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Gender differences in trust and trustworthiness: Individuals, single sex and mixed sex groups

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ABSTRACT

We explore gender differences in trust and trustworthiness between male and female individuals and groups consisting of two members of the same sex to understand if single sex groups behave differently from individuals of the same sex. We find some differences in the early rounds such as: (i) all-male (all-female) groups are more trusting than male (female) individuals and (ii) female individuals are most reciprocal compared to other entities. However, such early differences dissipate over time. We find that groups – whether single sex or mixed – behave very similar to each other and that there are little or no significant differences either in trust or trustworthiness between male and female groups. Our results have implications for the study of gender differences in economic transactions.

1. Introduction

Economists and other social scientists now clearly recognise that the willingness to trust strangers or to reciprocate another's trust is *sine qua non* to a vast range of economic transactions. This is true, for instance, in transactions where there is a lag between payment for a good and the receipt of the same, including the more anonymous and rapidly increasing transactions over the internet. Many of the contracts we enter into in our day-to-day lives are incomplete and rely on mutual trust and reciprocity. In this paper, we wish to explore differences in the levels of trust and trustworthiness between individuals and groups with a particular emphasis on possible gender differences in behaviour. In order to do so we look at the behaviour of individual males and females and compare that to the behaviour of single-sex groups where each group consists of either two males or two females. However, for the sake of completeness, we also have a control treatment of mixed-sex groups with one male and one female. Primarily we wish to understand if single sex groups behave differently from an individual

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of the same sex. We measure trust and reciprocity using the investment (trust) game introduced by Berg, Dickhaut, and McCabe (1995). We expect readers to be familiar with the game and therefore dispense with a formal description here. We provide more details in the section on experimental design.

Given that there is now a voluminous literature discussing the role of trust in economic transactions, there is not much value to belabouring the point here. We refer the interested reader to Fukuyama (1995) and Putnam (2000) for comprehensive overviews of the issues. Chaudhuri (2009) provides an overview of the literature that uses economic-decision making experiments to explore the role and impact of trust and reciprocity in economics, including their role in agency theory in particular and the labour market in general.

However, the vast majority of experiments exploring these issues focus on decisions made by an individual agent. But there is now increasing recognition among social scientists that many – if not most – decisions are made not by individuals but by committee and hence conclusions drawn on the basis of individual decision-making experiments may not necessarily be robust for many economic situations.

Consider academic recruitments for instance. These are typically the outcome of robust discussions between members of a recruiting committee who may have very divergent views on the matter at the outset but in the end coalesce around a consensus. Kugler, Kausel, and Kocher (2012) take a broader perspective and point out (p. 472):

> *Boards of directors (not individual managers) decide on corporate strategy; congresses (not individual legislators) declare war on other countries; families (not individual family members) decide about budget allocation; and work design in organizations is evolving from an individual task to a group task.*

When groups make these decisions, the resulting dynamic is necessarily quite different from individual decision making. There is communication between group members and a collective brain-storming that is absent when the decisions are made on an individual basis. Therefore, looking at differences in the behaviour of groups and individuals seems to be an exercise that can add value.

As a result there is a growing literature which compares the behaviour of groups with that of individuals across a range of decision making situations. Charness and Sutter (2012) and Kugler et al. (2012) provide comprehensive surveys on the differences in decision-making between groups and individuals. Charness and Sutter's review focus more on strategic (or interactive) decision making situations while Kugler et al.'s review looks at both individual (non-interactive) as well as strategic decision making.

Below we briefly address the evidence reported for games that address issues of trust and trustworthiness. Luhan, Kocher, and Sutter (2009) provide an overview of the literature that focuses specifically on differences in decision making between individuals and groups in games designed to explore social (or other-regarding) preferences.[1]

The two papers related most closely to our study are Cox (2002) and Kugler, Bornstein, Kocher, and Sutter (2007). Both these papers compare the behaviour of three person groups with those of individuals using a one-shot play of the Berg et al. version of the trust game. Cox finds no significant difference between groups and individuals either in the amount sent or the amount returned. Kugler et al., on the other hand, find that groups send less money in the trust game but there are no significant differences in the amounts returned.

The two studies differ in significant ways. In Cox (2002) participants play first as individuals and then as members of a three-person group. As a result individuals interact with other individuals (I–I) and groups with groups (G–G). In Kugler et al. (2007), on the other hand, participants either play as individuals or as members of a three person group. But there are four separate types of interactions; individual senders and individual receivers (I–I), individual senders and group receivers (I–G); groups of senders and receivers (G–G) and groups of senders but individual receivers (G–I). In the Kugler et al. study, individuals transfer more as the sender both to other individuals as well as to group receivers.

In this study we also look at the interaction between groups and individuals. Like Kugler et al. ours is a between-subjects design where participants play either as an individual or as a member of a two person group. So there is no possibility of participants carrying over any learning from the individual decision making situation to a group based decision scenario unlike in Cox (2002). In our study the interactions are either between individual senders and receivers (an I–I protocol) or between groups of senders and receivers (a G–G protocol).[2] We should also emphasise that in our study participants – whether groups or individuals – never learn the gender composition of the *other person or group* that they are playing against in any round.

[1] Cason and Mui (1997) explore differences in the behaviour of individuals and groups in the dictator game. Bornstein and Yaniv (1998) carry out a similar exercise for the ultimatum game while Bornstein, Kugler, and Ziegelmeyer (2004) do so for the centipede game. Kocher and Sutter (2005) look for differences between individuals and groups in a beauty-contest game while Kocher and Sutter (2007) do so for a gift-exchange game. Müller and Tan (2011) look at differences in individual and group behaviour in a market entry game. There is also a strand of this literature which looks at differences in trust and trustworthiness when individuals make decisions on their own as opposed to making decisions as the representative of a group. See, for instance, Song (2008).

