The Impact of Agency on Time & Risk Preferences

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Adversity and preferences

Prior research has demonstrated a relationship between adversity (like poverty or scarcity) and preferences (Dohmen, et al., 2011; Carvalho, 2010; Lawrance, 1991)

Recent work has argued that this relationship is causal (Haushofer & Fehr, 2014)

Adversity leads to:

- Greater risk aversion (Guiso & Paiella, 2008)
- Greater impatience (Haushofer, et al., 2013; Spears, 2011)

Adversity vs. agency

In that work, people experiencing adversity also often lacked agency over it

- I.e., they had few salient options that could alleviate their adversity
- E.g., Ps endowed with varying income levels in a lab could not increase their lab income in any way

Agency: the size of (a *salient*) choice set (Sen, 1988; Falk & Kosfeld, 2006)

- Larger choice set → greater agency

Adversity vs. agency

Although adversity and a lack of agency often move together in practice (Sheehy-Skeffington & Haushofer, 2014)

They are conceptually distinct

Ex: a person might know that they have an *option* to alleviate an immediate financial need (e.g., through a paycheck advance) but choose not to use it because it is unattractive or costly

- Same financial need (adversity), but more agency

Thus, it is not clear whether the previously-observed relationships between adversity and shifts in preferences were due to the adversity alone or *adversity coupled with a lack of agency*

Agency matters

There is reason to believe that agency could affect preferences

Prior work shows that agency can dramatically affect decision-making, outcomes, and experiences (Brehm, 1966; Carter, 1995; Falk & Kosfeld, 2006; Friedman & Friedman, 1990; Landau, et al., 2015; Langer, 1983; Langer & Rodin, 1976; Schulz, 1976; Sen, 1988)

- Even when people do not take advantage of the agency (additional options in their choice set)

Today

We aim to test whether agency itself can affect preferences (holding constant the level of adversity)

We show a lack of agency can lead to:

- Greater risk aversion
- Greater impatience

Theoretical framework

Why might agency affect risk preferences?

A lack of agency (limited ability to choose one's outcomes) → A desire to have greater control → A preference for more certain outcomes (risk aversion)

Thus, those with less agency should be more risk averse

Theoretical framework

At the same time, we know that risk and time are related: intertemporal choice inherently involves risk tradeoffs

- More distant future is less certain than dates closer to present
- These differences in uncertainty can, at least in part, explain time discounting and myopia (Halevy, 2008)

Thus, those who are more risk averse should also be more impatient

Theoretical framework

Putting these pieces together:

Roadmap

Study 1: Establish the causal effect of agency on time and risk preferences

- Show that the *lack of agency* over scarcity, rather than scarcity itself, can contribute to an increase in risk aversion and impatience

Study 2: Demonstrate the generalizability of the effect to another form of adversity

Study 1

Adversity: time scarcity (Shah, et al., 2012 & 2015; Fernbach et al., 2014)

Three conditions (between-subjects)

- No Scarcity
- Scarcity - Agency
- Scarcity - No Agency

Amazon MTurk (N = 217)

Study 1 design

Study 1 design

15 cognitive aptitude questions

Ex: *The letters in the word "Chimney" are in alphabetical order*

- *True*
- *False*

No Scarcity: no time limit
Scarcity-Agency and Scarcity-No Agency: 10 sec / question

Incentivized for correct answers

Study 1 design

Another 15 Qs

Incentivized for correct answers (up to $0.50)

Time scarcity (adversity) manipulation:

- No Scarcity: no time limit
- Scarcity-Agency & Scarcity-No Agency groups: 10 → 6 sec / question
  - 10 seconds = 43rd percentile of unconstrained time
  - 6 seconds = 19th percentile of unconstrained time

Agency manipulation:

- Scarcity-No Agency: could not do anything about their time scarcity
- Scarcity-Agency: could buy back lost time

Study 1 design

Agency manipulation:

"You have been given the option to gain an additional 4 seconds per question in exchange for 40 cents. If you choose to exercise this option, you will have 10 seconds per question. Instead of receiving 50 cents… you will receive 10 cents and whatever you earn…"

Study 1 design

Agency manipulation increases choice set size because can now gain more time (alleviate scarcity)

The high cost (80% of base pay, and 80% of what could earn if answer enough Qs correctly) discouraged Ps from exercising this agency

→ **Allows us to compare Ps who have varying levels of agency, but who face the same scarcity (adversity)**

Any Ps who chose to exercise their agency were routed out of the study

- Possible self-selection concern addressed in robustness checks

Study 1 design

Convex Time Budget (Andreoni & Sprenger, 2012; Gneezy & Potters, 1997)

Time preferences measure

2 decisions
Each decision involved allocating 100 experimental tokens across 2 dates
Tokens allocated to later date were worth more (implicit daily interest rate of 6%)
Incentive-compatible (1 decision randomly chosen to be paid out)

Primary DV: number of tokens allocated to *earlier time point*

More tokens to earlier dates = greater impatience

Please allocate your 100 tokens across these two choices. **Remember that the allocations in each row must sum to 100.**

	TODAY value = $0.20	IN ONE WEEK value = $0.30	Total
Choice 1	40	60	100

Study 1 design

Four binary decisions between a riskier and a safer option (Kahneman & Tversky 1979)

Risk preferences measure

Please choose between the following gambles:

$2500 with probability .33 $2400 with probability .66 $0 with probability .01	VS.	$2400 with certainty
$2500 with probability .33 $0 with probability .67	VS.	$2400 with probability .34 $0 with probability .66
$4000 with probability .80 $0 with probability .20	VS.	$3000 with certainty
$4000 with probability .20 $0 with probability .80	VS.	$3000 with probability .25 $0 with probability .75

Secondary DV: proportion of times a participant chose the safer option over the riskier option

Study 1 design

Study 1 design

Our framework would predict that the Scarcity-No Agency group will be…

- More impatient
- More risk averse

…than the Scarcity-Agency group

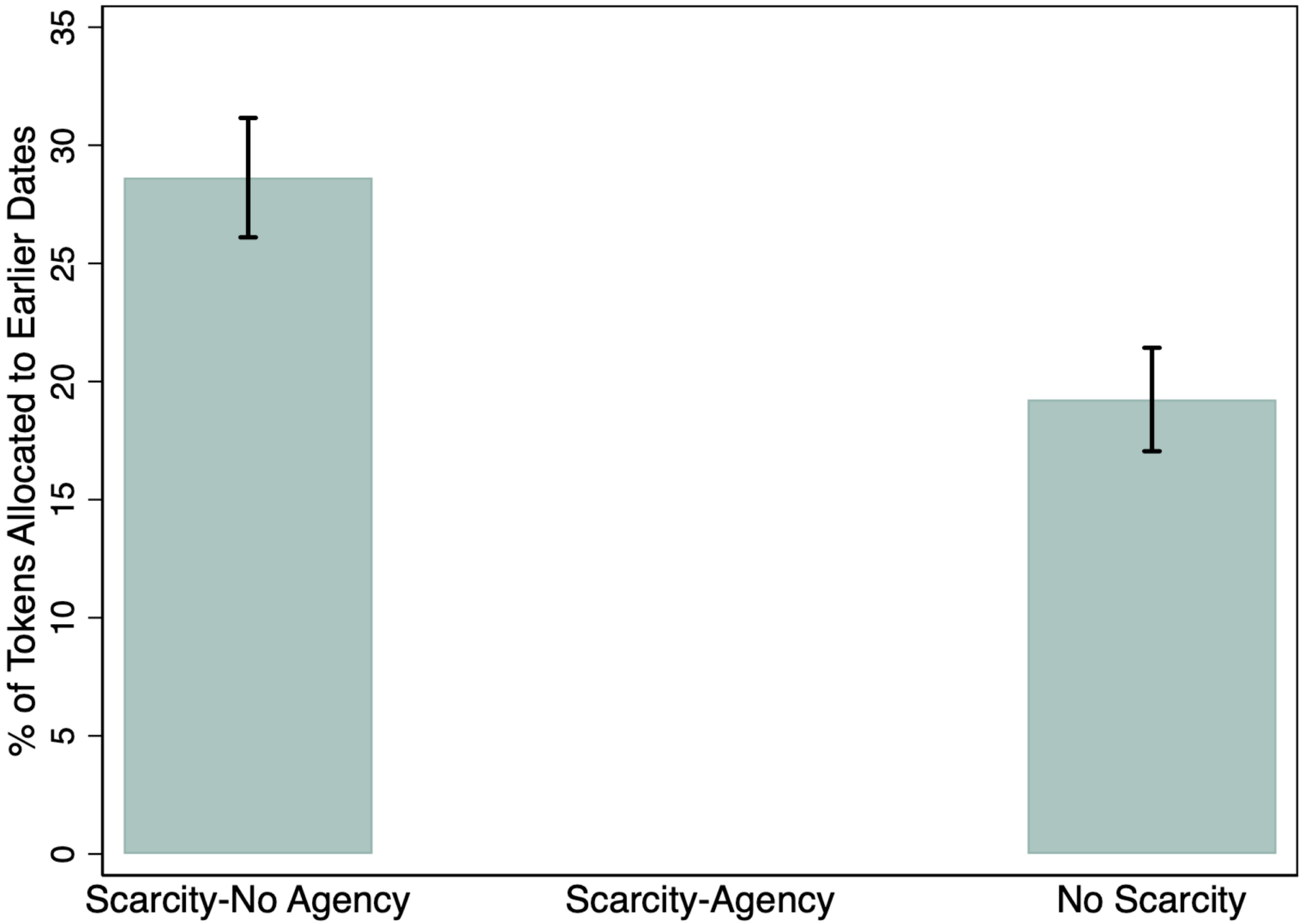
Study 1 results

4 Ps chose to gain more time

These Ps were routed out after the cognitive aptitude questions (and so are not included in these analyses)

