A Theory of Experiments

Invariance of Equilibrium to the Method of Elicitation

and Implications for Social Preferences

w/ M. Schonger

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Intuition

Consider these 2 questions:

- Suppose I hit you in the face. What would you do?
  (suppose answer is binding)
- Suppose in fact I just had hit you in the face, then what would you do?

Invariance of Equilibrium

Strategy Method (SM)—a popular way to estimate preferences

- Participants asked to indicate their choices at all information sets rather than only those actually reached
- Compare differences in decisions at different information sets
  - information set with low offer vs. information set with high offer

Appeal of SM

- Simplicity
- Elucidate equilibria actually played if theory predicts multiple equilibria
- Circumvent endogeneity problems in estimating preferences when making comparisons between heterogeneous individuals

Invariance of Equilibrium

Limitations

- Much of the debate revolves around emotion and cognitive fatigue
  - DE is more emotionally stimulating.
    - ★ "[agents] may [..] experience stronger emotions when reacting to an actual violation of a fairness norm than when contemplating what he would do in case of such a violation" (Fehr & Fischbacher 2004)
  - SM improves subjects' understanding of the game. (Casari & Cason 2009)
  - SM has weaker incentives per cognitive act. (Fehr & Fischbacher 2004)
- Construal theory (psychological distance) prima facie invalidate SM

This paper's focus - issues related to *economic theory*

e.g., intentions, disappointment aversion, self-image motives,..

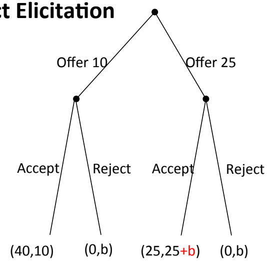
- Information sets in strategy method and direct elicitation (DE) differ
- *Drafting* a contract (Battigalli et. al 2002; Tirole 1999; Schwartz et. al 2004)

DE and SM games played in the lab are not in general strategically equivalent

Example of Variance w/ Self-Image Motives

Simplified ultimatum game

Direct Elicitation



Strategy Method

		x≥10 (AA')	x≥25 (RA')	(AR')	(RR')
p	10	(40,10)	(0,b)	(40,10)	(0,b)
1-p	25	(25,25)	(25,25+b)	(0,b)	(0,b)

Example of Variance w/ Self-Image Motives

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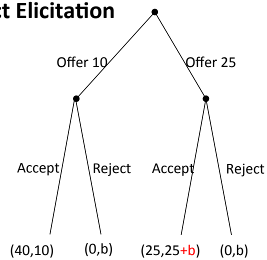

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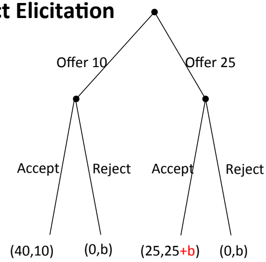
Can we find an example of a non-consequentialist preference that predicts different outcomes under Direct Elicitation vs. Strategy Method?

Example of Variance w/ Self-Image Motives

Simplified ultimatum game

Direct Elicitation



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Can we find an example of a non-consequentialist preference that predicts different outcomes under Direct Elicitation vs. Strategy Method?

Self-image: If I did not commit or in fact accept the unfair offer, I get an additional psychic benefit of 0<b<10.

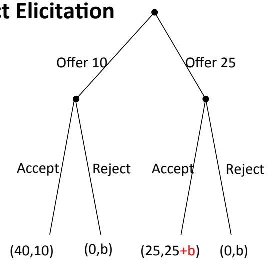
DE: offer 25 -> accept -> utilities (25,**25+b**)
DE: offer 10 -> accept -> utilities (40,10)

SM: strategy accept x≥10 yields: p*10 + (1-p)25 = 25-15p
SM: strategy accept x≥25 yields: p*(0+b) + **(1-p)(25+b)** = 25+b-25p

Example of Variance w/ Self-Image Motives

Simplified ultimatum game

Direct Elicitation



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Self-image: If I did not commit or in fact accept the unfair offer, I get an additional psychic benefit of 0<b<10.

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DE: offer 10 -> accept -> utilities (40,10)

SM: strategy accept x≥10 yields: p*10 + (1-p)25 = 25-15p
SM: strategy accept x≥25 yields: p*(0+b) + **(1-p)(25+b)** = 25+b-25p

Act on self-image (x≥25) **iff** p<0.1b (**low prob of bearing consequences of obtaining self-image**)

What We Do

Strategy Method (SM) helps examine rare or off-equilibrium behavior that cannot be observed using direct elicitation (DE)

- Strategic equivalence holds for monetary payoff (Kohlberg et al. 1986)
  - but not for game actually played, which is in terms of utilities

Formalize the mapping from monetary payoff game to the actual game

- Provide necessary and sufficient conditions for strategic equivalence
  - Fails w/ intentions, disappointment aversion, self-image motives,..

