SHARING THE WEALTH: FACTORS INFLUENCING RESOURCE ALLOCATION IN THE SHARING GAME

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Students chose between two allocation options, one that gave the allocator more and another participant still more (the ''optimal'' choice) and one which gave the allocator less and the other participant still less (the ''competitive'' choice). In a within-subjects design, students' behavior patterns were significantly correlated across the two rounds of decision-making; however, students allocated more optimally when the allocation involved real rather than hypothetical money, suggesting that both motivational context and individuals' personality and/or experience influence preference patterns. The nature of the putative other participant did not affect the allocation: students allocated in a comparable fashion whether the other participant was said to be male, female, or a computer.

Key words: choice, Sharing Game, economic games, resource allocation, money, Dictator Game, humans

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Choice has been the focus of scores of experiments in the experimental analysis of behavior. One type of choice, less frequently studied by behavior analysts, involves allocation of resources. Economists and psychologists have been among social scientists who have used popular economic games to study how individuals allocate resources between themselves and another participant. For example, two commonly studied games are the Ultimatum Game (Güth, Schmittberger, & Schwarze, 1982) and the Dictator Game (Forsythe, Horowitz, Savin, & Sefton, 1994). In the Ultimatum Game one player proposes a distribution of resources (for example, if $20, $15 for him/her and $5 for the other player). If the other player accepts, the $15/$5 split becomes reality. If the other player rejects the offer neither gets anything (no negotiation is possible). In the Dictator Game whatever the proposing player decides becomes reality (the second ''player'' is passive).

It is also informative to ask participants to choose between two possible fixed allocations of resources between themselves and another player. Kennelly and Fantino (2007) reported two such studies assessing college students' allocation of resources to themselves and another player where the allocations involved points either with or without monetary value. Students were given 20 choices, all of the following type: The subject may choose to receive $7 while another (unseen, passive, and in fact nonexistent) participant receives $9 OR the subject may choose to receive $5 while the other participant receives $3. The $7/$9 option is clearly optimal for the student choosing (by ''optimal,'' we mean the choice that yields the maximum amount for the chooser). This alternative also maximizes the other participant's gain, and thus the total sum for both parties, but subjects do not always choose this outcome. If a competitive advantage over the other participant is paramount for the student, then the $5/$3 option should be chosen. If instead subjects preferred keeping the earnings for the two participants comparable then they should alternate their choices on successive trials in order to maintain equity in the earnings. Kennelly and Fantino facilitated implementation of such a strategy by repeating options on consecutive trials. Thus, identical options were offered on the first and second trials, on the third and fourth, and so on through the total of 20 trials. If the student chose $7/$9 on the first trial and $5/$3 on the second, both participants would receive the same amount summed over the two trials ($12).

It should be clear that from the point of view of maximizing money earned participants

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should always choose the option that gives them the most money (in the example above, $7). Instead, summed over all conditions, only 49% of choices were optimal. Even when monetary incentive was provided, the other ''participant'' was a computer, and the computer's cumulative score was not displayed for the participant (the condition in which choosing nonoptimally made least sense of all, at least to the experimenters), nonoptimal choices were made on 41% of the trials. Kennelly and Fantino (2007) found evidence for all three patterns of choice: optimal, competitive, and equitable. In fact, their overall results produced a trimodal distribution with modes at each of these three basic response strategies. These three patterns also correspond roughly to those proposed by Van Lange, De Bruin, Otten, and Joireman (1997) who asserted that people exhibit stable preference patterns. However, a more fine-grained analysis of the results revealed that the trimodal pattern was illusory and that the preference patterns were far from stable. When data from participants in the conditions with real monetary payoffs were analyzed separately from data from participants in conditions with hypothetical payoffs, a different picture emerged. Preferences of participants in the real money conditions produced a bimodal distribution with modes at optimal and equitable; preferences of participants in the hypothetical money conditions produced a bimodal distribution with modes at competitive and equitable.

In a second experiment the instructions were amended to remove any suggestion that the participants were engaged in a ''game.'' Now the overall results were characterized by a bimodal distribution with modes at optimal and equitable. The competitive mode was eliminated. Again, a simpler picture emerged when the data were analyzed separately for the real and hypothetical money participants. A unimodal distribution captured the data for both types of payoffs: optimal with real money and equitable with hypothetical money. Although these conclusions are all based on between-subjects comparisons they point to the following conclusion: people do not exhibit stable preference patterns (whether based on personality and/or experience). Rather, these preferences are affected by the nature of both the rewards and the instructions. If this conclusion were correct it follows that in a within-subjects version of this experiment participants would show different preference patterns depending on whether they were distributing real or hypothetical monetary rewards. If, however, people do exhibit stable preference patterns, we would expect participants' behavior patterns to correlate closely from one within-subjects condition to another. A test of these implications is the major focus of the present experiments.

Another finding of Kennelly and Fantino (2007) was perplexing, at least to the authors. In both of our experiments we found absolutely no difference in the distribution of money (real or hypothetical) whether the other participant was alleged to be another student or a computer. Especially in the real-money conditions without game-like instructions, it would appear to be pointless to take less than an optimal amount of money in order to achieve equity with or to compete successfully with a computer. Because this result was so surprising we sought to replicate it in the first of the present experiments. We also found a gender effect: males tended to choose more optimally (in the sense of maximizing their own rewards) than women. The present experiments offer an opportunity to replicate this finding as well. In addition, the second experiment asks a novel question: When the gender of the other participant is known, does the gender of the recipient affect the distribution of money?

Thus, in Experiment 1 we studied 80 students (40 male, 40 female) in a within-subjects design to compare the effects of real versus hypothetical money using two rounds (20 trials per round) of the Sharing Game developed by Kennelly and Fantino (2007). The study also permitted a between-subjects comparison of the nature of the other participant (human versus computer as recipient) and of the gender of the students making the distributions. In Experiment 2 we studied 120 students (60 of each gender) in a within-subjects design for knowledge of the other participant's gender, again using two rounds of the Sharing Game. The study also permitted between-subjects comparison of both the gender of the students making the distribution and of the gender of the recipient (male, female, or unspecified). To what extent would participants choose optimally and to what extent would their choices be affected by the nature of the incentives (real or hypothetical money), the nature of the other participant (person or computer; male, female, or unspecified gender), and their own gender? In particular, would we find with a within-subjects design that preference patterns, rather than being stable, are affected by factors such as the nature of the rewards being distributed?

EXPERIMENT 1

In this experiment the primary focus was a within-subjects comparison of the effects of real versus hypothetical money on the distribution of money in 40 trials of the Sharing Game. We also sought to assess whether choices would also depend on the nature of the other participant (computer or person) and on the gender of the students making the allocations.

Method

Participants

A total of 89 (43 female, 46 male) young adult (M=20.5, SD=3.0 years) undergraduate students served as participants. Nine were dropped from the study for either misinterpreting the instructions or (in the conditions involving a putative second person) for indicating in debriefing that during the session, they were certain that the second person did not exist.[1] Of the remaining 80, there were 40 of each gender evenly distributed in all conditions. Specifically, 20 participants (10 men and 10 women) were quasirandomly assigned to each of the following conditions: (a) monetary first/human; (b) monetary first/computer; (c) hypothetical pay first/human; (d) hypothetical pay first/computer. All students received monetary compensation for their time, and reported being fluent English speakers, free of neurological and psychiatric disorders, and having normal or corrected-to-normal vision.