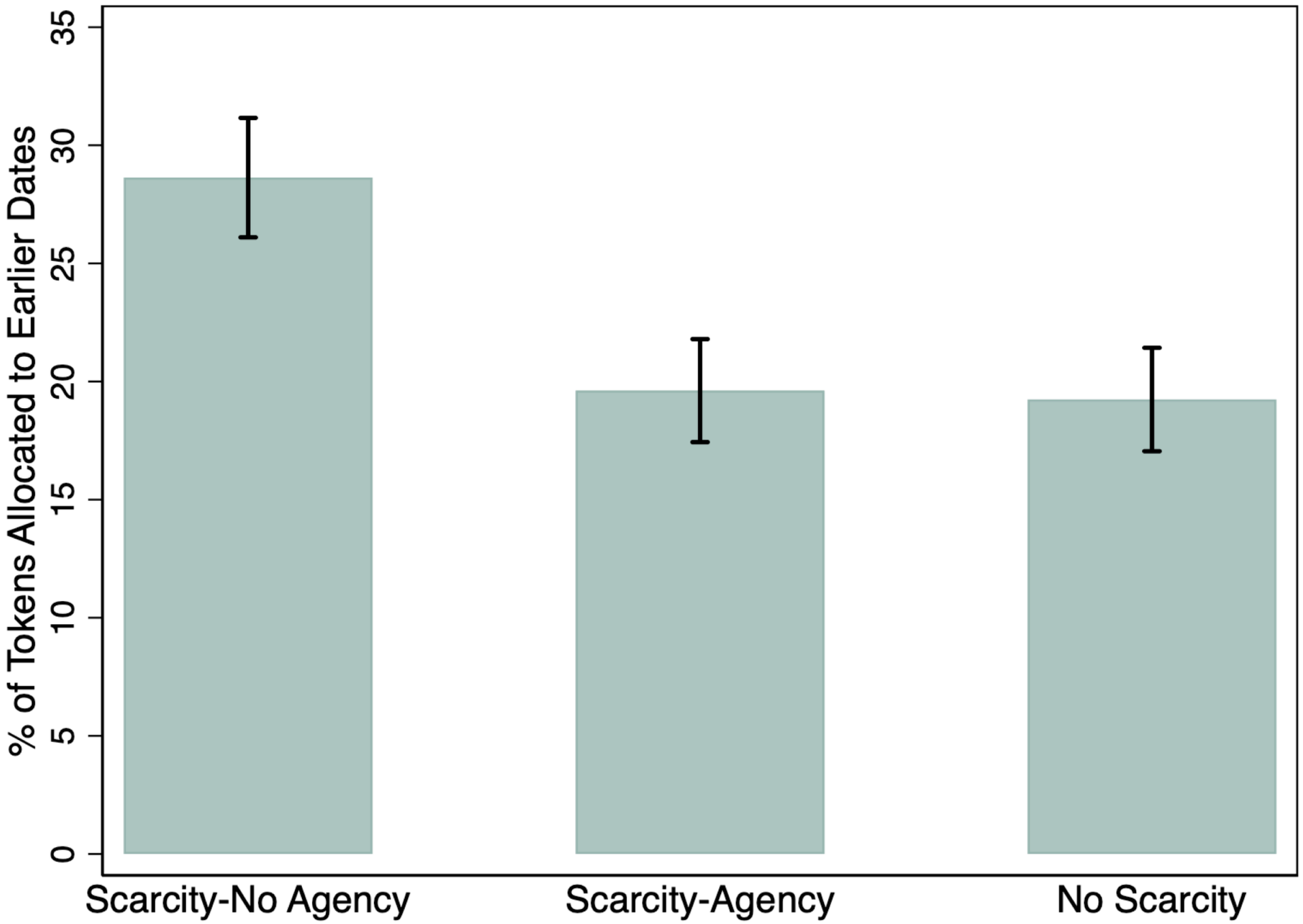
Everyone in Scarcity groups faces the same adversity / scarcity

Time preferences results



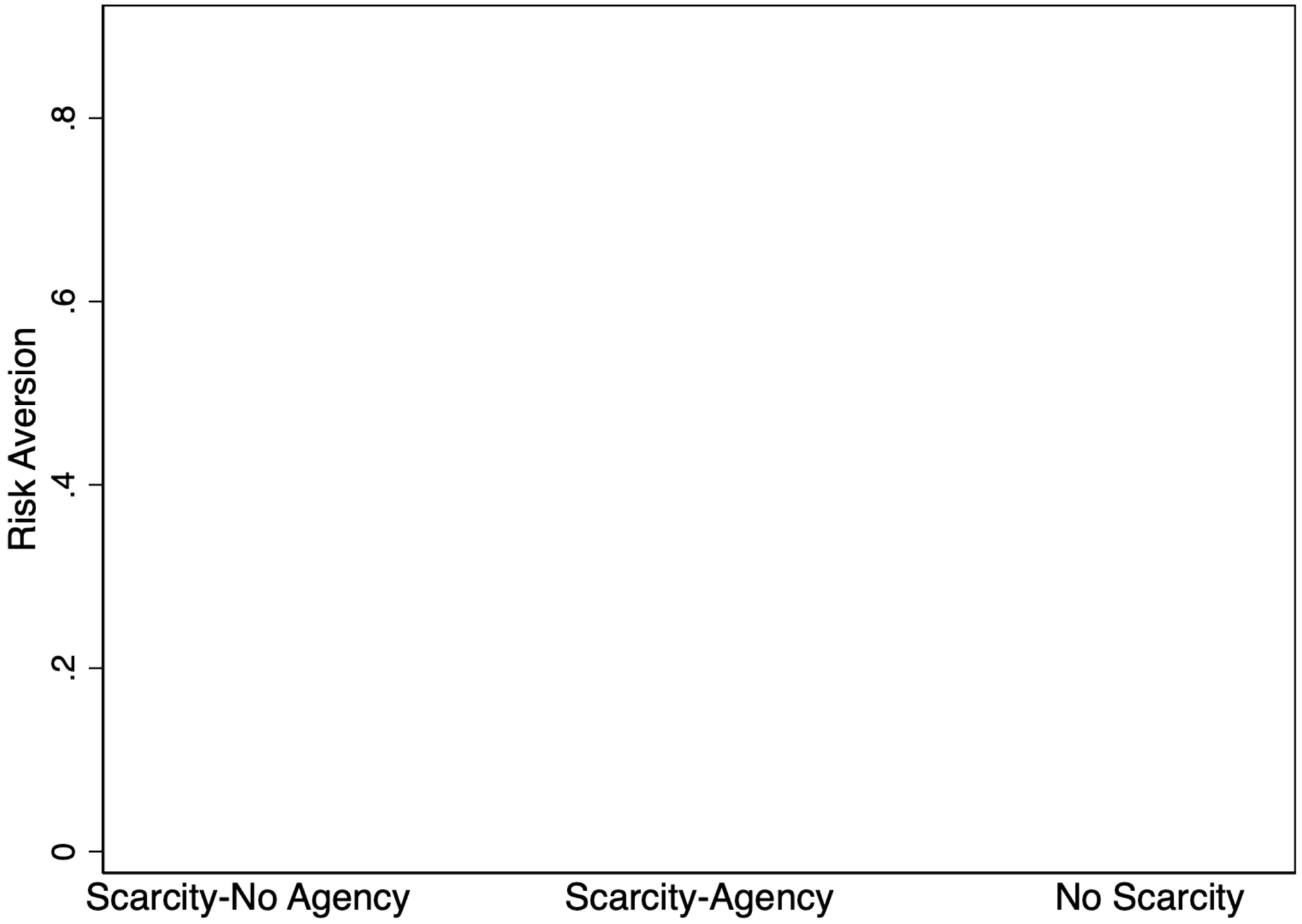
Collapsed across earlier dates (no difference if divide). Error bars are +/- 1 SE.

