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Trust in Private and Common Property Experiments

James C. Cox,* Elinor Ostrom,† James M. Walker,‡ Antonio Jamie Castillo,§ Eric Coleman,‖ Robert Holahan,# Michael Schoon,** and Brian Steed††

We report the results from a series of experiments designed to investigate behavior in two settings that are frequently posited in the policy literature as generating different outcomes: private property and common property. The experimental settings closely parallel earlier experimental studies of the investment or trust game. The primary research question relates to the effect of the initial allocation of property rights on the level of trust that subjects will extend to others with whom they are linked. We find that assigning the initial endowments as common property of each of N pairs of a first mover and second mover leads to marginally greater trust than when the initial endowments are fully owned by the two individual movers as their respective private property. Subjects' decisions are also shown to be correlated with attitudes toward trust and fairness that are measured in post-experiment questionnaires.

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I. Introduction

Numerous experimental studies involving private property endowments have demonstrated that individuals' decisions, in a variety of situations, reflect complex and diverse motivations beyond simple own-income maximization (see, for example, Ostrom 1998;

* Experimental Economics Center (ExCEN), 14 Marietta Street NW, Georgia State University, Atlanta, GA 30303, USA; E-mail jccox@gsu.edu; corresponding author.

† Workshop in Political Theory and Policy Analysis, 513 North Park Avenue, Indiana University, Bloomington, IN 47408, USA; E-mail ostrom@indiana.edu.

‡ Department of Economics, Wylie Hall 105, Indiana University, Bloomington, IN 47405, USA; E-mail walkerj@indiana.edu.

§ Department of Sociology, University of Granada, C/ Rector López Argüeta, s/n Granada, 18071, Spain; E-mail amjaime@ugr.es.

‖ Department of Political Science, Woodburn Hall 210, Indiana University, Bloomington, IN 47408, USA; E-mail eracolm@indiana.edu.

Workshop in Political Theory and Policy Analysis, 513 North Park Avenue, Indiana University, Bloomington, IN 47408, USA; E-mail raholaha@indiana.edu.

** Center for the Study of Institutional Diversity, Arizona State University, Tempe, AZ 85287, USA; E-mail mlschoon@indiana.edu.

†† Department of Political Science, Woodburn Hall 210, Indiana University, Bloomington, IN 47408, USA; E-mail bcsteed@indiana.edu.

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Camerer 2003; Ashraf, Bohnet, and Piankov 2006; Camerer and Fehr 2006; Cox, Friedman, and Gjerstad 2007; Cox, Friedman, and Sadiraj 2008). More pertinent to the research presented here, extensive research has been generated showing that subjects in "Trust Game" experiments (also called "Investment Game" experiments) achieve higher levels of efficiency than predicted by the stage game equilibrium for self-regarding (or "economic man") preferences. In the standard form of this game, first movers are assigned private property rights to an endowment that they can either keep or invest in a potentially advantageous way with an anonymous second mover (without the presence of a third-party enforcer of contracts).

The implication of such fairness behavior for individuals who own assets as common property has not been explored. Although not addressing the specific institutional context examined in this article, the traditional literature suggests a rather negative view of how individuals may cope with common property arrangements (see, for example, Alchian and Demsetz 1973). In addition, there is often confusion in the policy literature regarding open or limited access common-pool resource arrangements versus common property arrangements. Discussion of common-pool resource settings may, in fact, ignore the issue that commons may be utilized under a wide variety of property arrangements. A negative view of expected individual behavior of those who jointly own assets has been compounded by a confusion stimulated by Hardin's (1968) allegorical analysis of the "tragedy of the commons," which was effectively open access and not common property. Government ownership and private property have both been recommended as "panaceas" to correct for the presumed inefficiencies of what have loosely been called common property resources, even though in the extreme case of open access no one has property rights to these resources (Ostrom, Janssen, and Anderies 2007). Considerable field research has now challenged the frequently accepted conclusion that common property systems are more inefficient than private property systems and has illustrated the substantial difference in incentives and behavior between open access resources and resources owned as common property (NRC 1986, 2002; Dietz, Ostrom, and Stern 2003; Dolšak and Ostrom 2003).

Since contracts are typically incomplete, many of the possible gains from exchange with private property require trust and reciprocity (Fehr, Gächter, and Kirchsteiger 1997). Similarly, efficient outcomes with common property also require trust and reciprocity. In addition to the institutional context in which users of the commons make decisions, in both experimental and field research, trust appears to be a core variable explaining why participants in some settings tend to cooperate while tending not to cooperate in other settings (Ostrom, Gardner, and Walker 1994; Ostrom 1998; Walker and Ostrom 2007).

Recently, we embarked on an experimental research program designed to explore whether a *fundamental* difference exists in the trusting behavior of individuals holding private property assets as contrasted to holding common property assets. The experimental design used here focuses on the effects of assigning subjects' endowments as common property rather than private property. This study can be viewed as exploring the robustness of previously reported results for the two-person private property Trust Game. In addition, the sequential common property treatment used in this study complements earlier research on time-independent and time-dependent common-pool resources (Ostrom, Gardner, and Walker 1994). In common-pool resource experiments where *no* property rights are assigned and communication is not allowed, participants substantially overexploit the common-pool resource. When given an opportunity to communicate and to choose their own property rights, however, participants tend to trust one another to adhere to nonbinding agreements, generating near optimal decisions (Ostrom, Walker, and Gardner 1992).

The Private Property Trust Game and the Common Property Trust Game investigated here are both based on the standard Two-Person Trust Game (Berg, Dickhaut, and McCabe 1995). In the standard game, the first mover, endowed with a private good, makes a decision that can create a surplus to be shared with a second mover because each $1 sent to the second mover by the first mover is tripled by the experimenter. The first mover faces a social dilemma, however, because the second mover will be given full ownership and full authority over the distribution of the first mover's investment and the resulting surplus. That is, to create the efficiency-enhancing surplus, the first mover must either trust that the second mover will reciprocate the first mover's generous transfer or have altruistic preferences for the second mover's payoff (Cox 2004; Cox and Deck 2005; Ashraf, Bohnet, and Piankov 2006).

