A THEORY OF EXPERIMENTS:
INVARIANCE OF EQUILIBRIUM TO THE STRATEGY METHOD AND IMPLICATIONS

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Abstract Most papers that employ the strategy method (SM) use many observations per subject to study responses to rare or off-equilibrium behavior that cannot be observed using direct elicitation (DE), but ignore that the strategic equivalence between SM and DE holds for the monetary payoff game but not the game participants actually play, which is in terms of utilities. We formalize the mapping from the monetary payoff game to this actual game and delineate necessary and sufficient conditions for strategic equivalence to apply. We use results from the past literature and our own experiments and report three results. First, not accounting for bias in estimation when decisions at one information set can influence utility at another information set can render significant differences in decision-making. Second, the bias can be large and equivalent to other treatment effects being measured. Third, subtle interventions on salience can magnify these differences by a similar amount. The direction of treatment effects can significantly differ between SM and DE and flip in sign.

JEL Codes: C90, D64, A13, D03

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1. INTRODUCTION

The strategy method (SM) has become an increasing popular way to estimate preferences. SM consists of asking participants to indicate their choices at all information sets rather than only those actually reached. One then compares the differences in decisions at different information sets. For example, to identify the effect of a low offer in an ultimatum game, one might compare the changes in decisions for the information set with the low offer versus the decisions for the information set with the high offer. The great appeal of SM comes from its simplicity as well as its potential to elucidate the equilibria that are actually played when theoretical models indicate there are multiple equilibria and to circumvent many of the endogeneity problems that arise in estimating preferences when making comparisons between heterogeneous individuals.

Obviously, SM also has its limitations. It is appropriate when the decisions made at the other information sets do not affect the decision made at another information set. Much of the debate around the validity of the SM estimate typically revolves around the possibility of emotion or cognitive fatigue when making multiple decisions.[1] In psychology, a large body of work is devoted to construal theory, which would prima facie invalidate SM estimates (Liberman and Trope, 1998; Metcalfe and Mischel, 1999; Trope and Liberman, 2003, 2010).[2] In this paper, we address an altogether different problem with SM estimation. We put aside the biases due to psychological factors not formalized by economic theory in estimating preferences and instead focus on issues related to the *economic theory* underlying the estimate.

[1]When behavior does diverge between SM and direct elicitation (DE), researchers have suggested that DE settings involve a different degree of emotions being present, for example, when reacting to an actual violation of a fairness norm than when contemplating a violation (Fehr and Fischbacher, 2004); or individuals may be induced to think harder in the SM setting (Casari and Cason, 2009a), spend more time making the decision (Rand et al., 2012), or, instead, think less hard in the SM setting, and put less effort at each decision node because they receive less monetary return per decision (Fehr and Fischbacher, 2004). Those other papers did not present a formal model for the divergence.

[2]Construal theory involves the relation between psychological distance and the extent to which people's thinking (e.g., about objects and events) is abstract or concrete. An example of construal level effects is planning a summer vacation one year in advance will cause one to focus on broad features of the situation, like fun and relaxation, while the very same vacation planned next week will cause one to focus on specific features, like what restaurants to make reservations for. Temporal construal is believed to underly a broad range of temporal changes in evaluation, prediction, and choice. For an economic model of focusing, see Kőszegi and Szeidl (2013).

Put simply, a large body of economic theory render differences in information sets in SM and DE. The information set for a DE decision node is not the same information set for the same decision node in SM.

We argue that when the payoffs of the game played with the strategy method are an affine transformation of the payoffs at the induced terminal nodes in the game played with direct elicitation, the two games are strategically equivalent, and the game played with the strategy method essentially coincides with the strategic form of the game played with direct elicitation. Then, if the game satisfies this one-to-one assumption[3], the outcome will be the same under the two treatments if players' choices in the first game follow the iterated elimination of weakly dominated strategies, and in the second game follow Kuhn's algorithm.

Empirical researchers tend to rely on the behavioral validity of the strategy method (Fischbacher et al., 2012). Brandts and Charness (2011, pg. 376) write that, "according to the standard game-theoretic view, the strategy method *should* yield the same decisions as the procedure involving only observed actions," a conclusion we contend is incorrect. Roth (1995) points out in a footnote that "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." In this paper, we argue that the SM estimation is in practice subject to a possibly severe economic-theoretical bias. While economic theory of off-equilibrium motivations is frequently modeled, it implicitly assumed away by researchers using SM estimation. Three factors make off-equilibrium motivations an especially important issue in the SM context. First, SM estimation usually relies on many decisions at different information sets. Second, the most commonly used dependent variables in SM estimation are typically highly related. Third, and an intrinsic aspect of the SM estimation, the off-equilibrium decisions can affect the *utility* of decisions at different information sets, even when it does not affect the monetary payoff. These three factors reinforce each other so that the SM estimation for treatment effects could be severely biased relative

[3] The one-to-one assumption suffices to solve the game in terms of payoffs, not to pin down the exact strategies.

to DE (which we observe in our experiments).

Motivations that are based on disappointment aversion (Gul, 1991), intentions (Battigalli and Dufwenberg, 2007; Fehr and Schmidt, 2000), self-image (Bénabou and Tirole, 2011), or duty (Chen and Schonger, 2016), to name just a few, can cause equilibrium outcomes to differ between SM and DE. We provide a formal, general framework that embeds prior non-formal (psychological) explanations for differences between SM and DE and show that these explanations only hold under certain conditions in our formal model.

A different theoretical critique of SM is that the invariance of equilibrium outcomes under consequentialist preferences relies on individuals eliminating weakly dominated strategies. Game theorists may disagree about the actual prevalence in the field of individuals who play weakly dominated strategies, whether because eliminating weakly dominated strategies requires a greater level of cognition or because weakly dominated strategies may simply be more credible than strategies eliminated through subgame perfection. Our critique is an independent one. Our theoretical results focus on motivations (preferences), rather than deviations from rationality in decision-making. We provide a model-based elaboration that complements the footnote by Roth (1995). We cite a theorem from Moulin (1986, pgs. 84-86) and Rochet (1981) that would prima facie invalidate SM.

As evidence for the relevance of the theorem, we briefly revisit prior meta-analysis and conduct our own meta-analysis of ultimatum game experiments reported in the literature. We chose the ultimatum game because it appears to be the game most used in the academic literature. A google scholar search for "ultimatum game" yields roughly 22 thousand results, "dictator game" 14 thousand, "trust game" 13 thousand, and "public goods game" 12 thousand. "Prisoner's dilemma" appears roughly 49 thousand times, but "sequential prisoner's dilemma" only 276. We focus mainly on the simple games, but as the previous literature has highlighted that complexity is an important factor (Brandts and Charness, 2011), we also consider the three-player prisoners' dilemma (a public goods game with punishment).

In the meta-analysis, acceptance rates are 20 percentage points higher in the DE setting than in the SM setting. Next, we randomize whether the respondent is in SM or DE, but not the proposer, to ensure the proposal is the same in both treatments. The DE setting increases acceptances and is equivalent to an offer increase of 34% of endowment. Subsequent experiments allow the proposer to also know if the responder is in the DE or SM setting. Finally, we manipulate the salience of off-equilibrium motivations. DE increases acceptance rates in the ultimatum game by 18 percentage points. When off-equilibrium motivations are made salient, the difference increases to 27 percentage points. In total, we report the results of five analyses that all demonstrate the relevance of the theorem and we do so in the context of simple games, like the ultimatum game and trust game, and more complex games, like the three-player prisoners' dilemma. In the trust game, DE respondents return three times the amount SM respondents return. In the three-player prisoners' dilemma, DE affects deductions of defectors.

The last two of our five analyses highlight how treatment effects can significantly differ between SM and DE and also flip in sign. When we interpret salience as the treatment effect of interest, we see evidence that salience has a weakly positive treatment effect under DE but is negative under the strategy method, and the difference in treatment effects is statistically significant at the 5% or 10% level.

We use simple models to illustrate how SM can generally differ from DE. Intuitive off-equilibrium considerations break invariance. The upshot is not to check, under different modeling assumptions, motivations that break invariance in every circumstance. Rather, the degree to which off-equilibrium considerations break invariance is an empirical question. The direction and magnitude of bias depends on the degree to which dependent variables are related at different information sets, and in particular, how the off-equilibrium decisions affects the utility of decisions at other information sets.

Dozens of experimental studies have investigated whether the strategy method yields the same responses as direct elicitation where participants actually play the extensive form game. Though a recent study concluded in favor of using SM, it reported statistically significant and economically important differences in behavior by elicitation method in a considerable fraction of the studies comparing the elicitation methods: "We do find, however, that a particular aspect of emotions-related behavior, the use of punishment, is significantly more likely in situations with direct response than with strategy choice." Brandts and Charness (2011, pg. 394). In our reading, the set of games it studied divide into two: in simple games that had moral content[4], SM and DE tend to diverge, but in more complex games that were framed as economics games[5], SM and DE did not diverge or had mixed results. This difference is consistent with the heightened relevance of off-equilibrium considerations in social preference games. Schotter et al. (1994) presents games in extensive vs. normal form and finds that differences emerge in the simplest games, where subjects were more likely to use and fear incredible threats. This is consistent with our reading of the previous literature and the interpretation whose formalization we present here.

The remainder of the paper is outlined as follows. Section 2 organizes the theoretical disagreement as to whether DE and SM elicitation differs, proves that no strong consequentialist preferences can explain these differences, and provides an example of non-consequentialist preferences that can explain at least some DE vs. SM differences. Section 3 presents the first study, a meta-analysis of existing papers. Section 4 presents the second study where the ultimatum game respondent is randomized to DE or SM. Section 5 presents the third study where DE vs. SM differences extend to another simple game, the trust game. Section 6 presents the fourth study where the ultimatum game is randomized to DE or SM and where

[4]These would include ultimatum games (Eckel and Grossman, 2001; Guth et al., 2001; Oxoby and McLeish, 2004; Armantier, 2006; McGee and Constantinides, 2013), punishment games (Brandts and Charness, 2003; Brosig et al., 2003; Falk et al., 2005), trust games (Murphy et al., 2006; Fong et al., 2007; Casari and Cason, 2009b; Solnick, 2007; Meidinger et al., 2001; Cox and Hall, 2010), public goods and cooperation games (Offerman et al., 2001; Fischbacher and Gächter, 2010; Mengel and Peeters, 2011; Büchner et al., 2007; Muller et al., 2008), and prisoner dilemma/minority games (Schotter et al., 1994; Brandts and Charness, 2000; Linde et al., 2014; Reuben and Suetens, 2012).

[5]These would be games simulating firms (Kübler and Müller, 2002), market entry (Rapoport and Fuller, 1995; Seale and Rapoport, 2000; Sundali et al., 1995), asset pricing (Hommes et al., 2005), auction (Armantier and Treich, 2009; Goeree et al., 2002; Rapoport and Fuller, 1995), insurance (Bosch-Doménech et al., 2006), buying and selling games (Cason and Mui, 1998; Sonnemans, 2000), principal-agent games (Falk and Kosfeld, 2006), and negotiation games (Mitzkewitz and Nagel, 1993a; Rapoport et al., 1996; Rapoport and Sundali, 1996).

off-equilibrium considerations are randomly made salient. Section 7 presents the fifth study with a complex game, the three-player prisoners' dilemma. Section 8 concludes.

2. THEORETICAL BACKGROUND: DIRECT ELICITATION VS. STRATEGY METHOD

2.1. *Background and history*

The earliest use of a "strategy method" can be found in Selten (1967), where subjects are asked to give a strategy for the entire game instead of being only asked for decisions and information sets that are actually reached. As Roth (1995) points out, Selten's strategy method first lets participants gain practice by playing the game several times, and only then asks participants for strategies. In addition, Selten used group discussions and individual advising of participants by the experimenter to help subjects formulate strategies in what were quite complex games. The games used in more recent studies tend to be much simpler than Selten's games, usually two-player games where each player has only one move. And in these recent studies, there is no group discussion or individual advising. Thus, currently the strategy method is the same as Selten's except for pre-game practice and the group discussion and advising (for an early example, see Mitzkewitz and Nagel, 1993b). In both Selten's strategy method and the modern strategy method, subjects are made aware of an extensive game, but instead of actually playing that game, they are asked for their (hypothetical) decision at every decision node. Typically the game is not represented in strategic (i.e., matrix) form; for an exception see Schotter et al. (1994). The strategy method contrasts with direct elicitation (also referred to as direct response method) where players are only asked for their decisions at information sets that are actually reached. We follow convention and sometimes refer to the strategy method as the cold setting, and direct elicitation as the hot setting.

Formally, both the games played in the strategy method and in direct elicitation can be represented by an extensive form game. The extensive form games differ, but the corresponding normal form is the same for both methods. In that sense, they are theoretically equivalent. There is the view that for rational players the strategic form captures all relevant information, and different corresponding extensive forms just differ in irrelevant representation. Kohlberg and Mertens (1986) put this view nicely by writing, "In some sense, the fact that the reduced normal form captures all the relevant information for decision purposes results directly from the (almost tautological) fact that what matters for decision purposes in an outcome is only the corresponding utility vector (and not, e.g., the particular history leading to that outcome)."

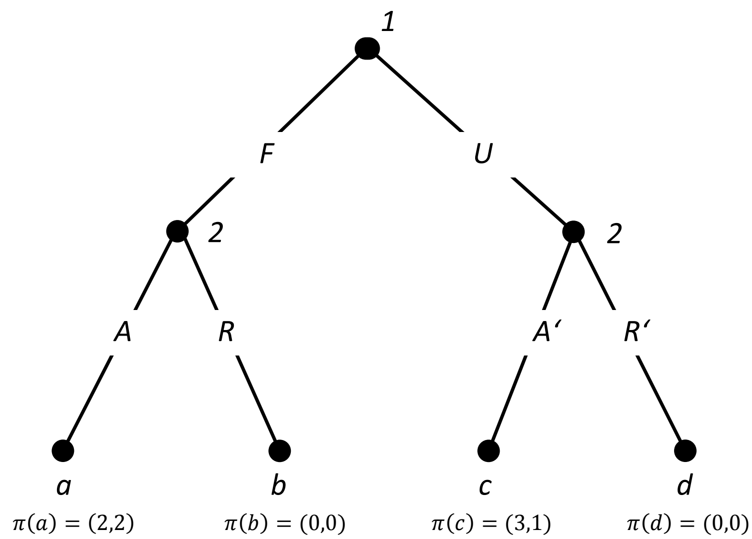
In an experiment, the observable vector is a vector of monetary payoffs and may not capture what utility players might get from feelings such as revenge, gratitude, kindness, or warm-glow. But even from a theoretical perspective, the Kohlberg-Mertens view is not universally accepted. Harsanyi and Selten (1988) disagree and argue that, "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." We show that even if one accepts the Kohlberg and Mertens (1986) view, it cannot be used as a justification for the strategy method of elicitation without further assumptions. The reason, in short, is that researchers neither observe the preferences nor the players' conception of the game, and there are plausible circumstances where use of the strategy method rather than direct elicitation can change players' conception of the game. The following subsection clarifies this point, and gives intuition for when this might occur and what it might tell us.

2.2. *Failure of invariance*

Consider the game in Figure 1. It is a kind of mini-ultimatum game. Player 1, the proposer, divides an endowment of $4 between herself and player 2, the responder. She can either make the fair offer $(2,2)$ or the unfair offer $(3,1)$. If both players are purely self-interested, the unique subgame perfect equilibrium is (UAA') resulting in terminal node c. In the strategic form, shown in the left of Figure 2, that is the unique strategy profile to survive iterated elimination of weakly strategies; thus, we have invariance.

Let us now vary the example and show how and when something like duty can break this

Figure 1: A mini ultimatum game



invariance. First, let us incorporate duty in a way which does not break invariance. Assume that whenever the responder in fact has accepted an unfair offer, that is, he responded A' to U, he suffers a psychic loss worth α, where $0 < \alpha < 1$. One can interpret this as damage to his honor (Nisbett and Cohen, 1996). The unique subgame perfect equilibrium of that game is again (UAA') resulting in terminal node c, which is also the sole surviving profile of iterated elimination of weakly dominated strategies in the strategic form shown in the third matrix of Figure 2.

Now assume a twist on that last game: The responder not only suffers a physic loss α when he has responded A' to U, but also when he has merely bindingly decided to do so. If the game is elicited via the direct elicitation there is no opportunity to commit; thus, as before, the unique subgame perfect equilibrium remains (UAA') resulting in terminal node c. If the game is elicited via the strategic method, then what is played is shown in the rightmost matrix in Figure 2: Four strategy profiles survive iterated elimination of weakly dominated strategies, and the Nash-equilibria among those are (UAA') as before, but in addition (FAR'). Why does this happen? Note that both $(FAA')$and (FAR') result in node a. But in the strategic form, they now have different utilities! In strictly game theoretic terms, this means that the reason for failure of invariance is that this strategic from cannot

Figure 2: Strategic Form: Mini Ultimatum Games

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

	AA'	AR'	RA'	RR'
F	$(2,2)$	$(2,2)$	$(0,0)$	$(0,0)$
U	$(3,1)$	$(0,0)$	$(3,1)$	$(0,0)$

	AA'	AR'	RA'	RR'
F	$(2,2)$	$(2,2)$	$(0,0)$	$(0,0)$
U	$(3,1-\alpha)$	$(0,0)$	$(3,1-\alpha)$	$(0,0)$

	AA'	AR'	RA'	RR'
F	$(2,2-\alpha)$	$(2,2)$	$(0,-\alpha)$	$(0,0)$
U	$(3,1-\alpha)$	$(0,0)$	$(3,1-\alpha)$	$(0,0)$

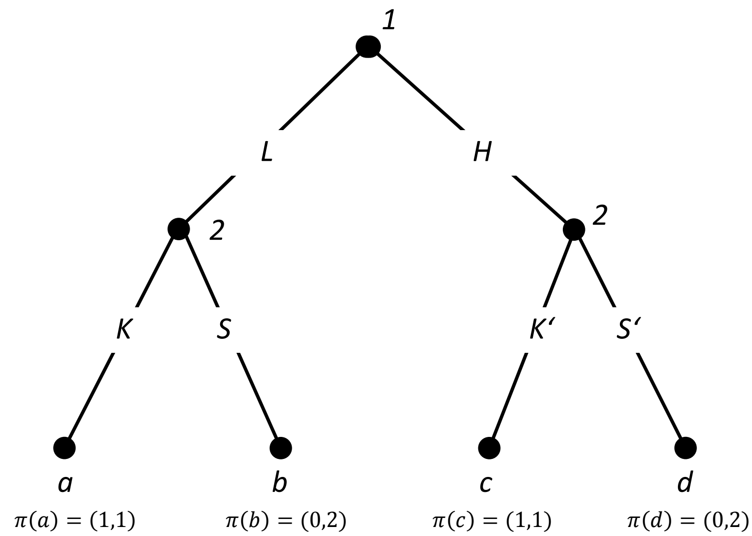
represent a game tree of the form shown in Figure 1.

Thus preferences that are non-consequentialist can generate differential predictions in DE vs. SM settings. One might call these preferences for duty or see them at least partially as rule-based (i.e., to maintain honor). Note that with these parameters, not all self-image concerns that incorporate off-equilibrium information break invariance (in this game). For example, self-image concerns about a psychic gain when one has committed to accepting an unfair offer (e.g., a turn-the-other-cheek self-image preference) would not break invariance. Such a responder would behave like homo oeconomicus.

2.3. *Invariance Example*

Next, we provide another example ("tribal game") where emotions affect decision-making, but invariance in DE vs. SM holds.

Figure 3: Tribal game



In the game in Figure 3, player 1 sends player 2 a message, where L means that she loves ISIS and H means she hates it. Player 2 has an endowment of \$2, and in response can either be kind (K, respectively K') and share equally or selfish and keep all to himself (S, respectively S'). Thus the payoff function of G^{π} is given by $\pi(a) = \pi(c) = (1, 1)$ and $\pi(b) = \pi(d) = (0, 2)$. If both players are purely self-interested then the game has two subgame-perfect Nash equilibria (LSS') and (HSS'), which yield the terminal nodes b, respectively. d, and payoff $(0, 2)$. Elimination of weakly dominated strategies in the strategic form gives the same equilibria.

Now consider a social preference, specifically Fehr-Schmidt preferences for player 2. In this game, regardless of the choice of parameters for advantageous and disadvantageous inequality, Fehr-Schmidt preferences imply that $u_2(b) = u_2(d) > u_2(a) = u_2(c)$. Thus the ranking of terminal nodes happens to remain unchanged and the analysis of equilibria is as before.