Time preferences results

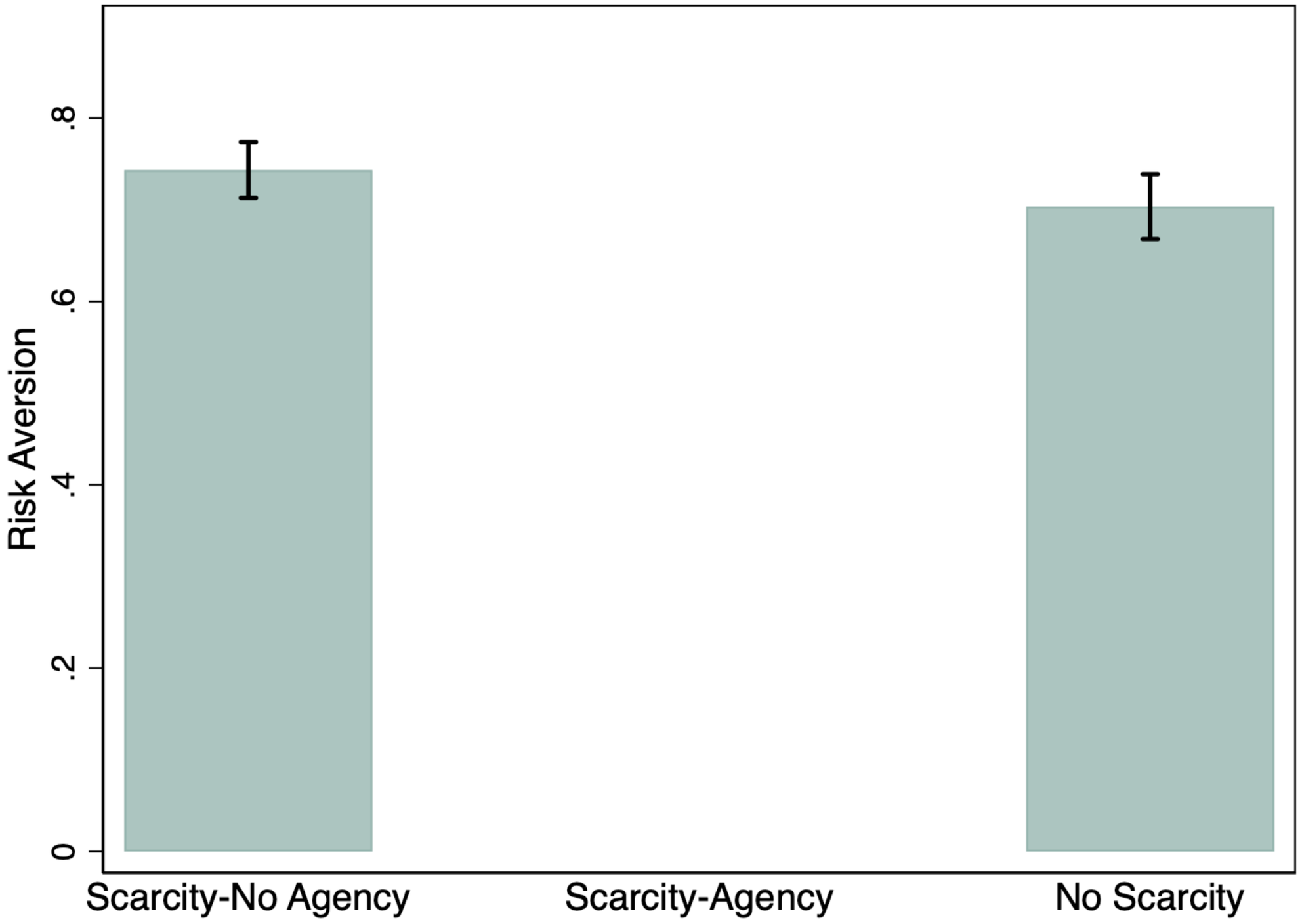


Collapsed across earlier dates (no difference if divide). Error bars are +/- 1 SE. OLS with robust SE clustered at participant level, No Agency versus Agency: *p*=0.041

Risk preferences results

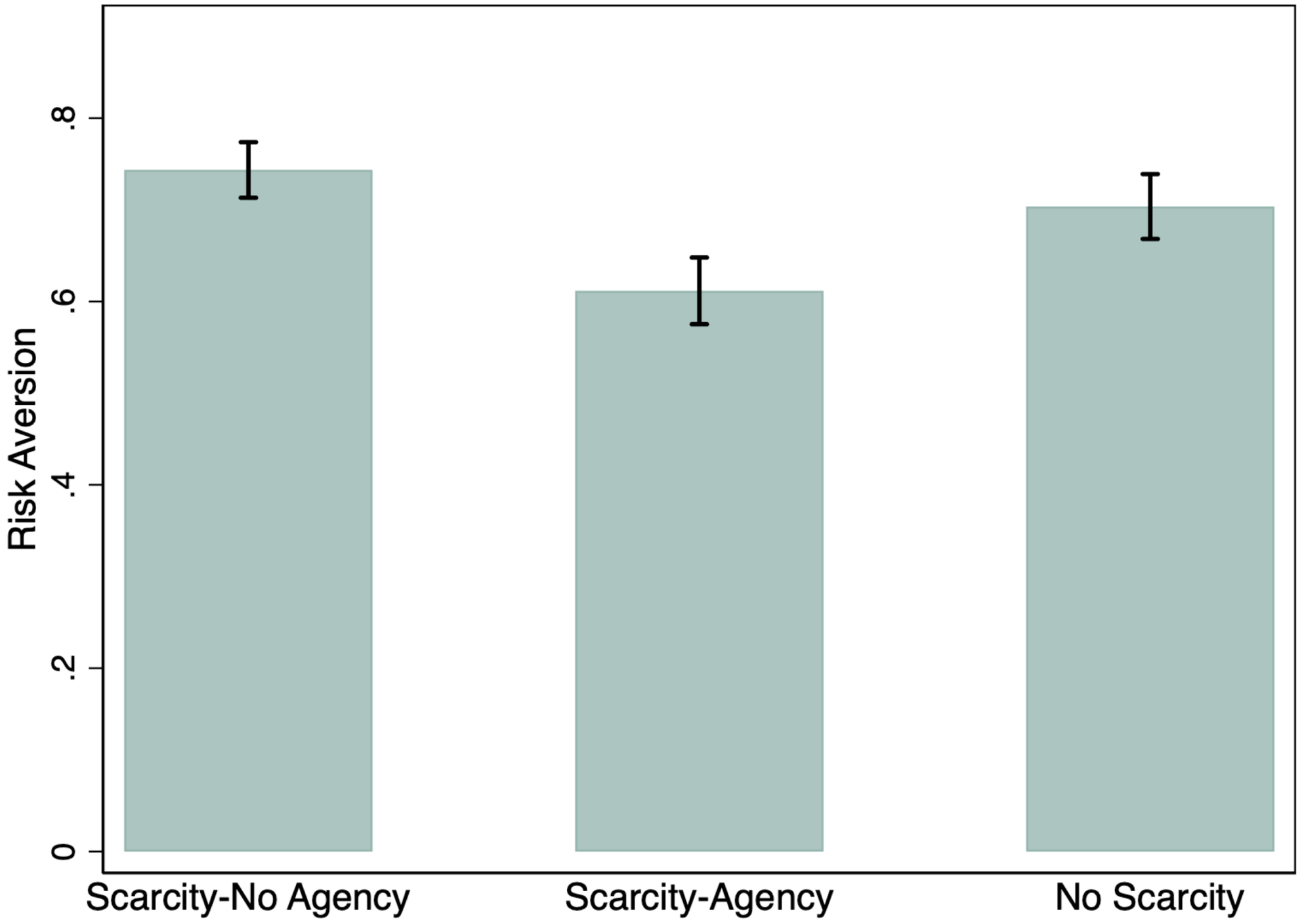


Risk preferences results



Error bars are +/- 1 SE.