The Common Property Trust Game is the inverse of the standard game—which we refer to in this paper as the Private Property Trust Game. In the Common Property Trust Game, the initial endowment of wealth (equivalent to the maximum possible tripled amount available to the second mover in the Private Property Trust Game) is assigned jointly to the two players. In this game, the first mover has the option of withdrawing resources from the joint fund, and in the process destroying surplus because every dollar withdrawn reduces the joint fund by $3.[1] Similar to the Private Property Trust Game, the first mover faces a social dilemma in the sense that the second mover has full authority over the final distribution of the fund remaining after the first mover makes the withdrawal decision. In order to refrain from withdrawing from the joint fund, the first mover must either have altruistic preferences or believe the second mover is trustworthy—as the first mover must do in order to invest a positive amount in the Private Property Trust Game.

The traditional Trust Game has been examined experimentally by many scholars. The first study to explore this game was undertaken by Berg, Dickhaut, and McCabe (1995). Using a double-blind protocol, the first mover and second mover are each individually endowed with $10. The experimenter triples any amounts that are sent by the first mover to the second mover. The second mover then has a decision as to how to divide the amount received. A large proportion of first movers sent money to the second movers, while only two of the first movers sent nothing. Half of the second movers returned either $0 or $1. On average, the second movers returned slightly less than what the first movers sent to them.

The experiment undertaken by Berg, Dickhaut, and McCabe (1995) has been replicated by a large number of scholars in Bulgaria (Koford 1998), France and Germany (Willinger et al. 2003), Germany (Jacobsen and Sadrieh 1996), and Sweden and Romania (Rothstein and Eek 2006). Camerer (2003) provides an overview of findings from Trust Games. In general, one finds that a large proportion of first movers send a substantial portion of their endowments to second movers, and many second movers return substantial amounts. Findings vary by country and the specific experimental design, but there is more congruence across experiments than disparity. Some experimental designs (for example, Cox 2002, 2004; Cox and Deck 2005) implement control treatments that discriminate between distinct motives for sending positive amounts (such as altruism or trust) and distinct motives for returning positive amounts (such as altruism or reciprocity). Methodological issues concerning such discriminations have recently been explored (see, for example, Cox, Sadiraj, and Sadiraj 2008).

[1] This game can be viewed as a stylistic abstraction of a two-period, sequential common property resource game with a particular institutional arrangement or allocation rule. View the decision of the first mover as allowing the resource to be maintained or "grow" for one period in order to enhance value. In the second period, the second mover chooses how to allocate the resource.

As discussed above, the focus of this study is to expand the set of property rights environments in which the Trust Game is played. In particular, our focus is on the extent to which decisions by first movers and second movers are affected by whether endowments are assigned as private property or common property. The traditional model of self-regarding (or "economic man") preferences, as well as models of unconditional social preferences (Fehr and Schmidt 1999; Bolton and Ockenfels 2000; Charness and Rabin 2002), all predict that behavior in the Trust Game will be the same, regardless of whether endowments are private property or common property because subjects' feasible choices and payoffs are invariant with the type of endowment. In contrast, recent models of reciprocal preferences (Cox, Friedman, and Gjerstad 2007; Cox, Friedman, and Sadiraj 2008) can be extended to explain why behavior may differ with the type of endowment, as follows.

The second mover's feasible set, corresponding to the private property endowment, allows the second mover to take for himself or herself an amount not greater than his/her private endowment of \$10. The second mover's feasible set, corresponding to a positive amount s sent by the first mover, allows the second mover to take for himself or herself any amount up to \$10 + \$3s. Therefore the second mover's feasible set, corresponding to the endowment in the Private Property Trust Game, is less generous (to the second mover) than all other feasible sets corresponding to positive amounts that the first mover might send to the second mover, according to the MGT ("more generous than") ordering of feasible sets defined by Cox, Friedman, and Sadiraj (2008, p. 36). The larger the amount of his/her private endowment that the first mover sends to the second mover, the more generous is the feasible set to the second mover, and the more altruistic he/she becomes, according to the MAT ("more altruistic than") ordering of preferences and Axiom R (for "reciprocity") in Cox, Friedman, and Sadiraj (2008, pp. 34, 40).[2] As a consequence, first movers may be inclined to send funds to second movers because of interest in encouraging more altruistic behavior by second movers as well as creating surplus.

The second mover's feasible set, corresponding to the common property endowment, allows the second mover to take for himself or herself an amount not greater than the (common property) endowment of \$40. The second mover's feasible set, corresponding to a positive amount e extracted by the first mover, allows the second mover to take for himself or herself any amount up to \$40 – \$3e. Therefore the second mover's feasible set, corresponding to the common property endowment, is MGT all other feasible sets corresponding to positive amounts that the first mover might extract from the common fund. The larger the amount of the common property endowment that the first mover extracts from the common fund, the less generous is the feasible set to the second mover, and the less altruistic he/she becomes, according to Axiom R.[3] As a consequence, first movers may be reluctant to extract funds from the common property endowment because of concern for provoking ungenerous behavior by second movers as well as avoiding destruction of surplus. In this way, reciprocal preference theory provides an explanation as to why first movers may behave differently in the Common Property Trust Game than in the Private Property Trust Game.

Although there are important differences in the strategic nature of the games, two studies are particularly relevant to the research presented here: Andreoni (1995) and Sonnemans, Schram, and Offerman (1998).[4] Andreoni (1995) examines the impact of positive and negative frames on cooperation in a linear public goods game. In the positive frame, the subject's choice is framed as contributing to a public good, which will have a positive benefit to other subjects. In the negative frame, the subject's choice is framed as purchasing a private good, which makes the other subjects worse off as a result of the opportunity cost of lowering the provision of the public good. The results of the Andreoni study suggest that subjects, across all decision rounds, are significantly more cooperative in the positive framing version of the game. As noted by Andreoni (2005, p. 2): "This indicates that much of the cooperation observed in public goods experiments is due to framing, and the warm-glow of creating a positive externality appears to be stronger than the cold-prickle of creating a negative externality."

Sonnemans, Schram, and Offerman (1998) examine a repeated step-level social dilemma game framed as providing a public good or preventing a public bad. The two games are strategically equivalent. In early decision rounds, behavior is not significantly different between the two games. Across later rounds, however, the setting in which the game is framed as preventing a public bad yields lower levels of cooperation (and efficiency).

In summary, the results from these studies suggest that framing may be an important design element for understanding behavioral differences between strategically equivalent games.[5] In addition, based on previous studies, both Andreoni (1995) and Sonnemans, Schram, and Offerman (1998) point to the generally accepted view that public goods experiments lead to higher levels of cooperation and efficiency than common-pool resource experiments. The experimental decision environments investigated here are designed to explore to what extent such behavioral differences may be a result of how endowments are assigned across games representing private property and common property arrangements.

