Master thesis for the Master of Philosophy in Economics degree

Trust and Cooperation

Experimental Evidence from Malawi

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Preface

I would like to express gratitude to my tutor Ph. D. Henrik Wiig at the Norwegian Institute of Urban and Regional Research - Department for International Studies in Development, Transition and Migration. I really appreciate his help and guidance during the process to finalize this paper.

I am also thankful for the Malawi Land Tenure and Social Capital (MLTSC) research project for supplying the data material, which is based on their considerable data collection during the summer of 2007.

Contents

1. Introduction

Trust can be seen as the confidence an agent has about the behaviour of another agent. A trusting action is one that creates the possibility of a mutual gain and the risk of loss to oneself if that other agent deviates from what is seen as mutual beneficial. Clearly, this is not easy to measure and observe. Historically, is has been common to use a so called *general social survey* (GSS) to investigate trust. Naturally, there are many ways to go about in order to measure the trust of someone. The GSS approach is to simply ask individuals if they trust people or ask them to rate their level of trust. Another form is to represent an agent's trust through money generating games. This thesis addresses the level of trust revealed through a money generating game known as the trust game and as the investment game. In the trust game the action of player one is interpreted as trust and the action of player two is seen as trustworthiness.

The trust game origins from the field of game theory and is part of a relative new and growing research field in economics known as experimental economics. The trust game is one of the games utilized in the Malawi Land Tenure and Social Capital MLTSC[1] research project. The game script for the Malawian trust game is given in the appendix. It is made by Abigail Barr and she has herself analysed the game in the rural parts of Zimbabwe, but the game structure origin from the article by Berg, Dickhaut and McCabe (1995) - Trust, Reciprocity, and Social History.

This paper examines the game theoretical prediction of the trust game. When observing the Malawian trust game outcome it becomes clear that well below ten per cent of the game participants is actually playing the game according to the theoretical game prediction, hence the Nash equilibrium is not satisfied. This finding is in harmony to the findings by both Barr (2003) and Berg et al. (1995). Further, there is argued by the use of various statistical calculations to be large geographical fluctuations with respect to how the game participants are playing the trust game, i.e.: players from different regions and villages play and cooperate differently in the trust game. It is also argued that individuals from poor villages

[1] http://nacal.nibr.no/

cooperate better in the trust game and they participate more in public cooperative works than players from relatively rich communities.

In this paper there is asked if the behaviour of player two is affected by the action taken by player one. The results are ambiguous. It has proven difficult to establish significant apparent results at the individual level. Nevertheless, it is argued to be a connection between the probability of receiving a high offer and the how much money player one decides to entrust player two and this could to some extent be explained by the inequality aversion of player two in the game.

This paper also examines the observed outcome in the trust game compared to what the players stated about trust before they participated in the game, i.e.: their survey answer versus their game behaviour. The empirical evidence is quite clear; there is a large inconsistency with regards to what the players say concerning trust and how they actually behave in the trust game.

All calculations in this paper have been executed through the use of the statistical software Stata 9.1.

2. Theory and Prediction

2.1 Introduction

The trust game consists of two players. Before the game begins both players are given an endowment equal to *s* and are randomly drawn to be either player one or player two. Further, the players from the two groups are matched with each other. Thus, there are *n/2* pairs in the game; where *n* is the total number of players. In the first stage, player one chooses an amount $y, 0 \le y \le s$, which is given to player two. The amount given, *y*, is in the interim stage multiplied by a factor of three by the experimenter, and then handed over to the second player. This means that player two, before the second and final stage of the game, will hold an endowment equal to $[s + 3y]$. In the last stage, player two is free to choose an amount $z, 0 \le z \le 3y$ to send back to player one, hence player two derives a payoff equal to $\pi_{P2} = s + 3y - z$. Player one will take home $\pi_{P1} = s - y + z$ from the experiment.

2.2 The Nash Equilibrium in a one shot trust game

When calculating the Nash equilibrium, as normal in game theory, we assume perfect rationality and selfishness by the individuals. The trust game is of sequential character - in the words of Gibbons (1992):

> "A Nash equilibrium is sub game perfect if the players' strategies constitute a Nash equilibrium in every sub game…" (page 124)[2]

And he argues:

> ..."there may be multiple Nash equilibriums in a game, but the only sub game perfect Nash equilibrium is the equilibrium associated with backwards induction outcome." (Page 59)

[2]The definition origins from Selten 1965

The sub game perfect Nash equilibrium in the trust game is equal to $y = 0$ and $z = 0$. Since both players are rational and by definition selfish they would keep positive utility themselves rather than giving it up. Player one solves the game by backward induction and finds that he or she should propose zero to player two, because it is a known fact that player two is rational agent who maximize the private utility and if player one in fact makes a positive investment, he will loose compared to keeping the initial endowment, since player two does not return any positive amount. Consequently, player one sends zero and the game ends, since the rules of the game prohibit player two to return anything if the offer from player one equals zero.

On the contrary, if y is of positive value, a pareto improvement occurs, if and only if player two sends back an amount equal or larger than the amount player one sent. If player two sends back an amount equal to the investment made by player one this implies that player one is as well off as by sending zero, but player two is better off, since the invested amount by player one is multiplied by a factor of three. If player two sends back a larger amount than the amount invested both players are better off compared to the game prediction. However, those two scenarios suggest different distributional issues. As well, if we look at the players' joint utility, the best action by player one is to send his whole endowment, since the investment is multiplied by three.

2.3 Empirical results from trust games

Barr (2003) finds that actions taken by the game participants do not comply with the predicted Nash equilibrium, since the average amount given from player one to player two is greater than zero. The proportion of pairs that in fact are playing the sub game perfect equilibrium is less than 10 per cent for all the players in the sample treated in Barr. The mean rate of investment (the action taken by player one) in Barr's paper are 0.52 and 0.4 in her two different treatments. The average returned amount by player two is 1.28 for both groups (measured as a proportion of the invested amount). About 70 per cent of the all the players in her paper gives back an amount that is equal or bigger than the amount they received from player one.

Berg, Dickhaut and McCabe – Trust, Reciprocity and Social History (1995) used undergraduate students in the U.S. in their trust game analysis. The results do not deviate greatly to the trust game analysis carried out by Barr. The average amount sent is approximately equal to half of the initial endowment, thus an investment rate about 0.5 and in coherence to the findings of Barr. Berg et al. (1995) observe that less than 10 per cent play the game's theoretical equilibrium. Only 5 out of 60 sent the Nash equilibrium of zero, so neither this case, nor the case of Barr, concludes that the individuals are entirely selfish, since the predicted equilibrium of the game is not satisfied.

2.4 The Dissatisfied Nash Equilibrium

As mentioned, standard game theory assumes that the rationality and the selfish axiom holds. In the trust game the monetary payoff is defined as utility. However, in real life laboratory experiments the theoretical predictions do not seem to be satisfied. People may make errors of different kinds. They may calculate their payoffs in a wrong manner, they might not be totally convinced that the other players in the game are in fact really rational, they might misunderstand the rules of the game or they could have a utility function that deviates from the standard assumption, i.e.: their utility functions incorporate not only the private utility. If any of these assumptions are violated the game outcome deviates from the theoretical prediction. The fact that most people do not play the theoretical prediction of the game does not mean that they are by definition irrational; most papers written on the subject claim that the selfishness axiom is violated[3]. Experimental evidence shows a replicable pattern of the other regarding preferences of individuals. As Cox (2004) puts it:

> "…game theory incorporates the assumptions that agents do not care about others' (relative or absolute) material payoffs or about their intentions." (Page 260)

This is followed by:

> "The part of the literature concerned with public goods experiments and trust and reciprocity experiments has produced replicable patterns of inconsistency with predictions of the model of self-regarding preferences. But this does *not* imply that

[3] Amongst others: Berg, Dickhaut and McCabe (1995)

> the observed behaviour is inconsistent with game theory, which is a point that has not generally been recognized in the literature." (Page 261)

People seem to have preferences, not only about their own utility, but also a concern toward others. In the trust game, this implies that an agent who is not playing the Nash equilibrium is not regarded as irrational, since the utility function of an agent could consist of factors such as inequality aversion or altruism, so called other regarding preferences. The level of social capital is also a factor of influence. Social capital is often defined as networks, norms and trust; however it has been normal through the last two decades to see social capital as a community level attribute (Glaeser, Laibson and Sacerdote, 2000). Repeated social interaction could be interpreted as social capital and some argue that social connection can be a substitute for a non existing institutional framework such as missing or expensive legal structures, which again could facilitate investments and financial transactions (Arrow 1972, sighted Glaeser et al. 2000).

2.5 Definitions, Explanations and Empirical Work

In standard economic theory it is usually said that individuals maximize their private utility. People have tradeoffs between different bundles of goods, such as consumption and leisure – these tradeoffs are referred to as an agent's preferences. Some like consumption more than they enjoy leisure and vice versa. An important distinction is drawn between private preferences and social preferences. If you strictly care about the wellbeing of yourself, your social preference is by definition low. On the other hand, an individual has social preferences if he or she also cares about *how* the bundles of goods are allocated between themselves and others.

An individual's inequality aversion, altruism (so called other-regarding preferences) or the desire to be reciprocal are typically mentioned as possible explanations for the violation of the selfishness axiom in experimental games. Positive reciprocity is to reward generous/friendly actions by adopting actions that are of a generous character. We can thus define reciprocity as an action where you reply to friendliness with generosity and you punish hostile behaviour by not being generous, although you might get worse off yourself in the end. You have inequality aversion if you are willing to take costly action to prevent or to reduce inequality. Altruism can be interpreted as pure kindness. If you are willing to take costly actions in order to make someone else better off, unconditional of previously behaviour by that other someone, you behave altruistic (Cox 2004). If an increased consumption gives individual A increase in utility, this concurs with the normal assumptions, but if individual A also gets utility increase if individual B's consumption increases, her utility function accounts for altruism as well. Whether the choices or behaviour of an individual origin from other regarding preferences such as inequality aversion and altruism or from reciprocity is not easily observable (Cox 2004) and it is difficult to differentiate the separate effect of these factors. In most cases there are most likely combinations of numerous factors.

