Financial Education and the Quality of Decision Making

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Introduction

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- Financial education seeks to improve decisions by helping consumers understand connection between choices and consequences
  - Efforts to deploy at multiple levels (high school, workplace, community)
- Large and growing literature examines the effects of financial education on financial literacy (test scores) and financial choices (such as saving)
  - Bernheim, Garrett, Maki (2001): high school financial education mandates
  - Bernheim & Garrett (2003), Duflo and Saez (2003): financial education in the workplace
  - Many subsequent studies; evidence is mixed (see Lusardi and Mitchell, 2014, Hastings, Madrian, & Skimmyhord, 2013)

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- Yet it is also possible that financial education alters behavior through other mechanisms: *indoctrination, exhortation, deference to authority, social pressure, and/or psychological anchors*
- If so, it may induce people to act contrary to the preferences they themselves would reveal (through choices) if they properly understood the consequences of their actions.

Contributions of the research agenda:

- ***First***, introduce a new approach to evaluating the quality of financial decision making
  - Ambuehl, Bernheim, and Lusardi (2015), "The Effect of Financial Education on the Quality of Decision Making"
  - Involves a precise concept of *financial competence*
  - Firmly rooted in the principles of *behavioral welfare economics* (Bernheim and Rangel, 2004, 2009).
  - Non-paternalistic, quantitatively precise, modest information requirements, easily implemented

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- ***Second***, document empirically the importance of assessing and analyzing financial competence, rather than relying exclusively on conventional outcome measures
  - Ambuehl, Bernheim, and Lusardi (2015), "The Effect of Financial Education on the Quality of Decision Making"
  - Ambuehl, Bernheim, Ersoy, and Lusardi (in progress), "Financial Education and the Quality of Portfolio Allocation"
  - The interventions we study appear successful based on conventional outcome measures (financial literacy, self-reported decision strategies, directional effects on choice), but they do not improve financial competence (welfare)
  - Points to a disconnect between what people understand in principle, and what they act on: *motivational rhetoric*
  - Creates a design problem for financial education programs: attention-getting motivational material may undermine substance

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- ***Third***, examine how the social environment affects financial competence and mediates the effects of financial education
  - Ambuehl, Bernheim, Ersoy, and Harris (in progress), "Social Transmission of Financial Decision-Making Skills: The Blind Leading the Blind?"
  - Social effects are potentially critical because many people turn to friends and family for advice and assistance
  - Does communication improve the quality of financial decisions? What are the secondary effects of financial education? Are the primary effects reinforced or muted by social feedback?

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- ***Third***, examine how the social environment affects financial competence and mediates the effects of financial education
- ***Fourth***, evaluate the impact of interventions in the field on the quality of financial decision making

Financial Competence

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- Approaches we reject
  - *Standard Revealed Preference*: cannot address welfare effects of financial education (all choices are tautologically optimal in light of the preferences they reveal)
  - *Behavioral Revealed Preference*, based on educated choices: assumes the conclusion
  - *Other Behavioral Revealed Preference strategies*: forces us to shoehorn choices into a model of preferences that might or might not be correct (Song, 2015)

Notion of financial competence is based on three observations:

- ***First***, financial decisions generally involve choices among *consumption instruments* rather than consumption bundles
  - Consumption instruments are derivative goods valued only because they provide the means to secure bundles of intrinsically valued goods
  - For example, in an intertemporal setting, a consumption bundle specifies current and future consumption. Deciding how much to invest in a retirement savings account involves the choice of a consumption instrument.

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- ***Second***, there are typically *many instruments that yield the same consumption opportunities*, giving rise to equivalent decision problems

  A simple illustration:

  – $10,000 invested in an account yielding 2% per year for 36 years

  – A zero-coupon bond that pays $20,000 in 36 years

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Thus:

- Perfect financial competence requires equivalent choices from *equivalent decision problems*
- Intuitively, the divergence between choices made in equivalent decision problems reflects the *degree of financial competence*

Measuring Financial Competence

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  - Investing $10,000 @ 2% for 36 years versus receiving $Y today
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- Elicit valuations through multiple price lists

Simple and Complex Framing

Two equivalent decision problems

Complexly framed:

Complete description of the instrument

Simply framed:

Complete description of the intermediate outcome implied by the instrument:

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- e.g., Asset A: ($5, $10), Asset B: ($3, $15), Portfolio: (50% Asset A, 50% Asset B)

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- e.g., Asset C: ($4, $12)

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Based on Bernheim and Rangel (2009)

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- When it is not dark, the individual correctly understands the options and chooses the orange
- When it is dark, the individual misunderstands the options, thinks the orange is a mandarin and chooses the apple
- Characterization failure occurs when it is dark
- We can use the choices made when it is not dark to evaluate the welfare loss from the choices made when it is dark

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Working Assumption:

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Maximal Welfare Loss:

- Suppose, for equivalent options, V(s) = $13 and V(c) = $18
- If you are offered the complexly framed instrument for $15, you will buy it, incurring a welfare loss of $2
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Expected Welfare Loss:

- To a second-order approximation, proportional to $(V(s) - V(c))^2$
- With uniformly distributed prices (as in our experiment), this formula is exact

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Benefits of evaluating financial competence based on *pairs of equivalent simply and complexly framed valuation tasks:*

- Paternalistic judgments are avoided
- Yields quantitatively precise and rigorously justifiable welfare measures
- Does not require one to have the right model of behavior (in contrast to the behavioral revealed preference approach)
  - No need to construct counterfactual behavior in the complexly framed decision problem based on “true preference”
  - No need to extrapolate measures of the welfare loss (equivalent or compensating variation) based on “true preferences”
  - The approach therefore has low information/modeling requirements and is easy to implement

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Why this possibility doesn't trouble us:

- The welfare measures treat the simply and complexly framed problems symmetrically, so it wouldn't change
- The assumption can be tested:
  - Does the individual spend more time making simply or complexly framed decisions?
  - Does financial education affect the simply framed or complexly framed decisions?

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  - Testable implication: financial education should affect decisions in the complexly framed problems, not in the simply framed ones

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  - Testable implication: financial education should affect decisions in the complexly framed problems, not in the simply framed ones
- Then we are measuring the welfare loss the consumer would incur if her understanding of the relationship between intermediate outcomes and consumption bundles were correct.
  - Does not measure the overall welfare loss, but does tell us how the misunderstanding of the relation between complexly framed instruments and intermediate outcomes contributes to that loss

Applications

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- Brevity is a design constraint
  - Fernandes et al. (2014): Typical financial education intervention involves less than 10 hours of instruction in total
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- Focus on simple, memorable, and potentially useful heuristics accompanied by highly motivating messages
  - Possibly optimal given the constraint of brevity

Intervention #1: Compound Interest

Ambuehl, Bernheim, and Lusardi (2015)

- Core topic in most financial education courses

- Generally taught in very short modules focusing on heuristics and simple motivational messages, and hence suitable for limited experimental intervention

- Addresses a known bias (*exponential growth bias* -- Eisenstein and Hoch, 2007, Stango and Zinman, 2009, Levy and Tasoff, 2014)

A preview of the findings:

- Based on conventional measures, the intervention appears to achieve the right effects for the right reasons:
  - Financial literacy increases significantly
  - People report that they use their improved knowledge when making their choices
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- Based on conventional measures, the intervention appears to achieve the right effects for the right reasons:
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- However, the intervention does not improve financial competence (welfare). Reasons:
  - Notwithstanding the above, the effect on behavior results from motivational rhetoric, not substance
  - The impact is indiscriminate, and not related to the initial bias

Structure of Experiment

1. Initial financial literacy quiz
2. Educational intervention
3. Decision problems
4. Survey questions, including test on compound interest

Financial education intervention

- Section on compound interest from a leading book on personal financial decision making
  - Malkiel and Ellis, *The Elements of Investing: Easy Lessons for Every Investor*
  - Widely used
  - Standard treatment of compound interest, with simple examples
  - Short, extremely well-exposited
  - “Naturalistic” intervention
- Presented as a video (narrated slides) in the style of Khan Academy

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- Rhetoric and exhortations
  - Quotes, e.g. “Albert Einstein is said to have described compound interest as the most powerful force in the universe“
  - Examples in which relatively small initial investments grow to millions of dollars (calculations not included)
  - Exhortations, e.g. “The power of compounding is why everyone agrees that saving early in life and investing is good for you."

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- So we have four treatment groups:
  - Full intervention
  - Substance-only intervention (no rhetoric)
  - Rhetoric-only intervention (no rule of 72)
  - Control (video based on unrelated material from same book)

Decision problems

- Elicit valuations for 20 future rewards (10 pairs)
  - Simple framing: “We will pay you $20 in 72 days”
  - Complex framing: “We will invest $10 at an interest rate of 1% per day. Interest is compounded daily. We will pay you those proceeds in 72 days.”

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- Some details:
  - Time horizon is either 36 or 72 days (simplifies application of the rule)
  - Order randomized at the individual level
  - Paired problems are not identified as such
  - Elicited using (iterated) multiple price lists

Multiple price list (complexly framed version)

	you will get the specified dollar amount within two days from today	we will invest $2 in an account with 5% interest per day. Interest is compounded daily. We will pay you the proceeds in 36 days.
$20	◉	○
$18	◉	○
$16	○	◉
$14	○	◉

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$ 17.8	○	○
$ 17.6	○	○
$ 17.4	○	○
$ 17.2	○	○
$ 17	○	○

Test on compound interest

- Incentivized
- 5 questions, e.g.
  - If someone tells you an investment will double in four years, what rate of return (per year) is he promising? 15%, 16%, 17%, 18%, 19%, 20%
  - If an investment grows at 8% per year (interest is compounded annually), how much has it grown in four years? 30%, 31%, 32%,…, 40%

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Self-reports about decision process

- Whether used the Rule of 72
- Whether used mathematical calculations
- Whether obtained help

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  - Lower income
  - More highly educated, with higher financial literacy
  - Slightly more likely to be employed
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- Advantageous features for out purposes
  - Over-represents some target populations (young, low income)
  - Highly motivated by rewards

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- Time preferences (based only on simply framed choices)
  - Not significantly different across treatments
  - Mean discounts rates:

    36 days: 76.7%

    72 days: 70.6%

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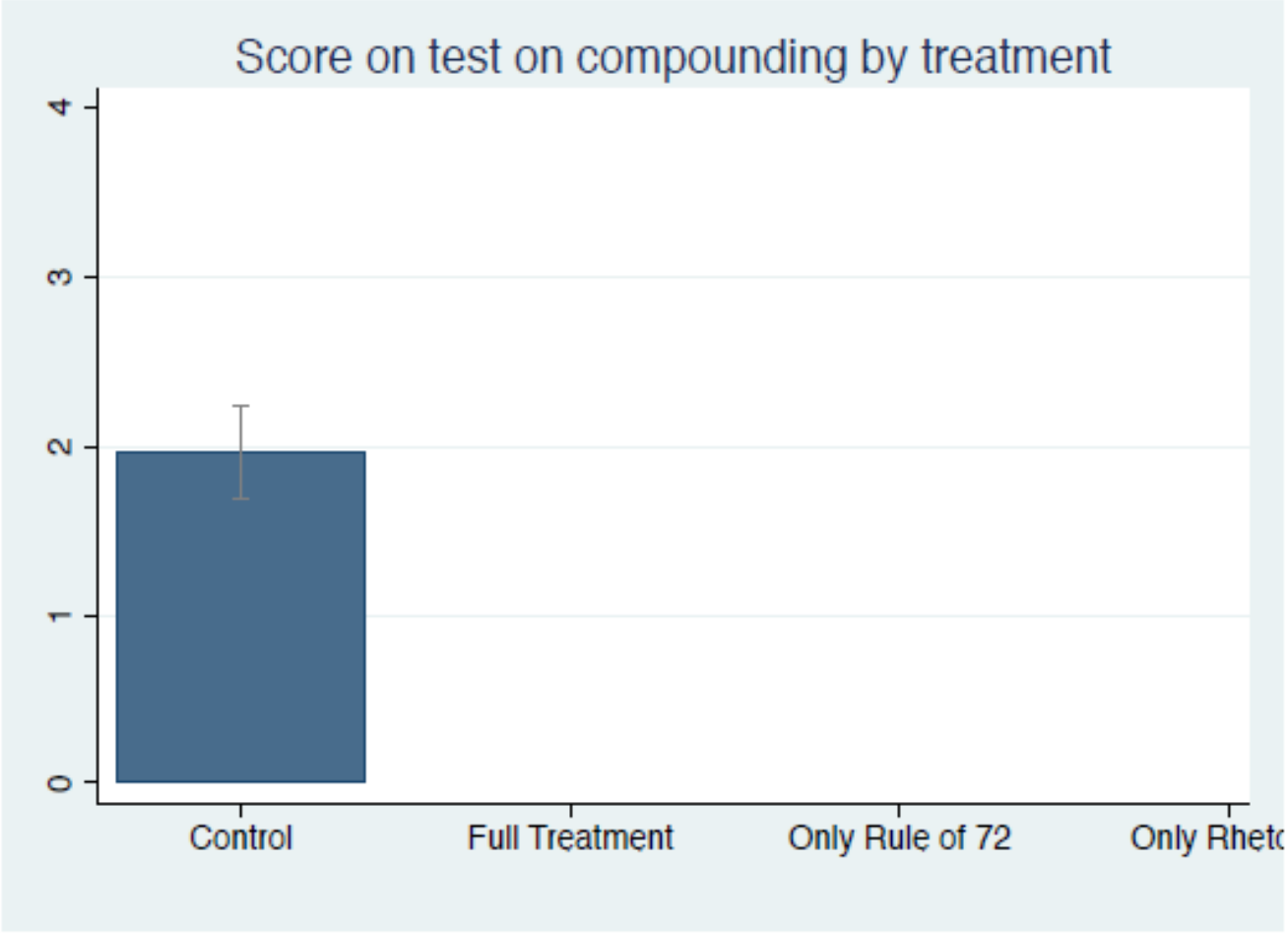
- Allows for population heterogeneity with respect to effects of education