Design and Stimuli

The economic game used in this study (the Sharing Game; Kennelly & Fantino, 2007) employed a single-player, multiple-trial, two-alternative forced-choice paradigm in which the player's allocation decision determines both that player's payoff and that of another (unseen, passive, and, in fact nonexistent) participant. Each trial offered participants an opportunity to choose between two options. One option gave the participants a smaller monetary reward and gave the other player even less. The second option gave participants a larger monetary reward and gave the other player even more. To illustrate, a typical choice might be

Participant One receives 35¢ and Participant Two receives 45¢

OR

Participant One receives 25¢ and Participant Two receives 15¢

Table 1 lists the 10 sets of choices presented to participants. In each trial, the participant was presented with a choice between one of the alternatives in the table's left hand column and its corresponding alternative in the right hand column. The two options for each choice were always numerically symmetrical in that the absolute value of the difference between the outcomes for Participant 1 and Participant 2 was the same for both alternatives. Regardless of the particular amounts offered, participants always had a choice between the optimal alternative (e.g., ''Participant One receives 35¢ and Participant Two receives 45¢'') and the competitive alternative (e.g., ''Participant One receives 25¢ and Participant Two receives 15¢''). Over 20 trials, the choices were always presented in pairs (e.g., the 35¢ and 45¢ versus 25¢ and 15¢ alternatives were presented twice in a row) to afford participants a third option: to match their earnings with those of the second player. By alternating between the top (optimal) and bottom (competitive) alternatives, both players would complete the game with equal (though nonmaximal) earnings. For example, when given the 35¢ and 45¢ versus 25¢ and 15¢ alternatives twice in a row, the allocator could (a) choose 35¢ and 45¢ both times, resulting in totals of 70¢ for him- or herself and 90¢ for the other; (b) choose 25¢ and 15¢ both times, resulting in respective

[1] Participants' data were retained (1) if they stated that they were not completely certain if the other person existed, but were willing to give the experimenter the benefit of the doubt, or (2) if they stated that they only became certain that there was no other person *after* completing the allocation sessions.

Table 1

Monetary choices presented to participants in the Sharing Game, in cents

First (optimal) alternative		Second (competitive) alternative	
Player 1 (participant) receives	Player 2 (putative other or computer) receives	Player 1 (participant) receives	Player 2 (putative other or computer) receives
30	40	20	10
30	35	25	20
35	45	25	15
40	55	25	10
45	65	25	5
30	45	25	10
35	45	15	5
40	50	20	10
40	45	25	20
40	50	30	20

totals of 50¢ and 30¢; or (c) choose 35¢ and 45¢ once and 25¢ and 15¢ once, resulting in totals of 60¢ for each.[2] Each choice pair was presented in random order. Once five pairs had been presented (the first 10 trials), those same five choice pairs were re-randomized and presented again on the remaining 10 trials.

Each subject participated in two consecutive 20-trial sessions. The first five choice pairs in Table 1 were used for one session, while the other five were used for the other session. The order of use of the two sets of choice pairs was counterbalanced. There were no significant effects of choice set or choice set order. The top option on the computer screen was always the optimal option and the bottom option always the competitive one.

Participants were informed before one of their two sessions that they and Player Two would each be paid the amount respectively earned in that session. Participants were neither told how much they nor the other participant could potentially earn. Those who chose competitively through all 20 trials using the first five choice pairs from Table 1 earned $4.80 for themselves and $2.40 for the other, while those who did so while using the second five choice pairs earned $4.60 and $2.60, respectively. Participants who chose optimally every time earned $7.20 for themselves and $9.60 for the other under the first five choice pairs, while those who did so under the second five earned $7.40 and $9.40, respectively. Under both sets of choice pairs, those who equalized both participants' earnings, most easily accomplished by alternating their choices from trial to trial, earned $6.00 for both parties. In the real money conditions in Experiment 1, the average earnings for the allocator and recipient, respectively, were $6.73 and $7.84. In addition, half of the participants were told that the second player was an anonymous person in an adjoining room, while the rest were informed that the second player was represented by the computer running the game program. The dependent variable was the percentage of trials in which the participant chose the optimal option, which afforded the maximum amount of money for the participant (and, incidentally, for the second player).

Procedure

Participants were assessed individually in a room with normal lighting, were seated 500 mm from a personal computer running the game program, and were informed that they were to take part in an economic scenario involving resource allocation. The experimenter told participants that the computer would display multiple trials of different monetary amounts that the participants could allocate to themselves and to Person 2 (P2), but did not reveal exactly how many trials there would be or that the choices would be presented in pairs. The experimenter orally described how a typical trial would appear, but neither suggested any strategy nor explained how the

[2] Although alternating successively between optimal and competitive choices was the easiest way to achieve equity, not every participant who claimed to desire comparable amounts for themselves and their partner did so through every choice pair. Regardless of their particular choice pattern, earning equal or near-equal amounts required each chooser to select the competitive and optimal choices each about half of the time.

top and bottom options were considered optimal and competitive, respectively. It was at this time that the experimenter explained to half of the participants that P2 was an anonymous person in the adjoining room waiting for the session to begin (the other half were informed that P2 was the computer). The participant was told that, as Person 1 (P1), only he or she had the ability to choose how much both players received in each trial. Depending on the condition to which the participant was randomly assigned, he or she was informed that the monetary amounts were hypothetical, or that he or she and P2 would actually receive the total amounts indicated for each of them at that session's conclusion. The experimenter did not reveal that there would be more than one 20-trial round, how many trials each round had, nor how much either they or P2 could potentially earn. Once the experimenter had determined that the participant understood the verbal instructions, P1 was prompted to read the instructions displayed on the computer screen. Appendix 1 contains sample transcripts of the computer-provided instructions from Experiments 1 and 2. If participants were in a condition in which they were told that P2 was human, the experimenter left the room for about 10 s and returned under the pretense of ascertaining that Player 2 was ready. After making certain that the participant had no questions and was ready to begin, the experimenter left the participant alone to begin the session. At the conclusion of the first round, the experimenter told the participant that he or she and P2 would take part in a second round with exactly the same conditions as the first, with the exception of the incentive. That is, those who played for real money in the first round would now play for hypothetical money in the second, and vice versa.

