Familiarity and Trust:

An experimental investigation

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Abstract

In Zimbabwe, people in resettled villages trust each other less than people in non-resettled villages. This does not appear to be due to differences in socially transmitted rules of behaviour. Further, there are good reasons to believe that it is not due to the self-selection of a particular type of person into resettlement. Rather, the variations appear to be due simply to a lack of familiarity and to the consequentially greater uncertainty faced by resettled villagers when trying to predict each other's behaviour in strategic situations.

1. Introduction

Between independence and 1997 approximately 71,000 Zimbabwean households were resettled onto land previously farmed by commercial farmers under the Rhodesian government. The majority of these households were resettled into villages made up of strangers, a very different environment from the more traditional sub-Saharan villages from whence they came and within which ties of kinship and friendship abound. This programme of land reform provides us with a rare opportunity to investigate the effects of a major social disruption on levels of trust. As Arrow (1972, 1974) and Fukuyama (1995) have argued and Knack and Keefer (1997) and LaPorta, Lopez-de-Silanes, Shleifer and Vishny (1997) have shown, greater trust is associated with better economic outcomes. Hence, at a time when land reform is high on many developing countries' policy agendas it is appropriate to ask whether and why trust is eroded by such processes.

Here, these issues are investigated by using the Zimbabwean resettlement exercise as one dimension in an experimental design. The specific question addressed by the experiment is whether and why resettlement in the manner described above leads to a persistent reduction in trust. The experiment involved the investment game originally designed by Burg, Dickhaut and McCabe (1995). In addition, an ultimatum game was played in order that behavioural rules relating to sharing and fairness, which may have a bearing on reciprocating behaviour, could be investigated. The games were played by two subject pools, one of villagers resettled shortly after independence, and one of villagers who were not involved in the resettlement programme.

The investment game, designed by Berg *et al*. (1995), investigates trust and reciprocity in the context of an investment decision. In this game both players are given a sum of money. The first player has the option of giving some of his/her money to the second player, i.e., of making an investment. Whatever he/she chooses to invest is tripled before being given to the second player. The second player then has the option of giving some portion of the tripled amount back to the first player. The one-shot nature of the game combined with player anonymity removes the possibility that reputation mechanisms based on repeated interactions, contractual pre-commitments and potential threats of punishment are generating the results. In this context, trust takes the form of an expectation based on a limited information set about another person's disposition. Berg *et al*. (1995) found that observed outcomes vary from the prediction of the unique sub-game perfect equilibrium. The majority of first players gave some amount greater than zero to the second players and in a large proportion of cases the second players gave something back.

Glaeser, Laibson, Scheinkman, and Soutter (1999) recently conducted an experiment involving a similar although not identical game and in which the players, Harvard undergraduates, were not anonymous to one another. In so doing they found that greater social connection led to larger investments by first players. They interpreted this result as evidence that the greater the potential for post play punishment the more trusting players became. The Glaeser *et al*. (1999) experiment and their underlying definition of trust differ from that of Berg *et al*. (1995). Even when the two players were strangers the likelihood of post play punishment would not have been zero. A variable element of what Yamagishi and Yamagishi (1994) call 'assurance', Shapiro, Sheppard and Cheraskin (1992) call 'deterrence-based trust', and Hardin (1991) calls 'encapsulated self-interest' would have always been present.

In Zimbabwe the one-shot, anonymous nature of the original Berg *et al*. (1995) game was maintained. Hence, the element of assurance in the Glaeser *et al*. (1999) game was not present in Zimbabwe. This notwithstanding an element of social connection was present in the Zimbabwean game that was not present in the Berg *et al*. (1995) game; the players were told that they were paired with people from their own village. Thus, while they did not know the identity and hence the specific behavioural characteristics of their playing partners they may have had some idea about the distribution of behavioural characteristics across the population from which they were drawn.

In the ultimatum game one player is given a sum of money and asked to divide it between him/herself and the second player. The second player can either accept, in which case each player receives their share in accordance with the first player's decision, or refuse, in which case neither player receives anything. Without exception experimenters have found that observed outcomes in this game vary significantly from the prediction of the unique sub-game perfect equilibrium, in which first players receive most or all the wealth and pareto-inefficient rejections by second players do not occur (Guth and Tietz (1990), Roth (1992)). Roth, Prasnikar, Okuno-Fujiwara, and Zamir (1991) sought to understand the nature of this out of equilibrium behaviour through a cross-cultural experiment. They found variations in behaviour between cultures and evidence that these variations were due to differences in socially transmitted behavioural rules rather than variations in 'aggressiveness', reinterpreted here as the willingness to risk rejection. More recently Henrich (1998) found a qualitatively similar but much larger difference in behaviour between the Machiguenga of the Peruvian Amazon and US undergraduates. In Zimbabwe, as in the investment game, the players in the ultimatum game knew that they were paired with people from their own village.

The behaviour observed in resettled and non-resettled villages in the context of these two games was as follows:-

1. **Investment game**: (a) In both subject pools the observed outcome deviated from the sub-game perfect equilibrium. On average first players invested more than zero and the second players gave more than zero back. (b) In both subject pools the proportion given back by the second players did not depend on the amount invested by first players. (c) On average, resettled first players invest significantly less, i.e., they are significantly less trusting. (d) In contrast, there was no discernible difference in the proportions given back by second players, i.e., there was no less reciprocity in resettled villages.
2. **Ultimatum game**: (a) In both subject pools the observed outcome deviated from the sub-game perfect equilibrium. On average first players offered more than zero to the second players. In addition, pareto-inefficient rejects are observed in both subject pools. (b) In both subject pools, one distinct modal offer corresponding to the 50-50 or fair division of the money is observed. (c) In both subject pools the probability that an offer will be rejected is greater than zero for all less than fair offers and is inversely related to offer size. (d) Resettled first players are significantly less likely to make a less than fair offer. (c) Due to the small number of rejected offers it is not possible to establish with any certainty whether either the overall rate of rejection or the rate of rejection for given offers varies between the two subject pools.

Whilst there remains some ambiguity in the case of second players' behaviour in the ultimatum game, in general, these results are consistent with there being no differences

in socially transmitted behavioural rules between the two subject pools. They are also consistent with the hypothesis that resettled villagers are neither more nor less altruistic than non-resettled villagers. Finally, they are consistent with the hypothesis that resettled villagers behave more cautiously in strategic situations because they know each other less well and so face greater uncertainty when predicting each other's behaviour. The experiment was designed to control for a variety of other factors that might lead to observed variations in behaviour between the two subject pools (see Section 2). This notwithstanding several factors were allowed to vary. To ensure that these variations were not driving the main results (see Sections 3.1 and 3.2), econometric techniques were employed to control for them *ex post* (see Section 3.3). There is an issue of self-selection bias that cannot be tackled using the available data. However, it is more likely that the bias be acting to suppress rather than create the observed variations in behaviour (see Section 3.4).