Now let us construct an example where the social preference changes the equilibria: Consider a very altruistic player 2 with preferences represented by $u_2(a) = u_2(c) > u_2(b) = u_2(d)$. A functional form from payoff vectors into utility that yields such a preference between terminal nodes would be, for example, $u_2(t) = \pi_2(t) + \alpha\pi_1(t)$, where $\alpha > 1$. The game has two subgame-perfect Nash equilibria (LKK') and (HKK'), which yield the terminal nodes a, respectively c, and payoff $(1,1)$. Elimination of weakly dominated strategies in the strategic form gives the same equilibria. Again, there is an invariance between the extensive and strategic forms.

Now let us change the game by changing the preference of player 2 only. Assume that he is an avid ISIS fan, and thus prefers to be kind to someone who also claims to love ISIS, and unkind to someone who does not. Specifically, assume that $a \succ d \succ b \succ c$, which, moreover, means that he prefers to encounter people who profess to be fans. Note that these preferences for player 2 are *not* a function of payoffs only; though $\pi(a) = \pi(c)$ he is not indifferent between a and c. Nevertheless, this extensive game is invariant to the method of elicitation: The unique subgame-perfect equilibrium is (Llh') yielding the terminal node a with payoff (not utility) $(1,1)$. In the strategic form, iterated elimination of weakly dominated strategies gives us the same equilibrium. Note that this invariance holds even though emotions play a role in player 2's decisions.

The upshot, in our view, is not to check theoretically which motivations break invariance in every circumstances, since the number of potential motivations is large. For instance, common theoretical motivations like intentions (Battigalli and Dufwenberg, 2007; Fehr and Schmidt, 2000), disappointment aversion (Gul, 1991), and self-image (Bénabou and Tirole, 2011), to name a few, can cause divergence, but the parameters in the player's utility function are also unobserved. Rather, off-equilibrium considerations accepted by formal theorists and by experimentalists can intuitively break invariance between SM and DE as we illustrate next theoretically and empirically.

2.4. *Theory*

In standard game theory, one way to describe an extensive form game with perfect information is by means of a tree Γ, a set of players $\{1, ..., I\}$, the set of nodes T, the decision nodes X, and set of terminal nodes Z, who plays at each decision node $\tau : X \to \{1, ..., \mathrm{I}\}$, and a complete and transitive preference over the terminal nodes represented by Bernoulli utility functions $u_i(a) : Z \to \mathbb{R}$. Thus let $G = (\Gamma, T_i, u_i, i = 1, ..., N)$ describe our extensive form game. Throughout we shall assume rationality and common knowledge.

Whether implemented in a laboratory or field setting, the preferences over terminal nodes are not directly observable by the researcher. One then typically assigns monetary payoffs to each terminal node, thus implementing a "game" $G^{\pi} = (\Gamma, T_i, \pi_i, i = 1, ..., N)$, where $\pi_i : Z \to \mathbb{R}$ assigns player i a payoff at every terminal node. G^{π} is a game in the game-theoretic sense with an additional assumption that all players' preferences are purely self-interested and this is common knowledge. We say that a player is *purely self-interested* if for all terminal nodes a, b, $\pi_i(a) \geqq \pi_i(b)$ if and only if $u_i \geqq u_i(b)$. We say that a player has *social preferences* where a player's preference between two nodes is a *function* of their monetary payoffs only (for all terminal nodes a, b, if $\pi(a) = \pi(b)$ then $u(a) = u(b)$).[6]

We can denote the direct elicitation (DE) extensive form game as G^{DE}, with extensive form $\mathit{\Gamma}^{DE}$ and the corresponding Bernoulli utility functions $u_i^{DE} : Z^{DE} \to \mathbb{R}$. We compare the direct elicitation (DE), $G_{\pi}^{DE} = \left(\mathit{\Gamma}^{DE}, \pi^{DE} : Z^{DE} \to \mathbb{R}\right)$ and $G^{DE} = \left(\mathit{\Gamma}^{DE}, u^{DE} : Z^{DE} \to \mathbb{R}\right)$ with the strategy method, $G_{\pi}^{SM} = \left(\mathit{\Gamma}^{SM}, \pi^{SM} : Z^{SM} \to \mathbb{R}\right)$ and $G^{SM} = \left(\mathit{\Gamma}^{SM}, u^{SM} : Z^{SM} \to \mathbb{R}\right)$.

The design choice of experimenter is $\mathit{\Gamma}^{DE}$, π^{DE}. Let $\mathit{\Gamma}^{SM} \equiv \phi\left(\mathit{\Gamma}^{DE}\right)$ (using the natural order of players), where ϕ : ext. forms $\to$ ext. forms and ζ:$Z^{SM} \to Z^{DE}$ (z^{DE} associated with several strategy profiles). By definition of SM, $\pi^{SM}\left(z^{SM}\right) = \pi^{DE}\left(\zeta\left(z^{SM}\right)\right)$. Note that u^{DE} and u^{SM} are neither a design choice nor directly observable. The following chart summarizes the theorem:

[6]By social preferences, here we refer to preferences like Fehr-Schmidt inequity aversion preferences, but not intentions-based preferences, which includes off-equilibrium considerations. See Sobel (2005), a literature review that organizes a large class of behavior beyond pure self-interest.

$G_\pi^{DE} = \left(\mathit{\Gamma}^{DE}, \pi^{DE} : Z^{DE} \to \mathbb{R}^{\mathrm{I}}\right)$ Strat. iden. $\Leftrightarrow$ $G_\pi^{SM} = \left(\mathit{\Gamma}^{SM}, \pi^{SM} : Z^{SM} \to \mathbb{R}^{\mathrm{I}}\right)$

$\uparrow$ equilibrium may change $\downarrow$ $\uparrow$ equilibrium may change $\downarrow$

$G^{DE} = (\mathit{\Gamma}^{DE}, u^{DE} : Z^{DE} \to \mathbb{R}^{\mathrm{I}})$ Thm. $\Leftrightarrow$ $G^{SM} = (\mathit{\Gamma}^{SM}, u^{SM} : Z^{SM} \to \mathbb{R}^{\mathrm{I}})$

Strategic equivalence: G^{DE} and G^{SM} are strategically equivalent if and only if for all players i, there exist real numbers $\alpha_i, \beta_i > 0$ such that for all $z^{SM} \in Z^{SM} : u_i^{SM}\left(z^{SM}\right) = \alpha_i + \beta_i u^{DE}\left(\zeta\left(z^{SM}\right)\right)$.

Conventional wisdom: The strategic forms of G_π^{DE} and G_π^{SM} are strategically equivalent.

Outcome-based preferences: If for all players i, there exists a function $f_i : \mathbb{R}^{\mathrm{I}} \to \mathbb{R}$ such that $u_i^{DE}\left(z^{DE}\right) = f_i\left(\pi\left(z^{DE}\right)\right)$ and $u_i^{SM}\left(z^{SM}\right) = f_i\left(\pi\left(z^{SM}\right)\right)$, then G^{DE} and G^{SM} are strategically equivalent.

These results follow from Axiom 1, as formulated by Moulin (1986, pgs. 84-86):

Axiom 1 (one-to-one) *A game* $(\Gamma, T_i, u_i, i = 1, ..., N)$ *satisfies the one-to-one condition if for any terminal nodes* $z, z' \epsilon Z(T)$ *and any player* i*:*

If $u_i(z) = u_i(z')$ *then* $u_j(z) = u_j(z')$ *for all* $j = 1, .., N$.

The theorem below follows the formulation of Moulin (1986, pgs. 84-86) and Rochet

(1981):

THEOREM 1 *Let* $G = (\Gamma, T_i, u_i, i = 1, ..., N)$ *be an N-player game in extensive form with perfect information satisfying the one-to-one assumption. Then the associated normal form of G is solvable by iterated elimination of weakly dominated strategies, and the equilibrium payoffs are the same as obtained in the extensive form by Kuhn's algorithm.*

Theorem 1 is only applicable if the payoffs given in the game are indeed the Bernoulli utility of the players. But researchers observe the monetary payoffs, but not the Bernoulli utility numbers of the players. The following two observations extend the applicability of the original theorem. First note that the risk attitude of a player need not be neutral, but can be anything:

COROLLARY 1 (Risk attitude) *Let* $G = (\Gamma, T_i, u_i, i = 1, ..., N)$ *be an* N*-player game in extensive form satisfying the one-to-one assumption. Let the domain of preferences be the agent's payoffs. Let preferences be a strict ordering. Then the normal form of G is solvable by iterated elimination of weakly dominated strategies, and the equilibrium payoffs are the same as obtained in the extensive form by Kuhn's algorithm.*

Corollary 2 (Social preferences) extends this result to social preferences:

COROLLARY 2 (Social preferences) *Let* $G = (\Gamma, T_i, u_i, i = 1, ..., N)$ *be an* N*-player game in extensive form satisfying the one-to-one assumption. Let the domain of preferences be the vector of payoffs. Let preferences be locally non-satiated. Then, almost surely, the normal form of G is solvable by iterated elimination of weakly dominated strategies, and the equilibrium payoffs are the same as obtained in the extensive form by Kuhn's algorithm.*

A standard response in behavioral economics to inaccurate predictions of the homo oeconomicus model is to assume richer preferences, particularly preferences that depend not only on the agent's own monetary payoff but also on the payoffs of others. We say that a player is *purely self-interested* (homo oeconomicus) if for all terminal nodes a, b, $\pi_i(a) \geqq \pi_i(b)$ if and only if $u_i \geqq u_i(b)$. *Social preferences* is where a player's preference between two nodes is a *function* of their monetary payoffs only.[7] Thus, we say that a player has social preferences if for all terminal nodes a, b, if $\pi(a) = \pi(b)$ then $u(a) = u(b)$.

This subsection discusses whether such preferences can generate differential predictions for DE vs. SM when the standard ones fail to do so. The answer is negative, and it is negative for all strongly consequentialist preferences, which we define as follows:

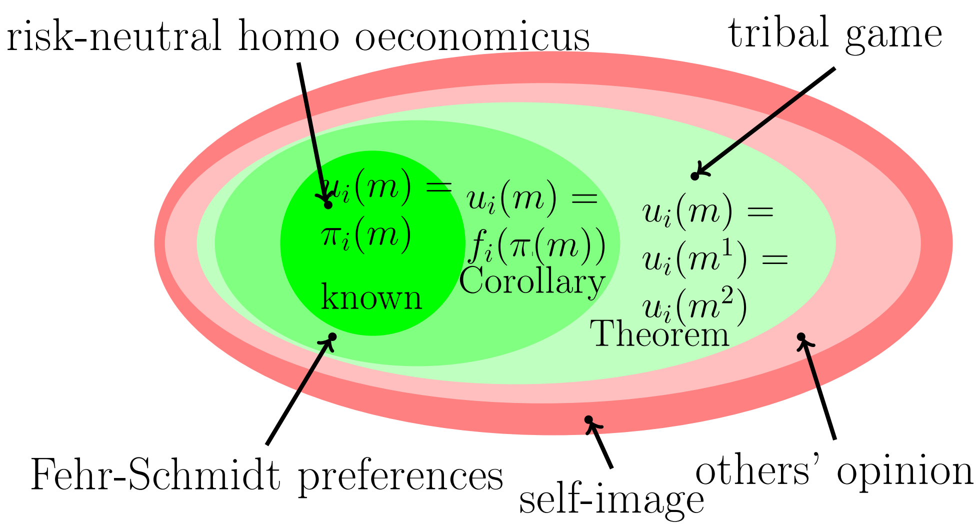
Definition 1 A preference is strongly consequentialist if it depends on payoffs (agent's own and others') only.

Fact *If the equilibrium concept depends on the reduced normal form only, then for all strongly consequentialist preferences the set of equilibria under direct elicitation is identical to the set of equilibria under the strategy method.*

Thus while social preferences can generate a different prediction than standard preferences about what the equilibrium will be, each social preference creates the same equilibrium prediction for DE and SM as long as one follows the Kohlberg-Mertens view.

[7]In contrast, homo oeconomicus preferences are simply the monetary payoffs. Also, by social preferences we refer to preferences like Fehr-Schmidt preferences, but not intentions-based preferences, which will be in a separate category.

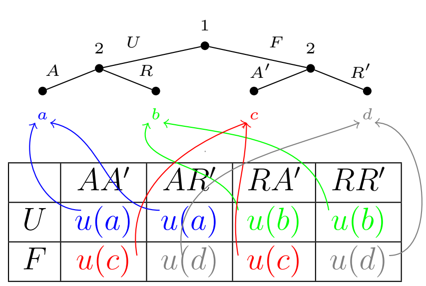
Venn diagram of theorem:



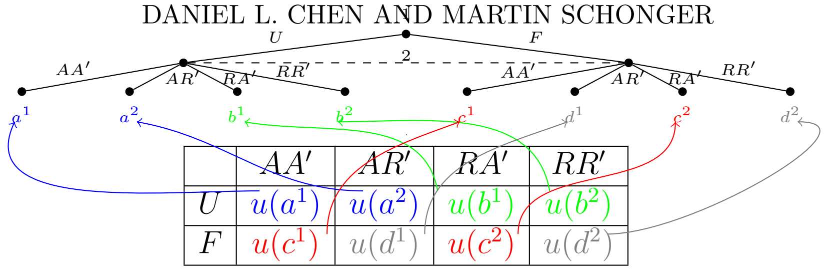
Notes: Green color indicates instances where DE and SM equilibria coincide (see examples in the appendices). Red color indicates instances where equilibria may differ.

2.5. *Linking Theory to Data*

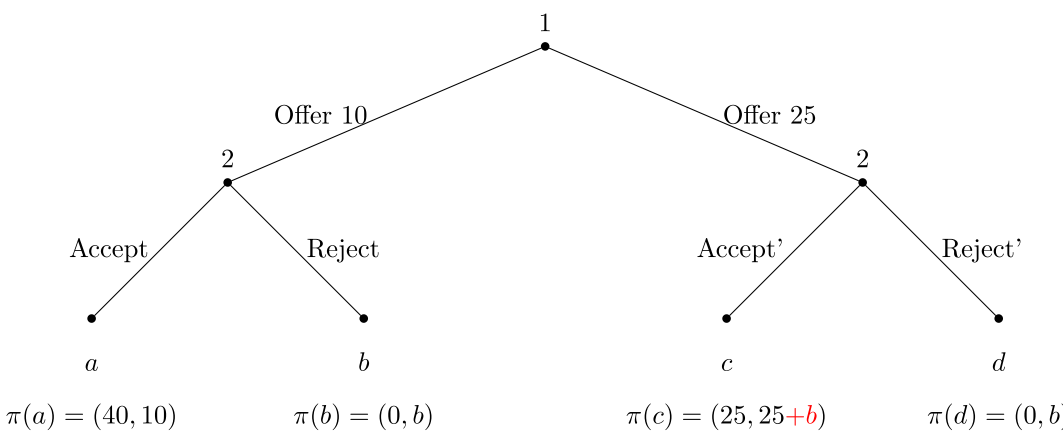
We can visualize the assumption behind experiments that rely on the invariance between the strategy method and direct elicitation using the simplified ultimatum game. Under direct elicitation:



Under the strategy method:



Even more concretely, the following simplified 0-50 ultimatum game illustrates how non-consequentialist motivations can breakdown the invariance between the strategy method and direct elicitation when collecting data. Suppose player 2 has duty motives: If he did not commit or in fact accept the unfair offer, he gets an additional psychic benefit of $0 < b < 10$. In the DE setting, if player 2 is offered 25 and he accepts, the utilities are $(25, 25 + b)$. If player 2 is offered 10 and he accepts, the utilities are $(40, 10)$.



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

In the SM setting, the strategy, accept $x \geq 10$, yields: $p * 10 + (1 - p) * 25 = 25 - 15p$ (p is the subjective belief of the responder on the choice of the proposer), while the strategy accept $x \geq 25$ yields: $p * (0 + b) + (1 - p) * (25 + b) = 25 + b - 25p$. Then player 2 picks the strategy, accept $x \geq 25$, if and only if $p < 0.1b$. That is, player 2 only accepts high offers if and only if there is low probability of bearing the adverse consequences of indulging in the psychic benefit of not being a loser. If $p < 0.1b$, then the DE setting yields payoffs $(40, 10)$

while the SM setting yields payoffs $(25, 25)$.[8]

3. STUDY 1: A SURVEY OF SM VS. DE PAPERS

Whether SM has led to serious bias relative to DE in estimation in the SM vs. DE literature so far depends on: (1) the type of decision involved, (2) the importance of off-equilibrium considerations, and (3) whether any procedures have been used to correct for it. Since these factors are inherently empirical, we collected data on all ultimatum game studies from the meta-study performed in 2011 (Brandts and Charness 2011), plus studies we located on Econlit using the keyword searches, "ultimatum game" and "minimum acceptable offer" or "acceptance threshold." We found 31 papers and 63 experiments.[9] Data were obtained from the authors or in some cases calculated from the graph.

We found 16 SM ultimatum games and 45 DE ultimatum games, which yields the number of observations in Table I. Out of 16 SM games, 12 are performed with the threshold method. Only six SM experiments reported the acceptance/rejection rate.

Next, we present evidence that behavior of the respondent diverges depending on whether the strategy method or direct elicitation is used. The average offer is not significantly influenced by the method of elicitation ($p > 0.1$) and is roughly 40% of endowment (Table I Column 1). Each observation represents one experiment and we report linear probability models as recommended by Angrist and Pischke (2008). Offer levels are higher in the more recent time period ($p < 0.05$) and lower in developing countries ($p < 0.01$). Controlling for these factors do not affect the relationship between offer and method of elicitation (Column

[8]Note that the self-image concern b must not scale with p linearly for this statement to hold. The Kantian categorical imperative would be an example. For a general statement about willingness to act on non-consequentialist motivations when the decision becomes more hypothetical (e.g., in the random lottery incentive), Chen and Schonger (2016) develops a shredding criterion for non-consequentialist motivations.

[9]Papers reporting DE experiments are: Bornstein and Yaniv (1998); Cameron (1999); Croson (1996); Fershtman and Gneezy (2001); Forsythe et al. (1994); Gneezy and Guth (2003); Güth et al. (1982); Henrich (2000); Henrich and McElreath (2001); Hoffman and Smith (1994); Hoffman et al. (1996); Ruffle (1998); Slembeck (1999); Slonim and Roth (1998); Suleiman (1996); Weg and Smith (1993); Roth et al. (1991); Anderson et al. (2000); Oxoby and McLeish (2004). Papers reporting SM experiments are: Andreoni et al. (2003); Blount (1995); Carter and Irons (1991); Harrison and McCabe (1996); Munier and Zaharia (2002); Solnick and Schweitzer (1999); Solnick (2001); Oxoby and McLeish (2004); Ong et al. (2012); Brañas-Garza et al. (2006); Poulsen and Tan (2007); Schmitt et al. (2008); Güth et al. (1997). Some papers reported multiple experiments.

TABLE I

Offer levels in ultimatum game meta-analysis

	(1)	(2)	(3)	(4)
(Intercept)	0.412***	-7.079*	0.402***	0.415***
	(0.00814)	(3.209)	(0.00813)	(0.00751)
Strategy method	0.0136	-0.0187	0.0133	0.00245
	(0.0159)	(0.0173)	(0.0352)	(0.0140)
Year of experiment		0.00376*		
		(0.00161)		
Repeated experiment		0.00728		
		(0.0142)		
Developing country		-0.0586**		
		(0.0174)		
Mean of Y	0.416	0.416	0.403	0.415
N	61	61	61	60

Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Notes: Column 1 has no controls, Column 2 controls for year of experiment, whether the experiment was conducted repeatedly, and whether the study was conducted in a developing country. Column 3 weights by citation counts for the paper. Column 4 weights by the number of observations in the study.

2). The lack of an effect is robust to weighting for the study's citation count (Column 3) or the study's number of observations (Column 4). A Wilcoxon-Mann-Whitney test cannot reject the null of equality of offers ($p = 0.59$).

Direct elicitation increases acceptance rate of the responder by roughly 20 percentage points ($p < 0.001$) (Table II Column 1). This increase is robust to controls for offered amount, whether the experiment is repeated, and whether the study is in a developing country (Column 2). Repeating the experiment reduces acceptance rate by 12 percentage points ($p < 0.001$) (Column 2). Like SM, repeating the experiment may involve decisions at one information set affecting the utility-but not the payoffs-of decisions at another information set.