Results and Discussion

A 2 (incentive) × 2 (gender) × 2 (Player 2's identity) × 2 (order of incentives) analysis of variance was conducted, with the first factor as a within-subjects variable. The central finding supported the hypothesis that participants would choose more optimally when the money being distributed was real rather than hypothetical. On average, when real money was being distributed, participants chose optimally (that is, selected the larger of the two possible

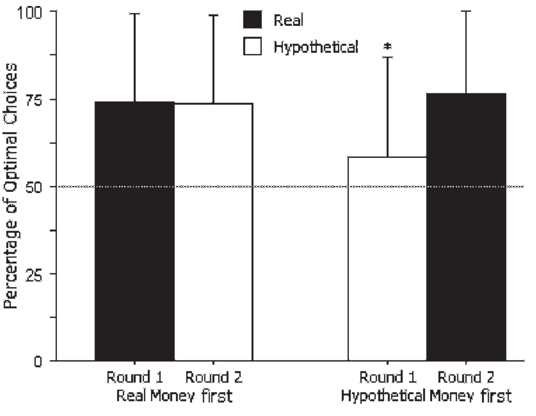

Fig. 1. Mean percentage of trials in the real and hypothetical money rounds of Experiment 1 in which participants chose the optimal alternative (split across order of incentive type). Zero percent indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior; 50% indicates choosing optimally in half of all trials, resulting in nonmaximal, but equal (or nearly equal) amounts for both players. Error bars indicate +1 standard deviation across participants.

amounts they could allocate to themselves) on 75.4% of trials. When hypothetical money was being distributed, participants chose optimally on 66.1% of trials. While this difference does not appear large it was significant, $F(1, 72) = 10.97$, $p = .0014$. Moreover, the difference was mitigated by a significant order × condition interaction, $F(1, 72) = 9.55$, $p = .0028$. As shown in Figure 1, participants exposed to the real money condition first (Round 1) continued to respond at the same (high) level of optimality when switched to the hypothetical money situation in Round 2. Thus, the effect of incentive was confined to the participants who received hypothetical money in Round 1. Their level of optimal choice increased from 58.5% in Round 1 (hypothetical money) to 76.5% in Round 2 (real money). The individual data for all 80 subjects are presented in Tables 2 and 3 for both rounds of 20 trials each.

Males made a higher percentage of optimal allocations but this difference missed statistical significance overall (74.1% vs. 67.3%; $F[1, 72] = 1.89$, *ns*). This difference seems largely attributable to allocations made in the real money conditions (80.6% vs. 70.1%; $F[1, 72] = 1.72$, *ns*). Although not significant in the current study, the directions of the observed gender differences are consistent with the

Table 2

Experiment 1: Participants' gender, P2 type, and percentage of optimal choices when Round 1 was real money and Round 2 was hypothetical money (n = 40)

Subject	Gender	P2 Type	Percentage of Trials in which the Optimal Alternative was chosen in Round 1 (Real Money)	Percentage of Trials in which the Optimal Alternative was chosen in Round 2 (Hypothetical Money)
33	Male	Human	100	95
79	Male	Human	100	90
57	Male	Human	100	70
14	Male	Human	95	60
29	Male	Human	90	90
63	Male	Human	90	55
48	Male	Human	55	100
83	Male	Human	55	100
86	Male	Human	55	90
73	Male	Human	55	50
8	Female	Human	100	100
11	Female	Human	100	100
22	Female	Human	100	100
44	Female	Human	100	100
52	Female	Human	100	100
49	Female	Human	100	95
58	Female	Human	70	80
16	Female	Human	50	75
25	Female	Human	50	50
28	Female	Human	50	50
56	Male	Computer	100	100
87	Male	Computer	100	100
37	Male	Computer	100	80
85	Male	Computer	90	100
50	Male	Computer	90	80
6	Male	Computer	80	50
69	Male	Computer	55	15
78	Male	Computer	50	50
41	Male	Computer	50	45
23	Male	Computer	40	45
66	Female	Computer	100	100
43	Female	Computer	95	100
20	Female	Computer	75	45
35	Female	Computer	55	100
1	Female	Computer	55	55
42	Female	Computer	55	55
21	Female	Computer	50	55
7	Female	Computer	50	45
30	Female	Computer	45	45
64	Female	Computer	20	30

results of Kennelly and Fantino (2007) and with the earlier literature summarized by Walters, Stuhlmacher, and Meyer (1998). In their meta-analysis of gender and competition, Walters et al. found generally small effects suggesting that women behave more equitably than men and that men behave more optimally, in terms of maximizing their own allocations. In the earlier studies, the more optimal choice was generally also the more competitive choice. In the Sharing Game studies the competitive and optimal choices are different. We find more optimal choices among men—even when these choices are less competitive—and more equitable choices among females (who are more likely to divide their choices among optimal and competitive, thereby arriving at more equitable overall outcomes).

Figure 2 shows bimodal frequency distributions of percentages of optimal choices, for the real and hypothetical money conditions split by order of incentive type, with the greatest mode (at 100%) corresponding to always choosing the optimal alternative, and the lesser mode (at 50%) with equalizing payoffs. The behavior of those who played for hypo-

Table 3

Experiment 1: Participants' gender, P2 type, and percentage of optimal choices when Round 1 was hypothetical money and Round 2 was real money (n = 40)

Subject	Gender	P2 Type	Percentage of Trials in which the Optimal Alternative was chosen in Round 1 (Hypothetical Money)	Percentage of Trials in which the Optimal Alternative was chosen in Round 2 (Real Money)
13	Male	Human	100	100
71	Male	Human	100	100
81	Male	Human	100	95
74	Male	Human	95	100
19	Male	Human	85	85
9	Male	Human	50	95
67	Male	Human	50	55
84	Male	Human	50	50
61	Male	Human	30	80
32	Male	Human	0	100
34	Female	Human	100	100
45	Female	Human	55	75
53	Female	Human	50	60
26	Female	Human	50	50
38	Female	Human	50	50
65	Female	Human	50	50
5	Female	Human	45	50
55	Female	Human	45	50
12	Female	Human	40	100
15	Female	Human	40	45
2	Male	Computer	100	100
47	Male	Computer	100	100
72	Male	Computer	85	100
17	Male	Computer	70	65
54	Male	Computer	65	65
76	Male	Computer	55	50
62	Male	Computer	50	100
68	Male	Computer	50	55
88	Male	Computer	5	80
89	Male	Computer	0	100
31	Female	Computer	100	100
59	Female	Computer	100	100
27	Female	Computer	60	80
36	Female	Computer	55	95
4	Female	Computer	55	75
24	Female	Computer	55	55
3	Female	Computer	50	100
40	Female	Computer	50	100
46	Female	Computer	50	50
39	Female	Computer	0	0

thetical money in the first round (Figure 2C) was slightly different in that the greater mode is at 50% and the lesser mode at 100%. Note that among the students who played for real money first (panels A and B), about the same number of participants were grouped between 45% and 55% optimality in Rounds 1 and 2 (16 and 14, respectively). Among those who played for hypothetical money first (panels C and D), however, 19 students were gathered between 45% and 55% in Round 1 but in Round 2 only 12 were. Regardless of incentive order, in both conditions behavior clustered at or around pure optimality or equality (very few students behaved purely or even mostly competitively). As mentioned previously, the easiest way to achieve equity between both parties was for the allocator to alternate between the optimal and competitive choices on successive trials. This strategy was not pointed out to participants (and nor was any other), but it was adopted by an appreciable minority of them. Of the 19 students who chose optimally in exactly half of Round 1's trials, 10 exhibited