2. Experimental Design

2.1 Sample design

The households from which the players in each of the subject pools originate are participants in an on-going monitoring exercise designed to assess the effects of resettlement in Zimbabwe. The experiment involved between 8 and 40 households in each of 22 resettled villages spread across three resettlement areas, each area having very different agro-climatic characteristics. The non-resettled control group contained between 16 and 24 households in each of 6 villages. These villages are situated on or close to the boarders of the resettlement areas (2 for each area) to control for agro-climatic factors. In two out of the three resettlement areas the monitoring exercise involves all the households in each of the randomly selected villages. In the third resettlement area and in the 6 non-resettled villages a random sample of households is involved.

Each household was asked to send one adult (above the age of 14) volunteer to the experimental session in their village. The chairman or headman of each village was charged with the duty of ensuring both that the volunteers arrived at the session and that between 40 and 60 percent of the volunteers were women. Approximately half of the volunteers (53 percent in the resettled villages and 51 percent in the non-resettled villages) were heads of households. Each volunteer played one or other game and was either a first or second player. Allocations of games and roles were determined randomly prior to the start of each session. In 16 of the 28 villages both games were played. In the remaining 12 the number of households in the monitoring exercise and hence the number of volunteers was less than 18 and so only one game selected at random was played. The investment game was played by 109 pairs in resettled villages and 32 pairs in non-resettled villages. The ultimatum game was played by 86 pairs of players in resettled villages and 31 pairs in non-resettled villages.

2.2 Procedural design

Experimenters working in developing countries, especially in rural areas, usually find it necessary to adopt procedures that deviate significantly from those typically employed in the US. This is made necessary by the generally low level of education and the potentially high incidence of illiteracy among subjects and the consequent need

to test the understanding of each subject verbally before they play. I adopted a procedural design similar to Henrich's (1998) to deal with these problems. During a pilot in three villages a script for each game was developed in Shona, the local language in all the villages (English translations of full scripts contained in Appendix I).[1] Each script contained three components: a detailed and repetitive description of the game; a set of examples and questions showing how particular combinations of decisions yield particular pay-offs for each player; and, for second players only, a description of what their corresponding first players had decided to do. For the ultimatum game the same set of examples was used for each player, while for the investment game one set was used for all first players and another for all second players. The sets were designed to demonstrate the key features of the games, while minimising the extent to which players might be led to behave in certain ways.

Once the pilot was over the scripts were adhered to in every session. When players had questions, the relevant part of the script was repeated. Players who could not demonstrate that they understood the games were not allowed to play. The need to test players' understanding verbally rendered a double blind procedure impractical. Hence, potential subject-experimenter effects need to be considered.[2] It is quite possible, for example, that the relatively large amounts invested by first players and returned by second players as compared to the US undergraduates observed by Berg *et al*. (1995), reflect the presence of such effects in the Zimbabwean experiment. To minimise the likelihood of subject-experimenter effects leading to observed differences in behaviour between the two Zimbabwean subject pools great care was taken to follow the same procedure with each player. To the extent possible even hand movements were standardised. This notwithstanding different subject-experimenter effects on male and female players could have biased the results.[3] While the proportion of females drawn from each subject pool remained within the prescribed limits, there was some variation: 44 and 56 percent of players were female in resettled and non-resettled villages respectively. Econometric methods were used *ex post* to control for this possible source of bias.

In each session the players of both games were gathered together. Then one by one they were called to meet with the experimenter and a Shona-speaking research assistant (RA) in private. In the first pilot village the private meetings took place in a hut. However, in some villages the players felt that if a hut was used it would be too easy for unobserved eavesdroppers to overhear the discussion. In these instances a table, chairs, and screens hiding both the player's and the experimenter's hands were set up some distance from the waiting players in an area where eavesdroppers could be seen and asked to go away before they had learnt anything. Special measures were taken to prevent subject contamination. Prior to their individual meetings with the experimenter and RA, the players were told nothing about what they were going to do save that they

[1] Data from the pilot villages (28 pairs of players, 17 from resettled villages, 11 from non-resettled villages, 16 playing the investment game, 12 playing the ultimatum game) has been included throughout the analysis. Excluding these observations from the analysis does not alter any of the conclusions.

[2] Hoffman *et al*. (1994) provide evidence that subject/experimenter anonymity affects behavior. However, Roth (1995) reviews several other studies that report the opposite.

[3] Eagly and Crowley (1986) found that subject-experimenter effects can differ for men and women.

would be playing games and could win some money. In addition, an appointed monitor was charged with the duty of preventing those who had already played returning to the group who had not yet played. There was an additional risk of contamination between villages in the few instances were they were close to one another. In these cases, the experimental sessions were held on the same or consecutive days. Interviews with all the players and some non-players indicated that between-village contamination was not occurring. Finally, there were concerns that in the villages where relatively few players were involved in the games the sense of anonymity felt by the players might be partially compromised.[4] While no experimental solution could be applied to this problem, econometric methods were used *ex post* to control for this possibility.

The ultimatum game was played with an initial stake of Zim$50 supplied to the first player as ten Zim$5 bills.[5] In the trust game each player was given Zim$20, supplied as four Zim$5 bills. These stakes were set to yield an average winning of approximately half a day's casual wage. Used rather than new Zim$5 bills were provided to the players throughout the experiment for two reasons. First, new bills are rarely seen in the areas where the experiments were being conducted and it was feared that their presence might affect play. Second, the supply of new Zim$5 bills was limited and uncertain and it could have gravely affected the results had it become necessary to change from new to used bills half way through the experiment.

3. Results

3.1 Village-level trust and reciprocity in the context of an investment decision

Berg *et al*. (1995) found that a significant proportion of first players invest more than zero. They interpreted this result as evidence that trust exists even in the absence of reputation mechanisms, contractual pre-commitments and potential threats of punishment. The results of the Zimbabwean experiment are similar. In both subject pools less than 10 percent of first players made an investment of zero. This result could be seen as lending further support to the conclusion drawn by Berg *et al*. (1995). However, both sets of results could also be explained by altruism, defined here as being unconditional other-regarding behaviour, while trust is conditional on there being an expectation of reciprocity and trustworthiness is conditional on having been trusted.

The distribution of investments made by the first players in both the subject pools are depicted in Figure 1 and corresponding descriptive and test statistics are reported in Table 1. While the mode investment is Zim$10 in both subject pools, only in resettled villages is the distribution of investments skewed to the left. This is reflected in the means which are Zim$8.03 and Zim$10.47 for resettled and non-resettled villages respectively. According to a t-test, in which the variances of the two distributions are assumed equal (p-value for Levine's test for equality of variance is 0.50), this difference is significant at the 0.02 level. An Epps-Singleton test indicates that the difference in the distributions is significant at the 0.001 level.

The variation in first players' behaviour between the two subject pools could be due to a difference in levels of altruism. There are two possible variants of this hypothesis.