[2] There is also a large literature in social psychology looking at differences in behaviour between groups and individuals. Insko and Schopler (1987) and Schopler and Insko (1992) find that groups are less cooperative than individuals in the prisoner's dilemma game. Wildschut, Pinter, Vevea, Insko, and Schopler (2003) provide reasons why groups might be less cooperative than individuals. Bornstein et al. (2004, p. 601) in discussing the results for their centipede game study, provide a concise summary of these arguments as follows: *The "social support for shared self-interest" hypothesis argues that groups are more competitive than individuals because group members provide each other with support for acting in a selfish, ingroup-oriented way. The "identifiability" explanation proposes that intergroup interactions are more competitive because the other side's ability to assign personal responsibility for competitive behaviour is more limited. Finally, the "schema-based distrust" hypothesis postulates that group members compete because they expect the outgroup to act selfishly and want to defend themselves against the possibility of being exploited. As a result of these processes, groups are more selfish than individuals and expect their opponents to behave more selfishly, which would explain why they terminate the Centipede game earlier than individuals.*

However, our study differs from prior ones in one important aspect. We focus not only on differences between individuals and groups but also on gender differences in individual and group behaviour by comparing the decisions made by individuals with those made by single-sex groups consisting of either two men or two women.

There is now a voluminous literature that explores gender differences in economic transactions and in a number of cases there are interesting differences in behaviour. Comprehensive overviews of this literature in gender differences is provided by Croson and Gneezy (2009) and Eckel and Grossman (2008, chap. 57). The issue of gender differences achieve greater relevance in the context of recent findings that women often tend to shy away from competitive situations. See for instance Niederle and Vesterlund (2007) for evidence of female propensity to avoid competition. Babcock and Laschever (2003) also provide some evidence along similar lines bearing testimony that women tend to shy away from confrontation particularly in the context of salary negotiations. As these authors point out such gender differences may have profound consequences for the relative achievements of men and women in the work-place.

The issue of trust and reciprocity, while not directly connected to the phenomenon of competition avoidance, can nevertheless have important implications for success in the workplace. The decision to trust others or to reciprocate trust is central to a wide variety of work-place interactions. For instance, trust is involved when delegating an important assignment to another person or group member. As a result if there are important differences between the genders in their levels of trust and trustworthiness that should be of interest to economists.

Looking at the issue of trust and reciprocity, the basic insight coming out of previous papers is that when it comes to trust either there are no strong gender differences or that men are more trusting. As far as reciprocity is concerned, again either there is no difference or else women appear to be more reciprocal than men. See the surveys by Croson and Gneezy (2009) or Eckel and Grossman (2008, chap. 57).

Our motivation here is threefold; first, *we wish to understand differences in behaviour between individuals and groups*. In order to do that we create three types of groups, one consisting of two males, another of two females and a third of one male and one female. This is not new since other studies as cited above have examined this issue prior to us. A second – and perhaps more novel – issue we are interested in is whether the differences that show up in individual interactions still make an appearance when it is a group of two members of the same sex that are involved? So our second question is: *if it is indeed the case that men are more trusting than women, would that still hold true if we look at the interaction between groups of two men or two women? Similarly, if women are more reciprocal than men, would a group of two women still be more trustworthy?* Finally, we look at the third issue: *whether there are any differences in the behaviour of single-sex and mixed-sex groups*.

Why study behaviour of single-sex groups? Here is an example from research on corruption. Across the world, there is a growing movement to promote female participation at all levels of government and the bureaucracy in order to reduce public sector corruption. A number of studies exploring gender differences in corruption start from a micro-level finding that women are less tolerant of corruption and then go onto propose a "macro" hypothesis about groups; that groups of women will similarly be less corrupt as well. See for instance Dollar, Fisman, and Gatti (2001) or Swamy, Knack, Lee, and Azfar (2001). See Sung (2003) or Goetz (2007) for counter-arguments. A number of cities have implemented policy on the basis of the idea that women – and by extension female groups – are less corrupt. In 1999, Mexico City and Lima (Peru) took away the ability to write traffic tickets from male police offices and gave this power exclusively to an elite corps of women traffic officers since the latter were deemed far less corrupt than their male counterparts. Chaudhuri (2012) provides an overview of this literature and relevant citations to the associated research. Consequently, it seems to us that whether – and to what extent – we may be able to extrapolate from the behaviour of individuals to that of single-sex groups of the same gender is an interesting question.

Finally, we have our participants play the trust game repeatedly for 10 rounds with random re-matching. This is different from most prior studies where participants play one-shot games. We chose the repeated play design for a number of reasons. For one thing laboratory experiments place participants in an unfamiliar environment. Typically instructions utilise neutral context-free language. Therefore even in the context of simple games there is scope for learning. Repeated plays of the game allow us to better understand how people learn about the task and the dynamics in their decision making.

Second, Samuelson (2005) comments: "*interpretation of experimental results can then depend importantly on how we imagine participants perceive the game*…." Levati, Miettinen, and Rai (2011) suggest: "*An important component of the requirement that a participant's model of a situation matches the experimenter's model is that the participant and the experimenter should attach the same meanings to the elements in the action sets of the agents involved in an interaction*."

While we are not claiming that repeated plays of the game guarantee that the players assign the same meaning to the actions as the experimenter does, it is likely that such convergence may take place better over repeated plays as opposed to one-shot plays of the game.

Chaudhuri and Sbai (2011) look at gender differences in repeated gift-exchange games played over 10 rounds with random re-matching to preserve the essence of one-shot interactions. They find that early differences with men showing greater trust disappear over time. They conclude: "*… earlier research that suggested significant gender differences between trust and reciprocity using one-shot plays might actually be overestimating such differences. … To the extent that most situations in real-life are better modelled as repeated interactions rather than one-shot games, it is important to pay attention to the dynamic aspects of behaviour and it appears that in such repeated interactions there are no strong gender differences in the tendency to trust or reciprocate.*"[3]

[3] Part of the analysis in Chaudhuri and Sbai (2011) relies on the same data for trust game played by individuals that we also use in this study.

Table 1
Experimental Design.

	Individual senders	Individual receivers		Group senders	Group receivers
Male individuals	22	26	Male groups	16	13
Female individuals	19	15	Female groups	15	17
			Mixed groups	20	21
Total individuals	41	41	Total groups	51	51
Total number of participants	41	41		102	102

We proceed as follows. In the next section we explain the experimental design. In Section 3 we present our results and in Section 4 we discuss the conclusions arising from this study.

2. Experimental design and procedure

The experiment was conducted in our computer laboratory at the University. We have a total of 286 participants in two treatments. We conduct four sessions with 82 participants (41 pairs) in the "*Individual*" treatment, one where people played as individuals in their role as both senders and receivers. In the second "*Group*" treatment we conduct 10 sessions where individuals played as members of two person groups. These groups can be either "single-sex", consisting two males/females or "mixed sex", consisting of one male and one female. We have 204 participants in the group treatment giving us 102 groups in all, 51 groups of senders and 51 receivers. Table 1 provides a break-down of the gender composition of each of these treatments. As mentioned above, the data for the trust game played by individuals is the same as that used by Chaudhuri and Sbai (2011) for their study of the dynamics of behaviour in gift-exchange games.

