
Stable	They are financially stable or do not run out of money at the end of the month	"For my wife and I, we both have stable jobs and currently we are managing our finances fairly well such that we don't run low on money at any point during the month. Therefore, I would simply prefer to receive a potential bonus sooner, rather than later."	6.3%
Random	They chose randomly or do not care	"I just decided randomly. No particular reason."	3.1%
Unexpected	They want to be able to cover anything unexpected	"I enjoy having money available at all times in case of emergencies. I would rather have it now, just in case something comes up and I need it immediately."	2.2%
Safer	They incorrectly believe they are more likely to receive the money	"In MTurk land, earlier is less risky."	1.9%
Unclear	Explanation vague or difficult to understand	"I went for consistency."	1.4%

Note: This table provides an overview of the categories, including examples of each category and the percent of responses classified as such, out of the sample of respondents who did not choose commitment and provided a free-text response ($n = 647$). Each response could be classified into multiple categories. They are arranged by percent from largest to smallest.

Table 10: Classification of Responses: Chose Commitment

Category	Description	Example	Percent
Timing	Any indication that the timing is beneficial for them	"I am tempted to take it earlier, but I know that I would still be strapped for grocery money toward the end of the month. And, on the 24th, I would thank myself for choosing the delayed payment."	93.1%
Need	They are struggling or need money	"Like the description on the previous page, I do tend to run low on money toward the end of the month. Even right now, at the end of this month, my family is struggling. Having that $50 come later would be a relief."	37.8%
Budget	The timing fits into their budget	"I do budget myself pretty tightly throughout the month, but money indeed does run low toward the end of my pay period. If I got an extra $50 toward the end of the month, it would guarantee a full shopping trip for my husband and I, an extra tank of gas, or even a dinner at a restaurant (which we don't do due to our budget)."	13.8%
Unexpected	Unexpected events are more likely to happen at this time	"Receiving the money later helps in case of unexpected expenditure that was not initially planned for."	10.1%
Impatient	They might spend the money frivolously if they received it earlier	"I simply DON'T trust myself with money. After paying the bills, if there is any money left over, there is always the danger that I will buy pizza or some other luxury food item..."	6.3%
Delayed Gratification	They would like a pleasant surprise	"If I win, I will have forgotten about the bonus and will be surprised and super delighted to receive it. If I would have picked the earlier date, I would be anxious and looking for it to pay."	6.3%
Regular Expenses	They have regular bills and expenses happen at this time	"That is when most of my household bills come due."	4.6%
One-Time Expenses	There is a specific one-time expense happening at this time	"It will be closer to my son's birthday and I can take all of my children out to their favorite Chinese restaurant for the occasion."	4.0%
Random	They chose randomly or do not care	"Entropy!"	1.4%
Delayed Bad News	They would like to delay bad news	"A later date postpones any bad news as long as possible."	1.2%
Safer	They incorrectly believe they are more likely to receive the money	"I figure my odds would be better selecting a later date while other participants selected the earlier date."	0.9%
Unclear	Explanation vague or difficult to understand	"I made this decision based on my own requirements."	0.3%

Note: This table provides an overview of the categories, including examples of each category and the percent of responses classified as such, out of the sample of respondents who chose commitment and provided a free-text response ($n = 347$). Each response could be classified into multiple categories. They are arranged by percent from largest to smallest.

7.2.5 Additional Analyses

Table 11: Heterogeneity of Commitment by Day Relative to Payday

	(1)	(2)	(3)	(4)	(5)	(6)
$d-11$	0.059	0.066	0.061	0.062	0.057	0.055
	(0.047)	(0.046)	(0.047)	(0.047)	(0.047)	(0.047)
$d-8$	0.109	0.117	0.117	0.118	0.119	0.115
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
$d-5$	0.040	0.033	0.037	0.039	0.035	0.034
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.047)
$d-2$	-0.002	-0.002	-0.001	0.001	-0.001	-0.001
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.045)
Female	0.100					
	(0.028)					
Age 35+		0.131				
		(0.027)				
Education						
Less than High School			-0.163			
			(0.207)			
High School or Equivalent			-0.047			
			(0.054)			
Some College or Associate's Degree			0.016			
			(0.033)			
Graduate Degree			0.001			
			(0.036)			
Income						
Less than $50,000				-0.025		
				(0.030)		
Over $100,000				0.000		
				(0.042)		
Cannot Raise $2,000					0.064	
					(0.035)	
Financial Well-Being						-0.048
						(0.013)
Constant	0.279	0.251	0.343	0.361	0.325	0.344
	(0.075)	(0.075)	(0.076)	(0.076)	(0.074)	(0.071)
Observations	1229	1229	1229	1229	1229	1229

Standard errors in parentheses

Note: Standard errors are heteroskedasticity robust. Results are from OLS models with the binary decision to adopt a commitment device as the dependent variable. All columns include time controls for day of the week, week, and month. The base group for the educational groups is a Bachelor's degree. The base group for the income groups is between $50,000 and $100,000. *Financial well-being* indicates the CFPB Financial Well-Being Scale, standardized to have a mean of 0 and a standard deviation of 1.

7.3 Pre-registration Details

CONFIDENTIAL - FOR PEER-REVIEW ONLY

ASPREDICTED

PROJECTION BIAS IN FINANCIAL DECISIONS - June 2019 (#24265)

Created: 06/01/2019 08:37 PM (PT)
Shared: 04/24/2020 08:59 PM (PT)

This pre-registration is not yet public. This anonymized copy (without author names) was created by the author(s) to use during peer-review.
A non-anonymized version (containing author names) will become publicly available only if an author makes it public. Until that happens the contents of this pre-registration are confidential.

1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
Projection bias will influence how individuals make financial decisions. In particular, when people who receive their monthly paychecks have the chance to delay a future bonus payment to help themselves consumption smooth over a pay period, their likelihood of doing so will non-monotonically increase at the end of their pay period when their financial resources are low and decrease again at the receipt of their next paycheck. Therefore, this effect will be pronounced for low-SES and credit-constrained individuals. I predict that participants with lower household income and more financial stress will be more likely to delay payment.

3) Describe the key dependent variable(s) specifying how they will be measured.
The rate of delaying a future bonus payment. In particular, each participant will have a 1% chance of receiving a $50 bonus payment. They choose between receiving the bonus payment at the beginning of a future pay period or 10 days before the end of that pay period. The pay period is at least one month in the future.

4) How many and which conditions will participants be assigned to?
Five conditions: when they make the decision: 11 days before their next paycheck, 8 days before their next paycheck, 5 days before their next paycheck, 2 days before their next paycheck, 1 day after their paycheck.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Linear regression predicting overall willingness to delay payment with dummy variables for the treatment groups and controlling for gender, household income, and financial well-being.

Pairwise comparisons and a chi-squared test of the proportion choosing to delay payment between each of the treatment groups. I will also report results controlling for gender, household income, financial-well being.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
I will exclude any participants who indicate that they did not correctly enter their paycheck dates during the pre-screen or who do not answer the attention check question correctly.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
I will enroll people until 1,500 people have participated or until July 31, 2019.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
I include additional questions and psychological measures for exploratory purposes including Cohen's Perceived Stress Scale, level of credit-constraint, self-report of being low on cash right now, and other demographic questions. I will investigate how these relate to willingness to delay payment as well as how they relate to household income and financial well-being.