Risk preferences results

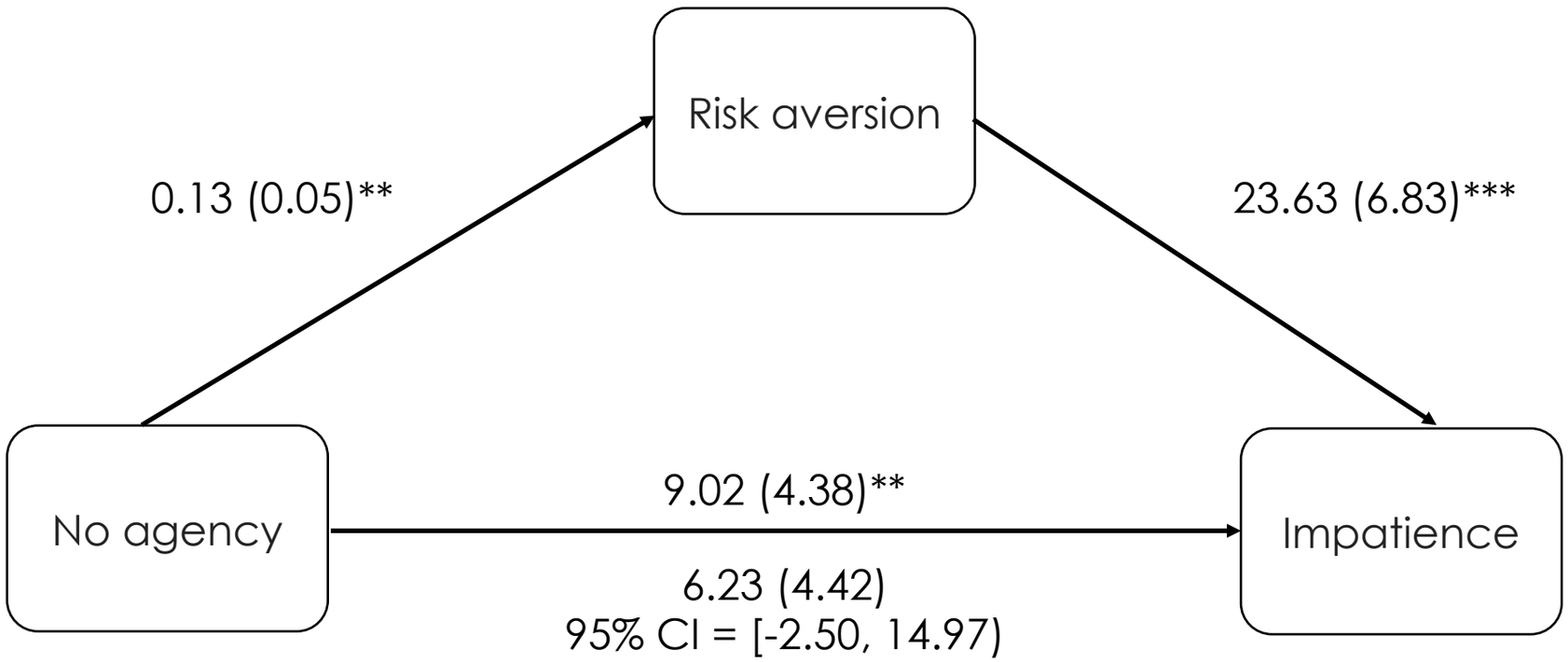


Error bars are +/- 1 SE. OLS with robust SE, No Agency versus Agency: *p*=0.006

Mediation analysis

Risk preferences mediate effect of a lack of agency on impatience

- ~30% of the effect of lack of agency on impatience is explained by shift in risk preference



Scarcity groups only. Regression coefficients are unstandardized; robust SE clustered at participant ID level in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Robustness

Scarcity-Agency and Scarcity-No Agency groups…

- …answered the same number of cognitive aptitude questions (*p*=0.49)
- …earned the same amount from the cognitive aptitude questions (p=0.53)

→ Rule out ego depletion and income effects as alternative explanations

Results are robust to:

- Excluding risk preferences questions that capture a tradeoff between certainty and uncertainty
- Controlling for performance on comprehension check

Lee bounds

4 out of 69 (6%) of Ps in the Scarcity-Agency group chose to exercise their agency (get more time)

This introduces a potential self-selection concern

To address this, we calculate Lee bounds, which give us a conservative estimate of our treatment effects (Lee, 2009)

Results: 95% CI does not include 0 for either DV

- Time preferences: (0.32, 16.91)
- Risk preferences: (0.04, 0.25)

Study 1b: manipulation check

Objective: test whether agency manipulation influenced perceived agency (as opposed to e.g., trust in experimenter or negative affect) using a behavioral measure

Study 1b

Original conditions: Scarcity-No Agency, Scarcity-Agency, No Scarcity

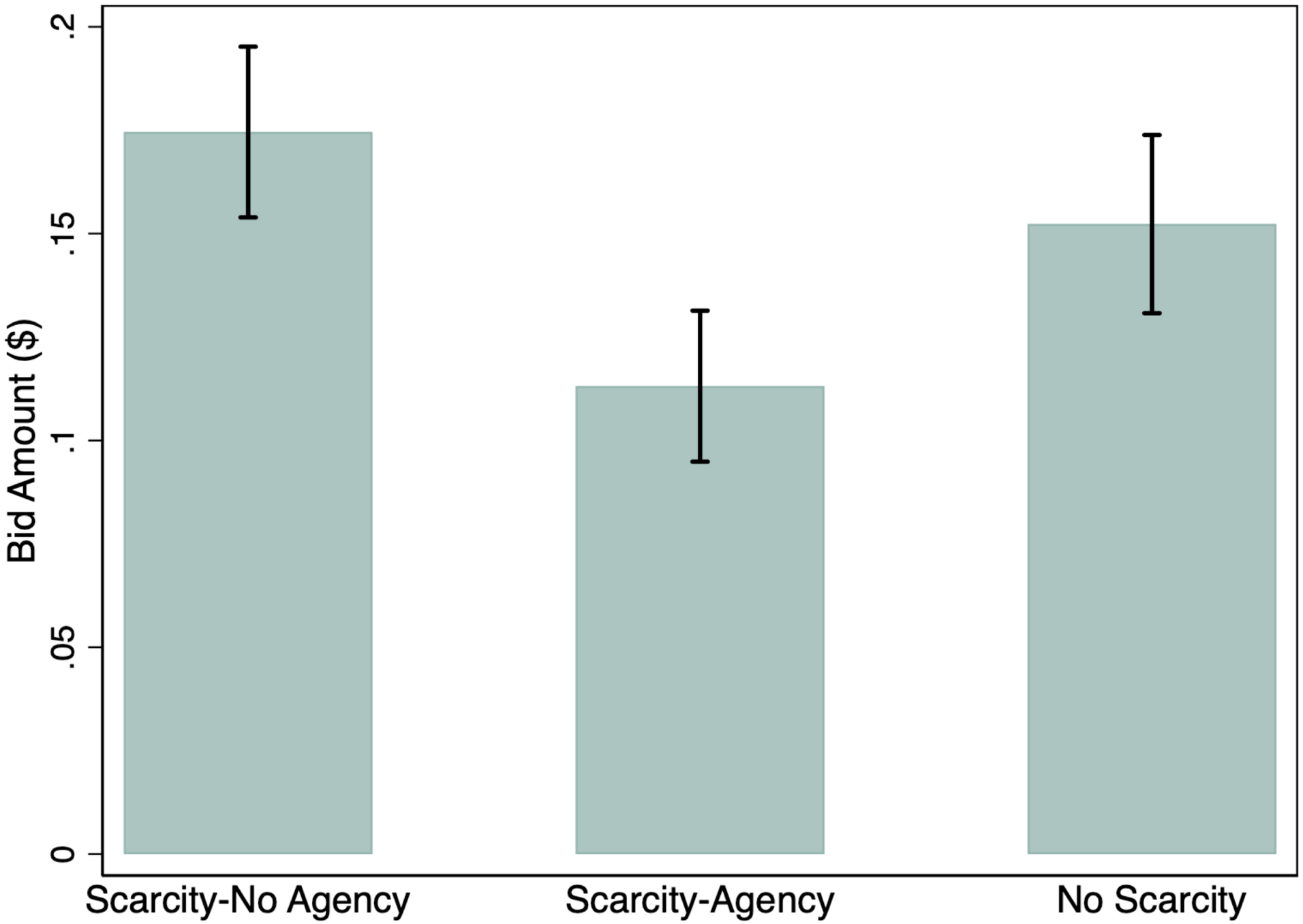
N=221

Same design as Study 1, except:

- No time/risk preferences DV
- Instead, elicit willingness to pay (WTP) to exert control over environment (Langer, 1975)
    - Coin flip, where P gets a $1 bonus if the coin lands on a particular side of the coin
    - Elicit WTP to pick which side of the coin results in the P winning ($0 - $0.50)
    - WTP deducted only if the P wins the coin flips
- Also elicit negative affect and trust in experimenter (via survey)

Hypothesis: The Scarcity-No Agency group will have higher demand for agency (higher WTP) than the Scarcity-Agency group

Demand for agency



Error bars are +/- 1 SE. OLS with robust SE, No Agency versus Agency: p=0.03. No effect on negative affect or trust in the experimenter (all p's > 0.125).

