The Structural Richness of Beliefs About Norms: Challenges for Empirical Elicitation

Glenn Harrison and Don Ross

NoBeC 2019

Norms and Behavioral Change Workshop

University College Cork

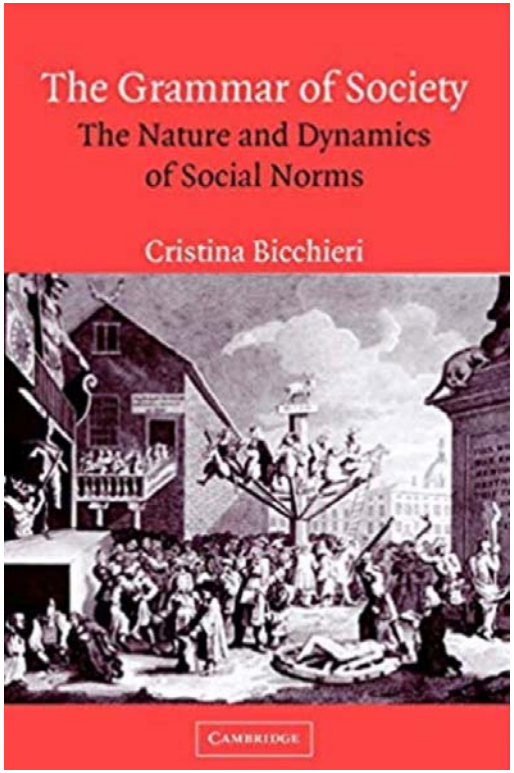
University of Cape Town

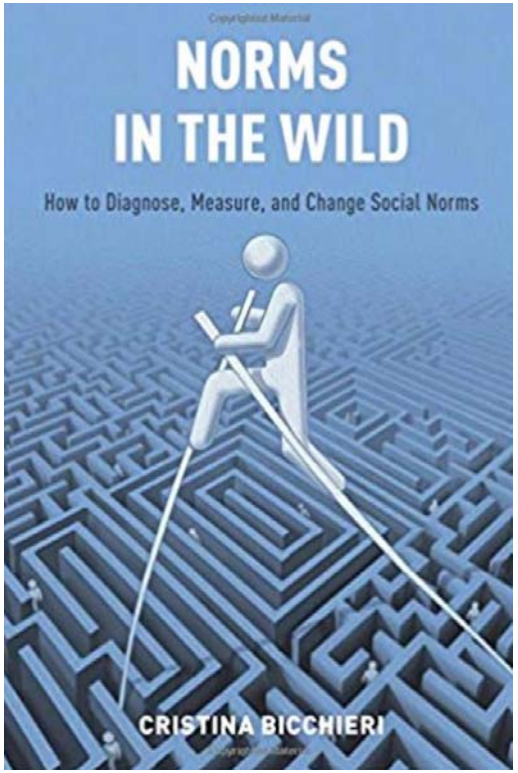
Georgia State University | CEAR CENTER FOR THE ECONOMIC ANALYSIS OF RISK

Outline

- Defining norms in terms of belief consistency
- Problems arise with leading experimental tests
  - Belief distributions ≠ mean or mode
  - No discussion of confidence of beliefs
  - No discussion of statistical consistency of beliefs
- Elements of an improved experimental approach
- New theoretical approach for games with norms

Defining norms





Defining norms

- Descriptive beliefs
  - First-order: what does an agent believe others will do?
  - Second-order: what does an agent believe others believe that others will do?
- Normative beliefs
  - First-order: what does an agent believe she and others should do?
  - Second-order: what does an agent believe others believe she and others should do?
- Conditional preference for following the norm
  - The conditionals are all four beliefs are consistent

Defining norms

- Some subtleties
  - "in the appropriate circumstances"
  - "for the relevant group of people"
- Distinctions
  - "Social preference": choosing as if abstract social states are arguments in the agent's utility function
  - Conditional preference for following a social norm ≠ a "social preference"

Confidence in beliefs

- **Overestimation** of one's actual ability
- **Overplacement** of one's self relative to others
- **Overprecision**: excessive certainty about accuracy of one's beliefs