Test Scores


Score on test on compounding by treatment
0
1
2
3
4
Control
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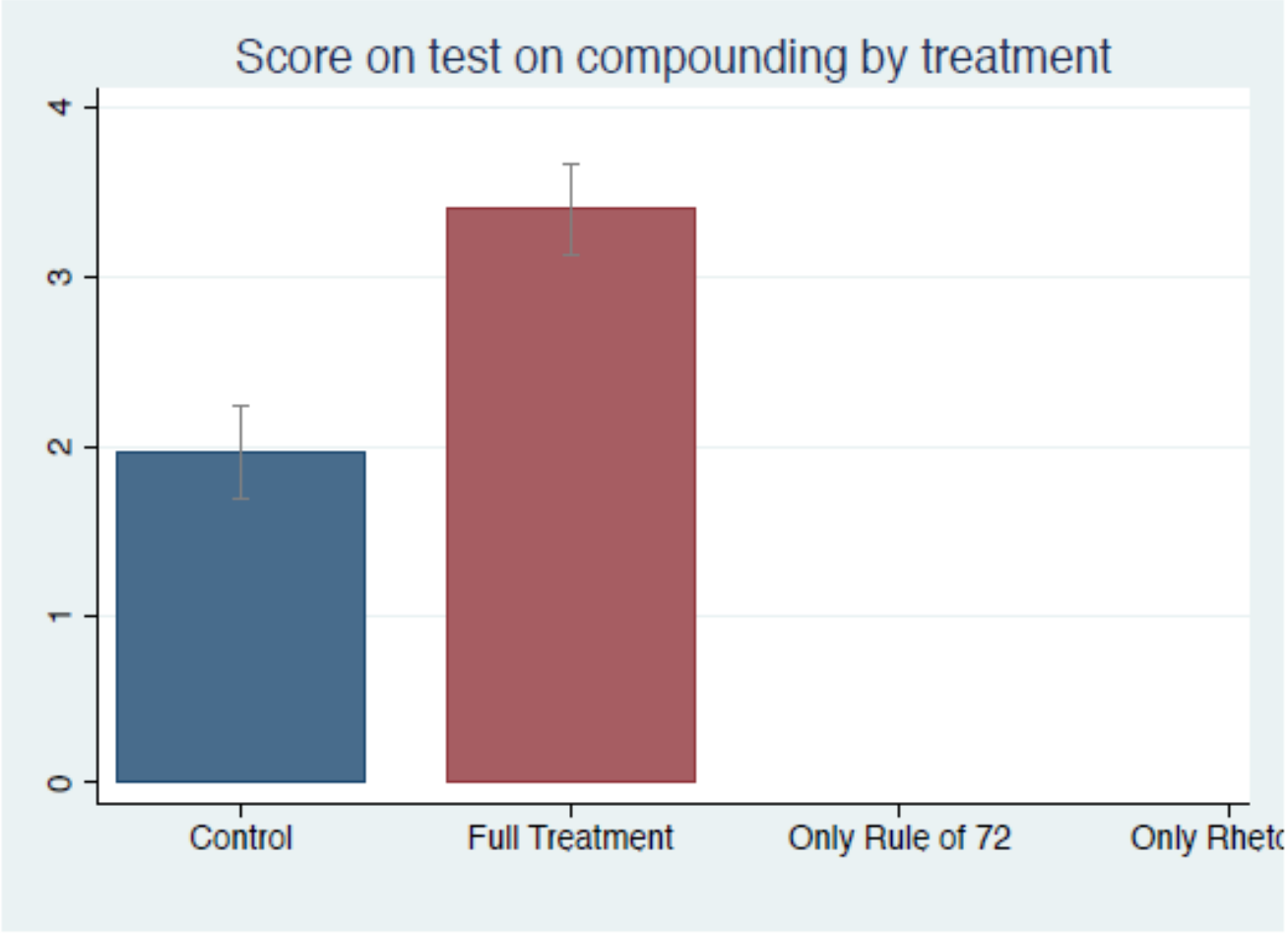
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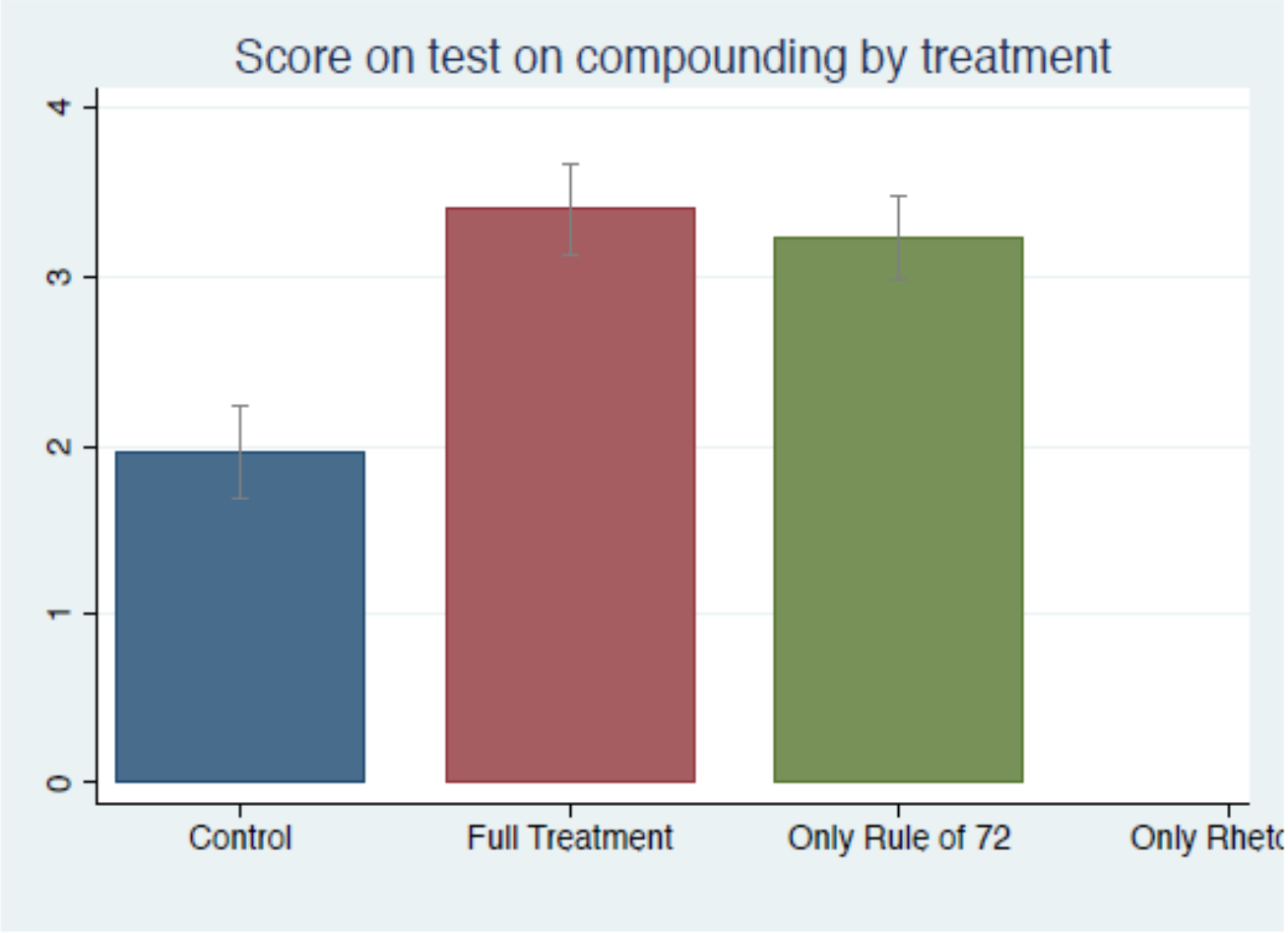
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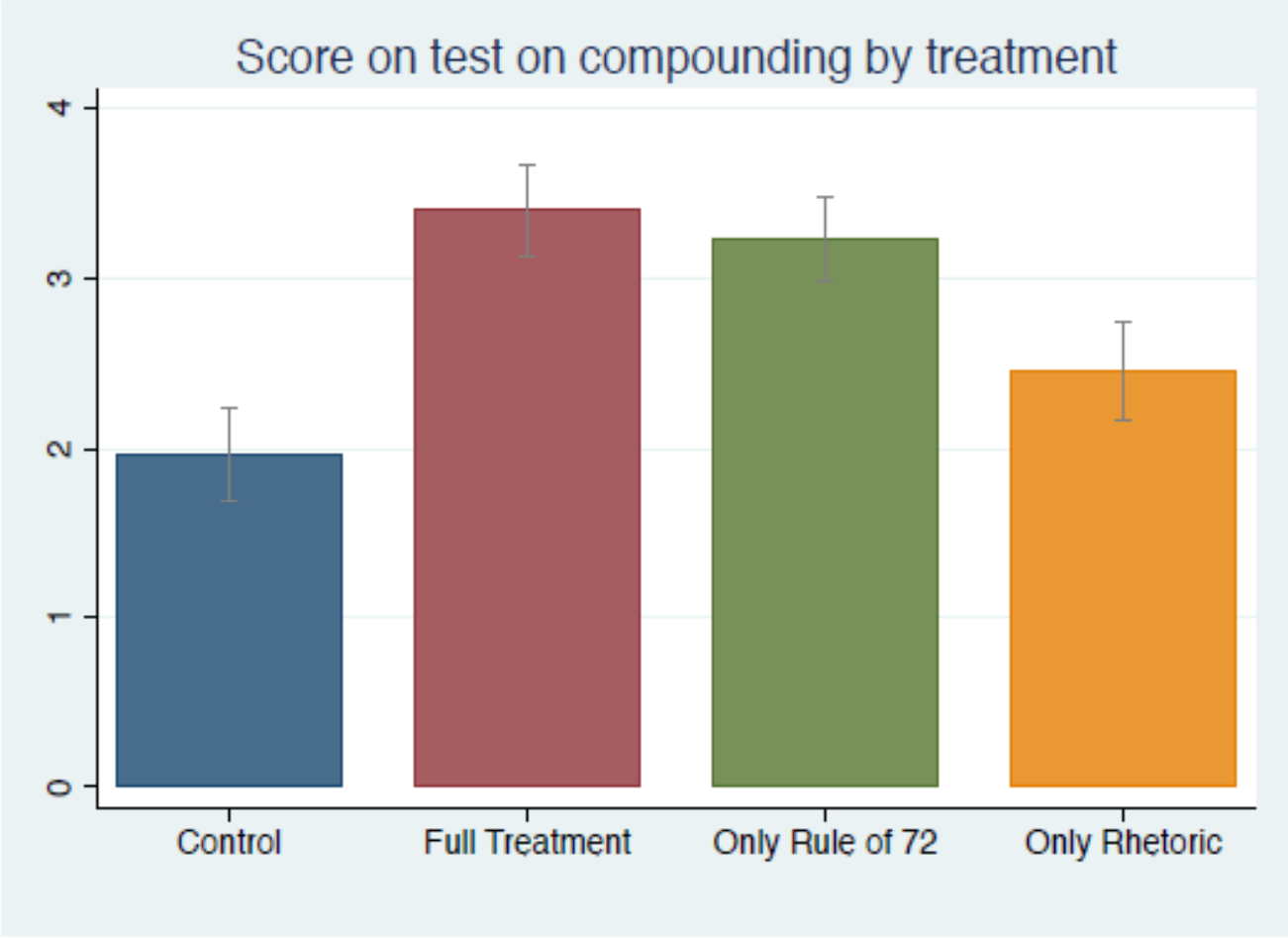
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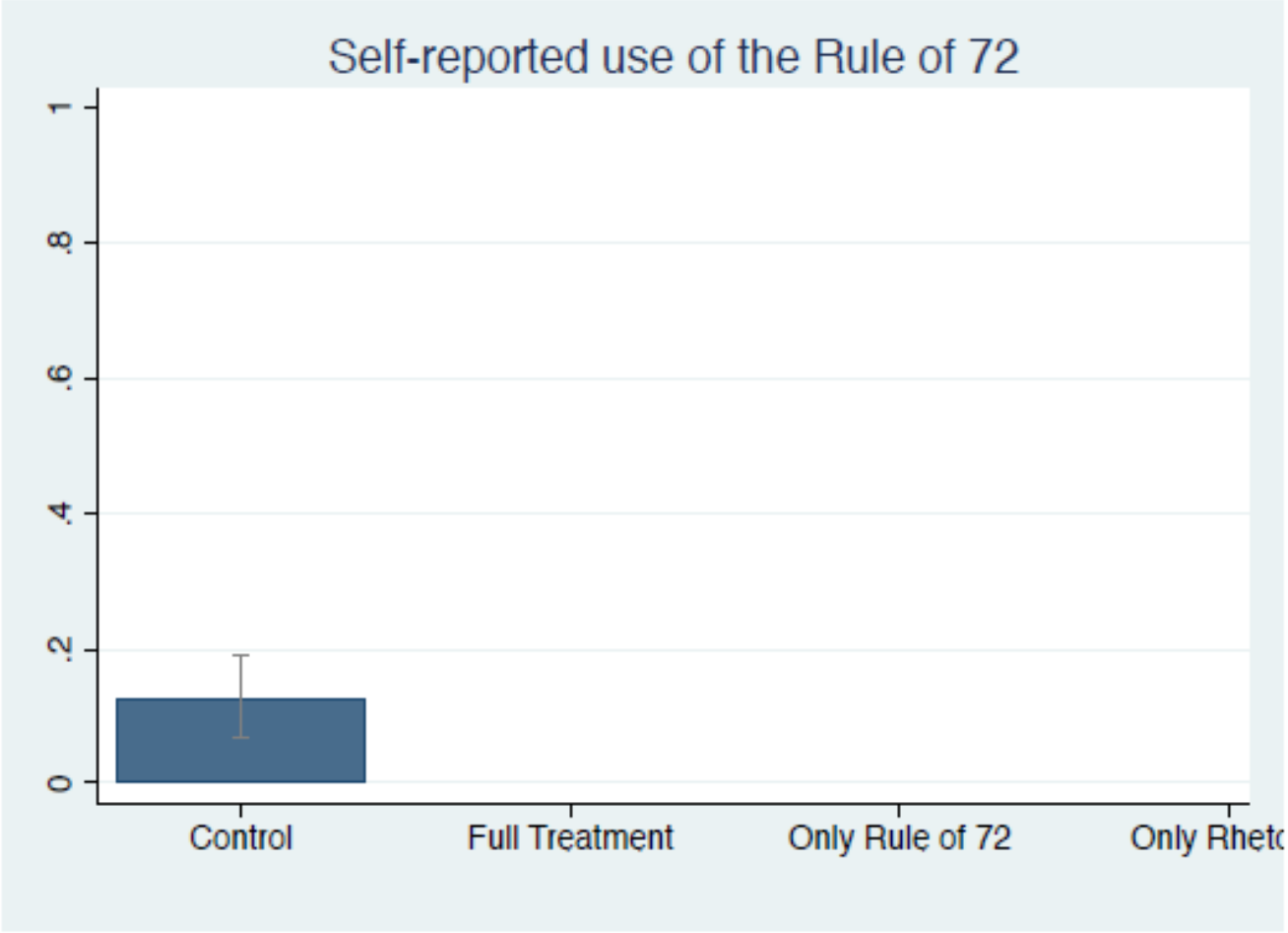
Self-reported use of the rule of 72 for complex framing



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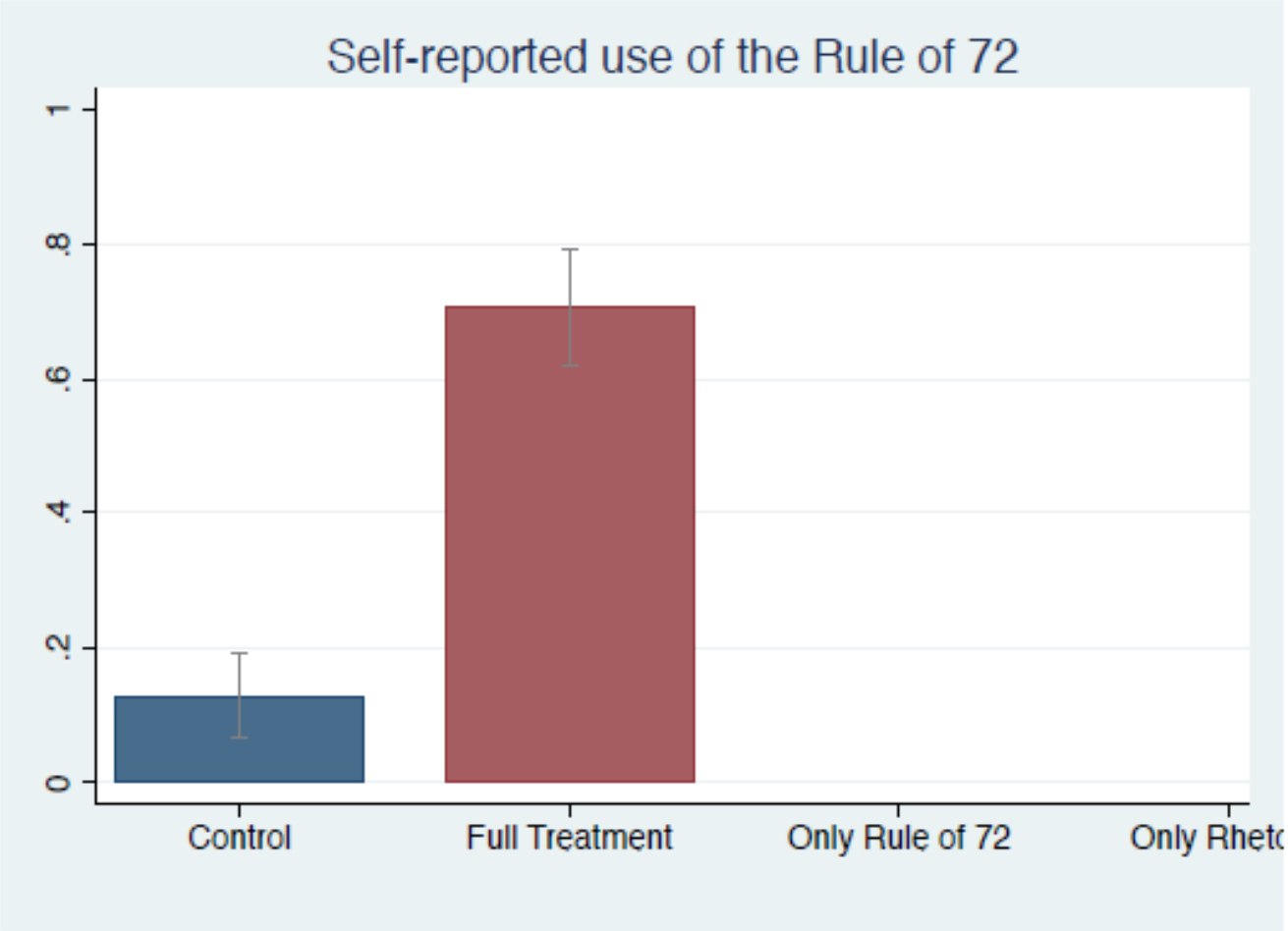
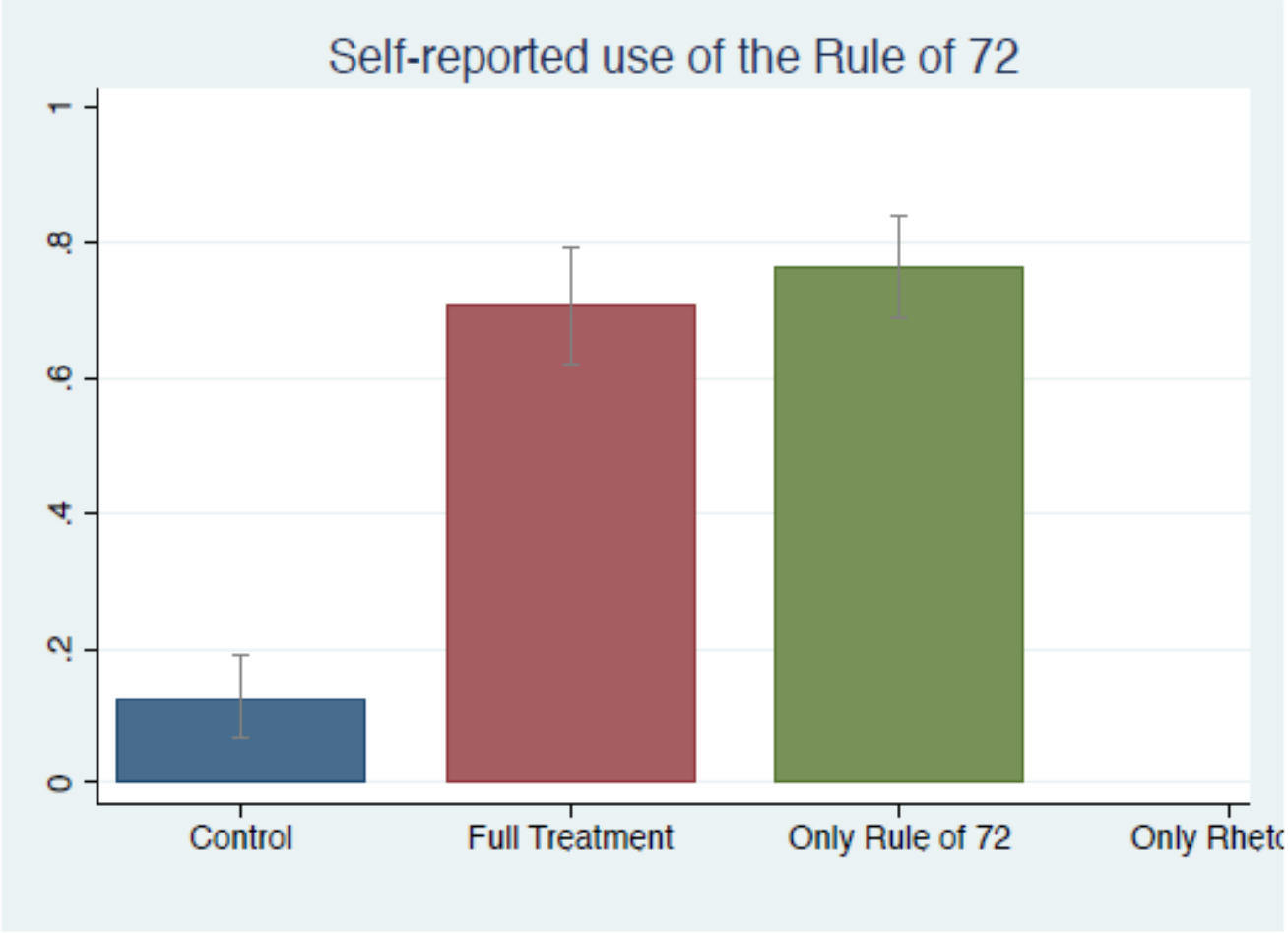


Self-reported use of the rule of 72 for complex framing



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Some related findings

- Results for “using explicit calculations” is very similar to results for “using Rule of 72”
  - Effects for full and substance-only treatments are large, significant, and about the same
  - Effect for rhetoric only treatment is small and insignificant
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- Use of external help was low in the control group (around 20%), and was not affected by the treatments
  - Financial literacy is therefore relevant (because people are not turning to authoritative sources)
  - Education does not displace advice