Study 1 summary

A comparative lack of agency leads to:

- Greater risk aversion
- Greater impatience

Scarcity alone does not seem to shift preferences

Study 2

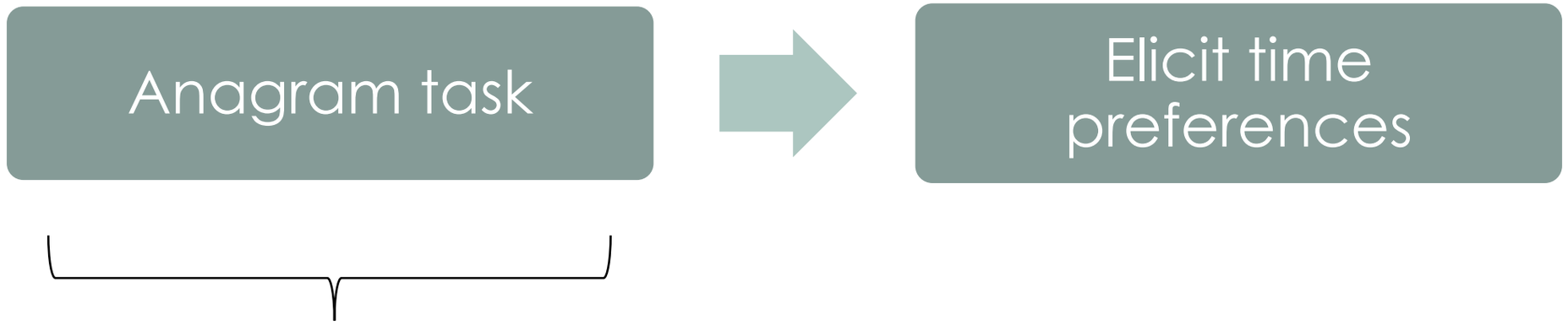
Objective: test whether the effect of agency on time preferences generalizes to another form of adversity

- An environmental stressor

Undergrads (N=115)

Class credit, plus 1 in 10 randomly chosen to receive $20

Study 2 design



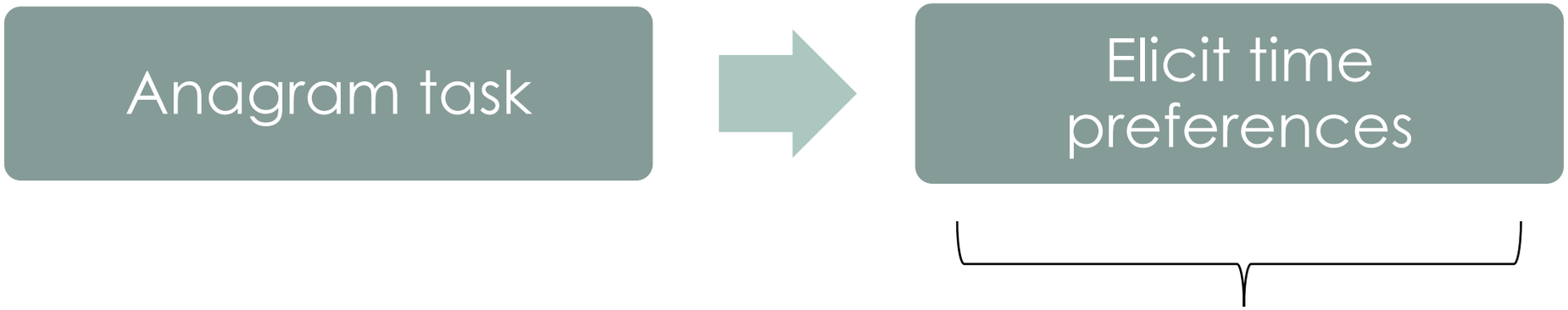
Ps solve anagrams while wearing headphones

Agency manipulation: classic agency paradigm (Alloy & Abramson, 1982)

- All Ps listen to a loud, unpredictable noise
- No Agency: must keep headphones on
- Agency: could remove headphones for 50% of potential $20
  - Increases choice set size
  - High cost discourages removal

→ Thus, all Ps experience the same environmental stressor, but some have option to alleviate it

Study 2 design



27 hypothetical choices between smaller-sooner vs. larger-later reward (Kirby, Petry, & Bickel, 1999)

E.g., "Would you prefer $14 today or $25 19 days from now?"

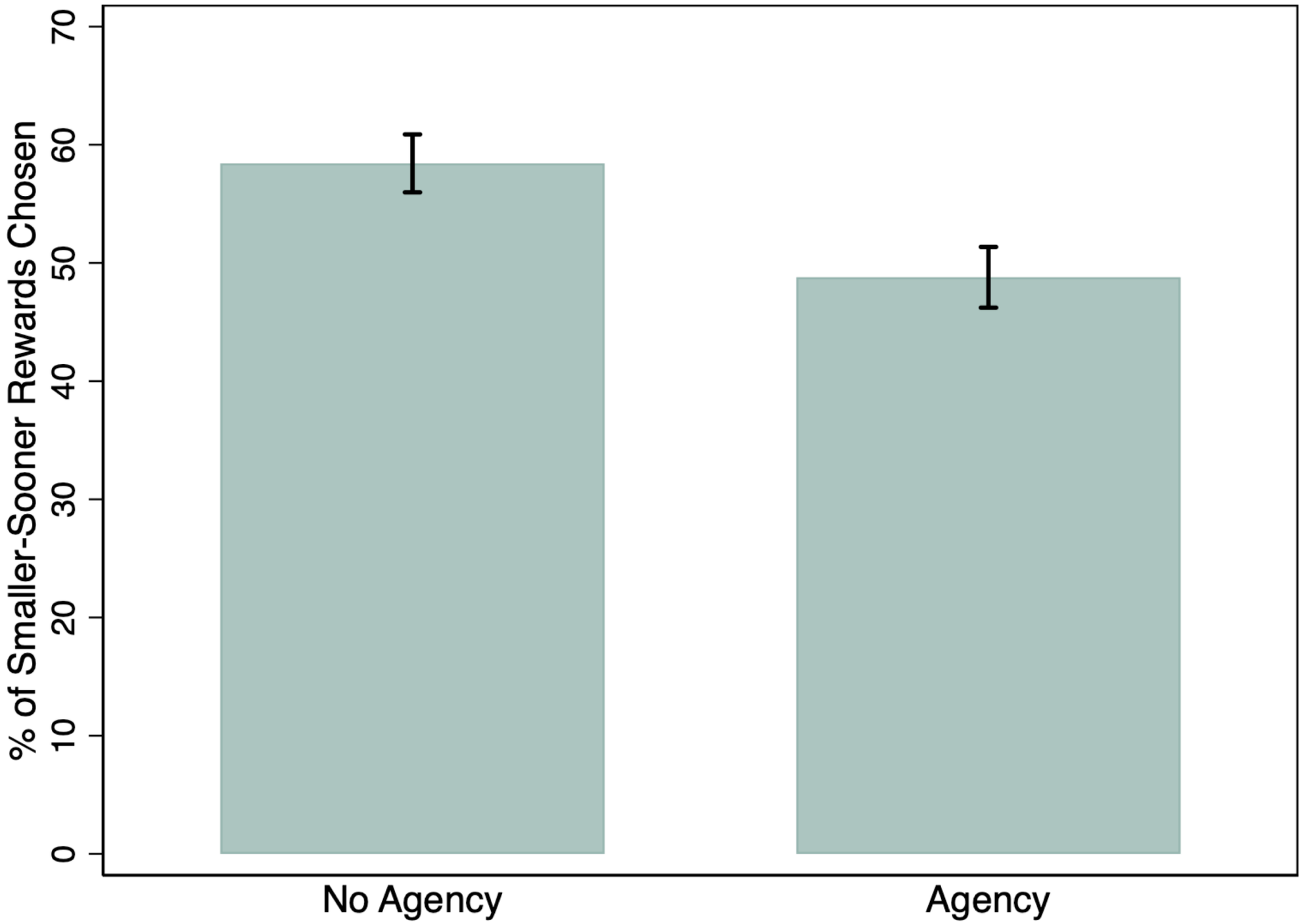
DV: % of questions where the participant chose smaller-sooner reward

