Experimental Methods in Social Sciences (in particular economics

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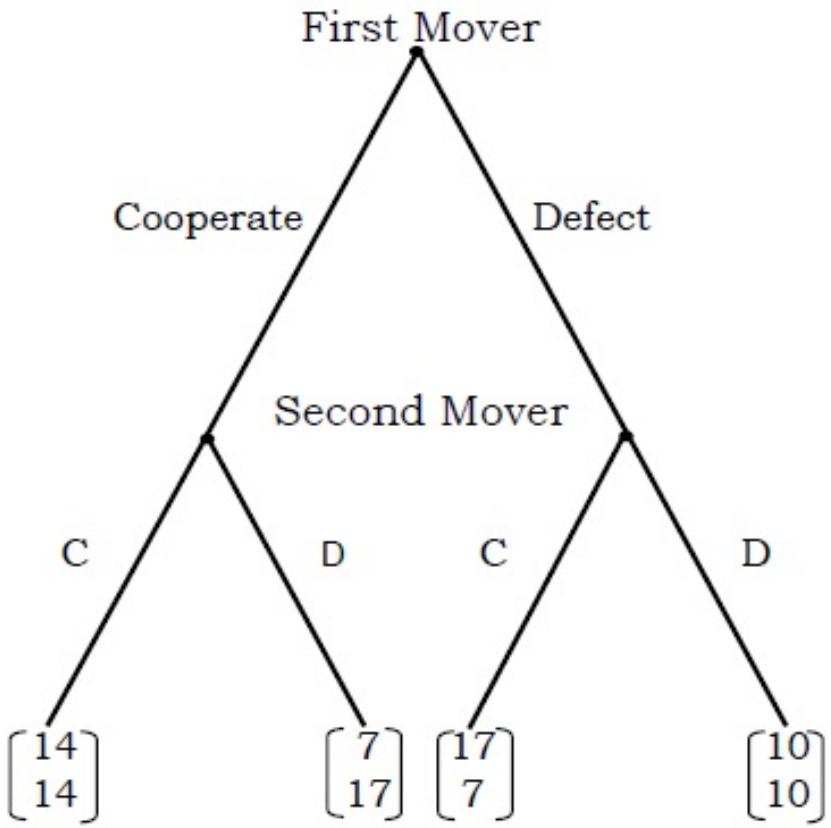
The Role of Beliefs and Eliciting Beliefs

Why Would We Want to Know Participants' Beliefs?

- In game theory, we typically assume players choose a best response to their beliefs
- In equilibrium, beliefs have to be correct (consistent with actual behavior of the other players)
- This is typically assumed
  - exception: non-equilibrium models such as level-k
- But beliefs might also be systematically biased, e.g.,
  - overconfidence
  - (false) consensus effect (Engelmann and Strobel, ExpEcon 2000)
- This can substantially change interpretation of experimental results

Why Is that Interesting?

- Consider the sequential prisoner's dilemma from Blanco, Engelmann, and Normann (GEB, 2011)
  - the correlation between first- and second-mover choice in the SPD was among strongest correlations observed in the within-subject design



Why Is that Interesting?