Average framing distortion

- Define the *discount factor* as the ratio of current value to future value

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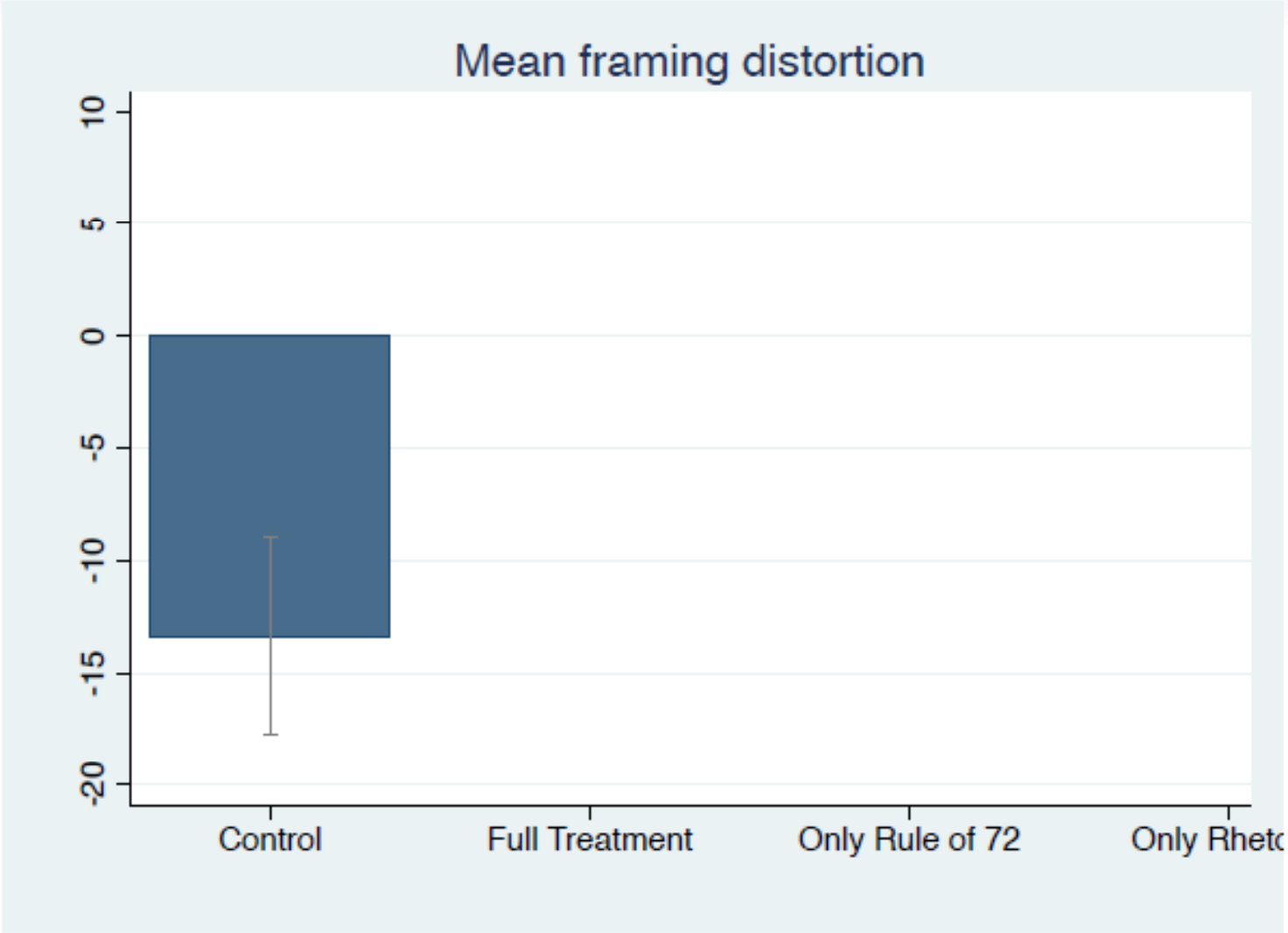
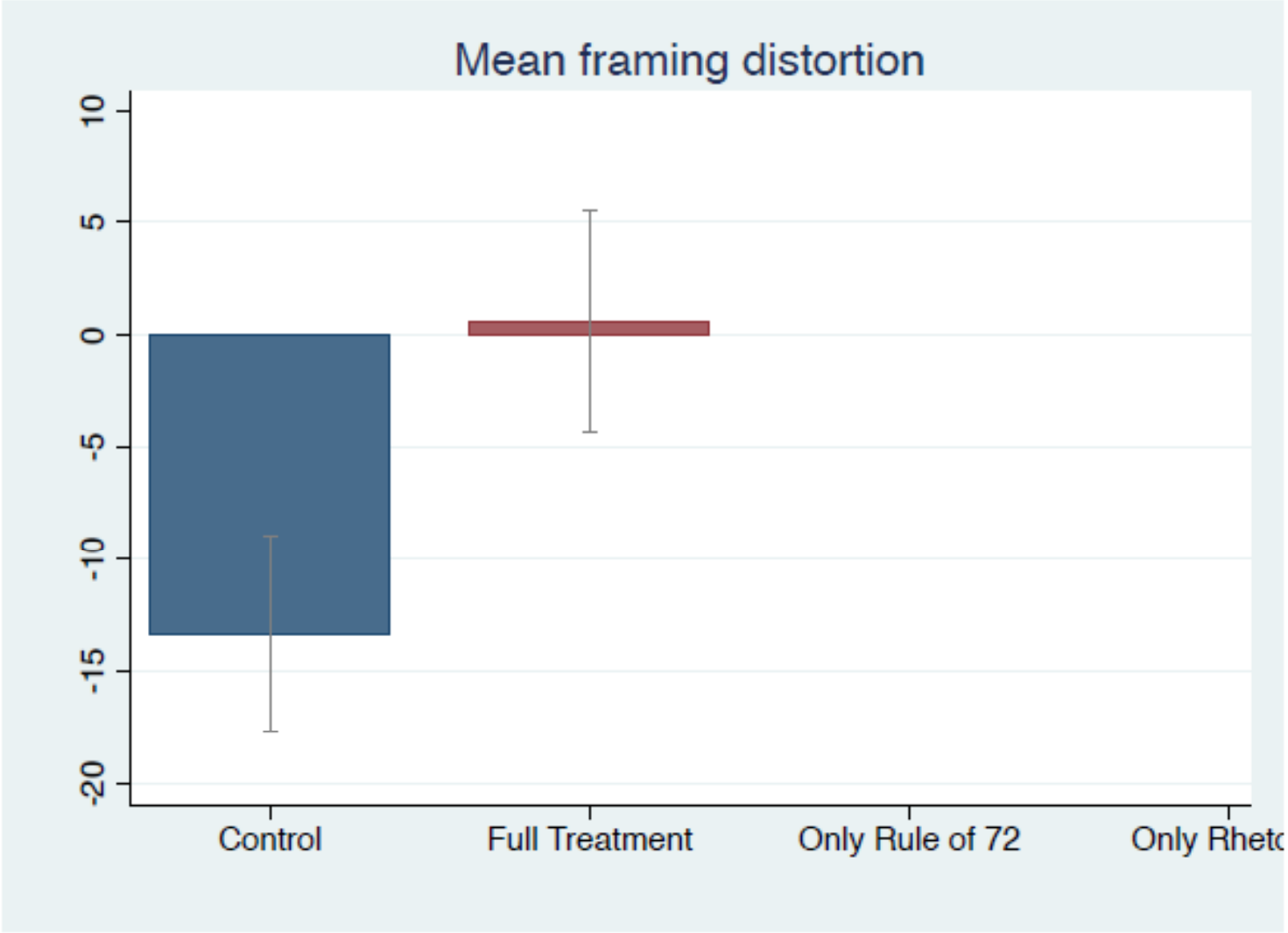
- The *framing distortion* is $d_c - d_s$

- For someone who underappreciates compound interest (suffers from exponential growth bias), the framing distortion will be negative



(pooled over time horizons)


Mean framing distortion
10
5
0
-5
-10
-15
-20
Control
Full Treatment
Only Rule of 72
Only Rhet

Pause to consider results so far

- Effects of financial education:
  - Improves financial literacy
  - Increases the (self-reported) use of the Rule of 72 in decisions
  - Increases the (self-reported) use of explicit calculations
  - The preceding results are due to substantive content, and not to rhetoric
  - Does not reduce other sources of assistance
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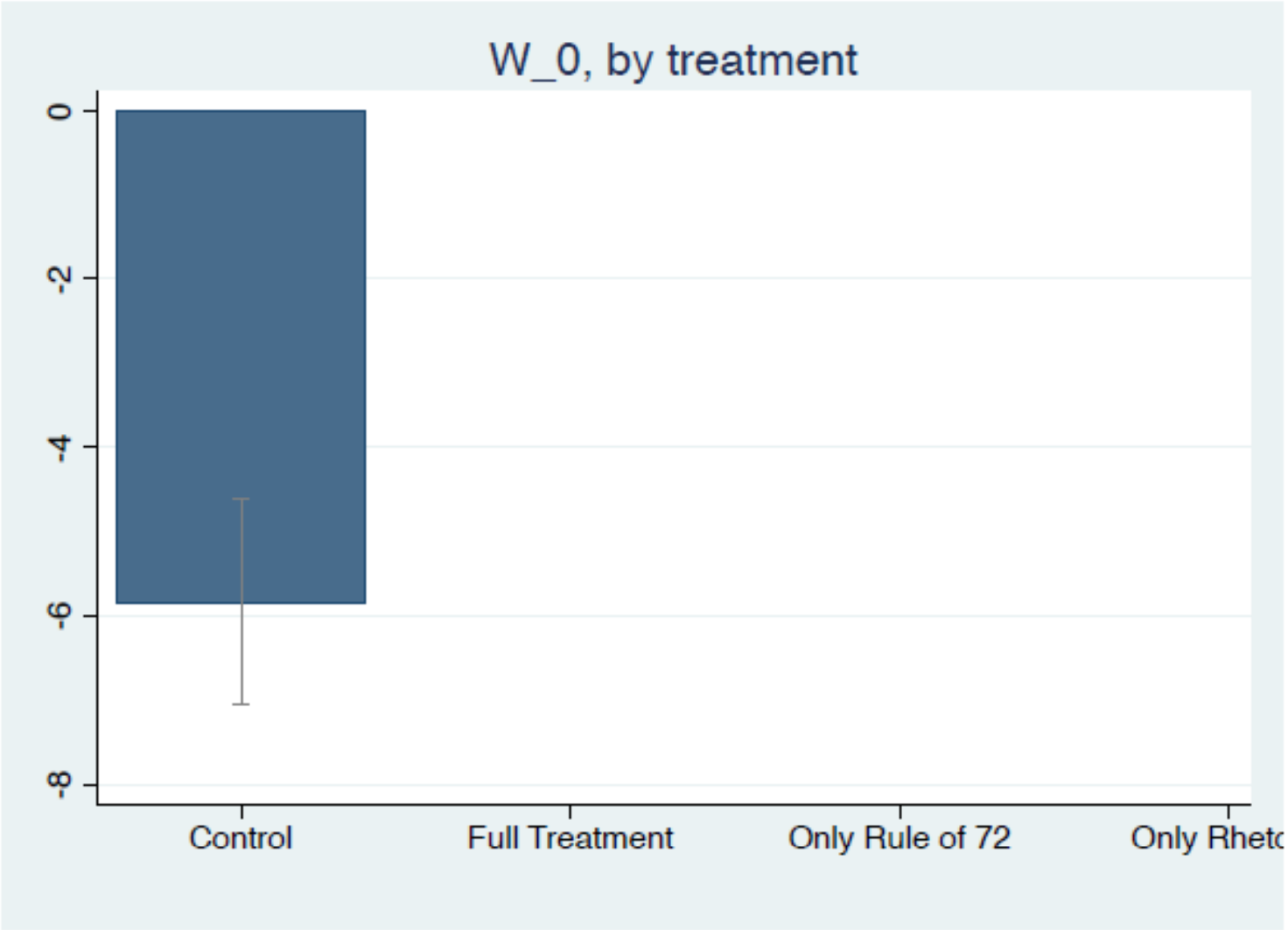
- Sounds like full treatment has the right effect on behavior for all the right reasons. So let's look at welfare.

Effect of treatments on welfare



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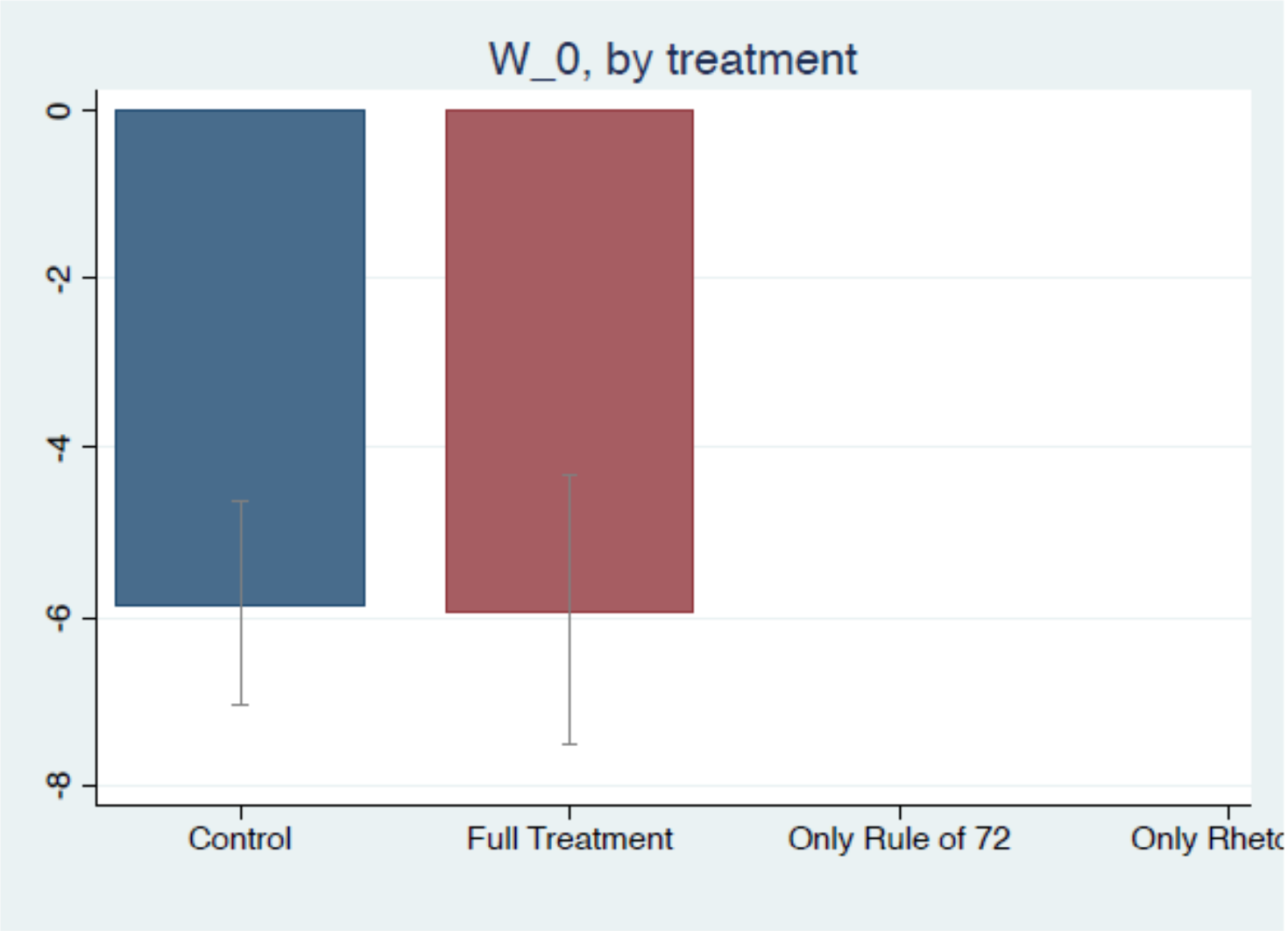
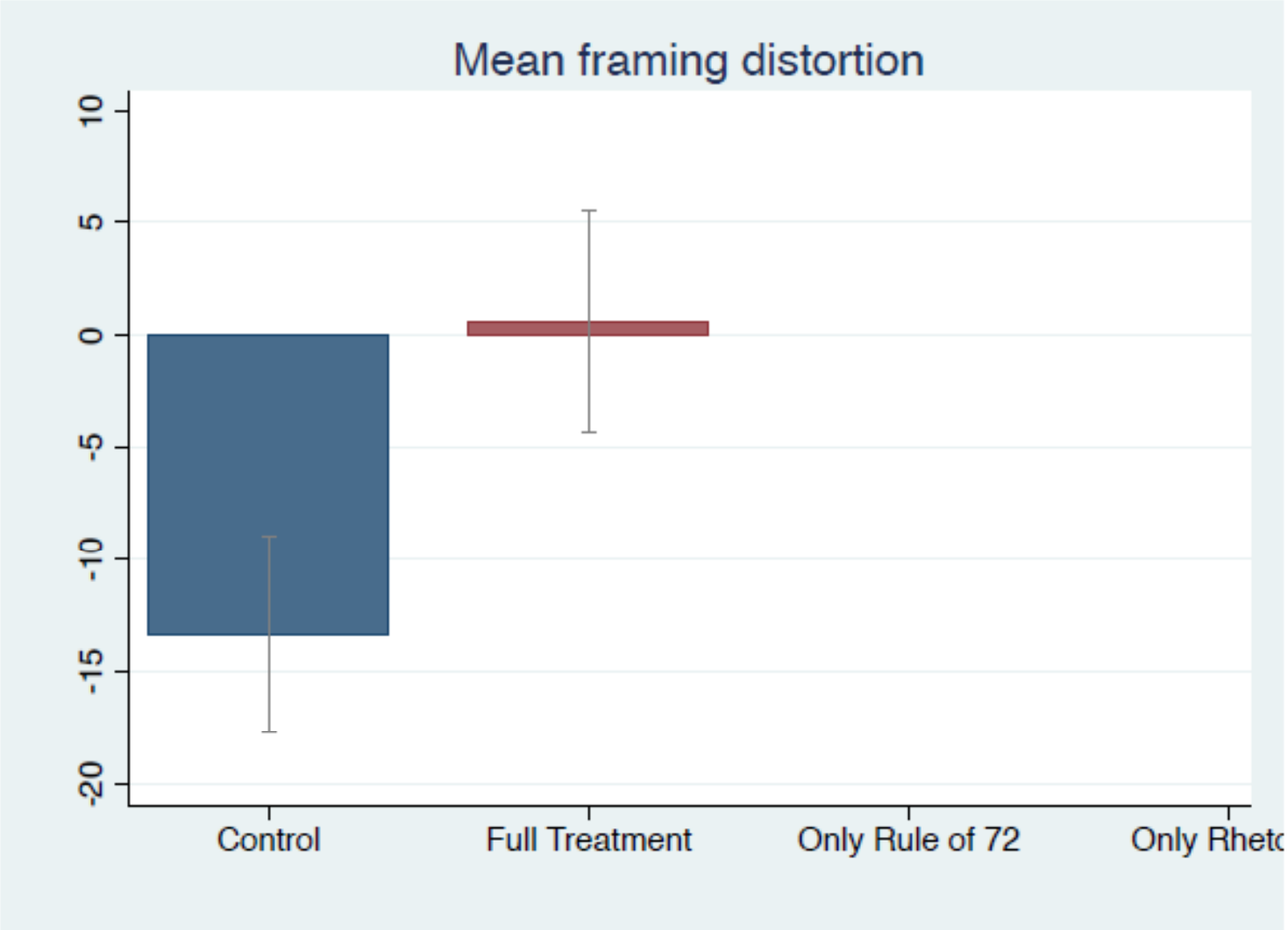


WHAT???

Let’s have another look at the mean framing distortion:



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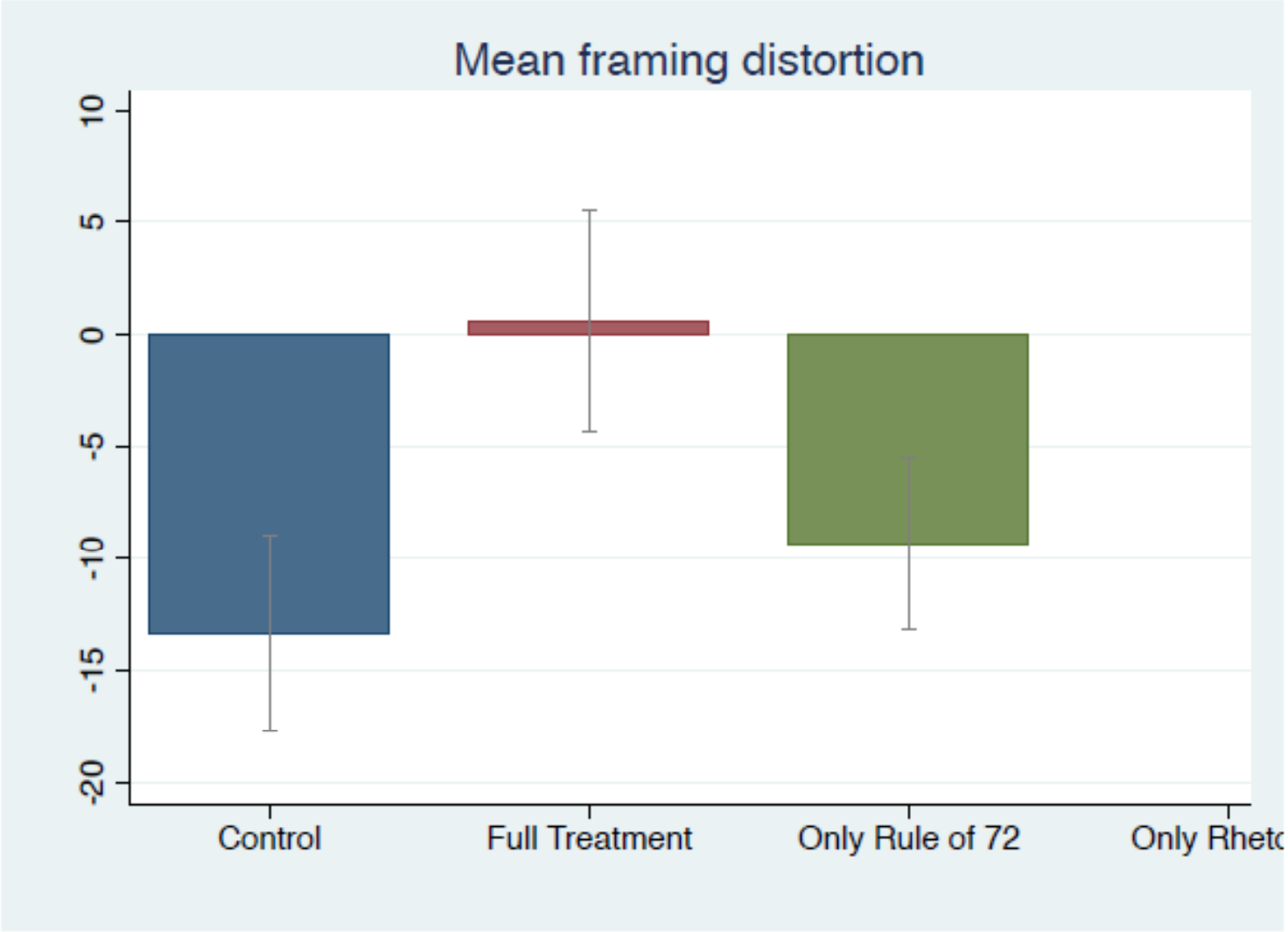