We use the Veconlab website to conduct the experiments. The website is available here: http://vecoblab.econ.virginia.edu/admin.htm. See Holt (2009) for more details. Participants are seated in front of computer monitors with dividers separating them. They are provided with the instructions to the experiment. A copy of the instructions given to the participants is provided in the Appendix. The specific instructions are exactly the same as that provided within the Veconlab software. We add some general instructions on top of that to explain the experimental design to the participants and to emphasise that they will play the game for 10 rounds.

When participants login they are randomly assigned to the role of either the sender or the receiver. For the groups, we tell them that they should log onto one computer and enter their decisions using that one computer. The groups are specifically told that each group member will separately make the amount made by the group as a whole. These roles stay unchanged for the entire session. At the end of each round senders and receivers are re-matched using a stranger matching protocol as defined by the Veconlab software. Senders and receivers never learn the gender of the individuals or groups that they are paired with in any round.

At the beginning of each round each individual or group playing as the sender and each individual or group playing as the receiver is endowed with 10 experimental dollars which are equivalent to NZ $1. (At the time we ran the experiments NZ $1 was around US $0.75.) The senders can transfer any or the entire amount to the receiver by entering the appropriate number in the relevant box on the sender's screen. They are free to enter decimal amounts but virtually everyone chose whole numbers. Any amount transferred is tripled before it reaches the receiver. Once the sender has decided how much to send, the receiver gets to see that amount and the tripled amount of his screen. Then he has to decide how much (if any) of this amount to send back to the sender. At the end of each round, both senders and receivers get to see the decisions made by the pair members and their earnings for that round on their computer screen. The round ends at this point. Pair members are re-matched before the next round starts which proceeds in the exact same way. From the second period onwards participants can also see their cumulative earnings.

The mechanics for carrying out the group sessions are mostly similar to the ones for the individuals except that here two players together play as the sender and another two as the receiver in each pairing. See the Appendix for the additional instruction given in the *group* treatment. In these sessions, when participants come into the lab, they are asked to sit down at a computer cubicle as usual. We tell them that for this particular experiment they are going to be playing as a member of a two person group. These groups will consist of either two men or two women or of one man and one woman. Then we re-seat the participants so that women are sitting next to women, or men next to men, or it is a mixture of the two sexes. This is done on a fairly *ad hoc basis* where we try and put together people sitting closest to each other. Then we remove the partition between two members of the same group and tell them to log into one computer and make all decisions using that computer alone. Each member of the group is told that he/she will each separately earn the amount earned by the group.[4] We do not

[4] We make sure that there is at least one empty cubicle between the groups. One problem we have is that the lab seats 32 people and we typically have fewer than 10 groups in each role – sender or receiver. This means that even with random re-matching groups interact more than once during a session. Given the logistics of the group treatment we could not do much about this. However the participants do not learn the identity of the person or groups they are paired with and therefore there should be no scope for reputation building or signaling preserving the essence of one-shot interactions. A referee pointed out that it is easy for groups to make out that they will be interacting with some of the other groups more than once and hence it is possible that this led to differences in levels of trust between individuals and groups. We would like to point out that these differences do dissipate over time and that while we get some early differences in trust, we do not get any corresponding differences in reciprocity. But we certainly cannot rule out the referee's conjecture on this issue.

Table 2
Summary statistics for senders.

	No. of participants	Average amount passed	Average passed in round 1	Average passed in round 10
Individuals	41	2.56	3.32	1.56
Groups	51	3.99	5.71	2.29
Male individuals	22	2.71	3.55	1.23
Female individuals	19	2.37	3.05	1.95
Male groups	16	4.58	7.00	2.56
Female groups	15	2.91	4.80	1.60
Mixed groups	20	4.34	5.35	2.60

impose any restrictions on the discussions they can have. We also do not dictate how they should arrive at their decisions. We leave it up to the participants. We do not impose a time restriction but found that while people deliberated longer in the early rounds, after a while matters progressed expeditiously. We only request that they speak *sotto voce* so that other groups cannot hear what they are discussing. We do not record or attempt to quantify the within group conversations in any way or form.

At the end of the 10 rounds the session participants are paid their earnings privately. A session lasts about 50 min and on average participants earned NZ $13. In addition they also receive a NZ $5 show-up fee.

3. Experimental results

We will start by looking at the issue of trust as measured by the amount sent by the sender. Here we will compare the behaviour of both individuals and groups. After that we will look at reciprocity by focusing on the proportion of amount received returned by the receivers.

3.1. Sender behaviour

Result 1: *Groups are more trusting compared to individuals in the early rounds but the differences tend to dissipate over time*.

Table 2 provides a break-down of the amounts sent by the various entities in the experiment. Here and elsewhere the amounts we report are expressed in experimental dollars or percentages thereof. Fig. 1 depicts the average amount passed over 10 rounds for groups and individuals. Looking at Table 2 we find that groups on average transfer fourteen percentage points more than individuals and much of this seems to be driven by all-male groups and mixed-sex groups who transfer 46% and 43% on average respectively.

Given that participants are randomly-re-matched from one round to the next, observations within the session are not independent. Only session-level averages can be considered independent observations. This, however, will leave us with only four observations for the individual treatment and 10 for the group treatment. Therefore, bearing the above caveat in mind, we went ahead and carried out non-parametric tests for the amounts sent using all the decisions over 10 rounds as independent units of observation. The average amount sent is 2.56 dollars in the individual treatment and 3.99 in the group treatment. A ranksum test reports a significant difference in population distribution between individuals and groups ($z = 5.5$ and $p < 0.01$). Hence on average groups passed more than individuals.

However, it is also clear that over time the differences tend to dissipate with the amount sent by groups approaching those of individuals. Ranksum tests report a significant difference in the amount sent between individuals and groups in the first round with $z = 3.93$ and $p < 0.01$ but no significant difference in the last round with $z = 0.96$ and $p = 0.34$.