Study 2 results

2 Ps took off headphones (both in Agency condition)

Agency and No Agency groups solved the same number of anagrams (p=0.13)

Time preferences results



Error bars are +/- 1 SE. OLS with robust SE, p=0.008. Mann-Whitney U test, p=0.015

Robustness

Results are robust to:

- Intent-to-treat analysis including the 2 Ps who took off headphones (all *p*'s < 0.018)
- Non-parametric analysis:
    - Discount parameters:
        - No Agency: 0.015
        - Agency: 0.007
- *p*=0.008

Study 2b

Objective: test whether the agency manipulation affects perceived agency

Study 2b: manipulation check

Conceptually equivalent to Study 1b

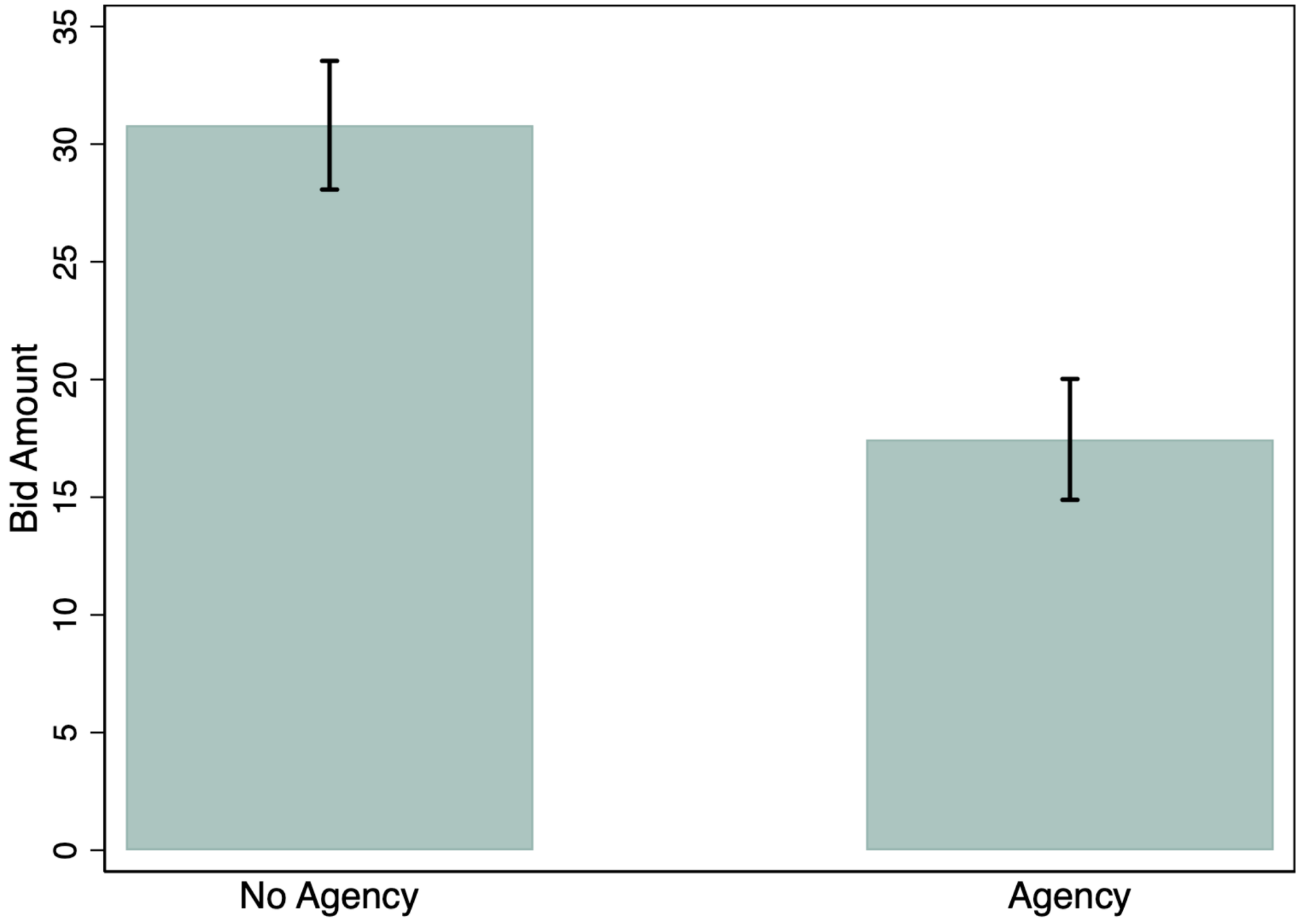
The two conditions from Study 2 (No Agency & Agency)

N=92

Instead of eliciting time preferences, elicit WTP to choose the "winning side" of a coin flip (exert control over the environment)

Hypothesis: No Agency group will have a higher WTP than the Agency group

Demand for agency



Error bars are +/- 1 SE. OLS with robust SE, p=0.001

General discussion

Relative to not having agency, agency over adversity

- Decreases risk aversion
- Decreases impatience

…even though agency was not exercised

Simply *knowing* that one has agency is enough to generate these effects

Theoretical contribution

First paper to disentangle whether adversity alone or adversity coupled with a lack of agency shifts preferences

- We show that agency has a significant impact on preferences

Qualify existing literature on scarcity / adversity

Policy implications

Programs that promote agency may help break cycles characterized by a lack of agency and exacerbated by impatience

- E.g., poverty

Increase educational attainment and healthy eating

Decrease crime and superfluous spending

Thank you!

Questions & comments welcome:

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Extras

Study 1

Study 1 time preference instructions

Instructions

In the next section, you will be asked to make two decisions about how to divide a set of 100 tokens between two dates. Your earnings will depend on these choices.

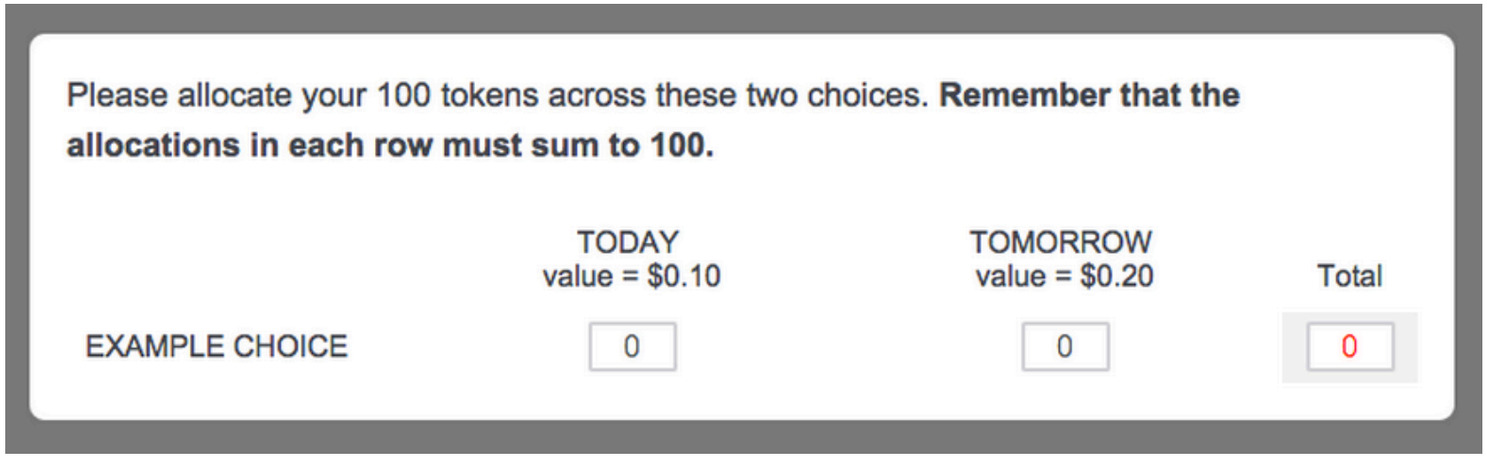
The tokens you allocate to the later date will always be worth more money than the tokens you allocate to the earlier date. This process is best described by an example.

The decision on the screenshot below shows the choice to allocate 100 tokens between two dates: today, and tomorrow. In this decision, each token you allocate to today is worth $0.10, while each token you allocate to tomorrow is worth $0.20.

So, if you allocate 80 tokens to today and 20 tokens to tomorrow, the value of the tokens is 80 x $0.10 = $8.00 today, and 20 x $0.20 = $4.00 tomorrow.

On the other hand, if you allocate 20 tokens to today and 80 tokens to tomorrow, the value of the tokens is 20 x $0.10 = $2.00 today, and 80 x $.20 = $16.00 tomorrow.