[4] Hoffman *et al*. (1994) show that reduced subject/subject anonymity leads to greater observed generosity.

[5] The exchange rate at the time of the experiments was Zim$37.95 per US$.

(1) There could be a lower level of altruism in resettled villages due to the social disruption associated with resettlement, i.e, due to the reduced density of kinship ties and the, at least initially, lower density of friendship ties. Alternatively, (2) less altruistic people could be more likely to resettle, perhaps to get away from friends and relatives. In either case we would expect to see the difference similarly reflected in the behaviour of second players; where first players invest less, second players should also return less.

Alternatively or additionally the investments by the first players may reflect their expectations about what their fellow villagers will do when placed in the role of second player, the more they trust them to reciprocate the more they will invest. Bearing this in mind, there are several other hypotheses as to why levels of investment differ between the two subject pools. (3) Average levels of reciprocity could be lower in the resettled villages either because differences in the behavioural rules relating to reciprocity or differences in levels of adherence to those rules have emerged since resettlement. Alternatively, (4) average levels of reciprocity could be lower in resettled villages because less reciprocating people are more likely to resettle. (5) There could be a greater variation in levels of reciprocity within resettled villages, perhaps because the inhabitants tend to come from a wider variety of backgrounds. This would add to the uncertainty faced by first players and, assuming that they are risk averse, cause them to be more cautious in their investment decisions. (6) Independent of their being any real difference in the distribution of reciprocal behaviour between the two subject pools, players in resettled villages may ascribe a greater variance to their expectations of reciprocity on the part of their fellow villagers because they have less experience of each other in strategic situations. Hence, the difference in variance is perceived as opposed to actual. Finally, (7) independent of their being either a real or a perceived variation in reciprocal behaviour, players in resettled villages could be more risk averse. This would occur if there was a tendency for more risk averse people to resettle.

The responses made by the second players are depicted in Figure 2 and corresponding descriptive and test statistics are reported in Table 2. The responses are presented as proportions or multiples of the amounts invested by the first players. Before comparing the two subject pools, note that there are three modes in the distribution. The modes appear at zero, which corresponds to returning nothing, one, which corresponds to returning the amount invested, and two, which corresponds to dividing the total amount of money in the game equally. This tri-modal distribution is not present in the Berg *et al*. (1995) data, which has a mode at zero only. Glaeser *et al*. (1999) find a single mode at one. However, the mathematics of their game are such that there may be a confounding of fairness and trustworthiness at some investment levels.

The results provide no evidence of a variation in the distribution of responses between the two subject-pools. In both, the dominant mode is at one and a similar proportion of second players (72 and 70 percent in resettled and non-resettled villages respectively) returned at least this amount. Further, in both resettled and non-resettled villages second players returned an average of 1.28 times the investment made by first players. There is a difference in the standard deviations of second players' responses between the two subject pools but it is not statistically significant. Finally, an Epps-Singleton test provides further evidence that second players' behaviour does not vary between the two subject pools.

This absence of variation in the second players' behaviour indicates that we should reject hypotheses (1) and (2). While the behaviour of both first and second players may, in part, be driven by altruism, there is no evidence that differences in altruism are accounting for the variation first players' behaviour. The absence of variation in the second players' behaviour also suggests that we should reject hypotheses (3), (4), and (5). Resettled villagers appear to be no less reciprocating and no more varied in terms of their levels of reciprocity. Counter to hypotheses (3) and (4), one might be tempted to argue that the combination of lower investments by first players and not lower responses by second players indicates that levels of reciprocity are in fact higher in resettled areas. However, this argument is based on the assumption that *ceteris paribus* higher levels of trust are rewarded with greater reciprocity, for which there is no supporting evidence. In neither the original experiment by Berg *et al*. (1995) nor the Zimbabwean experiment was a correlation found between the amount invested and the proportional response. The significance level of the correlation coefficient in the Zimbabwean case is 0.97. In the Glaeser *et al*. (1999) game a positive correlation was found and interpreted as evidence of punishment or spite by second players towards first players who made low offers. However, this interpretation is surprising if one considers the mathematics of their game. A fair split of the total money involves a lower proportional response for low investments and a higher proportional response for high investments. Indeed, as the authors themselves point out, when investments are below US$5, even if the second player returns nothing the total money in the game is divided in favour of the first player. This suggests that the lower proportional responses for lower investments might be motivated by fairness rather than spite or a desire to punish.

Finally, we are left with hypotheses (6) and (7). The lower level of trust observed in resettled villages is due either to less familiarity and consequently greater uncertainty, or to greater risk aversion on the part of resettled villagers.

3.2 Bargaining behaviour and behavioural rules relating to sharing and fairness

In the ultimatum game, once again, the sub-game perfect equilibrium was rarely observed (see Figure 3 and Table 3). In resettled villages no first players offered zero, only two (2.3 percent) players made the lowest possible positive offer of Zim$5, and one of these offers was rejected. In non-resettled villages one (3.2 percent) first player offered zero and was accepted, while one offered Zim$5 and was rejected. In both subject pools the mode offer was Zim$25, i.e., 50 percent of the original stake. The dominance of this mode is striking, with 69 and 55 percent of first players in resettled and non-resettled villages respectively making such offers. Evidence of a variation in first players' behaviour between the two subject pools is mixed. More super-fair offers combined with a relatively low tendency to make less than fair offers led to a mean offer of Zim$22.67 in resettled villages compared to a mean of Zim$20.32 in non-resettled villages. According to a t-test, in which equal variances are not assumed (p-value for Levine's test for equality of variance is 0.07), the difference between these means is statistically significant at the 0.10 level. However, the t-test may be inappropriate in this context as the underlying distributions may not be continuous. With this in mind, two tests reflecting the discreteness of the distributions were performed. An Epps-Singleton test suggests that there is no variation in first player behaviour between the two subject pools, while a Chi-squared test, based on the proportion of

first players from the two subject pools who made less than fair offers yields a statistic that is significant at the 0.08 level. These mixed results can be reconciled as follows: while the 50-50 split is the dominant and possibly the only behavioural rule relating to sharing in both subject pools, there is a tendency for some players to deviate from this rule by offering less and that tendency is greater in non-resettled villages.

Roth *et al*. (1991) argued that offers in ultimatum games vary between subject pools because either behavioural rules vary or the willingness to risk rejection varies. In the case of the former higher average offers do not lead to lower overall rejection rates, while any given offer is more likely to be rejected. In the case of the latter higher average offers do lead to lower overall rejection rates, while any given offer is equally likely to be rejected. The data on first players' behaviour favoured the latter explanation. Sadly our ability to confirm this conclusion by identifying the prescribed pattern in rejection rates is hampered by the low overall number and rate of rejections (see Figure 4 and Table 3). The overall rates of rejection are 7 percent (6 out of 86) and 10 percent (3 out of 31) in resettled and non-resettled villages respectively. The rates increase to 25 and 21 percent respectively for offers under Zim$25 and to 50 percent in both subject pools for offers under Zim$10. One of the more striking results is the greater than zero likelihood of offers as high as Zim$20 (40 percent of the total stake) being rejected in both subject pools. These results indicate neither a variation in the overall rejection rate nor a variation in rejection rates for given offers. Further, while they must be viewed with some caution, both a Chi-squared test (see Table 3) and probit analyses (see Table 4) ran on the full sample of 117 second players' responses (9 rejections, 108 acceptances) and the sub-sample of responses by second players facing offers of less than Zim$25 (9 rejections 29 acceptance) provide similarly unsatisfactory results.