Investigate past literature and our own experiments

- (1) Not accounting for estimation bias when decisions at one information set can influence utility at another can render significant differences
- (2) Bias can be large, equivalent to other causal effects being measured
- (3) Subtle interventions on salience can magnify these differences
- (4) Treatment effects can differ between SM and DE

Conventional Wisdom

Empirical researchers

Behavioral Validity of the Strategy Method in Pubic Good Experiments *(Fischbacher et. al 2012)*

"According to the standard game-theoretic view, the strategy method should yield the same decisions as the procedure involving only observed actions." *(Brandts and Charness 2011)*

Theoretical researchers

"..any solution concept [..] should only depend on the normal form [of the game]" *(Kohlberg and Mertens 1986)*

"..in general the solution of a game with a sequential structure simply has to depend on this sequential structure and cannot be made dependent on the normal form only" *(Harsanyi and Selten 1988)*

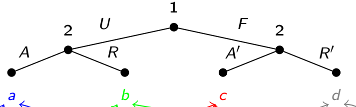
"..the notion of subgame perfect equilibrium is lost in the transition from the extensive to the strategic form of the game, since there are no subgames in a game in which players state their strategies simultaneously." *Alvin E. Roth (ch.4, Handbook of Experimental Economics, 1995)*

Causal inference can be severely biased

- (1) SM relies on many decisions at different information sets
- (2) Most dependent variables are typically highly related
- (3) Off equilibrium decisions can affect utility at other information sets

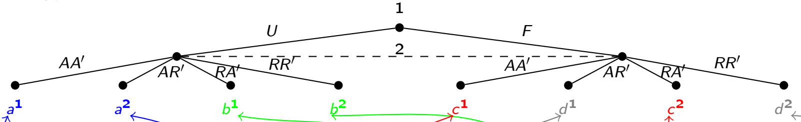
General Idea

Direct Elicitation:



	AA'	AR'	RA'	RR'
U	$u(a)$	$u(a)$	$u(b)$	$u(b)$
F	$u(c)$	$u(d)$	$u(c)$	$u(d)$

Strategy Method:



	AA'	AR'	RA'	RR'
U	$u(a^1)$	$u(a^2)$	$u(b^1)$	$u(b^2)$
F	$u(c^1)$	$u(d^1)$	$u(c^2)$	$u(d^2)$

Formal framework

Extensive form Γ

- game tree
- I - number of players
- who plays at each non-terminal node
- information sets (perfect recall)
- Z - set of terminal nodes
  examples: a, b, b^1..., generic: z

Extensive form game G

- extensive form Γ
- Bernoulli utility functions $u_i : Z \to \mathbb{R}$ (not directly observable)

Laboratory

- extensive form Γ
- monetary payoff functions $\pi_i : Z \to \mathbb{R}$

Problem: $u_i(z) \neq \pi_i(z)$

Theorem

$$\begin{array}{ccc}
G_\pi^{DE} = \left(\mathit{\Gamma}^{DE}, \pi^{DE} : Z^{DE} \to \mathbb{R}^{\mathrm{I}}\right) & \overset{\text{Strat. iden.}}{\Leftrightarrow} & G_\pi^{SM} = \left(\mathit{\Gamma}^{SM}, \pi^{SM} : Z^{SM} \to \mathbb{R}^{\mathrm{I}}\right) \\
\uparrow & & \uparrow \\
\text{equilibrium may change} & & \text{equilibrium may change} \\
\downarrow & & \downarrow \\
G^{DE} = \left(\mathit{\Gamma}^{DE}, u^{DE} : Z^{SM} \to \mathbb{R}^{\mathrm{I}}\right) & \overset{\text{Thm.}}{\Leftrightarrow} & G^{SM} = \left(\mathit{\Gamma}^{SM}, u^{SM} : Z^{SM} \to \mathbb{R}^{\mathrm{I}}\right)
\end{array}$$

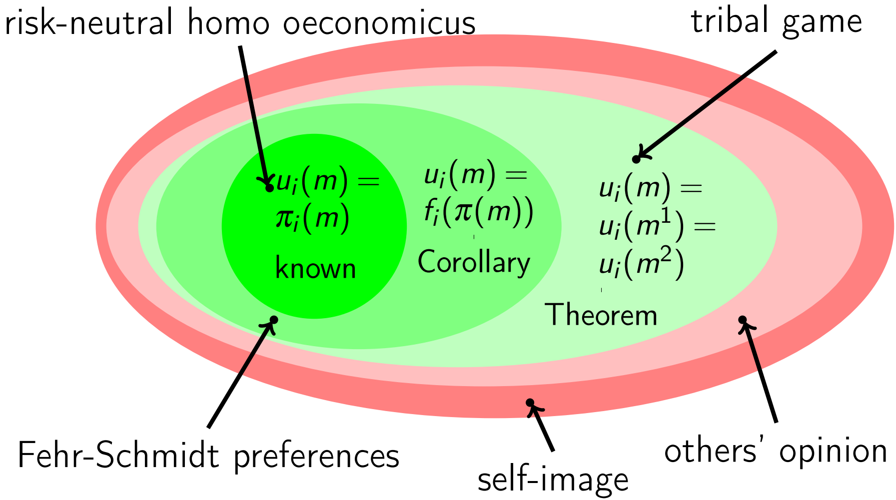
- Strategic equivalence if their strategic forms are identical up to a positive affine transformation of each player's Bernoulli **utility**

