Network Effects, Riskiness and Cooperation Norms: A Lab-in-the-field Study in Rural Uganda

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Abstract

We identify two opposing ideas regarding the channel that drives cooperation behavior on a network: a norm transmission hypothesis (NTH) on the one hand, and an individual position hypothesis (IPH) on the other. Our study is conducted in the light of these opposing ideas, comparing the relevance of NTH and IPH across different specifications of riskiness. We employ a two-player minimum effort game, conducted as lab-in-the-field experiment in 28 small-scale communities in rural Uganda. Riskiness is determined by the costs incured if a player invests more effort than his/her partner does, such that higher effort costs imply higher riskiness. We considered two different versions of this game, one with high effort costs (HEC) and one with low effort costs (LEC). In the LEC condition, we observe a pattern that conforms to the NTH. However, in the HEC condition, we see behavior in favor of the IPH. Based on these observations, we argue that the NTH and the IPH apply in very different situations: In low-risk cooperation situations, individuals act mostly based on norms that are prevalent in their network, while in high-risk situations, individual network position becomes the driving factor of cooperation decisions.

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1 Introduction

Local cooperation is important to achieve economic development and poverty reduction. It does so through the production of local public goods, such as the development and maintenance of community projects (Svensson and Björkman, 2009; Reinikka and Svensson, 2011), or by ensuring sustainable use of common pool resources (Baland and Platteau, 1996; Ostrom, 1990; Cardenas, 2003). While growing attention is paid by economists to the role of social network structures to achieve high levels of cooperation, this has received relatively little attention among development economists so far.[1] [2]

Numerous theoretical papers have argued for network structure being a relevant determinant of cooperation behavior, most prominently Ballester et al. (2006) and Galeotti et al. (2010). Specifically, Ballester et al. (2006) look at cooperative behavior on a network. They show that a player's equilibrium action is proportional to his Bonacich centrality, stating that more central players cooperate more. Fosco and Mengel (2011) make a similar point by showing that, if players' actions and the underlying network are allowed to co-evolve, one possible outcome is the marginalization of defectors, de facto leaving the more cooperative players also as the more central ones. Galeotti et al. (2010) analyze settings with varying degrees of information availability and show that incomplete information can function as a means of equilibrium selection. They allow for positive and negative neighbor affiliation where, under positive neighbor affiliation, players believe that high own degree also means high degree of neighbors, while under negative neighbor affiliation the opposite holds true.

Apicella et al. (2012) analyze hunter-gatherer communities in Tanzania and show that they display high between-group but low within-group variation in public good game donations. Their results suggest that cooperation norms get transmitted through a social network, and that it is these norms, rather than individual network position, that determine cooperation behavior. This observation stands in direct contrast to the theoretical results derived by Ballester et al. (2006), which state that it is precisely the individ-

[1]Development economists have studied the role of social networks for technology adoption Bandiera and Rasul (2006), risk sharing Fafchamps and Gubert (2007), labour-sharing (Krishnan and Sciubba, 2009), and the functioning of microfinance groups Karlan (2007a).

[2]Related areas where network effects have been shown to be important are worker productivity (Bandiera et al., 2009), welfare culture (Bertrand et al., 2000), migration and labor markets (Rees, 1966; Granovetter, 1973, 1995; Montgomery, 1991; Ioannides and Loury, 2004; Munshi, 2003), mutual insurance (Fafchamps and Lund, 2003; De Weerdt and Dercon, 2006), informal credit markets (McMillan and Woodruff, 1999; Karlan, 2007b), and international trade (Casella and Rauch, 2002).

ual network position that is decisive for a person's contribution. We are thus confronted with two conflicting ideas regarding the channel that drives cooperation behavior: a norm transmission hypothesis (NTH) on the one hand, and an individual position hypothesis (IPH) on the other.

Both the transmission of norms through networks and the relevance of individual position have been analyzed extensively. To the best of our knowledge, however, these concepts have been looked at as distinct approaches in all existing empirical studies. We challenge this perspective by comparing the relevance of these conflicting concepts across different specifications of riskiness of cooperation. We employ a two-player minimum effort game, conducted as lab-in-the-field experiment in 28 small-scale communities in rural Uganda. Riskiness is determined by the costs incured if a player invests more effort than his/her partner does, such that higher effort costs imply higher riskiness. This concept is similar to the optimization premium introduced by Battalio et al. (2001). However, the optimization premium was developed specifically for a two-player/two-option stag-hunt game, while our riskiness concept extends that notion to a two-player/multiple-option version of that game, i.e. a two-player minimum effort game. Specifically, we consider two different versions of that game, one with high effort costs (HEC) and one with low effort costs (LEC)[3].

Based on this game structure and the results from an extensive social network survey in the respective communities, we observe that results are strikingly different in the HEC and the LEC conditions. In the LEC condition, we observe a pattern that conforms to the story told by Apicella et al. (2012), i.e. one where between-group variation in cooperation decisions appears to be much larger than within-group variation. This can be interpreted as evidence in favor of the norm transmission hypothesis. However, in the HEC condition, we observe the opposite: here within-group differences seem to constitute the more relevant source of variation in behavior. This can be interpreted in favor of the individual position hypotheses. Based on these observations, we argue that both the NTH and the IPH constitute valid explanations of behavior, but they apply in very different situations. In low-risk cooperation situations, individuals act mostly based on norms that

[3]The basic structure behind the minimum effort game is inspired by the simple production technology outlined in Bryant (1983). The game was introduced into experimental economics by Van Huyck et al. (1990). Various results regarding the MEG (and the stag hunt as a two-player, two-action version of the MEG) have subsequently been derived, for instance, Cooper et al. (1992), Battalio et al. (2001), Goeree and Holt (2001), Goeree and Holt (2005) and Dubois et al. (2012). One of the main insights of this literature is the idea that changing parameters, especially with respect to costliness of effort, alters the frequency of choosing the Pareto optimal action over the risk dominant one. Anderson et al. (2001) introduced the concept of logit equilibrium to MEG games in order to cope with this stylized fact.

are prevalent in their network, while individual network position does not play a relevant role in influencing their behavior. In high-risk situations, however, individual network position becomes the driving factor of cooperation decisions, dominating the influence of norms within groups.

The remainder of this paper is structured as follows. Section 2 introduces the game, and explains both the experimental setup as well as the design of the social tie and socio-economic survey. Section 3 first gives an overview of the structure of the village networks and the decisions made in the two versions of the game, and then moves on to outlining the main results of the paper. Finally, section 4 concludes.

2 Design

2.1 Game

Many different setups could potentially be chosen to analyze cooperation behavior. One of the most used games is the classical public goods game, but also other cooperation-related setups have been employed in the field, such as risk-sharing (e.g. Fafchamps and Gubert (2007)) and favor giving (e.g. Jackson et al. (2012)). We opt for a minimum effort game as a coordination game with aligned interests. This game has the advantage of allowing for an analysis of coordination behavior, in a setting that endorses the cooperation focused aspects of coordination. It thus allows to cover questions related to cooperation, while introducing a decisively different payoff structure than, for instance, a classical public goods game.

The minimum effort game is usually played as a multi-player/multi-option game. There is a direct connection, however, in terms of the underlying payoff structure to the stag-hunt game as, essentially, a two-player/two-option version of the minimum effort game. The version of the game that we employ is located in between the canonical minimum effort game and the stag-hunt game as we pick a two-player/multiple-option setup. The two-player characteristic leaves the game closer to a stag-hunt, while the multiple-option characteristic leads it towards a minimum effort game. For the ease of categorization, we will label it as two-player minimum effort game.

In a two-player minimum effort game, the payoff of a player i is given by

$$\Pi_i = a \times \min\{e_i, e_j\} - c \times e_i \qquad (i, j = 1, 2;\ i \neq j) \qquad (1)$$

where e_i (e_j) is the effort exerted by player i (j), $a > c > 0$ with a marginal benefit of effort and c marginal private cost of effort. Players receive the minimum of the effort they invest, timed by the marginal benefit of effort, minus the costs they incur from the investment made. This payoff structure induces that any combination of (e_i^*, e_j^*) with $e_i^* = e_j^*$ is a Nash equilibrium. A unilateral increase in effort does not affect the gains from the effort exerted while increasing costs from effort exertion, and a unilateral decrease reduces the gains from effort exertion by more than the amount gained by saving on effort costs. These pure-strategy Nash equilibria can be Pareto-ranked. Both players are better off in an equilibrium where each of them exerts higher effort, leading $e_i^* = e_j^* = e_{max}$ to be the Pareto-optimal choice of effort levels.

It can, however, be shown that equilibria with lower effort levels risk-dominate equilibria with higher effort levels in pair-wise comparison. Thus, payoff-dominance and risk-dominance act in opposite directions: while equilibria with higher effort levels payoff-dominate equilibria with lower effort levels, equilibria with lower effort levels risk-dominate equilibria with higher effort levels, constituting a tradeoff based on the perceived riskiness of heading for a payoff-dominant equilibrium[4]. For the minimum effort game the magnitude of the perceived riskiness depends on the costliness of effort, with higher costs increasing perceived riskiness. Based on a laboratory experiment Goeree and Holt (2001) find that costliness of effort significantly influences behavior, even though theory would predict that it should not.

We adopt Goeree and Holt (2001)'s basic idea of employing different levels of costliness of effort exertion, and we extend it by connecting the idea of riskiness of cooperation with the concept of network structure. Specifically, we are interested in the relation between the riskiness of effort exertion and a person's position in the network. A field context, based on real-life networks from small-scale communities, serves as a suitable environment to test this relation.