II. Experimental Design and Procedures

Below, we summarize important details related to each decision setting: the Private Property Trust Game and the Common Property Trust Game, as well as the procedures implemented in the laboratory.

Decision Settings

The Private Property Trust Game examined in this study follows closely that of several earlier studies (in particular, see Berg, Dickhaut, and McCabe 1995; Cox 2004). Similar to those studies, both first movers and second movers begin with a starting balance of 10 tokens, each token having a starting value of \$1. However, the setting examined here differs from the earlier studies in that the second mover has the option of returning all or part of their own initial endowment to the first

[2] Both part (a) and part (b) of the definition of the MGT ordering are satisfied (thus "mainly self-serving" generosity is excluded) because, for each additional \$1 that the first mover sends to the second mover, the maximum possible payoff to the second mover increases by \$3; whereas, the maximum possible payoff to the first mover increases by \$2.

[3] Both parts of the definition of the MGT ordering are satisfied because, for each additional \$1 that the first mover extracts, the maximum possible payoff to the second mover decreases by \$3; whereas, the maximum possible payoff to the first mover decreases by \$2.

[4] There is also somewhat-related literature in experimental economics (for example, see Hoffman et al. 1994; List and Cherry 2008) that examines how random assignments of endowments versus earned endowments affect subjects' choices in ultimatum and dictator games. In both of our settings, the endowments are "granted" by the experimenter. Of course, the common property game begins with a larger "common" endowment, and the private property game begins with two smaller "private" endowments.

[5] Andreoni (1995) offers a useful summary and critique of related studies dealing with framing effects within the social psychology literature.

mover in addition to the option of returning tripled amounts sent by the first mover. Parallel to those earlier studies, our experimental protocol uses double-blind procedures.

Subjects are randomly paired as "Type X" and "Type Y" subjects. Each person of Type X decides whether or not to send any of his/her tokens to the paired person of Type Y. Each token that a Type X person sends reduces the value of his/her token fund by \$1 but increases the value of the token fund of the paired Type Y person by \$3. After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is how to divide the value of the token fund he/she holds between his/her self and the paired person of Type X. That is, the Type Y person decides how much of the fund to keep for his/her self and how much to send back to the Type X person. Appendix A contains the instructions for the Private Property Trust Game and the Common Property Trust Game.

In the Common Property Trust Game, each pair of decision makers is given a starting balance of 40 tokens in their joint decision fund. The 40 tokens have a starting value of \$1 each, for a total initial value of the joint decision fund of \$40. Each person of Type X decides whether or not to withdraw tokens (up to 10 tokens) from the joint decision fund. Each token that a Type X person withdraws has a value to that person of \$1. Each token withdrawn reduces the value of the joint decision fund by \$3. After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is how to divide between his/her self and the paired person of Type X the value of the joint decision fund remaining after the Type X person's withdrawal decision. That is, the Type Y person decides how much of the remaining value of the fund to appropriate for his/her self and how much to leave for the Type X person.

Procedures

The experiments were conducted in the Interdisciplinary Experimental Laboratory at Indiana University, Bloomington. Subjects were recruited from a database of volunteers.[6] Due to space limitations in the laboratory, the design called for 12 to 18 subjects per experimental session, with additional subjects recruited as alternates in case some subjects did not arrive at the scheduled time. Eight experimental sessions were conducted, four using each of the two decision environments. In total, there were four experiment sessions per treatment, with sessions lasting approximately one hour. Including a \$5 show-up fee, on average Type X subjects earned \$16.00 and Type Y subjects \$25.29 in the Private Property Trust Game, and on average Type X subjects earned \$17.15 and Type Y subjects \$26.06 in the Common Property Trust Game. The data include decisions by 34 subject pairs in the Private Property Trust Game and 33 pairs in the Common Property Trust Game. The experiments followed the double-blind procedures summarized below.

All sessions began with subjects seated in a large room, where they were instructed not to talk with each other. The experimenter then reviewed, on an overhead projector, the instructions for the decision setting, as well as the procedures to be followed.[7] Subjects were

[6] A representative from the lab visited various large introductory classes (psychology, geography, and economics) to ask students to enlist in the database if they were interested in participating in experiments. A wide variety of majors are represented in these large introductory classes.

[7] For further experimental control, in all sessions the experimental protocol and instructions were reviewed with the participants by a single experimenter (Walker).

informed that there would be complete privacy in terms of personal decisions and earnings. As explained to the subjects, privacy was accomplished by a procedure in which individuals collected their earnings, contained in sealed envelopes, from a numbered mailbox for which only they had the key. Their privacy was guaranteed because neither their name nor their student ID number appeared on any form that recorded their decisions. The only identifying mark on the decision forms was an identification number known only to the individual. Subjects collected their payoffs with privacy using a key that opened a mailbox located in an adjacent room.

After reviewing the instructions and procedures with the subjects, the experimenter had each participant draw a sealed envelope from a box. The envelope contained a piece of paper marked with the participant's Type (X or Y). All Type X decision makers remained in the room to make their decisions. All Type Y decision makers moved to an adjacent room to make their decisions. Then an experimenter walked through the Type X room carrying a box containing unmarked envelopes. Each Type X person took one of the envelopes. Each envelope contained a mailbox key with a private identifying number and a decision form with the same identifying number. Each Type X person then wrote his/her decision on the decision form and placed the form back inside the envelope. Type X persons were then given a questionnaire to complete in private.