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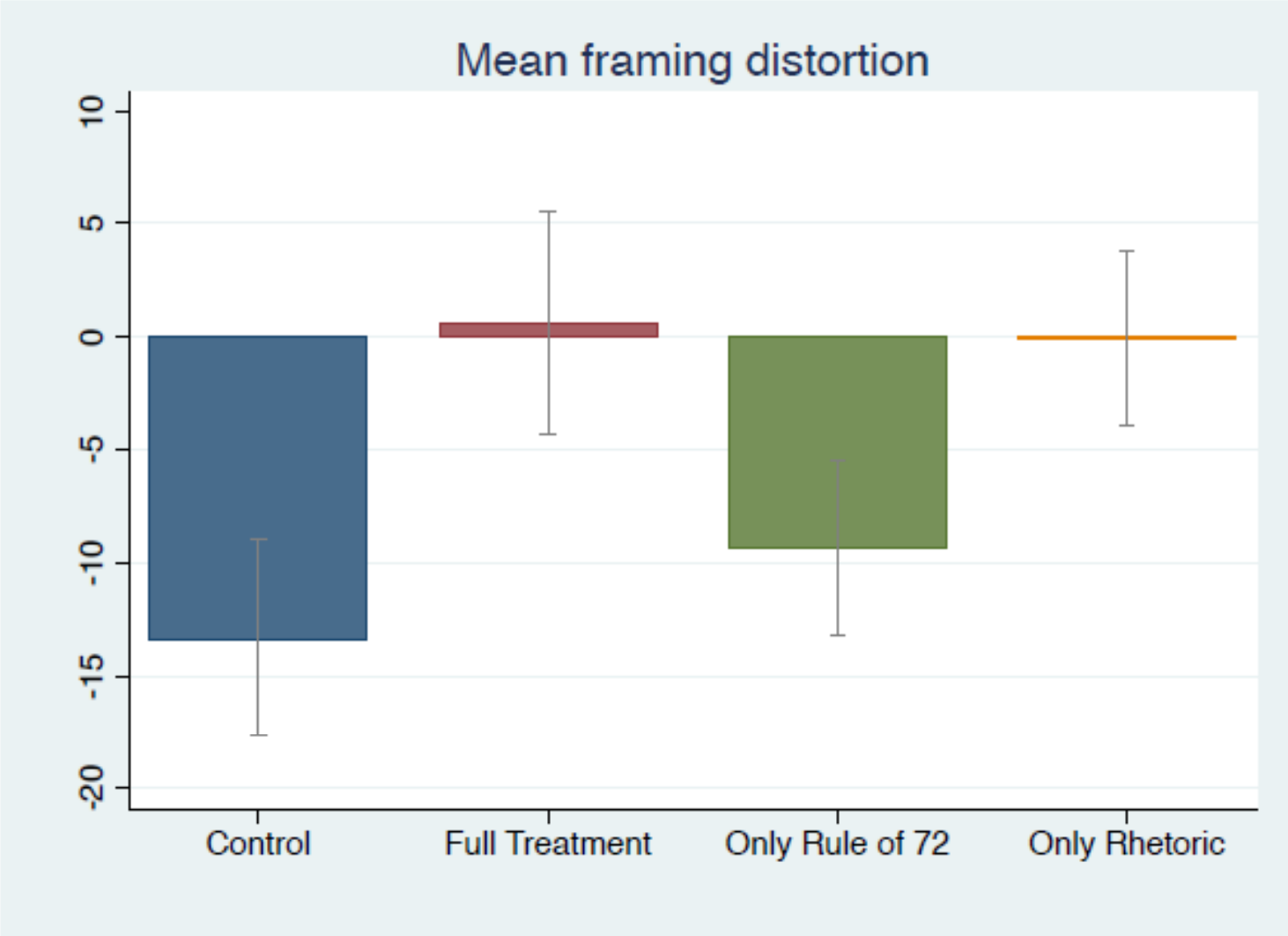
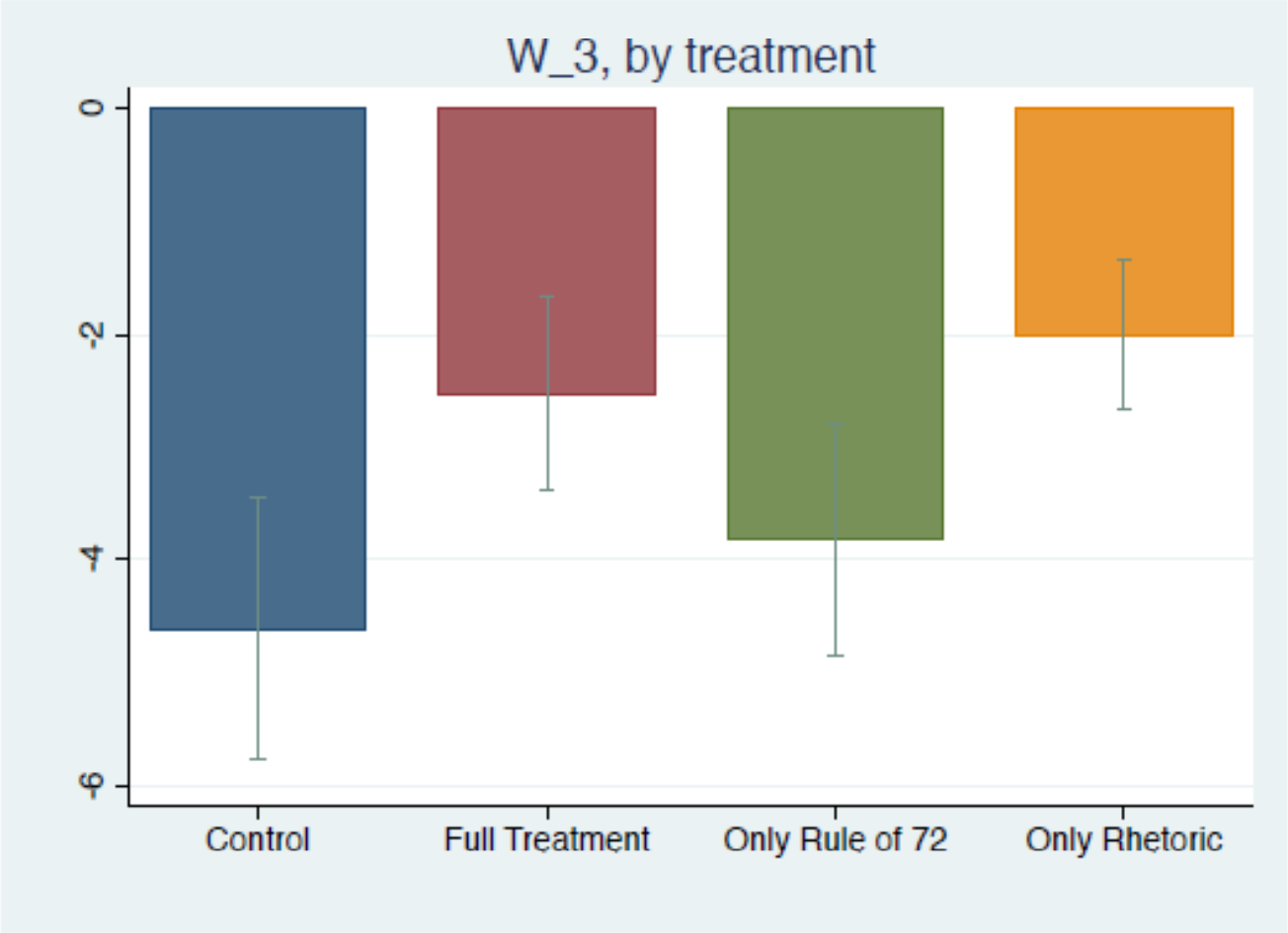


- So despite the effects on literacy, self-reported decision making strategies, and the elimination (on average) of exponential growth bias, the effect on *decisions* comes from motivational rhetoric, not substance

- Moreover, the effect of rhetoric is apparently haphazard and unrelated to the initial degree of bias

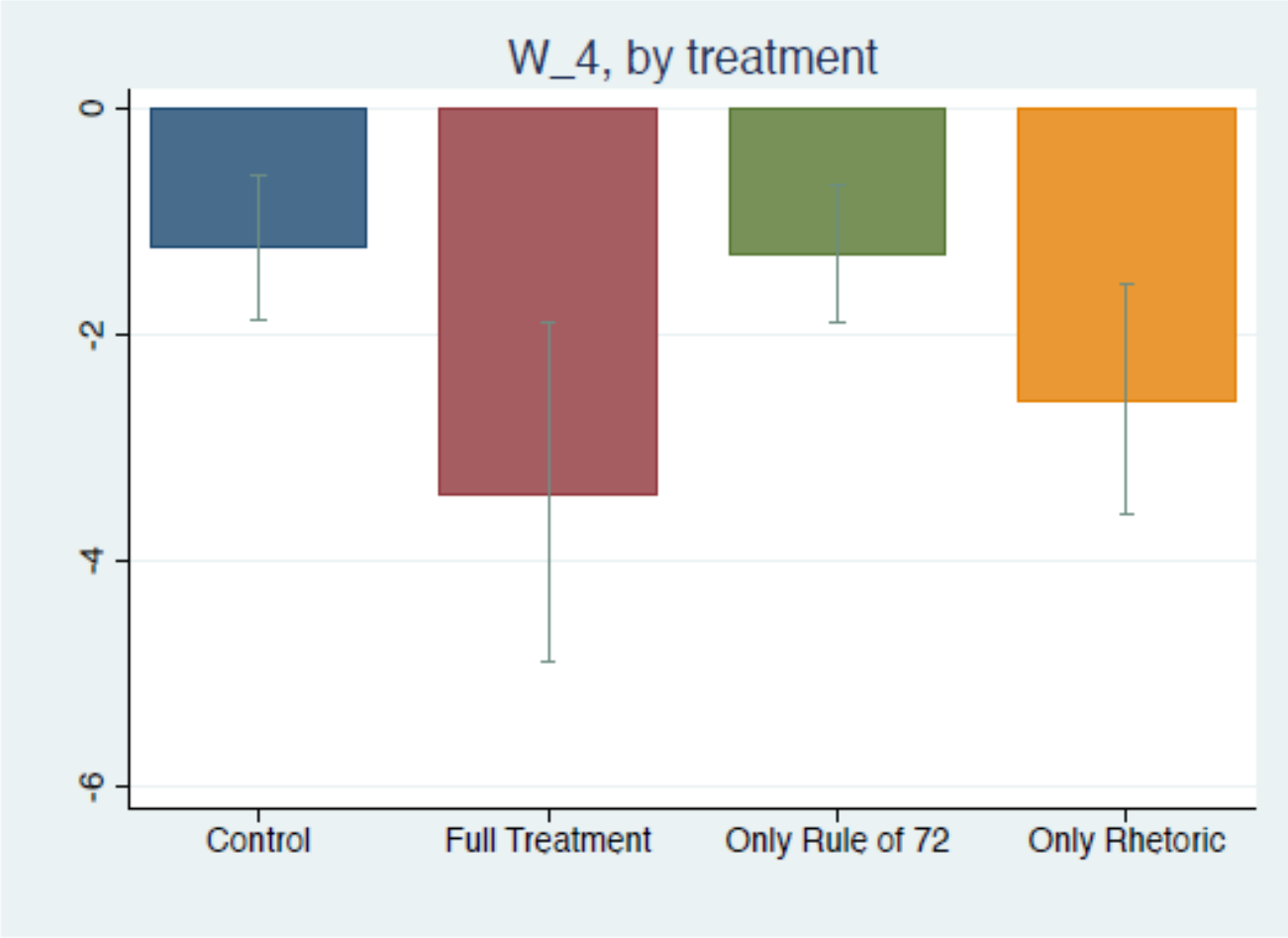
Counting only *under*-estimation of compound interest:

$$W_3 = \frac{1}{2}(\min\{d_{i,r,t}, 0\})^2$$



Counting only *over*-estimation of compound interest:

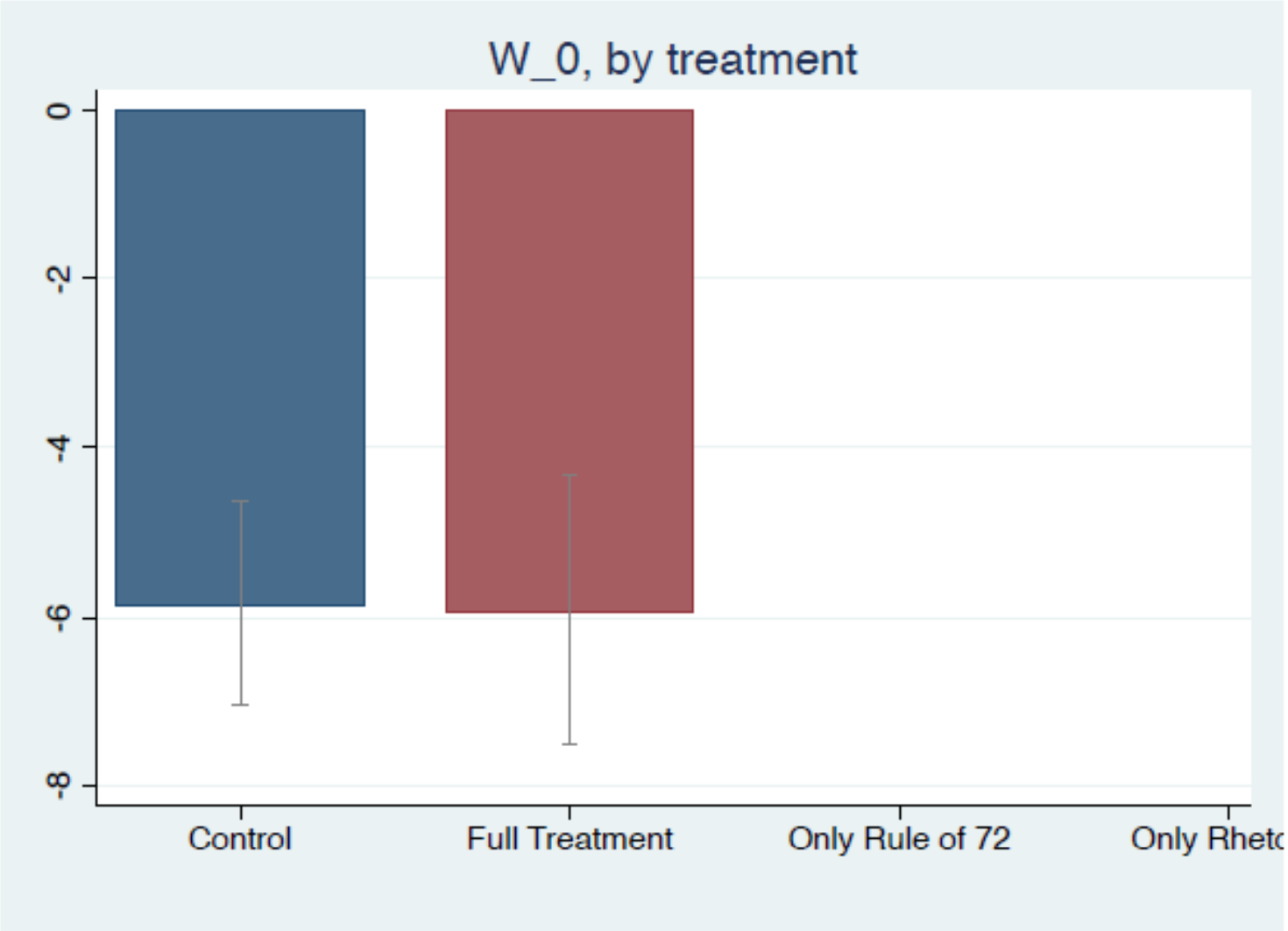
$$W_4 = \frac{1}{2}(\min\{0, -d_{i,r,t}\})^2$$



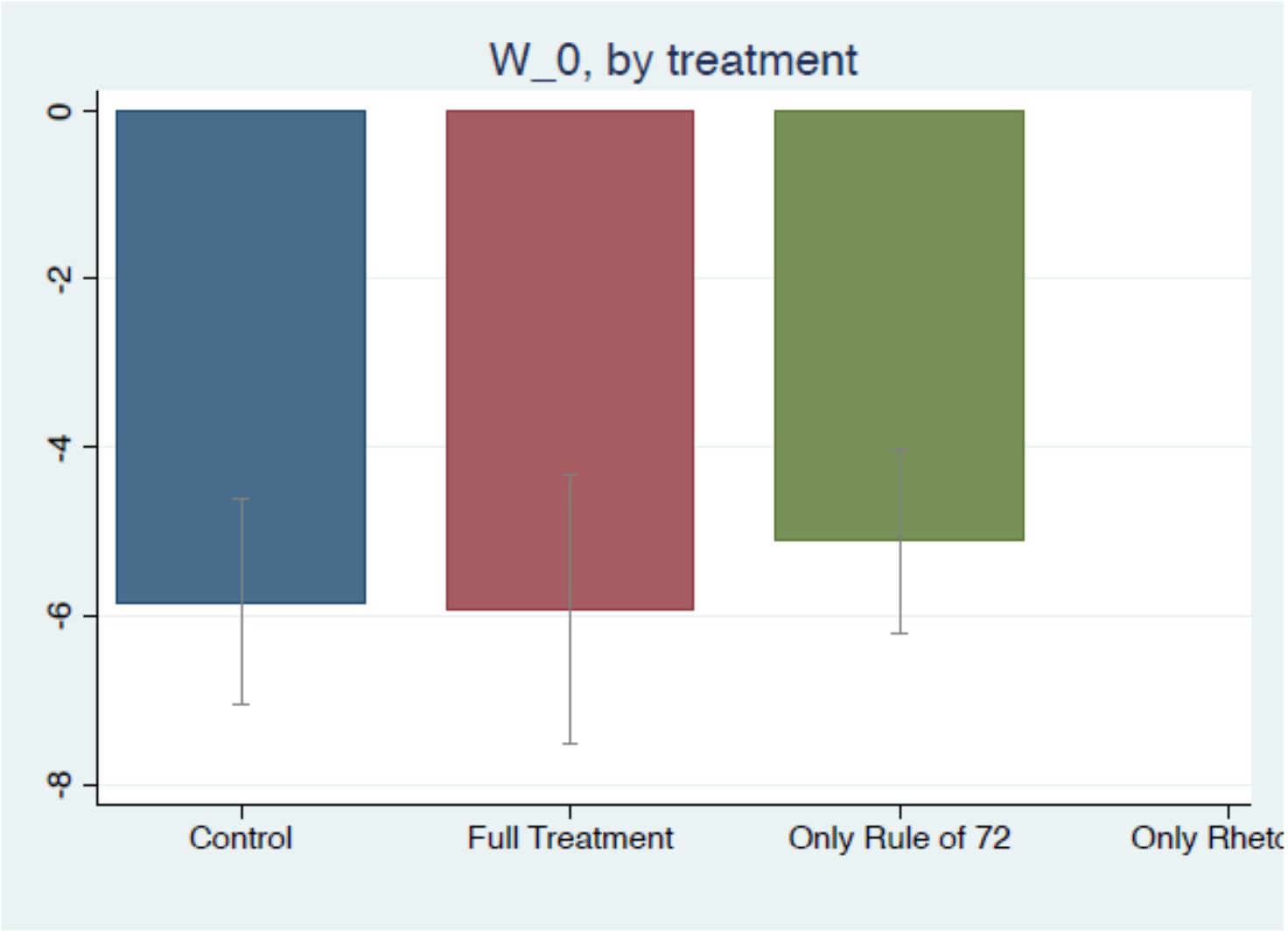
The Full and Rhetoric treatments change behavior by introducing a *countervailing bias*.