Please remember that your earnings will depend on your responses to these questions. One of your choices will be randomly chosen and on the specified date, you will be given a bonus equal to 1/100 of the value you allocate to that date.



Study 1 comprehension check

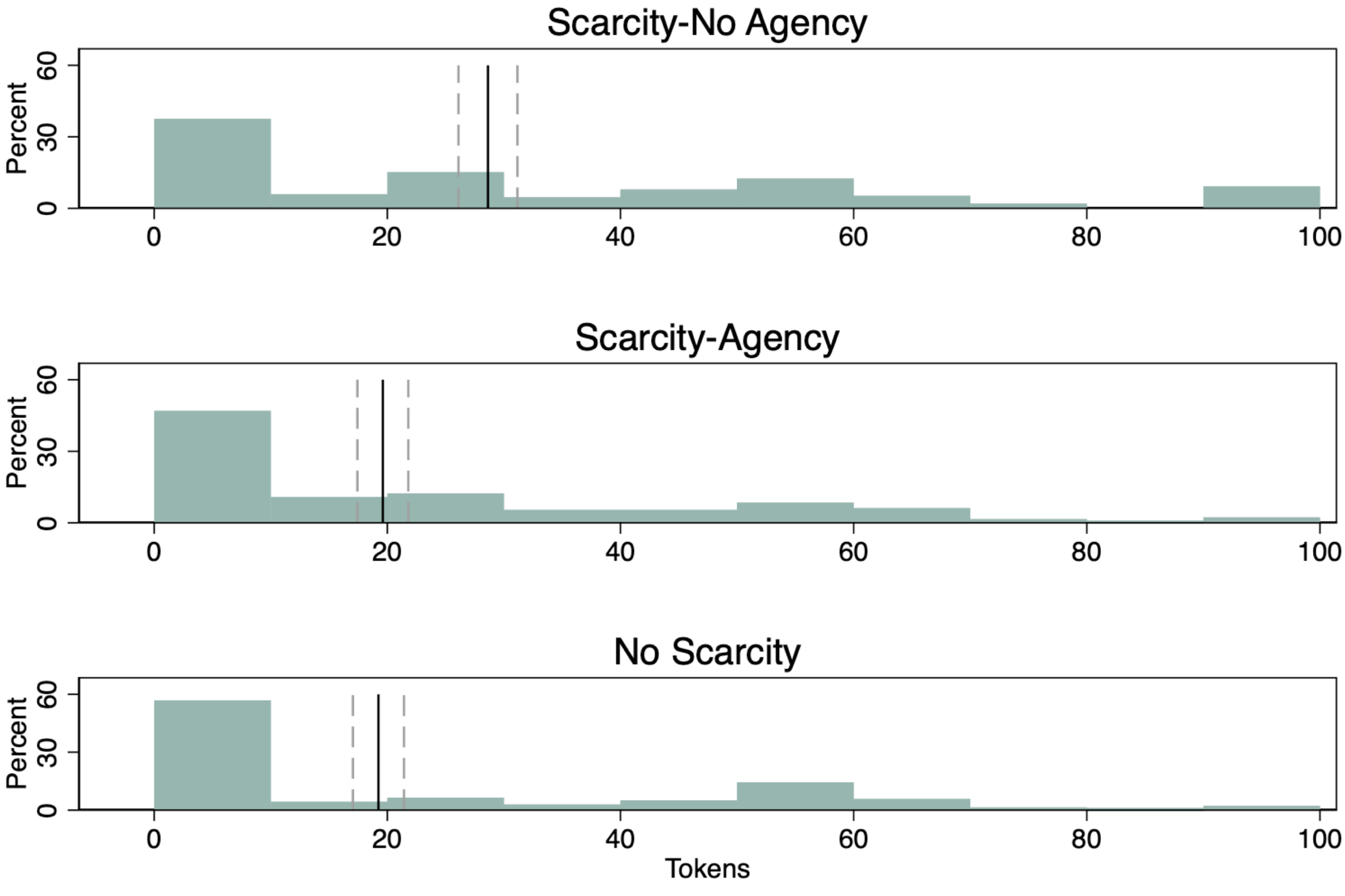
Suppose the values of the tokens are $0.20 for today and $0.30 one week from now. If you allocate 50 tokens to today and 50 tokens to one week from now, what is the value of the tokens (before we divide them by 100)?

$10 today and $20 in one week

$10 today and $15 in one week

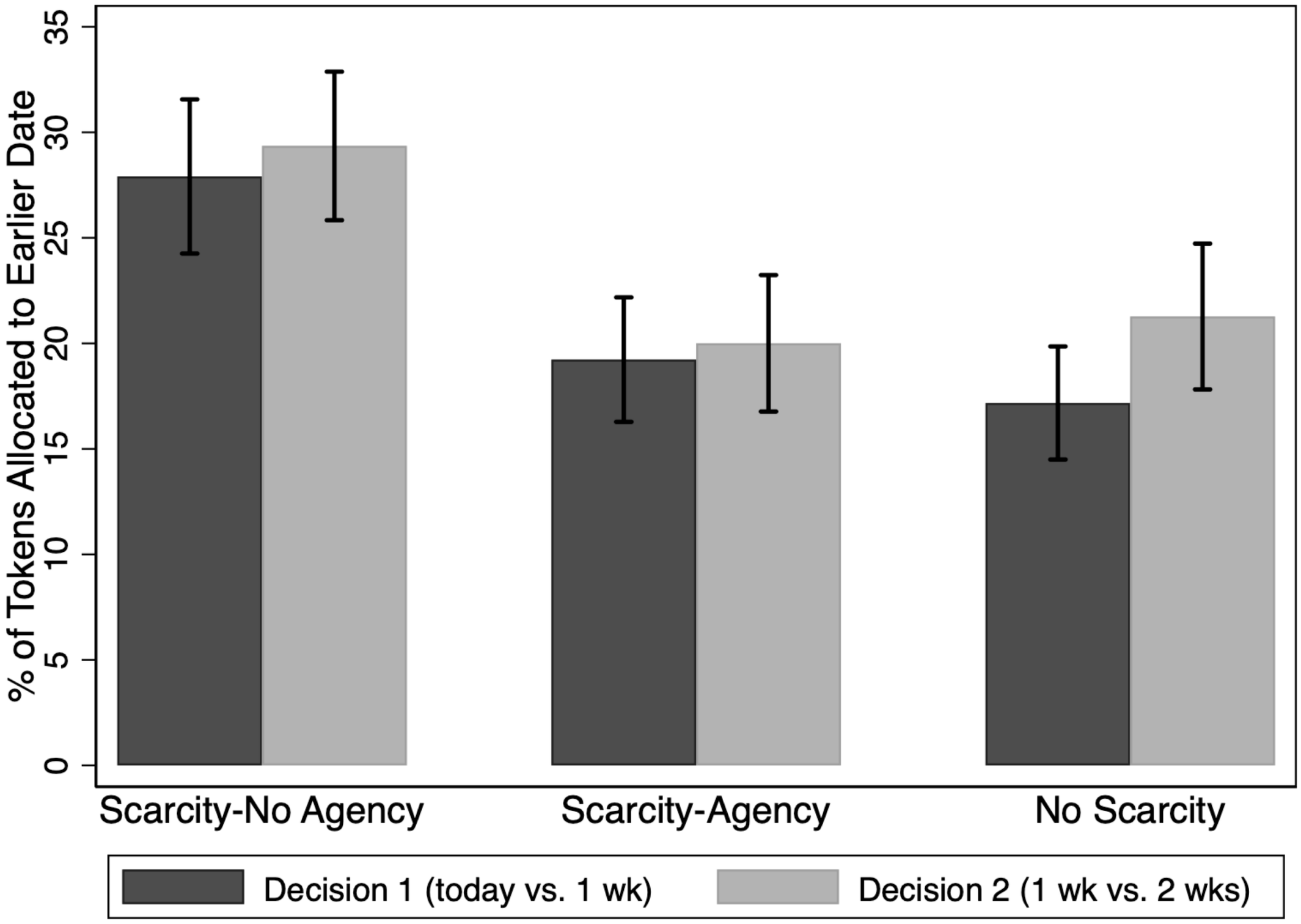
$20 today and $30 in one week

Distribution of Tokens Allocated to Earlier Dates



Black solid lines represent the mean. Grey dashed lines represent +/- 1 S.E.