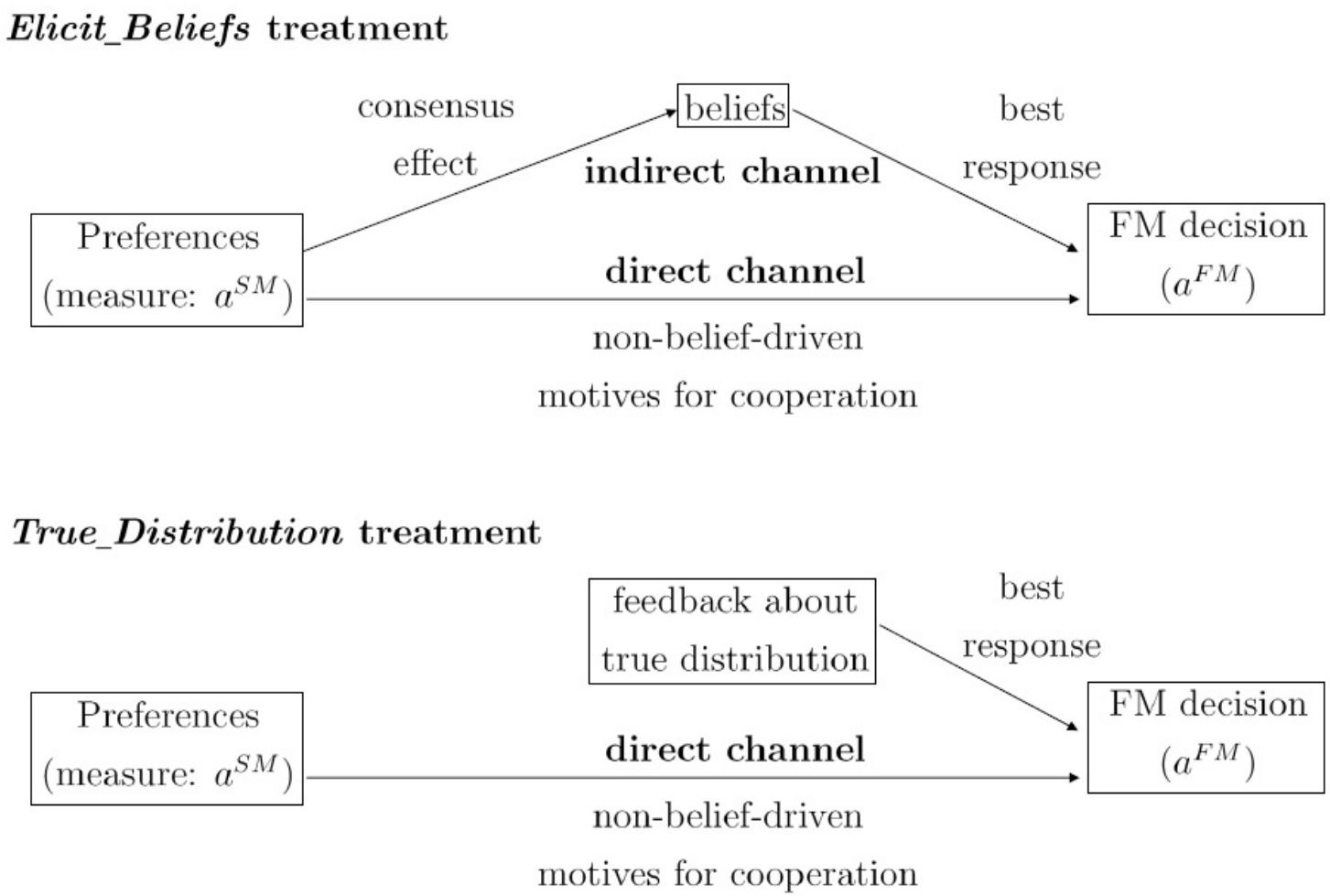
- The observed correlation is intriguing because, e.g., Fehr-Schmidt model predicts a negative correlation
- There could be two entirely different explanations:
  - players have heterogenous preferences for cooperation in both roles
    - so given fixed beliefs about the behavior of Player 2, subjects who are more likely to cooperate as Player 2 are also more likely to cooperate as Player 1
    - this explanation allows for all players to have correct beliefs
  - subjects' beliefs are subject to a consensus effect (and preferences for cooperation as Player 2 are heterogenous)
    - some subjects cooperate as Player 2 (simply because they prefer it)
    - these players expect a higher probability of Player 2 cooperation than those who defect (consensus effect)
    - hence maximization of expected payoffs as Player 1 makes them more likely to cooperate

Blanco, Engelmann, Koch, and Normann (2014)

- Subjects play SPD in both roles
  - player 2 only conditional on Player 1 cooperating
- Begin with Player 2 choice
- Three treatments
  - Baseline
  - Elicit_Beliefs
    - between Player 2 choice and Player 1 choice, beliefs about other 9 subjects' Player 2 choice in the session is elicited
  - True_Distribution
    - between Player 2 choice and Player 1 choice, subjects are informed about distribution of other subjects' Player 2 choices in the session
- Correlation between Player 1 and Player 2 choice can be driven by a direct channel or an indirect channel
- True_Distribution treatment switches off the indirect channel

Blanco, Engelmann, Koch, and Normann (2014)