So let’s return to the welfare results – what about the other treatments?

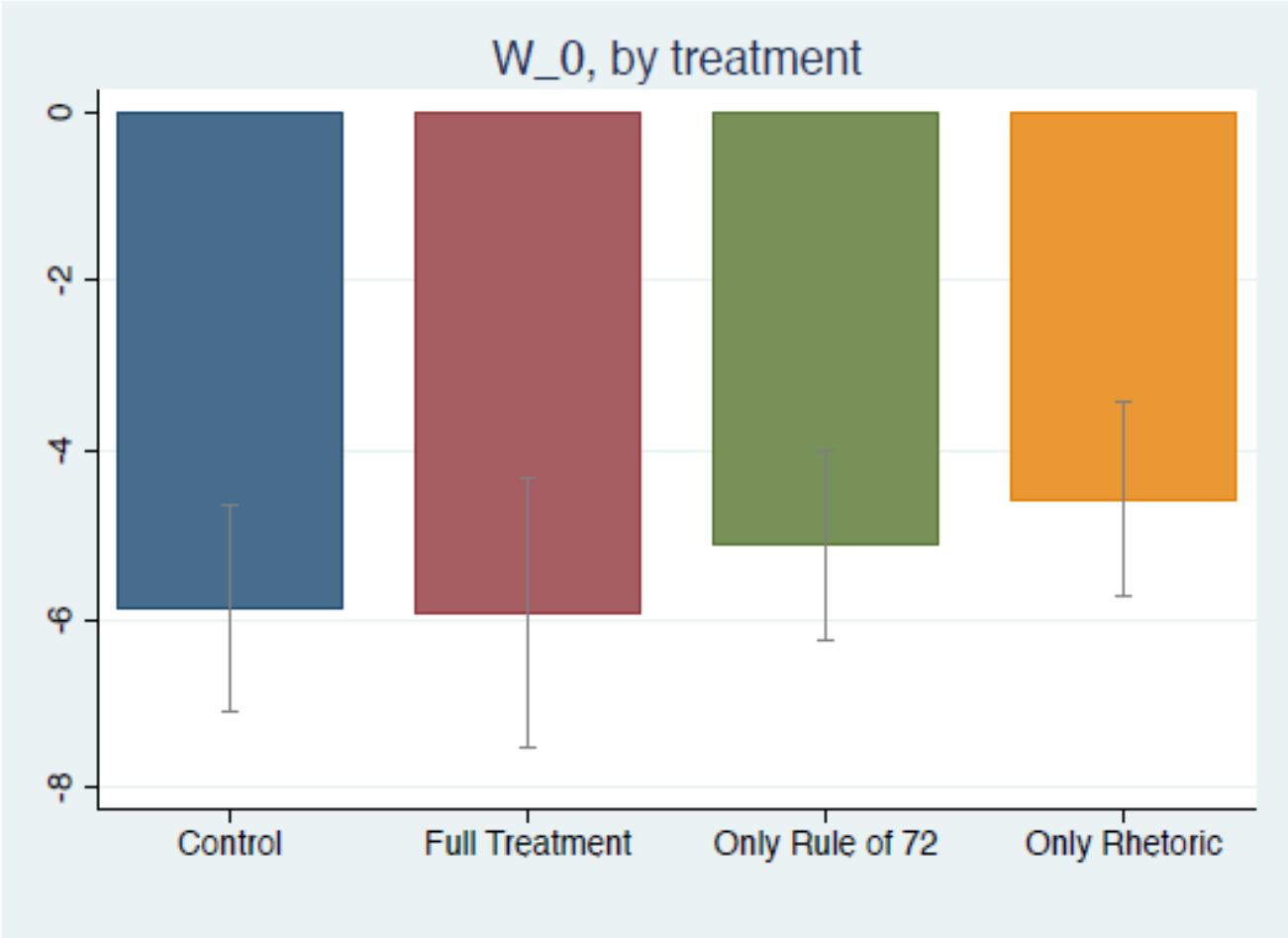
Effect of treatments on welfare



Effect of treatments on welfare

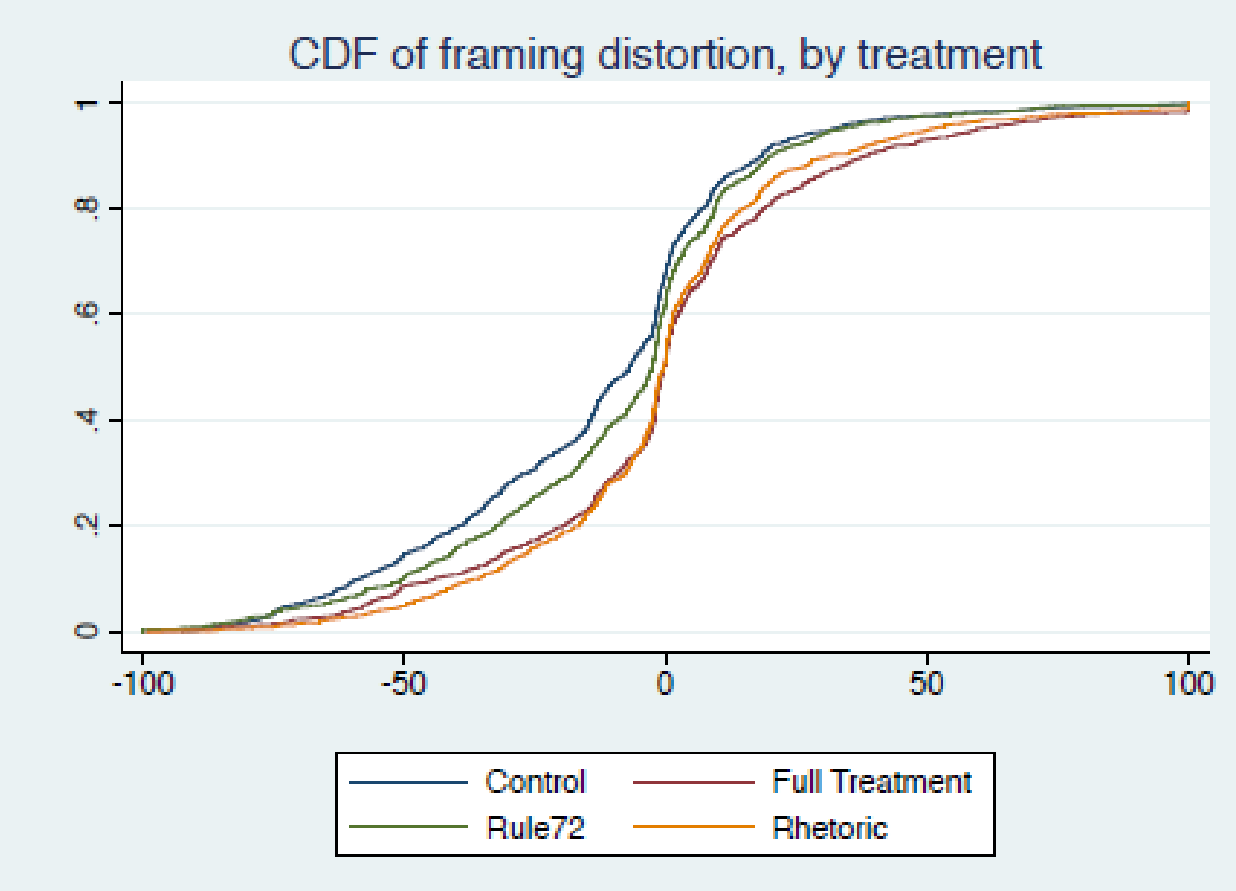


Effect of treatments on welfare



$P(\text{joint insignificance}) = 0.390$

- Notice that greatest welfare gain is achieved for the treatment that has the smallest effect on financial literacy
- Rhetoric sets up the most effective countervailing bias, and substance just gets in the way



Additional findings concerning mechanisms

- How do the interventions affect response times?
  - Substance-only treatment causes subjects to make complexly framed decisions more slowly
  - When motivational rhetoric is added, the effect on response time disappears
  - Corroborates that motivational rhetoric plays a dominant role when it is included

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- Do the welfare effects of the interventions depend on the difficulty of applying the rule of 72?
  - Difficulty varies according to whether there is one doubling, an integer number of doublings, or a non-integer number of doublings
  - The welfare effects do not differ by the difficulty of the problem
  - Implies that our findings are not due to a mismatch between the depth of the intervention and the difficulty of the decision tasks

Additional findings concerning mechanisms

- Do interventions reduce reliance on simple interest calculations?
  - Evaluate by using a regression framework to compare the variation in the ratio of valuations for complexly and simply framed decision problems to the ratio of valuations based on simple interest and compound interest
  - All treatments reduce reliance on simple interest calculations
  - Indicates that the problem is not one of intellectual stubbornness. People migrate to new heuristics that are equally inappropriate.

Summary

- According to conventional measures, a representative financial education intervention appears to have all the desired effects for all the right reasons
- In fact, it does not improve the quality of financial decision making (financial competence)
- Explanation: contrary to the appearances, the effect on behavior is driven by rhetoric, not substance, and the effect is indiscriminate
- Improvements in financial literacy not sufficient for improvements in welfare (and possibly not even necessary)
- Underscores importance of evaluating financial competence

Implications for policy strategies

- Devise educational strategies that more effectively lead people to put knowledge into practice when they make decisions

- Use education for “targeting debiasing”

- Develop better visualization tools to turn complexly framed decisions problems into simply framed ones

Intervention #2: Portfolio Diversification

Ambuehl, Bernheim, Ersoy, and Lusardi (2015)

- Another core topic in most financial education courses
- Interventions are generally designed to address the concern that people insufficiently diversify

Research Question

- How does an education intervention on diversification affect behavior and welfare?

- What are the mechanisms driving these effects?
  - Do people follow the "1/N" heuristic?
  - Do people care about the correlation structure of assets in a given portfolio?

Experiment Structure

(Web-based experiment)

The same structure with the first project:

1. Educational video

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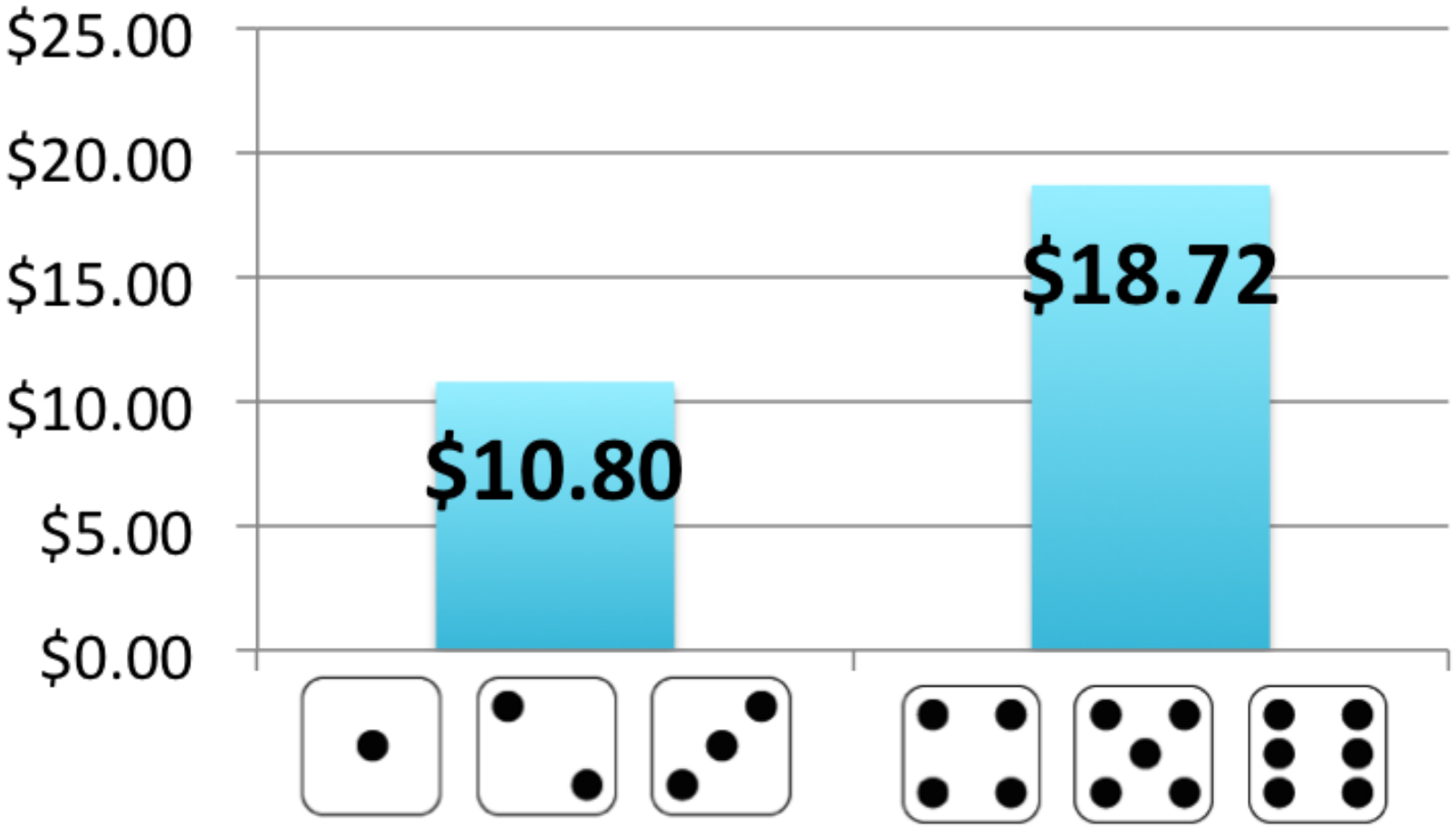
Simple Frame



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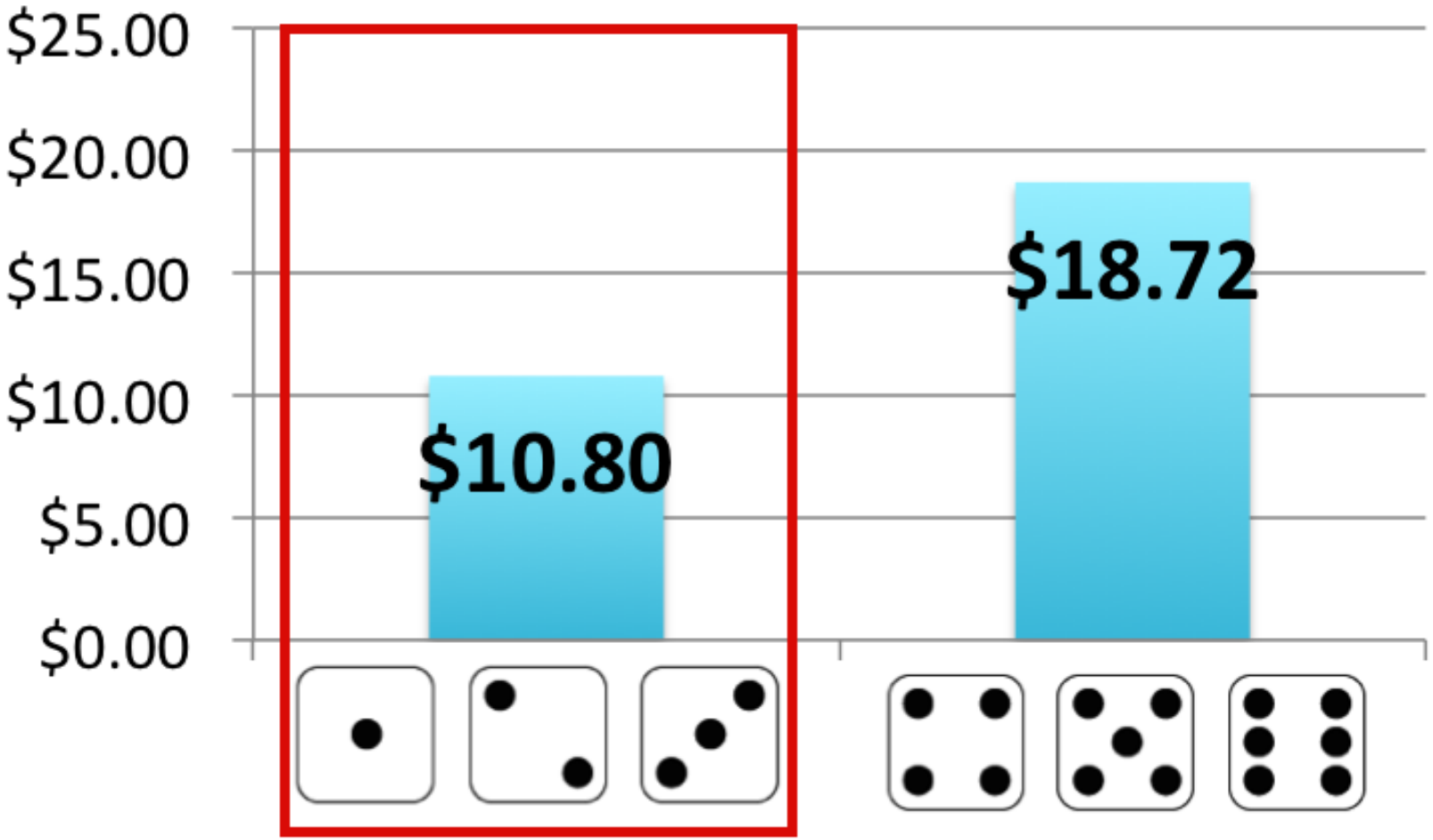

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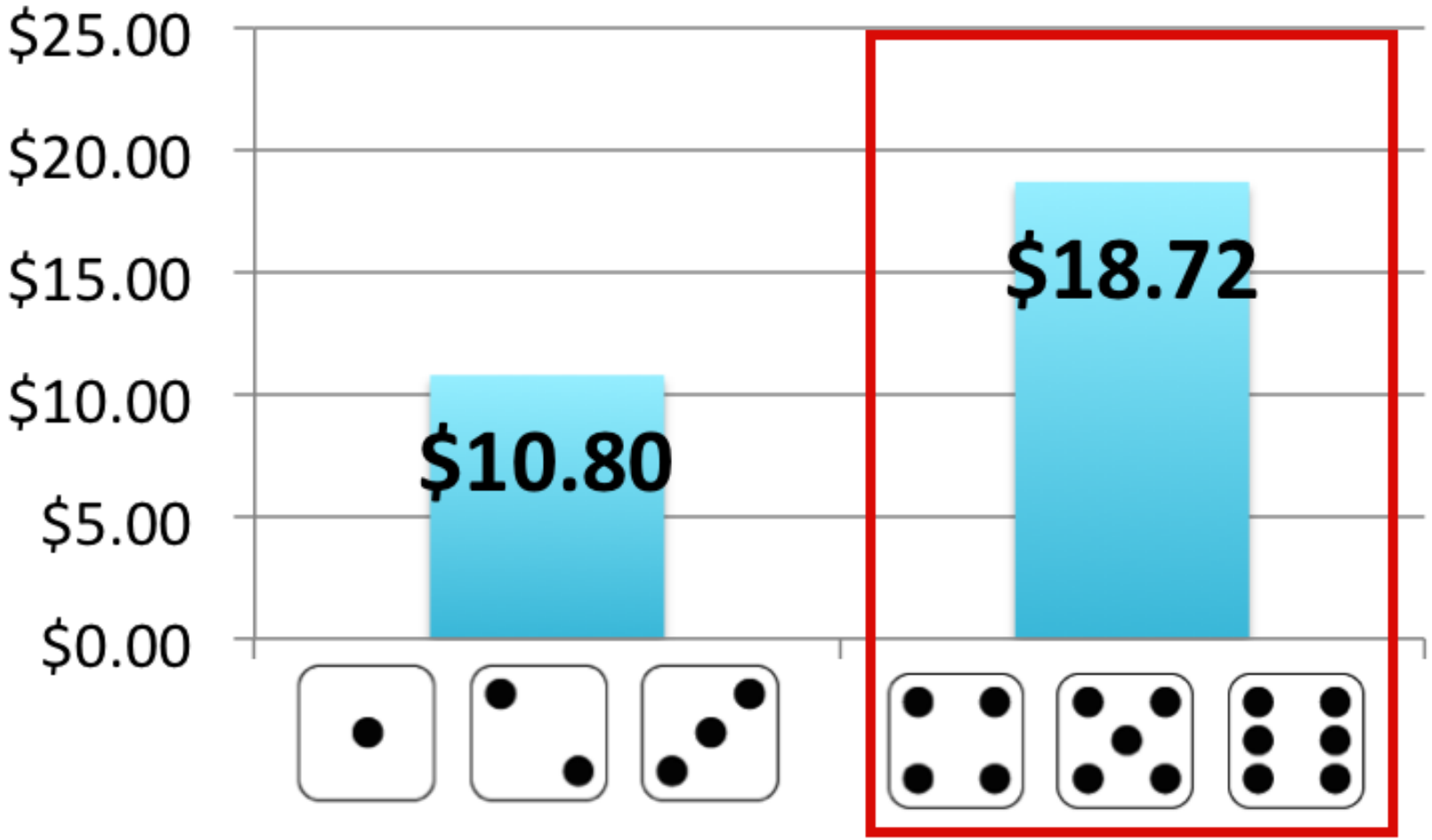