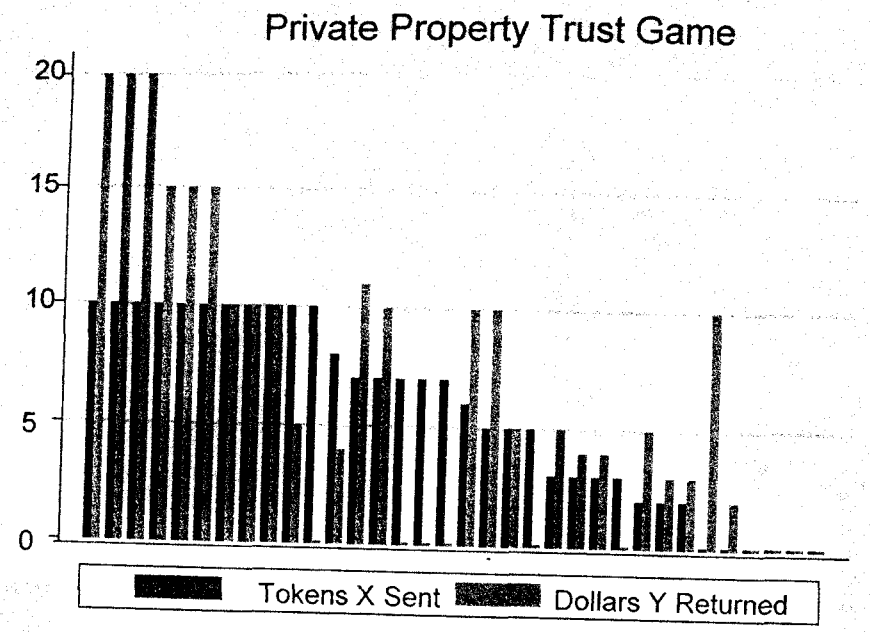
After all Type X decisions were made, an experimenter took the box containing the envelopes with the decisions of the Type X persons to an adjacent room and wrote the decision of each Type X person on a decision form for a Type Y person. The experimenter then placed a decision form for a Type Y person and a mailbox key with an identifying number in each envelope. An experimenter then walked through the Type Y room carrying the box containing the envelopes. Each Type Y person took one of the envelopes from the box. Each Type Y person then wrote his/her decision on the decision form and put the form back inside the envelope.

After all Type Y decisions were made, an experimenter took the envelopes to an adjacent room. The decisions marked on the Type Y decision forms determined the earnings for each Type X/Type Y pairing. While waiting for the distribution of payoffs, Type Y persons were given a questionnaire to complete in private. The experimenters placed the payoff for each person in a sealed envelope marked with the identifying number of that person. The envelope was then placed in that person's mailbox. Each envelope also included a \$5 show-up payment. After being informed by an experimenter that it was time to receive their payoffs, Type X persons put their completed questionnaires in an envelope and went to retrieve their payoff envelopes from their mailboxes. As each person left the lab area, he/she signed an acknowledgment that he/she received a cash payoff for the experiment, but not the amount. Type Y persons then followed the same procedure after all Type X persons had left the lab.

III. Results

Descriptive Statistics

The presentation of results begins with summary descriptive statistics for each experimental design. Recall, Type X refers to first movers, subjects making the initial decision. Type Y refers to second movers, subjects who responded to the decisions made by Type X subjects. Figures 1 and 2 present bar graphs and summary statistics for key behavioral



Private Property Trust Game Type X and Type Y – N=34				
	Mean	Standard Deviation	Minimum	Maximum
Tokens X Sent	5.65	3.83	0	10
$ Y Returned	6.65	6.43	0	20
$ X Earned	11.00	5.08	0	20
$ Y Earned	20.29	9.09	0	40

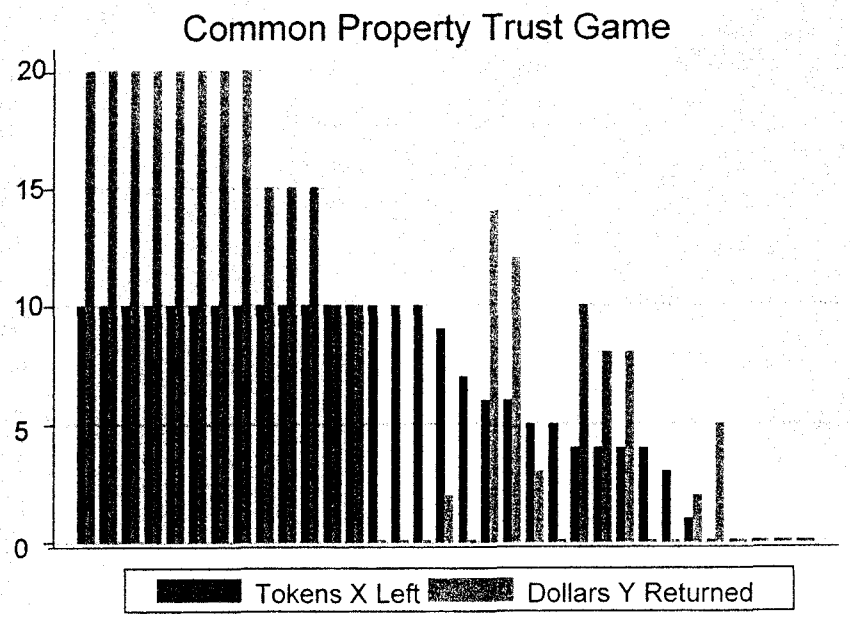
As shown on the far right side of the figure, there were four observations where Type X sent $0 and Type Y returned $0.

Figure 1. Private Property Trust Game Decisions and Descriptive Statistics

measures from each of the two decision settings. Each bar graph displays the decision by an X-Type, the amount sent to a Y-Type in the Private Property Trust Game or the amount left in the joint fund in the Common Property Trust Game, as well as the corresponding decision by the Y-Type, the amount of payoff allocated to X by Y. The decisions are sorted from high to low, first by the X decision and then by the Y decision.

Observation 1: *As with previous studies of the Trust Game (our Private Property Trust Game), there is large variation in decisions by X-Types and the responses by Y-Types.*

As shown in the figures, we observe an average X decision (tokens sent) of 5.65 and a corresponding Y decision (amount returned) of $6.65 in the two-person Private Property Trust



Common Property Trust Game Type X and Type Y – N=33				
	Mean	Standard Deviation	Minimum	Maximum
Tokens X Left	6.61	3.89	0	10
$ Y Returned	8.76	8.20	0	20
$ X Earned	12.15	6.54	0	20
$ Y Earned	21.06	9.21	5	40

The analysis presented in Figure 2 excludes one observation that was omitted because of clear confusion on the part of one subject. The X-Type player left all tokens, leaving the Y-Type player with $40 to allocate. The Y-Type player allocated all $40 to the X-Type player. On the questionnaire, he/she commented: "Logic, if both people left all the money, then they would get more in the end. $10 was the most you could receive if you took all the tokens, $20 if you split the joint fund." Note: As shown on the far right side of the figure, there were four observations where Type X sent $0 and Type Y returned $0.

Figure 2. Common Property Trust Game Decisions and Descriptive Statistics

Game, and an average X decision (tokens left) of 6.61 with a corresponding Y decision (amount returned) of $8.76 in the two-person Common Property Trust Game. Note that Berg, Dickhaut, and McCabe (1995) observe an average amount sent by X of $5.16 and an average amount returned by Y of $4.66 in their baseline (no social history) treatment. Cox (2004) reports an average amount sent by X of $5.97 and an average amount returned by Y of $4.94 in his investment game (treatment A).