[4] Battalio et al. (2001) define this tradeoff for the stag-hunt game by characterizing the concept of optimization premium. It describes the incentive to best respond as given by the difference in payoff between playing the best response and the inferior response.

2.2 Experiment

We employ two different versions of a two-player minimum effort game, one with high effort costs (HEC) and one with low effort costs (LEC). The game is played in dyads consisting of two randomly matched subjects. The cost level is identical for both subjects within a dyad, such that either both players in a dyad are confronted with high effort costs or both are confronted with low effort costs.

Additionally to the riskiness of effort exertion, we vary the disclosure of identities. Subjects either receive full information, partial information or no information regarding the identity of the other player. Under full information, labeled full-disclosure (FD), both players know the identity of the respective other participant. Under partial information, called semi-disclosure (SD), only one of the players is informed about the identity of the other, while the other player does not have information but knows that the other one knows. Under no information, anonymity (AN), none of the two players is informed about the other's identity. The AN condition consists of two distinct parts: one part where both subjects in a dyad are from the same village (AN-S), and one where they are from different and non-neighboring villages (AN-D). The treatment variations are outlined in table 1.

Table 1: Experimental design

		Effort cost	
		LEC	HEC
Identity disclosure	AN-D	LEC & AN-D	HEC & AN-D
	AN-S	LEC & AN-S	HEC & AN-S
	SD	LEC & SD	HEC & SD
	FD	LEC & FD	HEC & FD

The effort cost (or riskiness of effort) dimension is organized as between-subject comparison: in half of the sessions subjects face the LEC condition, while in the other half they face the HEC condition. Within each session, participants are subsequently paired with four different participants. They make one decision within each of these four dyads. In two of the dyads, participants are anonymous (one AN-D and one AN-S dyad), and in both of the remaining dyads, participants are either fully informed or partially informed. Thus, all subjects make decisions in the AN-D, AN-S, and either SD or FD conditions. So AN-D, AN-S and SD or respectively AN-D, AN-S and FD are within-subject comparisons, while the comparison between SD and FD is between-subject. This design specifically allows us to conduct the identity disclosure dimension partially as between- and partially as within-subject treatment. The order of the different disclosure conditions is randomized at the session level, and the identity disclosure in the SD condition is randomized within each pair.

In the LEC condition, the effort cost c is equal to 0.25, while in the HEC condition the effort cost is set to 0.75. This generates the two payoff tables 2 and 3. To explain the different payoff combinations, participants were told that they had 4 days at their disposal. In the LEC version, for each day that they work at home they would gain 500 UGX for sure, while on a day where they decided to work on a joined project they would gain 2000 UGX if the other person also decided to work on the project. If the other person decided to stay home they would gain 0 UGX for that day. In the HEC version, participants were told that they would earn 1500 UGX for sure for each day that they worked at home, all other parameters are the same.

Table 2: Payoff table LEC

		Decision player j				
		4	3	2	1	0
	4	8000, 8000	6000, 6500	4000, 5000	2000, 3500	0, 2000
	3	6500, 6000	6500, 6500	4500, 5000	2500, 3500	500, 2000
Decision player i	2	5000, 4000	5000, 4500	5000, 5000	3000, 3500	1000, 2000
	1	3500, 2000	3500, 2500	3500, 3000	3500, 3500	1500, 2000
	0	2000, 0	2000, 500	2000, 1000	2000, 1500	2000, 2000

Table 3: Payoff table HEC

		Decision player j				
		4	3	2	1	0
	4	8000, 8000	6000, 7500	4000, 7000	2000, 6500	0, 6000
	3	7500, 6000	7500, 7500	5500, 7000	3500, 6500	1500, 6000
Decision player i	2	7000, 4000	7000, 5500	7000, 7000	5000, 6500	3000, 6000
	1	6500, 2000	6500, 3500	6500, 5000	6500, 6500	4500, 6000
	0	6000, 0	6000, 1500	6000, 3000	6000, 4500	6000, 6000

Participants are informed at all times about the condition under which they are making a decision. They know the parameters of the game, as well as the amount of information the other participant in their dyad has about their identity. To reveal a player's identity, a card with both the name and photograph of the respective player is shown to the other participant within the dyad. As the communities chosen for this study are small-scale rural communities, it is safe to assume that participants from the same village know each other, such that showing the name and picture of a participant ensures identity disclosure. In all disclosure conditions, we elicit beliefs regarding the action of the other participant[5]. Subjects receive a decision card, on which they find a space to mark both their own decision and the decision they expect the other to make.

It is explained in the beginning of each session that the participants are paid only if they make all decisions in the session. Further, it is clarified that only one decision is randomly selected at the end of the session for payment and that the money earned is paid out privately and confidentially. The participants are made aware of these procedural details before making any decisions. The experimental instructions were pretested to make sure that they are understandable to participants with low literacy. Because of concerns regarding the low literacy of some of the participants, instructions are given in a standardized oral (rather than written) manner. After the explanation of the instructions, each participant is privately asked a series of control questions. This allows to identify participants who are struggling with the instructions, such that, if needed, experimenters can provide additional explanations in private. Data of those participants who, after the additional explanations, still struggle with the instructions will be excluded from the analysis.

2.3 Survey

As location for the study we selected the Sironko district in eastern Uganda. This district is subdivided into 5 sub-counties. We randomly chose between 5 and 6 villages per sub-county, such that we are able to include 28 villages in our study while ensuring representativeness as well as sufficient distance between communities. The selected villages are communities with between 10 and 34 households. We included all of the households from the selected villages and randomly chose one of the adults from each household to participate in our survey and to subsequently be invited to the experimental session.

The survey was administered a month before the experimental session with the goal of

[5]Beliefs have been shown to have a significant influence on coordination behavior in various contexts. For instance, Battalio et al. (2001) show for a stag-hunt game that behavior is more sensitive to beliefs when choosing the payoff-dominant equilibrium is more risky.

capturing important socio-economic characteristics of the participants and their households as well as their ties to other households from their village. The survey is divided into a social tie questionnaire and a more general socio-economic survey.

The main purpose of the social tie questionnaire is to elicit the social relations among the households of each of the 28 villages that participated in our study. To do so, we took a photograph of each of the randomly selected household representatives and mounted it on a small card together with the name of the respective person. For each of the cards the interviewee was first asked whether he or she knew that household. If the answer to this question was affirmative the interviewer asked for details on the content of the relation. To avoid any order bias, the stack of cards was reshuffled for every new interview. To administer the interview a portable data entry device was used.

In order to elicit social-economic characteristics of the household and its randomly selected representative, we included questions on wealth, age, gender, ethnicity and religion, as well as psychological characteristics such as trust, agreeableness and risk aversion. Wealth is measured based on a variety of aspects such as characteristics of the home a family lives in, whether and how it receives electricity, and whether and how much livestock it owns. Risk aversion is captured by a self-reported score in the domains health, investment, agriculture, traffic and security, measured on a scale from 1 to 4. Further, agreeableness is based on the respective set of questions from the NEO PI-R[6]. Trust is similarly elicited with a range of self-reported questions.

2.4 Centrality

Knowledge about social relations as acquired through the social tie questionnaire serves as a basis to analyze the position of an individual (his/her household) within the village. This study focuses on degree centrality in the friendship network. The degree centrality of an individual is determined as the number of direct ties a person has (the size of his/her neighborhood), divided by the maximum possible amount of direct ties a person in a network of the same size could have.

If the number of nodes in a network is denoted by n, and the neighborhood of player i is

[6]The Revised NEO Personality Inventory is a psychological personality inventory, comprising five different personality traits: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience (Costa and McCrae (1990)).

labeled as N_i, degree centrality can be expressed as:

$$C_i = \frac{1}{n-1} \sum_{j \in N_i} ij \qquad (2)$$

In our case the maximum possible amount of ties is the number of households in a village minus one. The parameter n can thus be seen as the number of households in a village.

Given the small-scale nature of the villages under scrutiny (n between 10 and 34), it can credibly be argued that people have a reasonably good estimate of the position of another person in the sense of his/her existing connections. Degree centrality can therefore serve as a valid measure of individual network position in our context, where knowledge of the others' network position is a crucial factor for our experimental setup.

3 Results

3.1 Descriptive Analysis

We ran a total of 28 experimental sessions, with between 16 and 26 participants each. In total, 537 participants took part in the experiment, taking overall 1192 decisions in the LEC condition and 1196 decisions in the HEC condition.

The participants in the experiment are aged between 18 and 75, with the mean of the distribution at an age of 42. About half (49.2%) of them are female. The average age for the females is 40, average age for the males is 43.

The socio-economic survey indicates that all our participants have the same ethnicity, ensuring that there are no in-group/out-group effects based on ethnic divisions. Most participants are catholic (46.7%), with the second biggest group belonging to Anglicanism (31.1%), and minor parts declaring themselves as belonging to Islam, Born Agains and Seventh Day Adventists. An overwhelming majority works on their own household farm (85.1%), with the rest being distributed, in decreasing order, between running a business, doing non-farming wage work, providing farm labour on somebody else's farm, taking care of household chores, looking after livestock for others, and studying.