While the ambiguity surrounding the behaviour of second players is frustrating, the results of the ultimatum game do provide some additional insight relating to the hypotheses listed above. Resettled first players invest less in the investment game, but are more likely to make a fair offer in the ultimatum game. This pattern of behaviour is inconsistent with hypotheses (1) and (2) both of which state that resettled villagers are less altruistic, but is consistent with hypothesis (6), that variations in first players' behaviour reflect the degree of uncertainty they face, and (7), that they reflect variations in their levels of risk aversion. The less risky strategy in the ultimatum game is to make a fair offer, while in the investment game it is to invest less.

3.3 Controlling for other factors

At several points in the preceding text factors other than resettlement that might affect player behaviour have been mentioned. These include the number of players in a session and whether the players are men or women. In addition, recall that the experimental subjects inhabit three agro-climatic regions. Agro-climatic factors are among the most important exogenous determinants of income in Zimbabwe. Thus, controlling for region will at least partially control for income effects. It may also control for regional variations in socially transmitted behavioural rules.

The investigation involves a series of simple regressions (see Table 5). First, the two behavioural variables from the investment game, investments by first players (*invest*) and proportional responses by second players (*response*) are regressed upon a dummy that takes the value one for resettled players and zero otherwise (*resettled*)

using ordinary least squares. Then a dummy that takes the value one for female players and zero otherwise (*female*), the number of players involved in the session each player attended (*session*), and two regional dummies (*agroclim2* and *agroclim3*) are added to the right-hand side and the effect on the significance and magnitude of the coefficient on *resettled* monitored. For the ultimatum game, a similar procedure is followed, although the dependent variable is a dummy variable that takes the value one for offers of Zim$25 or above and zero otherwise (*fairoffer*), and a probit is fitted. Finally, where *response* is the dependent variable the regressions are also run with *invest* as an additional right-hand side variable.

When the dependent variable is either *invest* or *fairoffer* the introduction of the additional variables has little effect on the significance or the magnitude of the coefficient on *resettled*. When *response* is the dependent variable *resettled* remains insignificant. These results support earlier conclusions, while the inclusion of the additional right-hand side variables reveals some interesting patterns in the data. Both *invest* and *response* are lower in agro-climatic regions 2 and 3 than in region 1 (there is no significant difference between regions 2 and 3) and *response* is lower for female players and players in larger sessions.[6]

Correcting the standard errors in the regressions for heteroscedasticity using White's (1980) procedure affects the significance of some of the coefficients but does not alter the main conclusions (see Appendix II). Similarly, correcting for the possibility that error terms are correlated within villages because fellow villagers share unobservable characteristics leaves the main conclusions unaltered.

Several other variables were entered as right-hand side variables in the estimated equations but were found neither to be significant nor to affect the results relating to the *resettled* dummy. These other variables included a dummy for household heads and a series of interaction terms between *resettled* and the agro-climatic dummies.

3.4 Discerning between variations in familiarity and risk aversion and the issue of self selection

The empirical analysis leaves two competing hypotheses, that variations in trust are due to differences in either the familiarity between villagers or their levels of risk aversion. The first of these explanations is synonymous with there being an effect of resettlement on economic behaviour, while the second depends on a particular type of person being more likely to resettle.

What sort of people do we expect to find in a resettled village? The resettled subject-pool was made up of households that were resettled shortly after independence in 1982. They were among the first to resettle at a time when little was known about what the government had in store for resettled families. All of these households chose to resettle. Some were escaping landlessness, others the horrific memories associated with the struggle for independence. Some squatted before being officially resettled, while the majority awaited the government's approval. Whatever the reason for seeking resettlement it is safe to assume that there were many more households in similar situations who did not. They would have sought land through traditional channels and

[6] The probit analyses for the rejection of offers in the ultimatum game was similarly augmented. None of the additional variables where significant and the results relating to resettlement remained ambiguous.

coped with their horrific memories in traditional ways. The factor most likely to influence a decision between the traditional and familiar on the one hand and the new and unknown on the other is the level of risk aversion. We would expect less risk averse people to have chosen resettlement. But, this cannot account for the observed pattern of behaviour. If we assume no difference in levels of uncertainty, then the observed variations are consistent with resettled villagers being more not less risk averse. If the self-selection bias described here does exist it will be acting to suppress rather than induce the observed variations in behaviour.

4. Conclusions

The results presented above provide no evidence of differences in socially transmitted rules of behaviour between resettled and non-resettled villages in Zimbabwe. Further, despite the relatively low density of kinship and initial friendship ties, there is no evidence of a difference in altruism between resettled and non-resettled villages. While problems of small sample size prohibit the drawing of conclusions from the behaviour of second players in the ultimatum game, the behaviour of both first and second players in the investment game and first players in the ultimatum game is consistent with these conclusions. Their behaviour is also consistent with the hypothesis that resettled villagers are less familiar with one another and so face greater uncertainty when predicting each other's behaviour. In addition it is consistent with there being a greater level of risk aversion in resettled areas. Although the absence of any data on risk aversion renders it impossible to distinguish between these two explanations formally, consideration of the process by which some households became resettled and others did not tends to rule out this second explanation. We would expect resettled villagers to be less rather than more risk averse.

Thus, we can tentatively conclude that resettlement into villages of relative strangers leads to a reduction in within-village familiarity and thus greater uncertainty and less trust in strategic situations. To the extent that this reduced familiarity is due to the lower density of kinship ties, it may persist, indeed it has already persisted for 17 years, and may only be restored by intermarriage. Finally, within the context of the experiment this reduced familiarity led to less investment. If this effect on behaviour is also manifest in everyday life, it could have important implications. Where trust is low more complex and potentially more costly institutional arrangements are required to keep transactions costs to acceptable levels. If such institutional arrangements are not forthcoming resettled villagers may have to suffer the consequences of reduced investment.