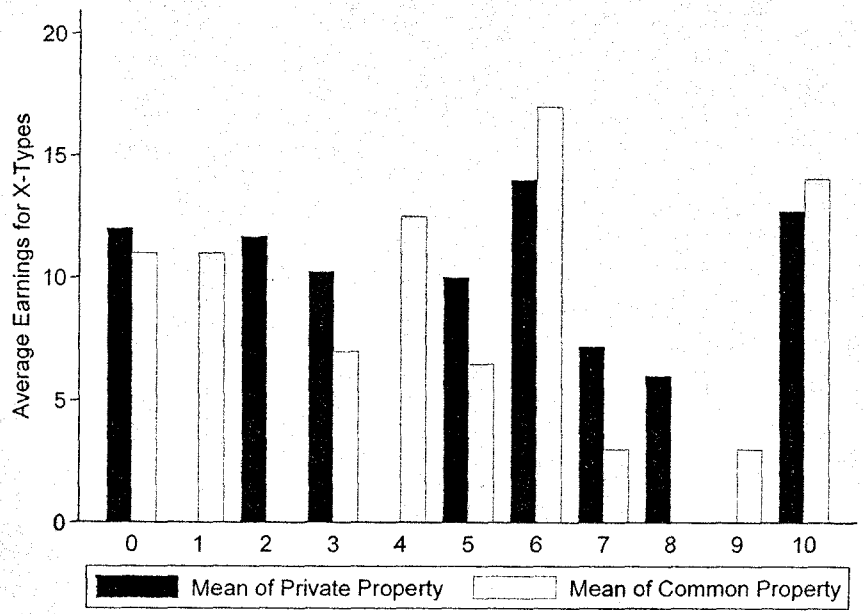


Figure 3. Earnings of X-Types in Both Experiments by Tokens Sent or Left

Observation 2: *On average, X-Types leave more tokens (in the joint fund) in the Common Property Trust Game than they send in the Private Property Trust Game (although the difference is not statistically significant).*[8]

Beyond the average decisions, however, there is an interesting distributional difference in the behavior of X-Types in the two game settings. As shown in the figures, in the Private Property Trust Game, 11 of 34 Type X subjects sent all 10 tokens. This compares to 16 of 33 Type X subjects who left all 10 tokens in the Common Property Trust Game.[9]

Clearly, one interpretation of the difference in behavior observed by X-Types in the Common Property Trust Game is the existence of joint ownership of the starting fund. That is, in the Private Property Trust Game, the starting balances were assigned separately to each individual. Similar to how one might interpret a form of a common property regime setting, however, starting balances in the Common Property Trust Game were assigned jointly to the two individuals.

Observation 3: *On average, Y-Types return more dollars to the X-Types in the Common Property Trust Game than in the Private Property Trust Game, corresponding to the larger amount left by X-Types in the former game.*

Again, beyond the average decisions, there is an interesting distributional difference in the behavior of Y-Types in the two game settings. As shown in the figures, in the Private Property Trust Game, 3 of 11 Type Y subjects who were sent all 10 tokens by Type X subjects chose the equal-split fairness focal outcome of equal $20 payoffs. This compares to 8 of 16 Type Y subjects who chose the equal split when the Type X subjects left all 10 tokens in the Common Property Trust Game.

[8] Comparing tokens sent (left) by Type X players, Private Property Trust Game versus Common Property Trust Game (t=1.02, d.f.=65, p=.31).

[9] Both Kolmogorov-Smirnov and Wilcoxian rank sum distribution tests are not significant (p=.26 and .23, respectively).

Table 1. Linear Model Estimates across Decision Settings*

	Private Property		Common Property	
	OLS	Tobit	OLS	Tobit
Constant	0.82 (p = 0.472)	−1.95 (p = 0.398)	0.11 (p = 0.923)	−5.54 (p = 0.141)
X-Sent	1.03 (p = 0.000)	1.29 (p = 0.000)		
X-Left			1.31 (p = 0.000)	1.83 (p = 0.000)
R-squared	0.36	0.07	0.39	0.08
N	34	34	33	33

* Ordinary least squares (OLS) results use robust standard errors. The Type Y Tobit model uses left censoring at zero.

Observation 4: *The ordering across decision settings for total earnings by Type X subjects is Private Property Trust Game < Common Property Trust Game.*[10]

Finally, one obvious question concerns the *a priori* "optimal" investment by Type X subjects, given expected responses by Type Y subjects. For both decision settings, Figure 3 plots the average earnings by Type X subjects, contingent on the amount kept, the amount sent to Type Y subjects, and the amount returned by Type Y subjects.

Observation 5: *There is no clear evidence of an* a priori *optimal decision by Type X subjects.*

Pooling the data further lends additional support to this conclusion. For X-Types sending or leaving zero to five tokens, average earnings equal $10.83. For X-Types sending or leaving 6 to 10 tokens, average earnings equal $12.13.

Model Comparisons across Investment Settings

In this section, we examine the decisions by Y-Types ($Y-Returned) as a linear function of the decisions of corresponding X-Types (X-Decision). All estimates are derived using generalized least squares procedures with robust standard errors. Because of the clustering of data at the end points (in particular 10 tokens), as a robustness check, we also present results from a Tobit analysis.

Model 1: ($Y-Returned) = $\alpha + \beta$ (X-Decision) + e_i

Table 1 presents the model estimates for each of the decision settings.

Observation 6: *Consistent with the summary observations drawn from the descriptive statistics, the magnitude of the coefficient on the variable "X-Decision," which measures the marginal dollars returned by Y for each token ($3) sent by X, can be ordered as follows: Private Property Trust Game < Common Property Trust Game.*

Observation 7: *Although the linear models do a reasonable job of capturing individual decisions, in all settings there is considerable variation in response by Y-Types unaccounted for by controlling for the X-Type decision.*

Behind the X and Y Decisions: Motives and Norms

The analysis above focuses explicitly on the quantitative measures of subject choices in the two different property settings. In this section, using evidence drawn from post-experiment

[10] Comparing total earnings by Type X players, Private Property Trust Game versus Common Property Trust Game (t=0.81, d.f.=65, p=.42).