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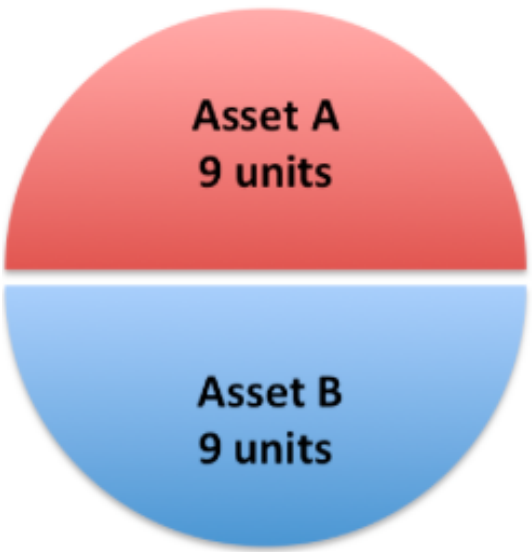

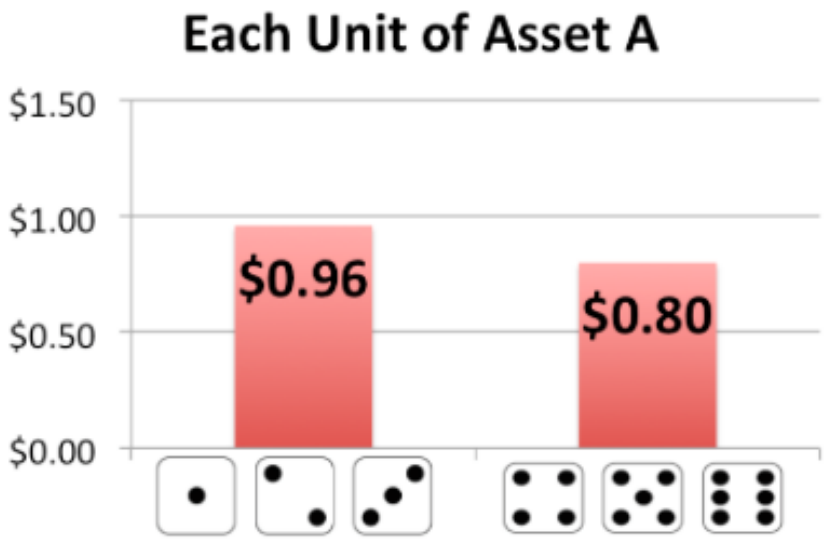

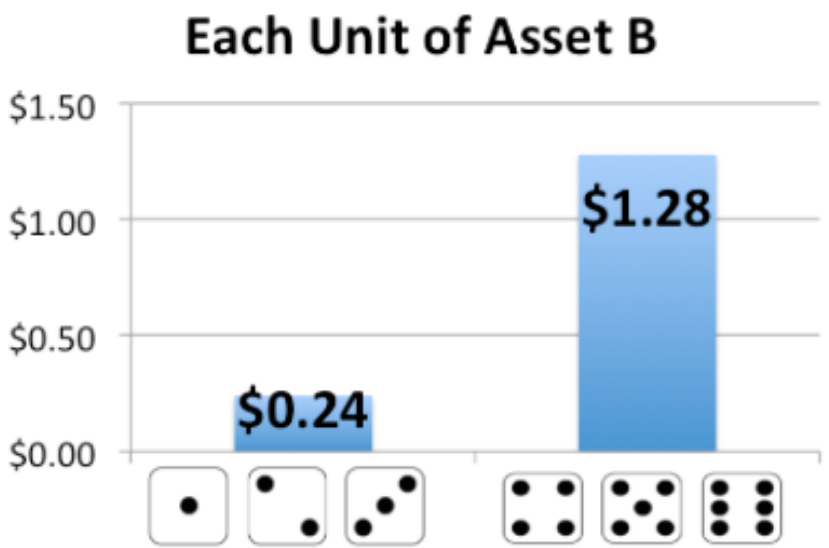

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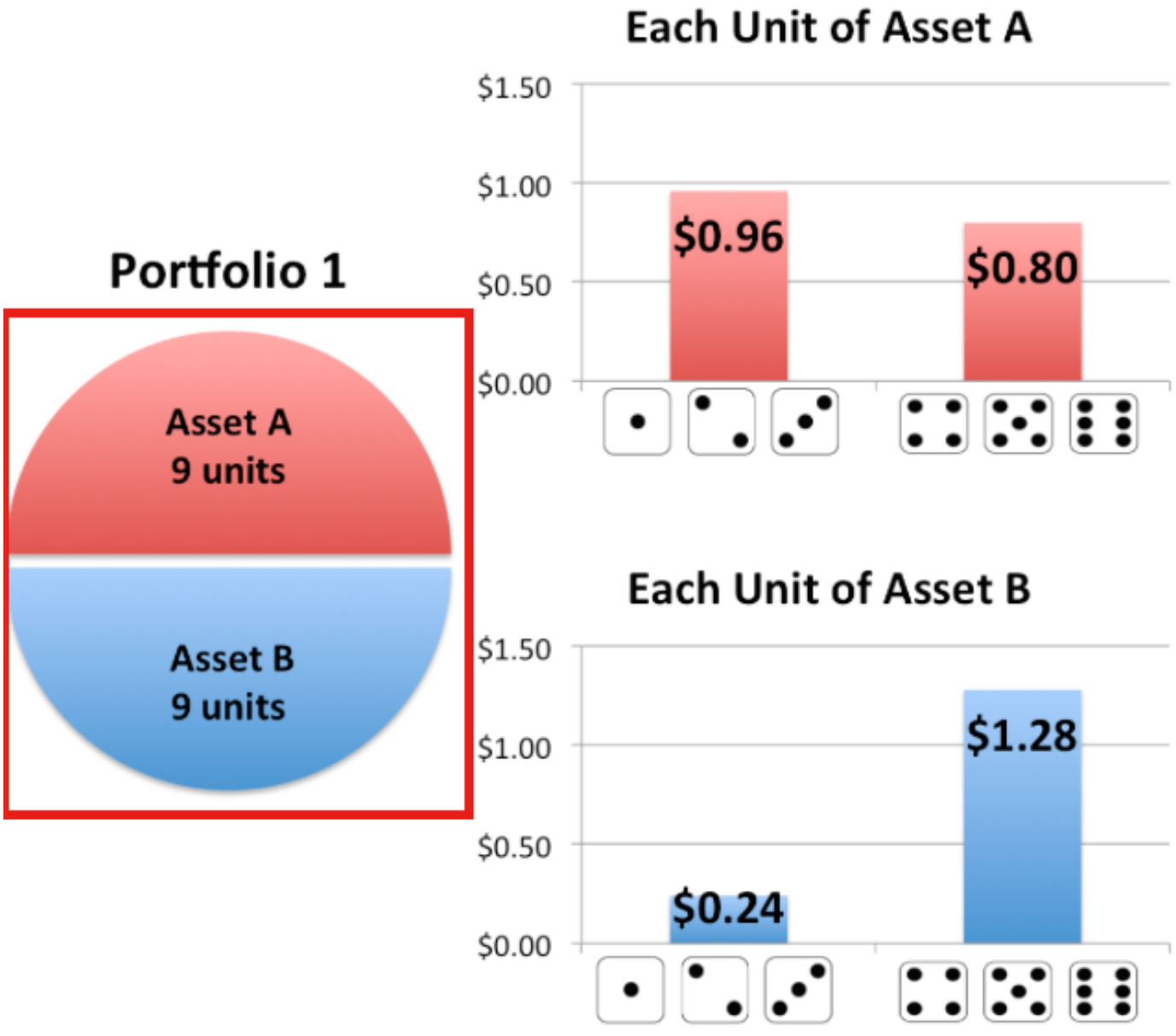

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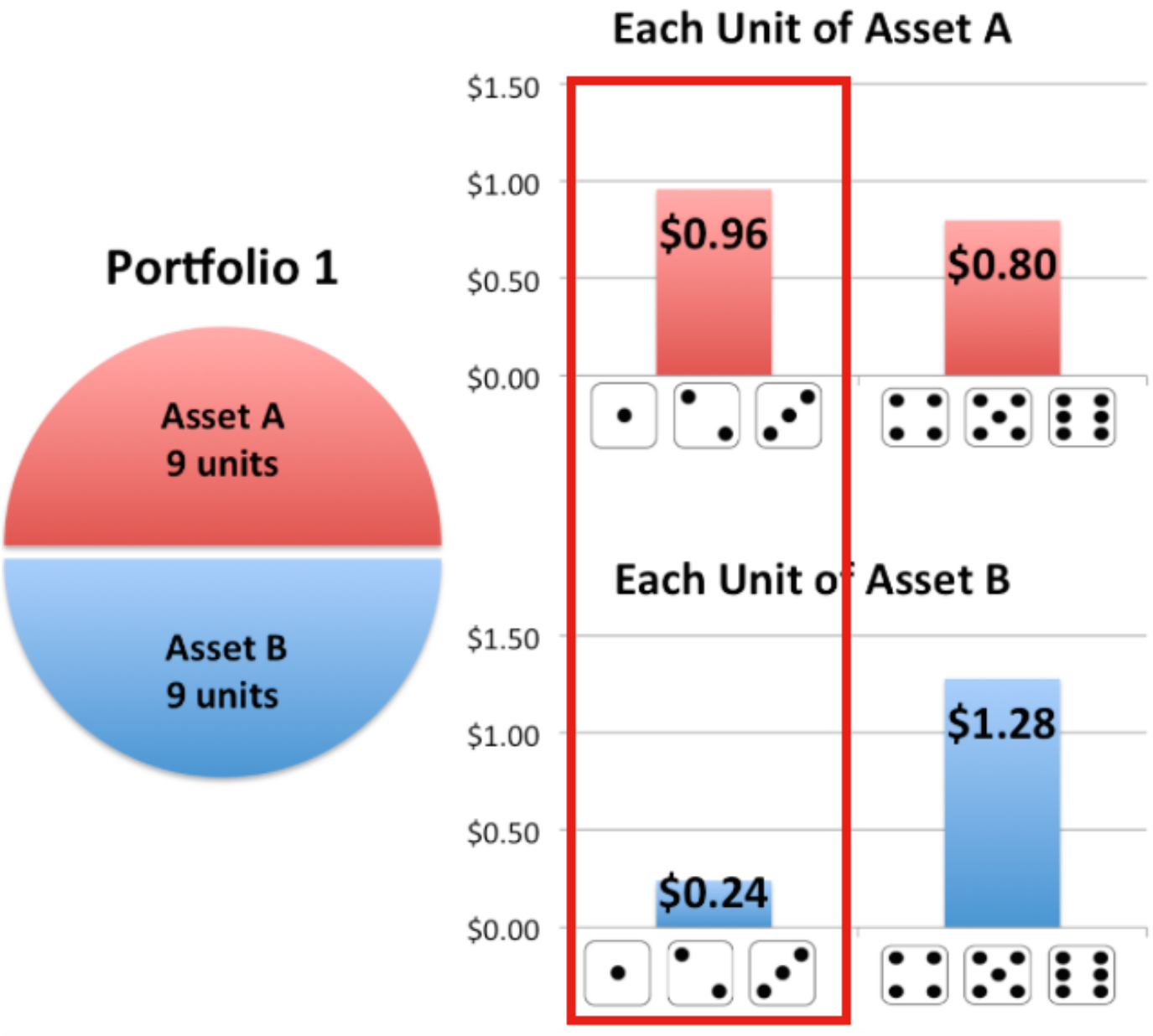

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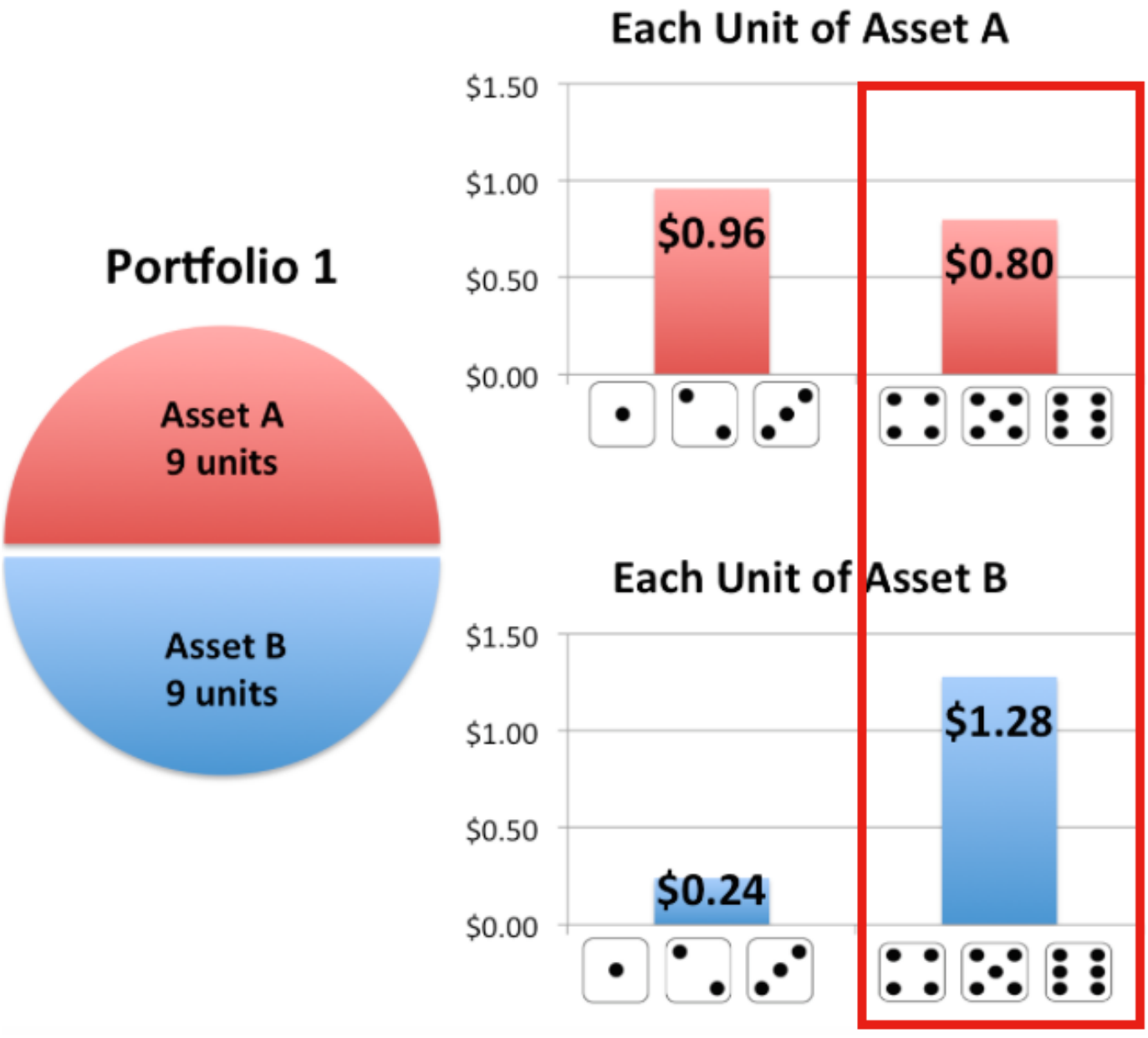

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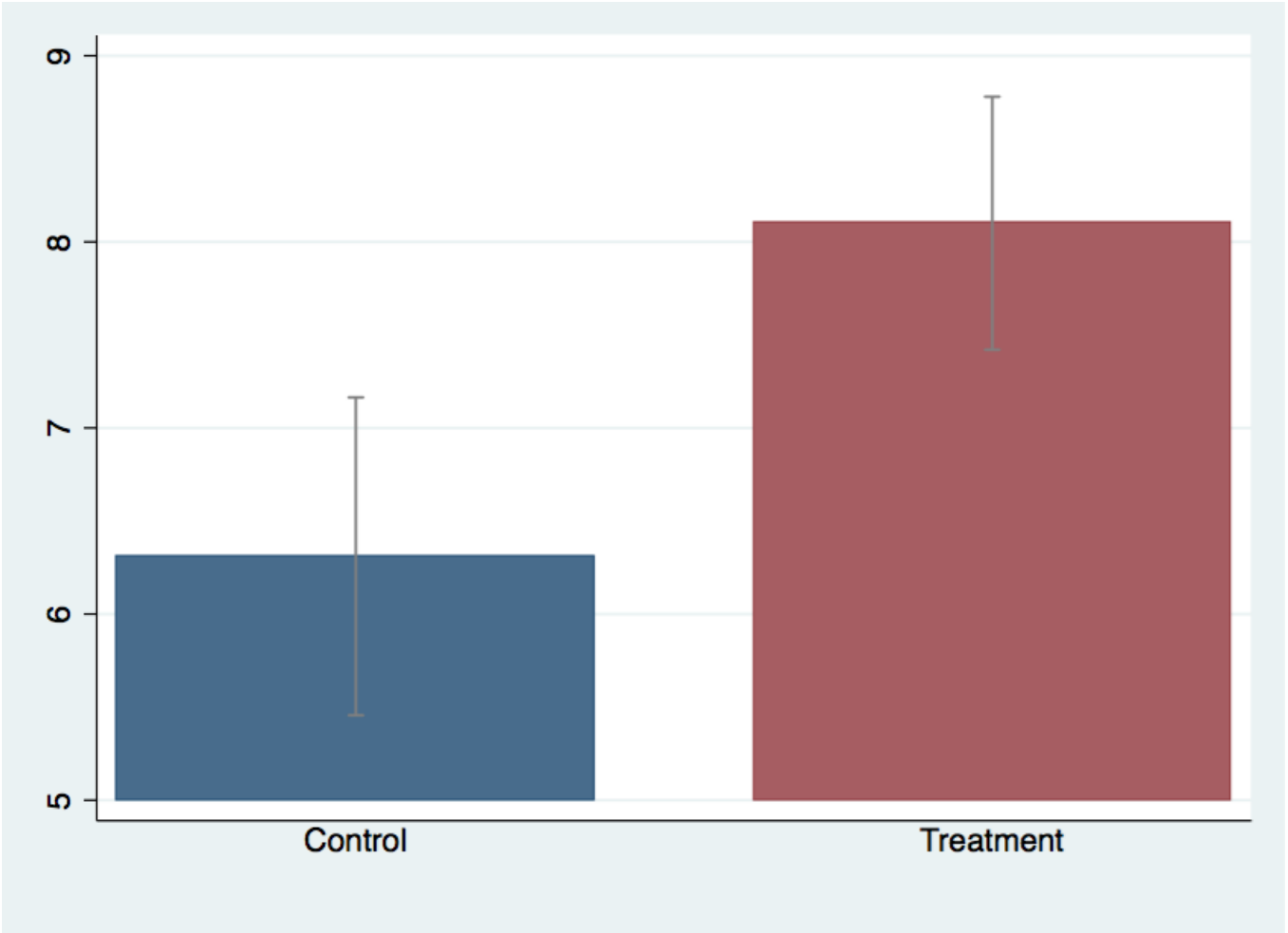
2. 20 Valuation Tasks
   - 10 equivalent pairs
   - Simple framing
   - Complex framing
3. Incentivized test and surveys
   - 10 questions on portfolio allocation
   - 10 additional questions on compound interest
   - Self reports about decision process