The Trouble With Overconfidence

Don A. Moore
Carnegie Mellon University

Paul J. Healy
The Ohio State University

Psychological Review
2008, Vol. 115, No. 2, 502–517

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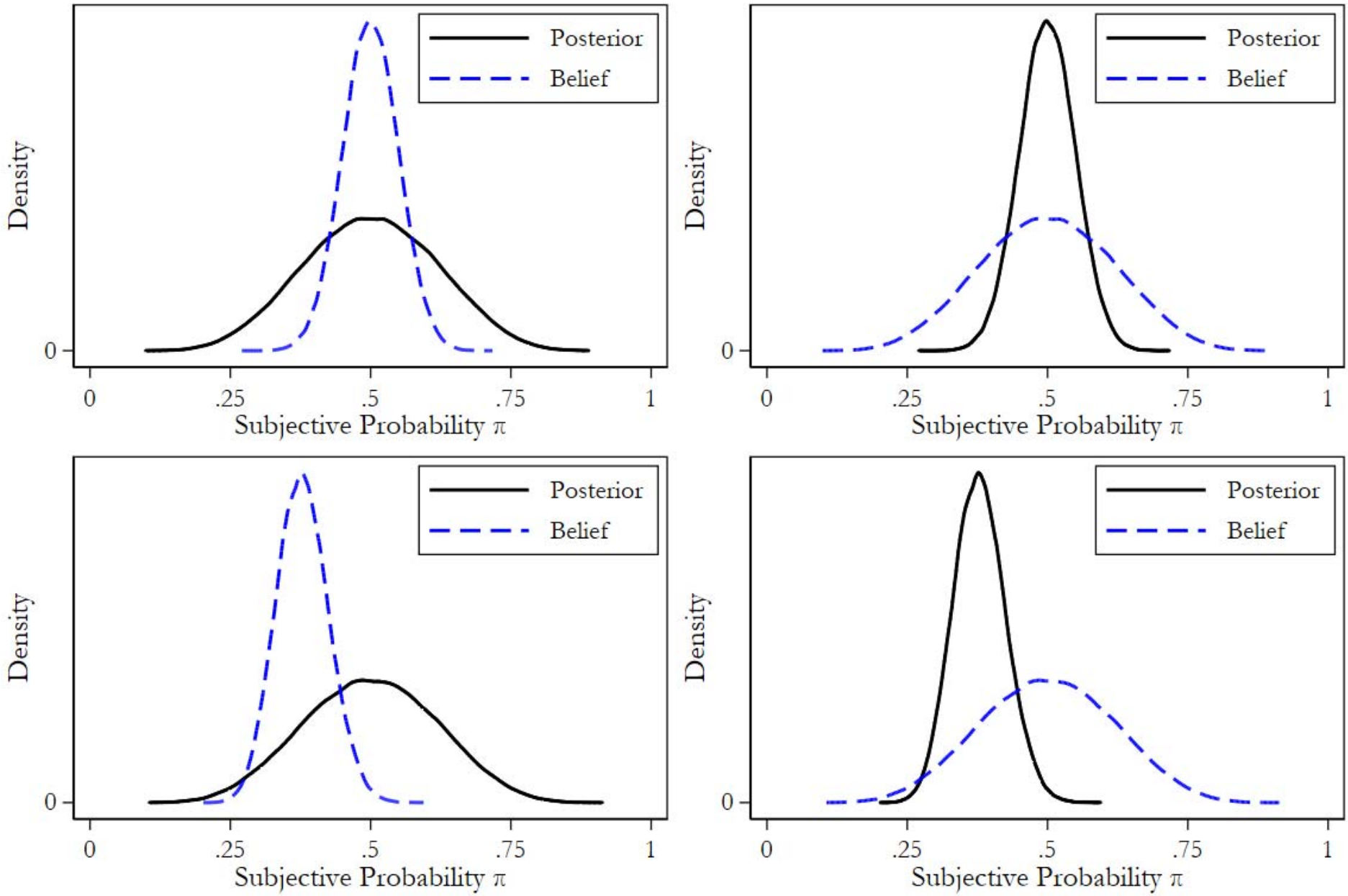
Bias and Confidence



Eliciting subjective beliefs

- Use Quadratic Scoring Rules to incentivize
  - Risk preferences and beliefs jointly estimated
- Underlying events
  - Binary → subjective probability
  - Continuous → subjective probability density function
  - Categorical → subjective probability mass function

- Set aside debates over elicitation methods for now

Our Team: CEAR and CEAR-Africa

Andre Hofmeyr

Brian Monroe

Dawn Wang

J Risk Uncertain (2014) 48:207–229
DOI 10.1007/s11166-014-9194-z

Estimating subjective probabilities

Steffen Andersen · John Fountain · Glenn W. Harrison · E. Elisabet Rutström

JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 52, No. 2, Apr. 2017, pp. 737–750

doi:10.1017/S0022109017000035

Information Characteristics and Errors in Expectations: Experimental Evidence

Constantinos Antoniou, Glenn W. Harrison, Morten I. Lau, and Daniel Read*

Journal of Economic Behavior & Organization 134 (2017) 430–448

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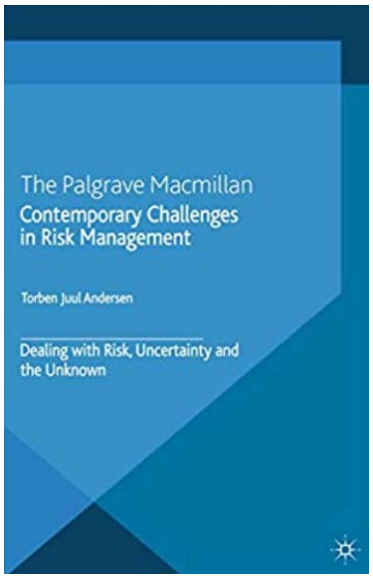
journal homepage: www.elsevier.com/locate/jebo