In Table 3 we use regression analysis to compare the amounts sent between individuals and groups using three different models – a random effects regression, a dynamic panel Tobit regression and a GMM regression. We use random effects rather than fixed effects because each participant has individual-specific effects such as gender, subject of study and family background. To ensure the consistency of the estimators, we estimate the Tobit model with the correction for the dynamic structure as suggested by Wooldridge (2002, pp. 542–544). We then compare the results from the dynamic Tobit model to an Arellano-Bond dynamic panel GMM model following Roodman (2006). Within Roodman's xtabond2 command for stata, we correct for the downward bias of standard errors using the process developed by Windmeijer (2005).

Column 2 of Table 3 presents the random effects estimates. The dependent variable is the amount sent by each sender in each round. Independent variables include (1) *round*, (2) *group*, a dummy for the group treatment with the individual treatment as the base category, and (3) *interaction term* between round and group dummy. This model reports that the group dummy is positive and significant which implies that groups send more in the initial round compared to the individuals. The estimated coefficients for round and the interaction term between round and the group dummy are negative and significant. This implies that both groups and individuals decrease the amount send over time with groups reducing the amount sent at a faster rate than individuals. These findings are consistent with the sending patterns depicted in Fig. 1.

Column 3 presents results from the dynamic Tobit model and column 4 presents results from the GMM model. Independent variables include (1) *lag amount sent*, the amount sent in the previous round, (2) *round*, and (3) *lag earn*, the amount earned in the previous round. Both here and elsewhere in the paper, we look at a number of different specifications of the regression model and report the results of the model that best fits the data on the basis of likelihood ratio tests. We have chosen to omit the details of these likelihood ratio tests.

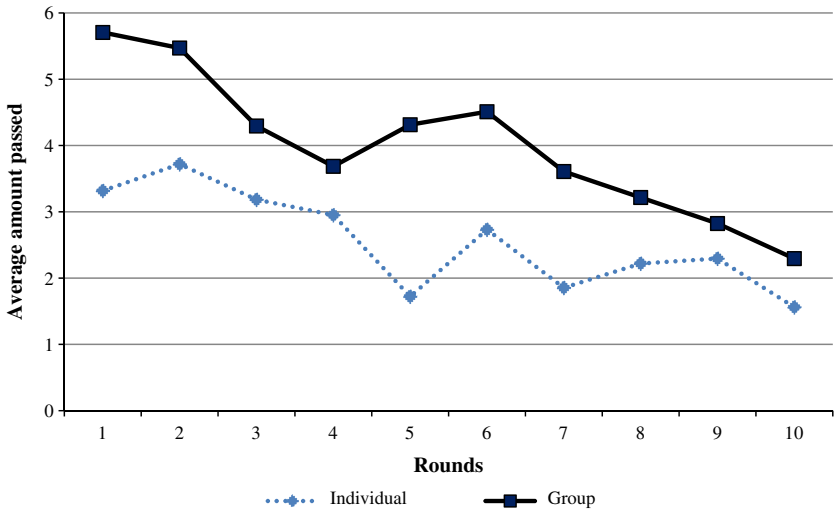

Fig. 1. Average amount passed by individuals and groups.

Table 3
Regression results for amount sent by individuals and groups.

Amount sent	Random effects	Tobit	GMM
Lag amount sent	–	0.449*** (0.078)	0.384*** (0.059)
Round	−0.199*** (0.053)	−0.531*** (0.075)	−0.175*** (0.039)
Group	2.163*** (0.648)	–	–
Round ∗ Group	−0.132* (0.076)	–	–
Lag earn	–	0.365*** (0.055)	0.255*** (0.036)
Constant	3.652*** (0.483)	5.366* (3.153)	0.553 (0.588)
R-squared	0.099	–	–
P-value for Hansen test	–	–	0.795
P-value for second-order autocorrelation	–	–	0.318
Observations	920	828	828
Left-censored observations	–	361	–
Uncensored observations	–	358	–
Right censored observations	–	109	–

Standard errors are presented in parentheses.
** Significance at 5% level.
*** Significance at 1% level.
* Significance at 10% level.

In both Tobit and GMM models, we find that the estimated coefficients for the lag amount sent and lag earn variables are positive and significant. Hence in making their decisions participants take into account their own actions and earnings in the previous round. The higher the amount sent in the previous round the more a participant will send in the current round. Similarly, the more a participant earned in the previous round the higher the amount she will send in the current round. The estimated coefficient for round variable is negative and significant implying that participants decrease the amount sent over time. However, unlike the random effects model, the dynamic models which include the lagged variables show no significant difference in the amount sent between individuals and groups.

The basic insight coming out of Table 3 is that there is some weak evidence to suggest that groups are most trusting in the early rounds. But there is more pronounced decay in group transfers resulting in the absence of any significant difference towards the end of the 10-round interaction.

Result 2: *(a) Initially (i) male groups are more trusting than male individuals; (ii) female groups are more trusting than female individuals. (b) There are no significant differences in the levels of trust between male groups, female groups and mixed groups; (c) all early differences in behaviour dissipate over time.*

Next we take a disaggregated look at the sender's decision. We focus on the decisions made by male and female individuals and compare those to the decisions made by male, female and mixed-sex groups. Fig. 2 shows how the amount sent changed over the 10 rounds for these five different entities. As noted in Table 2, on average male groups and mixed-sex groups send around 19 percentage points more compared to the other entities.

Fig. 3 shows that compared to others male groups exhibit a pronounced tendency to send their entire endowment to the paired receiver. On average per round nearly one third of male groups sent their entire token endowment to the receiver. On

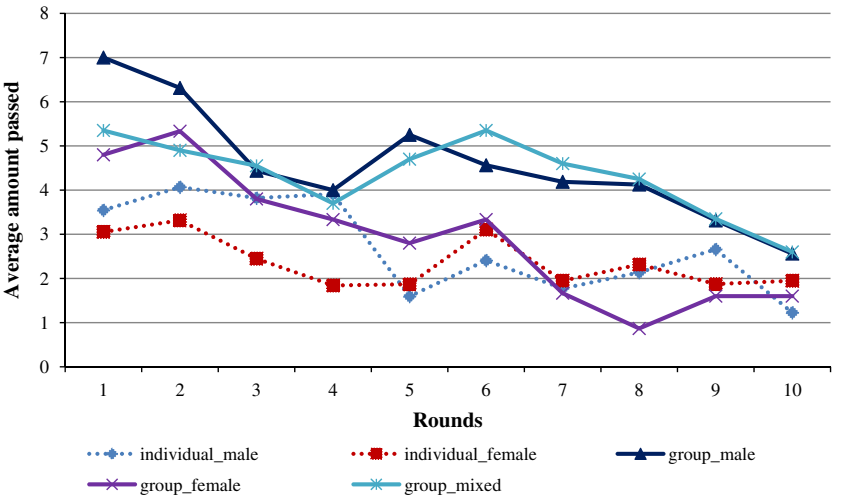

Fig. 2. Average amount passed broken up by gender of individuals and groups.