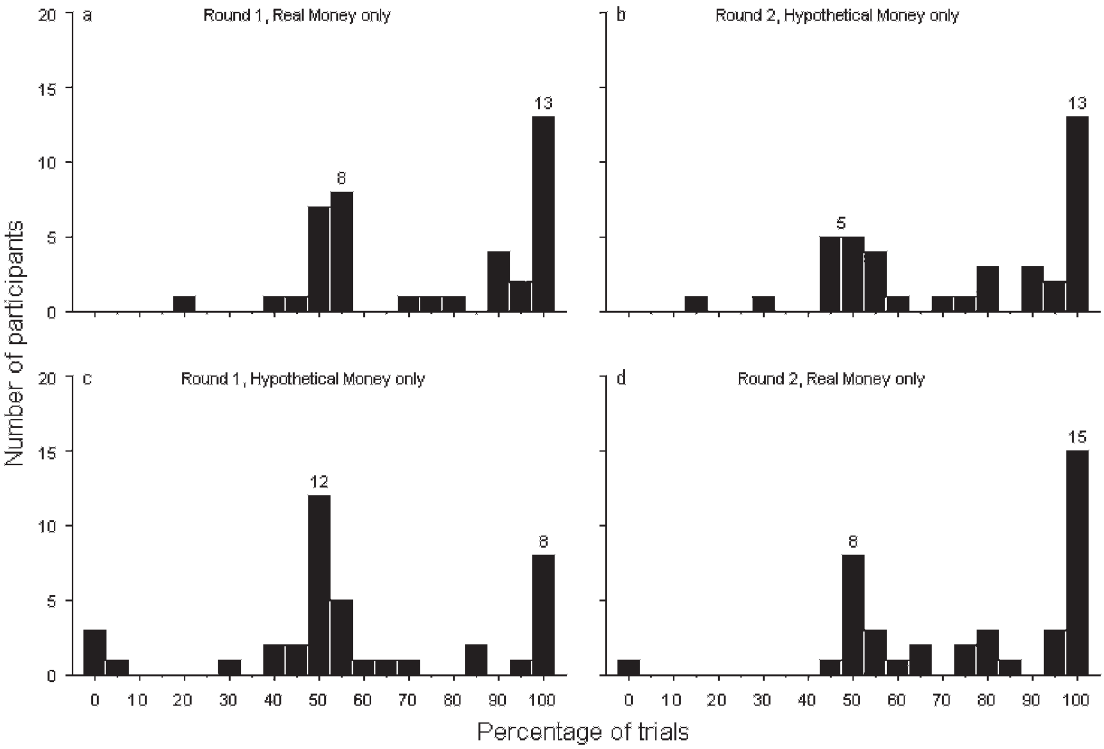

Fig. 2. Number of participants and the percentage of the trials in which they chose the optimal option in Experiment 1. Zero percent indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior; 50% indicates choosing optimally in half of all trials, resulting in nonmaximal, but equal (or nearly equal) amounts for both players. *a* and *b,* Data for those who played for real money in Round 1 and for hypothetical money in Round 2 (n = 40). *c* and *d,* Data for those who played for hypothetical money in Round 1 and for real money in Round 2 (n = 40).

this pattern of perfect alternation; 13 chose optimally 50% of the time in Round 2, of whom 8 alternated perfectly. Five of these students had alternated perfectly in both rounds. A detailed breakdown of students who chose optimally in 50% of trials for both experiments is included in Appendix 2. Although it could be argued that those who chose the competitive option about half of the time were acting more competitively than those who chose it less frequently, no participant who allocated equitably ever mentioned during debriefing that they perceived their behavior as being even partially competitive in their pursuit of parity. These students simply mentioned that they chose the bottom option approximately half of the time in an effort to minimize the difference between their own and the other's earnings.

Although the above analyses of variance support the contention that situational context, and not one's history, has an influence on one's behavior, correlation analyses show a different picture. Figure 3 shows a plot of the percentage of trials in which the optimal option was chosen for hypothetical gains versus the percentage of trials in which the optimal option was chosen for real money. Participants' data points are split by the type of incentive (real or hypothetical money) they received in the first round. As can be seen in the figure, the tendency to choose optimally across both within-subjects conditions was strongly correlated across all participants, $r = .51$, $p < .0001$. Despite the contextual influence of incentive type, participants displayed some measure of behavioral stability across incentive conditions. Correlation coefficients were computed for a variety of subgroups (e.g., females who were paired with a computer P2). With the exceptions of the subgroups of just the male participants and

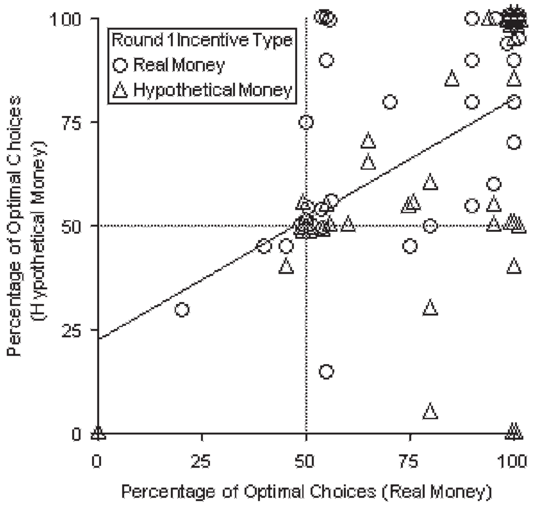

Fig. 3. Percent of optimal choices for hypothetical money versus percent of optimal choices for real money in Experiment 1. Participants' data points are split by the type of incentive (real or hypothetical money) they received in the first round. Zero percent indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior; 50% indicates choosing optimally in half of all trials, resulting in nonmaximal, but equal (or nearly equal) amounts for both players. For display purposes, multiple data points at the same coordinates were randomly dithered by up to ±0.5.

the 20 males paired with a human P2, $r = .07$, *ns*, every correlation was significant, with most p values smaller than .01. By themselves, men tended toward behavioral stability across incentive conditions, but just missed statistical significance, $r = .29$, $p = .07$. When paired with a human, men chose optimally at least 50% of the time when playing for real money, but varied widely when allocating hypothetical earnings. The analysis of variance revealed no significant gender × P2 identity interaction, however, $F(1, 72) = .008$, *ns*. Participants also showed consistency within each 20-trial round. There was no observed difference between subjects' behavior patterns in the first 10 and second 10 trials of any given round. A full list of all subgroup correlations and their respective r- and p-values is included in Appendix 3.