Table 2. Linear Model Estimates—Type X and Y Decisions*

Dependent Variable	Type X Decisions Amount Sent or Left		Type Y Decisions Amount Returned	
	OLS	Tobit	OLS	Tobit
Constant	−5.08 (p = 0.267)	−17.07 (p = 0.175)	−2.71 (p = 0.664)	5.18 (p = 0.642)
Common Property	1.24 (p = 0.147)	2.57 (p = 0.165)	1.22 (p = 0.365)	0.67 (p = 0.723)
Age	0.40 (p = 0.079)	0.91 (p = 0.138)	0.17 (p = 0.556)	−0.39 (p = 0.471)
Gender	1.10 (p = 0.177)	1.61 (p = 0.396)	−3.09 (p = 0.037)	−4.87 (p = 0.012)
DumTrust-pos	2.91 (p = 0.003)	6.96 (p = 0.007)	3.41 (p = 0.046)	4.17 (p = 0.044)
DumTrust-null	2.87 (p = 0.040)	6.54 (p = 0.052)	−2.53 (p = 0.244)	−4.50 (p = 0.161)
DumFair-pos	2.06 (p = 0.023)	3.56 (p = 0.098)	2.90 (p = 0.079)	5.28 (p = 0.016)
DumFair-null	1.21 (p = 0.370)	3.01 (p = 0.269)	2.02 (p = 0.228)	3.44 (p = 0.126)
Type X: Amount Sent	Not Applicable	Not Applicable	0.96 (p = 0.000)	1.22 (p = 0.000)
R-squared	0.313	0.089	0.522	0.131
N	68	68	67	67

* OLS results use robust standard errors. The Type X Tobit model uses upper and lower censoring. The Type Y Tobit model uses left censoring at zero and robust standard errors.

questionnaires, we turn to an analysis providing evidence of subjects' motivations and/or norms of behavior.

We begin first with a reexamination of the decisions made by Type X decision makers and Type Y decision makers. In particular, the post-survey questionnaire provides information on two demographic variables of interest: age of the decision maker and gender of the decision maker. In addition, the questionnaire provides qualitative data on each subject's attitude toward trust in others, helpfulness of others, and fairness of others.[11] Each question allows the responder the opportunity for a negative, a positive, and a "don't know" response (coded as a null response in the statistical analysis reported in Table 2).[12]

1. Generally speaking, would you say that most people can be trusted, or that you can't be too careful dealing with people?

Can't be too careful/Most people can be trusted/Don't know

2. Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?

Just look out for themselves/Try to be helpful/Don't know

3. Do you think that most people would take advantage of you if they got a chance, or would they try to be fair?

Most people would take advantage/They would try to be fair/Don't know

After further reflection, we decided that the question related to "helpfulness" was not appropriate for our analysis. Statistical analyses supported this conclusion. The results we report are robust to inclusion or exclusion of the answers to the helpfulness question.

[11] Appendix B contains the post-experiment questionnaires that were used for the Private Property Trust Game. The questionnaires used for the Common Property Trust Game are modified only with regard to the alternative endowment assignment for the Type X decision maker. Note that because of the game design, first movers, Type X, would not know the results of their decisions (their ultimate earnings) at the time they completed the questionnaire. However, second movers, the Type Y subjects, would have completed the questionnaire after observing the decision by the Type X subject and making their decisions regarding earnings.

[12] An analysis of the correlation in responses to the three questions by subjects revealed statistical correlations in the range of .20 to .40 for Type X and Type Y subjects.

Based on the survey responses, the first two columns of results in Table 2 (ordinary least squares and tobit) provide model estimates for decisions made by Type X subjects, as a function of the following independent variables:

Common Property: dummy=1 if decision is from the Common Property Trust Game;

Age: chronological age of decision maker;

Gender: dummy=1 if male;

Trust Dummy Variables: DumTrust-pos=1 if response was positive, DumTrust-null=1 if response was null ("don't know"); and

Fairness Dummy Variables: DumFair-pos=1 if response was positive, DumFair-null=1 if response was null ("don't know").

Thus, the coefficients reported in Table 2 should be interpreted as shifts away from a base condition where the decision maker was in the Private Property Trust Game, was female, and gave a negative response to each of the two attitudinal variables.[13]

Several interesting observations emerge from the analysis of Type X subjects. In particular, although not statistically significant, there is a positive effect of age and being male. Further, the response to the survey question regarding trust is highly significant and in the expected direction. The fairness variable associated with a positive response is also positive and significant. Thus, those who responded that most people could be trusted sent (left) more tokens than those who disagreed with this statement. Similarly, those who responded that most people would try to be fair also sent (left) more tokens than those who responded that most people would take advantage of them.

Table 2 also reports model estimates for a similar analysis of the Type Y subjects, where the dependent variable is "amount returned," and there is one additional independent variable, "amount sent or left" by the Type X decision maker. Parallel to the results reported in Table 1, the amount sent (left) by the Type X decision maker had a significant effect on the amount returned by the Type Y decision maker. Interestingly, there is also a statistically significant gender effect. Controlling for the amount sent by Type X subjects, Type Y males returned less.[14] The qualitative variables for a positive response are of the expected sign and are statistically significant. However, the null responses for the trust and fairness questions are not statistically significant. In fact, the coefficient for "DumTrust-null" shows a negative relationship with amount returned.

The observation that the "attitudinal" variables appear to be somewhat more closely associated with Type X decisions than with Type Y decisions raises an interesting methodological point. As noted, because of the game design, first movers, X-Types, would not know the results of their decisions at the time they completed the questionnaire. However, second movers, the Y-Types, completed the questionnaire after observing the decision by the Type X subject with whom they were matched and making their own decision.

[13] Recall, in the Common Property Trust Game, the Type X decision maker chooses how many tokens to remove from the joint fund. To make this decision comparable to the Type X decision in the Private Property Trust Game, this choice is recoded as (10 minus Tokens removed).

[14] Reported gender effects differ across studies. Buchan, Croson, and Solnick (2004) find a result similar to ours. However, Cox (2002) and Ashraf, Bohnet, and Piankov (2003) found that men returned more than women. Cox and Deck (2006) explain how many reported differences in gender effects across studies can be accounted for by differences in the experimental designs and protocols.