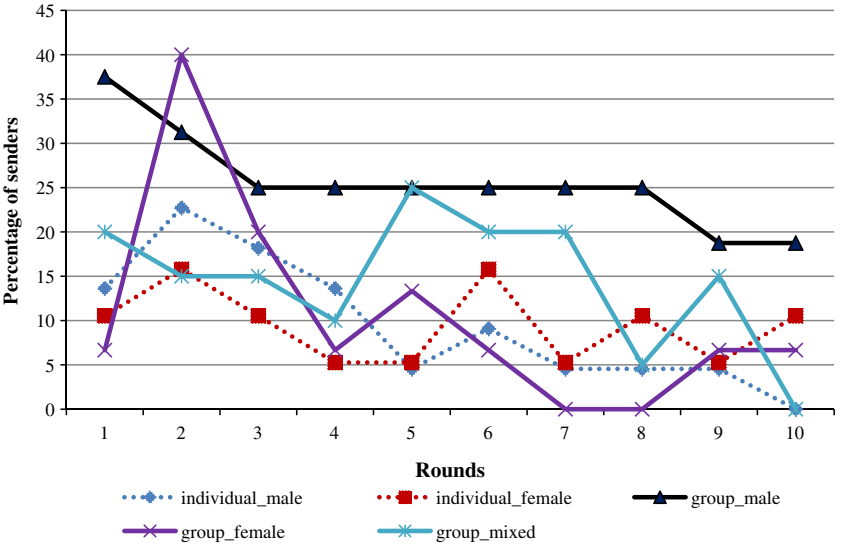

Fig. 3. Percentage of senders sending their entire endowment to the paired receiver.

Table 4
Ranksum tests on the amount sent broken up by gender.

	Male individuals		Male groups		Female groups		Mixed groups	
Female individuals	$z = 0.33$ $p = 0.74$	$z = -0.93$ $p = 0.35$	**$z = 3.54$** **$p < 0.01$**	$z = 0.35$ $p = 0.73$	**$z = -2.38$** **$p < 0.02$**	$z = 0.71$ $p = 0.48$	**$z = -2.67$** **$p < 0.01$**	$z = -0.66$ $p = 0.51$
Male individuals	–		**$z = -3.02$** **$p < 0.01$**	$z = -1.19$ $p = 0.23$	$z = -1.58$ $p = 0.12$	$z = -0.10$ $p = 0.92$	**$z = -1.97$** **$p < 0.05$**	$z = -1.65$ $p = 0.10$
Male groups	–		–		**$z = 2.34$** **$p < 0.02$**	$z = 0.90$ $p = 0.37$	$z = 1.86$ $p = 0.07$	$z = -0.29$ $p = 0.77$
Female groups	–		–		–		$z = -0.34$ $p = 0.73$	$z = -1.24$ $p = 0.21$

Note: The unshaded boxes report ranksum test results for round 1 while the shaded boxes report ranksum test results for round 10.

Table 5
Regression results for amount sent broken up by gender.

Amount sent	Random effects	Tobit	GMM
Lag amount sent	–	0.401*** (0.078)	0.319*** (0.067)
Round	−0.380*** (0.080)	−0.561*** (0.137)	−0.553** (0.255)
Male individuals	−2.457** (1.083)	–	–
Female individuals	−3.653*** (0.974)	−3.694*** (1.442)	−6.893** (3.071)
Female groups	−1.280 (1.175)	–	–
Mixed groups	−1.203 (0.993)	–	–
Round ∗ Male individuals	0.108 (0.115)	−0.162 (0.168)	0.114 (0.240)
Round ∗ Female individuals	0.264*** (0.099)	0.370* (0.207)	1.219*** (0.431)
Round ∗ Female groups	−0.069 (0.114)	−0.363** (0.177)	−0.039 (0.331)
Round ∗ Mixed groups	0.175 (0.126)	0.128 (0.154)	0.395 (0.332)
Lag earn	–	0.354*** (0.055)	0.254*** (0.037)
Constant	6.663*** (0.792)	8.463** (3.315)	2.257 (0.838)
R-squared	0.1101	–	–
P-value for Hansen test	–	–	0.826
P-value for second-order autocorrelation	–	–	0.367
Observations	920	828	828
Left-censored observations	–	361	–
Uncensored observations	–	358	–
Right censored observations	–	109	–

Standard errors are presented in parentheses.
*** Significance at 1% level.
** Significance at 5% level.
* Significance at 10% level.

average 14% of mixed-sex groups did the same per round. However, for male groups the fraction of senders sending their entire token endowment drops from nearly 40% in round 1 to 25% in round 3 but remains mostly steady after that. For mixed-groups this proportion decays much faster and becomes zero by round 10.

A Kruskal–Wallis test reports a significant difference between the amounts sent by each entity in the first round (chi-squared = 19.01, $p < 0.01$). But these differences disappear by the last round (chi-squared = 0.61, $p = 0.47$). Table 4 reports non-parametric ranksum tests on the population distribution between paired entities for round one and round 10. In round 1, (i) male groups are more trusting than male individuals, (ii) female groups are more trusting than female individuals while (iii) male groups are more trusting than female groups. There are no significant differences between male groups and mixed groups. Based on this table we can conclude that both male groups and mixed groups are the most trusting entities in round 1. However, by round 10 any early differences between the different entities have completely disappeared. Contrary to the findings of some earlier studies we do not find any significant differences between male and female individuals either at the beginning or at the end of the 10 period interactions.

Next we use regression analysis to study sender decisions disaggregated by the various entities. We adopt the same approach as that in Table 3. Column 2 of Table 5 reports a random effects regression where the dependent variable is the amount sent by each participant in each round. Independent variables include (1) *round*, (2) dummies for each separate entity – *male individuals, female individuals*, *female groups* and *mixed groups* with *male groups* being the reference category, and (3) *interaction terms* between round and dummies for the different entities.