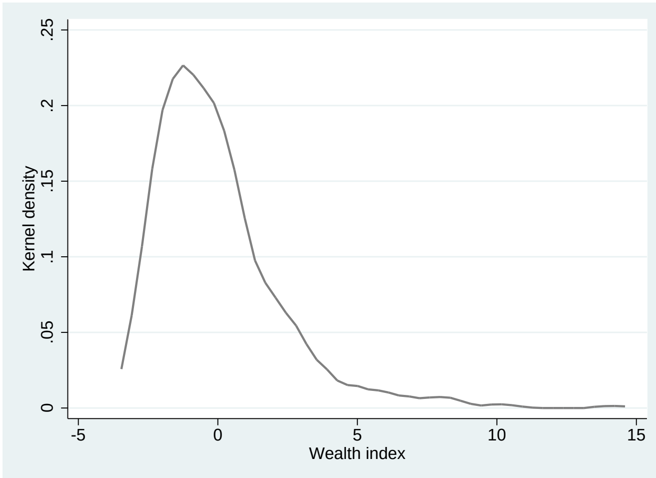

Figure 1: Wealth index

The socio-economic survey allows us further to calculate a wealth index based on the characteristics of the home a family lives in, whether and how it receives electricity, and whether and how much livestock it owns. Based on a principal component analysis which takes into account a variety of questions on each of these aspects, we see that the first component has a mean of .07 and a standard deviation of 2.26, with a minimum at -3.00 and a maximum at 14.14. Figure 1 shows a kernel density plot of the first component, which we will use as wealth index in the subsequent analysis. The purpose of this index is primarily to give an indication regarding the relative wealth of subjects.

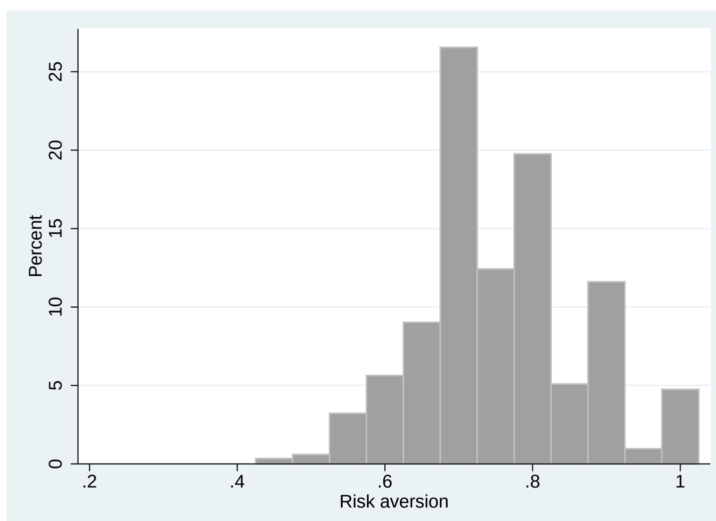

Figure 2: Risk aversion

Risk aversion is captured through a cumulative measure that combines the self-reported scores of risk aversion in the domains health, investment, agriculture, traffic and security. Risk aversion is measured on a scale from 1 to 4 in each of these domains, scores are added and normalized such that the maximally possible cumulative report is 1. If a person's score on the cumulative measure is 1 that means that s/he reported maximal risk aversion for all domains, a score of 0.2 means s/he reported minimal risk aversion across all domains. As figure 2 shows, we observe a distribution between 0.45 and 1, with a mode at 0.7.

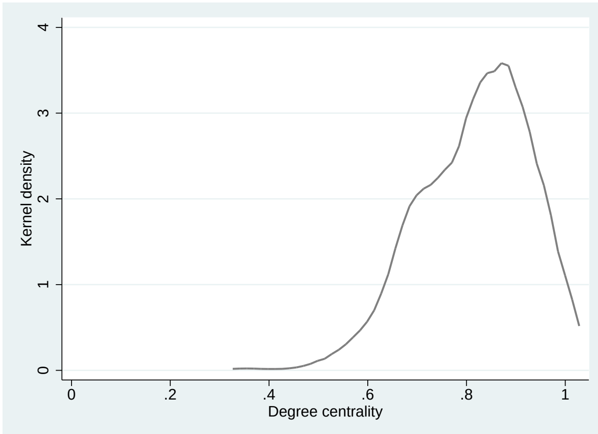

Figure 3: Aggregate degree centrality

The social tie survey allows us to analyze centrality in the village networks under scrutiny. Figure 3 shows the distribution of degree centrality across the set of all 28 villages included in the analysis. In order to obtain this graph, observations are pooled across all villages. Average degree centrality in the set of 28 villages is .82 with a standard deviation of .11. We calculate the centrality measure which is displayed in figure 3 and used throughout the analysis based on friendship ties, where a tie is counted as existing if at least one of the players in a dyad mentions the other one as friend. In using these so-called OR-ties we follow the practices of earlier empirical network studies (cf. Leider et al., 2009; Jackson et al., 2012).

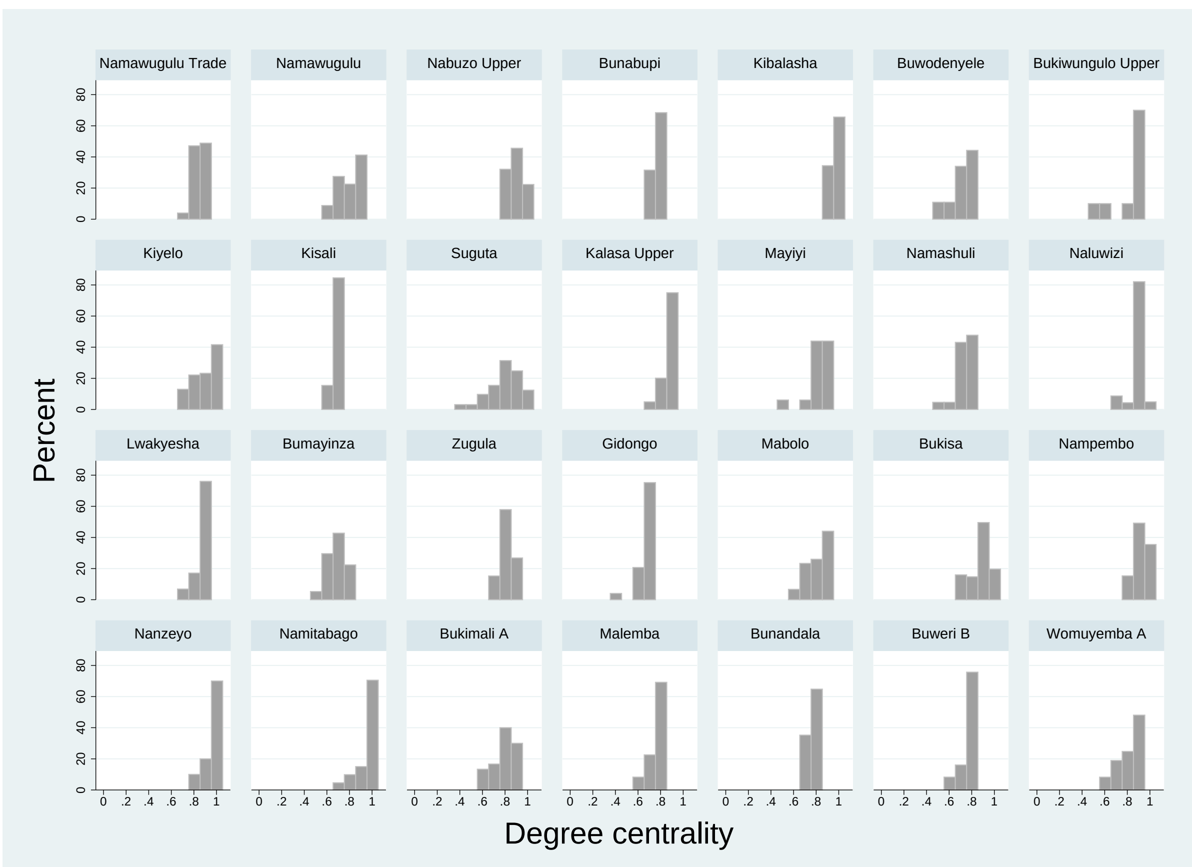

Figure 4: Degree centrality by village

Networks vary substantially across the villages included in the analysis. This variation can be observed in figure 4.

Figure 5 shows that decisions in the two versions of the game differ substantially. While an effort level of 3 is chosen at about the same frequency in the LEC and HEC conditions, an effort of 4 is chosen substantially less often under HEC than under LEC, while an effort of 2 is chosen substantially more often. The average effort level under LEC is 3.4, while it is 3.2 under LEC. This is in line with earlier results on the minimum effort game that argue that higher costs of effort exertion lower the observed effort level (Battalio et al. (2001)). Higher effort costs under the HEC condition make effort exertion more risky than under LEC and thereby push subjects towards lower effort levels.