  (Moulin 1986; Rouchet 1981)

  - G^{DE} and G^{SM} are strategically equivalent iff $\forall$ players i, $\exists$ real numbers $\alpha_i, \beta_i > 0$ such that $\forall\ z^{SM} \in Z^{SM} : u_i^{SM}\left(z^{SM}\right) = \alpha_i + \beta_i u^{DE}\left(\zeta\left(z^{SM}\right)\right)$

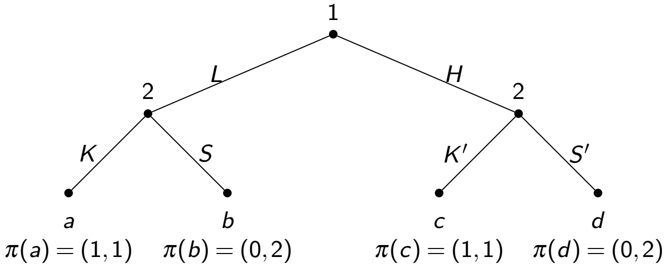
Venn diagram

◂ Examples of invariance holding vs. breaking down



Tribal Game: the story

- Social preferences, preference of payoff vectors only: Invariance
  - Fehr-Schmidt preferences, altruism, envy, utilitarianism
- Next question: Can this be broadened? Tribal Game



Story:

- 1 can claim to love (L) or hate (H) the favorite sports team of 2
- 2 divides \$2 between self and 1 in a kind (K) or self-interested way (S)

Tribal Game: Emotions

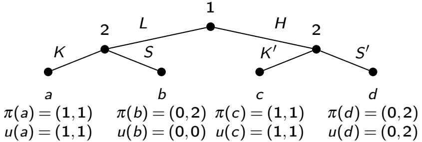
- player 1: homo oeconomicus
- player 2 has emotions:
  $a \sim a^1 \sim a^2 \succ d \sim d^1 \sim d^2 \succ b \sim b^1 \sim b^2 \succ c \sim c^1 \sim c^2$

- $u_2(a) = -1, u_2(d) = -2, u_2(b) = -3, u_2(c) = -4$
- note: $\nexists\ f_2 : u(m) = f_2(\pi(m))$

- Invariance: DE and SM strategically equivalent

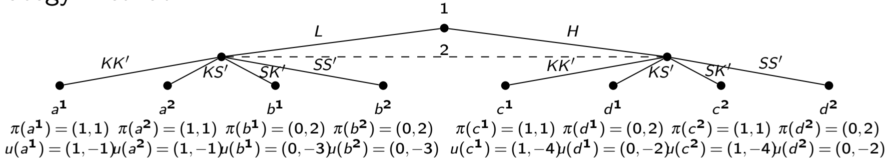
Tribal Game: DE and SM with emotions

Direct Elicitation:



	KK'	KS'	SK'	SS'
L	$u(a) = (1,-1)$	$u(a) = (1,-1)$	$u(b) = (0,-3)$	$u(b) = (0,-3)$
H	$u(c) = (1,-4)$	$u(d) = (0,-2)$	$u(c) = (1,-4)$	$u(d) = (0,-2)$

Strategy Method:



	AA'	AR'	RA'	RR'
U	$u(a^1) = (1,-1)$	$u(a^2) = (1,-1)$	$u(b^1) = (0,-3)$	$u(b^2) = (0,-3)$
F	$u(c^1) = (1,-4)$	$u(d^1) = (0,-2)$	$u(c^2) = (1,-4)$	$u(d^2) = (0,-2)$

Corollary

Corollary

If off-equilibrium behavior does not impact evaluation of a history then DE and SM are strategically equivalent (e.g. $(L, KS') \sim (L, KK')$*)*

- Some concerns for actions/labels may be unproblematic for strategic equivalence
◂ Venn Diagram

Experimental Evidence

Briefly revisit prior meta-analysis

and conduct our own meta-analysis of ultimatum game experiments (31 papers) [**Study 1**]

Randomize whether respondent is in SM or DE in ultimatum game [**Study 2**]

- Extend to another simple game, the trust game [**Study 3**]
- Subsequent experiments allow proposer to know if respondent is in SM or DE

Manipulate salience of off-equilibrium motivations

- Simple game like ultimatum game [**Study 4**]
- Complex game like three-player prisoners' dilemma [**Study 5**]

Study 1 (Meta-Analysis: Ultimatum Game) $N = 31$ papers

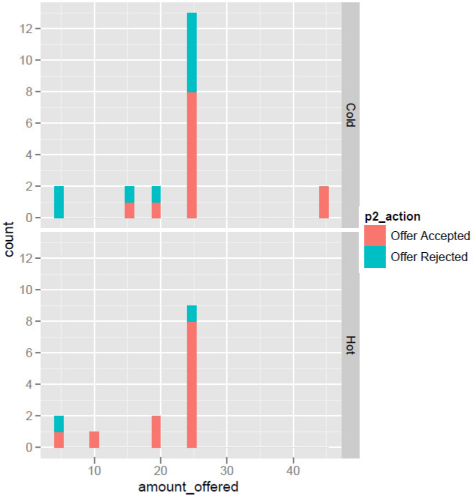
Accept ($Y = 1$) or Reject ($Y = 0$)?