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Table 1. First Player Behaviour in the Investment Game

	Non-resettled Villages	Resettled Villages
Number of playing pairs	32	109
Stake size (Zim$)	20	20
Sub-game perfect equilibrium plays		
(number of pairs)	2	10
(proportion of pairs)	0.06	0.09
Mode investment		
(Zim$)	10	10
(proportion of stake)	0.50	0.50
Mean investment		
(Zim$)	10.47	8.03
(proportion of stake)	0.52	0.40
Standard deviation of investments (Zim$)	5.44	4.57
Levene's test for equality of variance in investments (p-value)	0.504	
t-test for equality of mean investments, equal variance assumed (p-value)	0.012	
t-test for equality of mean investments, equal variance not assumed (p-value)	0.026	
Epps-Singleton test for equality of distribution (p-value)	0.000	

Table 2. Second Player Behaviour in the Investment Game

	Non-resettled Villages	Resettled Villages
Number of responding second players *	30	99
Dominant mode response (expressed as a proportion of investment)	1.00	1.00
Mean response (expressed as a proportion of investment)	1.28	1.28
Rate of reciprocation (proportional response >=1)	0.70	0.72
Standard deviation of proportional response	0.96	1.04
Levene's test for equality of variance in responses (p-value)	0.698	
t-test for equality of mean responses, equal variance assumed (p-value)	0.983	
t-test for equality of mean responses, equal variance not assumed (p-value)	0.983	
Epps-Singleton test for equality of distribution (p-value)	0.906	

* – A response is made only when the investment by the first player is greater than zero.

Table 3. First and Second Player Behaviour in the Ultimatum Game

	Non-resettled Villages		Resettled Villages
Number of playing pairs	31		86
Stake size (Zim$)	50.00		50.00
Sub-game perfect equilibrium plays*			
(number of pairs)	2		1
(proportion of pairs)	0.06		0.01
Mode offer			
(Zim$)	25.00		25.00
(proportion of stake)	0.50		0.50
Mean offer			
(Zim$)	20.32		22.67
(proportion of stake)	0.41		0.45
Standard deviation of offers (Zim$)	6.94		5.07
Levene's test for equality of variance in offers (p-value)		0.073	
t-test for equality of means, equal variance assumed (p-value)		0.048	
t-test for equality of means, equal variance not assumed (p-value)		0.092	
Epps-Singleton test for equality of distribution (p-value)		0.425	
Offers of less than Zim$25			
(number of pairs)	14		24
(proportion of pairs)	0.45		0.28
Chi-square test for equality of proportion of offers less than Zim$25 (p-value)		0.079	
Rate of rejection (proportion)	0.10		0.07
Chi-square test for equality of rate of rejection (p-value)		0.629	
Rate of rejection of offers below Zim$25, 50% of stake	0.21		0.25
Rate of rejection of offers below Zim$10, 20% of stake	0.50		0.50
Highest offer rejected			
(Zim$)	20		20
(proportion of stake)	0.40		0.40

* - First player offers zero or lowest possible non-zero amount and second player accepts.

Table 4. Probit analysis of Rejections by Second Players in the Ultimatum Game (Dependent variable: *reject* = 1 if second player rejects offer, = 0 otherwise)

	Full Sample		***Sub-sample of those facing less than fair offers***	
constant	-1.300***	0.752	-0.792**	0.217
	(0.31)	(0.56)	(0.38)	(0.63)
resettled	-0.177	0.214	0.117	0.250
	(0.37)	(0.48)	(0.47)	(0.50)
offer		-0.124***		-0.074*
		(0.03)		(0.04)
Observations	117	117	38	38
Pseudo R^2	0.003	0.334	0.001	0.093

Note: Standard errors in parentheses. *** – coefficient significant at 0.01 level, ** – coefficient significant at 0.05 level, * – coefficient significant at 0.10 level.

Table 5. Controlling for Other Factors

	invest **(OLS)**	***invest*** **(OLS)**	***response*** **(OLS)**	***response*** **(OLS)**	***response*** **(OLS)**	***response*** **(OLS)**	***fairoffer*** **(probit)**	***fairoffer*** **(probit)**
constant	10.469*** (0.84)	12.423*** (2.18)	1.275*** (0.19)	1.283*** (0.31)	2.705*** (0.46)	2.791*** (0.54)	0.122 (0.23)	0.779 (0.62)
resettled	-2.441** (0.96)	-2.855*** (0.99)	-0.004 (0.21)	-0.003 (0.22)	-0.179 (0.22)	-0.196 (0.22)	0.464* (0.27)	0.518* (0.28)
female		0.155 (0.82)			-0.312* (0.18)	-0.313* (0.18)		-0.248 (0.26)
session		-0.021 (0.07)			-0.042*** (0.01)	-0.042*** (0.01)		-0.025 (0.02)
agroclim2		-2.810** (1.26)			-0.557** (0.28)	-0.571** (0.29)		0.133 (0.42)
agroclim3		-2.019* (1.12)			-0.488** (0.25)	-0.498* (0.25)		-0.111 (0.31)
invest				-0.001 (0.02)		-0.007 (0.02)		
Observations	141	141	129	129	129	129	117	117
R^2, Pseudo R^2	0.044	0.098	0.000	0.000	0.093	0.094	0.020	0.044

Note: Standard errors in parentheses. *** – coefficient significant at 0.01 level, ** – coefficient significant at 0.05 level, * – coefficient significant at 0.10 level.