Of interest was the difference in allocations to the other participant when the other participant was a person versus a computer. As in Kennelly and Fantino (2007), there was no significant difference (74.3% in the human condition versus 67.2% in the computer condition; $F(1, 72) = 2.03$, *ns*). There are some investigators who would probably predict such a result. According to the ''Computers Are Social Actors'' or CASA model (e.g., Reeves & Nass, 1996), the social rules that apply to human–human interactions apply with equal force to human–computer interactions. Aside from any inherent implausibility in this theory it is unclear how well it applies to allocations selected in the Sharing Game since in our experiments the recipients (person or computer) do not directly interact with the students making the allocations. Studies of CASA always involve types of two-way interactions. A similar hypothesis is that students have so much experience interacting with computers (video and other computer games) that the computers have taken on a human aura. We have no satisfactory explanation. However we have found the same result in three experiments and in no case was there even a trend in the direction of more optimal allocations when the computer was the recipient—indeed, we found that participants paired with a computer tended to act slightly less optimally than those paired with a human. The within-subject nature of the experimental design used here further strengthens the reliability of this surprising result. Thus, in Experiment 2 we no longer assessed this variable. In Experiment 2 the effect of the gender of the other participant was assessed in a within-subjects design. It may not matter if the other participant is a person or computer. But, if a person, does it matter if the gender is female, male, or unknown? And is there an interaction between the gender of the person selecting the allocation and the recipient? In Experiment 2 all conditions involved a person as the other participant (the recipient) and real money.

EXPERIMENT 2

Method

Participants

A total of 149 (75 female, 74 male) young adult (M=20.8, SD=1.8 years) undergraduate students served as participants. Sixteen were dropped from the study for either misinterpreting the instructions or for indicating in debriefing that during the session, they were certain that the second person did not exist.[3] An additional 13 were dropped due to experimenter error. Of the remaining 120, there were 60 of each gender evenly distributed in all conditions. Specifically, 20 participants of each gender were quasirandomly assigned to one of the following conditions: (a) P2's gender revealed as female; (b) P2's gender revealed as male; (c) P2's gender undisclosed. All students received monetary compensation for their time, and reported being fluent English speakers, free of neurological and psychiatric disorders, and having normal or corrected-to-normal vision.

Design, Stimuli, and Procedure

The design, stimuli, and procedure for Experiment 2 were identical to those used in Experiment 1, with the following exceptions: P1 was informed that both he or she and P2 would be paid real money for half of the choices he or she made during the experiment, and that the trials for which the two would be paid would be randomly selected at the conclusion of the experiment (at the end, the experimenter flipped a coin in the participant's presence to determine which round's total would be paid to him or her). The experimenter emphasized that it was in the participant's best interest to treat each trial as if it were for real money, because for 50% of the trials it would be. This was done to encourage students to treat each round similarly with respect to expected value—we reasoned that the only perceived differences between the two rounds should have been participants' knowledge of P2's gender, and their history with Round 1. In addition, prior Sharing Game research performed in our lab as well as in the current Experiment 1 has revealed that there is a significant difference in behavior when participants know that they are playing for real money and when they know that they are not. A transcript of the computer-provided instructions is included in Appendix 1. Once again, the experimenter did not reveal that there would be more than one round, how many trials each round had, nor how much either they or P2 could potentially earn. The experimenter used gender-neutral (if not grammatically correct) language through Round 1 with all participants (e.g., ''I'm going to check on the other person to make sure they're ready''). At the conclusion of the first round, the experimenter told the participant that he or she and P2 would take part in a second round with exactly the same conditions as the first and, depending on the condition to which P1 was assigned, would or would not reveal the gender of P2 just before the beginning of the second round (e.g., ''Okay, she's all ready for this next part''). In the control condition the experimenter maintained gender-neutral language throughout both rounds.

Results and Discussion

A 2 (knowledge of P2's gender) × 2 (participant's gender) × 3 (P2's gender) analysis of variance was conducted, with the first factor as a within-subjects variable. The only statistically significant result was a main effect of the gender of the participant making the allocations. Again males allocated more optimally (for themselves) than women but, unlike in Experiment 1, this time the difference was significant (83.0% optimal allocations by males and 72.0% optimal choices by females; $F(1, 114) = 7.23$, $p = .0083$). As for Experiment 1, this finding is consistent with those of Kennelly and Fantino (2007) and with the prior literature that suggests females may allocate slightly more equitably than males (Walters et al., 1998). This effect is shown across both rounds of Experiment 2 in Figure 4. Like Figure 2, Figure 4 displays bimodal distributions for both male and female participants across both rounds. Purely optimal behavior was the greater mode for both genders, but note how more women than men clustered around the lesser modes at 50%. Of the 20 students who chose optimally in exactly half of Round 1's trials, 11 of them (7 of whom were female) exhibited perfect alternation; 19 chose optimally 50% of the time in Round 2, of whom 10 (including 7 women) alternated perfectly. Five of these students, all of whom were female, had alternated perfectly in both rounds. A detailed breakdown of students who chose optimally in 50% of trials for both experiments is included in Appendix 2.

[3] Participants' data were retained (1) if they stated that they were not completely certain if the other person existed, but were willing to give the experimenter the benefit of the doubt, or (2) if they stated that they only became certain that there was no other person *after* completing the allocation sessions.

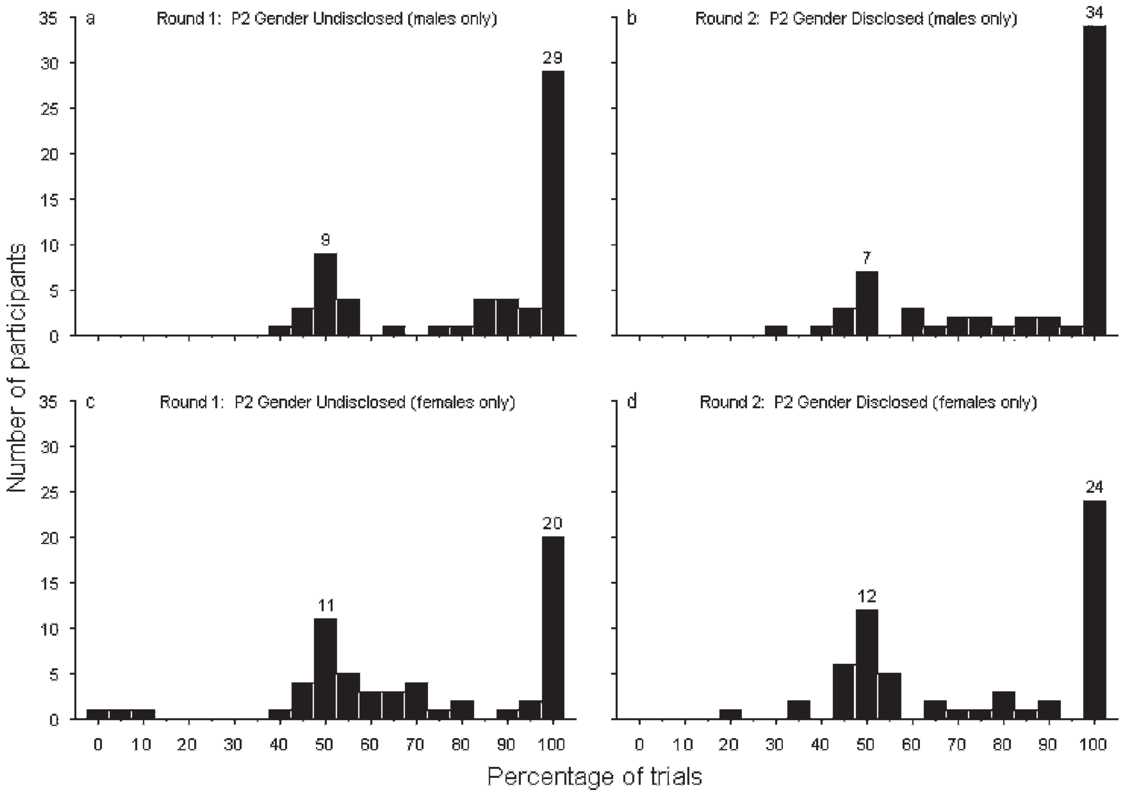

Fig. 4. Number of participants and the percentage of the trials in which they chose the optimal option in Experiment 2. Zero percent indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior; 50% indicates choosing optimally in half of all trials, resulting in nonmaximal, but equal (or nearly equal) amounts for both players. *a* and *b,* Data for all male participants in Round 1 (P2 gender undisclosed) and Round 2 (P2 gender disclosed; $n = 60$). *c* and *d,* Data for all female participants in Round 1 (P2 gender undisclosed) and Round 2 (P2 gender disclosed; $n = 60$).