The Malawi trust game is a one shot game and is played anonymously. In the words of Berg, Dickhaut and McCabe, 1995:

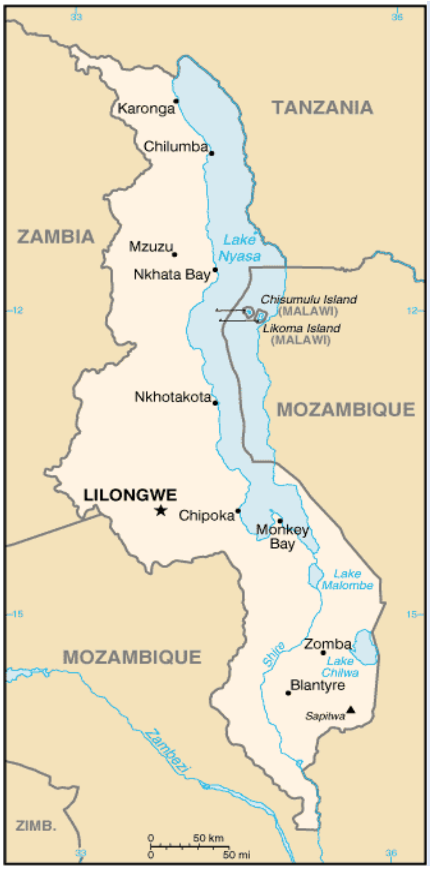
> "By guaranteeing complete anonymity and by having subject play the investment game only once, we eliminate mechanisms which could sustain investment without trust…" (Page 123)

They mention contractual pre-commitments and reputation from repeated interactions as being eliminated mechanisms by performing a one shot game anonymously, thus the action of the players could be interpreted as a measure of trust. Stenman, Mahmud and Martinsson, 2006, argue that it is some advantages to perform games, like the trust game, in a relative poor rural environment. The financial stakes has a larger consequence for the individual playing the game, thus they will have stronger incentives to do the "right" thing than a university student (given the same stakes and a substantial difference in income and wealth). Additionally, a sample consisting of players from the rural societies has a greater variation in the socio economic background amongst the players compared to what is normally treated - a population of university students from an industrialized western society (Stenman et al. 2006).

2.6 The organization of the trust game in Malawi

Upon arrival each participants is given an amount equal to 80 Kwacha (MWK)[4], which is the Malawian currency. The following example is for illustrative purpose only. There are two players, player one and player two. Both players are given s = 80 kwacha as they arrive to the experimenter's laboratory. The 80 Kwacha is available only in bills and everybody receives four twenty Kwacha bills each. They are then divided into groups consisting of first and second movers of the game. Player one makes his offer and decides to give half of the endowment to player two. The experimenter will thus add 80 kwacha in addition to the 40 kwacha investment, so player two is before the last round endowed with the initial s=80 kwacha plus the 3y=120 - a total of 200 kwacha. For the sake of the argument, let us say that player two decides to give back 20 to player one and this ends the game. These circumstances give player two a payoff of 180 ($\pi_{P2} = s + 3y - z$). The investor on the other hand does not gain on the 40 kwacha investment and returns quite desolated home with only 60 kwacha ($\pi_{P1} = s - y + z$).

Map and facts[5] of Malawi:



Malawi facts at a glance

- **Total area:** 118,480 sq
- **Land area:** 94,080 sq km
- **Comparative area:** slightly smaller than England
- **Border countries:** Mozambique, Tanzania and Zambia
- **Climate:** tropical; rainy season (November to May); dry season (May to November)
- **Official languages:** English and Chichewa
- **Per capita GDP:** $170 (2003 World Bank)
- **Currency** - Malawi Kwacha: £1 = MWK 212 (Jun 2005)
- **International dialing code:** +265
- **Internet domain** .mw
- **Capital City** - Lilongwe
- **Population:** 10.5 million
- **Infant mortality rate per 1000 births:** 121
- **Life expectancy:** 37
- **Total fertility rate:** 5.18 children born per woman
- **People living with HIV/AIDS:** 800,000
- **Population living below poverty line:** 60%
- **Literacy rate:** 58% (male: 72.8%; female: 43.4%, 1999 est.)
- **Agricultural exports:** tobacco, tea, sugar, cotton, coffee
- **External debt:** $2.9 billion (2000 est.)
- **Debt servicing** accounts for 29% of government expenditure
- **Radios:** 2.6 million (1997 est.)

[4] All the amounts discussed in this paper is of the value MWK (if not otherwise stated)
[5] http://www.malawimacs.org/facts.htm

All the calculations in this paper arrive from a data set consisting of a total of 176[6] observations. The observations are derived by merging twelve trust games from the same number of villages. The villages are located in four different regions in Malawi. These regions are located in the south or the central part of the country. An observation is interpreted, unless otherwise stated, as a playing pair where a pair consists of two players. The variable reflecting the action of player one is referred to as *invest* and the action of player two is represented by the variables *return* and *return_1*.

The trust game consists of 15 pairs in each game, so at the time where the data material is finalized, 540 persons have played the game. In each village there has been gathered additional survey data for about half of the players in each game, so in the final data set there will be a substantial amount of information concerning 270 players. The information about the players comes from a so called household head questionnaire and a household parcel questionnaire. The household head questionnaire, henceforth HHQ, concerns questions like household structure, different social capital questions, work, religion, education, schooling and more. The household parcel questionnaire, henceforth HPQ, was executed simultaneously as the HHQ and it asks the respondent to give the interviewer information about crop, production, land type, size, irrigation and more information with respect to the different parcels his family has to their disposal (not every household owns a parcel of land).

[6] Originally, each game consisted of 15 playing pairs, but four pairs are not accounted for in the dataset. In the village of Mkwenya there are 13 pairs playing the game. In Katsukunya village one observation is omitted. The Chambwe village dataset is somewhat incomplete, including only 14 pairs.

3. Basic statistics

3.1 Descriptive statistics

When pooling the observations from the twelve games in Malawi, the following game statistics are given in table 1 and table 2 below. The variable *invest* refers to the amount invested by player one in the game. The mean amount invested by player one is 45.8, which gives an average investment rate of 45.8/80 = 0.5725. The variable *return* refers to the action taken by player two, and the variable value is the amount sent back to player one in the final stage of the game.

Table 1 – Observed averages:

Variable	Obs	Mean	Min	Max
Invest	176	45,79	0	80
Return	176	71,47	0	240

Table 2 – Action of player one:

Invest	Freq.	Per cent
0	12	6.82 %
20	38	21.59 %
40	51	28.98 %
60	37	21.02 %
80	38	21.59 %
Total	176	100.00 %

Table 2 indicates that there are twelve players playing the prediction of the game, so about seven per cent of the first movers can be found at the sub game perfect equilibrium. About 43 per cent of the players are giving away equal or more than 75 per cent of their initial show up fee and about 28 per cent are investing less than half of their show up fee.

Table 3 – Action of player two:

Return	Freq.
0	13
20	29
40	32
60	28
80	14
100	15
120	19
140	9
160	12
180	4
240	1
Total	176

Table 3 tells us that there are 13 second movers who play the theoretical outcome of the game, zero. Compared to table 2, this implies that there is *one* player who receives a positive amount and returns nothing. On the other hand, notice that one person is actually returning as much as 240, which means that he or she returns everything he or she received.

As table 1 points out, player two returns on average 71.5 to player one. Hence, on average, it is beneficial for player one to make a positive investment, rather than keep the initial endowment, since the average returned amount takes on a larger value than the average invested amount.

Table 4 – Loss and gain:

Variable	Obs	Calculation
Invest	157	$return \geq invest$
Invest	98	$return > invest$
Invest	19	$return < invest$

The calculation in table 4 shows that 157 of the first movers do not lose by giving up a positive amount to player two. There are 98 (0.55) of the players that receive an amount which is in fact larger than the amount they sent. Finally, there are 19 of the 164, about 11 percent, who loose by giving up a positive amount to player two, since the returned amount is smaller than the amount player one sent in the first place.

3.2 Trust game payoff

The final average payoff for the two players is given in table 5. The distribution of the final payoff amongst the players in the dataset is distributed somewhat unequally. At least, if you compare it to the initial endowment they both received at the start of the experiment. Before the interaction begins, they both have 80, but as table 5 indicates, player two takes home a substantial part of the total pie.

Table 5 – Trust Game Payoff:

Variable	Obs	Mean	Std. Dev.	Min	Max
PayoffP1	176	105,68	36,9	20	240
PayoffP2	176	145,9	50,29	80	300

On average, player two has a payoff of 45 more than player one, which is more than half of the 80 they received before the interaction began. Notice as well the minimum and maximum values from table 5. The respective amounts tells us that the players with the lowest payoff of the first players pockets only 20 and the maximum value for player two is 300, which gives us a factor of 15 between the least fortunate and "the winner of the game". We can thus observe a substantial difference in the final allocation of funds amongst some of the players in the game.

3.3 The Nash equilibrium outcome

As mentioned, the theoretical prediction of the game indicates that both player one and player two should send an amount equal to zero. Based on the data from table 1 it is clear that the average invested rate equals 0.57[7] and the average sum sent back measured as a rate equals 1.56[8]. Obviously, these numbers differ from zero. Table 2 shows that 12 players are investing zero and table 3 shows that 13 players are returning zero, thus well below ten per cent are playing the Nash equilibrium. Hence, since only twelve of 176 observations are located at the theoretical prediction, so this must be interpreted as evidence that a substantial fraction of the players in the Malawian games are not behaving according to the prediction.

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7 $\frac{\overline{invest}}{endowment} = \frac{45.79}{80} = 0.57$

8 $\frac{\overline{return}}{\overline{invest}} = \frac{71.47}{45.79} = 1.56$

As in Barr (2003) and Berg (1995), only a small fraction (below 10 per cent) of the players is playing the sub game perfect Nash equilibrium. The number is actually even smaller for the players in our sample. The players in the Malawian games are both investing and returning more compared to the populations treated in both Barr and Berg.

3.4 Findings and Discussion

As normal in trust games, the players from the Malawi sample are not playing the predicted outcome of the game. The fact that the average player does not play the prediction of the game could origin from factors such as altruism, inequality aversion, norms, trust, networks and risk preferences. It could be a result of what the first movers expect of the behaviour of their fellow pair mate. As well, something that makes it even more difficult to segregate the reasoning behind the chosen amount by each player is that individuals could have different levels of altruism, risk preferences and inequality aversion. Additionally, individual characteristics such as gender, age, village of origin, income and social status could also effect the decisions taken by the numerous players.

