Appendix for

Patience Across Payday: The Role of Scarcity in Commitment Decisions

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Contents

1.1 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 1, 2019. This section describes the study instructions in detail. Section 1.1.1 describes the part one pre-screen and section 1.1.3 describes part two, in which participants make a commitment decision.

1.1.1 Part One

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 part one 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 questions are worded so as to not reveal the screening criteria.

Do you expect to receive income during **July, August, September, and October 2019** from any of the following sources? Please check all that apply.

☐ Wages and Salaries (NOT Amazon Mechanical Turk)

☐ Self-Employment (NOT Amazon Mechanical Turk)

☐ Amazon Mechanical Turk

☐ Unemployment Compensation

☐ Social Security or Disability

☐ Public Assistance or Welfare

☐ Retirement Income

☐ Other income:

Figure 4: Pre-Screen Question #1

Which of the following sources will be your **main source of income** in July, August, September, and October 2019? That is, the source of income from which you will receive the largest share of your income?

○ Wages and Salaries (NOT Amazon Mechanical Turk)

○ Self-Employment (NOT Amazon Mechanical Turk)

○ Amazon Mechanical Turk

○ Unemployment Compensation

○ Social Security or Disability

○ Public Assistance or Welfare

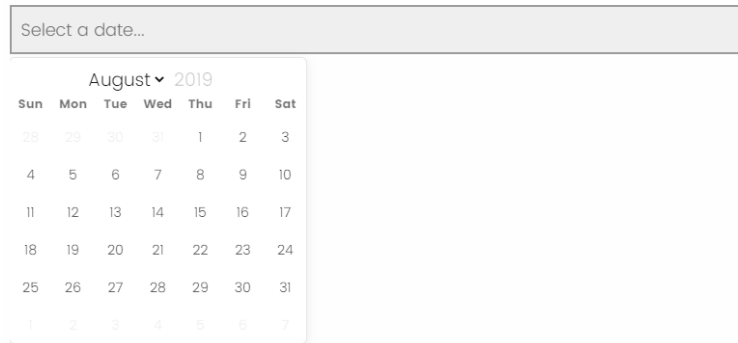○ Retirement Income

○ Other income

Figure 5: Pre-Screen Question #2

How many times do you expect to receive payments from **Wages and Salaries (NOT Amazon Mechanical Turk)** in **August 2019**?

○ 0

○ 1

○ 2

○ 3+

Figure 6: Pre-Screen Question #3

Figure 7: Pre-Screen Question #4

1.1.2   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.

1.1.3   Part Two

Part two 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.

Welcome to the HARVARD FINANCIAL DECISIONS STUDY!

Thank you for completing the pre-screen! You are now invited to take part in a research study run by Holly Dykstra from Harvard University.

This HIT will consist of two parts. The first part is a financial decision and the second part is a set of survey questions.

The survey is completely anonymous, and no one will be able to link your answers back to you. Please do not include your name or other information that could be used to identify you in the survey responses. Please make sure to mark your Amazon Profile as private if you do not want it to be found from your Mechanical Turk Worker ID.

This survey will take you about 7 minutes. You may stop it at any time. You will be paid a guaranteed payment of $2 if you complete the survey, plus a chance of a bonus payment.

Questions? Please contact Holly Dykstra at dykstra@g.harvard.edu.

If you would like to continue, please enter your MTurk ID below.

Figure 8: Introductory Screen

Part 1 (of 2)

You have the chance to receive a $50 cash payment as a bonus for taking part in this study. Out of all of 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.

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.**

In the pre-screen for this study, you indicated that you will receive your monthly paycheck on 8/1/2019 and on 9/1/2019.

Today, you have the choice of receiving the $50 bonus payment at the beginning of your pay period on **8/1/2019**, or later in your pay period on **8/22/2019.** Your choice will not affect your chance of receiving the bonus payment.

If you are randomly selected to receive this $50 bonus, when in your upcoming pay period do you want to receive it?

○ I want to receive it at the **beginning** of my pay period on **8/1/2019**.

○ I want to receive it **later** in my pay period on **8/22/2019**.

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.

1.2 Additional Tables

1.2.1 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	Over $250,000	0.01
35–44	0.24		
45–54	0.13	*Employment*	
55–64	0.15	*Employed Full Time*	0.44
65+	0.12	Employed Part Time	0.14
		Unemployed and Looking	0.03
Race and/or Ethnic Group		Unemployed and Not Looking	0.01
Caucasian	0.78	Student	0.03
Hispanic, Latino, or Spanish origin	0.04	Retired	0.14
Black or African American	0.09	Homemaker	0.03
American Indian or Alaska Native	0.01	Self-employed	0.11
Asian	0.06	Unable to Work	0.07
Native Hawaiian or Pacific Islander	0.00		
Other	0.02	*Raise $2,000 in an emergency*	
		Could raise easily	0.33
Education		*Would involve some sacrifices*	0.31
Less than a high school diploma	0.00	Require something drastic	0.17
High school degree or equivalent	0.07	Don't think I could raise it	0.19
Some college, no degree	0.20		
Associate's degree	0.10	*Available Credit*	
Bachelor's degree	0.39	Median number of credit cards	3
Master's degree	0.19	Median total line of credit	$10,000
Professional degree	0.01		
Doctorate	0.04		
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 ($n = 1,229$).

1.2.2 Balance

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 (0.031)	0.687 (0.030)	0.583 (0.032)	0.636 (0.030)	0.618 (0.031)	1.461 0.212
Age	42.180 (0.905)	42.366 (0.880)	42.579 (0.906)	43.264 (0.868)	42.237 (0.895)	0.253 0.908
Caucasian	0.775 (0.027)	0.811 (0.025)	0.779 (0.027)	0.771 (0.026)	0.767 (0.027)	0.433 0.785
Bachelor's degree	0.385 (0.031)	0.395 (0.031)	0.413 (0.032)	0.403 (0.031)	0.345 (0.030)	0.703 0.590
Married	0.500 (0.032)	0.490 (0.032)	0.498 (0.033)	0.519 (0.031)	0.518 (0.032)	0.170 0.954
Income $25,000-$49,000	0.238 (0.027)	0.276 (0.029)	0.285 (0.030)	0.279 (0.028)	0.301 (0.029)	0.672 0.611
Works full-time	0.422 (0.032)	0.453 (0.032)	0.438 (0.032)	0.473 (0.031)	0.418 (0.031)	0.525 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.

1.2.3 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	0.089
	(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	0.065
	(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 (0.041)	0.010 (0.042)	0.115 (0.043)	0.039 (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)	(0.195)
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.

1.2.4 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."	55.1%
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."	19.4%
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!"	14.3%
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."	12.8%
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."	6.4%
Random	They chose randomly or do not care	"I just decided randomly. No particular reason."	3.3%
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."	1.9%

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. Minor typographical errors were corrected for clarity.

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."	93.7%
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."	37.6%
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)."	14.1%
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%
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."	7.2%
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%
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!"	2.0%
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	"According to my requirements I decided."	0.6%

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. Minor typographical errors were corrected for clarity.

1.2.5 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.

1.3 Pre-registration Details

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.

Available at https://aspredicted.org/blind.php?x=n8cm66

Wharton UNIVERSITY of PENNSYLVANIA **CREDIBILITY LAB**