Figure 1. Investment Game Investments

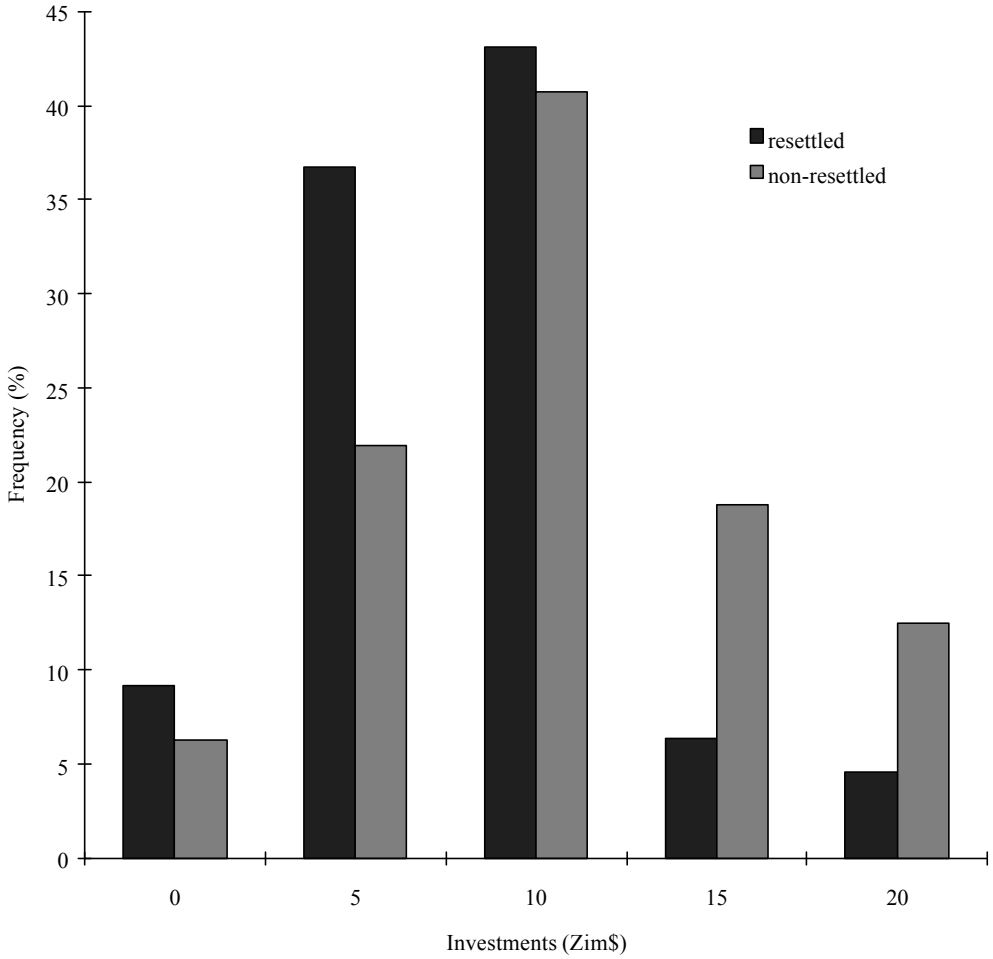


Figure 2. Investment Game Responses

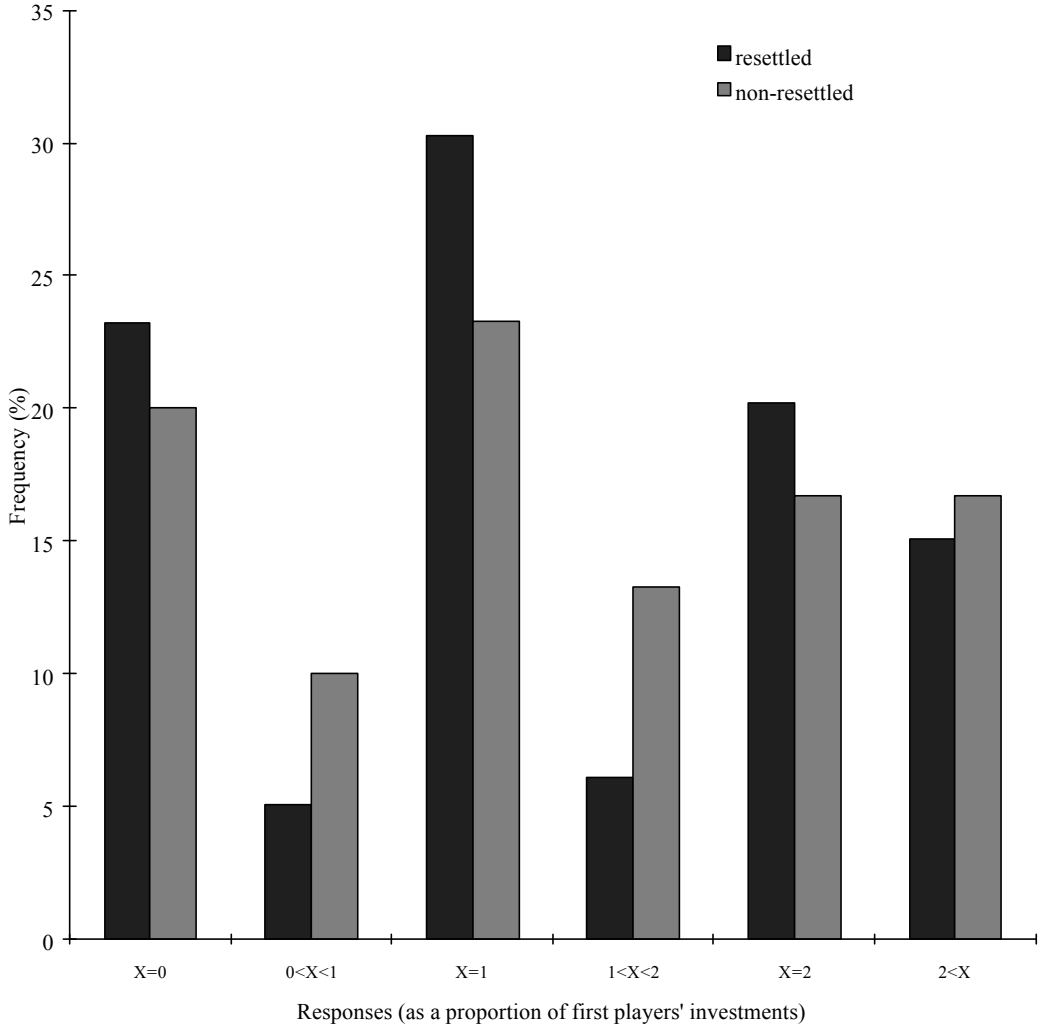


Figure 3. Ulimatum Game Offers

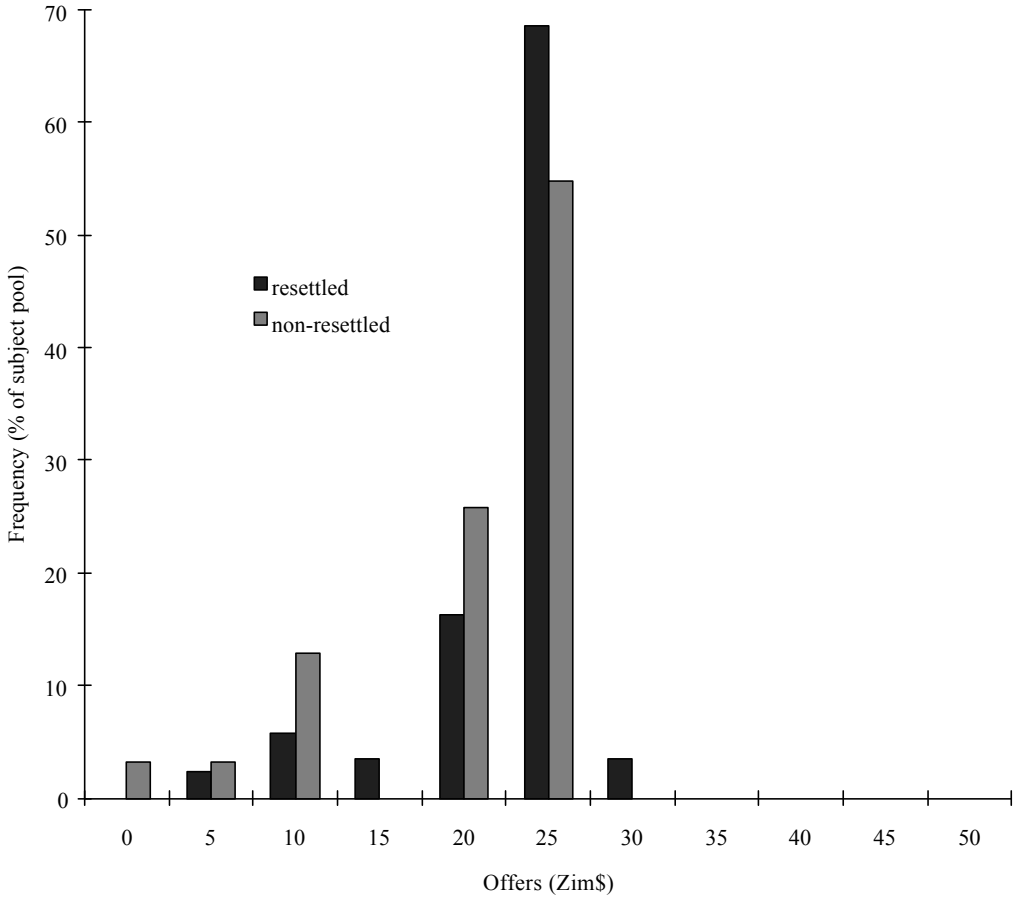
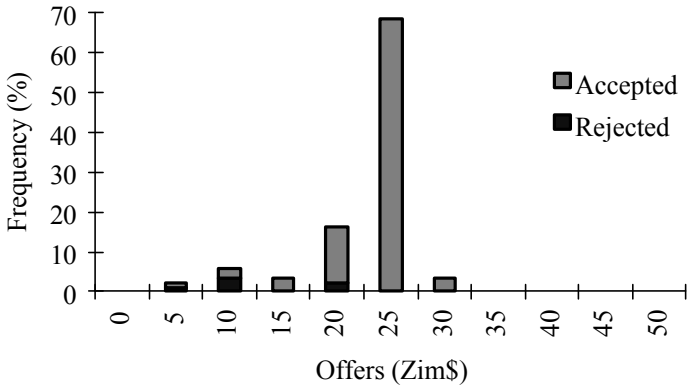
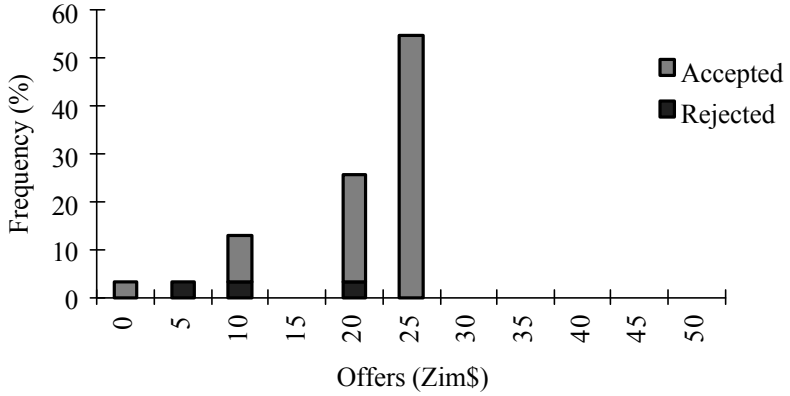


Figure 4. Rejection Rates in the Ultimatum Game

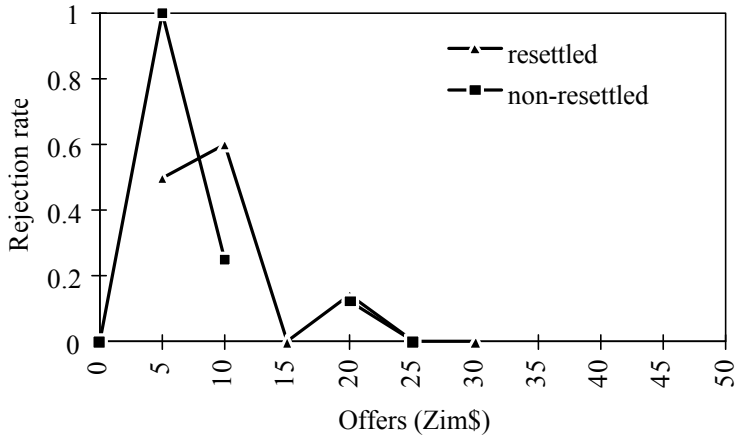
4a. Resettled Villages



4b. Non-resettled Villages



4c. Rejection Rates



APPENDIX I: Game Scripts

Ultimatum Game

We are gathering knowledge through the playing of games. We would like you to take the games seriously. You may win some money.

Have you heard about the game that we want you to play? If you have, we will not waste time explaining it to you.

I will begin by explaining the game to you. Then I will ask a few questions to check your understanding.

You will be playing this game with someone from your village. However, the identity of each player will remain unknown to the other. The amount of money that will be used in playing the game is $50. We supply the $50. The first player's role is to divide the $50 into two piles, one for himself and the other for the second player. Later on we will show the second player the division made by the first player and indicate which pile has been allocated to him. The names of the players will not be revealed. It is up to the second player to accept or refuse the pile allocated to him. If the second player accepts, both players will be given the money as per the first player's division. If the second player refuses, neither player gets any money. The first player gets nothing and the second player gets nothing.

Note that the first player has the power to divide the money into two piles, while the second player has the power to prevent the first from getting any money. The second player can do this by refusing to accept his allocation. Once the second accepts his allocation both players will their money.

Example: If the first player, out of the $50, allocates $20 to the second player, who then accepts, the first player gets $30 and the second gets $20. But if the second player refuses the $20, knowing that the first player would get $30 if he accepted, both players get nothing.