When the interaction between offer and SM is included, offers increase acceptance in SM ($p < 0.1$) (Column 3): an additional 1 percentage point in offer is associated with an

TABLE II
ACCEPTANCE RATE IN ULTIMATUM GAME META-ANALYSIS

	(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
+ $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Notes: Column 1 has no controls, Column 2 controls for year of experiment, whether the experiment was conducted repeatedly, and whether the study was conducted in a developing country. Column 3 adds the interaction between strategy method and offer level. Column 4 does the same but drops developing countries. Column 5 weights by citation counts for the paper. Column 6 weights by the number of observations in the study.

additional 2.5 percentage points in acceptance rate when SM is used than when DE is used. When we drop developing countries (all of which used direct elicitation), DE still increases acceptance rates ($p < 0.1$) (Column 4). Furthermore, a significant effect of offers emerges: an additional 1 percentage point in offer is associated with an additional 0.9 percentage points in acceptance rate when DE is used ($p < 0.1$); SM yields an insignificant greater 1.9 percentage points in acceptance rate per 1 percentage point in offer ($p > 0.1$).

Removing interaction terms, but weighting by citation counts renders the main effect of DE vs. SM insignificant (Column 5). Weighting by the number of observations yields an effect of 10 percentage points ($p < 0.01$) (Column 6). In sum, we observe that the behavior of the respondent diverges depending on whether SM or DE is used, especially the acceptance rate.

In addition, among the 16 SM experiments, six report the acceptance/rejection rate along with average threshold, nine report average threshold only (rendering the acceptance data unusable for Table II), and one reports nothing for the responder (also rendering the data unusable). The six SM studies reporting acceptance rates have a somewhat lower average threshold than the nine studies reporting thresholds only. This suggests that if these nine studies also reported acceptance rates, the nine studies would have had lower acceptance rates than the six studies reporting both. In this case, the effect of DE increasing acceptance rates would be larger and more significant. Appendix A shows a CDF of the rejection rate study by study, which shows that the SM first-order stochastically dominates the results from the DE studies. Still, since these studies may have idiosyncratic differences in design and did not necessarily randomize whether subjects experienced SM or DE, we next turn to our own experiments.

4. STUDY 2: ULTIMATUM GAME - DE VS. SM FOR RESPONDENT

4.1. *Design*

Study 2 used MTurk. We first asked MTurk subjects to transcribe three paragraphs of text[10] to reduce the likelihood of their dropping from the study after seeing treatment, a technique to minimize differential attrition that may affect causal inference when using MTurk subjects (Chen and Yeh 2010; Chen et al. 2017; Chen 2012; Chen and Horton 2016).[11] After the lock-in task, subjects have an opportunity to split with the recipient a 50 cent bonus (separate from the payment they received for data entry), up to 23 times the expected wage.[12] We had 156 subjects split evenly between the role of proposer and respondent and between strategy method and direct elicitation (2x2 design). Instructions are in Appendix C.

In the ultimatum game (Figure B.1), the proposer proposed a split of \$0.50 between herself and the responder, in increments of \$0.05. In the direct elicitation treatment, the responder was informed about the amount offered and asked whether she accepts or rejects the offer (Figure B.2). If the offer was accepted, both players received the payoff according to the split proposed by the proposer. If the offer was rejected, both players received zero payoff. In the strategy method treatment, the responder indicated whether she would accept or reject each possible offer without knowing the actual offer. If the responder rejected the offer actually

[10] A sample paragraph of data entry was a Tagalog translation of Adam Smith's *The Wealth of Nations*: Kaya sa isip o diwa na tayo ay sa mga ito, excites ilang mga antas ng parehong damdamin, sa proporsyon ng kasiglahan o dulness ng kuru-kuro.Ang labis na kung saan sila magbuntis sa kahirapan ng mga wretches nakakaapekto sa partikular na bahagi sa kanilang mga sarili ng higit pa sa anumang iba pang; dahil sa takot na arises mula sa kathang isip nila kung ano ang kani-kanilang mga sarili ay magtiis, kung sila ay talagang ang wretches kanino sila ay naghahanap sa, at kung sa partikular na bahagi sa kanilang mga sarili ay talagang apektado sa parehong miserable paraan. Ang tunay na puwersa ng mga kuru-kuro na ito ay sapat na, sa kanilang mga masasaktin frame, upang gumawa ng na galis o hindi mapalagay damdam complained ng.

[11] This task was sufficiently tedious that no one was likely to do it "for fun," and it was sufficiently simple that all participants could do the task. The source text was machine-translated to prevent subjects from finding the text elsewhere on the Internet.

[12] A paragraph takes about 100 seconds to enter so a payment of 10 cents per paragraph is equivalent to \$86.40 per day. The current federal minimum wage in the Unites States is \$58/day. In India, payment rate depends on the type of work done, although the "floor" for data entry positions appears to be about \$6.38/day (Payscale, Salary Snapshot for Data Entry Operator Jobs, http://www.payscale.com/research/IN/Job=Data_Entry-_Operator/Salary?, accessed June 17, 2011). In one data entry study, one worker emailed saying that \$0.10 was too high and that the typical payment for this sort of data entry was \$0.03 cents per paragraph. Our study involves \$0.20 for a comparable task: reading essentially a single paragraph and making 1 decision, with an additional \$0.50 possible.

made by the proposer, neither player received any bonus. The responder's behavior can be characterized by a rejection *threshold*, the minimum offer the responder is willing to accept (Figure B.3). The proposer did not know the method of elicitation for the responder in order to hold proposer's decisions constant. We are interested in the average treatment effect of DE vs. SM on the responder.

4.2. *Results*

Table III regresses an indicator for whether or not the ultimatum game offer was accepted on the treatment indicator, SM, using a linear probability model. Results are robust to using a probit specification. While there were 20 percentage points fewer acceptances in the strategy method ($p < 0.1$) (Column 1), the effect becomes 22 percentage points and more significant ($p < 0.05$) when controlling for the amount offered (Column 2).[13] For each additional \$0.01 offered, the acceptance rate increases by 2 percentage points ($p < 0.001$). In terms of magnitude, direct elicitation is equivalent to an additional 17 cents offer in a 0-50 ultimatum game, or roughly 34% of endowment. Including an interaction between offer and SM yields a significantly greater association of 1.7 percentage points acceptance rate per \$0.01 offer amount ($p < 0.1$) (Column 3), which is analogous to what was found in the survey of prior literature in Study 1.

5. STUDY 3: TRUST GAME - DE VS. SM FOR RESPONDENT

5.1. *Design*

In Study 3, we examine another canonical game, the trust game, also on MTurk. The recruitment procedure was the same as in Study 2. We had 94 subjects split evenly between the role of proposer and respondent and between strategy method and direct elicitation (2x2 design). In the trust game, the proposer receives \$0.50 and chooses how much to transfer to

[13]To put this in perspective, Oosterbeek et al. (2004) conducted a meta-analysis of 66 studies and found that the strategy method reduced acceptance rates by 13%.

TABLE III

Ultimatum game offer acceptance

	(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

Notes: This table examines the determinants of whether the ultimatum game offer is accepted by the second player. Column (1) shows the raw correlation between acceptance and the treatment indicator (strategy method decision-making). Column (2) also controls for amount offered by the first player. Column (3) examines whether treatment affects the relationship between acceptance and amount offered.

the responder, in increments of $0.10 (Figure B.4). Any money transferred by proposer is tripled. Responder then chooses how much to return to the proposer. In DE, she is informed about the amount transferred and decides how much should be given back. In SM, she is asked to indicate how much she would return for every possible amount transferred using the strategy method (Figure B.5). Proposer's transfer can be considered a measure of trust, while responder's return-transfer can be considered a measure of trustworthiness. Instructions are in Appendix B.

5.2. *Results*

In Figure 4, we plot the relationship between amount offered by the proposer and the amount returned by the responder. We can see that the relationship is more intense in the DE (hot) setting.

A linear probability model indicates that respondents return $0.66 for each $1.00 that is offered in the SM setting, but they return $1.85 for each $1.00 offered in the DE setting

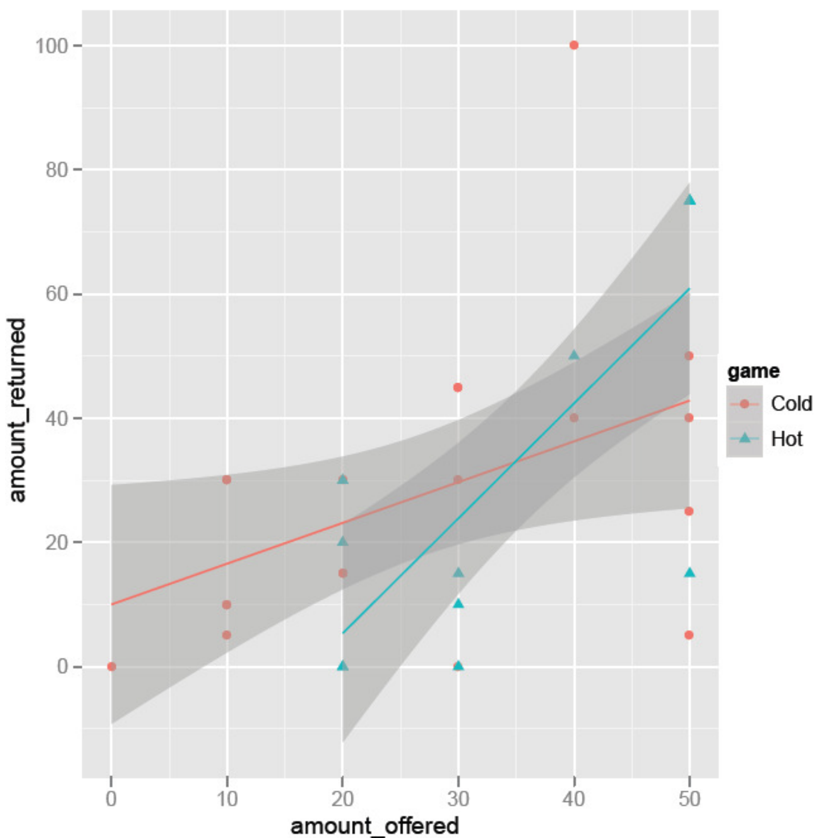


Figure 4:

Each point represents an amount offered and amount returned in the trust game. Red dots indicate SM scenarios while blue dots indicate DE scenarios.

($p < 0.05$).

6. STUDY 4: ULTIMATUM GAME - DE VS. SM AND LOW VS. HIGH SALIENCE

6.1. *Design*

We chose to run our remaining studies in the lab, which may be a more controlled setting than MTurk. In Study 4, we ran the lab experiment at the MaXLab following their standard procedures in Magdeburg and used oTree (Chen et al., 2016). We collected data on 418 subjects across 16 experimental sessions. Instructions are in Appendix B. In Study 4, the proposer knows the method of elicitation for the responder, so we examine and control for the offer. The endowment was €1.00, with stakes about twice that of Study 2 for a similar amount of reading. Roughly 70 participants were in each of six treatments (3x2 design), listed as follows with abbreviations in parentheses: Direct elicitation (DE) / strategy method (SM) / threshold method (SM-Th) x neutral (neu) / emotional (emo).

We introduce two variants of SM. In one variant, subjects report the *threshold* (where the responder had to state the minimum level of the offer that she would accept), and in another, they report their *strategy* (where the responder had to decide whether she would accept every theoretical offer that could be made by the proposer before the actual offer was revealed).[14] We also introduced a cross-cutting treatment to increase the salience of off-equilibrium payoffs (for a total of six possible groups, two emotional settings x three game variants). In the high salience treatment, the experiment changed two words: *proposer* → *dictator* and *respondent* → *subject*. The intervention involves only these two words. If SM vs. DE invariance is affected by a few words, the basis for using SM instead of DE would seem fragile.

[14]Some may argue that the threshold method is sufficient to capture SM, but many experimental studies document that subjects may have multiple switches when presented with the full strategy method.

Figure 5: Ultimatum game: Average offer levels for different treatments with 95% confidence intervals.

6.2. *Results*

We cannot reject the null that the proposer's offer is the same across treatments (see Figure 5). Offers are slightly lower in DE than in SM, which is consistent with proposers being aware that responders are more likely to accept in DE. In Oosterbeek et al. (2004)'s meta-analysis of 66 studies, offered shares were significantly lower with DE by 2% ($p < 0.1$).

Figure 6 reports the natural pattern in ultimatum games: Acceptances are positively associated with the offered amount regardless of treatment. In Column 1, DE shows one observation per subject-pair. In Columns 2 and 3, SM and SM-Th show all possible observations per subject-pair. For the threshold method, we generate an acceptance or rejection for every possible offer. The display is intentionally saturated to illustrate the standard data analysis with SM.

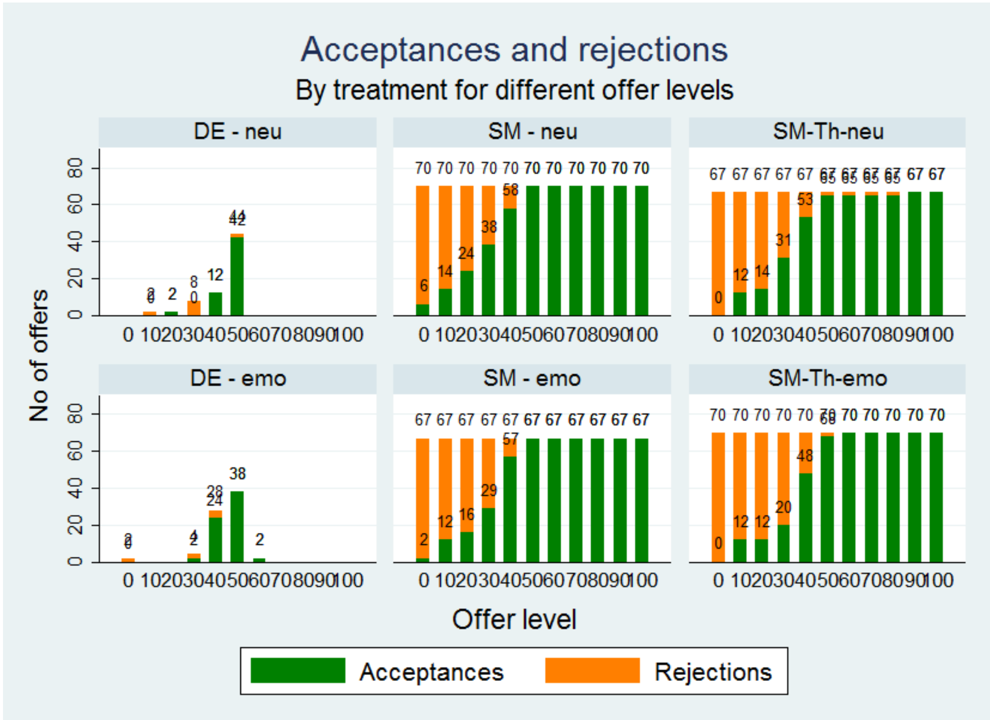


Figure 6: Ultimatum Game in laboratory: Acceptances and rejections for different offer levels and different treatments.

Figure 7 shows that DE results in more acceptances, similar to the survey of prior literature and to our other experiment. In particular, the increase in acceptance is visible in both the low salience (neu) and high salience settings (emo). Increases in acceptance rates under DE are somewhat larger in the high salience setting, which suggests that salience of off-equilibrium considerations may drive some of the differences between DE and SM.[15] Notably, equilibrium behavior does not diverge between the strategy (SM) and threshold (SM-Th) methods.

We next examine these relationships in regression analysis. We create indicator variables for every treatment and their interaction: direct elicitation (DE) / strategy method (SM) / threshold method (SM-Th) x neutral (neu) / emotional (emo) (Table IV, Column 1). We include a control for offer level in Column 2 and interactions of offer level and treatment indicators in Column 3.

[15]Regression analyses indicate statistical significance level just shy of 10%.

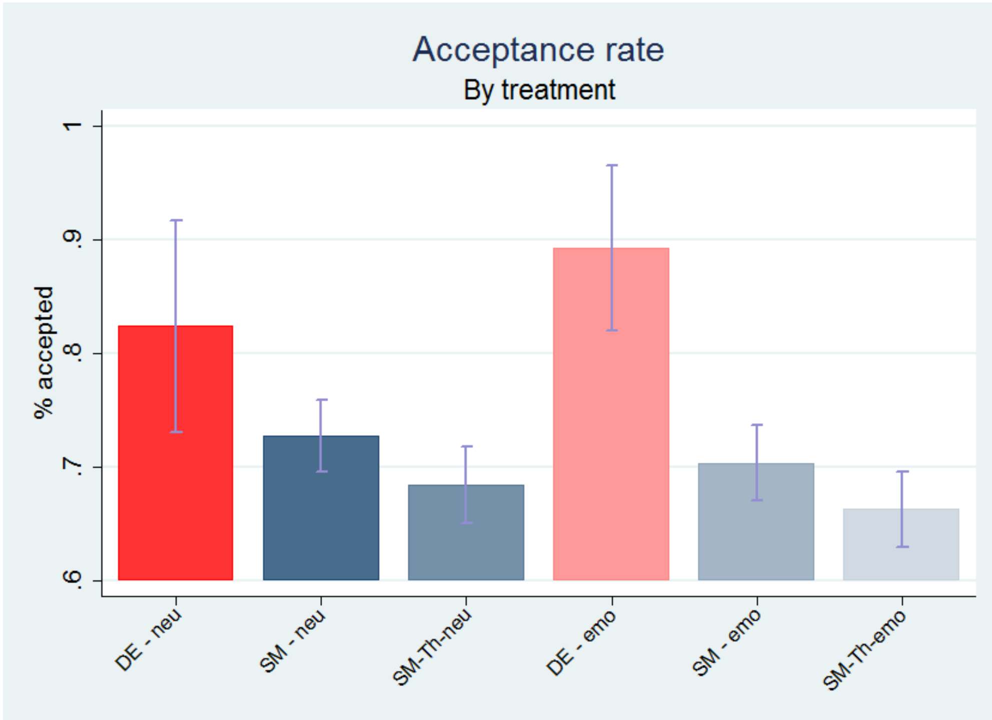


Figure 7: Ultimatum Game in laboratory: Acceptance ratio for different treatments with 95% confidence intervals.

We begin with a large sample size for illustrative purposes, but later restrict to one observation per subject-pair. The fact that the proposer makes slightly lower offers in DE means that restricting to one outcome would lead to the erroneous conclusion of higher acceptances in SM.[16] Indeed, comparing Columns 1 and 2 show that the difference between SM and DE almost doubles from 9.6 percentage points higher acceptance rate in DE ($p < 0.05$) to 16.2 percentage points ($p < 0.001$) once the offer level is controlled for. This doubling did not occur in Study 2 when offer was added as a control, as the offerer in Study 2 was unaware of the respondent's method of elicitation. Note that the high salience treatment further increases the difference in acceptance rates by 9 percentage points ($p < 0.1$) (Column 2). Here, we see that the "Emotions" treatment has significant interaction with the full strategy method rather than with the threshold method. If we interpret salience as the treatment effect of interest, we see evidence that salience has no significant treatment effect

[16]Note that this was not necessary in the online experiment since the proposer did not know whether the responder was in DE or SM.

but is weakly positive under DE but appears weakly negative under the full strategy method, and the difference in treatment effects is statistically significant at the 10% level.

Since the strategy and threshold methods both involve off-equilibrium considerations and render similar results[17], we pool these treatments in Table V. Columns 1 and 2 confirm the lower acceptance rate in SM of 12 percentage points ($p < 0.05$) and 18 percentage points ($p < 0.001$) respectively. When we control for offer level (Column 2), this difference is highly significant. In Column 3, fully interacting offer with the treatments shows that while 1% of offer is associated with 24 percentage points higher acceptance rates ($p < 0.001$), SM reduces this association by 14 percentage points ($p < 0.01$) in the low salience setting. This interaction differs from the previous experiment and literature. The main result remains that behavior in DE and SM diverges rather than stay invariant.

We can visualize the different correspondence between acceptance rates and offer level for DE and SM in Figure 8. DE responders are more sensitive to offers (the regression line for the raw data is red), more than twice as sensitive than for SM responders. This is true for both the low and high salience settings.

In sum, DE responders are 18 percentage points more likely to accept than SM responders in the low salience setting and are 27 percentage points more likely to accept in the high salience setting (Table V Column 2). Column 3 echoes Figure 8 as the coefficient on the interaction term of Strategy and Offer level suggests that differences between DE and SM responders grows with the offer level.