Time preferences by allocation decision



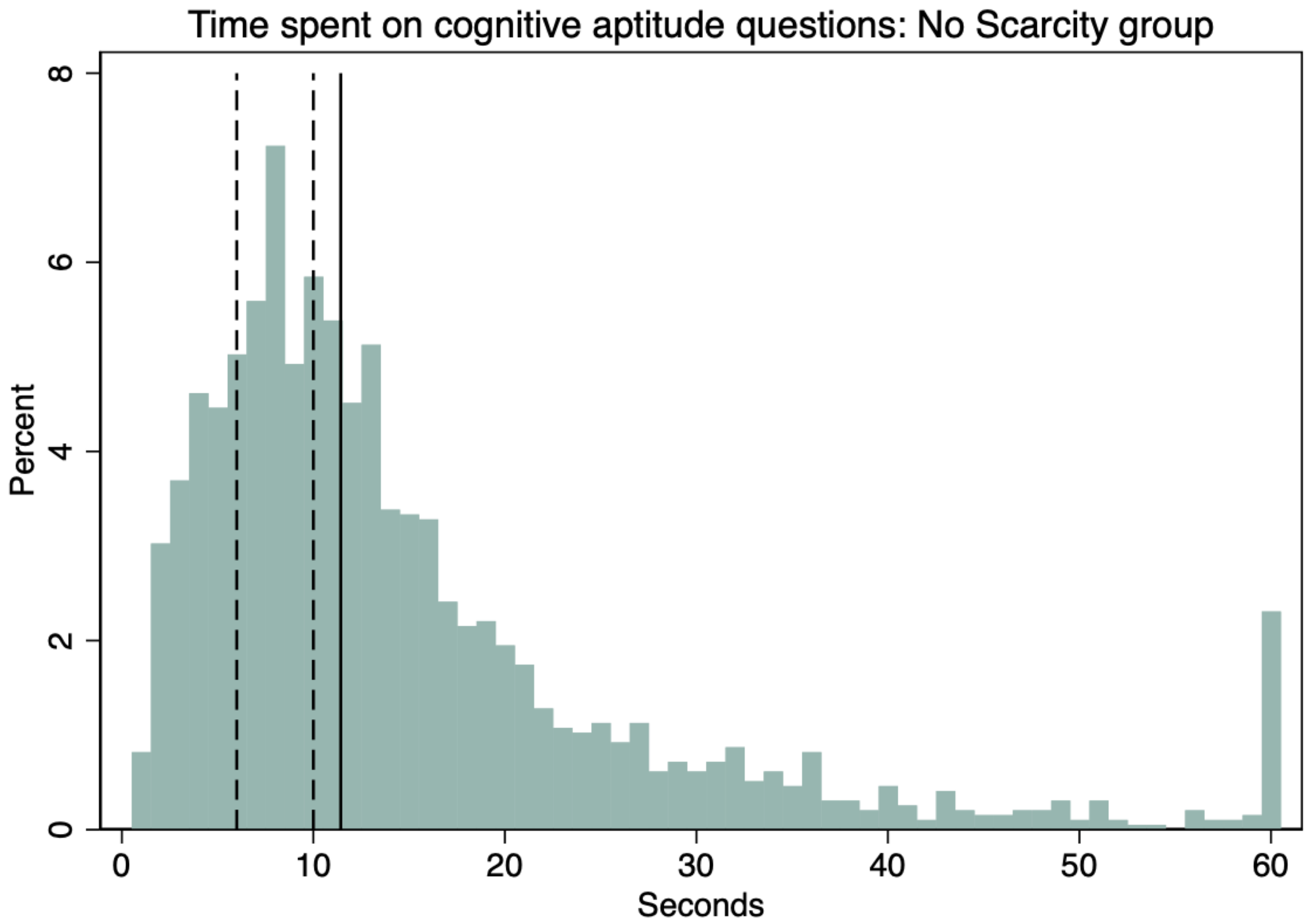
Study 1b

We will now flip a fair coin. You have the opportunity to potentially earn an additional bonus based on the outcome of the coin flip. You will have a "winning side" -- either Heads or Tails. If the outcome of the coin flip matches your "winning side," you will win an additional $1.00 bonus. If the coin comes up on the other side, you will lose and not get an additional bonus.

You have the opportunity to choose your "winning side." You will first state the *highest amount you are willing to pay to choose your "winning side*" (from $0.00 to $0.50). After you state this amount, we will choose a random number from $0.00 to $0.50. If your willingness to pay is lower than the random number, we will choose your side for you. If your willingness to pay is equal to or higher than the random number, the random number will be deducted from the bonus (should you win the coin flip) and you will get to choose your "winning side." An amount will only be deducted from your bonus if you win the coin flip.

So, the more you are willing to pay, the more likely it is that you will be able to choose your "winning side" of the coin.

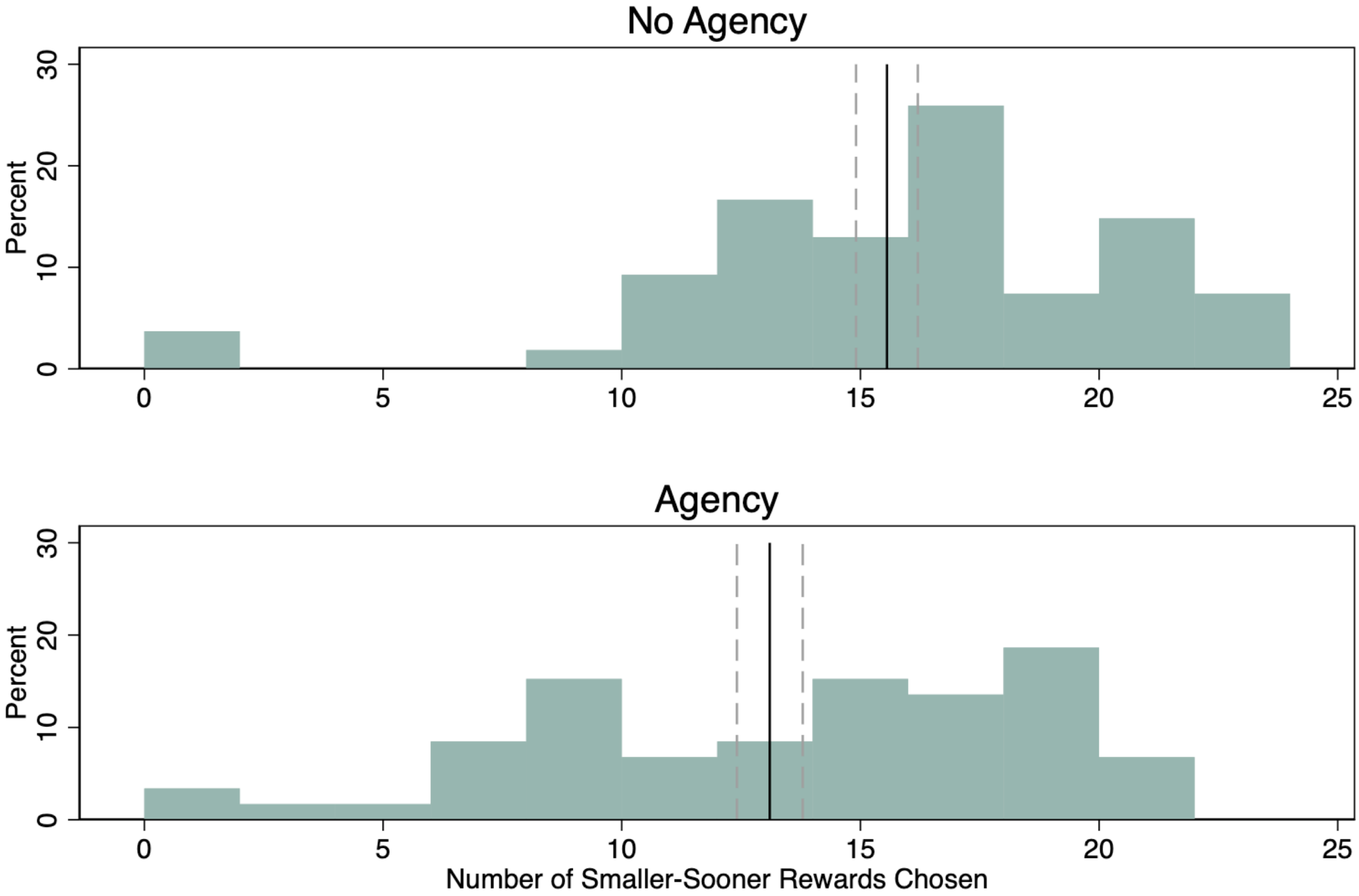
How much are you willing to pay to choose your "winning side" of the coin? *(Sliding scale $0.00-$0.50)*



Black solid line represents the median. Dashed lines are at 6 and 10 seconds.

Study 2

Distribution of Smaller-Sooner Rewards Chosen



Black solid lines represent the mean. Grey dashed lines represent +/- 1 SE.