On the basis of the random effect regression we can conclude the following: (1) the amount sent decreases over time for all entities. (2) In the first round male groups transfer significantly more than either male or female individuals. (3) While the ranksum test results presented in Table 4 suggest that female groups are less trusting in round 1, regression results find no significant differences in the amount sent by male, female or mixed-sex groups even in round one. (4) Wald tests report a significant difference between the female individuals dummy and the female groups dummy (chi-squared = 5.24, $p = 0.02$), and a significant difference between the female individuals dummy interacted with round and the female groups dummy interacted with round (chi-squared = 10.96 and $p < 0.01$). This suggests that female groups start off sending more than female individuals but the amount sent by the former decreases at a faster rate than female individuals.

Column 3 reports the results from the dynamic Tobit regression and column 4 reports those for the GMM regression. The dependent variable is the amount sent by each sender in each round. The independent variables are similar to the ones in the random effects regression except that in these two models we also include the lagged variables – *lag amount sent* and *lag earn*.

Both dynamic regressions report positive and significant estimated coefficients for the lagged variables – lag amount sent and the lag earning. As in the case of Table 3, this again suggests that amount sent and earnings in the previous round play an important role in determining amount sent in the current round.

On the basis of joint Wald tests for the various interaction terms we can say the following. It is clear that female individuals transfer less in the early rounds but over time the amounts transferred by the other entities decrease faster resulting in insignificant differences by round 10.[5] Thus the regression results basically confirm the non-parametric test results that while there are some early differences in the amounts transferred as described above these differences disappear by the last round.

[5] For the ease of exposition we have omitted the details of the joint Wald tests but they are available from the authors upon request.

Table 6
Summary statistics for receivers.

	No. of Participants	Average percentage returned	Average percentage returned in round 1	Average percentage returned in round 10
Individuals	41	24	21	18
Groups	51	25	30	24
Male individuals	22	19	14	14
Female individuals	19	31	31	22
Male groups	16	33	42	19
Female groups	15	20	28	17
Mixed group	20	25	25	30

On the basis of the evidence provided above, one can make the tentative claim that male groups appear to be the most trusting entity. Male groups are more trusting than male individuals while female groups trust more than female individuals. Male and female individuals do not differ significantly in their levels of trust. There is also very little difference in the decisions made by the groups whether single-sex or mixed-sex and other early differences dissipate over time.

3.2. Receiver behaviour

Result 3: *Individuals and groups reciprocate at the same level.*

To investigate reciprocity we look at the proportion returned by the receivers out of the amount sent to them. Table 6 provides an overview of the average proportions sent back by the receivers. Fig. 4 shows the average proportions returned over the 10 rounds for groups and individuals. Non-parametric ranksum test reports that there is no significant difference in the distribution of the proportion sent back by the receivers between individuals and groups.[6]

In Table 7 we report results from random effects, Tobit and GMM regressions. The dependent variable here is the percentage returned by the receiver. The random effects regression does not find any significant difference between the percentage returned by groups and individuals. However, when we introduce lagged values of the dependent variable as a regressor in the Tobit and GMM models, then these models suggest that groups are less reciprocal than individuals. However, it is also true that the coefficient of round interacted with group is positive and significant suggesting that the proportion returned by individuals decays faster than that returned by groups. We conclude that while there may be some differences in the patterns of reciprocity between groups and individuals, these differences do not seem very strong.

Result 4: (*a) Initially (i) female individuals are more reciprocal than male individuals; (ii) male groups are more reciprocal than male individuals; (iii) there are no significant differences between female groups and female individuals; (b) there are no significant differences in behaviour among any of the groups – male, female or mixed; (c) once again early differences disappear over time*.

Fig. 5 shows the proportions returned by breaking up the data for percentage returned by the different entities. It shows that female individuals and male groups send back a larger proportion in round 1–31% and 43% on average respectively – but over time this difference disappears. Between rounds 1 and 10, the proportion returned by mixed groups increases from 25% to 30% while the proportioned returned fall for all the other entities. Kruskal–Wallis test reports a significant difference in the population of the proportion returned between each entity in the first round (chi-squared = 9.18, probability = 0.06) however the test shows no significant difference in the proportion returned in the last round (chi-squared = 0.21, probability = 0.19). Table 8 reports non-parametric ranksum tests on the distribution of the proportion sent back by the receivers between paired entities. The findings reported in Table 8 are broadly summed up in the statement of Result 4.

Next, we investigate the pattern of the reciprocity across genders and groups by using random effects, Tobit and GMM regressions. Columns 2–4 of Table 9 report the results. Column 2 reports the results from the random effects regression where the dependent variable is the percentage returned by each participant in each round. Independent variables are similar to the ones used in the previous regressions and should be self-explanatory.

The random effects regressions are in line with the results from the non-parametric tests. (1) Female individuals returned significantly more than male individuals at the outset but the percentage returned by female individuals decreases at a faster rate over time resulting in the differences dissipating over time. (2) Male groups start out returning significantly higher than male individuals and the percentage returned decay faster for male groups over time. (3) Female groups start out returning significantly less than female individuals. (4) Mixed groups start out returning less than the other groups but over time mixed groups increase the percentage returned while this is decreasing for the other groups.

Columns 3 and 4 report the Tobit and GMM regressions. In these two dynamic regressions we include the lag dependent variable and only one dummy for the female individuals. The dynamic regressions corroborate the results of the random effects regression with one exception: they both suggest that female individuals are more reciprocal compared to the other entities. However, unreported Wald tests also suggest that the percentage returned by female individuals decreases at a faster rate over time.

On the basis of the above evidence, there is some evidence to suggest that at least early on female individuals are more reciprocal than male individuals as has been suggested by prior studies. Male groups appear more reciprocal than male indi-

[6] Ranksum test reports $z = -1.37$ and probability = 0.17.

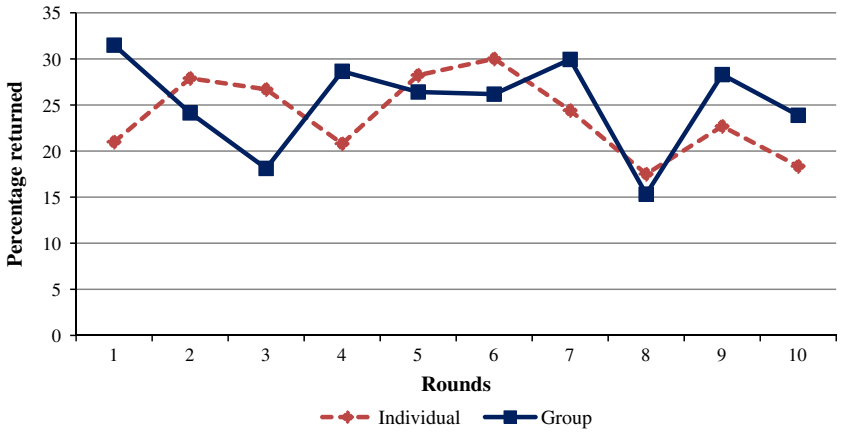

Fig. 4. Average percentage returned by individuals and groups.