Figure: Direct and Indirect Channel



Blanco, Engelmann, Koch, and Normann (2014)

- Direct channel could be driven by, e.g.:
  - social welfare preferences (Charness and Rabin, QJE 2002)
  - conditional altruism (Levine, REconDyn 1998)
  - reciprocal altruism (Cox, Friedman, Sadiraj, Econometrica 2008)
- But not by, e.g.:
  - inequality aversion (Bolton and Ockenfels, AER 2000, Fehr and Schmidt, QJE 1999)
    - predicts a negative correlation
  - reciprocity (Dufwenberg and Kirchsteiger, GEB 2004)
    - predicts a mild negative correlation

Blanco, Engelmann, Koch, and Normann (2014)

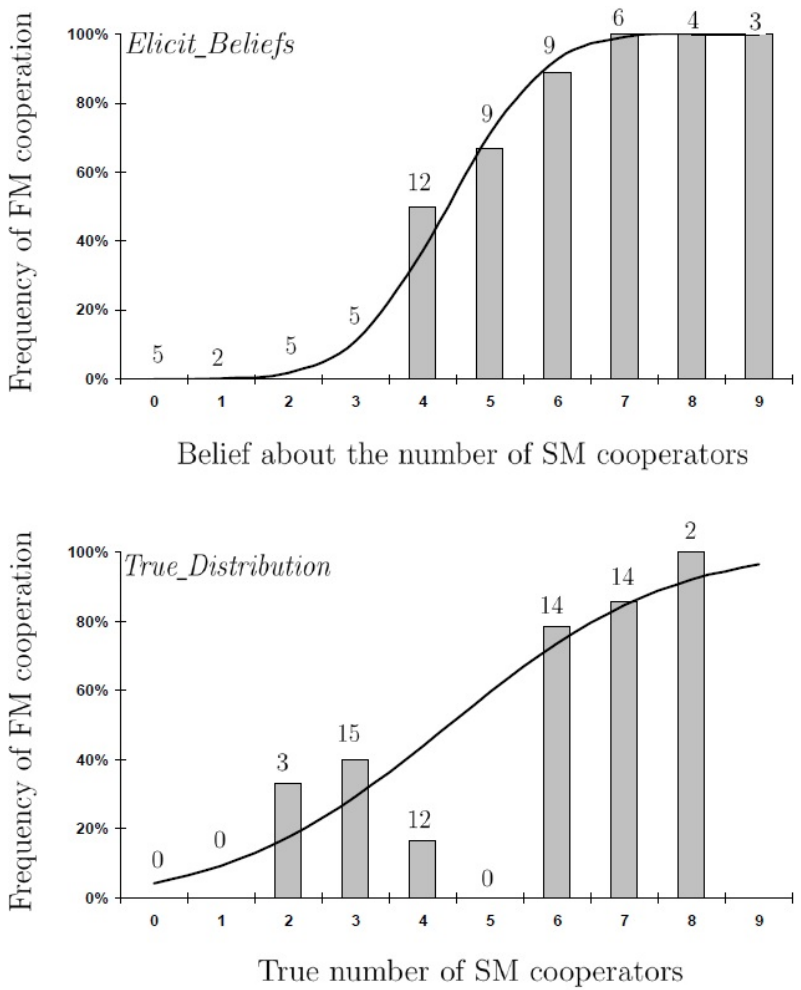
- Results
  - Baseline replicates correlation between Player 1 cooperation and Player 2 cooperation
  - Elicit_Beliefs finds strong correlation, but that is almost completely captured by the indirect channel (strong consensus)
  - In True_Distribution a positive correlation remains

Figure: Probits for Player 1 Cooperation (Marginal Effects)

	Elicit_Beliefs		*True_Distribution*	
	(E1)	(E2)	(T1)	(T2)
$E\left[\#\ a_{-i}^{SM} = c\right]$ (*"belief"*)	0.35***	0.33***	–	–
	(0.09)	(0.11)		
$\#\ a_{-i}^{SM} = c$	–	–	0.15***	0.14***
	–		(0.04)	(0.04)
a_i^{SM}	–	0.07	–	0.26*
		(0.24)		(0.14)
Observations	60	60	60	60
LR $\chi^2(1)$	45.64	45.72	15.46	18.94
p-value	<0.001	<0.001	<0.001	<0.001
Pseudo R^2	0.55	0.55	0.19	0.23