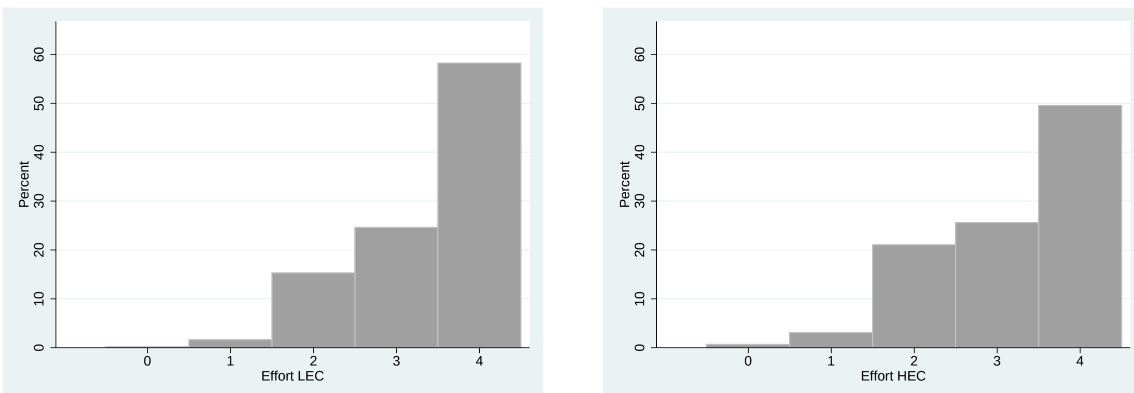

Figure 5: Effort levels in LEC and HEC

3.2 Regression Analysis

The analysis presented in this part of the paper aims at connecting the concepts of degree centrality, on the one hand, and riskiness of effort exertion, on the other. The descriptive analysis has shown that there are substantial differences in the choices made across the two riskiness conditions, LEC and HEC. It has also made clear that there is a large degree of variation both in network structure across villages and in individual positions within village. Based on these observations, the two main questions we aim to answer in the subsequent analysis are: How does the variation in individual network position influence decisions made in the two riskiness conditions? And what is the relation between variation within village and variation across villages in influencing the decisions made in each of these conditions?

3.2.1 Specification

In order to analyze these questions, we estimate e_{ij}, being the effort level of player i when matched with player j, as a function of the following explanatory variables:

$$
\begin{aligned}
e_{ij} = {} & \beta_0 + \beta_1\delta_i + \beta_2\delta_j + \beta_3(\delta_i \times \delta_j) \\
& + \beta_4 C_i + \beta_5(C_i \times \delta_i) + \beta_6(C_i \times \delta_j) + \beta_7(C_i \times \delta_i \times \delta_j) \\
& + \beta_8(C_i - C_j) + \beta_9((C_i - C_j)\times\delta_i) + \beta_{10}((C_i - C_j)\times\delta_j) + \beta_{11}((C_i - C_j)\times\delta_i\times\delta_j) \\
& + \beta_{12}\mathbf{X} + \epsilon_{ij} \qquad (3)
\end{aligned}
$$

The variables δ_i and δ_j are dummies, such that $\delta_i = 1$ if i knows the identity of j, and $\delta_j = 1$ if j knows the identity of i. This definition allows us to disentangle the influence of the different information conditions on outcomes in the experiment. If either $\delta_i = 1$ or $\delta_j = 1$ this signals the two different parts of the SD condition. If $\delta_i \times \delta_j = 1$ both players are informed of the other's identity, corresponding to the FD condition. In the baseline specification, the anonymous same village condition, AN-S, constitutes the reference category where both $\delta_i = 0$ and $\delta_j = 0$. This baseline specification applies solely to those observations where both players are from the same village, i.e. AN-S, SD and FD. We separately test for differences between in-group and out-group behavior, based on a direct comparison between the AN-S and AN-D conditions. In order to do so, we define a different dummy variable γ that represents whether player j is from the same village as player i, with $\gamma = 1$ indicating same village.

The second and third line of equation 3 introduce the concept of centrality into the regression. C_i and C_j stand for the centrality of players i and j, respectively. $C_i - C_j$ represents the difference in centrality between the two players. The difference is positive if player i is more central, and negative if player j is more central. We include both the absolute and the relative centrality of player i because each of these variables reflects a different facet of explaining cooperation behavior. It can be argued that the absolute centrality of a player reflects how cooperative a person is in general, with more cooperative people on average having more direct connections (cf. Fosco and Mengel (2011)). In following this view, absolute centrality can act as important predictor of cooperative behavior in a specific instance, such as our experimental setting. However, relative centrality plays a relevant role as well in our experiment as the return for one additional unit of effort depends largely on the action of the other player. So even a very central player might act less cooperatively when s/he knows that s/he is matched with a less cooperative player. So the hypotheses here are that C_i has a positive influence on effort exertion, while $C_i - C_j$ has a negative influence.

We include interaction terms between C_i and the two information dummies as well as between $C_i - C_j$ and the two information dummies. This allows us to characterize the effect of centrality on effort levels for each of the different information conditions. Comparing the effect sizes across information conditions allows us to make precise statements regarding the relevance of own and other's centrality for players' effort choices.

$\mathbf{X}$ stands for a vector of control variables. It includes measures from our socio-economic survey for wealth, age, gender, risk aversion, trust and agreeableness. Specifically, we take into account the variables wealth, wealth_dif, age, age_dif, gender, gender_dif, trust, agreeableness, risk, and friend. The variable friend is based on the social-tie survey and indicates whether two players have a direct friendship tie. Risk reflects a risk aversion measure calculated based on responses in the socio-economic survey. Wealth gives the values for the wealth index as generated by a principal component analysis based on survey responses. For wealth and age, we include both the absolute value for player i and a variable that calculates the difference between player i and player j's values. Regarding gender, we define an additional dummy variable that indicates whether the two players have the same gender, gender_dif. We control additionally for beliefs of player i regarding the effort exerted by player j. Further, village and experimenter fixed effects are taken into account[7]. We use robust standard errors to control for potential non-independencies within sessions.

As our dependent variable e_{ij} can only take the values of the 5 effort levels players can choose from during the experiment (0, 1, 2, 3, and 4), we use an ordered logit regression to analyze the data. The 5 levels that we allow subjects to pick from can be seen as a censored version of a potentially more continuous way in which effort exertion might react to the proposed explanatory variables. The ordered logit regression utilizes the censored data that we actually observe during the experiment to estimate the influence of the explanatory variables. This is in opposition to an ordinary least squares approach which attempts to analyze the uncensored, continuous version of the censored data that it is actually confronted with. In that sense, the ordered logit regression can be seen as an extension of the binary logit regression, where the values which the dependent variable can take are increased from two to multiple levels.

[7] Three different experimenters conducted the sessions in the individual villages. All of them were given the same instructions and training.

3.2.2 Low Effort Costs

Table 4 displays the decisions made in the LEC condition, as regressed on the explanatory variables outlined in section 3.2.1. Model (1) regresses the decisions made on the information dummies and the centrality variables, without taking any further controls into account. Model (2) additionally includes the controls from the socio-economic survey as well as village and experimenter fixed effects, and model (3) in addition takes beliefs into account.

When taking a closer look at the coefficients for model (1), it can be observed that there is a positive effect of both players knowing the others identity. As this is an ordered logit regression, the coefficient has to be interpreted with care. It says that the ordered log-odds for exerting a higher effort in the FD condition than in the AN-S condition are 8.406 units when the other variables are held constant. Model (1) suggests further that own centrality has a negative effect on the effort level in AN-S, with the ordered log-odds for exerting a higher effort decreasing by 3.804 units when centrality increases by one unit. However, if player i is informed about the identity of the other, the model suggests a more positive influence of centrality than under AN-S. On the contrary, if both players are informed about each others identities, centrality has a more negative influence on the effort level than under AN-S. Interestingly, the difference in centrality between the two players has a positive effect on effort levels in AN-S. But this effect is reversed entirely when player i is informed about the other's identity.

Model (2) shows that all of the effects which could be observed in model (1) disappear as soon as village fixed effects are included into the regression. While table 4 introduces the additional controls and both types of fixed effects simultaneously, this effect is due almost exclusively to the village fixed effects. These are highly significant across a wide range of villages, suggesting that the driver of differences in behavior are differences across villages, rather than differences within village. This stays unchanged for model (3), where beliefs are indicated to have a highly significant positive effect on the effort level.

These observations suggest two things: on the one hand, differences across villages seem to be a relevant influence in determining effort levels, and on the other, beliefs clearly matter. We follow up on this last aspect by taking a closer look at what influences beliefs. In order to do so, we regress beliefs on the set of explanatory variables presented in table 5.

Table 4: Decisions in the LEC condition

Decision	(1)		(2)		(3)	
δ_i	-5.557	(3.556)	-4.199	(3.507)	-3.244	(4.234)
δ_j	-0.523	(2.332)	1.273	(2.044)	1.748	(2.885)
$\delta_i \times \delta_j$	8.406**	(4.180)	-1.187	(4.823)	-0.835	(5.250)
C_i	-3.804*	(2.046)	-1.952	(3.364)	-0.772	(2.613)
$\delta_i \times C_i$	7.076*	(4.238)	5.557	(4.231)	4.605	(5.030)
$\delta_j \times C_i$	0.946	(2.992)	-1.022	(2.689)	-1.728	(3.326)
$\delta_i \times \delta_j \times C_i$	-10.31**	(4.926)	0.264	(5.915)	-0.338	(6.234)
$(C_i - C_j)$	3.189**	(1.475)	2.089	(2.111)	0.434	(2.535)
$\delta_i \times (C_i - C_j)$	-3.188*	(1.833)	-1.658	(2.551)	0.115	(2.771)
$\delta_j \times (C_i - C_j)$	-0.268	(2.145)	0.561	(2.372)	2.710	(3.082)
$\delta_i \times \delta_j \times (C_i - C_j)$	4.613	(3.607)	-1.134	(4.535)	-1.624	(4.282)
Belief					1.599***	(0.311)
X	no		yes		yes	
FE	no		yes		yes	
Observations	516		514		514	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