4. Empirical investigation

4.1 Behavioural explanation

4.1.1 Introduction

How do the former basic statistics relate to each other? Do the amount sent by player one influence the amount player two returns? If we try to explain the amount returned with the amount invested as our explanatory variable we are likely to produce a quite good fit, since the investment and the returning of money, by the sense of the game should incorporate a high degree of correlation. The amount given to player two is multiplied by a factor of three by the experimenter, thus the upper bound for the responses of the second player is directly influenced by the size of the investment made by player one. Instead there is created at a new variable which is a proportion variable. This variable is the amount returned divided by the amount invested and it is referred to as *return_1* throughout the thesis[9]. This transformation is convenient for our regression analysis later on. A proportion variable will not inhabit the same properties as in the former case, since it's upper bound is constant at three, and is not in the same way related to the size of the investment made by player one. In addition, the proportion variable has some useful interpretations. If the proportion is equal to zero, there is pure self interested money maximizing behaviour. If the proportion is equal to one, we have a case of *pure reciprocity*, where player two sends back an amount equal to the amount invested. If the value of the proportion variable equals two, we interpret this as *pure sharing*, where the two players divide the total amount of money in their pair equally amongst each other (As interpreted by Barr, 2003).

Table 6 – Statistics player two:

Variable	Obs	Mean	Std. Dev.	Min	Max
Return_1	164	1,569	0,72	0	3

[9] $return\_1 = \frac{return}{invest}$

From table 6 it is obvious that player two sends on average back an amount 1.57 times larger than the amount invested by player one, thus player two are located in the interval between pure reciprocity and pure sharing. However, note that this number is only valid for the observations where player one makes a positive offer, thus the 12 observations where player one sends zero have been removed compared to the variable *return*.

Table 7 – Correlation Matrices:

. corr invest return
(obs=176)

	invest	return
invest	**1.0000**	
return	**0.7271**	**1.0000**

. corr invest return_1
(obs=164)

	invest	return_1
invest	**1.0000**	
return_1	**-0.0260**	**1.0000**

The correlation matrix between the variable *invest* and the variable *return* confirms the suspicion with regards to the high correlation amongst the two variables, so it does seem to be true that the amount sent by player one is naturally correlated to the amount sent back from player two. A more interesting observation in table 7 is the correlation matrix on the right hand side. It indicates a poor correlation between the transformed variable *return_1* and the variable *invest*, hence when there is made an adjustment for the amount sent by player one the correlation almost completely disappears. This indicates that the action taken by player one does not influence the proportion returned by player two.

4.1.2 Generous, reciprocal or selfish?

In the former section, the correlation matrix between *invest* and *return_1* rejects that the amount invested influences the action of player two. Like that section suggested, it might be perfectly true that it does not matter for player two if player one entrusts him or her with a small or a large amount. However, the data from the former section could need a new set of eyes, since the results are not entirely convincing. There might be a case of type II error in our conclusions, i.e.: keeping the result when it is false. More specifically, to reject a null hypothesis is a stronger conclusion than failing to reject it (Hill, Griffiths and Judge, 2000). So in order to pursuit the question concerning player one's effect towards the behaviour of player two this section treats a transformed version of the variable *return_1*.

As mentioned before, the action of player two is discussed and defined into categories. The responses of player two are located in an interval from zero to three, where the trustworthiness increases in the variable value. Let us now take this one step further and define the offer of player two as being either high or low. Now, what is a high offer? Well, this can of course be defined in many different manners, but in this treatment the offer from player two is categorized as high if player one is better off than he would be if he had decided to send zero. Hence, the offer from player two is interpreted as high if the offer takes on a value which is strictly larger than one. Consequently, the dependent (based on the variable know as *return_1*) variable *high* is coded such that it takes the value 0 if the offer is smaller or equal to 1, thus taking the value 1 otherwise. Seen in comparison to the definitions explained earlier, an offer that is of a pure reciprocal character is not interpreted as being a high offer. This means that the definition of a high offer in this treatment is conditional upon an improvement of the game utility for player one, of course, player one must have made a positive investment in the first place, since this treatment does not include the cases where player one sends zero.

Logistic regression is commonly used when the dependent variable takes on binary values, thus since the definition of high falls into the two different categories defined above is it to a large extent natural to use logistic regression. The logistic regression is based on the maximum likelihood estimator, MLE, and it is consistent and normally distributed in large samples (Rice, 1995). This is convenient, since this makes it possible to make use of the statistics and the confidence intervals in the normal manner (Stock and Watson, 2007). The population logit model of the binary endogenous variable *high* and the variable *invest* as the regressor is given in (1).

(1) $P\ (\text{high}= 1 \mid \text{invest}) = F\ (\alpha + \beta\text{invest}) = \dfrac{1}{1+e^{-(\alpha+\beta invest)}}$, where F is the cumulative standard logistic distribution function.

Regression (1) – Logistic treatment:

```
. logit  high invest

Iteration 0:   log likelihood = -110.53407
Iteration 1:   log likelihood = -106.91607
Iteration 2:   log likelihood = -106.90631
Iteration 3:   log likelihood = -106.90631

Logistic regression                               Number of obs   =        164
                                                  LR chi2(1)      =       7.26
                                                  Prob > chi2     =     0.0071
Log likelihood = -106.90631                       Pseudo R2       =     0.0328

------------------------------------------------------------------------------
        high |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      invest |   .0202653   .0076951     2.63   0.008     .0051832    .0353474
       _cons |  -.5812985   .3981688    -1.46   0.144    -1.361695     .199098
------------------------------------------------------------------------------
```

The estimated coefficients are probabilities. These are a bit tricky to interpret, so table 9 below accounts for separate calculations treating the predicted probabilities. As one can observe from the regression output the p-value of the model as a whole equals 0.0071, which is an indication towards a significant model at least at the 95 per cent significance level. The p-value for the estimated coefficient β harmonizes to this suggestion by being equal to 0.008. This result indicates that the normal null hypothesis H_0: β=0 has to be rejected and the alternative hypothesis H_A: β ≠0 has to be accepted. This means that there is in fact a relationship between the endogenous variable *high* and the explanatory *invest* variable. Table 8 states the predicted probability of positive outcome of the variable *high* conditional upon the four different values of the invest variable. The action of sending zero by player one is as said omitted, since this probability should by definition be equal to zero.

Table 8 – Predicted Probabilities:

Invest	Prediction	95 % Conf.Interval	
20	0,4561	0,32	0,58
40	0,5571	0,47	0,64
60	0,6535	0,56	0,73
80	0,7388	0,62	0,85

As the estimated coefficient from the regression reports, there is a positive relationship between the amount invested and the probability of a positive outcome for the variable *high*. As evident from table 8, an investment of 20 gives a predicted probability of 0.4561 for a positive outcome of *high*. If player one invests 80 there is a predicted probability equal to 0.7388 that the returned offer is a high offer. Hence, regression (1) and table 8 indicate that there is a higher probability of receiving a high offer the more the players invest, since the predicted probability is increasing as the level of investment is augmenting. Of course, these results have to be interpreted with some prudence, since the confidence intervals are quite wide and to some extent are overlapping each other.

4.1.3 Findings and Discussion

The correlation between the variable *invest* and *return_1* is almost non existent, which means that the variation in the variable *invest* does not explain much of the variation in the *return_1* variable. However, when the variable *return_1* is transformed into the variable *high* and treated endogenously, the results seem to be the other way around - there is in fact a relationship between the amount invested and if the offer sent back to player one from player two is of high or low value. However, due to the wide confidence intervals in the predictions from table 8 one should be somewhat careful when interpreting and deriving conclusions from this chapter.

4.2 Game behaviour – Geographical differences

4.2.1 Introduction

In the data set related to the Malawian trust games there is information about which village each player belongs to, since the players have participated in a trust game in their respective village. As well, we know in which region these villages are located. The players in the game belong to twelve different villages and these villages are again located in four different regions. These four regions are located either in the south or in the central part of the country. Thus for the 176 playing pairs, there are information about what the players have played and which village and region each participant of the game belongs to. Consequently, a natural inquiry is pointed towards potential difference in behaviour within the trust game when adjusted for the players' geographical origin. The rational behind this comes from how villages and regions differ in a number of aspects. Amongst other things, there could be segregated effects of the social structure, religion and education and these effects could be difficult to differentiate at the individual level. These factors could affect how much player one decides to give player two, since a person living in given society is most likely to be influenced by for example social norms or customs that prevail in this village or region.

Table 9 – Regional Overview:

1. Chidradzulu
2. Dzoole
3. Njombwa
4. Phalmobe

4.2.2 Regional differences – data for player one

Can the geographical differences explain some of the variation with respect to how much player one decides to send? The function (2) accounts for the behaviour of player one and use the player's region as the explanatory variable. The regression function is treated according to the ordinary least square method. The regions have been coded as (0/1) dummy variables. The region of Chidradzulu, region 1, has been omitted and thereby being the reference region and the region that the other three regions are compared against. The regression output, however, is given in the appendix.

(2) $Invest_i = \alpha + \beta_j region_i + \varepsilon_i$, where j=2,3,4 and i=1,….176

The only statistically significant parameter is the estimate for the region of Phalombe (region 4) where the p-value corresponds to 0.047 and thereby is significant at a 95 per cent significance level. None of the other p-values for the estimated coefficients are significantly different from zero at the 95 per cent significance level. The R^2 is quite low and equals 0.0299, thus our model explains approximately three per cent of the variation around the mean of the endogenous variable. The F-test of the regression is equal to 1.76. This is a small number. The F-test executes the hypothesis: all the estimated regression parameters are equal to zero, H_0: β_2=0, β_3=0 and β_4=0 against the alternative H_A: At least one of the β's is different from zero. With three numerator degrees of freedom and 173 denominator degrees of freedom at a 95 per cent significance level the critical F-value F_C equals 2.60, which is larger than the value from the regression output. Hence, since the F-test indicates that the model (2) is not significantly specified there is more interesting to investigate the geographical difference in playing pattern at the village level.

4.2.3 Player one behaviour - the village treatment

The results from the former regression did not give a clear cut answer (due to the low F-test value) to our investigation concerning the regional variations in trust for player one, so it falls natural to extend the analysis by looking at potential variation in investment level at the village level. Table A2 in the appendix gives an overview of the different regions with their respective villages included. In each region there is data from three villages. Each village has a unique number, in order to easily differentiate them from one another when doing the statistical calculations. The explanatory village variables are coded as (0/1) dummy variables, which means that the dummy variable takes the value 1 if the characteristic is present, 0 otherwise. Since there are twelve villages that could explain the variation in the amount sent by player one the function (3) is defined as below. The omitted variable is village one, Chambwe.