Table 7
Regression results for percentage returned by individuals and groups.

	Random effects	Tobit	GMM
Lag percentage returned	–	0.255*** (0.083)	−0.033 (0.144)
Round	−0.864* (0.521)	−2.477*** (0.797)	−3.435∗ (1.774)
Group	−1.564 (5.916)	−19.261*** (7.378)	−49.686*** (17.307)
Round∗Group	0.381 (0.670)	2.370** (0.985)	4.907* (2.810)
Amount received	0.516 (0.315)	0.968** (0.414)	−0.206 (0.489)
Constant	25.763*** (5.267)	1.665 (6.841)	59.122*** (11.421)
R-squared	0.0270	–	–
P-value for Hansen test	–	–	0.931
P-value for second-order autocorrelation	–	–	0.432
Observations	541	450	450
Left-censored observations	–	156	–
Uncensored observations	–	283	–
Right censored observations	–	11	–

Standard errors are presented in parentheses.
*** Significance at 1% level.
** Significance at 5% level.
* Significance at 10% level.

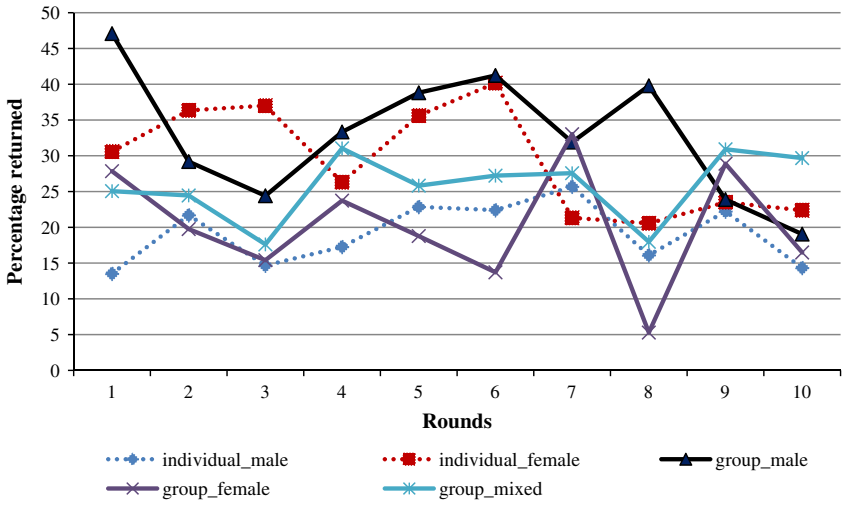

Fig. 5. Average percentage returned broken up by gender of individuals and groups.

Table 8
Ranksum tests on the proportion returned by receivers broken up by gender.

	Male individuals		Male groups		Female groups		Mixed groups	
Female individuals	***z* = −2.01** ***p* < 0.05**	$z = -1.27$ $p = 0.20$	$z = 0.81$ $p = 0.42$	$z = -1.1$ $p = 0.28$	$z = 0.23$ $p = 0.82$	$z = 1.49$ $p = 0.14$	$z = 0.46$ $p = 0.65$	$z = -0.64$ $p = 0.52$
Male individuals	–		***z* = −2.44** ***p* < 0.02**	$z = 0.22$ $p = 0.83$	***z* = −2.15** ***p* < 0.04**	$z = 0.16$ $p = 0.87$	***z* = −2.18** ***p* < 0.03**	$z = -1.65$ $p = 0.10$
Male groups	–		–		$z = 1.04$ $p = 0.30$	$z = -0.26$ $p = 0.79$	$z = 1.44$ $p = 0.15$	$z = -1.25$ $p = 0.21$
Female groups	–		–		–		$z = 0.10$ $p = 0.92$	$z = -1.94$ $p = 0.06$

Note: The unshaded boxes report ranksum test results for round 1 while the shaded box report ranksum test results for round 10.

Table 9
Regression results for percentage returned by receivers broken up by gender.

	Random effects	Tobit	GMM
Lag percentage returned	–	0.235*** (0.085)	−0.213 (0.130)
Male individuals	−19.849* (10.644)	–	–
Female individuals	−0.1766 (12.752)	26.807*** (8.797)	95.893** (38.194)
Female groups	−17.225 (10.855)	–	–
Mixed groups	−17.179* (10.389)	–	–
Round	−1.811* (1.054)	−1.439 (1.003)	2.885 (3.532)
Round * Male individuals	1.989* (1.181)	1.171 (1.165)	−2.188 (3.700)
Round * Female individuals	−0.404 (1.347)	−2.124 (1.418)	−10.413 (6.633)
Round * Female groups	1.149 (1.265)	0.147 (1.212)	2.214 (4.592)
Round * Mixed groups	2.056* (1.180)	2.146* (1.099)	−3.209 (4.809)
Amount received	0.601* (0.316)	1.067** (0.412)	−0.335 (0.539)
Constant	36.997*** (9.872)	−15.643*** (5.679)	15.139 (7.258)
R-squared	0.0604	–	–
P-value for Hansen test	–	–	0.881
P-value for second-order autocorrelation	–	–	0.989
Observations	541	450	450
Left-censored observations	–	156	–
Uncensored observations	–	283	–
Right censored observations	–	11	–

Standard errors are presented in parentheses.
*** Significance at 1% level.
** Significance at 5% level.
* Significance at 10% level.

viduals. But once again we do not find any significant differences in group behaviour whether single-sex or mixed-sex. And once again early differences disappear over time.

4. Concluding remarks

In this paper we explore whether the behaviour of single-sex and mixed-sex groups differ from the behaviour of individuals of the same sex. At the level of the individuals our results provide some corroboration of earlier findings that female individuals are more trustworthy than male individuals but we not find significant differences in the levels of trust between male and female individuals. However, the majority of earlier studies that look at this issue do so using one-shot plays of the game. Our results suggest that while differences may show up in such one-off plays, these differences at the level of individuals do tend to dissipate over time. Chaudhuri and Sbai (2011) also reach a similar conclusion.