There was no effect of the gender of the recipient, nor were there any interactions involving gender of allocator and of recipient. During debriefing, 25 (14 men and 11 women) of the 80 participants for whom P2's gender was revealed indicated that they did not hear the experimenter's disclosure. Of the remaining 55, only 2 (both of whom were female) indicated during debriefing that that knowledge affected their behavior in Round 2. One of them indicated that at first she was skeptical about P2's existence through Round 1, but once the experimenter had said ''he'' in reference to P2, she felt inclined actually to make sure that ''he got a decent amount.'' The other stated, ''For the second [round] I was tempted to hoarde [sic] because [the experimenter] said 'he' and men earn more than women in the work world so [my behavior in Round 2] would balance things out sort of.''

The contextual influences found in Experiment 1 and in Kennelly and Fantino (2007) are not in play in Experiment 2, but the correlation data reveal that stable preference patterns are. Figure 5 plots the percentage of trials in which the optimal option was chosen in Round 2 (when P2's gender was revealed) versus the percentage of trials in which the optimal option was chosen in Round 1. Once again, the tendency to choose optimally before or after the gender of the second person was revealed was strongly correlated across all participants, $r = .80$, $p < .0001$. Correlation coefficients were computed for a variety of subgroups (e.g., those for whom P2 was revealed to be female). Every correlation was significant, with most *p*-values smaller than

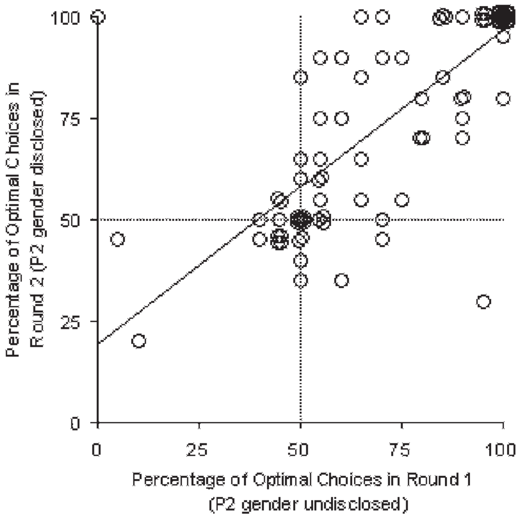

Fig. 5. Percent of optimal choices in Round 2 (P2 gender disclosed) versus percent of optimal choices in Round 1 (P2 gender undisclosed) in Experiment 2. Zero percent indicates never choosing the optimal choice (i.e., acting purely competitively); 100% indicates perfect optimal behavior; 50% indicates choosing optimally in half of all trials, resulting in nonmaximal, but equal (or nearly equal) amounts for both players. For display purposes, multiple data points at the same coordinates were randomly dithered by up to ±0.5.

.0001. As in Experiment 1, participants also showed consistency within each 20-trial round. There was no observed difference between subjects' behavior patterns in the first 10 and second 10 trials of any given round. A full list of all subgroup correlations and their respective *r*- and *p*-values is included in Appendix 3.

Thus, just as the nature of the recipient was irrelevant in Experiment 1 (person or computer) so was the gender of the recipient in Experiment 2 (female, male, or unspecified). The mean percentage of trials in which participants chose optimally when paired with male, female, and undisclosed P2s were, respectively, 73.6%, 81.5%, and 77.6%. The individual data are presented in Table 4 for all 120 subjects and for both 20-trial rounds.

GENERAL DISCUSSION

The sharing task studied in the present experiments offered participants repeated binary choices in which the payoffs for one outcome pair were higher for both players (and the chooser received the smaller payoff) and the payoffs for the other outcome were lower for both players (and the chooser received the larger payoff). On any given trial the participant was constrained to select between these two outcomes. Unlike the well-established Ultimatum and Dictator games, which do not constrain participants' choices in this way, the Sharing Game allows us to delineate between those whose allocations maximize their earnings and those whose allocations result in establishing a relative advantage over the other participant (the recipient). Across both experiments, the nature of the recipient did not affect the amounts allocated. In the first experiment allocations were unaffected by the recipient's status as a person or computer; in the second experiment allocations were unaffected by the recipient's gender. Males chose optimally more frequently than females and, in agreement with prior research, participants in the monetary conditions allocated more optimally than those in the nonmonetary conditions. In both experiments about one quarter of the allocations were not optimal, providing further evidence that allocation decisions in economic games are not made solely on the basis of maximization of personal payoffs (e.g., Camerer & Hogarth, 1999; Zizzo & Oswald, 2001).

The central focus of the first experiment was to confirm in a within-subjects experiment that students would behave more optimally (in the sense of maximizing their own payoffs) when real money was being allocated than when hypothetical money was being allocated. This possibility was confirmed by the findings of Experiment 1, findings that have at least three important implications. First, our students did not display stable preference patterns that would perhaps reflect social values and/or personality variables. Instead, such patterns were influenced by the nature of the incentive being allocated. We return to this point at the end of this discussion. Second, the results bear on a debate that has engaged psychologists and economists studying decision-making. Hertwig and Ortmann (2001) noted that psychologists generally use hypothetical incentives whereas economists insist that meaningful data can be collected only with real financial incentives. These results support the economists' view that findings with hypothetical incentives would not necessarily mirror

Table 4

Participants' gender, disclosure of P2 gender, and percentage of optimal choices in Rounds 1 (before disclosure) and 2 (after disclosure) of Experiment 2 (n = 120)