(3) $Invest_i = \alpha + \beta_j village_i + \varepsilon_i$, where j=2,3,…,12 and i=1,2,…,176

Regression (3) – OLS treatment:

Source	SS	df	MS
Model	33974.3506	11	3088.57733
Residual	70114.2857	164	427.526132
Total	104088.636	175	594.792208

Number of obs =	176
F(11, 164) =	7.22
Prob > F =	0.0000
R-squared =	0.3264
Adj R-squared =	0.2812
Root MSE =	20.677

invest	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_Ivill_2	-3.714286	7.683705	-0.48	0.629	-18.88603	11.45746
_Ivill_3	-18.38095	7.683705	-2.39	0.018	-33.55269	-3.209211
_Ivill_4	9.619048	7.683705	1.25	0.212	-5.552694	24.79079
_Ivill_5	-14.28571	7.81506	-1.83	0.069	-29.71682	1.145392
_Ivill_6	4.285714	7.683705	0.56	0.578	-10.88603	19.45746
_Ivill_7	-42.38095	7.683705	-5.52	0.000	-57.55269	-27.20921
_Ivill_8	-15.71429	7.963932	-1.97	0.050	-31.43934	.0107726
_Ivill_9	-13.04762	7.683705	-1.70	0.091	-28.21936	2.124122
_Ivill_10	-17.04762	7.683705	-2.22	0.028	-32.21936	-1.875878
_Ivill_11	-15.71429	7.683705	-2.05	0.042	-30.88603	-.5425445
_Ivill_12	6.952381	7.683705	0.90	0.367	-8.21936	22.12412
_cons	55.71429	5.526082	10.08	0.000	44.80285	66.62573

The constant of the regression equals 55.7. This value is the average invested amount in the village of Chambwe. The p-values of the estimated regression parameters conclude that seven villages have estimated coefficients that are significantly different from zero. All these estimated parameters are significant at the 0.1 level. This tells us that the average invested amount in village two, four, six and twelve do not deviate to a large extent from the average invested amount by player one in the village of comparison, Chambwe. Of the statistically significant villages, compared to village one, Dambulesi (village 3), Katsukunya (village 5), Mdoda (village 7), Mkwenya (village 8), Mthambi (village 9), Mulambulo (village 10) and Murike (village 11) are the villages where the difference in the level of investment is most apparent. The R^2 and the adjusted R^2 indicates a that roughly 30 per cent of the variation in the investment about its mean can be explained by the village dummies. The statistical software reports an F-value equal to 7.22, which indicates that the model is properly specified[10]. From table A1 in the appendix the heteroskedasticity test reveals a p-value equal to 0.2726. This implies that the variances of the error term are of homoskedastic nature, since the null hypothesis is being kept at the 95 per cent significance level. However, the same table indicates that the error terms are not normally distributed.

4.2.4 Regional differences – data for player two

Seemingly, there is a difference in the playing behaviour of player one due to geographical dissimilarities - at least at the village level. It is quite obvious that there might as well be a similar relation for the segment of the second players. Consequently, this section investigates if the variation in the proportion variable, *return_1,* could be explained by the characteristics of being from different regions and villages. The action of player two, *return_1*, is in this treated as the endogenous variable. As before, *return_1* consists of 164 observations. The names of the regions and the villages are similar as in the treatment for player one. The action of player one, *invest*, is also included in the function. The following function (4) is defined for the regional treatment and is carried out by the use of OLS. As for player one, region one is the omitted dummy variable and the region of comparison in (4). The regression output is given in the appendix.

$$(4)\ \text{return\_1}_i = \alpha + \beta_j \text{region}_i + \mu \text{invest}_i + \varepsilon_i, \text{ where } j=2,3,4 \text{ and } i=1,\ldots.164$$

As evident from the regression output there are two significant estimated parameters, β_2 and β_3, which are the coefficients for the regions known as Dzoole and Njombwa, respectively. Both are significant at the 95 per cent significant level, since both regions have estimated p-values which are below this level of significance. The coefficients β_4 and μ do not seem to influence the endogenous variable. The F-test value seems to be at an acceptable level, since it has a p-value that is close to zero; hence the model is interpreted as being specified

[10] The F-test value is larger than the critical value for the F-distribution with 11 nominator degrees of freedom and 164 denominator degrees of freedom.

properly. The R^2 and the adjusted R^2 report values close to 0.1, thus the variation in the dummy variables explains about 10 per cent of the variation in the dependent variable *return_1*. The table in the appendix shows that there is evidence towards homoskedastic residuals, because the test reports a p-value equal to 0.5640, thus the error terms are interpreted as being of homoskedastic nature. The appendix also reports the Swilk test result. The Swilk test rejects that the error terms are normal distributed, since the p-value of the test almost equals zero.

4.2.5 Player two behaviour - the village treatment

As for player one, let us check if the village dummy variables could explain some of the variation in the independent variable *return_1*. Each of the twelve villages uses the same unique identification as in the player one analysis. The dummies are coded as usual (0/1). The action of player one is also accounted for in this section and is represented by the variable, *invest*. However, this creates a potential problem, since there has already been established that the *invest* variable is influenced by the village dummies. The statistical analysis in this section differs to some extent compared to the former regressions. When executing the regression function (5) in a normal ordinary least square treatment the computer software reports back evidence towards large fluctuations in the size of the variance of the residuals, thus the error terms seem to be heteroskedastic[11]. This has certain implications for the derived results with respect to the estimates, thus the regression output below reports and take use of so called robust standard errors in order to make the statistical data valid even though the error terms are heteroskedastic.

(5) $return\_1_i = \alpha + \beta_j village_i + \mu invest_i + \varepsilon_i$, where j=2,3,…,12 and i=1,2,…,164

[11] The least square estimates are no longer the *best linear unbiased estimator*, BLUE, hence the hypothesis tests and the confidence intervals that have taken use of these estimates could be misleading. On other hand, the existence of heteroskedastic variances is quite common encountered when doing research with cross-sectional data (Hill, Griffiths and Judge, 2000).

Regression (5) – OLS treatment with robust standard errors:

```
Linear regression                                      Number of obs =     164
                                                       F( 12,   151) =    8.51
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.3041
                                                       Root MSE      =     .63
```

return_1	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_Ivill_2	.46726	.2709989	1.72	0.087	-.0681793	1.002699
_Ivill_3	.0682217	.2427781	0.28	0.779	-.411459	.5479024
_Ivill_4	.7112295	.2211992	3.22	0.002	.2741844	1.148275
_Ivill_5	-.4289134	.1993936	-2.15	0.033	-.822875	-.0349518
_Ivill_6	.7816239	.1779354	4.39	0.000	.4300593	1.133189
_Ivill_7	.2446711	.3077075	0.80	0.428	-.3632971	.8526393
_Ivill_8	-.2750231	.2057338	-1.34	0.183	-.6815118	.1314656
_Ivill_9	.2266039	.2328647	0.97	0.332	-.2334899	.6866977
_Ivill_10	.9036506	.2680975	3.37	0.001	.3739438	1.433357
_Ivill_11	.3557461	.2601899	1.37	0.174	-.1583367	.869829
_Ivill_12	.7135928	.2147598	3.32	0.001	.2892707	1.137915
invest	-.0057383	.0027678	-2.07	0.040	-.0112069	-.0002697
_cons	1.523787	.2180732	6.99	0.000	1.092918	1.954656

Seven coefficients are different from zero at the 0.1 significance level. Six village dummy estimates and the parameter for the variable *invest*. Five of estimates for the village dummies take on positively values and only one village dummy coefficient is negative. The 7th significant parameter is the estimate for the *invest* variable and the estimate takes a non-positive value. The F-test with 12 numerator degrees of freedom and 151 denominator degrees of freedom is reported to be equal to 8.52. This value is well within the significance margin, thus the model is said to be specified properly. From table A1 in the appendix we see that the error terms are not normal distributed and thus violates the OLS regression assumption concerning normal distributed residuals.

4.2.6 Findings and Discussion

The statistical evidence for player one in section 4.2.1 and 4.2.2 indicates that players from different regions and villages invest money in the trust game differently. Thus the fact that two players are from different places indicates that they have different investment behaviour in the trust game. The statistical evidence in section 4.2.3 and 4.2.4 derives a similar interpretation for the action taken by player two. In the player two treatment the action of player one, the variable *invest*, is included as an explanatory variable. The *invest* variable is unable to account for much of the variation in the regional treatment. However, when the regional dummies are exchanged with the village dummies in section 4.2.4, the effect of the investment by player one is at a significant level, hence a marginal increase in the investment by player one has a negative effect with respect how much player two gives back.

4.3 The Sample

In the last sections we have seen some regressions of the result from 12 different villages in the MLTSC project. There has been shown evidence of geographical differences with respect to how people play the trust game and this could thus be interpreted as the existence of different levels of trust and trustworthiness at the inter-village level. The trust game has been carried out in 18 villages throughout Malawi, but since this was carried through during the summer of 2007, all of these data are not yet available, because the MLTSC project has not yet accessed all the data from the all the trust games. Hence, our attention in this section is to be turned towards a smaller sample. The players in this sample are from six of the twelve villages from the former analysis, Chambwe, Dambulesi, Mkwenya, Chiphaphi, Kayaza and Katsukunya.

Since there are 15 pairs in each game and half of the participants have been interviewed in each of the six villages this sample should have accounted for 90 observations, however due to unforeseen circumstances in the field of data collection the data set in this section consist of 39 first movers and 42 second players, 81 observations in total. This is a result of the fact that the interviewing was carried out before the trust game was played and some of the players did not have the opportunity to participate on the day where the game took place. Consequently, the next analyses have to divide the total 81 observations into two separate groups – player one and player two, since we do not necessarily hold survey data for player one *and* player two in the same pair. From the HHQ the game participants have been interviewed on several domestic issues. This section takes a closer look at two variables from this questionnaire. One variable is called *coop* and the other is referred to as *trust*. The coop variable origin from a question in the HHQ and was presented to the participants in the following way:

> *"Have you or anybody in your household participated in any type of public works without payment in the last year, e.g. construction or maintenance of roads or buildings?"*

The other variable, *trust*, is based on the following question:

> *"In general, can most people be trusted?"*

These variables are both coded as (0 / 1) dummies, since they both are yes/no responses, where zero equals no and one equals yes. They are in this section used in the effort of trying to explain the investment made by player one, previously referred to as the variable *invest*, and the action of player two, denoted as *return_1*. The only difference with respect to the earlier analysis is the sample size, so the name of the variables remains as they are.

This section also accounts for the income of the players from the sample. Two variables are accounting for the income. These variables are the personal income and the average income. The income of the individual is referred to as the variable *income* throughout the paper and the average income is called *income_1*. These measures have been extracted from the HPQ and are not income per se, but do in fact refer to the total amount of land, measured in hectare, owned (or at least disposable) for the family of the person playing the trust game. The amount of land is thus used as a proxy for income. The average income, *income_1*, is the average income of the village in which the game has been played. The variable transformation consists of measuring the average income of an entire village. Since there are six villages in this treatment there are naturally six different average income values.