Table 5: Beliefs in the LEC condition

Belief	(1)		(2)		(3)	
δ_i	-6.304***	(2.056)	-5.857***	(1.939)	-4.859***	(1.521)
δ_j	-1.901	(3.521)	-1.423	(2.913)	-0.172	(3.602)
$\delta_i \times \delta_j$	6.049	(4.714)	5.184	(3.985)	0.176	(3.494)
C_i	-4.856**	(2.068)	-5.088**	(2.038)	-2.719	(3.850)
$\delta_i \times C_i$	7.395***	(2.602)	6.718***	(2.497)	5.526***	(1.951)
$\delta_j \times C_i$	2.492	(4.472)	1.889	(3.734)	0.478	(4.487)
$\delta_i \times \delta_j \times C_i$	-7.113	(5.691)	-5.849	(4.789)	-0.183	(4.121)
$(C_i - C_j)$	4.740**	(2.041)	4.448***	(1.549)	2.942	(2.083)
$\delta_i \times (C_i - C_j)$	-6.178***	(2.116)	-5.786***	(1.871)	-4.887***	(1.644)
$\delta_j \times (C_i - C_j)$	-4.179	(2.564)	-4.612**	(1.942)	-3.346	(2.119)
$\delta_i \times \delta_j \times (C_i - C_j)$	5.835	(3.976)	5.996*	(3.355)	2.119	(3.787)
X	no		yes		yes	
FE	no		no		yes	
Observations	516		514		514	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

Model (1) is a specification that takes into account solely information dummies and centrality variables. Model (2) additionally includes the set of controls from the socio-economic survey, and model (3) introduces fixed effects. Interestingly, player i being informed about the other's identity has a negative effect on beliefs relative to anonymity. Between models (1), (2), and (3), the effect stays significant but decreases from 6.304 units of ordered log-odds, to 5.857, to 4.859. Centrality has a significant negative effect under anonymity only in the first two models where fixed effects are not included. However, the effect of centrality when i knows the other's identity is positive compared to the influence of centrality under anonymity, and it stays significant across all specifications. For the difference in centralities the opposite holds true. The difference has a positive effect under anonymity in the first two models. All specifications show that the effect of centrality when player i is informed about the other's identity is negative when compared to its effect under anonymity.

These results suggest that any effect of centrality on beliefs under anonymity gets captured by village fixed effects. This is very intuitive as formation of beliefs about the other players action, when no information about the identity of the other player is provided, can do little but take existing ideas about cooperative behavior in the village as a guideline.

Table 6: Decisions in the HEC condition

Decision	(1)		(2)		(3)	
δ_i	-3.451	(2.975)	-1.798	(3.302)	-0.0529	(2.728)
δ_j	-1.620	(1.722)	0.0134	(1.525)	1.271	(1.718)
$\delta_i \times \delta_j$	6.210	(3.837)	3.015	(4.387)	-1.399	(4.020)
C_i	-1.209	(1.328)	-2.597**	(1.020)	-3.776**	(1.497)
$\delta_i \times C_i$	3.416	(3.529)	1.771	(3.829)	0.0316	(3.084)
$\delta_j \times C_i$	2.017	(1.963)	0.453	(1.779)	-1.109	(2.056)
$\delta_i \times \delta_j \times C_i$	-6.363	(4.511)	-3.454	(5.071)	1.178	(4.561)
$(C_i - C_j)$	-0.311	(1.051)	-0.179	(0.840)	-0.129	(0.791)
$\delta_i \times (C_i - C_j)$	1.069	(3.008)	2.015	(3.107)	6.349*	(3.355)
$\delta_j \times (C_i - C_j)$	2.257	(2.442)	2.234	(2.603)	3.601	(2.581)
$\delta_i \times \delta_j \times (C_i - C_j)$	-2.754	(4.238)	-3.736	(3.757)	-9.035**	(4.106)
Belief					1.601***	(0.280)
X	no		yes		yes	
FE	no		yes		yes	
Observations	598		589		589	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

3.2.3 High Effort Costs

After having analyzed decisions made and beliefs held in the LEC, we now turn to the HEC. Table 6 presents the results from regressing the decisions made in the HEC condition on the same set of controls analyzed for the LEC.

As for the LEC condition, model (1) regresses the decisions made on the information dummies and the centrality variables, without taking any further controls into account. Model (2) additionally includes the controls from the socio-economic survey as well as village and experimenter fixed effects, and model (3) in addition takes beliefs into account.

Interestingly, in the HEC condition centrality only seems to play a relevant role once fixed effects are included. That is, once the village specific effects are controlled for, there remains a negative effect of centrality on effort levels. The coefficient stays significant also when beliefs are included in the regression in model (3). Additionally, in model (3) the difference between the players' centralities is significantly negative in the FD condition compared to AN-S.

These results suggest a very different dynamic from the LEC condition. While under LEC the driving factors behind demands seem to be village specific characteristics, we can see here that centrality becomes a relevant factor only after these village specific effects are controlled for. Thus, while village specific characteristics do also play an important role under HEC, the significance of centrality actually depends on controlling for them. This points out that there are underlying effects of centrality which influence decisions in a more general, non-village specific way.

We then we turn towards beliefs in the HEC, specifically asking whether the pattern observed in the analysis of decisions continues to hold. But as table 7 shows, it does not. Similarly to the beliefs in the LEC, we observe that there is a positive effect of being in the full disclosure condition compared to being in the anonymous condition. Higher centrality is negative in FD compared to the effect of centrality under AN-S. But both of these effects get captured by village fixed effects. So, while there is a non-village specific influence of centrality on decisions in the HEC, beliefs seem to be oriented strongly at village specific characteristics.

Table 7: Beliefs in the HEC condition

Belief	(1)		(2)		(3)	
δ_i	-3.314	(2.306)	-3.689	(2.329)	-2.478	(2.438)
δ_j	-2.451	(2.000)	-2.785	(2.035)	-1.484	(1.921)
$\delta_i \times \delta_j$	7.515**	(3.746)	7.918*	(4.257)	5.471	(4.033)
C_i	0.135	(1.295)	0.178	(1.319)	-0.541	(1.815)
$\delta_i \times C_i$	3.623	(2.803)	4.062	(2.852)	2.584	(2.919)
$\delta_j \times C_i$	3.270	(2.268)	3.642	(2.347)	2.115	(2.274)
$\delta_i \times \delta_j \times C_i$	-8.677**	(4.413)	-9.102*	(5.123)	-5.980	(4.713)
$(C_i - C_j)$	-0.800	(1.176)	-1.145	(1.176)	-0.817	(1.237)
$\delta_i \times (C_i - C_j)$	-1.509	(2.728)	-2.260	(2.596)	-1.941	(2.137)
$\delta_j \times (C_i - C_j)$	-0.350	(2.133)	-0.677	(2.308)	0.247	(2.469)
$\delta_i \times \delta_j \times (C_i - C_j)$	2.141	(3.875)	3.149	(4.059)	1.905	(3.153)
X	no		yes		yes	
FE	no		no		yes	
Observations	598		589		589	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

4 Conclusion

Based on existing studies in the areas of network and development economics, we have identified two opposing ideas regarding the channel that drives cooperation behavior on networks: a norm transmission hypothesis (NTH) on the one hand, and an individual position hypothesis (IPH) on the other. Apicella et al. (2012) analyze hunter-gatherer communities in Tanzania and show that they display high between-group but low within-group variation in public good game donations. Their results suggest that cooperation norms get transmitted through a social network, and that it is these norms, rather than individual network position, that determine cooperation behavior. This observation stands in direct contrast to the theoretical results derived by Ballester et al. (2006), which state that it is precisely the individual network position that is decisive for a person's contribution.

We conducted our study in the light of these opposing ideas, by comparing the relevance of NTH and IPH across different specifications of riskiness of cooperation. We have employed a two-player minimum effort game, conducted as lab-in-the-field experiment in 28 small-scale communities in rural Uganda. Riskiness is determined by the costs incured if a player invests more effort than his/her partner does, such that higher effort costs imply higher riskiness. Specifically, we considered two different versions of that game, one with high effort costs (HEC) and one with low effort costs (LEC).

Based on this game structure and the results from an extensive survey which covers both socio-economic indicators as well as information on social ties, we have observed that results are strikingly different in the HEC and the LEC conditions. In the LEC condition, we observe a pattern that conforms to the story told by Apicella et al. (2012), i.e. one where between-group variation in cooperation decisions appears to be much more relevant than within-group variation. This can be interpreted as evidence in favor of the NTH. However, in the HEC condition, we observe the opposite: here within-group differences seem to constitute the more relevant source of variation in behavior. This can be interpreted in favor of the IPH. Based on these observations, we argue that both the NTH and the IPH constitute valid explanations of behavior, but they apply in very different situations. In low-risk cooperation situations, individuals act mostly based on norms that are prevalent in their network, while individual network position does not play a relevant role in influencing their behavior. In high-risk situations, however, individual network position becomes the driving factor of cooperation decisions, dominating the influence of norms within groups.

References

Anderson, S. P., Goeree, J. K., and Holt, C. A. (2001). Minimum-effort coordination games: Stochastic potential and logit equilibrium. *Games and Economic Behavior*, 34(2):177–199.

Apicella, C. L., Marlowe, F. W., Fowler, J. H., and Christakis, N. A. (2012). Social networks and cooperation in hunter-gatherers. *Nature*, 481(7382):497–501.

Baland, J.-M. and Platteau, J.-P. (1996). *Halting degradation of natural resources: is there a role for rural communities?* Food & Agriculture Organization.