Scoring rules for subjective probability distributions☆

Glenn W. Harrison[a,*], Jimmy Martínez-Correa[b], J. Todd Swarthout[c], Eric R. Ulm[d]



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Subjective Beliefs and Statistical Forecasts of Financial Risks: The Chief Risk Officer Project

Glenn W. Harrison and Richard D. Phillips

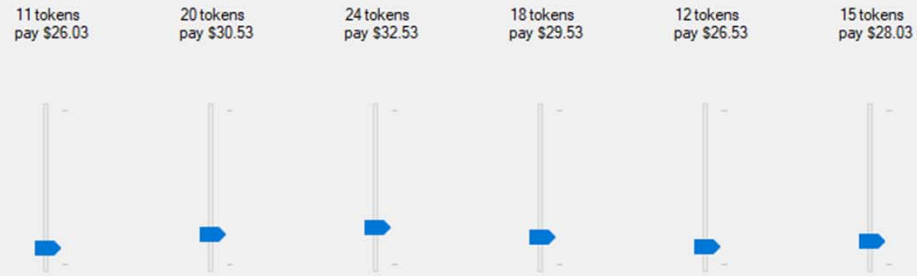
2014

An Example: a Trust Game

- Player 1 and Player 2 each have $100
- Player 1 can send $0, $20, $40, $60, $80 or $100
- Player 3, the experimenter, scales up by 3

Beliefs about Player 1 choices

How much of the $100 will Player 1 send to Player 2?



Unallocated tokens: 0

Submit

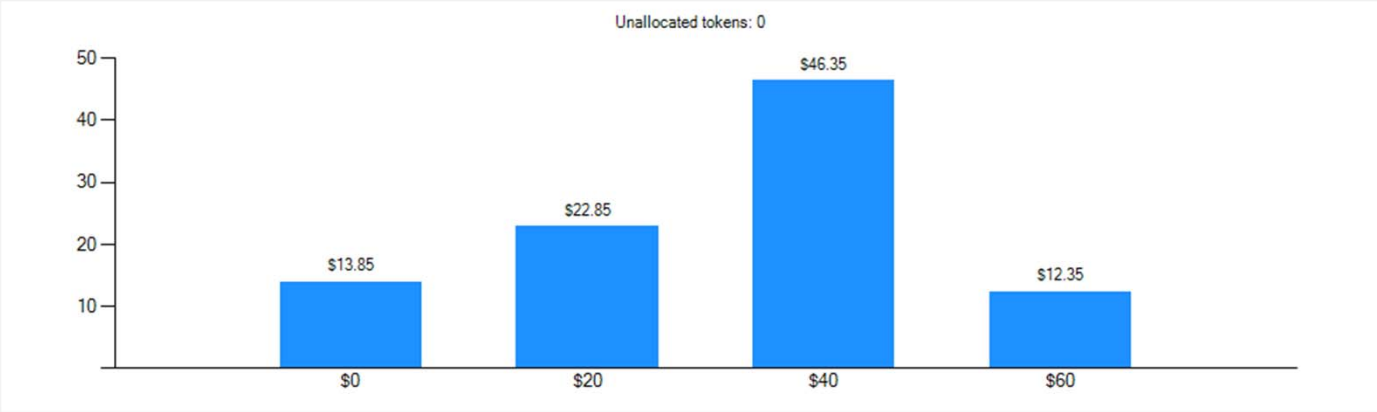
Submit your decision or
continue making choices

An Example: a Trust Game

- Player 1 and Player 2 each have $100
- Player 1 can send $0, $20, $40, $60, $80 or $100
- Player 3, the experimenter, scales up by 3
- So Player 2 has $0, $60, $120, $240 or $300 to send back to Player 1
- Strategy method used for choices
- Focus on beliefs about Player 2 choices if has $60
  - Using data on choices from trust games run by CEAR-Africa

First-order descriptive beliefs

How much of the $60 received by Player 2 **will** be returned to Player 1?