Blanco, Engelmann, Koch, and Normann (2014)

Figure: Player 1 Cooperation Rate



Blanco, Engelmann, Koch, and Normann (2014)

- Interpretation
  - preferences and beliefs interact
  - in particular, consensus effect is important
  - that has strong effects on game play
  - but does not exclusively explain correlation
  - when beliefs are elicited, their impact may appear inflated
    - subjects with strong preferences for cooperation might cooperate even if they had a very pessimistic belief
    - but because of consensus effect, they typically do not have such a belief
    - in True_Distribution we can detect these, but not in Elicit_Beliefs

How to Elicit Beliefs?

- When asking subjects for their beliefs, we can pay them for accuracy or not
  - not paying may be problematic
    - subjects have no incentive to state their true belief
    - sometimes it is not clear why they should not
    - but often stated beliefs could reflect justification of own behavior
  - but paying for accuracy of stated beliefs can be a problem as well, because subjects might hedge
    - state a belief that insures against a risky action
    - e.g., in trust game, invest a lot but say one expects low return
    - then if returns from trustee are high, payoff in game is high
    - if returns from trustee are low, payoff from belief is high
    - thus overall intermediate payoff is assured

How to Solve the Hedging Problem?

- Choose comparatively low incentives for belief task
  - does not really solve the problem, but combines weaker versions of problems of not paying and hedging
- Pay for game matched with one player, but for belief accuracy with respect to another
  - does not fully solve hedging problem if one is uncertain about underlying preference distribution in population
- Play a lottery and pay either for the game or the belief task (Blanco, Engelmann, Koch, and Normann, ExpEcon, 2010)
  - solves the problem in theory (for expected utility maximizers)

Is There a Hedging Problem and Does the Cure Work?

- Blanco, Engelmann, Koch, and Normann (ExpEcon, 2010)
  - Compare experiments with SPD from BEKN (2014) and simple coordination games (payment 15 for correct guess) with
    - hedging-prone standard design paying both game payoffs and for belief accuracy
    - hedging-proof design paying randomly either game payoffs or for belief accuracy

Figure: Coordination Game

		Player k	
		X	Y
Player i	X	(0,0)	(16,14)
	Y	(14,16)	(0,0)

Is There a Hedging Problem and Does the Cure Work?

- Is hedging a problem?
  - not in the SPD (no difference in play or beliefs between treatments)
  - but in simple coordination game (more hedging combinations in hedging-prone design)
- Does the cure work?
  - not fully, even with "hedging-proof" design some choice-belief combinations in coordination game suggest hedging
  - could be explained by ambiguity aversion

Literature

- Blanco, Mariana, Engelmann, Dirk, Koch, Alexander K., and Normann, Hans-Theo (2010) "Belief Elicitation in Experiments: Is there a Hedging Problem?", Experimental Economics 13(4), 412–438.
- Blanco, Mariana, Engelmann, Dirk, Koch, Alexander K., and Normann, Hans-Theo (2014) "Preferences and Beliefs in Sequential Social Dilemma: A Within-Subject Analysis", Games and Economic Behavior 87, 122–135.
- Bolton, Gary E. and Ockenfels, Axel (2000) "ERC: A Theory of Equity, Reciprocity, and Competition" American Economic Review 90(1), 166–193.
- Charness, Gary and Rabin, Matthew (2002) "Understanding Social Preferences With Simple Tests", Quarterly Journal of Economics, 117(3), 817–869.

Literature

- Cox, James C., Friedman, Dan, and Sadiraj, Vjollca (2008) "Revealed Altruism". Econometrica 76(1), 31–69.
- Dufwenberg, Martin and Kirchsteiger, Georg (2004) "A Theory of Sequential Reciprocity"' Games and Economic Behavior 47(2), 268–298.
- Engelmann, Dirk and Strobel, Martin (2000) "The False Consensus Effect Disappears if Representative Information and Monetary Incentives are Given", Experimental Economics 3(3), 241–260.
- Levine, David K. (1998) "Modeling Altruism and Spitefulness in Experiments". Review of Economic Dynamics, 1(3), 593–622.