4.3.1 The cooperation hypothesis

The decision to participate in cooperative public works can arrive from numerous factors. An agent may be conscious towards the level of public goods and has a desire to contribute and to augment the amount this good within the village. However, the question is posed in a manner that one could believe that the decision to participate is voluntary. In the hypothetical sense, it might be true that the individual decision is of voluntary character, but if you do not participate you might get sanctioned in some way, so this variable could be interpreted as a contingent voluntarism. Nevertheless, in both of these cases, if you are attending public cooperation works and you are cooperating with your fellow villagers, thus it would be interesting to see if the people that have been participating in cooperative public works also are more cooperating in the trust game, i.e.: they are both investing and returning larger amounts than those who did not participate.

4.3.2 The trust hypothesis

The hypothesis concerning the variable *trust* is relatively straight forward, since there is a direct relationship to the issue in hand and the inquiry of the question. *Do you trust people?* The idea towards the stated trust question is the following: If the game investor responds positively to the question about trust – he or she should also invest more of the total endowment, since the player states that *"yes, in general I think most people can be trusted"*. When including the trust variable the effect of what the participants answer before the game and the actual behaviour in the game is compared to one another. The same reasoning does not directly translate with regards to player two, since player two, when faced with the decision, already has been trusted, so the result here are more dubious, however a person that in general trust other people are perhaps more willing to give away a larger fraction of the total endowment in the last stage of the game. The latter could by far be questioned.

4.3.3 The income hypotheses

As mentioned above, there are two different variables that represent income, *income* and *income_1*. At the individual level one could imagine that families with large parcels of land most likely also have higher productions relative to the producers that have small parcels, hence they have larger income. However, most of the players that have been participating in the MLTSC project are so called subsistence farmers, i.e., they produce to cover their everyday consumption and do not produce agriculture products to sell on the market, but there might be inter-village trading of goods and services that are segregated from the conventional market. When indoctrinating the income issue it is quite simple, do players, who come from families holding large parcels of land, i.e.: have a large income, behave differently compared against agents who do no control large land plots? A normal argument from the microeconomic theory states that if your income increases and all other parameters remain constant you will demand more of all normal goods, since your relative purchasing power has increased. If we define trust as a normal good, individuals with higher income will on average demand more of this good than a person which has a lower income. Alternatively, a person who is holding a large income can afford to take greater risk with respect to the investment in the trust game.

As mentioned, the average income is also utilised in the next couple of treatments. The average village income could be interpreted as a term of reference towards the opponents in the game. Most people often know where they rank within the hierarchy of a community, thus the average income can be seen as a community level explanatory variable. It is perfectly possible that a person playing the trust game involves some reflection towards his opponents in terms of how well of they feel they are compared to others, so it is preferable to look at how this variable explains the action of both player one and player two.

4.3.4 The model for player one.

With section 4.3.1, 4.3.2 and 4.3.3 in mind, the following function is defined for player one:

$$(6)\ invest_{ij} = \alpha + \beta_1 income_{ij} + \beta_2 income\_1_j + \beta_3 trust_{ij} + \beta_4 coop_{ij} + \mu_{ij}$$

$$i = 1,..,39 \qquad j = 1,..,6$$

As seen from the regression output below there are two omitted observations of the total 39[12]. The variable *invest* is the endogenous variable and the variables *income*, *income_1*, *trust* and *coop* are defined as explanatory variables.

Regression (6) – OLS treatment:

Source	SS	df	MS
Model	6884.20093	4	1721.05023
Residual	15148.2315	32	473.382234
Total	22032.4324	36	612.012012

Number of obs =	37
F(4, 32) =	3.64
Prob > F =	0.0150
R-squared =	0.3125
Adj R-squared =	0.2265
Root MSE =	21.757

invest	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	3.486817	2.800931	1.24	0.222	-2.218493	9.192126
income_1	-15.21791	7.697143	-1.98	0.057	-30.89648	.4606551
trust	-23.4505	10.86786	-2.16	0.039	-45.58761	-1.313384
coop	-33.04291	10.8188	-3.05	0.005	-55.08009	-11.00574
_cons	97.75542	17.22038	5.68	0.000	62.67865	132.8322

Three of the estimated coefficients are significantly different from zero at the 0.1 significance level. It is only the estimated parameter for the variable *income* that does not seem to be statistically different from zero. The effect of the three significant estimates relate themselves negatively with regards to the dependent *invest* variable, since the signs of their respective estimated parameters are all negative. The p-value of the F-test equals 0.0150, so

[12] One player from Chiphaphi is missing in the final regression output, since the data for the variables *coop* and *trust* are missing for this player. Also, one player from Chambwe is omitted, because the value of the variable *trust* is missing in the data set

the model can be said to be significant at the 95 per cent level[13]. According to the R^2 and the adjusted R^2 the explanatory power for the model lies in the interval between 22 and 31 per cent. Table A1 in the appendix shows that the p-value of the heteroskedasticity test equals 0.7913, hence the assumption concerning constant variances in the residuals is not violated and it is thus understood that the residuals are of a homoskedastic nature. However, the residuals are not normally distributed, as the same table in the appendix points out.

Table 10 – Correlation Matrix:

(obs=37)

	income	income_1	trust	coop
income	1.0000			
income_1	0.0540	1.0000		
trust	-0.0340	0.5058	1.0000	
coop	-0.0358	-0.4891	-0.7238	1.0000

If many of the variables in the sample move systematic in the same direction, we say that these variables are collinear or multicollinear if several variables are involved. A rule of thumb is that one should be alert of potential harmful collinearity if the correlation between two variables is 0.8 or larger (Hill, Griffiths and Judge, 2000). The correlation matrix above explains the correlation amongst the explanatory variables utilized in the regression function (6). The correlation coefficient between the variables *trust* and *coop* takes a high value and is calculated to -0.7238. The other correlation coefficients seem to be at more appropriate levels. Since there are smaller amount of observations in this section compared to the earlier treatments and the variables are somewhat collinear two Ramsey RESET tests have been testing the model with respect to omitted variables. One is using powers of the fitted values of the endogenous variable *invest* and the other raise the explanatory variables in (6) into powers. Both p-values from table A1 in the appendix conclude that the model (6) does not have any omitted variables.

4.3.5 The model for player two

The model for player two is almost identical as in the case of player one, however the variable *invest* is added as an explanatory variable. The following function is specified for player two:

[13] The critical F-value with 4 numerator degrees of freedom and 32 denominator degrees of freedom at the 0.05 level of significance is smaller than 3.64.

(7) $return\_1_{kj} = \alpha + \beta_1 income_{kj} + \beta_2 income\_1_j + \beta_3 trust_{kj} + \beta_4 coop_{kj} + \beta_5 invest_{kj} + \delta_{kj}$

$k = 1,..,42 \qquad j = 1,..,6$

In (7) the endogenous variable is *return_1*. *Income*, *trust*, *coop* and the investment by pair pate for individual *k* from village *j* and as well the average income of village *j* is included as regressors. Three observations not accounted for in the final regression output, since the statistical software drops the observations where variable values are missing[14].

Regression (7) – OLS treatment:

Source	SS	df	MS
Model	4.47314247	5	.894628494
Residual	9.3901051	33	.284548639
Total	13.8632476	38	.364822304

Number of obs =	39
F(5, 33) =	3.14
Prob > F =	0.0198
R-squared =	0.3227
Adj R-squared =	0.2200
Root MSE =	.53343

return_1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	-.0177809	.0638762	-0.28	0.782	-.147738	.1121763
income_1	-.2567904	.2066357	-1.24	0.223	-.6771938	.163613
trust	-.3994713	.2203968	-1.81	0.079	-.8478721	.0489294
coop	-1.031954	.2699881	-3.82	0.001	-1.581249	-.4826588
invest	-.0000458	.004386	-0.01	0.992	-.0089692	.0088776
_cons	2.60133	.6259992	4.16	0.000	1.327725	3.874935

All the coefficients are not statistically significant. The estimated regression coefficients for the variables *trust* and *coop* are significant at the 0.1 level of significance. The estimated parameters for the variables *income* and *invest* are not significant, since their respective p-values have values of 0.782 and 0.992. The p-value of the estimated regression coefficient of the average village income variable, *income_1*, equals 0.223 and thus indicating that neither the variable *income_1* is seen as significant at the 0.1 significance level. The p-value of the F-test equals 0.0198 and seemingly the specified model is significant at the 95 per cent level. The two R-square calculations indicate that about 22 to 32 per cent of the variation in *return*_1 is explained by the explanatory variables defined in the function above. From the table A1 in the appendix it is easily observable that the error terms are homoskedastic, the model has no omitted variables, but the residuals are not normal distributed.

[14] There is one *income* variable missing for a player from Katsukunya. There is a player from Kayaza and a player from Katsukunya where the *coop* variable data is missing, thus there are a total of 39 observations in the regression output.

Table 11 – Correlation Matrix:

(obs=39)

	income	income_1	trust	coop	invest
income	1.0000				
income_1	0.4736	1.0000			
trust	0.1215	0.4481	1.0000		
coop	-0.3483	-0.6536	-0.5938	1.0000	
invest	-0.2542	-0.4457	-0.2763	0.2074	1.0000

The problem for variables that have the property of being collinear is that they do not provide sufficient information in order to separate their explanatory effect from each other, so the effect of one variable could in fact be accounted for by the wrong variable. As for the correlation matrix for player one, we see that the correlation coefficient for the variables *trust* and *coop* takes a quite large value, as well does the coefficient for the variable pair (*income_1* , *coop*), however since all the correlation coefficients are smaller than 0.8, we do not interpret this as harmful correlation.

4.3.6 Findings and Discussion

In the model for player two the *invest* variable is included as an explanatory variable. The regression output clearly, as the correlation table 7 from section 4.1 did, derives to the conclusion that the invested amount does not influence the amount sent back to player one by player two. The variable *coop* relate itself negatively to the endogenous variables in both the model for player one and the model for player two. In both models the estimated parameter for the variable *coop* has a negative effect on the endogenous variables *invest* and *return_1*.

The variable *trust* also relates itself negatively at a significant level to the endogenous variables *invest* and *return_1* in the regression analyses from the last sections. This result is to some extent of surprising character, since people that state that they do in fact, on a general level, have trust in other people invest less than people that say that they do *not* have trust. On the other hand, the variable *trust* could to some extent be biased. It is not sure that the respondent actually gave the questionnaire his honest view about trust.