Questions: If the first player, out of the $50, allocates $10 to the second player, who then accepts, what does the first player get? What does the second player get? If the second player refuses the $10, knowing that if he accepts the first player will get $40, what will each player get?

If the first player, out of the $50, allocates $30 to the second player, who then accepts, what does the first player get? What does the second player get? If the second player refuses the $30, knowing that if he accepts the first player will get $20, what will each player get?

If the first player, out of the $50, allocates $25 to the second player, who then accepts, what does the first player get? What does the second player get? If the second player refuses the $25, knowing that if he accepts the first player will get $25, what will each player get?

If the first player, out of the $50, allocates $5 to the second player, who then accepts, what does the first player get? What does the second player get? If the second player refuses the $5, knowing that if he accepts the first player will get $45, what will each player get?

First player: You are the first player. Show Dr. Barr the amount of money you want to allocate to the second player. [*At this point $50 is placed on the table in front of the player and the player makes the division and indicates which pile he intends for Player 2*.] We shall tell the second player your offer, but not your name. You will not be told the name of the second player either. If the second player accepts the division we will inform you and give you your share.

Second player: You are the second player. Dr. Barr will show you the amount of money that the first player has allocated to you out of the $50. [*At this point the two piles of money are placed in front of the player and the one that is for him indicated.*] Do you agree or disagree with the division that has been made? [*If they agree they are encouraged to take their pile…*] Go ahead, its yours!