5 tokens
pay $13.86

23 tokens
pay $22.86

70 tokens
pay $46.36

2 tokens
pay $12.36

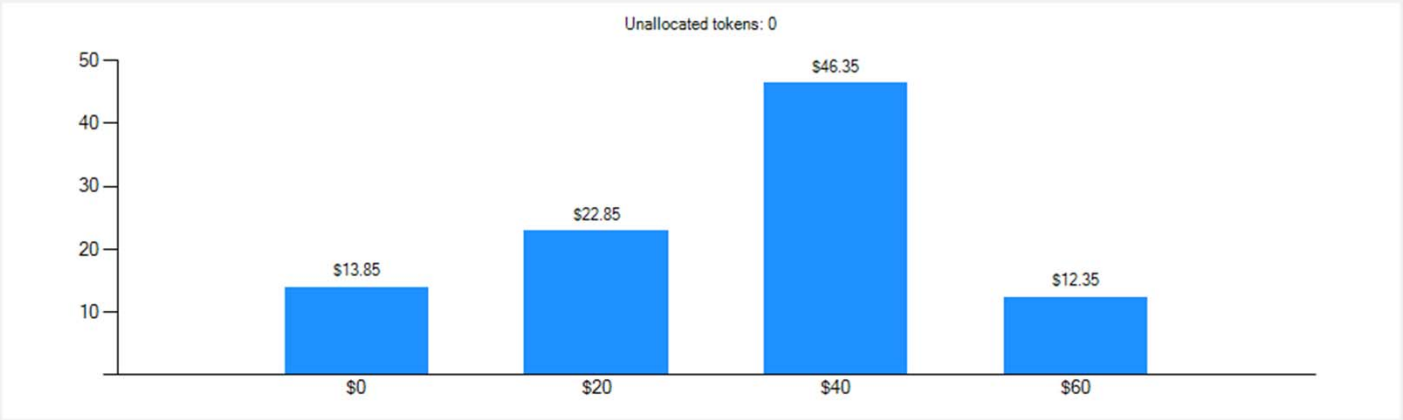
Unallocated tokens: 0

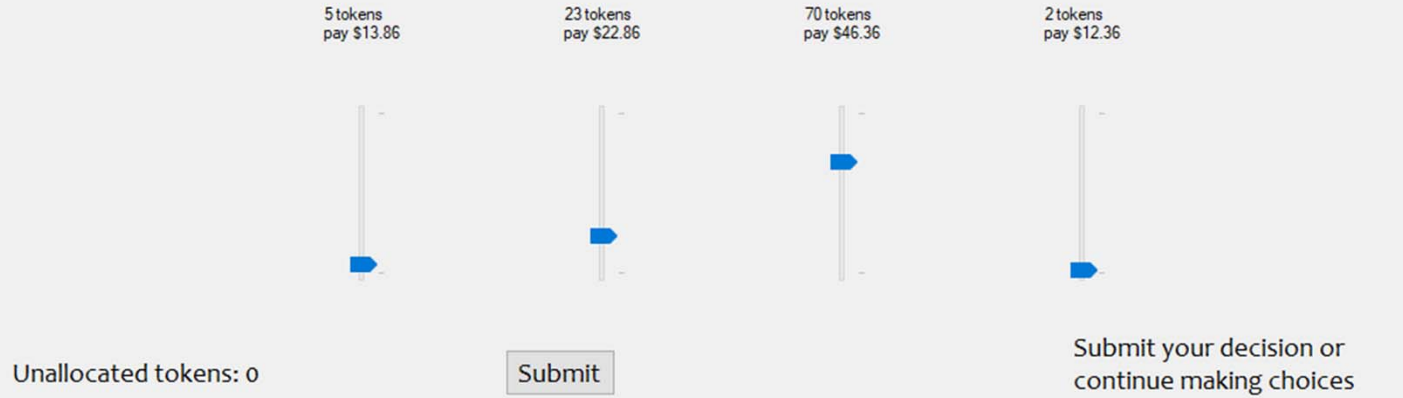
Submit

Submit your decision or
continue making choices

First-order normative beliefs

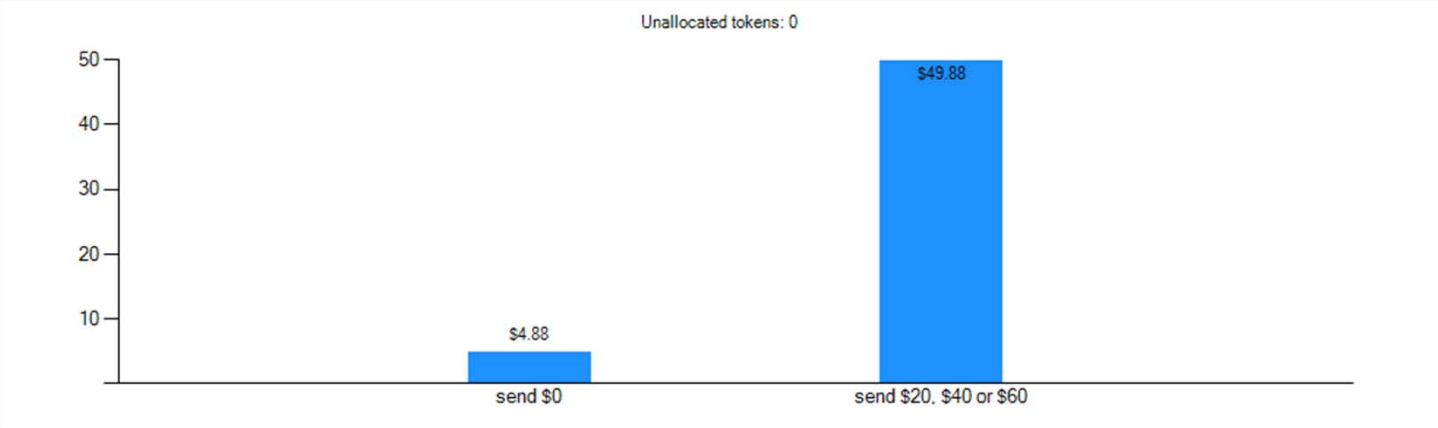
How much of the $60 received by Player 2 do **you** think **should** be returned to Player 1? **This is a hypothetical question**





Second-order descriptive beliefs

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **$0 will be sent back** to Player 1?