Next, we look at the difference between individual and group behaviour. More specifically we focus on the behaviour of single-sex groups for reasons explained in the introduction. We find that there are little or no differences in the behaviour of male or female groups (or mixed groups for that matter). Thus any gender differences that might exist between males and females at the individual level do not carry over to the behaviour of groups of two males and two females.

We feel that there are at least three insights arising from this study. First, earlier studies that report gender differences between trust and trustworthiness on the basis of play in one-shot game may actually be over-stating these differences. It is clear that with repeated play and learning early differences disappear. Therefore, to the extent that many, if not most, interactions in day-today life are in the nature of repeated interactions, even if there are some gender differences in behaviour initially, such differences would not persist over time.

Second – and probably more importantly for the purposes of this current study – it is also clear that even if there exist gender differences at the level of individuals (at least in one-shot plays or early on in repeated interactions), we do not find

any significant differences between single-sex or mixed sex groups. This suggests that groups of individuals who have the opportunity to discuss about the task at hand make decisions that are similar regardless of the gender composition of the relevant group.

Finally, while we do find some early differences in trust between groups and individuals we do not find significant differences in reciprocity between the two. Furthermore, even the early differences in trust dissipate over time so that groups and individuals behave in a similar manner towards the end of the session. Our results are broadly similar to those reported by Cox (2002) who also fails to find significant differences while they are different from Kugler et al. (2007) who report that groups are less trusting. There are multiple differences in the experimental designs of the three studies making comparisons difficult. Kugler et al. use a between-subjects design where participants play either as part of a group or as an individual. In Cox the design is within-subjects with participants first playing as individuals and then as group members. Clearly there is greater scope for learning and transfer across the treatments in Cox than in Kugler et al. and in that sense there is greater similarity between our design and that of Cox. This probably explains why both our study and that of Cox do not find significant differences between individual and group behaviour.

Of course, our paper looks at only one particular game involving an aspect of trust and reciprocity. We do not look at the issue of corruption which we use as a motivating example. But given the widespread interest in differential outcomes for men and women in the work-place as well as gender differences in economic transactions, it is probably worthwhile examining such individual and group level gender differences in other games and other contexts. We leave that for future research.

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Appendix A

Participant ID _____
Password _____

General Instructions

Welcome. The University of Auckland has provided funding in order to conduct this research. The instructions are simple. If you follow them closely and make appropriate decisions, you may make an appreciable amount of money. For this experiment all earnings are denoted in experimental dollars. At the end of the session you will be paid your earnings in cash at the rate of 10 experimental dollars = NZ $1. This money is in addition to the $5 show-up fee that you get.

The experiment will be conducted using computers. In a minute we will give you the instructions for logging into the experiment.

This experiment consists of 10 rounds.

Please do not talk at any point during the experiment.

[For groups we add the following paragraph:

For this experiment you are going to take part in pairs. These pairs will consist of either two males or two females or one male and one female. In a minute we will pair you up with another participant in the room. You will then login into one computer and make all your decisions together. Each you will be separately paid the same amount that is earned by your group. As you discuss your decisions with your group member, we ask that you speak softly so that other groups around the room cannot hear what you are discussing. There is no audio or video-taping of your discussion involved.]

Login Instructions

- Login to the computer (using your user name and password).
- Check that you are logged into your Net Account.
- Open Internet Explorer.
- Enter the following web address and press enter:
  http://veconlab.econ.virginia.edu/login.htm.
- The "Veconlab Participant Login Screen" screen should be displayed.
- Click on 'Login'.

- The 'Veconlab: Enter Session Name' screen should be displayed.
  Enter the Session Name: aicXX. Click on 'Submit'.
- The 'Veconlab Participant Login' screen should be displayed.
  Fill in the boxes. Click on 'Continue'.
- The computer will assign you a Participant ID Number. Please write down your ID number and Password at the top of the page of your instructions in the space provided. It is important that you remember the password! This password will help us to go back and retrieve your data should you happen to close the browser window by mistake during the session.
- Please follow the instructions displayed on screen.

Specific Instructions

Rounds and Matchings: The experiment consists of a number of rounds. Note: In each round, you will be matched with another person selected at random from the other participants. There will be a new random rematching each round.

Interdependence: The decisions that you and the other person make will determine the amounts earned by each of you.

Pass/Keep Decisions: One of you will be designated to move first, and that person will begin by receiving a specified amount of money $10.00. The first mover will decide how much money (if any) to pass onto the other person and how much (if any) to keep. All money passed gets multiplied by 3 before it is received by the second mover, who then decides how much (if any) to keep and how much (if any) to pass back to the first mover. These pass/keep decisions determine earnings for the round, as explained below.

Role: You have been randomly assigned to be a first mover, and you will begin each round with an amount of money, $10.00. You will decide how much to keep and how much to pass. All money that you pass to the second mover is multiplied by 3, and the second mover then decides how much of this to pass back to you.

Earnings from Pass/Keep Process: You earn the amount kept initially plus the amount that is passed back by the second mover. The second mover earns the amount kept at this stage.

Fixed Payments: In addition to what is earned (if any) from the pass/keep process, the first mover will receive an amount $0.00, and the second mover will receive an amount $10.00. These fixed payments are received each round, irrespective of the outcome of the pass/keep process for that round.

Cumulative Earnings: The program will keep track of your total earnings for all rounds, and these will be shown as "cumulative earnings" on a results page.

Matchings: At the beginning of each round, there will be a new random pairing of all participants, so the person who you are matched with in one round may not be the same person you will be matched with in the subsequent round. Matchings are random, and you are no more likely to be matched with one person than with another.

Decisions: The first mover begins each round with $10.00 and must decide how much (if any) to keep and how much (if any) to pass. What is passed gets tripled before being received by the second mover. The second mover in each pair then decides how much (if any) to keep and how much (if any) to pass back.

Earnings: The first mover earns the amount kept initially plus the amount passed back. The second mover earns the amount kept in the second stage. In addition to what is earned (if any) from the pass/keep process, the first mover will receive an amount $0.00, and the second mover will receive an amount $10.00.

Rounds: There will be a number of rounds, with random rematchings in each one.

Special Earnings Announcement: Your cash earnings will be 10% of your total earnings at the end of the experiment.

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