Ballester, C., Calvó-Armengol, A., and Zenou, Y. (2006). Who's who in networks. wanted: the key player. *Econometrica*, 74(5):1403–1417.

Bandiera, O., Barankay, I., and Rasul, I. (2009). Social connections and incentives in the workplace: Evidence from personnel data. *Econometrica*, 77(4):1047–1094.

Bandiera, O. and Rasul, I. (2006). Social networks and technology adoption in northern mozambique*. *The Economic Journal*, 116(514):869–902.

Battalio, R., Samuelson, L., and Van Huyck, J. (2001). Optimization incentives and coordination failure in laboratory stag hunt games. *Econometrica*, 69(3):749–764.

Bertrand, M., Luttmer, E. F. P., and Mullainathan, S. (2000). Network effects and welfare culture. *Quarterly Journal of Economics*, 115(3):1019–1055.

Bryant, J. (1983). A simple rational expectations keynes-type model. *The Quarterly Journal of Economics*, pages 525–528.

Cardenas, J.-C. (2003). Real wealth and experimental cooperation: experiments in the field lab. *Journal of Development Economics*, 70(2):263–289.

Casella, A. and Rauch, J. E. (2002). Anonymous market and group ties in international trade. *Journal of International Economics*, 58(1):19–47.

Cooper, R., DeJong, D. V., Forsythe, R., and Ross, T. W. (1992). Communication in coordination games. *The Quarterly Journal of Economics*, pages 739–771.

Costa, P. T. and McCrae, R. R. (1990). Neo pi-r.

De Weerdt, J. and Dercon, S. (2006). Risk-sharing networks and insurance against illness. *Journal of Development Economics*, 81(2):337–356.

Dubois, D., Willinger, M., and Van Nguyen, P. (2012). Optimization incentive and relative riskiness in experimental stag-hunt games. *International Journal of Game Theory*, 41(2):369–380.

Fafchamps, M. and Gubert, F. (2007). Risk sharing and network formation. *The American economic review*, pages 75–79.

Fafchamps, M. and Lund, S. (2003). Risk-sharing networks in rural Philippines. *Journal of Development Economics*, 71(2):261–287.

Fosco, C. and Mengel, F. (2011). Cooperation through imitation and exclusion in networks. *Journal of Economic Dynamics and Control*, 35(5):641–658.

Galeotti, A., Goyal, S., Jackson, M. O., Vega-Redondo, F., and Yariv, L. (2010). Network games. *The review of economic studies*, 77(1):218–244.

Goeree, J. K. and Holt, C. A. (2001). Ten little treasures of game theory and ten intuitive contradictions. *American Economic Review*, pages 1402–1422.

Goeree, J. K. and Holt, C. A. (2005). An experimental study of costly coordination. *Games and Economic Behavior*, 51(2):349–364.

Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6):1360–1380.

Granovetter, M. ([1974]1995). *Getting a job: A study of Contacts and Careers*. The University of Chicago Press, second edition.

Ioannides, Y. M. and Loury, L. D. (2004). Job information networks, neighborhood effects, and inequality. *The Journal of Economic Literature*, 42(4):1052–1093.

Jackson, M. O., Rodriguez-Barraquer, T., and Tan, X. (2012). Social capital and social quilts: Network patterns of favor exchange. *American Economic Review*, 102:1857–1897.

Karlan, D. S. (2007a). Social connections and group banking*. *The Economic Journal*, 117(517):F52–F84.

Karlan, D. S. (2007b). Social connections and group banking. *The Economic Journal*, 117(517):F52–F84.

Krishnan, P. and Sciubba, E. (2009). Links and architecture in village networks*. *The Economic Journal*, 119(537):917–949.

Leider, S., Möbius, M. M., Rosenblat, T., and Do, Q.-A. (2009). Directed altruism and enforced reciprocity in social networks. *Quarterly Journal of Economics*, 124(4):1815–1851.

McMillan, J. and Woodruff, C. (1999). Interfirm relationships and informal credit in Vietnam. *Quarterly Journal of Economics*, 114(4):1285–1320.

Montgomery, J. D. (1991). Social networks and labor-market outcomes: Toward an economic analysis. *American Economic Review*, 81(5):1408–1418.

Munshi, K. (2003). Networks in the modern economy: Mexican migrants in the U.S. labor market. *Quarterly Journal of Economics*, 118(2):549–599.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Rees, A. (1966). Information networks in labor economics. *American Economic Review*, 56(1/2):559–566.

Reinikka, R. and Svensson, J. (2011). The power of information in public services: Evidence from education in uganda. *Journal of Public Economics*, 95(7):956–966.

Svensson, J. and Björkman, M. (2009). Power to the people: Evidence from a randomized field experiment of a community-based monitoring project in uganda. *Quarterly Journal of Economics*, 124(2):735–769.

Van Huyck, J. B., Battalio, R. C., and Beil, R. O. (1990). Tacit coordination games, strategic uncertainty, and coordination failure. *The American Economic Review*, pages 234–248.

APPENDIX A: Full Tables

LEC: Decisions	(1)		(2)		(3)	
δ_i	-5.557	(3.556)	-4.199	(3.507)	-3.244	(4.234)
δ_j	-0.523	(2.332)	1.273	(2.044)	1.748	(2.885)
$\delta_i \times \delta_j$	8.406**	(4.180)	-1.187	(4.823)	-0.835	(5.250)
C_i	-3.804*	(2.046)	-1.952	(3.364)	-0.772	(2.613)
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$(C_i - C_j)$	3.189**	(1.475)	2.089	(2.111)	0.434	(2.535)
$\delta_i \times (C_i - C_j)$	-3.188*	(1.833)	-1.658	(2.551)	0.115	(2.771)
$\delta_j \times (C_i - C_j)$	-0.268	(2.145)	0.561	(2.372)	2.710	(3.082)
$\delta_i \times \delta_j \times (C_i - C_j)$	4.613	(3.607)	-1.134	(4.535)	-1.624	(4.282)
Risk			0.761	(1.158)	0.494	(1.211)
Agree			-0.0837*	(0.0503)	-0.00990	(0.0453)
Trust			-0.0193	(0.175)	0.0858	(0.171)
Wealth			0.107	(0.101)	0.0485	(0.0898)
Wealth_dif			-0.00178	(0.0651)	-0.0108	(0.0580)
Age			-0.0102	(0.00890)	-0.00521	(0.0108)
Age_dif			-0.000867	(0.00842)	0.00258	(0.00904)
Gender			0.0193	(0.273)	-0.117	(0.338)
Gender_dif			0.340*	(0.175)	0.412*	(0.215)
Friend			-0.400	(0.496)	-0.504	(0.619)
Belief					1.599***	(0.311)
Bukimali			2.571***	(0.0998)	2.672***	(0.280)
Bukisa			1.642***	(0.441)	1.441	(0.913)
Bumahaga			0.824	(0.582)	0.839	(1.097)
Bumayinsa			2.723***	(0.817)	2.321**	(1.102)
Bunabupi			-0.402*	(0.232)	-0.559**	(0.245)
Buweri			5.012***	(0.657)	4.291***	(0.950)
Buwodenyele			2.659***	(0.680)	2.630**	(1.069)
Gidongo			2.632***	(0.798)	2.515**	(1.178)
Kisali			0.938***	(0.362)	0.454	(0.301)
Kiyelo			1.157**	(0.554)	0.708	(0.489)
Lwakyesha			3.263***	(0.584)	2.343**	(0.953)
Mabolo			0.326	(0.408)	-0.205	(0.478)
Mayiyi			3.785***	(0.840)	3.690***	(0.968)
Nabitabago			2.222**	(1.051)	2.165*	(1.129)
Nabiwuka			1.522***	(0.437)	0.890	(0.843)
Nabuzo Upper			-0.00971	(0.378)	0.0369	(0.469)
Naluwizi			1.526*	(0.808)	1.334	(0.973)
Namashuli			2.361***	(0.609)	1.369	(0.938)
Namawugulu			2.004***	(0.454)	1.755	(1.165)
Nampembo			0.863	(0.794)	0.860	(1.104)
Womuyemba			3.278***	(0.678)	2.596**	(1.119)
Constant cut1	-7.493***	(1.683)	-3.238	(3.034)	1.455	(2.762)
Constant cut2	-4.679***	(1.600)	-0.298	(2.981)	4.826*	(2.729)
Constant cut3	-3.448**	(1.673)	1.134	(2.949)	6.735**	(2.714)
Observations	516		514		514	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