5 tokens
pay $4.88

95 tokens
pay $49.88

Unallocated tokens: 0

Submit

Submit your decision or
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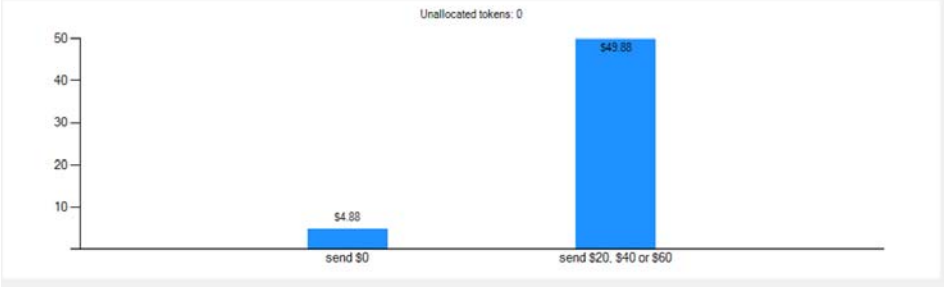
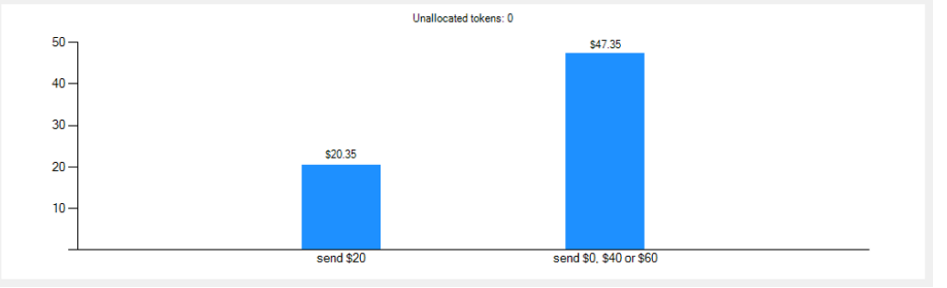
Second-order descriptive beliefs

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **$0 will be sent back** to Player 1?

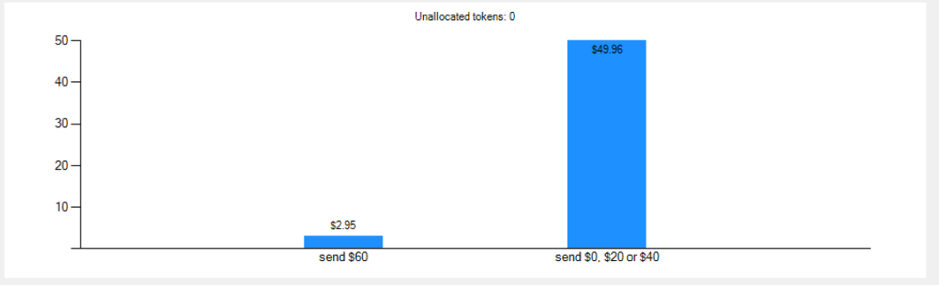


If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **$20 will be sent back** to Player 1?



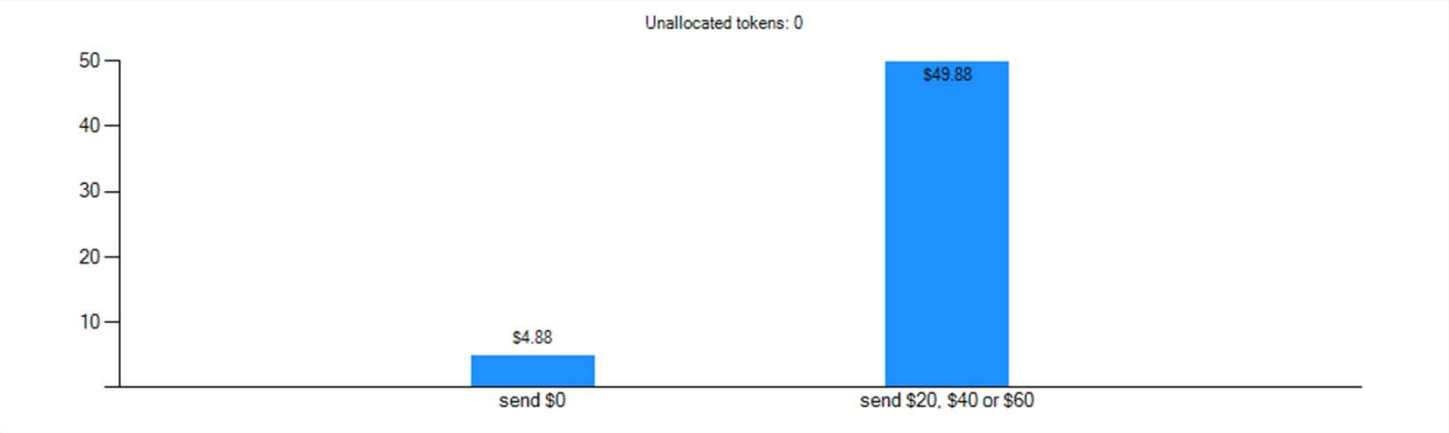
If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **40 will be sent back** to Player 1?