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.877***	0.768***	0.823***	0.549**	0.788***	0.696***
	(0.0183)	(0.134)	(0.133)	(0.197)	(0.0915)	(0.111)
Strategy method	-0.198***	-0.208***	-1.205*	-0.933+	-0.0943	-0.103**
	(0.0528)	(0.0507)	(0.535)	(0.518)	(0.122)	(0.0357)
Offer level		0.399	0.264	0.900+	0.291	0.554*
		(0.306)	(0.306)	(0.451)	(0.225)	(0.267)
Repeated experiment		-0.120***	-0.114**	-0.113**	-0.138***	-0.125***
		(0.0337)	(0.0330)	(0.0352)	(0.0300)	(0.0272)
Developing country		-0.0241	-0.0278			
		(0.0381)	(0.0372)			
Strategy Method X Offer			2.507+	1.874		
			(1.338)	(1.288)		
Mean of Y	0.853	0.853	0.853	0.841	0.860	0.867
N	50	50	50	33	50	49

Standard errors in parentheses
+ $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

- Direct elicitation increases acceptance rates by 20%
- Robust to controls for offer amount, whether the experiment was repeated, and whether in LDC
- Strategy method increases sensitivity to offer
- Drop LDCs
- Weight by citation counts renders main effect insignificant
- Weight by number of observations
- Our reading of Brandts and Charness (2011) is SM and DE diverged in simple games with moral content, but did not or had mixed results for complex games framed as economic games; Schotter et al. (1994) also finds differences emerge in simple games, where subjects were more likely to use and fear incredible threats.

Study 2 (Ultimatum Game DE vs. SM for Respondent) $N = 78$



- Direct elicitation increases acceptance rates by 20% (as in Study 1)
  - equivalent to an offer increase of 34% of endowment
- Strategy method increases sensitivity to offer (as in Study 1)

Study 2 (Ultimatum Game DE vs. SM for Respondent) $N = 78$

Accept ($Y = 1$) or Reject ($Y = 0$)?

	(1)	(2)	(3)
(Intercept)	0.917***	0.543***	0.784***
	(0.0467)	(0.126)	(0.214)
Strategy method	-0.202*	-0.223**	-0.629*
	(0.0846)	(0.0817)	(0.268)
Offer level		0.0155***	0.00552
		(0.00453)	(0.00814)
Strategy x Offer level			0.0165+
			(0.00960)
Mean of Y	0.808	0.808	0.808
N	78	78	78

Robust standard errors in parentheses
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

- Direct elicitation increases acceptance rates by 20% (as in Study 1)
  - equivalent to an offer increase of 34% of endowment
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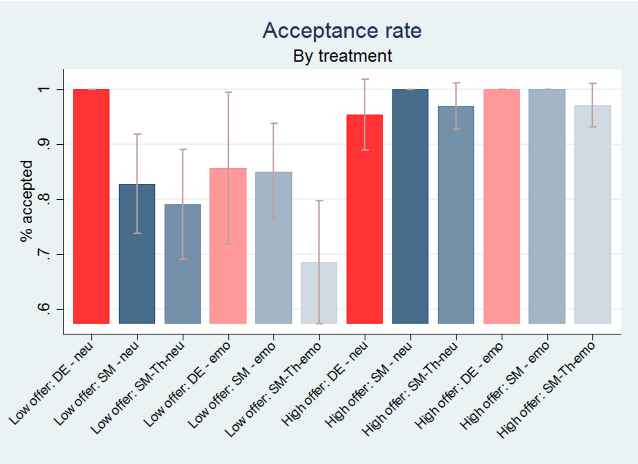
Study 4 (Ultimatum Game: *DE vs. SM* × *Emotion vs. Neutral*) $N = 418$

In the high salience treatment, two word changes: *proposer* → *dictator*, *respondent* → *subject*.