One concern with the aforementioned analyses is that strategy/threshold provides far more data at offer levels that are off-equilibrium or rare. Discarding data for offers other than 40% or 50% (these offers occur over 80% of the time) still yields divergence between

[17]The coefficient on Threshold in Columns 1 and 2 of Table IV suggest that SM-Th renders 4.3 percentage points lower acceptance rate than SM ($p < 0.1$, $p < 0.01$).

TABLE IV

Acceptance rates in laboratory ultimatum game

	(1)	(2)	(3)
(Intercept)	0.824***	0.248***	-0.488+
	(0.0463)	(0.0406)	(0.284)
Strategy method	-0.0963*	-0.162***	0.625*
	(0.0490)	(0.0410)	(0.286)
Threshold method	-0.0434+	-0.0434**	-0.0943*
	(0.0235)	(0.0165)	(0.0399)
Emotions	0.0684	0.0659	0.355
	(0.0587)	(0.0498)	(0.325)
Strategy x Emotions	-0.0928	-0.0903+	-0.427
	(0.0632)	(0.0523)	(0.327)
Threshold x Emotions	0.00291	0.00291	0.00789
	(0.0336)	(0.0229)	(0.0545)
Offer level		0.107***	0.244***
		(0.00159)	(0.0488)
Strategy x Offer level			-0.145**
			(0.0489)
Threshold x Offer level			0.00848+
			(0.00465)
Emotions x Offer level			-0.0541
			(0.0547)
Strategy x Emo x Offer			0.0620
			(0.0549)
Threshold x Emo x Offer			-0.000830
			(0.00634)
Mean of Y	0.702	0.702	0.702
N	3156	3156	3156

Robust standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Notes: This table reports regression results for acceptance rate. The threshold method is treated as a subset of strategy method, (i.e., the strategy dummy is set to 1 also for threshold method observations).

TABLE V
ACCEPTANCE RATES IN LABORATORY ULTIMATUM GAME

	(1)	(2)	(3)
(Intercept)	0.824***	0.248***	-0.488
	(0.0463)	(0.0406)	(0.284)
Strategy method	-0.117*	-0.184***	0.579*
	(0.0477)	(0.0402)	(0.285)
Emotions	0.0684	0.0659	0.355
	(0.0587)	(0.0497)	(0.325)
Strategy x Emotions	-0.0923	-0.0898	-0.425
	(0.0610)	(0.0510)	(0.326)
Offer level		0.107***	0.244***
		(0.00159)	(0.0488)
Strategy x Offer level			-0.141**
			(0.0488)
Emotions x Offer level			-0.0541
			(0.0547)
Strategy x Emo x Offer			0.0618
			(0.0548)
Mean of Y	0.702	0.702	0.702
N	3156	3156	3156

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

Notes: This table reports regression results for acceptance rate. Strategy method and Threshold method are pooled together.

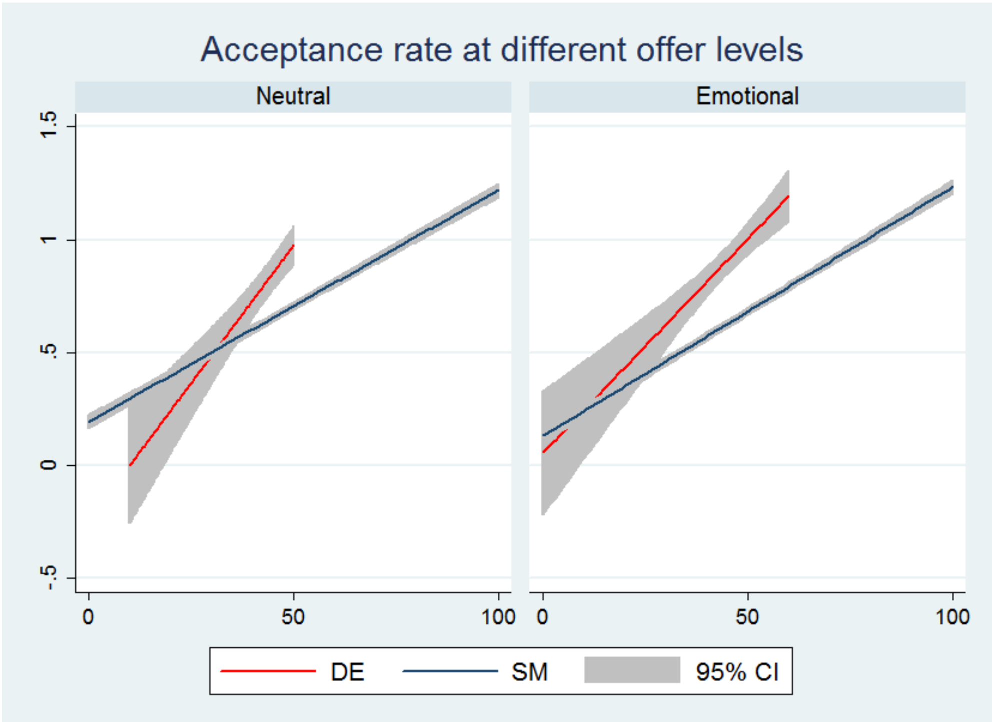


Figure 8: Ultimatum Game in laboratory: Acceptance at different offer levels for direct elicitation and strategy method (pooled with threshold method).

SM and DE (Figure 9). Focusing only on 40% offers with one observation per subject-pair, renders 100% acceptance in DE but significantly lower acceptance in SM.[18]

7. STUDY 5: THREE-PLAYER PRISONERS' DILEMMA - DE VS. SM AND LOW VS. HIGH SALIENCE

7.1. *Design*

In Study 5, we ran the lab experiment at the WiSo-Experimentallabor lab[19] following their standard procedures in Hamburg and used oTree (Chen et al., 2016). We collected data from 585 participants across 24 sessions. Subjects play the three-player prisoners' dilemma. We chose a more complex game because previous studies suggested differences between SM and DE may depend on the complexity of the game. In this game, participants were divided

[18]High salience of off-equilibrium considerations further reduce the willingness for responders to accept low offers in the threshold setting.

[19]We used a different lab because of the number of subjects we needed.

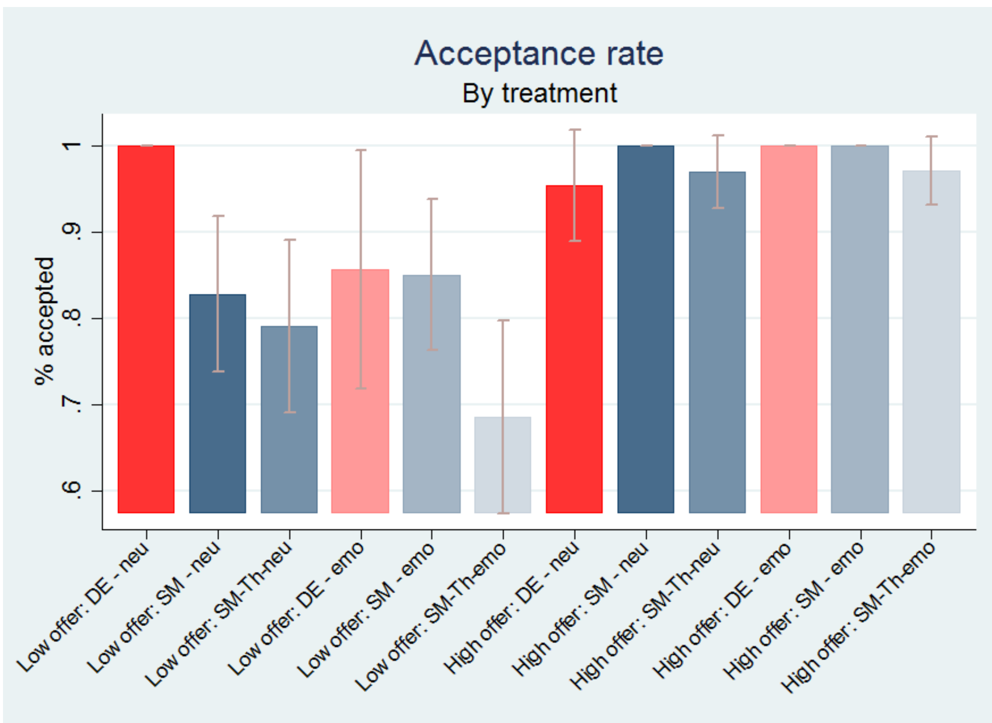


Figure 9: Ultimatum Game in laboratory: Acceptance at different offer levels for direct elicitation, strategy method, and threshold method. Low offer level is 40% and high offer level is 50% of the endowment.

into groups of three. The identities of the other players were never revealed. Each player was endowed 100 points (which were later converted into cents, 5 points = 1 cent). In the first stage, they had to decide whether to contribute 20 points to a common investment project. The payoff was the sum of retained points, either 80 or 100–plus the payoff from the project– which was defined as 0.6 * total amount of contributions. Thus, if everyone contributed, the payoff from the project was 36 (0.6 * 3 * 20). But if only one player contributed, the project payoff would be 12, and the contributor is left with 92 points (80 + 0.6 * 20), while the two non-contributing players end the first stage with 112 points each (100 + 0.6 * 20).

In the second stage, each player can deduct up to 21 points from each of the other players. However, any deduction is also applied to the deducting player. For example, when a player deducts 10 points from another player, her own payoff is also deducted by 10 points. Deductions can be contingent on the behavior of the other players in the first stage. In the *direct elicitation* setting, players are informed about the behavior of other players in the first stage before choosing the deductions.

In the *strategy method* setting, players are not informed about the first stage results, but are asked to decide hypothetically what to deduct in each possible outcome of the first stage (when the two other players contribute, when the two other players defect, and when one defects and one contributes). Thus, in total, in the SM setting, each player reports four possible deductions. After the decision is made, the action of other players (but not their identity) is revealed and the final payoffs are calculated.

Finally, we again implement a cross-cutting randomization of high vs. low salience for a total of four treatments (SM vs. DE x emo- vs. neutral). As in Study 4, we designed the salience treatment to avoid framing effects. To manipulate salience, the experiment changed one word: *group* → *team,* and changed the background color: purple → red, when describing the game. The setting with *group* and purple is coded as Emotions = 0 and the setting with *team* and red is coded as Emotions = 1 in the data analysis. In color psychology, red tends to lead to feelings of excitement, while purple tends to calm (Valdez and Mehrabian, 1994; Elliot and Maier, 2014). A team is typically perceived as a group with a common team purpose. Again, if invariance between SM and DE is affected by a few words or background color, the basis for using SM instead of DE would seem fragile. Instructions are in the Appendix B.

Participants are assigned to matches with three players each. In brief, as in the ultimatum game, DE responders were more cooperative than SM responders. They were less willing to punish non-cooperative first-stage behavior. Differences between DE and SM were affected by salience. We find similar results when we control for the first-stage outcome, restrict the sample to specific first-stage outcomes, or restrict to one observation per subject-first stage outcome.

7.2. *Results*

7.2.1. *Contributions*

Figure 10 presents the number of contributors across different treatments. Across all four treatments, between 80-90% of groups had two or more contributors.

Table VI reports regression analyses, which yield statistically insignificant differences in the probability of contribution (Column 1) and the number of contributors (Columns 2 and 3).

Figure 11 shows deductions. Deductions are larger for defectors than for contributors. Defectors are punished more when one of the other players contributes.

The action of the deductor in the first stage also matters. Defectors deduct less than contributors (Figure 12).

Figure 13 reports the average treatment effects. SM subjects deduct more, but this figure is slightly misleading because SM asks players to specify all potential deductions, whereas

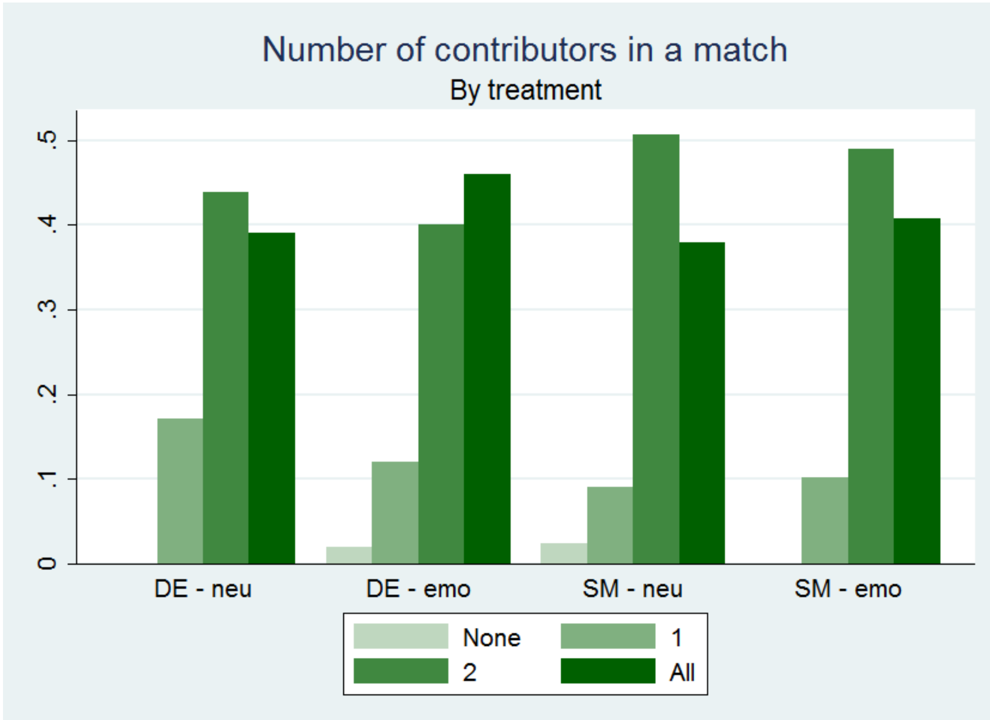


Figure 10: Three-Player Prisoners' Dilemma: Number of contributors per match for different treatments.

TABLE VI

Contributions in Three-Player Prisoners' Dilemma

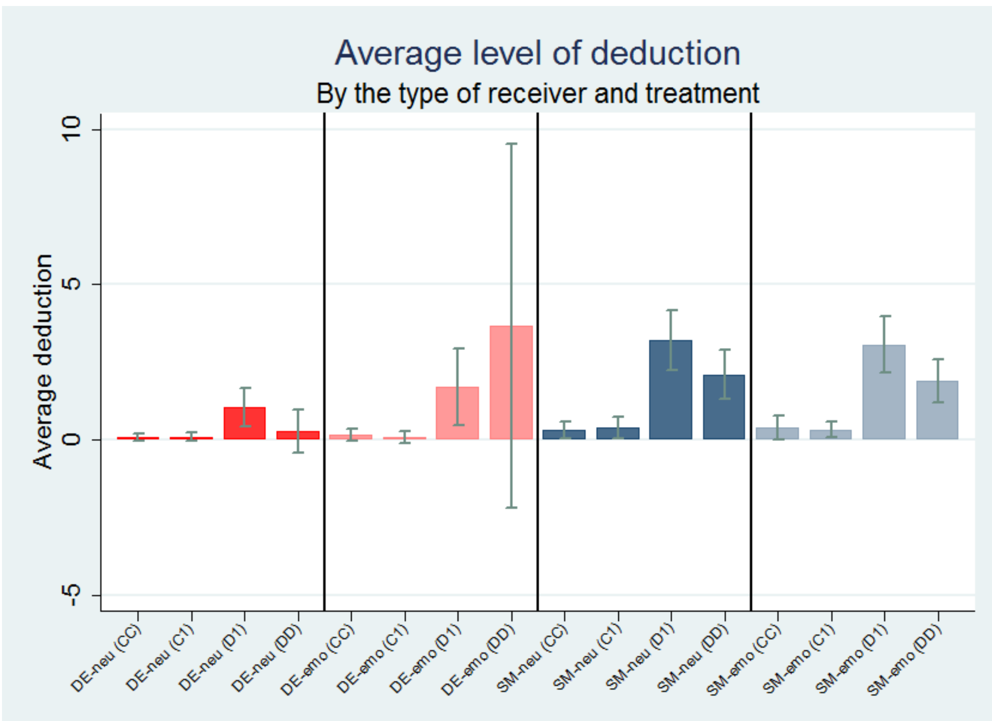
	Contribution rate	No. of contributors	No. contr (ordered probit)
(Intercept)	0.740***	2.220***	
	(0.0397)	(0.0648)	
Strategy method	0.00715	0.0215	0.0301
	(0.0522)	(0.0853)	(0.132)
Emotions	0.0268	0.0805	0.135
	(0.0527)	(0.0896)	(0.141)
Strategy x Emotions	-0.00511	-0.0153	-0.0360
	(0.0717)	(0.118)	(0.186)
Mean of Y	0.756	2.268	2.268
N	586	586	586

Robust standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

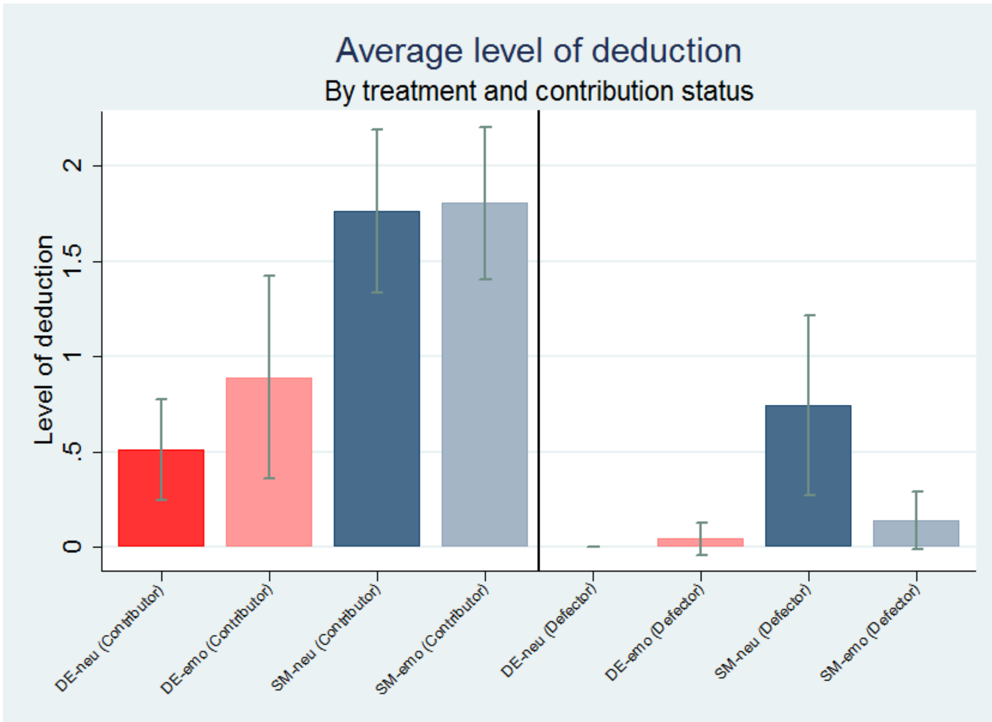
Notes: Contribution rate and number of contributors per match explained by treatment dummies. Column (3) contains estimates of an ordered probit model.

Figure 11: Three-Player Prisoners' Dilemma: Average deduction to different receivers for different treatments.



Notes: DD represents a deduction to both defectors, CC represents a deduction to both contributors. In a situation when one player contributes and the other defects, D1 represents a deduction to a defector and C1 to a contributor.

Figure 12: Three-Player Prisoners' Dilemma: Average deductions for different treatments depending on whether deducting player was a contributor or defector.



in DE, players specify only deductions in realized nodes. Since scenarios with two or more defectors are rare in DE, we observe larger average deductions in SM, when we do not condition on the type of receiver.

Figure 11 examines deductions by type of receiver. The third column in each set of four in this figure is of interest - it shows the deduction applied to defectors when there is 1 defector, as roughly 40% of the time, there is only 1 defector and the punisher is a contributor. SM subjects deduct more. Thus, less acceptance of non-cooperative behavior is observed in SM in both the ultimatum game and the three-player prisoners' dilemma. We next examine the interaction with salience. Figures 13 and 14 report the aggregate effects of salience: differences between SM and DE emerge depending on salience.