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **$60 will be sent back** to Player 1?



Second-order normative beliefs

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **she should** send back $0 to Player 1?



5 tokens
pay $4.88

95 tokens
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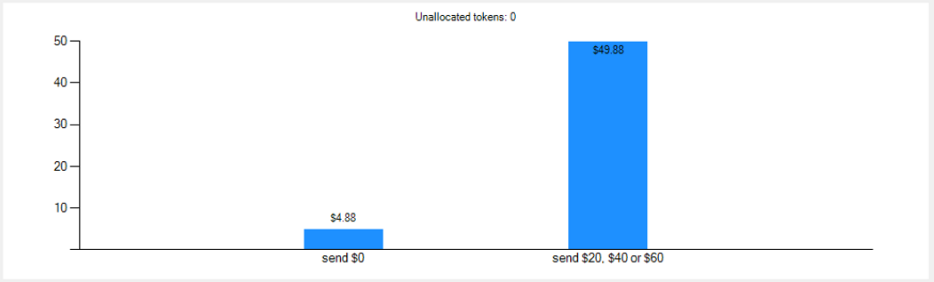
Second-order normative beliefs

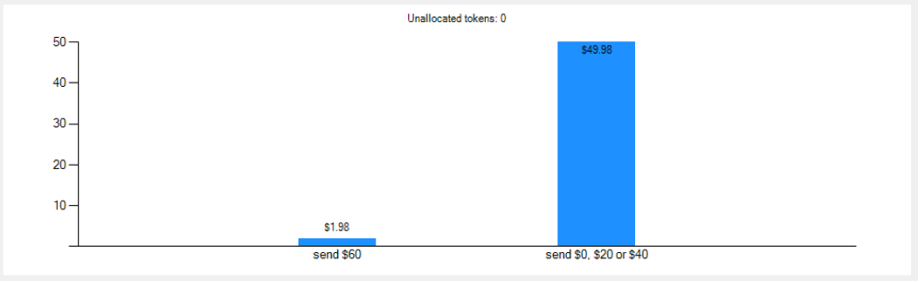
If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **she should** send back $0 to Player 1?



If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **she should** send back $20 to Player 1?

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **she should** send back $30 to Player 1?

If $60 is sent to Player 2, what fraction of tokens will be allocated to **believing** that **she should** send back $60 to Player 1?



Belief inconsistency, 1D ≠ 1N

How much of the $60 received by Player 2 **will** be returned to Player 1?