- Direct elicitation (DE) increases acceptance rates by 18% (as in Studies 1 & 2)
- This effect is larger when off-equilibrium payoffs are salient (increases to 27%) (c3 - c4 vs. c1 - c2)
- No significant differences between strategy (SM) and threshold method (TM)
- Note: Offers are slightly lower in direct elicitation setting; Control for Offer

Study 4 (Ultimatum Game: *DE vs. SM* × *Emotion vs. Neutral*) $N = 418$



- Concern: strategy/threshold provides far more data at offer levels that are off the equilibrium or rare. UG
- Focusing on the sample of frequent offers that are 40 or 50% (these offers occur over 80% of the time)
  - Responder acceptance rates of low offers still diverge between DE and SM (c1 vs. c2)
  - This effect is larger when off-equilibrium payoffs are salient (c5/6 vs. c2/3)

Study 4 (Ultimatum Game: *DE vs. SM* × *Emotion vs. Neutral*) $N = 418$

- Imagine "salience" is a treatment of interest
  - DE suggests salience reduces acceptance of low offers (c1 vs. c4)
  - SM suggests salience has no effect (c2 vs. c5)

Signpost

- We have shown theoretically that SM vs. DE are not strategically equivalent in general
- .. and empirical evidence they differ for simple games
- "Treatment" of salience also renders different conclusions in SM vs. DE

What about a more complex game?

Study 5 (3-player prisoner's dilemma: *DE vs. SM* × *Emotion vs. Neutral*) $N = 585$

- Each player was endowed 100 points
- Stage 1: contribute 0 or 20 points to pool
  - Payoff (for each player) = 0.6 * total amount of contributions
- Stage 2: each player can deduct up to 21 points from others
  - However, any deduction is also applied to the deducting player.
- In SM, each player reports four possible deductions
  - CC: 2 contributors
  - DD: 2 defectors
  - D1: deduction to sole defector
  - C1: deduction to sole contributor

Study 5 (3-player prisoner's dilemma: *DE vs. SM* × *Emotion vs. Neutral*) $N = 585$

Stage 1 public goods game, stage 2 deduction opportunity *also* from self

To manipulate salience, one word change and color change: *group* → *team*, purple → red

- Direct elicitation responders were more cooperative (as Study 1, 2, 4)
  - Deductions differentially affected by emotional prime
  - Controlling for first stage outcome
- Differences between DE and SM (and diff-in-diff) were greater:
  - for deductions of D1
  - if you are a contributor

Direct elicitation responders were more cooperative

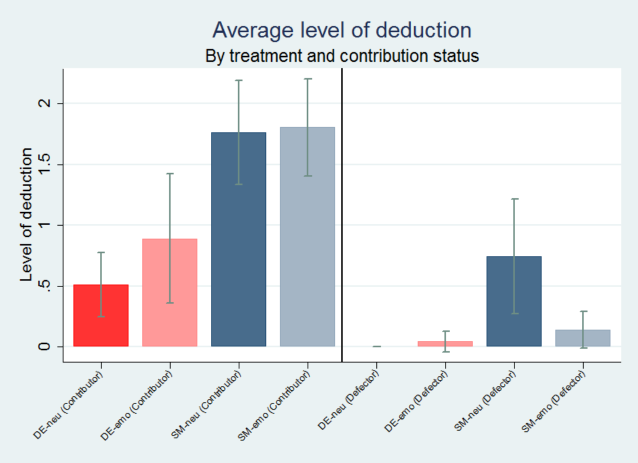
Differences also emerge depending on salience, which doubles difference between SM and DE (c3 - c1 vs. c4 - c2)

Imagine "salience" is a treatment of interest

- DE suggests salience increases deductions (c2 > c1)
- SM suggests salience decreases deductions (c4 < c3)

Direct elicitation responders were more cooperative

(when controlling for first stage outcome)

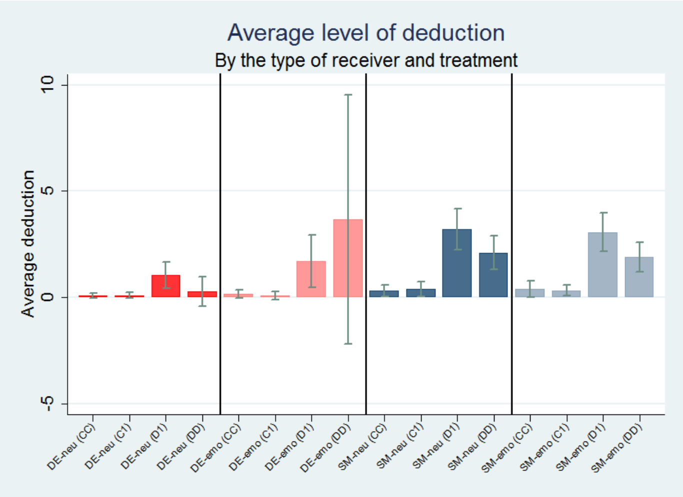


Differences also emerge depending on salience, (e.g., defectors punishment of others, c7)

Imagine "salience" is a treatment of interest

- DE suggests salience has no impact on defectors punishing (c5 vs. c6)
- SM suggests salience affects defectors punishing (c7 vs. c8)