Table VII shows that subjects in SM made 1.1 points larger deductions ($p < 0.001$) and

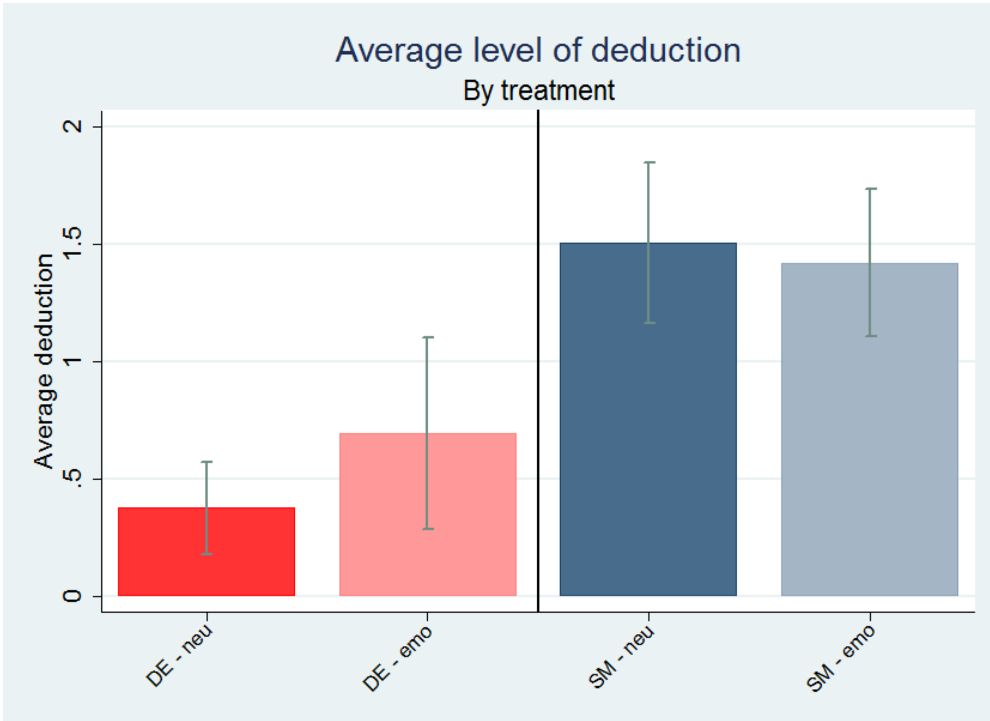


Figure 13: Three-Player Prisoners' Dilemma: Average deductions for different treatments

Figure 14: Three-Player Prisoners' Dilemma: Average positive deductions for different treatments (observations with deduction being zero excluded)

TABLE VII

Deductions in Three-Player Prisoners' Dilemma.

	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 x 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

Notes: Columns (1) and (2) use the entire sample; Column (3) examines positive deductions only.

were 5.7 percentage points more likely to deduct ($p < 0.1$) in the *group* salience setting (Columns 1 and 2). Restricting to non-zero deductions, salience significantly affects the difference between DE and SM by 4.9 points ($p < 0.05$) (Table VII Column 3). In terms of magnitudes, salience is roughly equivalent to the entire difference between SM and DE. SM subjects in the *group* salience setting made 5.9 points larger deductions ($p < 0.001$). To put this in perspective, like in Study 4, if we interpret salience as the treatment effect of interest, we see evidence that salience has no significant treatment effect but is weakly positive under DE but appears weakly negative under the strategy method, and the difference in treatment effects is statistically significant at the 5% level.

Similar results emerge when we control for the first stage outcome or restrict the sample to specific first stage outcomes, that is, restrict the sample to one observation per subject-first stage outcome. Table VIII restricts to contributors making the decision to deduct when the first stage resulted in exactly one defector and exactly two contributors (including the subject). Defectors received 3.1 points more deduction ($p < 0.001$) and were 34 percentage points more likely to have a deduction ($p < 0.001$) (Columns 1 and 2). SM subjects made 1.3

TABLE VIII

DEDUCTION LEVEL REGRESSION FOR A SUBSAMPLE: ONLY OBSERVATIONS FOR PEOPLE WHO CONTRIBUTED WITH DEDUCTIONS MADE TOWARDS THE ONLY OTHER CONTRIBUTOR OR THE ONLY DEFECTOR.

	Deduction level	Deduction probability	Non-zero deduction level
(Intercept)	-0.772	0.0235	2.085
	(0.546)	(0.0469)	(2.258)
Strategy method	1.345*	0.00717	6.383**
	(0.587)	(0.0504)	(1.919)
Emotions	0.371	-0.0194	2.406
	(0.712)	(0.0612)	(2.399)
Strategy x Emotions	-0.371	0.0789	-4.691+
	(0.819)	(0.0703)	(2.697)
Receiver is defector	3.128***	0.342***	2.317
	(0.351)	(0.0301)	(1.742)
Mean of Y	1.858	0.219	8.489
N	626	626	137

Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

points larger deductions ($p < 0.05$) in the *group* salience setting (Column 1), equivalent to roughly 40% of the effect of being a sole defector. Restricting to non-zero deductions, salience significantly affects the difference between DE and SM by 4.7 points ($p < 0.1$) (Column 3). In terms of magnitudes, salience is roughly 70% of the entire difference between SM and DE. SM subjects in the *group* salience setting made 6.4 points larger deductions ($p < 0.01$). If we interpret salience as the treatment effect of interest, we again see evidence that salience has no significant treatment effect but is weakly positive under DE but appears weakly negative under the strategy method, and the difference in treatment effects is statistically significant at the 10% level.

Other models also yield significant differences between SM and DE. Table IX controls for the status of the deductor (contributor or defector) and for the first stage outcome (two defectors, one defector, or none). As noted from the figures, contributors deduct more ($p < 0.001$), by 1.2 points, and defectors get more deductions, 1.6 points more when defecting as a pair ($p < 0.001$) and 2.4 points more when defecting singly ($p < 0.001$). SM subjects deduct 0.9 points more in the *group* salience setting ($p < 0.01$), roughly equivalent to being

TABLE IX

Full sample, controlling for effect of contribution status and for the receiver of the deduction, but no interactions of these controls with emotions or strategy method dummy.

	Deduction level	Deduction probability	Non-zero deduction level
(Intercept)	-1.225***	-0.0825**	0.855
	(0.347)	(0.0312)	(2.398)
Strategy method	0.880**	0.0290	6.089***
	(0.319)	(0.0287)	(1.681)
Emotions	0.347	0.00415	3.290
	(0.383)	(0.0345)	(2.073)
Strategy x Emotions	-0.458	0.0148	-5.186*
	(0.436)	(0.0393)	(2.261)
To the only contributor	-0.0249	0.000368	-0.193
	(0.250)	(0.0225)	(2.020)
To the only defector	2.387***	0.268***	1.776
	(0.250)	(0.0225)	(1.541)
To two defectors	1.555***	0.175***	1.357
	(0.273)	(0.0246)	(1.644)
Contributor	1.165***	0.131***	1.658
	(0.213)	(0.0192)	(1.544)
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

a contributor (Column 1). Restricting to non-zero deductions, significant differences between DE and SM emerge depending on salience ($p < 0.05$) (Column 3). In terms of magnitudes, salience is roughly equivalent to the entire difference between SM and DE. SM subjects in the *group* salience setting made 6.1 points larger deductions than DE subjects ($p < 0.001$). To say it another way, salience has no significant treatment effect but is weakly positive under DE but is weakly negative under the strategy method, and the difference in treatment effects is statistically significant at the 5% level.

Table X fully interacts all possible first stage outcomes and saturates them as controls. Analogous to the other results, contributors deduct 2.5 points more ($p < 0.001$) (Column 1) and are 18 percentage points more likely to deduct ($p < 0.01$) (Column 2). Defectors get deducted 2 points more ($p < 0.001$) (Column 1) and are 22 percentage points more likely to

TABLE X

Regression with all the possible outcomes of first stage dummied (contribution status and the number of all contributors in the group).

	Deduction level	Deduction probability
(Intercept)	-1.460	-0.1000
	(0.913)	(0.0829)
Strategy method	1.161***	0.0626*
	(0.322)	(0.0292)
Emotions	0.344	0.00375
	(0.387)	(0.0352)
Strategy x Emotions	-0.472	0.0146
	(0.442)	(0.0401)
Receiver is defector	2.034***	0.221***
	(0.214)	(0.0194)
Contributor	2.487***	0.176**
	(0.609)	(0.0553)
No of contr = 1	0.214	0.0165
	(0.923)	(0.0838)
No of contr = 2	0.562	0.0537
	(0.893)	(0.0810)
Contributor X No of contr = 2	-1.649*	-0.0551
	(0.675)	(0.0613)
No of contr = 3	-0.817	-0.0113
	(1.065)	(0.0967)
Mean of Y	1.253	0.150
N	1627	1627

Standard errors in parentheses

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

be deducted ($p < 0.001$) (Column 2). Contributors deduct less by 1.6 points when everyone contributed ($p < 0.05$) (Column 1). Notably, SM subjects deduct 1.2 points more in the *group* salience setting ($p < 0.001$) (Column 1) and are 6 percentage points more likely to deduct ($p < 0.05$), equivalent to a large fraction of the deduction to defectors.

Based on previous experiments and our own experiments, we have reviewed the performance of DE vs. SM for preference elicitation. The results we obtain are in accord with the previous literature and across our four experiments. First, not accounting for the bias in the estimation when decisions at one information set can influence the utility at another information set can render significant differences in decision-making. Second, the bias can be large and equivalent to some of the other treatment effects being measured. Third, subtle interventions on salience can magnify differences between strategy method and direct elicitation by a large amount, and if we interpret salience as the treatment of interest, we present evidence that the sign of the treatment flips between the two elicitation methods and flips significantly.

8. CONCLUSION

Our study suggests that, because of off-equilibrium motivations, conventional SM estimates may be grossly biased, leading to misleading treatment effects relative to DE. Since a large fraction of SM papers rely on many decisions at different information sets that are typically highly related, the off-equilibrium decisions can affect the *utility* of decisions at different information sets, even when it does not affect the monetary payoff. These factors reinforce each other so that the SM estimation for treatment effects could be severely biased. Theoretically, SM estimation may be positively or negatively biased away from DE depending on how utility interacts with decisions at other information sets. We leave empirical exploration of positive and negative bias for future work.

We have illustrated with simple models of off-equilibrium motivations in the SM context. Differences between DE and SM can reveal the importance of motivations beyond strong consequentialist ones. An alternative to the view of natural field experiments (a subset of DE) as the gold standard for causal estimates (Harrison and List, 2004; Levitt and List, 2007), is that differences between SM and DE can be used to understand the general way in which agents' motivations influence behavior (Camerer, 2011). To be sure, another reason to use SM may be if the situation approximates natural decision making.

The closest economic analog to our argument in the field may be the *drafting* of a contract (Battigalli and Maggi, 2002; Tirole, 1999; Schwartz and Watson, 2004). Contemplation of all possible contingencies involves SM decision-making, while the actual decision when the information set is revealed involves DE decision-making. Differences in decision-making provide another reason, besides incentive compatibility, why agents might not have incentives aligned with principals. Legal doctrine has neglected this dimension of contractual capacity.

REFERENCES

Anderson, Lisa R, Yana V Rodgers, and Roger R Rodriguez, "Cultural Differences in Attitudes Toward Bargaining," *Economics Letters*, 2000, *69* (1), 45–54.

Andreoni, James, Marco Castillo, and Ragan Petrie, "What do Bargainers' Preferences Look Like? Experiments with a Convex Ultimatum Game," *American Economic Review*, 2003, pp. 672–685.

Angrist, Joshua and S. Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, 2008.

Armantier, Olivier, "Do Wealth Differences Affect Fairness Considerations?," *International Economic Review*, 2006, *47* (2), 391–429.

——— **and Nicolas Treich**, "Subjective Probability in Games: An Application to the Overbidding Puzzle," *International Economic Review*, 2009, *50* (4), 1079–1102.

Battigalli, Pierpaolo and Giovanni Maggi, "Rigidity, Discretion, and the Costs of Writing Contracts," *The American Economic Review*, 2002, *92* (4), 798–817.

——— **and Martin Dufwenberg**, "Guilt in Games," *The American Economic Review*, May 2007, *97* (2), 170–176.

Bénabou, Roland and Jean Tirole, "Identity, Morals, and Taboos: Beliefs as Assets," *The Quarterly Journal of Economics*, May 2011, *126* (2), 805–855.

Blount, Sally, "When Social Outcomes Aren't Fair: The Effect of Causal Attributions on Preferences," *Organizational Behavior and Human Decision Processes*, 1995, *63* (2), 131–144.

Bornstein, Gary and Ilan Yaniv, "Individual and Group Behavior in the Ultimatum Game: Are Groups More "Rational" Players?," *Experimental Economics*, 1998, *1* (1), 101–108.

Bosch-Doménech, Antoni, Joaquim Silvestre et al., "Risk Aversion and Embedding Bias," Technical Report 2006.

Brañas-Garza, Pablo, Ramón Cobo-Reyes, and Almudena Domínguez, ""Si él lo necesita": Gypsy Fairness in Vallecas," *Experimental Economics*, 2006, *9* (3), 253–264.

Brandts, Jordi and Gary Charness, "Hot Vs. Cold: Sequential Responses and Preference Stability in Experimental Games," *Experimental Economics*, 2000, *2*, 227–238.

——— **and** ——— , "Truth or Consequences: An Experiment," *Management Science*, 2003, *49* (1), 116–130.

——— **and** ——— , "The strategy versus the direct-response method: a first survey of experimental comparisons," *Experimental Economics*, 2011, *14*, 375–398.

Brosig, J., J. Weimann, and C.L. Yang, "The Hot versus Cold Effect in a Simple Bargaining Experiment," *Experimental Economics*, 2003, *6* (1), 75–90.

Büchner, Susanne, Giorgio Coricelli, and Ben Greiner, "Self-centered and Other-regarding Behavior in the Solidarity Game," *Journal of Economic Behavior & Organization*, 2007, *62* (2), 293–303.

Camerer, Colin, "The Promise and Success of Lab-Field Generalizability in Experimental Economics: A Critical Reply to Levitt and List," *Available at SSRN 1977749*, 2011.

Cameron, Lisa A., "Raising the stakes in the ultimatum game: experimental evidence from Indonesia," *Economic Inquiry*, 1999, *37* (1), 47–59.

Carter, John R and Michael D Irons, "Are Economists Different, And If So, Why?," *The Journal of Economic Perspectives*, 1991, *5* (2), 171–177.

Casari, M. and T.N. Cason, "The strategy method lowers measured trustworthy behavior," *Economics Letters*, 2009, *103* (3), 157–159.

Casari, Marco and Timothy N Cason, "The Strategy Method Lowers Measured Trustworthy Behavior," *Economics Letters*, 2009, *103* (3), 157–159.

Cason, Timothy N and Vai-Lam Mui, "Social Influence in the Sequential Dictator Game," *Journal of Mathematical Psychology*, 1998, *42* (2), 248–265.

Chen, Daniel L. and John J. Horton, "Are Online Labor Markets Spot Markets for Tasks? A Field Experiment on the Behavioral Response to Wage Cuts," *Information Systems Research*, June 2016, *27* (2), 403–423. TSE Working Paper No. 16-675.

——— **and Martin Schonger**, "Social Preferences or Sacred Values? Theory and Evidence of Deontological Motivations," *American Economic Journal: Microeconomics*, 2016. invited to resubmit, TSE Working Paper No. 16-714.

——— **and Susan Yeh**, "Does Obscenity Law Corrode Moral Values and Does It Matter? Evidence from 1958-2008," Technical Report, Duke University mimeo 2010.

———**, Martin Schonger, and Chris Wickens**, "oTree—An open-source platform for laboratory, online, and field experiments," *Journal of Behavioral and Experimental Finance*, March 2016, *9*, 88 – 97.

———**, Vardges Levonyan, and Susan Yeh**, "Do Policies Affect Preferences? Evidence from Random Variation in Abortion Jurisprudence," *Journal of Political Economy*, 2017. TSE Working Paper No. 16-723, under review.

Chen, D.L., "Markets and Morality: How Does Competition Affect Moral Judgment," Technical Report, Working Paper, Duke University School of Law 2012.

Cox, James C and Daniel T Hall, "Trust with Private and Common Property: Effects of Stronger Property Right Entitlements," *Games*, 2010, *1* (4), 527–550.

Croson, Rachel TA, "Information in Ultimatum Games: An Experimental Study," *Journal of Economic*

Behavior & Organization, 1996, *30* (2), 197–212.

E., K. McCabe K. Shachat Hoffman and V. Smith, "Preferences, Property Rights, and Anonymity in Bargaining Games," *Games and Economic Behavior*, 1994, *7* (3), 346–380.

Eckel, Catherine C and Philip J Grossman, "Chivalry and Solidarity in Ultimatum Games," *Economic Inquiry*, 2001, *39* (2), 171–188.

Elliot, Andrew J and Markus A Maier, "Color psychology: Effects of perceiving color on psychological functioning in humans," *Annual review of psychology*, 2014, *65*, 95–120.

Falk, Armin and Michael Kosfeld, "The Hidden Costs of Control," *The American Economic Review*, 2006, pp. 1611–1630.

———, Ernst Fehr, and Urs Fischbacher, "Driving Forces Behind Informal Sanctions," *Econometrica*, 2005, *73*, 2017–2030.

Fehr, Ernst and Klaus M Schmidt, "Fairness, Incentives, and Contractual Choices," *European Economic Review*, 2000, *44* (4), 1057–1068.

——— and Urs Fischbacher, "Third-party punishment and social norms," *Evolution and Human Behavior*, 2004, *25* (2), 63 – 87.

Fershtman, Chaim and Uri Gneezy, "Strategic Delegation: An Experiment," *RAND Journal of Economics*, 2001, pp. 352–368.

Fischbacher, Urs and Simon Gächter, "Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Goods Experiments," *American Economic Review*, 2010, *100* (1), 541–556.

———, ———, and Simone Quercia, "The Behavioral Validity of the Strategy Method in Public Good Experiments," *Journal of Economic Psychology*, 2012, *33* (4), 897–913.

Fong, Yuk-Fai, Chen-Ying Huang, and Theo Offerman, "Guilt Driven Reciprocity in a Psychological Signaling Game," 2007.

Forsythe, Robert, Joel L Horowitz, N Eugene Savin, and Martin Sefton, "Fairness in Simple Bargaining Experiments," *Games and Economic Behavior*, 1994, *6* (3), 347–369.

Gneezy, Uri and Werner Guth, "On Competing Rewards Standards: An Experimental Study of Ultimatum Bargaining," *The Journal of Socio-Economics*, 2003, *31* (6), 599–607.

Goeree, Jacob K, Charles A Holt, and Thomas R Palfrey, "Quantal Response Equilibrium and Overbidding in Private-value Auctions," *Journal of Economic Theory*, 2002, *104* (1), 247–272.

Gul, Faruk, "A Theory of Disappointment Aversion," *Econometrica*, 1991, *59* (3), 667–686.

Güth, Werner, Nadege Marchand, and Jean-Louis Rulliere, *On the Reliability of Reciprocal Fairness: An Experimental Study*, Wirtschaftswissenschaftliche Fakultät Berlin, 1997.

———, Rolf Schmittberger, and Bernd Schwarze, "An Experimental Analysis of Ultimatum Bargaining," *Journal of Economic Behavior & Organization*, 1982, *3* (4), 367–388.

Guth, Werner, Steffen Huck, and Wieland Mueller, "The Relevance of Equal Splits in Ultimatum Games," *Games and Economic Behavior*, 2001, *37(1)* (1), 161–169.

Harrison, Glenn W and Kevin A McCabe, "Expectations and Fairness in a Simple Bargaining Experiment," *International Journal of Game Theory*, 1996, *25* (3), 303–327.

Harrison, G.W. and J.A. List, "Field Experiments," *Journal of Economic Literature*, 2004, *42* (4), 1009–1055.

Harsanyi, J.C. and R. Selten, *A general theory of equilibrium selection in games*, MIT Press, 1988.

Henrich, Joseph, "Does Culture Matter in Economic Behavior? Ultimatum Game Bargaining Among the Machiguenga of the Peruvian Amazon," *The American Economic Review*, 2000, *90* (4), 973–979.

Hoffman, Elizabeth, Kevin A McCabe, and Vernon L Smith, "On Expectations and the Monetary Stakes in Ultimatum Games," *International Journal of Game Theory*, 1996, *25* (3), 289–301.

Hommes, Cars, Joep Sonnemans, Jan Tuinstra, and Henk van de Velden, "A Strategy Experiment in Dynamic Asset Pricing," *Journal of Economic Dynamics and Control*, 2005, *29* (4), 823–843.

J., R. Boyd S. Bowles C. Camerer E. Fehr H. Gintis Henrich and R. McElreath, "In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies," *The American Economic Review*, 2001, *91* (2), 73–78.