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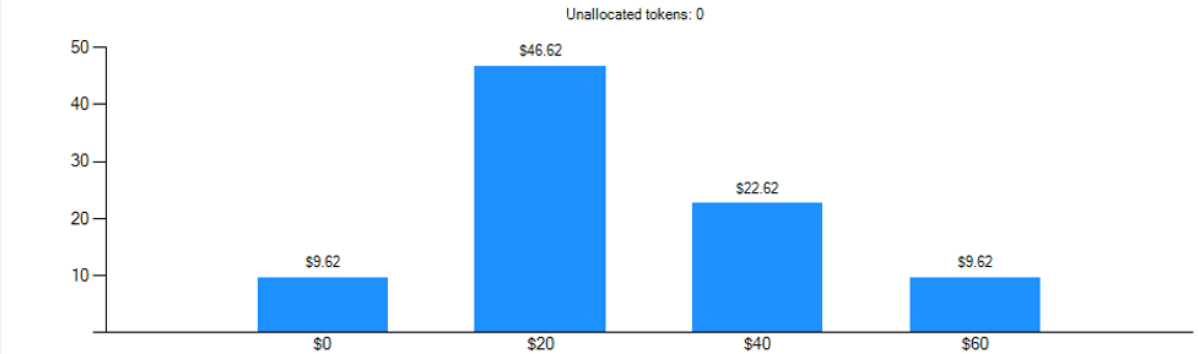
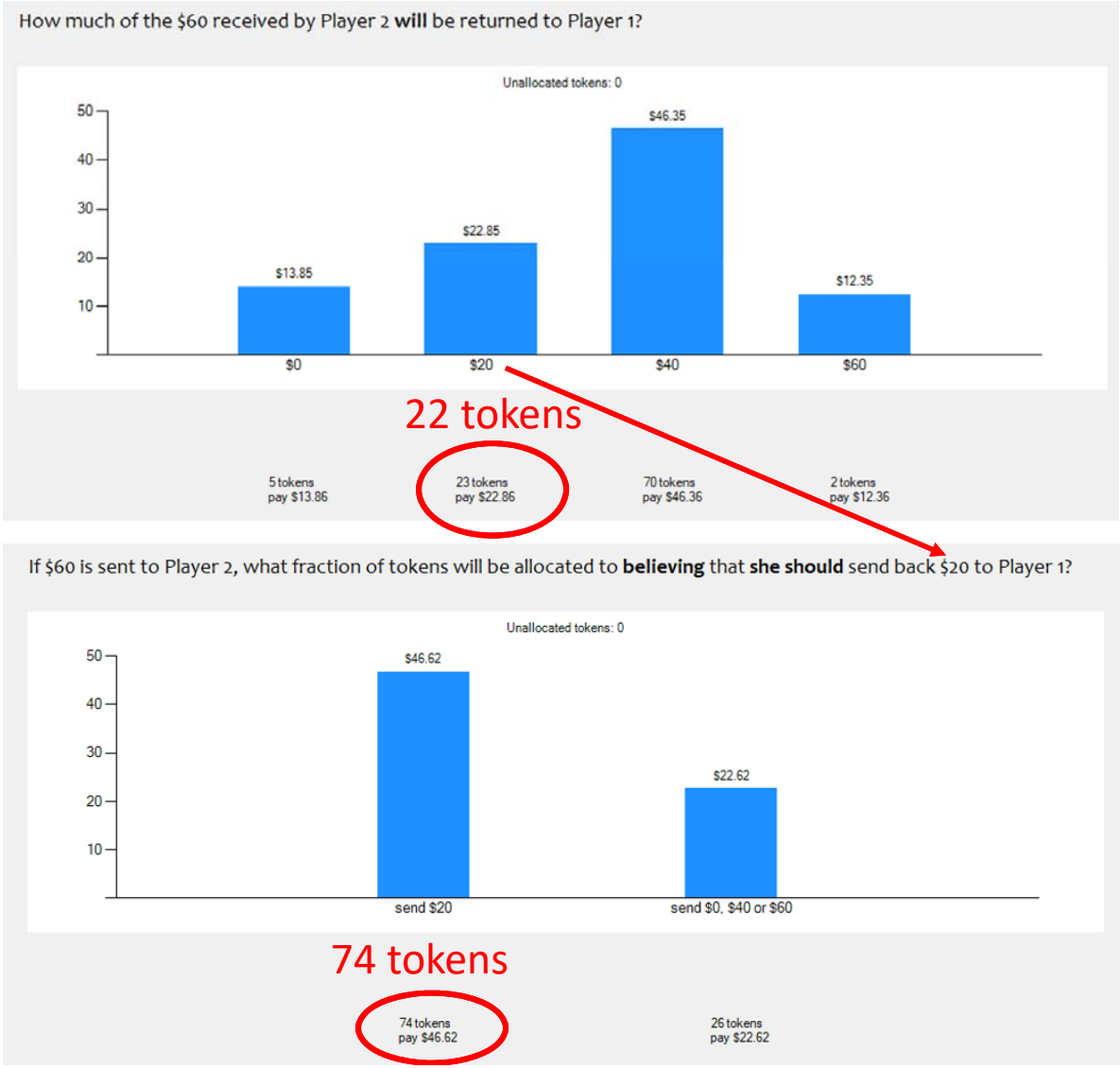


Belief inconsistency, 1D ≠ 1N

How much of the $60 received by Player 2 **will** be returned to Player 1?

How much of the $60 received by Player 2 do **you** think **should** be returned to Player 1? **This is a hypothetical question**

Belief inconsistency, 1D ≠ 2N



Evaluating consistency

- Now a simple statistical problem
- Not the same as a distribution of point estimates from a sample
  - Often confused with uncertainty of beliefs
  - Many examples: inflation expectations

Evaluating consistency

- Now a simple statistical problem
- Not the same as a distribution of point estimates from a sample
  - Often confused with uncertainty of beliefs
  - Many examples: inflation expectations
- Statistical tests for consistency w.r.t. bias
- Statistical tests for consistency w.r.t. confidence
- Statistical tests for consistency of **both**

Statistical insights

- Consistency measured by more than just bias
- Statistical measures of degree of consistency
  - Overall consistency: 1D = 1N = 2D = 2N
  - Partial consistency: 1D = 1N, 1D = 2D or 1N = 2N
- Identification of degree of consistency of different “reference networks” by demographics
- Identification of influential “norm disruptors”
- Identification of those with “norm wiggle room”

What is done in the literature?