IV. Comments and Conclusions

This study broadens the growing literature on decision making in the experimental game commonly referred to as the "Investment Game" or the "Trust Game." The primary research question relates to whether there are behavioral differences between Private Property and Common Property experiments that can be attributed to subjects' sense of ownership and/or equitable distribution of gains from trust and cooperation. In particular, we examine to what extent behavior is dependent upon how property rights in endowments are initially assigned to the subjects as private property or common property. The primary motivation behind the experimental design is drawn from the literature on common property regimes, where participants are faced with a social dilemma of how best to manage a commonly owned resource. In field settings, behavior differs substantially where participants using a common-pool resource interact within a common property regime as contrasted to open-access settings where no property rights have been defined (NRC 1986, 2002; Ostrom 1990; Dietz, Ostrom, and Stern 2003).

In the standard Trust Game, the first mover, endowed with a private good, makes an allocation decision that creates a surplus to be shared with a second mover. The first mover faces a social dilemma, however, in the sense that the second mover has full private ownership and authority over the distribution of the investment and the resulting surplus. In the Common Property Trust Game, the initial endowment of wealth (equivalent to the maximum possible tripled amount available to the second mover in the Private Property Trust Game) is assigned jointly to the two players. Now the first mover has the option of withdrawing resources from their *joint* endowment, and in the process destroying surplus because every dollar withdrawn reduces the joint fund by $3. As in the standard Trust Game, the first mover faces a social dilemma in the sense that the second mover has full authority over the final distribution of payoffs.

We find that endowments that are induced as common property lead to marginally greater cooperation or trust. Relative to the Private Property Trust Game, in the Common Property Trust Game subjects are more likely to leave the full joint fund untouched (parallel to sending the full endowment in the first game). Second movers respond by returning marginally more to the first movers. However, in terms of overall earnings, the Common Property Trust Game leads to only a 6% increase over the Private Property Trust Game.

Subjects' decisions are shown to be correlated with attitudes toward trust and fairness measured in post-experiment questionnaires. The regression analysis, including responses to the questionnaire, and excerpts from subjects' open-ended comments suggest that many of the subjects see *both* of these games as primarily related to trust and reciprocity. However, there clearly exists a tension for first movers as to how much trust to extend and, for some second movers, a clear motivation to reap the benefits of trust. Finally, an interesting set of results related to gender emerges. Although not statistically significant, the results suggest that males invest slightly more than females as first movers. However, as second movers, males return significantly less to first movers.

The overall results are intriguing because many scholars presume that owners of common property will be less *trusting* and cooperative than owners of private property. Future experiments will be conducted to analyze the robustness of this study through increased replication of the decision environment and a move to Private Property Trust Games and Common Property Trust Games with more than two players.

Appendix A: Instructions

Private Property Trust Game
No Talking Allowed

Now that the experiment has begun, we ask that you do not talk. If you have a question after we finish reading the instructions, please raise your hand and the experimenter will approach you and answer your question in private.

Two Types

The participants in today's experiment will be randomly divided into two types, referred to as Type X and Type Y.

Random Pairing and Anonymity

Each person of Type X will be randomly paired with a person of Type Y. No one will learn the identity of the person with whom he/she is paired. As discussed below, Type X persons will make their decisions anonymously in one room, and Type Y persons in another room.

Starting Balances

Each person in a pair of decision makers will be given a starting token fund of 10 tokens. The 10 tokens have a starting value of one dollar each, for a total value of $10.

Complete Privacy

This experiment is structured so that no one, including the experimenters or the other participants, will ever know the personal decision or money earnings of anyone in the experiment. This is accomplished by a procedure in which you collect your earnings, contained in a sealed envelope, from a numbered mailbox that only you have the key for. Your privacy is guaranteed because neither your name nor your student ID number will appear on any form that records your decisions in this experiment. The only identifying mark on the decision forms will be an identification number known only to you. You will be able to collect your money payoffs with privacy by using a key, which opens a mailbox located in a room adjacent to this room. The key and mailbox will be labeled with the same number as your decision-reporting forms. But you will be the only person who knows your personal number.

The Type X Decision Task

Each person of Type X will decide whether or not to send any of his/her tokens to the paired person of Type Y. Each token that a Type X person sends reduces the value of his/her token fund by $1 but increases the value of the token fund of the paired Type Y person by $3. A Type X person cannot send more than his initial 10-token starting balance. Four examples illustrate how the values of the tokens that may be sent by Type X are related to the value of the Type Y token fund.

- If the Type X person sends 0 tokens, that reduces the value of his/her fund by $0 and adds $0 to the value of the fund held by the paired Type Y person.
- If the Type X person sends 1 token, that reduces the value of his/her fund by $1 and adds $3 to the value of the fund held by the paired Type Y person.
- If the Type X person sends 5 tokens, that reduces the value of his/her fund by $5 and adds $15 to the value of the fund held by the paired Type Y person.
- If the Type X person sends 10 tokens, that reduces the value of his/her fund by $10 and adds $30 to the value of the fund held by the paired Type Y person.

The Type Y Decision Task

After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is to divide the value of the token fund he/she holds between his/her self and the paired person of Type X. That is, the Type Y person decides how much of the fund to keep for his/her self and how much to send back to the Type X person.

Experiment Procedures – We will review all procedures before we begin.

1. Each participant will draw a sealed envelope from the box. That envelope will contain a piece of paper marked with the participant's Type (X or Y).
2. All Type X decision makers will remain in this room to make their decisions. All Type Y decision makers will move to an adjacent room to make their decisions.
3. An experimenter will walk through the Type X room carrying a box containing large manila envelopes. Each Type X person can take any one of the envelopes from the box. Each envelope contains a mailbox key with a private identifying number and a decision form with the same identifying number written on the Type X Key Number line on the form.
4. Each Type X person writes his/her decision on the decision form and then puts the form back inside the manila envelope. The key is NOT put back in the envelope. Each Type X person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.
5. An experimenter takes the box containing the manila envelopes with the decisions of the Type X persons to an adjacent room. The experimenter adds the decision of the Type X person on the decision form for the Type Y person with whom

he/she has been randomly paired. The experimenter places the decision form for the Type Y person and a mailbox key with an identifying number in each envelope. These are the mailbox keys for the Type Y persons. The experimenter also writes the identifying number from the key onto the Type Y Key Number line on the form.