In the model for player one there is a significant negative relationship between the average income variable, *income_1*, and the endogenous regressed variable *invest*. This finding indicates that an increase in the average income within a village will in fact reduce the invested amount by player one. The same relationship does not exist at the significant level on behalf of player two. The individual income variable, *income*, does not influence neither the behaviour of player one nor of player two according to the regression outputs.

4.4 Stated trust and cooperation

From the former analyses there has been shown evidence that the cooperative variable *coop* and the variable for the stated trust, *trust*, which are both taken from the HHQ, are in fact negatively correlated with both the *invest* variable and the *return_1* variable. This means that people who cooperate in public works do not seem to cooperate better in the trust game. As well, the players who have stated to have trust toward others do not play the trust game in agreement to this proclamation. These new findings consequently reveal additional issues with respect to the stated trust and cooperative public works. What could determine the decision to interact in cooperative works within the village? Who are the players that claim to inhabit trust toward others?

There are two measures for trust in this paper, the trust game and the stated trust. These measures are travelling in different directions, since they are negatively correlated. Consequently, in an attempt to investigate these issues, the variables are rearranged with respect to dependency. This section treats the former explanatory variables *coop* and *trust* as endogenous variables in an attempt to clarify which factors it is that influence these variables. The effect from the variable *trust* and the variable *coop* were the same for both players, so they can be treated simultaneously, which means that we do not need to divide our 81 observations from the sample into two groups as was done in section 4.3, but they can be treated within the same analysis. Since both the *coop* variable and the *trust* variable are binary, thus only taking the values zero or one, a logistic regression framework is used. For both of the binary endogenous variables the explanatory variables are income for individual *i*, *income*, and the average income for individual i from village *j*, *income_1*.

4.4.1 The cooperation model

The population logit model of the binary endogenous variable *coop* where the variables *income and income_1* is included as the regressors is given in (8).

(8) P (coop=1 | income, income_1)

$$\updownarrow$$

$$F(\alpha + \beta_1 income + \beta_2 income\_1) = \frac{1}{1 + e^{-(\alpha + \beta_1 income + \beta_2 income\_1)}},$$

where F is the logistic cumulative distribution function.

Regression output (8) – Logistic Treatment:

```
Iteration 0:   log likelihood =  -51.00379
Iteration 1:   log likelihood = -37.512272
Iteration 2:   log likelihood =   -36.7464
Iteration 3:   log likelihood = -36.682584
Iteration 4:   log likelihood =  -36.68158
Iteration 5:   log likelihood =  -36.68158

Logistic regression                               Number of obs   =         77
                                                  LR chi2(2)      =      28.64
                                                  Prob > chi2     =     0.0000
Log likelihood =  -36.68158                       Pseudo R2       =     0.2808
```

coop	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
income	-.1236491	.2461605	-0.50	0.615	-.6061148	.3588165
income_1	-2.819845	.855728	-3.30	0.001	-4.497042	-1.142649
_cons	5.409587	1.397111	3.87	0.000	2.671301	8.147874

With regards to level of significance there is evident from the regression output above that the coefficient for the *income_1* variable is the one that rejects the null hypothesis of being statistically significantly different from zero. The estimated parameter for the variable *income* has a p-value equal to 0.615, thus the data tells us that this variable does not to a large extent influence the endogenous variable *coop*. The value of the log likelihood ratio equals 28.64 and this indicates that our model is reasonable specified. The p-value of the model confirms this, since it is zero. The sign of the estimated parameter β_2 is negative, which means that the average income relates itself negatively towards the binary endogenous variable coop. This implies that a marginal increase with respect to the average income leads to a decrease in the probability of *coop* taking a positive value. So in the villages where they have a relative low income they have a higher probability of participating in cooperative public works. This is seen better in the table 12 below which explains, in terms of predicted probabilities for the average income variable, *income_1*, how the probability of receiving a positive outcome of the *coop* variable is varying with the average income variable, *income_1*. However, it is worth mentioning the relatively large gap between the largest income value 2.91 and the rest of the value for the average income variable, both in predicted probabilities and in the variable values themselves.

Table 12 – Predicted Probabilities:

logit: Predicted probabilities of positive outcome for **coop**

income_1	Prediction
.99	**0.9186**
1.49	**0.7337**
1.59	**0.6751**
1.61	**0.6626**
1.65	**0.6370**
2.91	**0.0478**

	income	income_1
x=	**1.5743896**	**1.6855844**

4.4.2 The model for the stated trust

In earlier treatments we have interpreted trust and trustworthiness as what the players are actually doing in the trust game and used information from the HHQ and HPQ surveys in order to explain their behaviour. As in the cooperation model, we distance ourselves from what the players in fact did in the trust game and instead concentrate towards their survey answer about their level of trust, since, they all have answered the question from the HHQ – *In general, can most people be trusted?* The logit model of the binary dependent variable *trust* where the variables *income and income_1* are defined as the explanatory variables is given in (9).

$$(9)\ P(\text{trust}=1 \mid \text{income, income\_1})$$

$$\updownarrow$$

$$F(\alpha + \beta_1 \text{income} + \beta_2 \text{income\_1}) = \frac{1}{1+e^{-(\alpha+\beta_1 income+\beta_2 income\_1)}},$$

where F is the logistic cumulative distribution function.

Regression output (9) – Logistic Treatment:

```
Iteration 0:   log likelihood = -53.654501
Iteration 1:   log likelihood = -44.272518
Iteration 2:   log likelihood = -43.775547
Iteration 3:   log likelihood = -43.753269
Iteration 4:   log likelihood = -43.753196

Logistic regression                               Number of obs   =         78
                                                  LR chi2(2)      =      19.80
                                                  Prob > chi2     =     0.0001
Log likelihood = -43.753196                       Pseudo R2       =     0.1845
```

trust	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
income	**-.2144925**	**.2158764**	**-0.99**	**0.320**	**-.6376025**	**.2086174**
income_1	**2.336826**	**.7132957**	**3.28**	**0.001**	**.9387921**	**3.73486**
_cons	**-3.735991**	**1.068892**	**-3.50**	**0.000**	**-5.83098**	**-1.641002**

The log likelihood ratio equals 19.80 and alongside a p-value approaching zero the model is interpreted as being properly specified. There is only one of the estimated regression coefficients which take a value significantly different from zero. This is the parameter for the average village income, *income_1*, since it has a p-value close to zero. The estimate for the variable *income* is, as in the cooperation treatment, not significant at any reasonable significant level; hence it is the average village income that explains the variation in the dependent variable *trust*. As evident from the regression output above and the next table, the relationship between the endogenous variable and the exogenous average income variable is positive.

Table 13 – Predicted Probabilities:

logit: Predicted probabilities of positive outcome for **trust**

income_1	Prediction
.99	**0.1466**
1.49	**0.3560**
1.59	**0.4112**
1.61	**0.4225**
1.65	**0.4455**
2.91	**0.9385**

	income	income_1
x=	**1.5787308**	**1.6910257**

The predicted probability of positive outcome of the dependent variable *trust* is increasing as the average income increases. This implies that people from villages with relatively large average incomes have a higher probability to state that they have a general trust toward others than otherwise. However, bear in mind from the table above that there is a large gap in the predicted probability between the highest value for the average income and the rest of the values, but this is a product of the large gap in the average income.

4.4.3 Findings and Discussion

The main findings in section 4.4 are based on the significance of the average village income, since the estimated coefficient of this variable has proven to be the statistically significant in both the cooperation model and the stated trust model. The findings show that there is a negative relationship between the endogenous cooperation variable and the variable *income_1*. There is a large gap in the predicted probabilities; there is nevertheless a downward sloping relationship between the two variables *coop* and *income_1* from our sample. This does not directly compare to the game behaviour of the players, but it is on the other side interesting to observe that people from villages where the average income is relatively small have a higher probability of participating in cooperative public works, i.e.: the players from our sample who origin from low income villages are to a larger extent participating in public cooperative works.

In the stated trust model there has been shown evidence that the stated trust of an individual from our sample is influenced by the average village income in a positive manner, hence the probability that the variable *trust* takes on a positive value, i.e.: an individual states that he or she has a general trust in other people, is increasing in probability when the average income increases. Alternatively, people who come from rich villages have a higher probability to state that they have in fact trust in others. However, in both the cooperation model and in the stated trust model the same trouble appears. One of the observed values from the variable *income_1* is relatively far away from the observed mean.

5. Findings and Discussion

The theoretical predictions in chapter two assume that players are rational and selfish. With respect to the game solution by backward induction, the players should have been located at the sub game Nash equilibrium, zero. However, since the average amount sent and the average amount returned both differs from zero the game prediction is not fulfilled. This finding concurs to the general picture drawn by most experimental economists. Table 1, 2 and 3 shows proof of reciprocal behaviour from player two and since the proportion given back to player one is between 1 and 2, the offer from player two lies in the interval from pure reciprocal and pure sharing, which agrees to the findings by for example Barr 2003.

However, to completely identify the reasoning behind every player's decision to not send as the game theory predicts is somewhat uncertain. If we still assume that the rationality axiom holds this implies a violation of the selfishness assumption. If so is the case, the action of the players could be explained by reciprocity or so called other regarding preferences such as altruism and inequality aversion. With respect to the behaviour of player one, it could be the expectation of positive reciprocity, thus that player one believes he or she can profit from the investment through trusting player two. If player two does not behave altruistic, it could be the case that giving makes him or her feel better, or that the utility function to some extent incorporates inequality aversion, contingent upon having been trusted. I A gives B a positive amount B might feel bad if he does not return anything to A. Finally, it might as well happen that the villagers are used to be part of a sharing society, hence the social capital in the society in which the players' origin could explain the diverging empirical results compared to the game prediction.

Section 4.2 investigates the game behaviour when it is adjusted for geographical differences. It is argued that there are large geographical fluctuations in how people behave in the trust game. From regression (2) we have seen that the players from region four have a game behaviour pattern that differs compared to the region of reference and the estimates for region two and three do not differ to the reference region[15]. On behalf of player two, the endogenous variable *return_1* and regression (4) report that region two and three differs from the region of reference and the estimate for region four is not significantly different from zero. This is exactly the reverse of the treatment for player one.

The geographical fluctuations are also present in the village treatments. From the player one analysis, the data from regression (3) indicates that village three, five, seven, eight, nine, ten and eleven differs most relative to village one. When looking at the actions of player two, regression (5) emphasizes that village two, four, five six, ten and twelve have statistically significantly different playing pattern compared to the reference village, village one. Both the regional differences and the differentiated behaviour observed in the various villages indicate a differentiated playing behaviour with respect to geographical settlement.