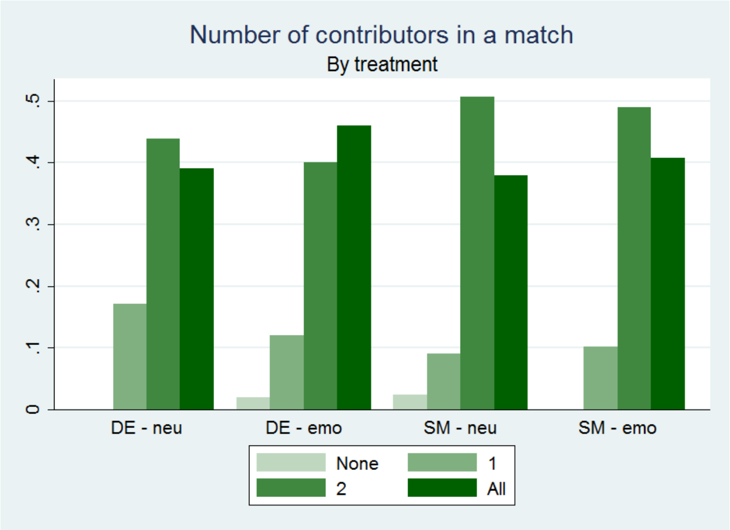
Differences larger for punishing sole defectors ("norm violaters")



SM deductions of D1 heightened relative to DE (c11 c15 vs. c3 c7)

"Treatment" effects of salience on deductions of DD emerge under DE (c4 vs. c8), but not SM (c12 vs. c16)

Distribution of contributors



D1 are the "norm violaters"

Slightly more defection in DE (consistent with anticipation of greater cooperation in stage 2)

Study 5 (3-player prisoner's dilemma: *DE vs. SM* × *Emotion vs. Neutral*) $N = 585$

	Deduction level	Deduction probability	Non-zero deduction level
(Intercept)	0.376	0.0983***	3.824*
	(0.294)	(0.0271)	(1.521)
Strategy method	1.129***	0.0569+	5.875***
	(0.330)	(0.0304)	(1.642)
Emotions	0.317	0.000744	3.176
	(0.400)	(0.0369)	(2.069)
Strategy × Emotions	-0.403	0.0210	-4.856*
	(0.456)	(0.0421)	(2.245)
Mean of Y	1.253	0.150	8.352
N	1627	1627	244

Standard errors in parentheses
+ $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

- Direct elicitation responders were more cooperative (as Study 1, 2, 4)
  - ◂ Deductions differentially affected by emotional prime

Research Questions

1. Is it really true that from a game theoretical perspective direct elicitation (DE) and the strategy method (SM) *should* yield the same equilibrium outcome?
   - No: Not in general
2. If not, can we find conditions such that DE and SM should yield the same equilibrium outcome?
   - Yes: But they are on preferences
3. Can we use the theoretical answers from above to shed some light on non-consequentialist motivations?
   - Perhaps

Discussion

Method of elicitation

- the strategy method (SM) is one of the most important tools in experimental economics
- compared to direct elicitation (DE) it generates vastly more data,
- unlike DE the SM gives us data on off-the-equilibrium-path behavior
- differences between DE and SM have been observed, explanations have been non-formal

Our contributions

- We provide an evaluation/appraisal of the SM
- We show that the SM incidentally turns out to be a method to investigate non-payoff dependent preferences
- To do so we provide formal insights as well as experimental evidence

Discussion

"For example, the notion of subgame perfect equilibrium is lost in the transition from the extensive to the strategic form of the game, since there are no subgames in a game in which players state their strategies simultaneously." *Alvin E. Roth (ch.4, Handbook of Experimental Economics, 1995)*

- We have learnt that there is a much more fundamental problem:
  - Strategic equivalence is often lost in the transition from direct elicitation to strategy method elicitation.
- Because of off-equilibrium motivations, conventional SM may be **grossly biased**, leading to serious over- or under-estimation of treatment effects.
  - A large fraction of SM papers rely on (1) many decisions at different information sets (2) that are highly related, (3) the off-equilibrium decisions can affect the *utility* of decisions at different information sets, even when it does not affect monetary payoff.

Implications for Experiments

An alternative view of natural field experiments (a subset of DE) as the gold standard for causal estimates (Harrison, Levitt, List, ...)

- Use differences between SM and DE to understand the general way in which agents' motives influence behavior (Camerer 2011)

Further work on alternative estimation methods besides DE that is more efficient in the presence of off-equilibrium motivations.

oTree An open-source platform for online, lab, and field experiments

- Automated testing with bots, data documentation, language translation
- 1000s of participants (network, voting, markets, macro)
- Continuous time, physiological measurements, open source qualtrics

A Theory of Surveys

Measurement

- Talk is cheap
  - Trump, Brexit, Colombia peace vote–all mispredicted
  - Sophisticated adjustments of polls still failed

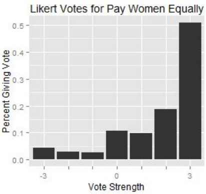
Model

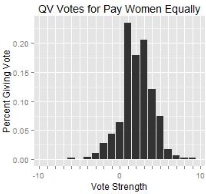
- Make costly the expression of moral and ideological beliefs in surveys
- Revealed preference heuristic
  - Marginal benefit of an additional "vote" scales linearly, so should the marginal cost
  - Implies quadratic costs $\sum_{i=1}^{N}(v_i^j)^2 = B$