Kohlberg, Elon and Jean-Francois Mertens, "On the Strategic Stability of Equilibria," *Econometrica*, 1986, *54* (5), 1003–1037.

Kőszegi, Botond and Adam Szeidl, "A Model of Focusing in Economic Choice," *The Quarterly Journal of Economics*, 2013, *128* (1), 53–104.

Kübler, Dorothea and Wieland Müller, "Simultaneous and Sequential Price Competition in Heterogeneous Duopoly Markets: Experimental Evidence," *International Journal of Industrial Organization*, 2002, *20* (10), 1437–1460.

Levitt, Steven and John List, "What Do Laboratory Experiments Tell Us About the Real World?," *The Journal of Economic Perspectives*, 2007, *21* (2), 153–174.

Liberman, Nira and Yaacov Trope, "The Role of Feasibility and Desirability Considerations in Near and Distant Future Decisions: A Test of Temporal Construal Theory," *Journal of Personality and Social Psychology*, 1998, *75* (1), 5.

Linde, Jona, Joep Sonnemans, and Jan Tuinstra, "Strategies and Evolution in the Minority Game: A Multi-round Strategy Experiment," *Games and Economic Behavior*, 2014, *86*, 77–95.

McGee, Peter and Stelios Constantinides, "Repeated Play and Gender in the Ultimatum Game," *The Journal of Socio-Economics*, 2013, *42*, 121–126.

Meidinger, Claude, Stéphane Robin, and Bernard Ruffieux, "Jeu de l'investissement et coordination par les intentions," *Revue d'économie politique*, 2001, *111* (1), 67–93.

Mengel, Friederike and Ronald Peeters, "Strategic Behavior in Repeated Voluntary Contribution Experiments," *Journal of Public Economics*, 2011, *95* (1), 143–148.

Metcalfe, Janet and Walter Mischel, "A Hot/Cool-system Analysis of Delay of Gratification: Dynamics of Willpower," *Psychological Review*, 1999, *106* (1), 3.

Mitzkewitz, Michael and Rosemarie Nagel, "Experimental Results on Ultimatum Games with Incomplete Information," *International Journal of Game Theory*, 1993, *22* (2), 171–198.

——— **and** ———, "Experimental results on ultimatum games with incomplete information," *International Journal of Game Theory*, 1993, *22*, 171–198. 10.1007/BF01243649.

Moulin, H., *Game Theory for the Social Sciences* Studies in Game Theory and Mathematical Economics, 2 ed., NYU Press, 1986.

Muller, Laurent, Martin Sefton, Richard Steinberg, and Lise Vesterlund, "Strategic Behavior and Learning in Repeated Voluntary Contribution Experiments," *Journal of Economic Behavior & Organization*, 2008, *67* (3), 782–793.

Munier, Bertrand and Costin Zaharia, "High Stakes and Acceptance Behavior in Ultimatum Bargaining," *Theory and Decision*, 2002, *53* (3), 187–207.

Murphy, Ryan O, Amnon Rapoport, and James E Parco, "The Breakdown of Cooperation in Iterative Real-time Trust Dilemmas," *Experimental Economics*, 2006, *9* (2), 147–166.

Nisbett, Richard E and Dov Cohen, *Culture of Honor: The Psychology of Violence in the South*, Westview Press, 1996.

Offerman, Theo, Jan Potters, and Harrie AA Verbon, "Cooperation in an Overlapping Generations Experiment," *Games and Economic Behavior*, 2001, *36* (2), 264–275.

Ong, Qiyan, Yohanes E Riyanto, and Steven M Sheffrin, "How Does Voice Matter? Evidence from the Ultimatum Game," *Experimental Economics*, 2012, *15* (4), 604–621.

Oosterbeek, Hessel, Randolph Sloof, and Gijs Van De Kuilen, "Cultural differences in ultimatum game experiments: Evidence from a meta-analysis," *Experimental economics*, 2004, *7* (2), 171–188.

Oxoby, R.J. and K.N. McLeish, "Sequential Decision and Strategy Vector Methods in Ultimatum Bargaining: Evidence on the Strength of Other-Regarding Behavior," *Economics Letters*, 2004, *84* (3), 399–405.

Poulsen, Anders U and Jonathan HW Tan, "Information Acquisition in the Ultimatum Game: An Experimental Study," *Experimental Economics*, 2007, *10* (4), 391–409.

Rand, David G., Joshua D. Greene, and Martin A. Nowak, "Spontaneous Giving and Calculated

Greed," *Nature*, 2012, *489* (7416), 427–430.

Rapoport, Amnon and James A Sundali, "Ultimatums in Two-person Bargaining with One-sided Uncertainty: Offer Games," *International Journal of Game Theory*, 1996, *25* (4), 475–494.

——— **and Mark A Fuller**, "Bidding Strategies in a Bilateral Monopoly with Two-sided Incomplete Information," *Journal of Mathematical Psychology*, 1995, *39* (2), 179–196.

———**, James A Sundali, and Darryl A Seale**, "Ultimatums in Two-person Bargaining with One-sided Uncertainty: Demand Games," *Journal of Economic Behavior & Organization*, 1996, *30* (2), 173–196.

Reuben, Ernesto and Sigrid Suetens, "Revisiting Strategic Versus Non-strategic Cooperation," *Experimental Economics*, 2012, *15* (1), 24–43.

Rochet, Jean Charles, *Selection on an Unique Equilibrium Value for Extensive Games with Perfect Information* Cahiers de mathématiques de la décision, Université Paris IX-Dauphine, Centre de recherche de mathématiques de la décision, 1981.

Roth, Alvin E., "Bargaining Experiments," in John H. Kagel and Alvin E. Roth, eds., *Handbook of Experimental Economics*, Princeton University Press, 1995.

Roth, Alvin E, Vesna Prasnikar, Masahiro Okuno-Fujiwara, and Shmuel Zamir, "Bargaining and market behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An experimental study," *The American Economic Review*, 1991, pp. 1068–1095.

Ruffle, Bradley J, "More is Better, But Fair is Fair: Tipping in Dictator and Ultimatum Games," *Games and Economic Behavior*, 1998, *23* (2), 247–265.

Schmitt, Pamela, Robert Shupp, Kurtis Swope, and Justin Mayer, "Pre-commitment and Personality: Behavioral Explanations in Ultimatum Games," *Journal of Economic Behavior & Organization*, 2008, *66* (3), 597–605.

Schotter, A., K. Weigelt, and C. Wilson, "A laboratory investigation of multiperson rationality and presentation effects," *Games and Economic Behavior*, 1994, *6*, 445–468.

Schwartz, Alan and Joel Watson, "The Law and Economics of Costly Contracting," *Journal of Law, Economics, and Organization*, 2004, *20* (1), 2–31.

Seale, Darryl A and Amnon Rapoport, "Elicitation of Strategy Profiles in Large Group Coordination Games," *Experimental Economics*, 2000, *3* (2), 153–179.

Selten, Reinhard, "Die Strategiemethode zur Erforschung eingeschraenkt rationalen Verhaltens im Rahmen eines Oligopolexperiments," *Beitraege zur experimentellen Wirtschaftsforschung*, 1967, *1*, 136–168.

Slembeck, Tilman, "Reputations and Fairness in Bargaining-Experimental Evidence From a Repeated Ultimatum Game with Fixed Opponents," 1999.

Slonim, Robert and Alvin E Roth, "Learning in High Stakes Ultimatum Games: An Experiment in the

Slovak Republic," *Econometrica*, 1998, pp. 569–596.

Sobel, Joel, "Interdependent preferences and reciprocity," *Journal of economic literature*, 2005, *43* (2), 392–436.

Solnick, Sara J, "Gender Differences in the Ultimatum Game," *Economic Inquiry*, 2001, *39* (2), 189.

———, "Cash and Alternate Methods of Accounting in an Experimental Game," *Journal of Economic Behavior & Organization*, 2007, *62* (2), 316–321.

——— **and Maurice E Schweitzer**, "The Influence of Physical Attractiveness and Gender on Ultimatum Game Decisions," *Organizational Behavior and Human Decision Processes*, 1999, *79* (3), 199–215.

Sonnemans, Joep, "Decisions and Strategies in a Sequential Search Experiment," *Journal of Economic Psychology*, 2000, *21* (1), 91–102.

Suleiman, Ramzi, "Expectations and Fairness in a Modified Ultimatum Game," *Journal of Economic Psychology*, 1996, *17* (5), 531–554.

Sundali, James A, Amnon Rapoport, and Darryl A Seale, "Coordination in Market Entry Games with Symmetric Players," *Organizational Behavior and Human Decision Processes*, 1995, *64* (2), 203–218.

Tirole, Jean, "Incomplete Contracts: Where Do We Stand?," *Econometrica*, 1999, *67* (4), 741–781.

Trope, Yaacov and Nira Liberman, "Temporal Construal," *Psychological Review*, 2003, *110* (3), 403.

——— **and** ———, "Construal-level Theory of Psychological Distance," *Psychological Review*, 2010, *117* (2), 440.

Valdez, Patricia and Albert Mehrabian, "Effects of color on emotions.," *Journal of experimental psychology: General*, 1994, *123* (4), 394.

Weg, Eythan and Vernon Smith, "On the Failure to Induce Meager Offers in Ultimatum Game," *Journal of Economic Psychology*, 1993, *14* (1), 17–32.

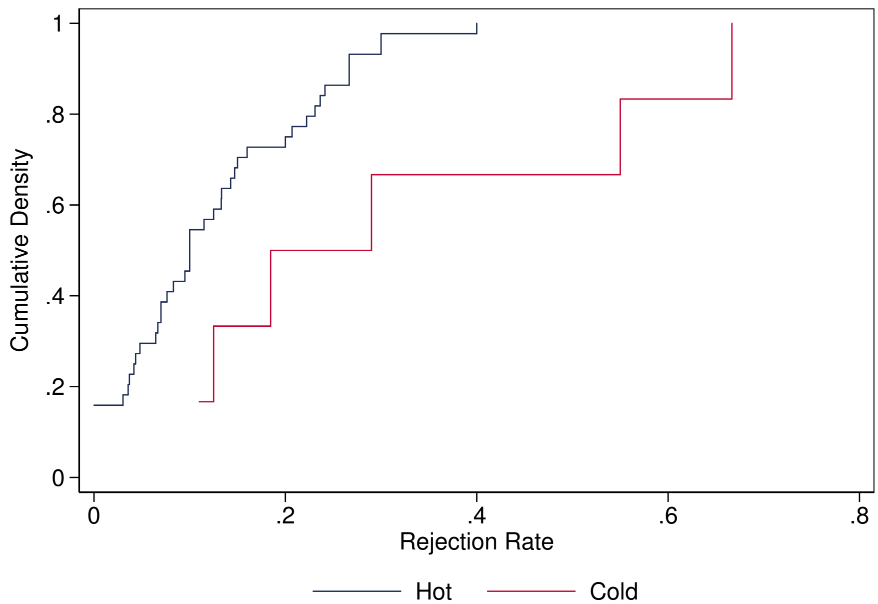
For Online Publication

Web Appendix:

APPENDIX A: ADDITIONAL RESULTS

A.1. *CDF from meta-analysis*

Appendix Figure A.1: Rejection Rates



APPENDIX B: EXPERIMENTAL INSTRUCTIONS

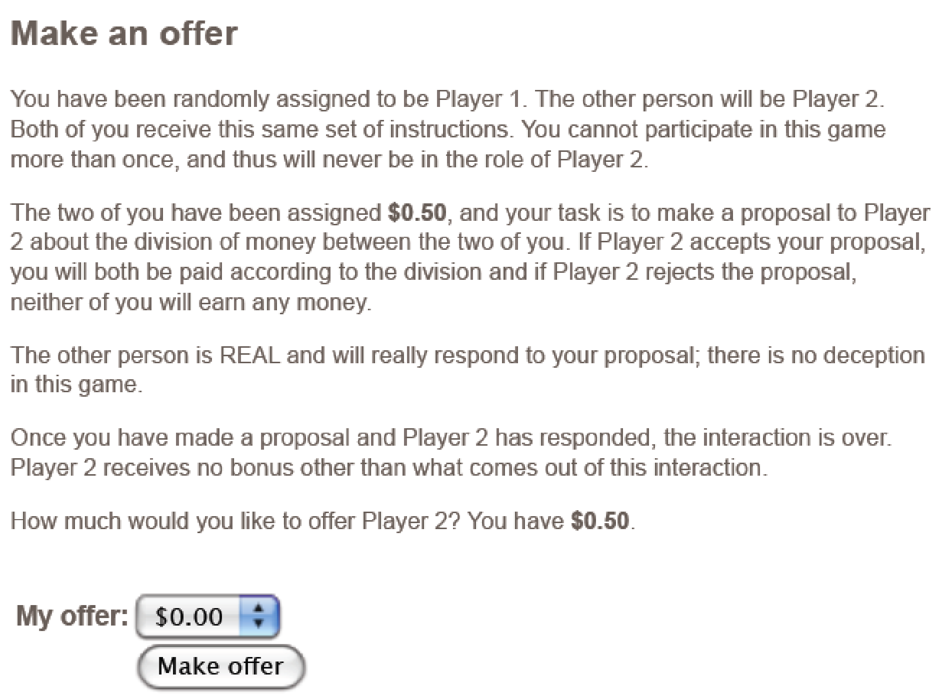
This section presents the online and lab instructions for the experiments.

B.1. *Amazon Mechanical Turk*

A sample paragraph from the login task is transcribing (not translating) a Tagalog translation of Adam Smith's *The Wealth of Nations*: Kaya sa isip o diwa na tayo ay sa mga ito, excites ilang mga antas ng parehong damdamin, sa proporsyon ng kasiglahan o dulness ng kuru-kuro. Ang labis na kung saan sila magbuntis sa kahirapan ng mga wretches nakakaapekto sa partikular na bahagi sa kanilang mga sarili ng higit pa sa anumang iba pang; dahil sa takot na arises mula sa kathang isip nila kung ano ang kani-kanilang mga sarili ay magtiis, kung sila ay talagang ang wretches kanino sila ay naghahanap sa, at kung sa partikular na bahagi sa kanilang mga sarili ay talagang apektado sa parehong miserable paraan. Ang tunay na puwersa ng mga kuru-kuro na ito ay sapat na, sa kanilang mga masasaktin frame, upang gumawa ng na galis o hindi mapalagay damdam complained ng.

B.1.1. *Ultimatum game instructions (Study 2)*

Appendix Figure B.1: Player 1


Make an offer

You have been randomly assigned to be Player 1. The other person will be Player 2. Both of you receive this same set of instructions. You cannot participate in this game more than once, and thus will never be in the role of Player 2.

The two of you have been assigned **$0.50**, and your task is to make a proposal to Player 2 about the division of money between the two of you. If Player 2 accepts your proposal, you will both be paid according to the division and if Player 2 rejects the proposal, neither of you will earn any money.

The other person is REAL and will really respond to your proposal; there is no deception in this game.

Once you have made a proposal and Player 2 has responded, the interaction is over. Player 2 receives no bonus other than what comes out of this interaction.

How much would you like to offer Player 2? You have **$0.50**.

My offer: $0.00

Make offer

Appendix Figure B.2: Player 2 under direct elicitation

Accept or reject the offer

You have been randomly assigned to be Player 2. The other person is Player 1.

The two of you have been assigned **$0.50**, and Player 1 has proposed to give you **$0.30**. If you accept the proposal, you will both be paid according to the division, and if you rejects the proposal, neither of you will earn any money.

The other person is REAL and really made this proposal; there is no deception in this game.

Once Player 1 and you have responded, the interaction is over. Player 1 receives no bonus other than what comes out of this interaction.

The other user offered you $0.30 out of $0.50.

Do you accept or reject this offer?

[Accept] [Reject]

Appendix Figure B.3: Player 2 under the strategy method

Set your threshold

You have been randomly assigned to be Player 2. The other person will be Player 1. Both of you receive this same set of instructions. You cannot participate in this game more than once, and thus will never be in the role of Player 1.

The two of you have been assigned **$0.50**, and Player 1 will make a proposal about the division of money between the two of you. If you accept the proposal, you will both be paid according to the division, and if you rejects the proposal, neither of you will earn any money.

The other person is REAL and will really give you a proposal; there is no deception in this game.

Once Player 1 has made you a proposal and you have responded, the interaction is over. Player 1 receives no bonus other than what comes out of this interaction.

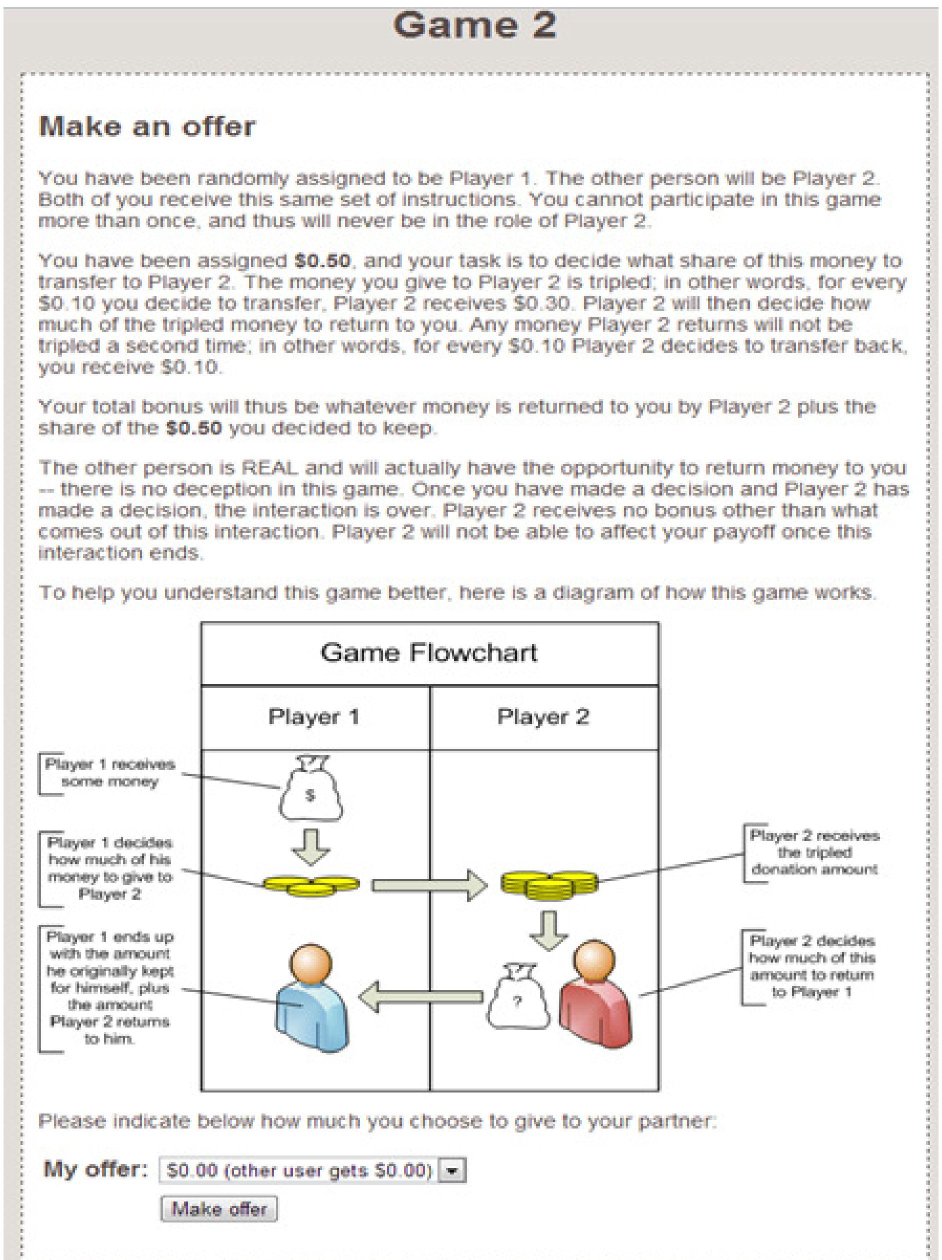
We want you to decide whether you will accept or reject each possible proposal before you know the actual proposal Player 1 made. The decision you have made at the proposal which Player 1 actually made, will then count for actual payment (notice that Player 1 only makes one proposal on how to divide the money, but you must make a decision at each possible proposal, before you know the actual proposal).