In every pure player two treatment there is accounted for the level of investment by player one. Do the action of player one influence the action of player two? The findings are somewhat ambiguous. The correlation between the invested amount and the proportion of the returned amount is weak. This can be seen in table 7 from section 4.1. From section 4.3 where the smaller sample is investigated it is obvious that the variable *invest* clearly has no influence with respect to the action taken by player two and the regional player two treatment from section 4.2 shows as well convincing evidence towards a non-existing relationship between the variable *invest* and the proportional returned amount by player two. However, the evidence of the village treatment for player two from section 4.2 travel in a different direction. In that case, the variable *invest* influence the proportion of the returned amount. The sign of the estimated coefficient is negative and significant at the 0.05 significance level.

Section 4.1.2 treats the transformed variable *high* and defines a high offer from player two as an offer that improves the game utility for player one. The findings suggest a positive relationship between the variable defined as *high* and the invested amount by player one, i.e.: the predicted probability of positive outcome for the variable high is increasing in the investment of player one. Since the invested amount by player one is multiplied by a factor

[15] Based on the F-test the model used in regression (2) is seen as being not significant, but it is nevertheless observable that the average invested amount in region four is substantially lower than the averages in the other regions.

of three, this finding could be interpreted as an aversion towards inequality on behalf of player two, since the total amount returnable for player two is increasing and the endowment for player one is decreasing when the investment by player one is augmenting.

The cooperation hypothesis discuss if people who are cooperating in public cooperative works are better to cooperate in the trust game, i.e.: there should be a positive correlation between presence of the variable *coop* and the endogenous variables *invest* and *return_1* in regression (6) and (7). The estimated regression coefficient for the variable *coop* is significant in both (6) and (7). However, the effect is negative in both cases, thus these findings do not support the cooperation hypothesis, but rather the opposite – the players that have participated in cooperative public works both invest and return less than those who did not participate, so there do not seem to be a fact that people that have participated in cooperative public works cooperate more in the trust game. On the other side, the variable *coop* might be better interpreted as an institutional variable. It is not necessarily a fact that the cooperation variable *coop* in fact is a voluntary decision and thereby not being a good measure of individual decision making.

The stated trust hypothesis argues a positive relation between the variable *trust* and the endogenous variables *invest* and *return_1* in both regression (6) and (7). However, the results indicate the opposite. There is a significant effect between the variable *trust* and both *invest* and *return_1*, but in both cases this relation is negative, thus a person saying that *"Yes, I generally believe people can be trusted"*, both sends and returns less than otherwise. If the actions taken by players in the trust game is in fact interpreted as the level of trust and trustworthiness for individual *i* and *k* – the results from the regressions clearly indicate an inconsistency between what the players say and what the players do in real life.

The income hypothesis from section 4.3.3 argues that the demand for trust and trustworthiness is increasing with respect to income. For instance, if player one has a high income, he or she can afford greater risks in the game, since the game payoff represents a smaller fraction the total budget. Regression (6) shows a weak tendency towards a positive relationship between the variable *income* and the variable *invest*, but the estimate for the *income* variable is however not very robust and does not fall within the normal level of significance. The data from regression (7) does not indicate a similar relationship for player two. Consequently, this hypothesis needs more research and it would be especially intriguing to observe how the estimate for the *income* variable is affected by an increase in the total number of observations.

The independent variable *income_1* relate itself negative to the endogenous variables *invest* and *return_1* in both regression (6) and (7). The regression reports indicate a significant relationship for player one, but the relationship is however not significant in the player two model. Nevertheless, this implies that in the villages where the average income is relatively low the players both send and return larger amounts than in the villages where the average income is higher. This is interesting; since this indicates that the people from relatively low income villages are more trusting and cooperate better than the players from relatively rich villages.

From regression (8) and (9) there is shown that the average income variable, *income_1*, plays an important part. From the cooperation treatment in (8) the effect is negative at a significant level, thus stating that the probability of someone participating in cooperative public works is decreasing in the average income. This means that in the villages where the average income is low the predicted probability of participating in these kinds of programs is higher than in the villages where the average income is larger, which implies that there is more public works cooperation in relatively poor villages than in relatively rich communities. Seen in comparison to the sample treatment from section 4.3, these findings are fascinating. Regression (8) and (9) indicate that the players from the poor villages are more cooperative, since they are to a larger extent participating in public works and regression (6) and (7) argue that players who origin from poor villages both invest and return more, since the variable *income_1* is negatively correlated to the dependent variables in both (6) and (7). Consequently, people from villages where the average income is relatively low cooperate more in public works and better in the trust game than villagers from relatively rich societies.

From the stated trust treatment carried out in regression (9) the correlation is opposite compared to the cooperation model. The average income variable, *income_1*, and the endogenous binary *trust* variable are positively correlated, so the stated trust in low income communities seem to be lower than in the communities where the average income is higher. From regression (6) and (7) there is proven a negative effect on behalf of both the invested and the returned amount in the game from the stated trust variable *trust*. The stated trust model in regression (9) shows that players from the villages with the largest incomes are more probable to state that they have a general trust towards others. This means that players from villages with high average income say they have trust, but as the evidence from the Malawian trust game has revealed, those are not necessarily the players who are the most trusting in the trust game, since the evidence from the various regressions tells us that the players from the low income communities are better to cooperate in the game. Consequently, there is not a strict coherence between what the game participants state and how they actually act in the trust game.

Much recent theoretical and empirical work has evidence of trust between people foster cooperation and economic activity and is crucial for economic and social development. Glaeser et al. (2000) combined GSS and the trust game but found a poor correlation between the stated trust in the GSS and the amount invested by player one. By comparison, the amount returned was significantly explained by the stated trust in the GSS. In recent research it seems to be other motivations beside trust and trustworthiness that should be considered, such as pure altruism and risk preferences (Cox 2004, Karlan 2005, and Schetcher 2006), since people have different risk preferences and most likely different levels of altruism.

Stenman et al. (2006) conclude that both measures (give and return) reflect trust, but none of them measure this especially well. However, this is not an isolated issue for the measurement of trust and could also be found other research fields. The conclusion of Stenman et al. (2006) is derived because they happen to observe from the results of stage one in the trust game that about one third of the players think that they will gain from sending a positive amount and approximately one third believe they will lose by giving away a positive amount, yet, they still sent a positive amount to the second player of the game, so there must be something else other than pure trust present in the decision making.

This paper concurs towards some of the findings by Glaeser et al. (2000) and Stenman et al. (2006). It has proven difficult to determine decisive determinants which influence the decision making at the agent level, since most of the variables at the individual level do not seem to affect the action by the players. On the other side, geographical differences and alongside geographical characteristics such as average village income has proven to be important factors in this paper, i.e.: the social capital of a group might disclose more with respect to the trust game behaviour compared to individual characteristics.

6. References/Literature

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7. Appendix

Regression (2) – OLS treatment:

$$(2)\ Invest_i = \alpha + \beta_j region_i + \varepsilon_i, \text{ where } j=2,3,4 \text{ and } i=1,\ldots.176$$

```
. xi:reg invest i.reg
i.reg            _Ireg_1-4           (naturally coded; _Ireg_1 omitted)

      Source |       SS       df       MS              Number of obs =     176
-------------+------------------------------           F(  3,   172) =    1.76
       Model |  3107.7417      3  1035.9139            Prob > F      =  0.1558
    Residual | 100980.895    172  587.098225           R-squared     =  0.0299
-------------+------------------------------           Adj R-squared =  0.0129
       Total | 104088.636    175  594.792208           Root MSE      =   24.23

------------------------------------------------------------------------------
      invest |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     _Ireg_2 |  -1.269841   5.198573    -0.24   0.807    -11.53105    8.991372
     _Ireg_3 |  -.7070707   5.137097    -0.14   0.891    -10.84694      9.4328
     _Ireg_4 |  -10.22222   5.108156    -2.00   0.047    -20.30497   -.1394781
       _cons |   48.88889   3.612012    13.54   0.000     41.75931    56.01847
------------------------------------------------------------------------------
```

Regression (4) – OLS treatment:

$$(4)\ return\_1_i = \alpha + \beta_j region_i + \mu invest_i + \varepsilon_i, \text{ where } j=2,3,4 \text{ and } i=1,\ldots.164$$

```
      Source |       SS       df       MS              Number of obs =     164
-------------+------------------------------           F(  4,   159) =    4.56
       Model | 8.85806176      4  2.21451544           Prob > F      =  0.0016
    Residual | 77.2615178    159  .485921496           R-squared     =  0.1029
-------------+------------------------------           Adj R-squared =  0.0803
       Total | 86.1195796    163  .528340979           Root MSE      =  .69708

------------------------------------------------------------------------------
    return_1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     _Ireg_2 |  -.5483154   .1504975    -3.64   0.000    -.8455474   -.2510833
     _Ireg_3 |  -.4612817   .1524772    -3.03   0.003    -.7624237   -.1601398
     _Ireg_4 |   -.116343   .1547402    -0.75   0.453    -.4219544    .1892683
      invest |  -.0005955   .0025298    -0.24   0.814    -.0055918    .0044008
       _cons |   1.878259   .1644477    11.42   0.000     1.553476    2.203043
------------------------------------------------------------------------------
```

Table A1 – Regression Diagnostic tests:

Regression Number	P-value of heteroskedasticity test	Error terms are homeskedastic	P-value of normality test	Error terms are normal distributed	P-value of the RESET test,lhs	P-value of the RESET test, rhs	The model has no omitted variables
2	0.3253	yes	0.00045	no	N/A	N/A	-
3	0.2726	yes	0.00019	no	N/A	N/A	-
4	0.5104	yes	0.00004	no	N/A	N/A	-
5	N/A	N/A	0.02859	no	N/A	N/A	-
6	0.7913	yes	0.14918	yes	0.2325	0.8172	yes
7	0.5106	yes	0.53191	yes	0.6037	0.9922	yes

Comments:

Test for heteroskedasticity[16] H_0: Constant variance, Breusch-Pagan / Cook-Weisberg

Test for normality[17] H_0: Normal distributed error terms, Shapiro Wilk, Swilk test

Ramsey RESET test[18] H_0: Model has no omitted variables, The RESET test gives two different p-values, the p-value for the left hand side (lhs) and the p-value for the right hand side (rhs)