Results: Financial Literacy

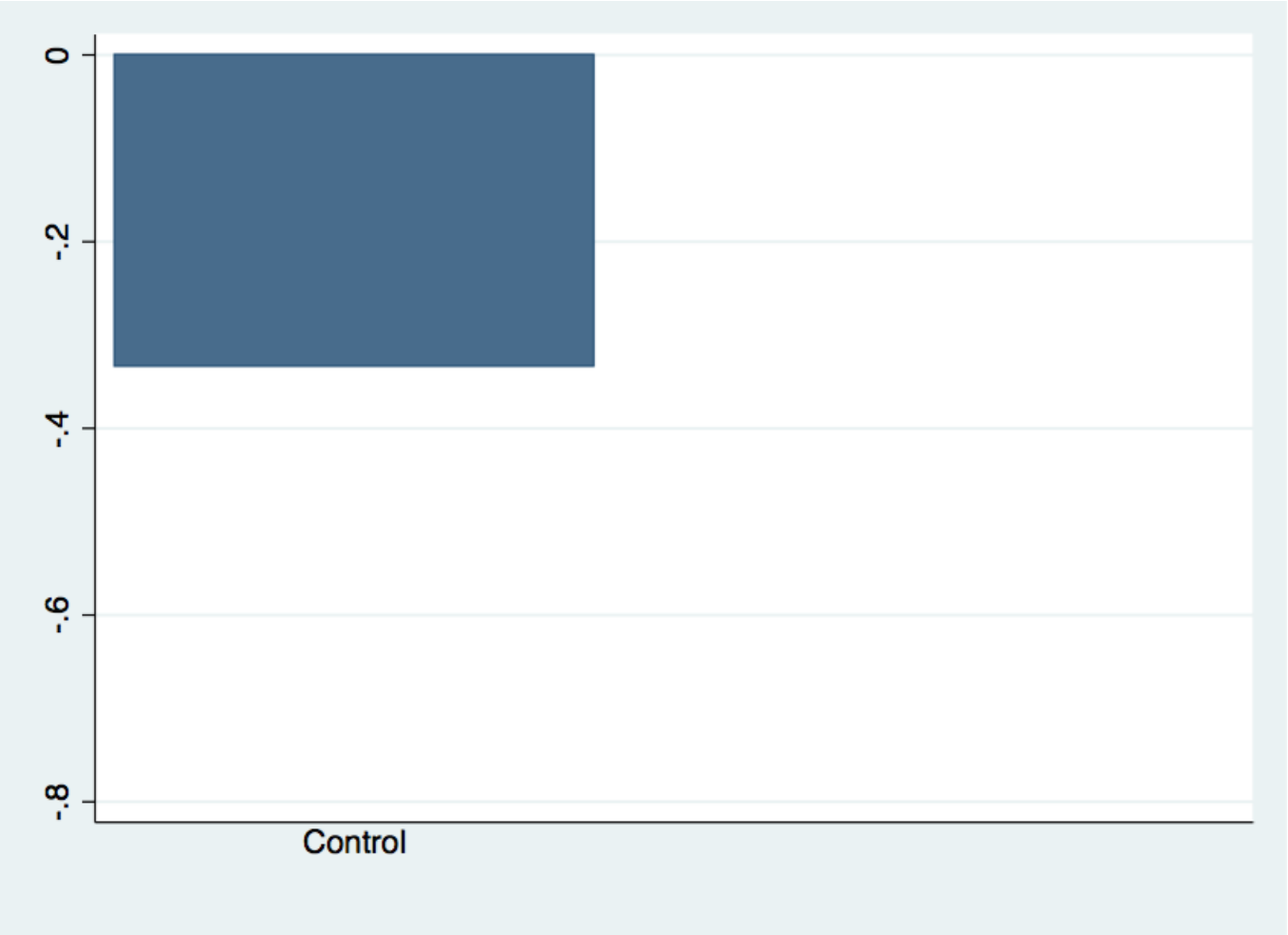
Caution! Pilot Data (Only 60 subjects) Details



Improvement in test scores

Results: Choices

$$\left(\frac{V^{complex} - V^{simple}}{Max - Min}\right)$$



Subjects in the control treatment undervalue the complexly framed lotteries.

Results: Choices

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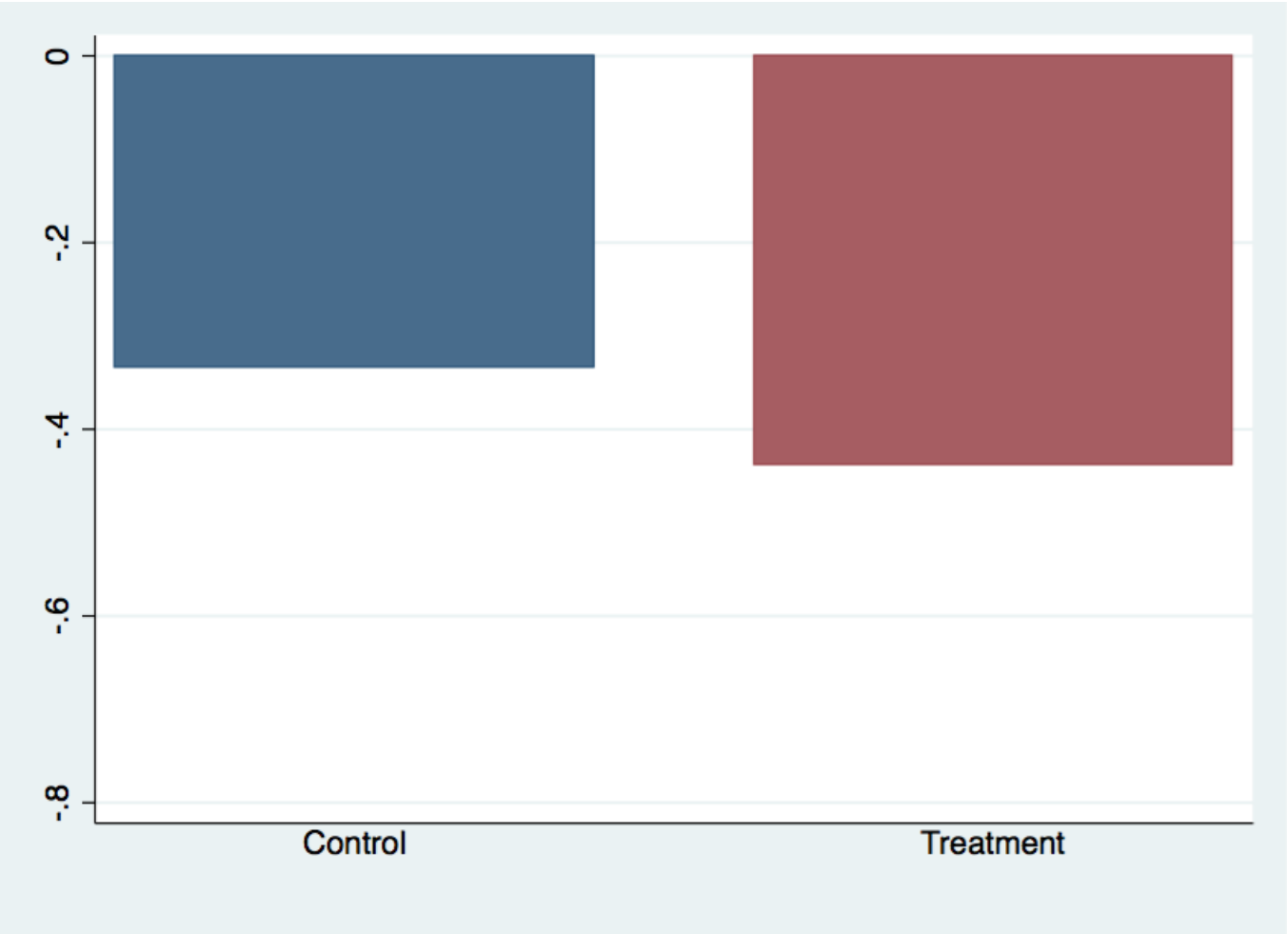
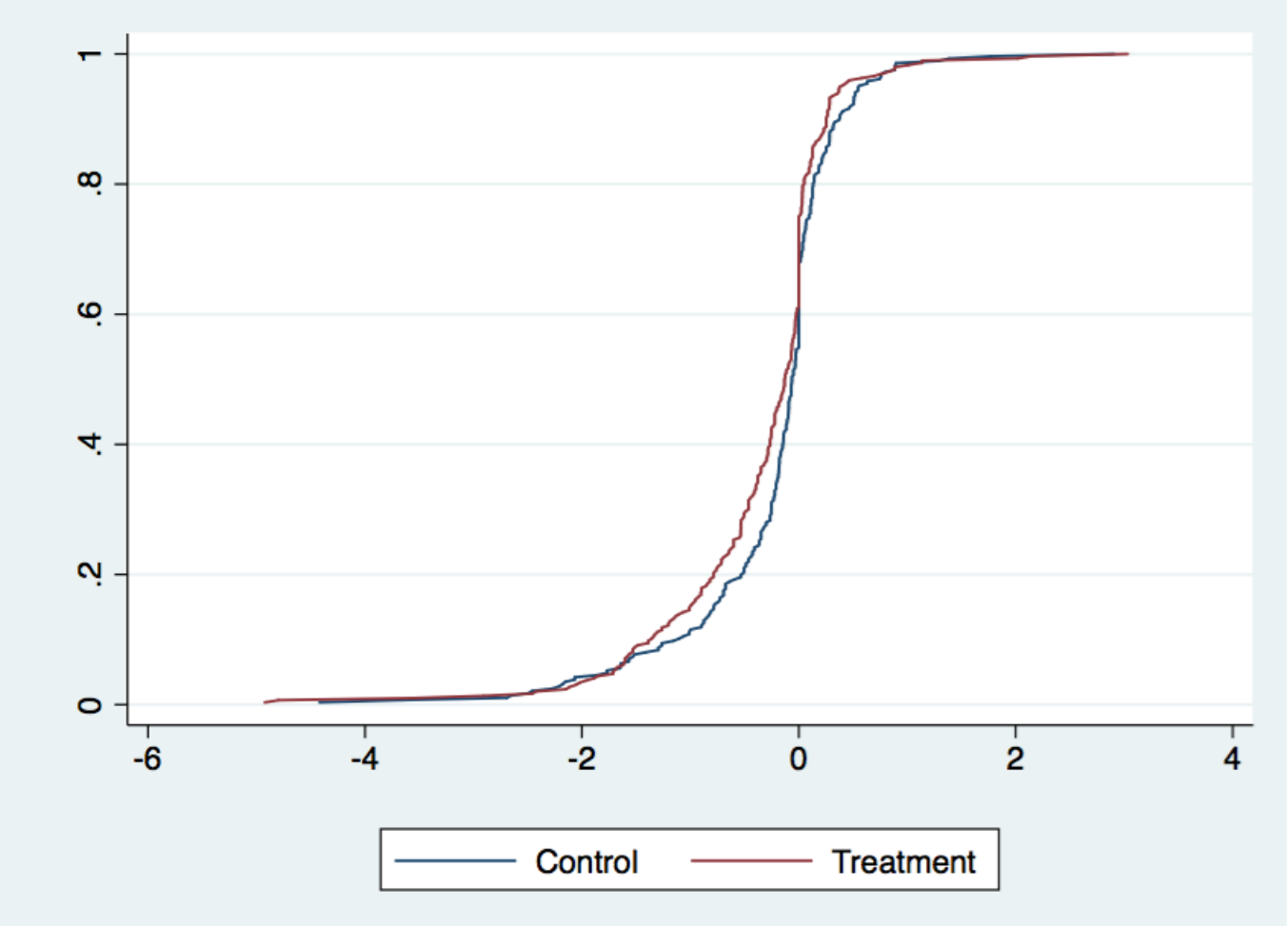


Subjects in the treatment undervalue them even more.

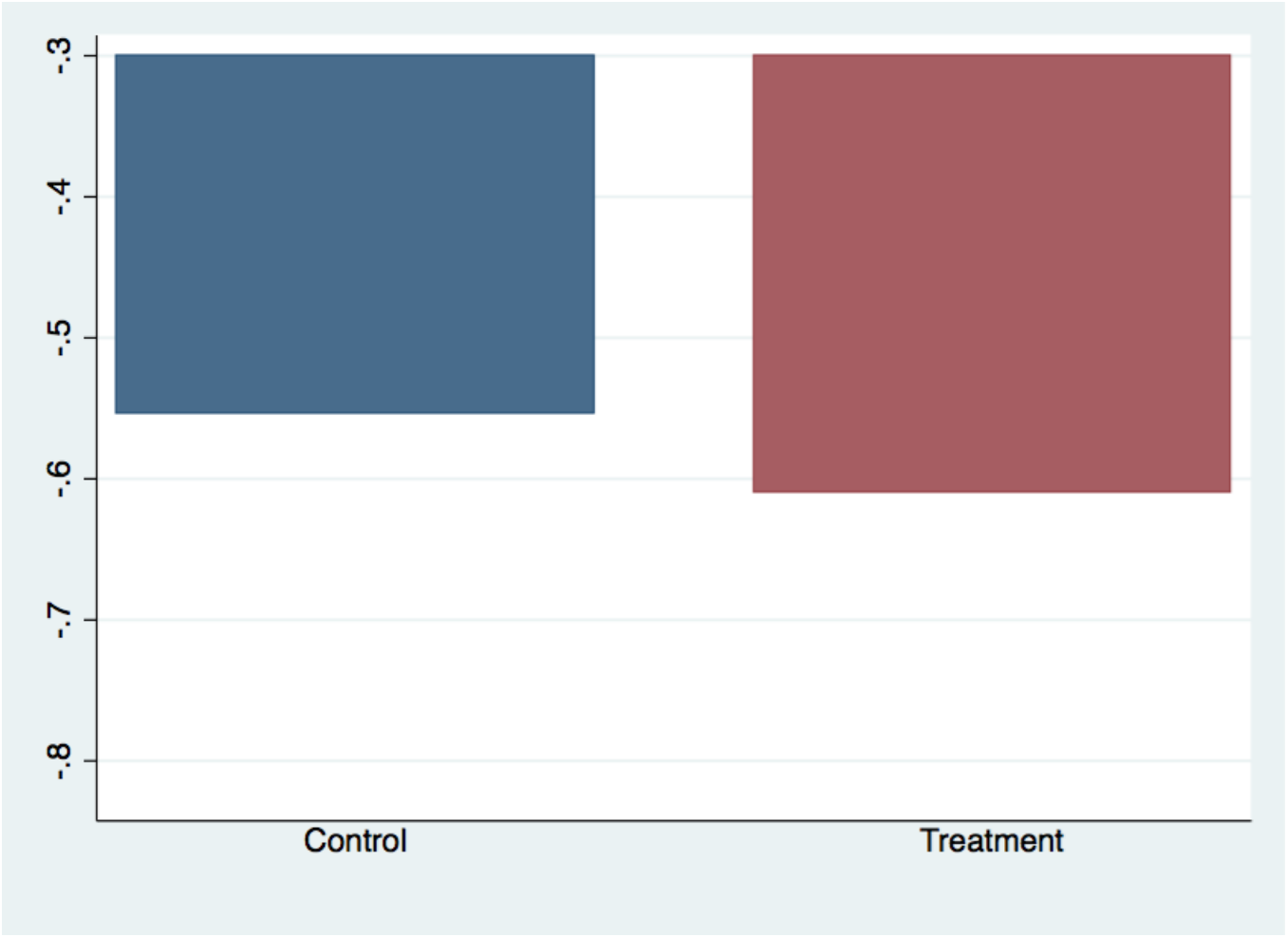
C.D.F. of $\frac{V^{complex} - V^{simple}}{Max - Min}$



Effect of intervention is indiscriminate

Results: Welfare Loss

$$(-|\frac{V^{complex} - V^{simple}}{Max - Min}|)$$



Hence, the treatment is welfare decreasing.

Next Steps

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- How does education affect financial meta-competence?

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Next Step:

Measure financial meta-competence in addition to financial competence.

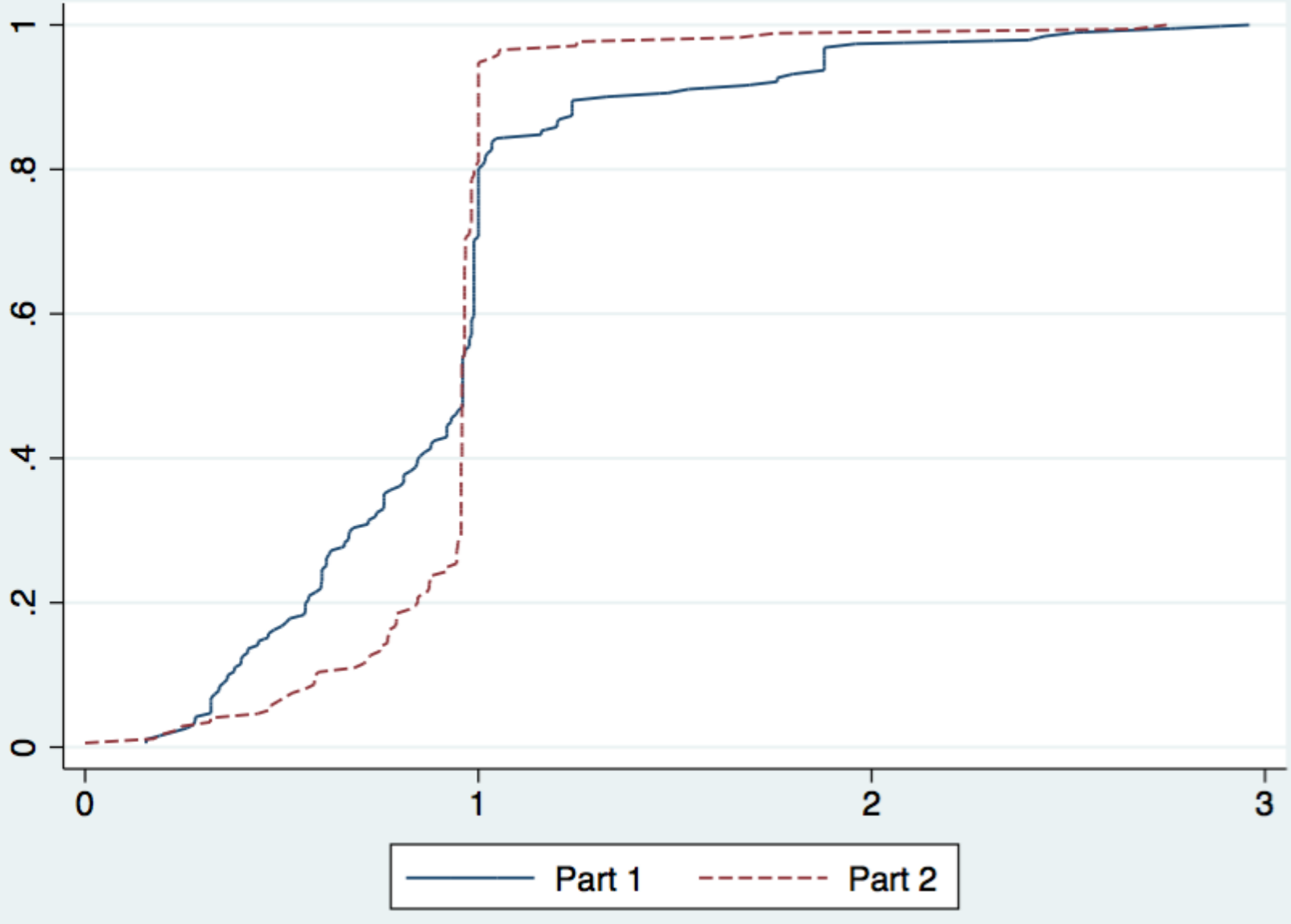
Social Transmission of Financial Competence

Ambuehl, Bernheim, Ersoy, and Harris (2015)

- How does social environment effect social competence and mediate the effects of financial education?
- Pilot study on *compound interest* at the University of Birmingham
- Intervention includes *practice*
- Three stages of decision making
  - Part 1: “Raw” choices
  - Part 2: Choices after an informational intervention (educational module or control)
  - Part 3: Choices after interaction (educated-uneducated, or uneducated-uneducated)

Is education effective for teaching compound interest?