Subject	Gender	P2 Gender	Percentage of Trials in which the Optimal Alternative was Chosen in Round 1 (before P2 Gender Disclosure)	Percentage of Trials in which the Optimal Alternative was Chosen in Round 2 (after P2 Gender Disclosure)
24	Male	Male	100	100
36	Male	Male	100	100
74	Male	Male	100	100
98	Male	Male	100	100
102	Male	Male	100	100
104	Male	Male	100	100
107	Male	Male	100	100
110	Male	Male	100	100
113	Male	Male	100	100
115	Male	Male	100	100
97	Male	Male	95	100
66	Male	Male	95	30
6	Male	Male	85	100
120	Male	Male	75	90
72	Male	Male	55	90
119	Male	Male	55	60
18	Male	Male	50	65
54	Male	Male	50	50
99	Male	Male	50	40
75	Male	Male	40	50
16	Female	Male	100	100
25	Female	Male	100	100
34	Female	Male	100	100
41	Female	Male	100	100
71	Female	Male	100	100
91	Female	Male	75	55
8	Female	Male	70	100
85	Female	Male	70	45
58	Female	Male	65	100
21	Female	Male	65	55
56	Female	Male	55	50
13	Female	Male	50	50
81	Female	Male	50	50
14	Female	Male	50	45
37	Female	Male	45	55
44	Female	Male	45	55
64	Female	Male	45	45
90	Female	Male	45	45
55	Female	Male	10	20
68	Female	Male	5	45
11	Male	Female	100	100
48	Male	Female	100	100
51	Male	Female	100	100
73	Male	Female	100	100
77	Male	Female	100	100
88	Male	Female	100	100
109	Male	Female	100	100
96	Male	Female	100	95
47	Male	Female	90	100
93	Male	Female	90	80
38	Male	Female	90	75
92	Male	Female	85	100
116	Male	Female	85	85
87	Male	Female	80	70
103	Male	Female	50	60
29	Male	Female	50	50
49	Male	Female	50	50

Table 4

(Continued)

Subject	Gender	P2 Gender	Percentage of Trials in which the Optimal Alternative was Chosen in Round 1 (before P2 Gender Disclosure)	Percentage of Trials in which the Optimal Alternative was Chosen in Round 2 (after P2 Gender Disclosure)
114	Male	Female	50	50
105	Male	Female	45	50
5	Male	Female	45	45
1	Female	Female	100	100
10	Female	Female	100	100
15	Female	Female	100	100
26	Female	Female	100	100
35	Female	Female	100	100
43	Female	Female	100	100
63	Female	Female	100	100
67	Female	Female	100	100
76	Female	Female	100	100
79	Female	Female	100	100
52	Female	Female	95	100
61	Female	Female	90	80
28	Female	Female	80	70
17	Female	Female	70	50
45	Female	Female	65	65
20	Female	Female	60	75
12	Female	Female	50	50
32	Female	Female	50	50
50	Female	Female	50	50
80	Female	Female	50	50
46	Male	Undisclosed	100	100
60	Male	Undisclosed	100	100
69	Male	Undisclosed	100	100
82	Male	Undisclosed	100	100
94	Male	Undisclosed	100	100
95	Male	Undisclosed	100	100
101	Male	Undisclosed	100	100
111	Male	Undisclosed	100	100
112	Male	Undisclosed	100	100
117	Male	Undisclosed	100	100
118	Male	Undisclosed	100	100
106	Male	Undisclosed	95	100
3	Male	Undisclosed	90	70
4	Male	Undisclosed	85	100
40	Male	Undisclosed	65	85
100	Male	Undisclosed	55	75
108	Male	Undisclosed	55	60
83	Male	Undisclosed	50	50
30	Male	Undisclosed	50	45
31	Male	Undisclosed	45	45
27	Female	Undisclosed	100	100
53	Female	Undisclosed	100	100
70	Female	Undisclosed	100	100
78	Female	Undisclosed	100	100
89	Female	Undisclosed	100	80
23	Female	Undisclosed	95	100
59	Female	Undisclosed	80	80
65	Female	Undisclosed	70	90
86	Female	Undisclosed	60	90
57	Female	Undisclosed	60	35
7	Female	Undisclosed	55	65
9	Female	Undisclosed	55	55
2	Female	Undisclosed	55	50
22	Female	Undisclosed	55	50
19	Female	Undisclosed	50	85

Table 4
(*Continued*)

Subject	Gender	P2 Gender	Percentage of Trials in which the Optimal Alternative was Chosen in Round 1 (before P2 Gender Disclosure)	Percentage of Trials in which the Optimal Alternative was Chosen in Round 2 (after P2 Gender Disclosure)
33	Female	Undisclosed	50	50
39	Female	Undisclosed	50	50
84	Female	Undisclosed	50	35

those with real incentives. The third implication of our results follows directly from the second: Studies using hypothetical incentives may have insufficient ecological validity. Fortunately, there may be other ways to achieve ecological validity than spending large amounts for human subject payoffs. As reported in Fantino, Gaitan, Kennelly, and Stolarz-Fantino (2007), time off from a tedious task can serve as a powerful reinforcer that may be employed successfully in economic allocation games.

The most surprising finding from the present pair of experiments was the lack of an effect on allocations by the nature of the recipient. In Experiment 1 allocations were comparable whether the recipient was another person or a computer. In Experiment 2 the gender of the recipient had no effect. Obviously there will be cases where the nature of the recipient has an effect (e.g., when a friend or family member), but the lack of an effect in the present experiment is noteworthy. In particular, it would appear to make little sense to maintain an advantage over a computer by allocating a smaller amount of real money to oneself. However, sensible or not, this result has now been found in three experiments.

Whereas the gender of the recipient had no effect on allocations, gender of the allocator did. Men tended to allocate in a more optimal manner (in terms of self-allocations) and women more equitably, though this finding was significant only in Experiment 2. This pattern of results is consistent with those from prior studies (e.g., Kennelly & Fantino, 2007; Walters et al., 1998) which report small but significant effects. Moreover, the present results go beyond those of Walters et al. in an important respect. As noted earlier, the results with the Sharing Game support gender differences where the greater degree of optimal choices by men cannot be attributed to competitiveness (as they might have been in the earlier literature). Here, men were more optimal even though the optimal responses were also noncompetitive.

Our prior research suggested that participants' allocations did not reflect the kind of stable preference patterns required by social value theories (e.g., van Lange et al., 1997). Kennelly and Fantino (2007), using a between-subjects design, found that preference patterns were affected by the nature of the incentive and by the instructions. Experiment 1 of the current study assessed whether the same type of shift would be found with a within-subjects design. The results support two major conclusions. First, there are significant individual differences that hold up across conditions. Strikingly, in Experiment 2 the tendency to choose optimally before or after the gender of the second person was revealed, was strongly correlated across all participants (r = .80). Second, despite the significant correlations between individuals' behavior patterns from one round to the next, participants who allocated hypothetical money in the first round of 20 trials allocated significantly differently than they did when allocating real money on the second round of 20 trials. While we cannot assert whether one's stable preference patterns are most influenced by the history of the last couple of decades or that of the last couple of trials, this result further supports the notion that contextual variables can and do affect behavior in choice situations (e.g., De Dreu & McCusker, 1997; Fantino, 2001; Fantino & Stolarz-Fantino, 2003; Grace, 1994).

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APPENDIX 1

Instructions Displayed by the Computer at the Beginning of Each Session

Sample instructions from Experiment 1, for participants in the condition with hypothetical money and a computer P2:

Welcome! You will be taking part in a brief scenario in which you will have a chance to earn hypothetical amounts of money for yourself and for a second participant (which will be represented by the computer). The task is fairly straightforward: on the screen you will be presented with two choices of monetary amounts to assign to yourself ('Participant 1') and the computer ('Participant 2'). Click the box next to the set of amounts corresponding to your choice. Then click the 'OK' button at the bottom to update both participants' earnings and proceed to the next trial.