LEC: Beliefs	(1)		(2)		(3)	
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$\delta_i \times (C_i - C_j)$	-6.178***	(2.116)	-5.786***	(1.871)	-4.887***	(1.644)
$\delta_j \times (C_i - C_j)$	-4.179	(2.564)	-4.612**	(1.942)	-3.346	(2.119)
$\delta_i \times \delta_j \times (C_i - C_j)$	5.835	(3.976)	5.996*	(3.355)	2.119	(3.787)
Risk			0.968	(0.897)	0.604	(1.008)
Agree			-0.125**	(0.0635)	-0.143**	(0.0672)
Trust			-0.112	(0.0870)	-0.153	(0.0943)
Wealth			0.178***	(0.0675)	0.112	(0.0692)
Wealth_dif			-0.0114	(0.0500)	0.0267	(0.0613)
Age			-0.00375	(0.00954)	-0.00748	(0.0125)
Age_dif			-0.00512	(0.00558)	-0.00425	(0.00740)
Gender			0.136	(0.258)	0.175	(0.246)
Gender_dif			0.108	(0.172)	0.0802	(0.172)
Friend			0.176	(0.410)	-0.297	(0.543)
Bukimali					1.421***	(0.176)
Bukisa					1.810***	(0.571)
Bumahaga					1.025*	(0.603)
Bumayinsa					2.506***	(0.777)
Bunabupi					0.0583	(0.165)
Buweri					4.380***	(0.916)
Buwodenyele					1.642**	(0.664)
Gidongo					2.342***	(0.762)
Kisali					1.015*	(0.554)
Kiyelo					0.962***	(0.270)
Lwakyesha					3.530***	(0.975)
Mabolo					0.533	(0.456)
Mayiyi					2.617***	(0.848)
Nabitabago					2.006*	(1.051)
Nabiwuka					2.036***	(0.589)
Nabuzo Upper					-0.228	(0.233)
Naluwizi					1.849**	(0.925)
Namashuli					3.192***	(0.765)
Namawugulu					1.620***	(0.498)
Nampembo					1.103	(0.853)
Womuyemba					3.985***	(0.822)
Constant cut1	-8.207***	(1.852)	-7.678***	(1.700)	-3.802	(3.001)
Constant cut2	-5.464***	(1.696)	-4.904***	(1.452)	-0.940	(2.779)
Constant cut3	-4.295**	(1.734)	-3.669**	(1.478)	0.422	(2.777)
Observations	516		514		514	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

HEC: Decisions	(1)		(2)		(3)	
δ_i	-3.451	(2.975)	-1.798	(3.302)	-0.0529	(2.728)
δ_j	-1.620	(1.722)	0.0134	(1.525)	1.271	(1.718)
$\delta_i \times \delta_j$	6.210	(3.837)	3.015	(4.387)	-1.399	(4.020)
C_i	-1.209	(1.328)	-2.597**	(1.020)	-3.776**	(1.497)
$\delta_i \times C_i$	3.416	(3.529)	1.771	(3.829)	0.0316	(3.084)
$\delta_j \times C_i$	2.017	(1.963)	0.453	(1.779)	-1.109	(2.056)
$\delta_i \times \delta_j \times C_i$	-6.363	(4.511)	-3.454	(5.071)	1.178	(4.561)
$(C_i - C_j)$	-0.311	(1.051)	-0.179	(0.840)	-0.129	(0.791)
$\delta_i \times (C_i - C_j)$	1.069	(3.008)	2.015	(3.107)	6.349*	(3.355)
$\delta_j \times (C_i - C_j)$	2.257	(2.442)	2.234	(2.603)	3.601	(2.581)
$\delta_i \times \delta_j \times (C_i - C_j)$	-2.754	(4.238)	-3.736	(3.757)	-9.035**	(4.106)
Risk			-0.499	(1.102)	0.175	(1.332)
Agree			-0.0193	(0.105)	0.0642	(0.120)
Trust			0.0441	(0.119)	0.0144	(0.116)
Wealth			0.0248	(0.0842)	0.0255	(0.0814)
Wealth_dif			0.0532*	(0.0288)	0.0288	(0.0448)
Age			0.0129	(0.0128)	0.0221**	(0.00941)
Age_dif			0.00635	(0.00580)	0.00102	(0.00479)
Gender			-0.185	(0.191)	-0.493**	(0.204)
Gender_dif			0.148	(0.183)	0.180	(0.182)
Friend			0.109	(0.514)	0.270	(0.410)
Belief					1.601***	(0.280)
Bukimali			-1.256***	(0.338)	-1.454***	(0.322)
Bukiwungulo Upper			-0.402**	(0.186)	0.618	(0.392)
Bumayinsa			-1.757***	(0.420)	-0.497	(0.587)
Bumuhaga			14.14***	(1.114)	14.59***	(1.190)
Bunabupi			-0.719**	(0.288)	0.152	(0.323)
Bunandala			-1.970***	(0.278)	-1.284***	(0.255)
Buweri			-3.189***	(0.326)	-2.441***	(0.340)
Buwodenyele			13.64***	(1.065)	14.33***	(1.121)
Gidongo			13.54***	(0.997)	13.69***	(1.095)
Kibalasha			-0.761***	(0.281)	0.179	(0.322)
Kiyelo			14.20***	(1.166)	14.09***	(1.167)
Lwakyesha			13.39***	(1.168)	13.94***	(1.230)
Mabolo			-1.051***	(0.157)	-0.864***	(0.142)
Malemba			14.01***	(0.997)	14.35***	(1.052)
Mayiyi			-1.977***	(0.346)	-1.275***	(0.312)
Nabitabago			13.96***	(1.183)	13.49***	(1.179)
Nabiwuka			14.16***	(1.194)	15.16***	(1.255)
Nabuzo Upper			14.19***	(1.169)	13.92***	(1.219)
Naluwizi			-1.738***	(0.301)	-0.493*	(0.293)
Namashuli			13.95***	(1.124)	14.60***	(1.114)
Namawugulu Trade			-0.844***	(0.256)	-0.257	(0.225)
Namawugulu			13.06***	(1.161)	14.21***	(1.211)
Nampembo			-0.0907	(0.334)	-0.00415	(0.314)
Nanzeyo			-0.182	(0.335)	0.607*	(0.351)
Womuyemba			-1.706***	(0.204)	-0.934***	(0.200)
Constant cut1	-5.791***	(1.311)	-7.389***	(1.439)	-3.323	(2.074)
Constant cut2	-4.316***	(1.126)	-5.901***	(1.363)	-1.461	(2.198)
Constant cut3	-2.112*	(1.161)	-3.591**	(1.429)	1.383	(2.469)
Constant cut4	-0.979	(1.111)	-2.336*	(1.418)	3.113	(2.580)
Observations	598		589		589	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

HEC: Beliefs	(1)		(2)		(3)	
δ_i	-3.314	(2.306)	-3.689	(2.329)	-2.478	(2.438)
δ_j	-2.451	(2.000)	-2.785	(2.035)	-1.484	(1.921)
$\delta_i \times \delta_j$	7.515**	(3.746)	7.918*	(4.257)	5.471	(4.033)
C_i	0.135	(1.295)	0.178	(1.319)	-0.541	(1.815)
$\delta_i \times C_i$	3.623	(2.803)	4.062	(2.852)	2.584	(2.919)
$\delta_j \times C_i$	3.270	(2.268)	3.642	(2.347)	2.115	(2.274)
$\delta_i \times \delta_j \times C_i$	-8.677**	(4.413)	-9.102*	(5.123)	-5.980	(4.713)
$(C_i - C_j)$	-0.800	(1.176)	-1.145	(1.176)	-0.817	(1.237)
$\delta_i \times (C_i - C_j)$	-1.509	(2.728)	-2.260	(2.596)	-1.941	(2.137)
$\delta_j \times (C_i - C_j)$	-0.350	(2.133)	-0.677	(2.308)	0.247	(2.469)
$\delta_i \times \delta_j \times (C_i - C_j)$	2.141	(3.875)	3.149	(4.059)	1.905	(3.153)
Risk			-0.0370	(0.965)	-0.211	(1.129)
Agree			-0.00985	(0.0715)	-0.0837	(0.0770)
Trust			0.0414	(0.0590)	0.0509	(0.0743)
Wealth			0.0972	(0.0701)	0.0561	(0.0656)
Wealth_dif			0.0168	(0.0332)	0.0455	(0.0379)
Age			-0.00824	(0.0129)	-0.00874	(0.0150)
Age_dif			0.00754	(0.00671)	0.00888	(0.00591)
Gender			0.00482	(0.192)	0.124	(0.274)
Gender_dif			0.217	(0.185)	0.111	(0.179)
Friend			-0.581*	(0.339)	-0.0825	(0.402)
Bukimali					-0.423*	(0.233)
Bukiwungulo Upper					-1.003***	(0.296)
Bumayinsa					-1.396***	(0.473)
Bumuhaga					15.22***	(1.063)
Bunabupi					-1.159***	(0.239)
Bunandala					-1.485***	(0.166)
Buweri					-1.800***	(0.308)
Buwodenyele					14.48***	(1.076)
Gidongo					15.31***	(1.092)
Kibalasha					-1.137***	(0.291)
Kiyelo					15.94***	(1.141)
Lwakyesha					14.75***	(1.098)
Mabolo					-0.680***	(0.145)
Malemba					15.00***	(1.010)
Mayiyi					-1.307***	(0.314)
Nabitabago					16.34***	(1.127)
Nabiwuka					14.70***	(1.075)
Nabuzo Upper					15.95***	(1.106)
Naluwizi					-1.468***	(0.264)
Namashuli					14.80***	(1.268)
Namawugulu Trade					-0.894***	(0.174)
Namawugulu					14.01***	(1.099)
Nampembo					-0.0886	(0.412)
Nanzeyo					-0.105	(0.356)
Womuyemba					-1.391***	(0.233)
Constant cut1	-4.400***	(1.314)	-5.216***	(1.851)	-6.323***	(1.684)
Constant cut2	-2.749**	(1.138)	-3.558**	(1.565)	-4.644***	(1.535)
Constant cut3	-0.712	(1.123)	-1.499	(1.501)	-2.473	(1.508)
Constant cut4	0.378	(1.091)	-0.419	(1.427)	-1.271	(1.421)
Observations	598		589		589	

Ordered logit regressions. Robust standard errors in parentheses. ***, **, * indicate two-sided significance levels at 1, 5, and 10 %, respectively.