Table A2 – Region and Village:

$$1.\ \text{Chidradzulu} \begin{cases} 4.\textit{Kajawo} \\ 9.\textit{Mthambi} \\ 10.\textit{Mulambulo} \end{cases}$$

$$2.\ \text{Dzoole} \begin{cases} 5.\textit{Katsukunya} \\ 6.\textit{Kayaza} \\ 8.\textit{Mkwenya} \end{cases}$$

$$3.\ \text{Njombwa} \begin{cases} 1.\textit{Chambwe} \\ 2.\textit{Chiphaphi} \\ 3.\textit{Dambulesi} \end{cases}$$

$$4.\ \text{Phalmobe} \begin{cases} 7.\textit{Mdoda} \\ 11.\textit{Murike} \\ 12.\textit{Namarwa} \end{cases}$$

[16] Obtained by typing the command **hettest** in Stata 9.1
[17] Obtained by typing the command **swilk** in Stata 9.1
[18] Obtained by typing the command **ovtest** and **ovtest, rhs** in Stata 9.1

THE TRUST GAME SCRIPT

[*Note to researchers: Be sure to read the general instructions that you always read before a game (see below). Group 1 players and Group 2 players should be separated in two rooms/locations before you begin this game. The risk of collusion in the holding room is greater in this game due to the tripling effect and warrants the trade-off. First instruct the Group 1 players to put their offers in envelopes, then take all of their envelopes. Ask them to wait while you play with the Group 2 players and then call back the Group 1 players to pay them off. Remember that there is no show-up fee with the trust game because both sides are given the same initial endowment.*]

GENERAL INSTRUCTIONS

Thank you all for taking the time to come today. This game may take 3-4 hours, so if you think you will not be able to stay that long without leaving please let us know now. Before we begin I want to make some general comments about what we are doing here today and explain some rules that we need to follow. We will be playing a game for real money that you will take home. You should understand that this is not [insert name of researcher]'s own money. It is money given to [him/her] by [his/her] university to use to do a research study. This is research—which will eventually be part of a book; it is not part of a development project of any sort. [Insert name of researcher] is working together with many other university professors who are carrying out the same kind of games all around the world.

Before we proceed any further, let me stress something that is very important. Many of you were invited here without understanding very much about what we are planning to do today. If at any time you find that this is something that you do not wish to participate in for any reason, you are of course free to leave whether we have started the game or not.

If you have heard about a game that has been played here in the past you should try to forget everything that you have been told. This is a completely different game. We are about to begin the game. It is important that you listen as carefully as possible, because only people who understand the game will actually be able to play it. [Insert name of researcher] will run through some examples here while we are all together. You cannot ask questions or talk about the game while we are here together. This is very important and please be sure that you obey this rule, because it is possible for one person to spoil the game for everyone, in which case we would not be able to play the game today. Do not worry if you do not completely understand the game as we go through the examples here in the group. Each of you will have a chance to ask questions in private with [insert name of researcher] to be sure that you understand how to play.

TRUST GAME INSTRUCTIONS

This game is played by pairs of individuals. Each pair is made up of a Player 1 and a Player 2. Each of you will play this game with someone from your own village. However, none of you will know exactly with whom you are playing. Only [*insert name of researcher*] knows who is to play with whom and [*he/she*] will never tell anyone else.

[*Insert name of* researcher] will give $4 to each Player 1 and another $4 to each Player 2. Player 1 then has the opportunity to give a portion of their $4 to Player 2. They could give $4, or $3, or $2, or $1, or nothing.

[Note: It is important to allow only 5 options for dividing the money—this is to simplify the game and to create the same focal points across sites.]

Whatever amount Player 1 decides to give to Player 2 will be tripled by [*insert name of researcher*] before it is passed on to Player 2. Player 2 then has the option of returning any portion of this tripled amount to Player 1.

Then, the game is over.

Player 1 goes home with whatever he or she kept from their original $4, plus anything returned to them by Player 2. Player 2 goes home with their original $4, plus whatever was given to them by Player 1 and then tripled by [*insert name of researcher*], minus whatever they returned to Player 1.

Here are some examples.

[*You should work through these examples by having all the possibilities laid out in front of people, with Player 1's options from $4 to $0 and a second column showing the effects of the tripling. As you go through each example demonstrate visually what happens to the final outcomes for each Player. Be careful to remind people that Player 2 always also has the original $4*]:

1. Imagine that Player 1 gives $4 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $12 (3 times $4 equals $12) over and above their initial $4. At this point, Player 1 has nothing and Player 2 has $16. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $3 to Player 1. At the end of the game Player 1 will go home with $3 and Player 2 will go home with $13.

2. Now let's try another example. Imagine that Player 1 gives $3 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $9 (3 times $3 equals $9) over and above their initial $4. At this point, Player 1 has $1 and Player 2 has $13. Then Player 2 has to decide whether they wish to give anything back to Player, and if so, how much. Suppose Player 2 decides to return $0 to Player 1. At the end of the game Player 1 will go home with $1 and Player 2 will go home with $13.

3. Now let's try another example. Imagine that Player 1 gives $2 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $6 (3 times $2 equals $6) over and above their initial $4. At this point, Player 1 has $2 and Player 2 has $10. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $3 to Player 1. At the end of the game Player 1 will go home with $5 and Player 2 will go home with $7.

4. Now let's try another example. Imagine that Player 1 gives $1 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $3 (3 times $1 equals $3) over and above their initial $4. At this point, Player 1 has $3 and Player 2 has $7. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $2 to Player 1. At the end of the game Player 1 will go home with $5 and Player 2 will go home with $5.

5. Now let's try another example. Imagine that Player 1 gives nothing to Player 2. There is nothing for [*insert name of researcher*] to triple. Player 2 has nothing to give back and the game ends here. Player 1 goes home with $4 and Player 2 goes home with $4.

Note that the larger the amount that Player 1 gives to player 2, the greater the amount that can be taken away by the two players together. However, it is entirely up to Player 2 to decide what he should give back to Player 1. The first player could end up with more than $4 or less than $4 as a result.

We will go through more examples with each of you individually when you come to play the game. In the mean time, do not talk to anyone about the game. Even if you are not sure that you understand the game, do not talk to anyone about it. This is important. If you talk to anyone about the game while you are waiting to play, we must disqualify you from playing.

[*Bring in each Player 1 one by one. Use as many of the examples below as necessary.*]

6. Imagine that Player 1 gives $4 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $12 (3 times $4 equals $12) over and above their initial $4. At this point, Player 1 has nothing and Player 2 has $16. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $6 to Player 1. At the end of the game Player 1 will go home with $6 and Player 2 will go home with $10.

7. Now let's try another example. Imagine that Player 1 gives $3 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $9 (3 times $3 equals $9) over and above their initial $4. At this point, Player 1 has $1 and Player 2 has $13. Then Player 2 has to decide whether they wish to give anything back to Player, and if so, how much. Suppose Player 2 decides to return $1 to Player 1. At the end of the game Player 1 will go home with $2 and Player 2 will go home with $12.

8. Now let's try another example. Imagine that Player 1 gives $2 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $6 (3 times $2 equals $6) over and above their initial $4. At this point, Player 1 has $2 and Player 2 has $10. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $0 to Player 1. At the end of the game Player 1 will go home with $2 and

Player 2 will go home with $10.

9. Now let's try another example. Imagine that Player 1 gives $1 to Player 2. [*Insert name of researcher*] triples this amount, so Player 2 gets $3 (3 times $1 equals $3) over and above their initial $4. At this point, Player 1 has $3 and Player 2 has $7. Then Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return $2 to Player 1. At the end of the game Player 1 will go home with $5 and Player 2 will go home with $5.

10. Now let's try another example. Imagine that Player 1 gives nothing to Player 2. There is nothing for [*insert name of researcher*] to triple. Player 2 has nothing to give back and the game ends here. Player 1 goes home with $4 and Player 2 goes home with $4.

Now, can you work through these examples for me:

11. Imagine that Player 1 gives $3 to Player 2. So, Player 2 gets $9 (3 times $3 equals $9) over and above their initial $4. At this point, Player 1 has $1 and Player 2 has $13. Suppose Player 2 decides to return $5 to Player 1. At the end of the game Player 1 will have how much? [*the initial $4-$3 (given to Player 2)=$1+return from player 2 of $5=$6. If they are finding it difficult, talk through the maths with them and be sure to use demonstration with the actual money*]. And Player 2 will have how much?

[*Their original $4+$9 (after the tripling of the $3 sent by Player 1)-$5 they return to Player 1=$8, if they are finding it difficult, talk through the maths with them*].

12. Imagine that Player 1 gives $1 to Player 2. So Player 2 gets $3 (3 times $1 equals $3) over and above their initial $4. Then, suppose that Player 2 decides to give $1 back to Player 1. At the end of the game Player 1 will have how much?

[*The initial $4-$1 (given to Player 2)=$3+return from player 2 of $1=$4.* I*f they are finding it difficult, talk through the maths with them and be sure to use demonstration with the actual money*]. And Player 2 will have how much? [*Their original $4+$6 (after the tripling of the $3 sent by Player 1)-$1 they return to Player 1=$6, if they are finding it difficult, talk through the maths with them*].

HOW TO PLAY THE GAME

First player: You are Player 1. Here is your $4. [*At this point $4 is placed on the table in front of the player.*] While I am turned away, you must hand [*insert researcher's name*] the amount of money you want to be tripled and passed on to Player 2. You can give Player 2 nothing, $1, $2, $3, or $4. Player 2 will receive this amount tripled by me plus their own initial $4. Remember the more you give to Player 2 the greater the amount of money at his or her disposal. While Player 2 is under no obligation to give anything back, we will pass onto you whatever he or she decides to return. [*Now the player hands back whatever he or she wants to have tripled and passed to player 2*.]

[*Note to researcher: Finish all Player 1's and send them to a third holding location—they must not return to the group of Player 1's who have not played and they must not join the Player 2's. Once all Player 1's have played you can begin to call Player 2's. Player 2's can be paid off immediately after they play and sent home.*]

Second player: You are Player 2. First, here is your $4. [*Put the $4 in front of Player 2.*] Let's put that to one side. [*Move the $4 to one side but leave it on the table.*] This pile represents Player 1's initial $4. [*Put this $4 in front of the researcher.*] Now [*insert name of researcher*] will show you how much Player 1 decided to give to you. Then [*he/she*] will triple it. Then you must hand back the amount that you want returned to Player 1. [*Take Player 1's offer out of the pile representing Player 1's stake and put it down in front of Player 2, near but not on top of Player 2's $4. Then add to Player 1's offer to get the tripled amount. Receive back Player 2's response.*] Remember, you can choose to give something back or not. Do what you wish. While I am turned away, you must hand [*insert researcher's name*] the amount of money you want to send back to Player 1. [*Now the player hands back his return for Player 1.*] You are now free to go home, but do not visit with any of the waiting players.