Treatment Senders



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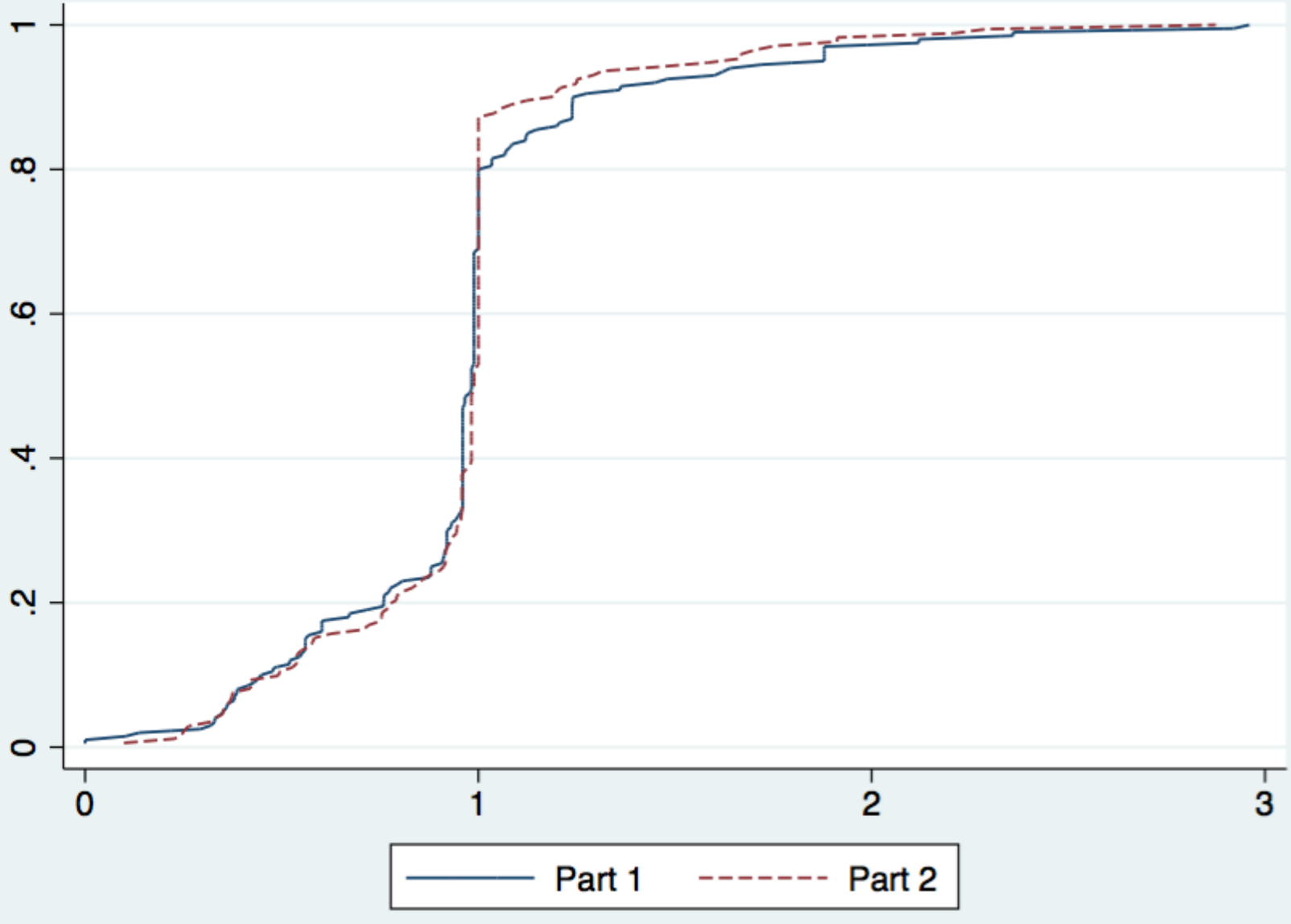
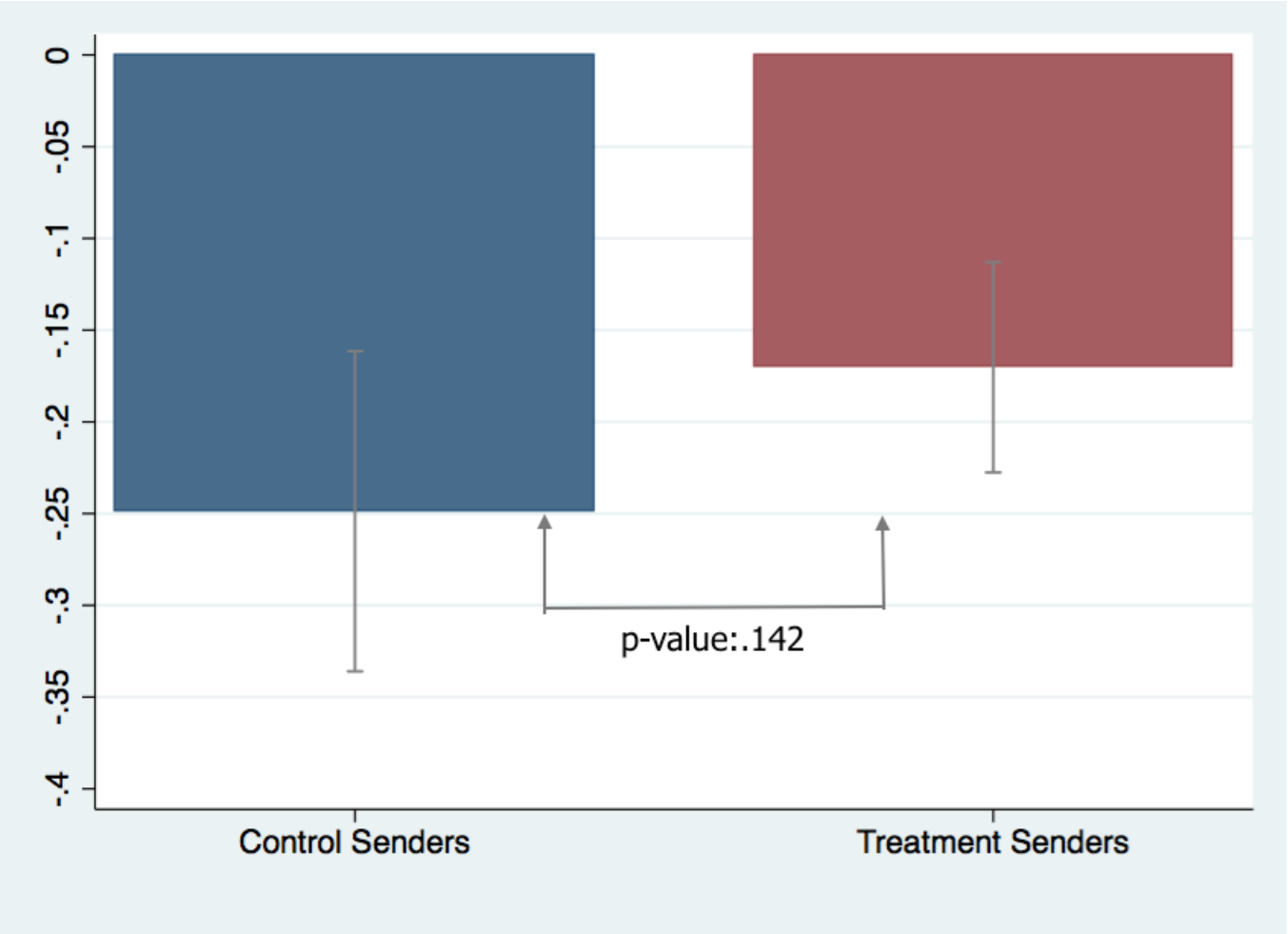
Control Senders

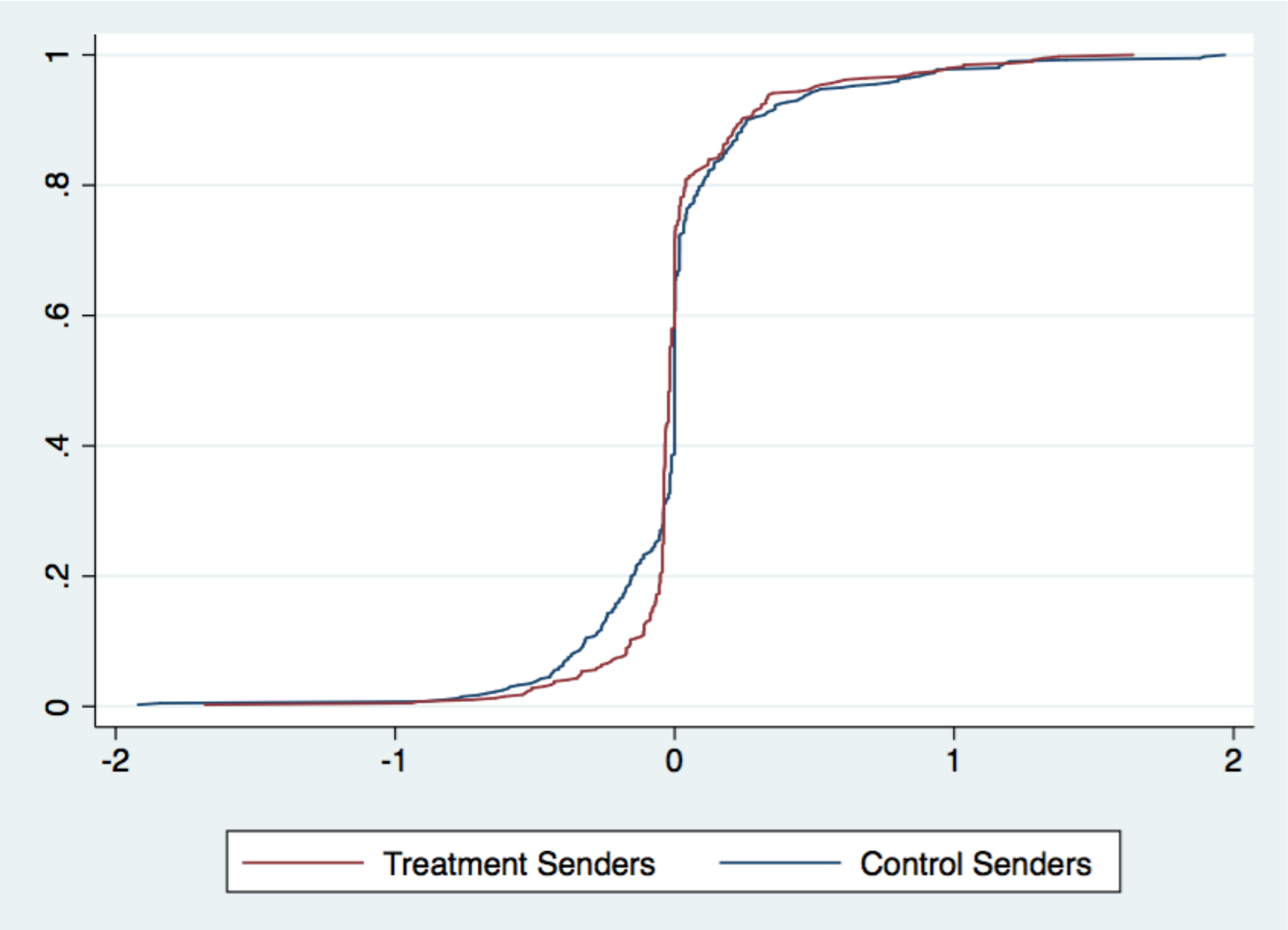


Does **education** affect financial competence?

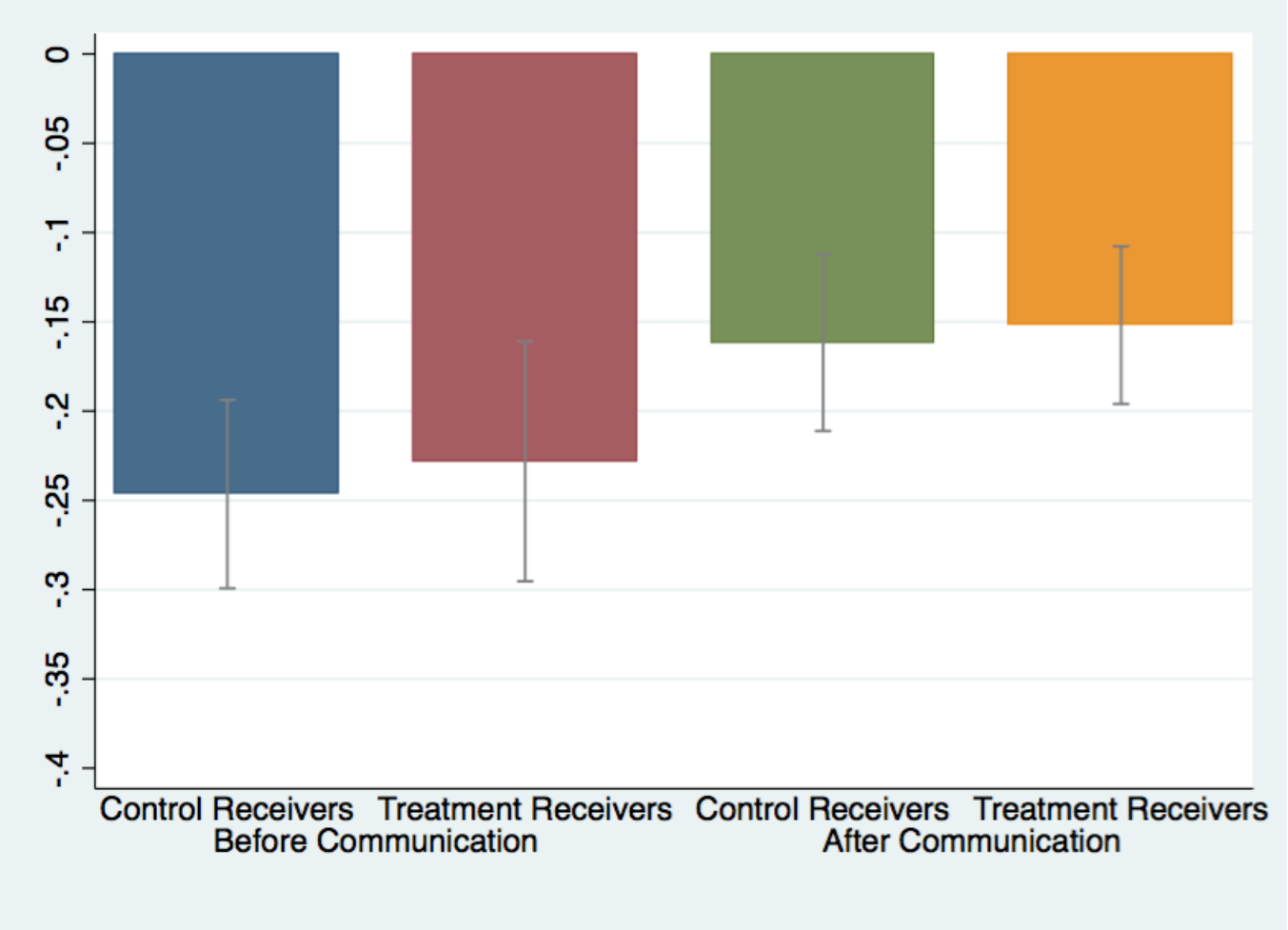


Education results in 32% reduction in welfare loss.

Does **education** affect financial competence?

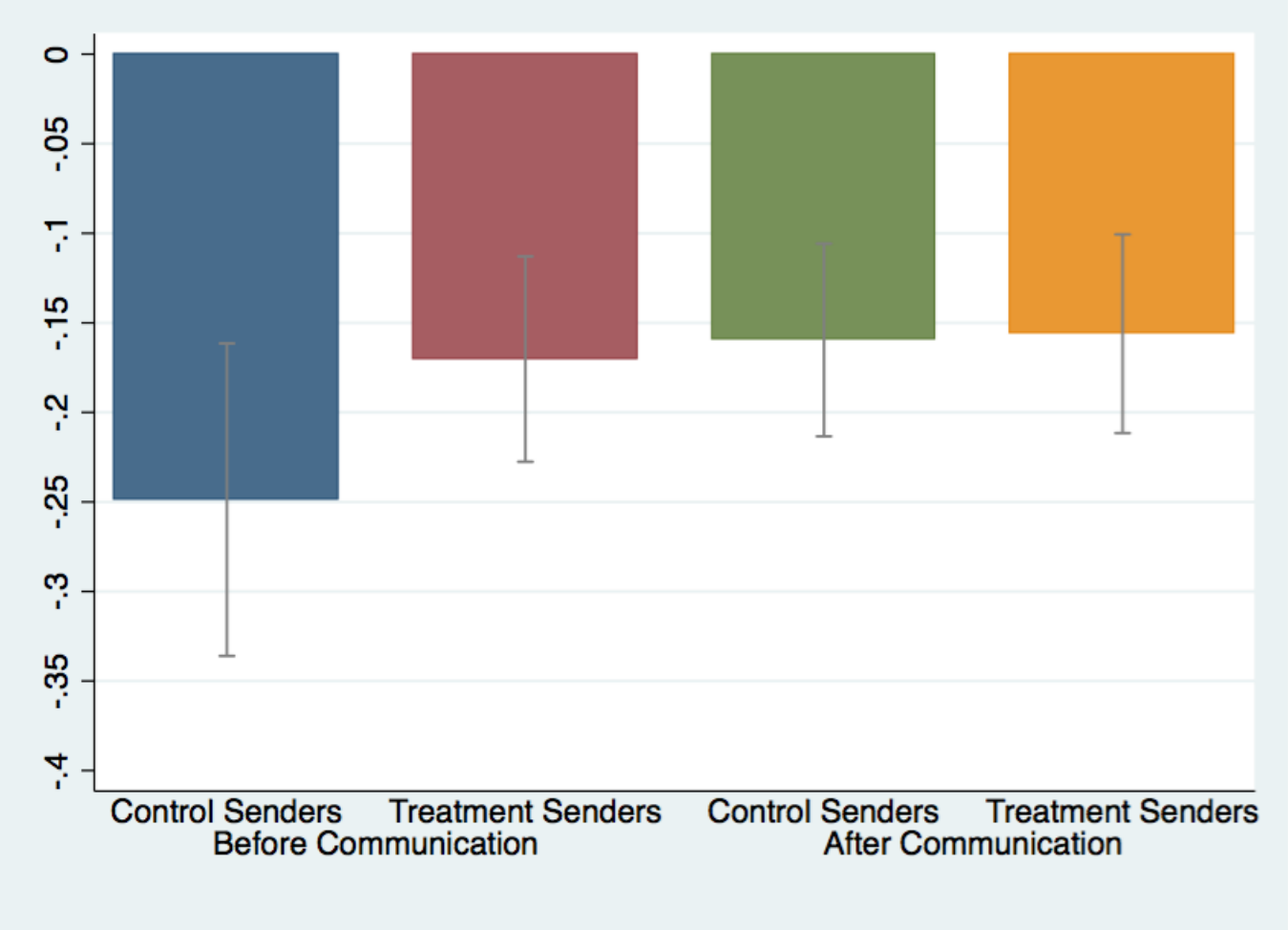


Does **communication** affect financial competence?



Communicating with an educated partner does not affect welfare differently than communicating with an uneducated partner.

Does **communication** affect financial competence?



Being a sender in the treatment group and communicating leads to 7.50 percentage points welfare loss (p-value: .053).

Conclusions

- Educational measures that look great according to conventional outcome measures may not improve the quality of decision making
- There appears to be a gap between understanding principles and operationalizing principles
- People are more likely to operationalize motivational rhetoric
- The prominent role that motivational rhetoric has played in adult financial education may be counterproductive
- Social interaction improves the quality of financial decision making irrespective of the qualifications of social contacts, and can even render a beneficial effective intervention redundant