The minimum amount I'd accept is: [$0.00 ▾]

[Submit]

B.1.2. *Trust game instructions (Study 3)*

Appendix Figure B.4: Player 1



Game 2

Make an offer

You have been randomly assigned to be Player 1. The other person will be Player 2. Both of you receive this same set of instructions. You cannot participate in this game more than once, and thus will never be in the role of Player 2.

You have been assigned **$0.50**, and your task is to decide what share of this money to transfer to Player 2. The money you give to Player 2 is tripled; in other words, for every $0.10 you decide to transfer, Player 2 receives $0.30. Player 2 will then decide how much of the tripled money to return to you. Any money Player 2 returns will not be tripled a second time; in other words, for every $0.10 Player 2 decides to transfer back, you receive $0.10.

Your total bonus will thus be whatever money is returned to you by Player 2 plus the share of the **$0.50** you decided to keep.

The other person is REAL and will actually have the opportunity to return money to you -- there is no deception in this game. Once you have made a decision and Player 2 has made a decision, the interaction is over. Player 2 receives no bonus other than what comes out of this interaction. Player 2 will not be able to affect your payoff once this interaction ends.

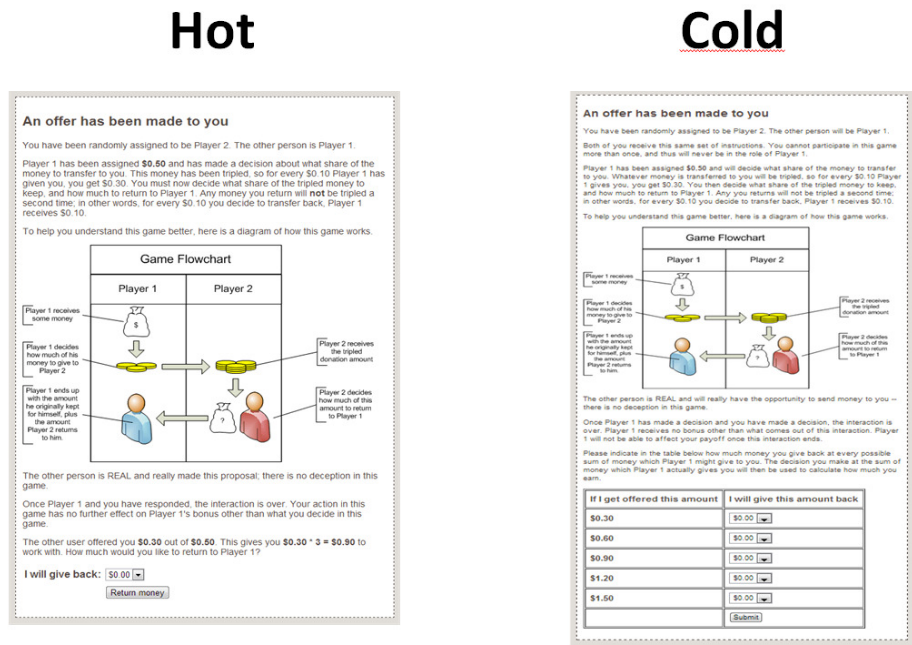
To help you understand this game better, here is a diagram of how this game works.

Please indicate below how much you choose to give to your partner:

My offer: $0.00 (other user gets $0.00)

Make offer

Appendix Figure B.5: Player 2



B.2. *Lab Instructions*

We present the original German and the English translations by Google; subjects only saw the German version.

B.2.1. *Ultimatum game instructions*[20] *(Study 4)*

Emotional Setting 1

All

Anleitung

Zu Beginn dieses Experiments sind die Teilnehmer zufällig in 2-er Gruppen aufgeteilt worden. Sie haben also ein Gegenüber, aber Sie wissen nicht wer es ist und werden es auch nie von uns mittgeteilt bekommen. Auch Ihrem Gegenüber werden wir Ihre Identität nie mitteilen.

Innerhalb Ihrer 2-er Gruppe gibt es 2 verschiedene Rollen: Vorschlagender und Antwortender. Per Zufall werden wir Ihre Rolle auf der nächsten Seite zuteilen. Zunächst die Regeln:

In diesem Experiment haben Sie beide zusammen 100 Cent erhalten. Um die Aufteilung dieser 100 Cent geht es in diesem Experiment. Dabei macht der Vorschlagende dem Antwortenden eine „Take-it-or-Leave-it-offer“, mit anderen Worten der Vorschlagende macht einen Vorschlag und der Antwortende kann diesen nur

[20]Emotional Setting 1 is coded as 0 and Emotional Setting 2 is coded as 1 in the data analysis.

entweder genau so annehmen oder ablehnen. Wenn er ablehnt bekommen beide Teilnehmer 0 Cent.

AUFGABE DES VORSCHLAGENDEN:

Der Vorschlagende schlägt eine Verteilung der 100 Cent vor. Der Vorschlagende hat dabei 11 Möglichkeiten:

1.) 100 Cent für sich, 0 Cent für den Antwortenden. 2.) 90 Cent für sich, 10 Cent für den Antwortenden.

3.) 80 Cent für sich, 20 Cent für den Antwortenden. 4.) 70 Cent für sich, 30 Cent für den Antwortenden.

5.) 60 Cent für sich, 40 Cent für den Antwortenden. 6.) 50 Cent für sich, 50 Cent für den Antwortenden.

7.) 40 Cent für sich, 60 Cent für den Antwortenden. 8.) 30 Cent für sich, 70 Cent für den Antwortenden.

9.) 20 Cent für sich, 80 Cent für den Antwortenden. 10.) 10 Cent für sich, 90 Cent für den Antwortenden.

11.) 0 Cent für sich, 100 Cent für den Antwortenden. Während der Vorschlagende seine Entscheidung trifft, wartet der Antwortende.

Direct Elicitation

AUFGABE DES ANTWORTENDEN:

Hat der Vorschlagende seine Auswahl getroffen, zeigt der Computer dem Antwortenden den Vorschlag an. Der Antwortende kann den Vorschlag entweder annehmen oder ablehnen.

ERGEBNISBILDSCHIRM:

Am Schluss sehen beide Teilnehmer einen Ergebnisbildschirm. Hier wird beiden der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

Strategy Method

AUFGABE DES ANTWORTENDEN:

Während der Vorschlagende seine Entscheidung trifft, entscheidet der Antwortende schon gleichzeitig welche Vorschläge er annehmen und welche er ablehnen würde. Das heisst für jeden der elf möglichen Vorschläge instruiert der Antwortende den Computer diesen entweder anzunehmen oder abzulehnen.

ERGEBNISBILDSCHIRM:

Erst wenn beide Teilnehmer ihre beiden Entscheidungen unwiderruflich getroffen haben wird der Computer den Vorschlag gemäss den Instruktionen des Antwortenden annehmen oder ablehnen. Beide sehen dann einen Ergebnisbildschirm. Hier wird der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

Threshold Method

AUFGABE DES ANTWORTENDEN:

Während der Vorschlagende seine Entscheidung trifft, entscheidet der Antwortende schon gleichzeitig wieviel er mindestens geboten bekommen muss um anzunehmen. Das heisst er instruiert den Computer welchen Betrag er mindestens geboten bekommen muss. Alle Vorschläge die ihm weniger bieten wird der Computer dann ablehnen, alle Vorschläge die ihm mehr bieten wird der Computer dann annehmen.

ERGEBNISBILDSCHIRM:

Erst wenn beide Teilnehmer ihre beiden Entscheidungen unwiderruflich getroffen haben wird der Computer den Vorschlag gemäss den Instruktionen des Antwortenden annehmen oder ablehnen. Beide Teilnehmer sehen dann einen Ergebnisbildschirm. Hier wird beiden der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

All

Ferner werden die resultierenden Auszahlungen angezeigt:

Wenn der Antwortende den Vorschlag annimmt: Beide bekommen das Geld genau gemäss dem gemachten Vorschlag.

Wenn der Antwortende den Vorschlag ablehnt: Beide Teilnehmer in der 2-er Gruppe bekommen 0 Cent.

Emotional Setting 2

All

Anleitung

Zu Beginn dieses Experiments sind die Teilnehmer zufällig in 2-er Gruppen aufgeteilt worden. Sie haben also ein Gegenüber, aber Sie wissen nicht wer es ist und werden es auch nie von uns mittgeteilt bekommen. Auch Ihrem Gegenüber werden wir Ihre Identität nie mitteilen.

Innerhalb Ihrer 2-er Gruppe gibt es 2 verschiedene Rollen: *Diktator*[21] und *Untertan*. Per Zufall werden wir Ihre Rolle auf der nächsten Seite zuteilen. Zunächst die Regeln:

In diesem Experiment haben Sie beide zusammen 100 Cent erhalten. Um die Aufteilung dieser 100 Cent geht es in diesem Experiment. Dabei macht der *Diktator* dem *Untertan* eine Take-it-or-Leave-it-offer“, mit anderen Worten der Vorschlagende macht einen Vorschlag und der *Untertan* kann diesen nur entweder genau so annehmen oder ablehnen. Wenn er ablehnt bekommen beide Teilnehmer 0 Cent.

AUFGABE DES *Diktator*:

Der *Diktator* schlägt eine Verteilung der 100 Cent vor. Der *Diktator* hat dabei 11 Möglichkeiten:

1.) 100 Cent für sich, 0 Cent für den *Untertan*. 2.) 90 Cent für sich, 10 Cent für den *Untertan*.

[21]Emphasis is added for the reader to see the difference with emotional setting 1. The subjects did not see italicized instructions.

3.) 80 Cent für sich, 20 Cent für den *Untertan*. 4.) 70 Cent für sich, 30 Cent für den *Untertan*.

5.) 60 Cent für sich, 40 Cent für den *Untertan*. 6.) 50 Cent für sich, 50 Cent für den *Untertan*.

7.) 40 Cent für sich, 60 Cent für den *Untertan*. 8.) 30 Cent für sich, 70 Cent für den *Untertan*.

9.) 20 Cent für sich, 80 Cent für den *Untertan*. 10.) 10 Cent für sich, 90 Cent für den *Untertan*.

11.) 0 Cent für sich, 100 Cent für den *Untertan*.

Direct Elicitation

Während der *Diktator* seine Entscheidung trifft, wartet der *Untertan*.

AUFGABE DES ANTWORTENDEN:

Hat der *Diktator* seine Auswahl getroffen, zeigt der Computer dem *Untertan* den Vorschlag an. Der *Untertan* kann den Vorschlag entweder annehmen oder ablehnen.

ERGEBNISBILDSCHIRM:

Hat der *Diktator* sich für Annahme oder Ablehnung entschieden sehen beide Teilnehmer einen Ergebnisbildschirm. Hier wird beiden der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

Strategy Method

AUFGABE DES ANTWORTENDEN:

Während der *Diktator* seine Entscheidung trifft, entscheidet der *Untertan* schon gleichzeitig welche Vorschläge er annehmen und welche er ablehnen würde. Das heisst für jeden der elf möglichen Vorschläge instruiert der *Untertan* den Computer diesen entweder anzunehmen oder abzulehnen.

ERGEBNISBILDSCHIRM:

Erst wenn beide Teilnehmer ihre beiden Entscheidungen unwiderruflich getroffen haben wird der Computer den Vorschlag gemäss den Instruktionen des *Untertan* annehmen oder ablehnen. Beide Teilnehmer sehen dann einen Ergebnisbildschirm. Hier wird beiden der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

Threshold Method

AUFGABE DES ANTWORTENDEN:

Während der *Diktator* seine Entscheidung trifft, entscheidet der *Untertan* schon gleichzeitig wieviel er mindestens geboten bekommen muss um anzunehmen. Das heisst er instruiert den Computer welchen Betrag er mindestens geboten bekommen muss. Alle Vorschläge die ihm weniger bieten wird der Computer dann ablehnen, alle Vorschläge die ihm mehr bieten wird der Computer dann annehmen.

ERGEBNISBILDSCHIRM:

Erst wenn beide Teilnehmer ihre beiden Entscheidungen unwiderruflich getroffen haben wird der Computer den Vorschlag gemäss den Instruktionen des *Untertan* annehmen oder ablehnen. Beide Teilnehmer sehen dann einen Ergebnisbildschirm. Hier wird beiden der Vorschlag angezeigt, und ob dieser angenommen oder abgelehnt wurde.

All

Ferner werden die resultierenden Auszahlungen angezeigt:

Wenn der *Untertan* den Vorschlag annimmt: Beide bekommen das Geld genau gemäss dem gemachten Vorschlag.

Wenn der *Untertan* den Vorschlag ablehnt: Beide Teilnehmer in der 2-er Gruppe bekommen 0 Cent.

B.2.2. *Ultimatum game instructions (Google Translation to English)*

Emotional Setting 1

All

manual

At the beginning of this experiment, the participants were randomly divided into groups of two. So you have a counterpart, but you do not know who it is and never will get it shared by us. We will never tell your counterpart about your identity.

Within your 2-person group there are 2 different roles: proposer and responder. By chance, we will assign your role on the next page. First the rules:

In this experiment, you both received 100 cents together. The distribution of these 100 cents is the topic of this experiment. In doing so, the proposer makes a "take-it-or-leave-it-offer" to the respondent, in other words the proposer makes a suggestion and the respondent can only either accept or reject it. If he declines, both participants get 0 cent.

TASK OF THE PROPOSAL:

The proposer suggests a distribution of 100 cents. The proposer has 11 options:

1) 100 cents for themselves, 0 cents for the respondent. 2.) 90 cents for themselves, 10 cents for the respondent.

3.) 80 cents for themselves, 20 cents for the respondent. 4.) 70 cents for themselves, 30 cents for the respondent.

5.) 60 cents for themselves, 40 cents for the respondent. 6.) 50 cents for themselves, 50 cents for the respondent.

7.) 40 cents for themselves, 60 cents for the respondent. 8.) 30 cents for themselves, 70 cents for the respondent.

9.) 20 cents for themselves, 80 cents for the respondent. 10.) 10 cents for themselves, 90 cents for the respondent.

11.) 0 cents for themselves, 100 cents for the respondent. While the proposer makes his decision, the respondent waits.

Direct Elicitation

TASK OF THE ANSWER:

When the proposer has made his selection, the computer displays the suggestion to the respondent. The respondent can either accept or reject the proposal.

RESULTS SCREEN:

At the end, both participants see a result screen. Here both are shown the suggestion and whether it was accepted or rejected.

Strategy Method

TASK OF THE ANSWER:

While the proposer makes his decision, the respondent decides at the same time what suggestions he would accept and which he would reject. That is, for each of the eleven possible suggestions, the respondent instructs the computer to either accept or reject it.

RESULTS SCREEN:

Only when both participants have irrevocably made their two decisions will the computer accept or reject the proposal according to the respondent's instructions. Both will see a result screen. Here the proposal is displayed and whether it has been accepted or rejected.

Threshold Method

TASK OF THE ANSWER:

While the proposer makes his decision, the respondent decides at the same time how much he has to get at least bid to accept. That means he instructs the computer which amount he has to get at least bid. The computer then reject any suggestions that will give it less, the computer then will accept any suggestions that will give it more.

RESULTS SCREEN:

Only when both participants have irrevocably made their two decisions will the computer accept or reject the proposal according to the respondent's instructions. Both participants will see a result screen. Here both are shown the suggestion and whether it was accepted or rejected.

All

In addition, the resulting payouts are displayed:

If the respondent accepts the proposal: Both get the money exactly according to the proposal made.

If the respondent rejects the proposal: Both participants in the 2-group get 0 cent.

Emotional Setting 2

All

manual

At the beginning of this experiment, the participants were randomly divided into groups of two. So you have a counterpart, but you do not know who it is and never will get it shared by us. We will never tell your counterpart about your identity.

Within your 2-person group there are 2 different roles: Dictator and Subject. By chance, we will assign your role on the next page. First the rules:

In this experiment, you both received 100 cents together. The distribution of these 100 cents is the topic of this experiment. In doing so, the dictator makes the subject a take-it-or-leave-it-offer ", in other words the proposer makes a suggestion and the subject can only either accept or reject it. If he declines, both participants get 0 cent.

TASK OF THE DICTATOR:

The dictator proposes a distribution of 100 cents. The dictator has 11 options:

1) 100 cents for themselves, 0 cents for the subject. 2.) 90 cents for themselves, 10 cents for the subject.

3.) 80 cents for themselves, 20 cents for the subject. 4.) 70 cents for themselves, 30 cents for the subject.

5.) 60 cents for themselves, 40 cents for the subject. 6.) 50 cents for himself, 50 cents for the subject.

7.) 40 cents for himself, 60 cents for the subject. 8.) 30 cents for themselves, 70 cents for the subject.

9.) 20 cents for themselves, 80 cents for the subject. 10.) 10 cents for himself, 90 cents for the subject.

11.) 0 cent for themselves, 100 cents for the subject.

Direct Elicitation

While the dictator makes his decision, the subject waits.

TASK OF THE ANSWER:

Once the dictator has made his selection, the computer displays the proposal to the subject. The subject can either accept or reject the proposal.

RESULTS SCREEN:

If the dictator has opted for acceptance or rejection, both participants will see a result screen. Here both are shown the suggestion and whether it was accepted or rejected.

Strategy Method

TASK OF THE ANSWER:

While the dictator makes his decision, the subject decides at the same time which proposals he will accept and which he would refuse. That is, for each of the eleven possible suggestions, the subject instructs the computer to either accept or reject it.

RESULTS SCREEN:

Only when both participants have irrevocably taken their two decisions will the computer accept or reject the proposal according to the subject's instructions. Both participants will see a result screen. Here both are shown the suggestion and whether it was accepted or rejected.

Threshold Method

TASK OF THE ANSWER:

While the dictator makes his decision, the subject decides at the same time how much he has to get at least bid to accept. That means he instructs the computer which amount he has to get at least bid. The computer then reject any suggestions that will give it less, the computer then will accept any suggestions that will give it more.

RESULTS SCREEN:

Only when both participants have irrevocably taken their two decisions will the computer accept or reject the proposal according to the subject's instructions. Both participants will see a result screen. Here both are shown the suggestion and whether it was accepted or rejected.

All

In addition, the resulting payouts are displayed:

If the subject accepts the proposal: Both get the money exactly according to the proposal made.

If the subject rejects the proposal: Both participants in the 2-group get 0 cent.

B.2.3. *Three-player prisoner's dilemma instructions (Study 5)*

This section presents screenshots of the experimental instructions. The first set of figures with the purple background (emotional setting 1[22]) are in the original German. The second set of figures show English translations by Google Chrome; subjects only saw the German version. The second set of figures use a red background (emotional setting 2). The other change between emotional setting 1 and 2 is the use of the word "group" or "team" when describing the game.

[22]Emotional Setting 1 is coded as 0 and Emotional Setting 2 is coded as 1 in the data analysis.

Appendix Figure B.6: Instructions for contribution stage of game

Experiment 2

Auch in diesem wirtschaftswissenschaftlichen Experiment entspricht alles, was wir Ihnen mitteilen, der Wahrheit. Sie werden in keinster Weise irregeleitet. Bitte unterhalten Sie sich auf keine Weise mit anderen Teilnehmern und seien Sie absolut leise. Bei Zuwiderhandlung müssen wir Sie leider von allen Experimenten und Zahlungen ausschließen.

Anleitung

GRUPPENEINTEILUNG

Zu Beginn des Experiments werden alle Teilnehmer vom Computer zufällig in Dreiergruppen eingeteilt. Neben Ihnen sind somit 2 weitere Teilnehmer in Ihrer Gruppe. Weder vor, während, noch nach dem Experiment werden Sie oder irgendein anderer Teilnehmer des Experiments über die Identität der Gruppenmitglieder informiert. Insbesondere erfahren Sie zu keinem Zeitpunkt die Computernummer der anderen Mitglieder Ihrer Gruppe.

VORSCHAU

In diesem Experiment kann Ihre Gruppe ein Projekt verwirklichen. Jedes Gruppenmitglied erhält ein Anfangsvermögen von 100 Punkten. Dann kann jedes Gruppenmitglied entweder 20 Punkte zum Projekt beitragen oder nicht. Für jedes Gruppenmitglied, das 20 Punkte beiträgt, erhält die Gruppe 36 Punkte. Diese werden dann automatisch gleichmäßig an alle Gruppenmitglieder aufgeteilt, also erhält jedes 12 Punkte. Dies ist Stufe 1 des Experiments. In Stufe 2 kann jedes Gruppenmitglied jedem anderen Abzugspunkte zuteilen, allerdings kostet 1 Abzugspunkt auch Sie 1 Punkt.

Im Folgenden werden die 2 Stufen näher beschrieben.