Finally, please do not reveal how you played to anyone, not even the amount of money you received. Do not tell any other villagers about the game otherwise you will jeopardise our research. This will make it difficult for us to come back and play more games with you.

Thank you.

Investment Game

We are gathering knowledge through the playing of games. We would like you to take the games seriously. You may win some money.

Have you heard about the game that we want you to play? If you have, we will not waste time explaining it to you.

I will begin by explaining the game to you. Then I will ask a few questions to check your understanding.

You will be playing this game with someone from your village. However, the identity of each player will remain unknown to the other. We will give twenty dollars to each player. The first player will be given the opportunity to give back any amount that he wishes from his $20. Whatever amount he gives back, we will increase and then pass it on to the second player. So, if he gives back $5, the second player will receive $35 and the first player will be left with $15. If he gives back $10, the second player will receive $50 and the first player will be left with $10. If he gives back $15, the second player will receive $65 and the first player will be left with $5. If he gives back $20, the second player will receive $80 and the first player will be left with nothing. The first player has the option of giving back nothing, in which case the second player will get and keep his $20. As long as the first player gives back some money, the second player will get the chance give something back to the first player.

I am now going to give/ask you some examples/questions. These are examples only. If, out of his $20, the first player decides to give $5 back to be increased and passed on to the second player, what does the first player have left? We will increase the $5 to $35 and pass it onto the second player. Now, if we ask the second player whether he wishes to give anything back to the first player and he refuses, what does the first player end up with? And what does the second player end up with?

Here is a different example. If, out of his $20, the first player decides to give $5 back to be increased and passed on to the second player, what does the first player have left? We will increase the $5 to $35 and pass it onto the second player. Now, if we ask the second player whether he wishes to give anything back to the first player and he gives back $10, what does the first player end up with? And what does the second player end up with?

Examples for Player 1s

P1 gives	P2 gets	P1 is left	P2 gives back	P1 ends up with	P2 ends up with
5	35	15	0	15	35
5	35	15	10	25	25
10	50	10	0	10	50
10	50	10	20	30	30
15	65	5	0	5	65
15	65	5	30	35	35
20	80	0	0	0	80
20	80	0	40	40	40

Examples for Player 2s

P1 gives	P2 gets	P1 is left	P2 gives back	P1 ends up with	P2 ends up with
5	35	15	0	15	35
5	35	15	10	25	25
10	50	10	0	10	50
10	50	10	30	40	20
15	65	5	0	5	65
15	65	5	20	25	45
20	80	0	0	0	80
20	80	0	25	25	55

Note that the larger the amount given back by the first player, the greater the amount that can be taken away by the two players together. However, it is entirely up to the second player to decide what he should give back to the first player. The first player could end up with more or less money as a result.

First player: You are the first player. Here is your $20. [*At this point $20 is placed on the table in front of the player*.] Will you please give back the amount of money that you wish us to increase and pass on to the second player. Give back whatever you wish, $5, $10, $15, $20, or zero. Remember the more you give back the greater the amount of money at the second player's disposal. Although the second player is under no obligation to give anything back, we will pass onto you whatever he decides to return. [*Now the player hands back his bid*.]

Second player: You are the second player. Dr. Barr will show you what player one has done. [*The player is shown $20 from which is taken what the first player chose to give back.*] The first player gave back $---- out of his $20. [*Then the appropriate amout is added to what the first player gave back.*] We have increased this to $----. So you are now getting $----. [*The pile of money showing what the first player currently has left is indicated.*] This means that the first player in left with $----. It is now up to you to decide what to give back to the first player. You can choose to give something back or not. Do what you wish.

Finally, please do not reveal how you played to anyone, not even the amount of money you received. Do not tell any other villagers about the game otherwise you will jeopardise our research. This will make it difficult for us to come back and play more games with you.

Thank you.

APPENDIX II: Regressions Analyses with Errors Corrected for Heteroscedasticity

Table II.i Controlling for Other Factors and using White's procedure to correct standard errors for heteroscedasticity

	invest	*invest*	*response*	*response*	*response*	*response*	*fairoffer*	*fairoffer*
constant	10.469*** (0.95)	12.423*** (2.08)	1.275*** (0.17)	1.283*** (0.31)	2.705*** (0.42)	2.791*** (0.52)	0.122 (0.23)	0.779 (0.66)
resettled	-2.441** (1.05)	-2.855*** (1.03)	-0.004 (0.20)	-0.003 (0.21)	-0.179 (0.20)	-0.196 (0.21)	0.464* (0.27)	0.518* (0.29)
female		0.155 (0.84)			-0.312* (0.18)	-0.313* (0.18)		-0.248 (0.25)
session		-0.021 (0.06)			-0.042*** (0.01)	-0.042*** (0.01)		-0.025 (0.02)
agroclim2		-2.810** (1.34)			-0.557** (0.24)	-0.571** (0.25)		0.133 (0.44)
agroclim3		-2.019* (1.06)			-0.488* (0.28)	-0.498* (0.28)		-0.111 (0.30)
invest				-0.001 (0.02)		-0.007 (0.02)		
Observations	141	141	129	129	129	129	117	117
R^2, Pseudo R^2	0.044	0.098	0.000	0.000	0.093	0.094	0.020	0.044

Note: Corrected standard errors in parentheses. *** – coefficient significant at 0.01 level, ** – coefficient significant at 0.05 level, * – coefficient significant at 0.10 level.

Table II.ii Controlling for Other Factors and correcting for within-village correlation in error terms

	invest	*invest*	*response*	*response*	*response*	*response*	*fairoffer*	*fairoffer*
constant	10.469*** (1.09)	12.423*** (2.34)	1.275*** (0.12)	1.283*** (0.27)	2.705*** (0.52)	2.791*** (0.57)	0.122 (0.12)	0.779 (0.62)
resettled	-2.441* (1.28)	-2.855*** (0.93)	-0.004 (0.20)	-0.003 (0.19)	-0.179 (0.18)	-0.196 (0.17)	0.464** (0.21)	0.518* (0.28)
female		0.155 (1.00)			-0.312 (0.22)	-0.313 (0.22)		-0.248 (0.26)
session		-0.021 (0.07)			-0.042** (0.02)	-0.042** (0.02)		-0.025 (0.02)
agroclim2		-2.810* (1.50)			-0.557** (0.26)	-0.571** (0.27)		0.133 (0.42)
agroclim3		-2.019 (1.34)			-0.488 (0.33)	-0.498 (0.34)		-0.111 (0.31)
invest				-0.001 (0.02)		-0.007 (0.02)		
Observations	141	141	129	129	129	129	117	117
R^2, Pseudo R^2	0.044	0.098	0.000	0.000	0.093	0.094	0.020	0.044

Note: Corrected standard errors in parentheses. *** – coefficient significant at 0.01 level, ** – coefficient significant at 0.05 level, * – coefficient significant at 0.10 level.