6. An experimenter will walk through the Type Y room carrying the box containing the manila envelopes. Each Type Y person can take any one of the envelopes from the box. Each envelope contains a mailbox key with a private identifying number and a decision form marked with a Type X person's decision.
7. Each Type Y person writes his/her decision on the decision form and then puts the form back inside the manila envelope. The key is NOT put back in the envelope. Each Type Y person puts his/her manila envelope containing the decision form back in the box on the table at the front of the room and picks up a questionnaire to fill out.
8. An experimenter takes the box containing the manila envelopes to an adjacent room and removes the decision forms from the envelopes. The decisions marked on the forms determine how much each person gets paid.
9. The experimenters place the experiment payoffs of each person in a sealed envelope marked with the identifying number of that person. The envelope will be placed in that person's mailbox. Each envelope will also include the $5 show-up fee.
10. Before leaving the experiment, each participant will note their involvement in this experiment on the computer in front of them. This is done by logging on the computer using instructions that will be given at that time.
11. After being informed by an experimenter that it is time to receive their payoffs, Type X persons will put their completed questionnaires in an envelope that will be provided and then place the questionnaires in a box at the front of their room. Type X persons will then go to the mailbox room and retrieve their payoff envelopes from their mailboxes, and leave the key in the mailbox. As each person leaves the lab area, he/she will be asked to sign an acknowledgment that he/she received a cash payoff for the experiment.

Type Y persons will follow the same procedure after all Type X persons have left the lab.

Common Property Trust Game

No Talking Allowed

Now that the experiment has begun, we ask that you do not talk. If you have a question after we finish reading the instructions, please raise your hand and the experimenter will approach you and answer your question in private.

Two Types

The participants in today's experiment will be randomly divided into two types, referred to as Type X and Type Y.

Random Pairing and Anonymity

Each person of Type X will be randomly paired with a person of Type Y. No one will learn the identity of the person with whom he/she is paired. As discussed below, Type X persons will make their decisions anonymously in one room, and Type Y persons in another room.

Starting Balances

Each pair of decision makers will be given a starting balance of 40 tokens in their joint decision fund. The 40 tokens have a starting value of one dollar each, for a total value of the joint decision fund of $40.

Complete Privacy

This experiment is structured so that no one, including the experimenters or the other participants, will ever know the personal decision or money earnings of anyone in the experiment. This is accomplished by a procedure in which you collect your earnings, contained in a sealed envelope, from a numbered mailbox that only you have the key for. Your privacy is guaranteed because neither your name nor your student ID number will appear on any form that records your decisions in this experiment. The only identifying mark on the decision forms will be an identification number known only to you. You will be able to collect your money payoffs with privacy by using a key, which opens a mailbox located in a room adjacent to this room. The key and mailbox will be labeled with the same number as your decision-reporting forms. But you will be the only person who knows your personal number.

The Type X Decision Task

Each person in Type X will decide whether or not to withdraw tokens from the joint decision fund. Each token that a Type X person withdraws has a value to that person of $1. Each token withdrawn reduces the value of the joint decision fund by $3. A Type X person cannot withdraw more than 10 tokens. Four examples illustrate how the values of the tokens remaining in the decision fund are related to the values of the tokens that may be withdrawn:

- If the Type X person removes 0 tokens, that adds $0 to his/her earnings and does not change the value of the joint decision fund.
- If the Type X person removes 1 token, that adds $1 to his/her earnings and reduces the value of the joint decision fund by $3.
- If the Type X person removes 5 tokens, that adds $5 to his/her earnings and reduces the value of the joint decision fund by $15.
- If the Type X person removes 10 tokens, that adds $10 to his/her earnings and reduces the value of the joint decision fund by $30.

The Type Y Decision Task

After the Type X person in a pair makes his/her decision, the Type Y person in that pair makes his/her decision. The Type Y person's decision is to divide between his/her self and the paired person of Type X the value of the joint decision fund after the Type X person's withdrawal decision. That is, the Type Y person decides how much of the remaining value of the fund to keep for his/her self and how much to leave for the Type X person.

Appendix B: Post-Experiment Questionnaires

Type X subjects

Thank you very much for participating in our decision experiment. We would like to ask you a few questions about your experience in this experiment and about you.
What is Your Key Number? ____

Questions about the experiment:

1. Is this the first decision experiment in which you have participated? Yes ____ No ____
2. If your answer to #1 is "No", approximately how many other experiments have you been in? ____
3. Were the experiment instructions clear? Yes____ No ____
4. Did you have any questions you wanted to ask us? If yes, please briefly write them in the space provided.

_____
_____
_____
_____

5. Did you send all or some of your tokens to the Type Y person with whom you were paired?
Yes ____ No ____
If yes, how many tokens did you send? ____
What were your reasons for making the decision that you made?

_____
_____
_____
_____

More general questions:

1. Generally speaking, would you say that most people can be trusted or that you can't be too careful dealing with people?
Most people can be trusted ____ Can't be too careful ____ Don't know ____
2. Would you say that most of the time people try to be helpful or that they are mostly just looking out for themselves?
Try to be helpful ____ Just look out for themselves ____ Don't know ____
3. Do you think that most people would take advantage of you if they got a chance or would they try to be fair?
Most people would take advantage ____ They would try to be fair ____ Don't know ____

Information about you:

What year are you in school? Freshman ____ Sophomore ____ Junior ____ Senior ____
What is your intended or declared major ? _____
What is your age? ____
What is your gender? Female ____ Male ____

Type Y subjects

Thank you very much for participating in our decision experiment. We would like to ask you a few questions about your experience in this experiment and about you.
What is Your Key Number? ____

Questions about the experiment:
1. Is this the first decision experiment in which you have participated? Yes ____ No ____
2. If your answer to #1 is "No", approximately how many other experiments have you been in? ____
3. Were the experiment instructions clear? Yes____ No ____
4. Did you have any questions you wanted to ask us? If yes, please briefly write them in the space provided.

_____
_____
_____
_____

5. Did the Type X person with whom you were paired send all or some of their token fund to you?
Yes ____ No ____
If yes, how much money from their fund did they send you? ____
How much did you send to the Type X person with whom you were paired? ____
What were your reasons for making the decision that you made?

_____
_____
_____
_____

More general questions:
1. Generally speaking, would you say that most people can be trusted or that you can't be too careful dealing with people?
Most people can be trusted ____ Can't be too careful ____ Don't know ____
2. Would you say that most of the time people try to be helpful or that they are mostly just looking out for themselves?
Try to be helpful ____ Just look out for themselves____ Don't know ____
3. Do you think that most people would take advantage of you if they got a chance or would they try to be fair?
Most people would take advantage ____ They would try to be fair ____ Don't know ____

Information about you:
What year are you in school? Freshman ____ Sophomore ____ Junior ____ Senior ____
What is your intended or declared major ? _____
What is your age? ____
What is your gender? Female ____ Male ____

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