APPENDIX B: Instructions

You will be paired with one other person in this room. Both of you will be asked to make a decision. Your decision as well as the decision of the other person will determine how much you can earn. These earnings depend on your own decision and the decision of the other person. Your earnings will be determined in the following way. Each of you has 4 days at your disposal. You have to decide how many days you want to work at home, and how many days you want to work on a project.

We assume that the days that you don't work at home, you will work for the project. So, if you decide to work 2 days at home, you will spend 2 days on the project. If you decide to work 1 day at home, you will work 3 days for the project, etc. For each day that you work at home you gain 500 UGX for sure. If you decided to work 2 days at home you would get 1000 UGX, if you worked 3 days you would get 1500 UGX from working at home.

The income you get from the project is calculated in the following way. For each day you decide to work on the project you gain 2,000 UGX, but only if the other person decides to work for at least as many days on the project as you do. For any day you work more on the project than the other person you will earn 0. [Emphasize the underlined] In other words, the amount of income from the project is determined by the person who spends least days on the project, as both of you are needed to get income out of the project.

For example, if you worked 2 days for the project and the other person worked 2 days for the project, you would earn 4000 UGX from the project and the other would also earn 4000 UGX from the project. For example, if you worked 3 days for the project and the other person worked 2 days for the project, you would again earn 4000 UGX from the project, and the other would also earn 4000 UGX from the project.

Let me check whether you understood [Ask the following questions in public]

- How much income would you earn from the project if you worked 3 days for the project and the other person worked 3 days for the project? (6000 UGX). How much would the other earn from the project? (6000 UGX)

- How much income would you earn from the project if you worked 2 days and the other person worked 3 days? (4000 UGX). How much would the other earn? (4000 UGX)

To calculate your total income you need to add the income from your own activities at home and the income obtained from the project. Spending a day at home gives you a certain income of 500 UGX, which you would forego if you decided to spend that day on the project. This income will be foregone independently of whether your partner works on the project. However, spending this day on the project may generate an income of 2000 UGX, but only if the other also spends at least as many days on the project.

For example, if you worked 2 days on the project (and 2 days at home) and the other person worked 2 days for the project (and 2 days at home), you would get 5000 UGX, and the other would get 5000 UGX as well. If you worked 3 days on the project (and 1 day at home) and the other person worked 2 days for the project (and 2 days at home) you would only get 4500 UGX, while the other would still get 5000 UGX.

Let me check whether you understood how to calculate your total income [ask the following questions in public and explain how we got to the answers.]

- What would be your final income if you worked 3 days on the project (and 1 day at home) and the other person worked 3 days for the project (and 1 day at home)? (6500 UGX). How much would the other person get? (6500 UGX).

- What would be your final income if you worked 2 days on the project (and 2 days at home) and the other person worked 3 days for the project (and 1 day at home)? (5000 UGX). How much would the other person get? (4500 UGX).

Pay-off table

To help you better understand how much income you and the other would get for the different decisions we use a table. The table shows your total income, which is the income you get from working at home and the income you get from the project. It is very important that you understand this table very well.

It is important to remember that at the time you take your decision you do not know the decision of the person you are paired with. Similarly, the other person does not know your decision, when taking his/her own decision. You can of course have beliefs about how many days the other will spend on the project and how many days he will spend at home.

As your income depends on the decision of the other person, you will have to go to the column that corresponds to the other's decision. You don't know the other's decision, but imagine the other decides to work 0 days on the project. In that case, you will have to go to the column that starts with 0. To find your income for a certain decision you make, you need to find the row that corresponds to your own decision.

Imagine you decide to spend 0 days on the project. In that case you need to use the row that starts with number 0. You will find your income in the cell at the intersection of column 0 (that corresponds to the decision of the other) and row 0 (that corresponds to your decision). In this example, your income will be 2000 UGX (first amount in the cell) and the income of the other will be 2000 UGX (second amount in the cell). [Explain the other examples on the diagonal: 1/1, 2/2, 3/3, 4/4; after this also explain the examples 1/0 and 0/1; 1/3 and 3/1; 2/4 and 4/2; note: we always explain the symmetric case]

[Ask the following questions in public and ask the participants to respond. Show for each question how they can find the correct answer in the table.] 1. Imagine that you believe the other person will work 2 days for the project (and 2 days at home). How much would you earn if you worked 2 days for the project as well? (5000 UGX). How much would the other earn? (5000 UGX) 2. Imagine that you believe the other person will work for 2 days for the project (and 2 days at home). How much would you earn if you worked 1 day for the project? (3500 UGX). How much would the other earn? (3000 UGX) 3. Imagine that you believe the other person will work for 2 days for the project (and 2 days at home). How much would you earn if you worked 3 days for the project? (4500 UGX). How much would the other earn? (5000 UGX) 4. Imagine that you believe the other person will work 3 days for the project. How much would you earn if you worked 3 days for the project as well? (6500 UGX) How much would the other earn? (6500 UGX) 5. Imagine that you believe the other person will work 3 days for the project. How much would you earn if you worked 4 days for the project? (6000 UGX). How much would the other earn? (6500 UGX) 6. Imagine that you believe the other person will work 3 days for the project. How much would you earn if you worked 2 days for the project? (5000 UGX). How much would the other earn? (4500 UGX)

As you can see in the table you will get a higher income if you both spent more days on the project. If you both spend 3 days on the project you will get more (6500 UGX) than when you both spend 2 days on the project (5000 UGX), or than when you both spend 1 day on the project (3500 UGX). However, you dont get more income when you spend more days on the project than the other person. If you increase your days on the project from 2 days to 3 days but the other keeps on spending 2 days on the project your final income will actually decrease from 5000 UGX to 4500 UGX.

Decision cards

To make decisions, we will proceed in the following way. First, we will ask you to specify on the decision card what you believe the other would decide, that is the number of days he would work for the project. After this, you will be asked to mark your decision on your decision card, that is the number of days you want to work on the project.

Remember that by deciding the number of days one works for the project one also determines the number of days one works at home. [We start a role-play to clarify the pairing and how the decision card is used. Two experimenters have a decision card.]

Pairing

You will make several decisions in which you will be paired with different persons in this room. At the end of today's programme we select one pair for your payment and you will get to know the identity of the other person in the selected pair and the other person in this pair will get to know your identity. However, at the moment when you will be asked to make a decision, you won't always know the identity of the person you are paired with.

In some pairs you wont know the identity of the other person, and neither will the other person know your identity. In this case the two boxes under YOU and Other person will be empty. The other person could be from the same village where you live or from another village. This will be indicated on the decision card [Show on the poster of the investment decision card where it will be indicated whether same/different village]. Semi-disclosure treatment: In other pairs, one person will know the identity of the person s/he is paired with, while the other person wont know the identity of the person s/he is paired with. The person who will know the identity of the other person will find the name and photograph of the other person on his/her decision card. If you get to see your photograph on the decision card the other will know your identity and name. If your photograph/name does not appear on your decision card, the other wont know your identity. [Show on the poster of the decision card where they can find the names and photographs of both persons]

In other words, if you get to see a photograph and name in the box under Other person, you get to know the identity of the person you are paired with. If you see your photograph on your decision card, the other will know your identity and name. If your photograph/name does not appear on your decision card, the other wont know your identity.

For each of the pairs you are involved in you will receive a new decision card. You may make the same decision or you may make a different decision.

Control questions

We will now ask some questions to see whether you understood the instructions. 1. What would be your total income if the other worked 2 days for the project and you worked 2 days for the project? (5000 UGX). How much would the other person get? (5000 UGX). 2. What would be your total income if the other worked 1 day for the project and you worked 3 days for the project? (2500 UGX). How much would the other person get? (3500 UGX). 3. What would be your total income if the other worked 4 days for the project and you worked 2 days for the project? (5000 UGX). How much would the other person get? (4000 UGX). 4. What would be your total income if the other worked 3 days for the project and you worked 2 days for the project? (5000 UGX). How much would the other person get? (4500 UGX).

[For each of the questions, record on the control question card whether they answered it correctly. If the participant gave a wrong answer for at least one of the questions, ask him/her to have a careful look at it once more and ask what was not clear. Answer their questions as clearly and accurately as possible. If necessary, clarify the instructions; but not more than once. Write down additional comments if you think the participants did not get enough understanding. Retain their decision cards.]

Decisions

[Give each participant a pen.] If you have no further questions, we will now begin. Remember, there are no wrong decisions, so you should choose the option as you prefer. We emphasize that it is important that you make your decision in private. Do not show your decision card to the other participants. If you need assistance, please raise your hand so that one of us can come to assist you. Once you have made your decision, please fold the decision card and raise your hand so that we can come by to collect your decision card. [The participants remain seated. We give decision card with pair no 1 to the participants. Clarify publicly the treatment (same/different village, anonymous/non-anonymous). After the participants have made their decision, they fold their decision card. When collecting the decision cards we check whether their answer is readable and consistent. Add comments if the participant was struggling (e.g. if he/she was helped with filling in the decision card). After all cards have been returned, we give them the decision card for pair no 2. Explain that it is a new pair and clarify publicly important elements such as the name/photograph of the involved participants (if relevant) including whose identity is known to whom, and whether they belong to the same village. Follow the same procedure for the other pairs. Make sure that distribution cards are distributed in the correct order 1 4.] [When all participants have made their 4 decisions, Part 1 is complete. Control that all decision cards have been returned. Collect pay-off table cards and remove poster]