- No incentives on elicitation of normative beliefs
  - Incentives ≠ incentive-compatibility
- Assume risk neutrality
- Elicit a subjective probability of a binary event
  - No role for confidence at all
- Elicit a statistic of a belief distribution
  - Mode: “tell me your belief and I’ll pay you $x if you are correct”

What we will do

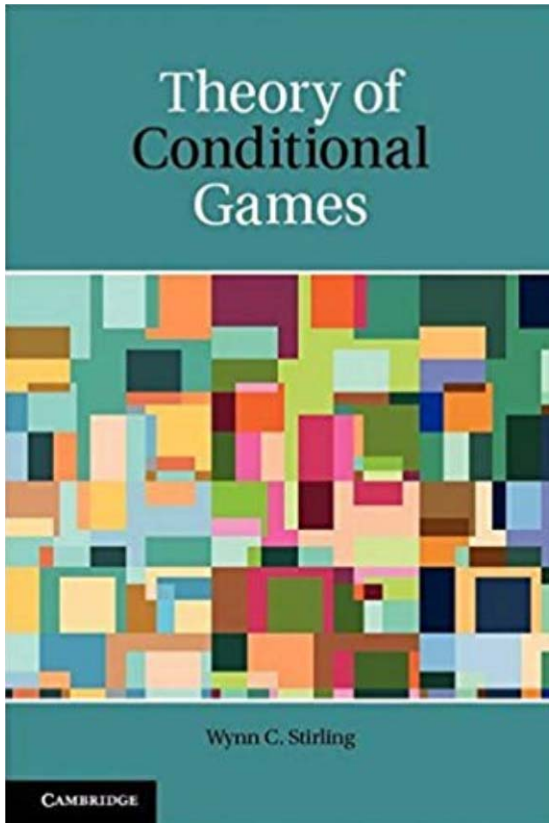
- Trust games (incentives)
- Risk preference elicitation (incentives)
- Elicit first-order descriptive beliefs (incentives)
- Survey first-order normative beliefs (no incentives)
- Elicit second-order normative beliefs (incentives)
- Do subjects in a second trust game pay a premium to play with others based on information about first-order normative beliefs?

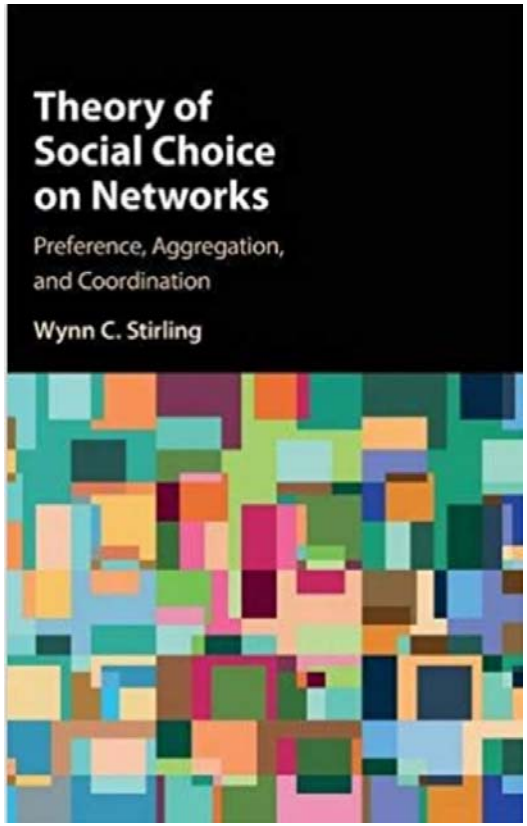
Analyzing trust game play

- Unconditional Nash Equilibrium
- Unconditional Quantal Response Equilibrium

- Conditional Nash Equilibrium
- Conditional Quantal Response Equilibrium

Theory of Conditional Games





Conditional Game Theory

- Distinguish *categorical* & *conditional* preferences

Categorical preferences *unconditionally* define an agent's ranking of possible outcomes, regardless of other agents' preferences

Conditional preferences are based on influence flows which propagate through a group and define agents' rankings of alternative outcomes as *conditional* on the preferences of others

Model this propagation of influence flows by applying the formal syntax of probability theory to game theory, and constructing a representation with Bayesian belief networks

Probability syntax & normative uncertainty

The conventional application of the probability syntax is as a means of expressing epistemological uncertainty regarding belief

This logical structure may be used in expressing behavioral uncertainty regarding preference: just as agent *i* is ***epistemologically*** uncertain if *i* does not have complete knowledge that a proposition is realized, so *i* is ***normatively*** uncertain if *i* is not completely decisive that an action should be taken

Norms for norm research

- Beliefs about what norms are
- Beliefs about how to elicit beliefs
- Beliefs about how to measure consistency
  - Critical statistical role for confidence here
  - Insights about heterogeneity of “reference networks”
- Beliefs about the formal conditionality of preferences in contexts where norms apply