PLEASE NOTE: As Participant 1, YOU have sole control over not only how much money you will attain, but ALSO how much money Participant 2 will attain.

Sample instructions from Experiment 2, Round 1, all conditions:

Welcome! You will be taking part in a brief scenario in which you will have a chance to earn actual money for yourself and for a second participant. The task is fairly straightforward: on the screen you will be presented with two choices of monetary amounts to assign to yourself ('Participant 1') and the other person ('Participant 2'). Click the box next to the set of amounts corresponding to your choice. Then click the 'OK' button at the bottom to update both participants' earnings and proceed to the next trial.

PLEASE NOTE: As Participant 1, YOU have sole control over not only how much money you will attain, but ALSO how much money Participant 2 will attain. This person will see what you see on their screen, but ONLY YOU are making any decisions. The two of you will be paid for only HALF of all trials in which you are involved (the trials for which you will be paid will be randomly determined at the end of the experiment, so be sure that you treat all trials with equal importance). All earned money will be paid out individually at the conclusion of the experiment.

APPENDIX 2

Participants' gender and order of incentive type (Experiment 1) or P2 gender (Experiment 2) among those who chose optimally in 50% of trials

Experiment 1

Round 1 - 19 of 80 total participants were 50% optimal:
7 (2 M, 5 F) were Round 1 Real Money; Round 2 Hypothetical Money
12 (5 M, 7 F) were Round 1 Hypothetical Money; Round 2 Real Money
10 of these 19 alternated perfectly (see p. 13):
4 (0 M, 4 F) were Round 1 Real Money; Round 2 Hypothetical Money
6 (2 M, 4 F) were Round 1 Hypothetical Money; Round 2 Real Money

Round 2 - 13 of 80 total participants were 50% optimal:
5 (3 M, 2 F) were Round 1 Real Money; Round 2 Hypothetical Money
8 (2 M, 6 F) were Round 1 Hypothetical Money; Round 2 Real Money
8 of these 13 alternated perfectly:
3 (1 M, 2 F) were Round 1 Real Money; Round 2 Hypothetical Money
5 (1 M, 4 F) were Round 1 Hypothetical Money; Round 2 Real Money

Both Rounds - 8 of the 19 participants who were 50% optimal in Round 1 were also 50% optimal in Round 2 (these students are among the 13 mentioned above):
3 (1 M, 2 F) were Round 1 Real Money; Round 2 Hypothetical Money
5 (1 M, 4 F) were Round 1 Hypothetical Money; Round 2 Real Money
5 of these 8 participants alternated perfectly in both rounds:
2 (0 M, 2 F) were Round 1 Real Money; Round 2 Hypothetical Money
3 (1 M, 2 F) were Round 1 Hypothetical Money; Round 2 Real Money

Experiment 2

Round 1 - 20 of 120 total participants were 50% optimal:
6 (3 M, 3 F) were paired with a Male P2
8 (4 M, 4 F) were paired with a Female P2
6 (2 M, 4 F) were paired with an Undisclosed P2
11 of these 20 alternated perfectly:
1 (0 M, 1 F) was paired with a Male P2
7 (3 M, 4 F) were paired with a Female P2
3 (1 M, 2 F) were paired with an Undisclosed P2

Round 2 - 19 of 120 total participants were 50% optimal:
5 (2 M, 3 F) were paired with a Male P2
9 (4 M, 5 F) were paired with a Female P2
5 (1 M, 4 F) were paired with an Undisclosed P2
10 of these 19 alternated perfectly:
3 (1 M, 2 F) were paired with a Male P2
5 (2 M, 3 F) were paired with a Female P2
2 (0 M, 2 F) were paired with an Undisclosed P2

Both Rounds - 13 of the 20 participants who were 50% optimal in Round 1 were also 50% optimal in Round 2 (these students are among the 19 mentioned above):
3 (1 M, 2 F) were paired with a Male P2
7 (3 M, 4 F) were paired with a Female P2
3 (1 M, 2 F) were paired with an Undisclosed P2
5 of these 13 participants alternated perfectly in both rounds:
1 (0 M, 1 F) was paired with a Male P2

3 (0 M, 3 F) were paired with a Female P2
1 (0 M, 1 F) was paired with an Undisclosed P2

APPENDIX 3

List of subgroup correlation analyses for Experiments 1 and 2

Experiment 1

The following analyses correlated percentage of trials in which the optimal choice was chosen for Hypothetical Money vs. for Real Money

Males only (n = 40): $r = 0.29$, *ns* ($p = .0662$)
Females only (n = 40): $r = 0.74$, $p < .0001$
Participants for whom P2 was Human (n = 40): $r = 0.44$, $p < .01$
Participants for whom P2 was a Computer (n = 40): $r = 0.56$, $p < .001$
Males paired with a Human P2 (n = 20): $r = 0.07$, *ns* ($p = .7683$)
Females paired with a Human P2 (n = 20): $r = 0.80$, $p < .0001$
Males paired with a Computer P2 (n = 20): $r = 0.45$, $p < .05$
Females paired with a Computer P2 (n = 20): $r = 0.69$, $p < .001$
Participants who Played Round 1 for Real Money and Round 2 for Hypothetical Money (n = 40): $r = 0.67$, $p < .0001$
Participants who Played Round 1 for Hypothetical Money and Round 2 for Real Money (n = 40): $r = 0.45$, $p < .01$

The following analyses correlated percentage of trials in which the optimal choice was chosen in the second 10 trials vs. in the first 10 trials

Rounds in which Participants Played for Real Money (n = 120): $r = 0.84$, $p < .0001$
Rounds in which Participants Played for Hypothetical Money (n = 120): $r = 0.84$, $p < .0001$

Experiment 2

The following analyses correlated percentage of trials in which the optimal choice was chosen in Round 2 (Gender Revealed) vs. in Round 1 (Gender Unrevealed)

Males only (n = 60): $r = 0.85$, $p <$
.0001
Females only (n = 60): $r = 0.75$, $p < .0001$
Participants for whom P2 was Male (n = 40): $r = 0.80$, $p < .0001$
Participants for whom P2 was Female (n = 40): $r = 0.95$, $p < .0001$
Participants for whom P2's gender was Undisclosed (n = 40): $r = 0.69$, $p < .0001$
Males paired with a Male P2 (n = 20): $r = 0.70$, $p < .001$
Males paired with a Female P2 (n = 20): $r = 0.95$, $p < .0001$
Males paired with an Undisclosed P2 (n = 20): $r = 0.92$, $p < .0001$
Females paired with a Male P2 (n = 20): $r = 0.83$, $p < .0001$
Females paired with a Female P2 (n = 20): $r = 0.95$, $p < .0001$
Females paired with an Undisclosed P2 (n = 20): $r = 0.48$, $p < .05$

The following analyses correlated percentage of trials in which the optimal choice was chosen in the second 10 trials vs. in the first 10 trials

Round 1 (P2 Gender Unrevealed; n = 120): $r = 0.81$, $p < .0001$
Round 2 (P2 Gender Revealed; n = 120): $r = 0.89$, $p < .0001$