Stufe 1

Sie sollen sich entscheiden, ob Sie 20 Punkte zu einem gemeinsamen Projekt Ihrer Gruppe beitragen oder ob Sie die Punkte für sich behalten. Die beiden anderen Gruppenmitglieder stehen vor derselben Entscheidung. Auch sie können entweder 20 Punkte zum Projekt beitragen oder nicht. Beachten Sie, dass es nur zwei Möglichkeiten gibt: Entweder werden 20 Punkte zum Projekt beigetragen oder nicht. Nachdem sich alle 3 Gruppenmitglieder entschieden haben, steht der neue Punktestand fest.

BERECHNUNG DER VERMÖGEN NACH STUFE 1

Der Stand des Vermögens jedes einzelnen Gruppenmitgliedes nach Stufe 1 wird auf die gleiche Weise berechnet. Das neue Vermögen setzt sich aus zwei Teilen zusammen: Erstens, den Punkten, die jemand für sich behält („Restvermögen"). Dies können also enweder 100 oder 100 - 20 = 80 Punkte sein. Zweitens, den Punkten, die aus dem Projekt pro Teilnehmer erzielt werden („Projekteinkommen"). Für jeden Teilnehmer, der 20 Punkte beiträgt, erhält die Gruppe 36 Punkte, pro Kopf bedeutet dies 12 Punkte. Tragen beispielsweise zwei Gruppenmitglieder bei, erzielen alle drei Gruppenmitglieder ein Projekteinkommen von je 2 × 12 = 24 Punkten.

Hier nochmals aufgestellt, wie sich Ihr Vermögen nach Stufe 1 berechnet:

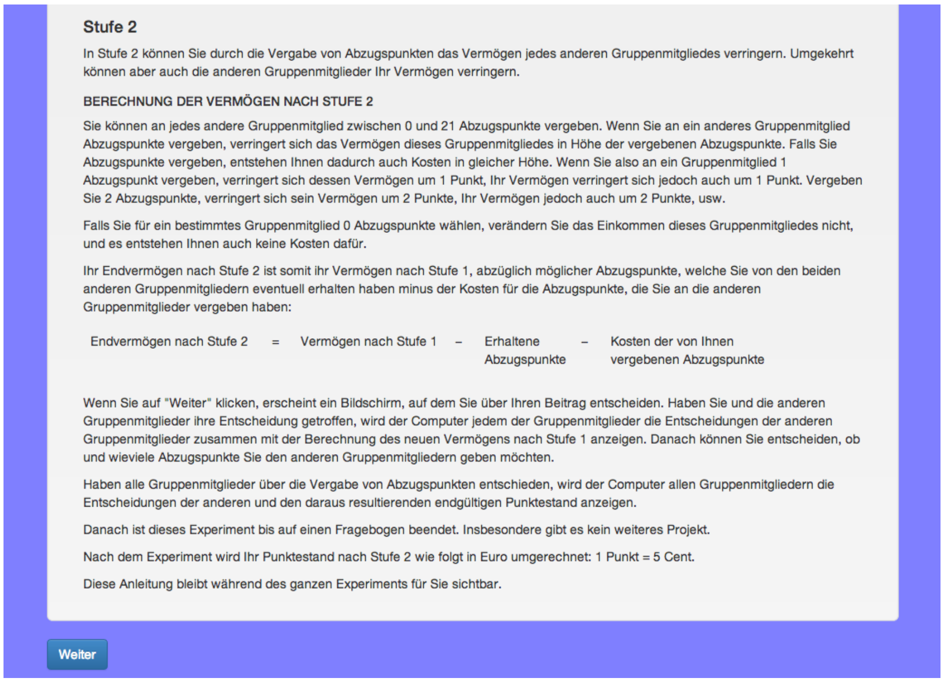
Vermögen nach Stufe 1	=	Restvermögen	+	Projekteinkommen
	=	100 – [Ihr Beitrag zum Projekt]	+	12 × [Anzahl der Gruppenmitglieder, die beitragen]

ZUR VERDEUTLICHUNG DER EINKOMMENSBERECHNUNG SOLLEN DREI BEISPIELE HELFEN:

- Falls kein Gruppenmitglied beiträgt: Dann ist das Restvermögen für alle drei Gruppenmitglieder 100. Das Projekteinkommen jedes Gruppenmitgliedes ist dann 0 Punkte. Das neue Vermögen jedes Gruppenmitgliedes ist somit 100 Punkte.
  - *Rechnung: (100 - 0) + 0 × 12 = 100*
- Falls alle drei Gruppenmitglieder beitragen: Dann hat Gruppenmitglied ein Restvermögen von 80 Punkten. Das Projekteinkommen jedes Gruppenmitgliedes ist dann 3 × 12 = 36 Punkte. Das neue Vermögen jedes Gruppenmitgliedes ist somit 116 Punkte.
  - *Rechnung: (100 - 20) + 3 × 12 = 116*
- Falls Sie selbst und ein weiteres Gruppenmitglied beitragen, das dritte aber nicht: Da zwei Gruppenmitglieder beigetragen haben, ist das Projekteinkommen eines jeden Gruppenmitgliedes 2 × 12 = 24 Punkte. Ihr Restvermögen ist, wie das des zweiten Gruppenmitgliedes, 80 Punkte. Somit ist Ihr neues Vermögen, wie das des zweiten Gruppenmitgliedes, 104 Punkte. Das Restvermögen des dritten Gruppenmitgliedes, welches nicht beigetragen hat, ist 100 Punkte. Somit ist sein neues Vermögen 124 Punkte.
  - *Rechnung für Sie und das zweite Gruppenmitglied: (100 - 20) + 2 × 12 = 104*
  - *Rechnung für das dritte Gruppenmitglied: (100 - 0) + 2 × 12 = 124*

Stufe 2

Appendix Figure B.7: Instructions for deduction stage of game



Stufe 2

In Stufe 2 können Sie durch die Vergabe von Abzugspunkten das Vermögen jedes anderen Gruppenmitgliedes verringern. Umgekehrt können aber auch die anderen Gruppenmitglieder Ihr Vermögen verringern.

BERECHNUNG DER VERMÖGEN NACH STUFE 2

Sie können an jedes andere Gruppenmitglied zwischen 0 und 21 Abzugspunkte vergeben. Wenn Sie an ein anderes Gruppenmitglied Abzugspunkte vergeben, verringert sich das Vermögen dieses Gruppenmitgliedes in Höhe der vergebenen Abzugspunkte. Falls Sie Abzugspunkte vergeben, entstehen Ihnen dadurch auch Kosten in gleicher Höhe. Wenn Sie also an ein Gruppenmitglied 1 Abzugspunkt vergeben, verringert sich dessen Vermögen um 1 Punkt, Ihr Vermögen verringert sich jedoch auch um 1 Punkt. Vergeben Sie 2 Abzugspunkte, verringert sich sein Vermögen um 2 Punkte, Ihr Vermögen jedoch auch um 2 Punkte, usw.

Falls Sie für ein bestimmtes Gruppenmitglied 0 Abzugspunkte wählen, verändern Sie das Einkommen dieses Gruppenmitgliedes nicht, und es entstehen Ihnen auch keine Kosten dafür.

Ihr Endvermögen nach Stufe 2 ist somit ihr Vermögen nach Stufe 1, abzüglich möglicher Abzugspunkte, welche Sie von den beiden anderen Gruppenmitgliedern eventuell erhalten haben minus der Kosten für die Abzugspunkte, die Sie an die anderen Gruppenmitglieder vergeben haben:

Endvermögen nach Stufe 2	=	Vermögen nach Stufe 1	–	Erhaltene Abzugspunkte	–	Kosten der von Ihnen vergebenen Abzugspunkte

Wenn Sie auf "Weiter" klicken, erscheint ein Bildschirm, auf dem Sie über Ihren Beitrag entscheiden. Haben Sie und die anderen Gruppenmitglieder ihre Entscheidung getroffen, wird der Computer jedem der Gruppenmitglieder die Entscheidungen der anderen Gruppenmitglieder zusammen mit der Berechnung des neuen Vermögens nach Stufe 1 anzeigen. Danach können Sie entscheiden, ob und wieviele Abzugspunkte Sie den anderen Gruppenmitgliedern geben möchten.

Haben alle Gruppenmitglieder über die Vergabe von Abzugspunkten entschieden, wird der Computer allen Gruppenmitgliedern die Entscheidungen der anderen und den daraus resultierenden endgültigen Punktestand anzeigen.

Danach ist dieses Experiment bis auf einen Fragebogen beendet. Insbesondere gibt es kein weiteres Projekt.

Nach dem Experiment wird Ihr Punktestand nach Stufe 2 wie folgt in Euro umgerechnet: 1 Punkt = 5 Cent.

Diese Anleitung bleibt während des ganzen Experiments für Sie sichtbar.

Weiter

Appendix Figure B.8: Control question

Experiment 2

Bitte beantworten Sie im Folgenden einige Verständnisfragen zur untenstehenden Anleitung.

1. Betrachten Sie den Fall, in dem keiner (inklusive Ihrer selbst) in Stufe 1 etwas beiträgt. Wie hoch ist dann Ihr Vermögen nach Stufe 1?

Weiter

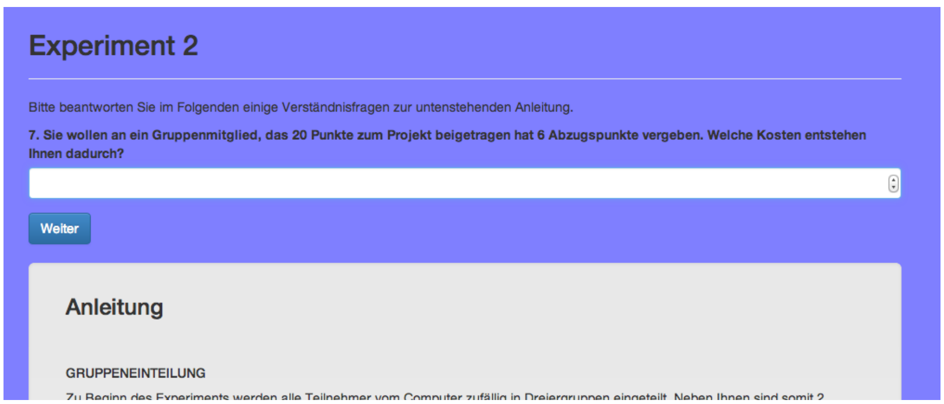
Anleitung

GRUPPENEINTEILUNG

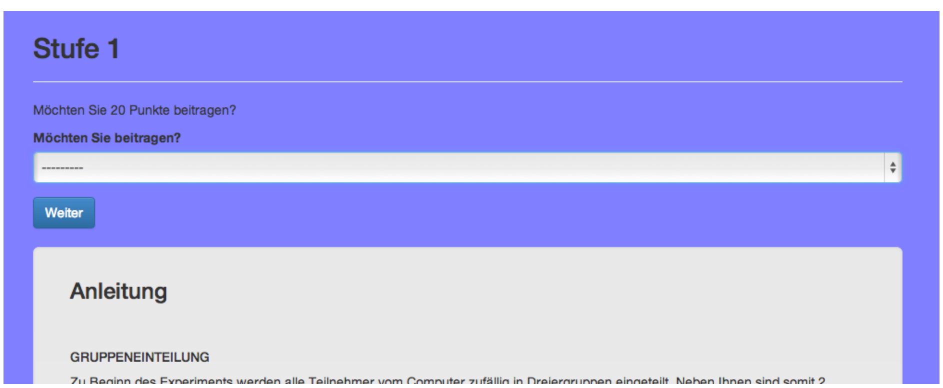
Zu Beginn des Experiments werden alle Teilnehmer vom Computer zufällig in Dreiergruppen eingeteilt. Neben Ihnen sind somit 2

Appendix Figure B.9: Control question feedback

Appendix Figure B.10: Second control question



Appendix Figure B.11: Contribution decision



Appendix Figure B.12: Deduction decision 1

Stufe 2

Dies sind die Ergebnisse aus Stufe1.

Beide anderen Teilnehmer haben nichts beigetragen.

	Sie	Teilnehmer B	Teilnehmer C
Anfangsvermögen	100 Punkte	100 Punkte	100 Punkte
Beitrag	0 Punkte	0 Punkte	0 Punkte
Restbetrag nach Abzug des Beitrags	100 Punkte	100 Punkte	100 Punkte
Zusammengenommenes Einkommen (0 Punkte + 0 Punkte + 0 Punkte) x 0.6	12 Punkte	12 Punkte	12 Punkte
Gesamteinkommen	**112 Punkte**	**112 Punkte**	**112 Punkte**

Bitte entscheiden Sie nachfolgend, wie viel Sie jedem Teilnehmer abziehen möchten. Beachten Sie, dass jeder Betrag, den Sie vom Vermögen der anderen abziehen auch von Ihrem Vermögen abgezogen wird.

Betrag, den ich jedem Teilnehmer abziehe

Weiter

Anleitung

GRUPPENEINTEILUNG

Appendix Figure B.13: Deduction decision 2

Stufe 2

Dies sind die Ergebnisse aus Stufe1.

Einer der anderen Teilnehmer hat beigetragen, der andere hat nichts beigetragen.

	Sie	Teilnehmer B	Teilnehmer C
Anfangsvermögen	100 Punkte	100 Punkte	100 Punkte
Beitrag	0 Punkte	20 Punkte	0 Punkte
Restbetrag nach Abzug des Beitrags	100 Punkte	80 Punkte	100 Punkte
Zusammengenommenes Einkommen (0 Punkte + 20 Punkte + 0 Punkte) x 0.6	12 Punkte	12 Punkte	12 Punkte
Gesamteinkommen	**112 Punkte**	**92 Punkte**	**112 Punkte**

Bitte entscheiden Sie nachfolgend, wie viel Sie jedem Teilnehmer abziehen möchten. Beachten Sie, dass jeder Betrag, den Sie vom Vermögen der anderen abziehen auch von Ihrem Vermögen abgezogen wird.

Betrag, den ich dem Teilnehmer abziehe, der beigetragen hat

Betrag, dem ich dem Teilnehmer abziehe, der nicht beigetragen hat

----

Weiter

Anleitung

GRUPPENEINTEILUNG

Zu Beginn des Experiments werden alle Teilnehmer vom Computer zufällig in Dreiergruppen eingeteilt. Neben Ihnen sind somit 2

Appendix Figure B.14: Deduction decision 3

Stufe 2

Dies sind die Ergebnisse aus Stufe1.

Einer der anderen Teilnehmer hat beigetragen, der andere hat nichts beigetragen.

	Sie	Teilnehmer B	Teilnehmer C
Anfangsvermögen	100 Punkte	100 Punkte	100 Punkte
Beitrag	20 Punkte	0 Punkte	20 Punkte
Restbetrag nach Abzug des Beitrags	80 Punkte	100 Punkte	80 Punkte
Zusammengenommenes Einkommen (20 Punkte + 0 Punkte + 20 Punkte) × 0.6	12 Punkte	12 Punkte	12 Punkte
Gesamteinkommen	**92 Punkte**	**112 Punkte**	**92 Punkte**

Bitte entscheiden Sie nachfolgend, wie viel Sie jedem Teilnehmer abziehen möchten. Beachten Sie, dass jeder Betrag, den Sie vom Vermögen der anderen abziehen auch von Ihrem Vermögen abgezogen wird.

Betrag, den ich dem Teilnehmer abziehe, der beigetragen hat

Betrag, dem ich dem Teilnehmer abziehe, der nicht beigetragen hat

----

Weiter

Anleitung

GRUPPENEINTEILUNG

Zu Beginn des Experiments werden alle Teilnehmer vom Computer zufällig in Dreiergruppen eingeteilt. Neben Ihnen sind somit 2

Appendix Figure B.15: English Translation

Experiment 2

Also in this experiment corresponds economics everything we notify you of the truth. They are misled in any way. Please talk to in any way with other participants and be absolutely quiet. In case of violation, we unfortunately have to exclude all experiments and payments.

Instructions

TEAM CLASSIFICATION

At the beginning of the experiment, all participants are randomly assigned by computer in teams of three. In addition you are thus 2 more members to your team. Neither before, during, or after the experiment you or any other participants of the experiment on the identity of teammates to be informed. Specifically, you will learn at no time the computer number of the other members of your team.

PREVIEW

In this experiment, your team can carry out a project. Each teammate receives an initial capacity of 100 points. Then, each teammate either 20 points or sponge can contribute to the project. For each teammate contributing 20 points, the team receives 36 points. This may be split evenly to all teammates, so each receives 12 points. This is level 1 of the experiment. In stage 2 can assign any other penalty points each teammate, however, costs 1 point and 1 point.

In the following, the two steps are described in more detail.

Level 1

They should decide whether you contribute 20 points to a common project of your team or if you keep the points for themselves. The other two teammates face the same decision. Also, they can either help or parasitize 20 points to the project. Note that there are only two possibilities: Either 20 points contributed to the project or not. After all three group members have decided that the new score is fixed.

CALCULATION OF ASSETS UNDER TIER 1,

The state of the assets of each teammates after stage 1 is calculated in the same way. The new assets are composed of two parts: First, the points that someone keep to himself ("remaining assets"). This can therefore enweder 100 or 100 - 20 = 80 points be. Second, the points are obtained from the project per participant ("Project Agreement"). For each participant, contributing 20 points, the team will receive 36 points per head, this means 12 points. For example, carry two team-mates, achieve all three teammates a project income of each 2 × 12 = 24 points.

Here again set up how your assets are calculated according to Level 1:

Assets included within Level 1	=	Remaining assets	+	Project income
	=	100 - [your contribution to the project]	+	12 × [number of teammates who contribute]

TO ILLUSTRATE THE CALCULATION OF INCOME TO HELP THREE EXAMPLES:

- If a teammate contributes Then the remaining assets for all three teammates 100. The project income for each teammate is then 0. The new assets of each teammate is therefore 100 points.
  - *Account: (100 - 0) + 0 × 12 = 100*
- If all three teammates contribute Then each teammate has a residual capacity of 80 points. The project income for each teammate is then 3 × 12 = 36 points. The new assets of each teammate is therefore 116 points.
  - *Account: (100-20) + 3 × 12 = 116*
- If you help yourself and another teammate, but the third is not: As two teammates have contributed to the project income of each teammate 2 × 12 = 24 points. Your remaining assets, such as that of the second teammate, 80 points. Thus, your new assets, such as that of the second teammates, 104 points. The remaining assets of the third teammates, which has not helped, is 100 points. Thus his new capacity is 124 points.
  - *Invoice for you and the second team mates: (100-20) + 2 × 12 = 104*
  - *Statement for the third teammates: (100 - 0) + 2 × 12 = 124*

Level 2

In step 2, you can reduce the ability of any other teammate by awarding penalty points. Conversely, however, can reduce your wealth, the other teammates.

Appendix Figure B.16: English Translation

Level 2

In step 2, you can reduce the ability of any other teammate by awarding penalty points. Conversely, however, can reduce your wealth, the other teammates.

CALCULATION OF ASSETS AFTER STAGE 2

You can assign to each other teammates 0-21 penalty points. When you place to another teammate penalty points, the assets of teammates reduces the amount of the penalty points awarded. If you give penalty points will result from even cost the same amount. So if you are assigned to a team-mate 1 point deduction, at its assets decreased by 1 point, but your assets is also reduced by 1 point. Assign 2 penalty points, the assets in your assets be reduced by 2 points, and by 2 points, etc.

If you choose 0 penalty points for a particular teammates, do not change the income of this teammates, and you also will not be charged for it.

Your final wealth after stage 2 is thus their assets to Level 1, less any penalty points, which you may obtain from the other two teammates minus the cost of penalty points you assigned to the other teammates:

Future value after step 2	=	Assets included within Level 1	-	Penalties Received	-	Returns the PFC's penalty points

How to make your entry at level 2?

In stage 1, all participants constitute their contribution to the project. *Before you learn how your other two teammates have decided* (ie whether they contributed or not), you must specify how many penalty points you select for all possible cases. There are three cases:

- **Case 1** : The two other teammates both have not contributed.
- **Case 2** : The other two teammates have both contributed.
- **Case 3** : Another teammate has helped others do not.

For **all** the three possible cases, you must decide whether and, if so, how many penalty points you want to assign to the other teammates. Only one of the three cases will actually occur, and only this case is relevant for your payment.

The other team mates will never know how you have chosen in the two cases not occurred.

Thereafter, this experiment is done up to a questionnaire. In particular, there is no next project.

After the experiment, your score after stage 2 is as follows converted into euros: 1 point = 5 cents.

These instructions will remain visible throughout the experiment for you.

Further