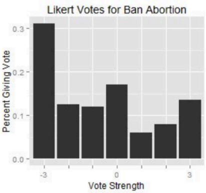
Applications

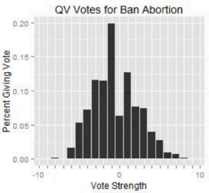
- Polls, attitudinal surveys, World Value Survey, GSS
- Preference curvature, ideal point estimation
- Decision-making in social & political settings

A Theory of Surveys









- With Likert, responses are strongly right-skewed
- With quadratic costs, normally distributed (but doesn't have to be)
  - (Quarfoot, Kohorn, Slavin, Sutherland, Konar 2016)
- What we do
  - formalize conditions where Likert is superior or inferior to 'costly' expression
  - link socially optimal curvature of survey voting costs to
    - ⋆ respondents' expressive v. strategic motivations
    - ⋆ surveyor's objective function

Conclusion

1. Public opinion and attitudes—mismeasured cheap talk can lead to
   - Spurious inferences
   - Magnified treatment effects ('leaders lead the public')
   - Different policy actions
     - ★ leaders may be less constrained by public preferences
2. Preference intensity and curvature—has implications for important real-world decision making
   - Predict real world behavior better than existing surveys
   - May be used to explore nature of motivated beliefs / polarization
     - ★ whether ideological perfectionists ignore information

Strategic equivalence: Definition

Definition (vNM-Strategic Equivalence)

2 games are strategically equivalent if their strategic forms are identical up to a positive affine transformation for each player's Bernoulli utility.
Harsanyi and Selten (1988)

- Trivial fact: An extensive form and its strategic form representation are strategically equivalent
- This strategic equivalence is the reason for the belief that theory says that direct elicitation and the strategy method should result in the same behavior.

  "According to the standard game-theoretic view, the strategy method should yield the same decisions as the procedure involving only observed actions."
  Brandts and Charness (2011)

- This paper: Game theory does not claim this. There are 2 weaknesses:
  - Multiple equilibria: equilibrium refinement and selection

Equilibrium refinement and selection

Irrelevant critique of SM if the Nash equilibrium is unique.

- Equilibrium refinement:

  "..any solution concept [..] should only depend on the normal form"

  Kohlberg/Mertens (1986)

  "..in general the solution of a game with a sequential structure simply has to depend on this sequential structure and cannot be made dependent on the normal form only"

  Harsanyi/Selten (1988)

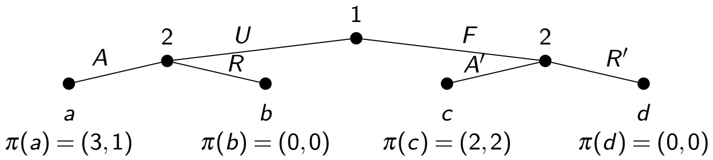
- Equilibrium selection:
  Universal agreement that seemingly irrelevant details like sunspots can determine the equilibrium selected. Thus whether DE or SM is used could be used as a selection device.

But this is not as bad for the SM as one might think, as in experiments when using the SM the game is framed in terms of the extensive form.

◂ Intro

Examples of invariance holding vs. breaking down

Simplified Ultimatum game



Story:

- 1 divides \$4 between herself and player 2
- Simplified UG: only 2 choices $(3,1)$ and $(2,2)$

What does the pictorial above represent?

- extensive form Γ
- monetary payoff functions π_i: $Z \to \mathbb{R}$

What is missing?

- Bernoulli utility functions u_i:$Z \to \mathbb{R}$

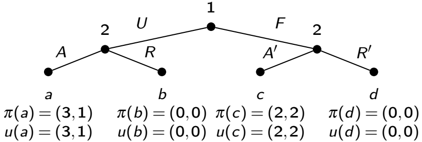
Examples of Bernoulli utilities

Exercise on the next slides: Assume different Bernoulli utilities and check for strategic equivalence.
Bernoulli utilities we consider:

- Player 1: example of homo oeconomicus $u_1(z) = \pi_1(z)$
- Player 2:
  1. example of homo oeconomicus: $u_2(z) = \pi_2(z)$
  2. example of Fehr-Schmidt: $u_2(z) = \pi_2(z)$ - $\frac{1}{2}max\{\pi_1(z) - \pi_2(z), 0\}$
  3. example of image concerns: like homo oeconomicus but deciding to accept unfair offer gives loss of $0 < \alpha < 1$

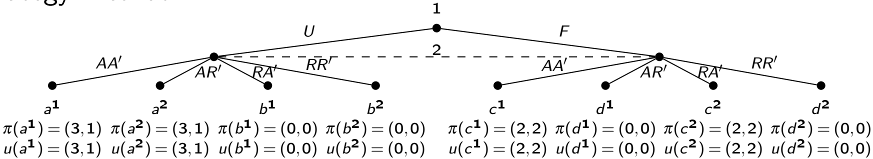
Ex.1: Homo oeconomicus

Direct Elicitation:



	AA'	AR'	RA'	RR'
U	$u(a) = (3,1)$	$u(a) = (3,1)$	$u(b) = (0,0)$	$u(b) = (0,0)$
F	$u(c) = (2,2)$	$u(d) = (0,0)$	$u(c) = (2,2)$	$u(d) = (0,0)$

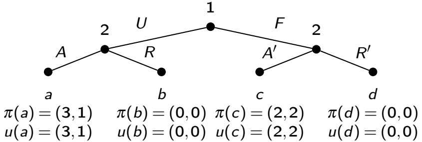
Strategy Method:



	AA'	AR'	RA'	RR'
U	$u(a^1) = (3,1)$	$u(a^2) = (3,1)$	$u(b^1) = (0,0)$	$u(b^2) = (0,0)$
F	$u(c^1) = (2,2)$	$u(d^1) = (0,0)$	$u(c^2) = (2,2)$	$u(d^2) = (0,0)$

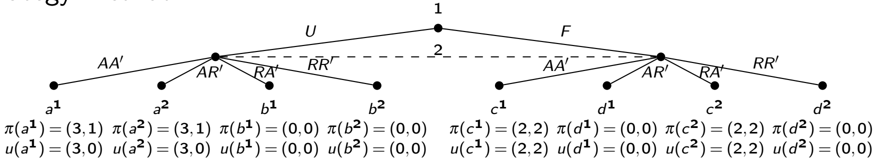
Ex.2: Fehr-Schmidt

Direct Elicitation:



	AA'	AR'	RA'	RR'
U	$u(a) = (3,0)$	$u(a) = (3,0)$	$u(b) = (0,0)$	$u(b) = (0,0)$
F	$u(c) = (2,2)$	$u(d) = (0,0)$	$u(c) = (2,2)$	$u(d) = (0,0)$

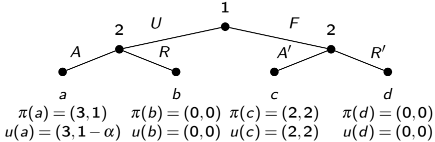
Strategy Method:



	AA'	AR'	RA'	RR'
U	$u(a^1) = (3,0)$	$u(a^2) = (3,0)$	$u(b^1) = (0,0)$	$u(b^2) = (0,0)$
F	$u(c^1) = (2,2)$	$u(d^1) = (0,0)$	$u(c^2) = (2,2)$	$u(d^2) = (0,0)$

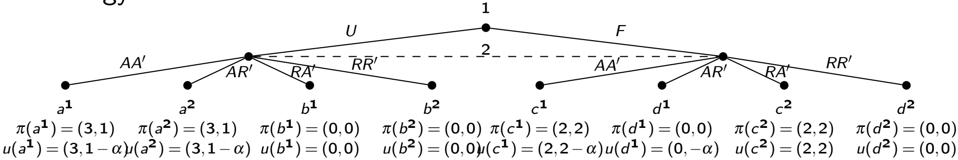
Ex.3: Image concerns

Direct Elicitation:



	AA'	AR'	RA'	RR'
U	$u(a) = (3, 1-\alpha)$	$u(a) = (3, 1-\alpha)$	$u(b) = (0,0)$	$u(b) = (0,0)$
F	$u(c) = (2,2)$	$u(d) = (0,0)$	$u(c) = (2,2)$	$u(d) = (0,0)$

Strategy Method:



	AA'	AR'	RA'	RR'
U	$u(a^1) = (3, 1-\alpha)$	$u(a^2) = (3, 1-\alpha)$	$u(b^1) = (0,0)$	$u(b^2) = (0,0)$
F	$u(c^1) = (2, 2-\alpha)$	$u(d^1) = (0, -\alpha)$	$u(c^2) = (2,2)$	$u(d^2) = (0,0)$

Summary of examples

- Strategic equivalence holds for homo oeconomicus and Fehr-Schmidt examples
- Strategic equivalence holds does not hold for image concerns examples
- This inspires and is the intuition for theorem 1.

Theorem 1

Theorem (1)

If for all players i there exists a function $f_i : \mathbb{R} \to \mathbb{R}$ such that $u_i(z) = f_i(\pi(z))$ for both $G^{DM} = (\Gamma^{DM}, u^{DM})$ and $G^{SM} = (\Gamma^{SM}, u^{SM})$ then the strategic forms of G^{DM} and G^{SM} are identical.

- Identity of strategical forms is the strongest form of strategic equivalence.
- social preferences, preference of payoff vectors only
- Preferences that fall under this class: Fehr-Schmidt preferences, altruism, envy, utilitarianism
- Next question: Can this be broadened?
  To answer this we propose a tribal game.

References I

Brandts, J. and Charness, G. (2011). The strategy versus the direct-response method: a first survey of experimental comparisons. *Experimental Economics*, 14:375–398. pages 42

Harsanyi, J. and Selten, R. (1988). *A general theory of equilibrium selection in games*. MIT Press. pages 42