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Risk Pooling, Risk Preferences, and Social Networks

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Abstract

Using data from a field experiment conducted in seventy Colombian municipalities, we investigate who pools risk with whom when risk pooling arrangements are not formally enforced. We explore the roles played by risk attitudes and network connections both theoretically and empirically. We find that pairs of participants who share a bond of friendship or kinship are more likely to (1) join the same risk pooling group and to (2) group assortatively with respect to risk attitudes. Also, consistent with our theoretical finding that when there is a problem of trust the process of pooling assortatively with respect to risk preferences is perturbed, we find (3) only weak evidence of such assorting among unfamiliar individuals.

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1. Introduction

Networks, interpersonal links and group memberships are extremely important in many poor people's lives. This is increasingly recognized both by researchers and development practitioners. Networks and groups affect information flows and behavioral patterns and may complement or substitute for market mechanisms in the provision of many goods including credit and insurance. The implications of this for policy are many and varied: existing network structures may impact on the effectivness of development interventions including those designed to increase access to credit and insurance; some interventions may lead to changes in network structure that compromise people's ability to cope in their absence; others might harness the networking and grouping capacities of people, both making use of and strengthening the networks as a result. The details of these processes depend, to a large extent, on how networks and groups are formed and what factors (both individual and environmental) affect who chooses to group or network with whom. The aim of this paper is to shed light, both theoretically and empirically, on the group formation mechanisms that come to the fore when risk sharing is the objective and enforcement is scarce.

The networks and groups formed by people when endeavoring to cope with the risks associated with living close to subsistence have attracted particular attention. We now know that informal risk sharing groups or networks rarely if ever encompass entire communities (Fafchamps and Lund (2003), Murgai et al. (2002), De Weerdt and Dercon (2006), Bold and Dercon (2009) and others) and we have sound theoretical explanations as to why this is so (Genicot and Ray (2003), Bloch et al. (2008), Bramoullé and Kranton (2007) and Ambrus et al. (2008)). We also know that, within communities, risk sharing groups and networks are not randomly formed.

In empirical studies, who shares risk with whom is strongly correlated with networks of kinship, caste and friendship and, to a lesser extent, with variables such as geographical proximity and demographic similarities that may be proxying for other types of social network (see for example, Fafchamp and Gubert (2007), De Weerdt and Dercon (2006), Dekker (2004), Munshi and Rosenzweig (2009), Mazzocco and Saini (2008)). These findings are not inconsistent with theories of risk sharing as a repeated exchange (Kimball (1988); Coate and Ravallion (1993); Kocherlakota (1996), Ligon, Thomas and Worrall (2001); and Foster and Rosenzweig (2001), Munshi and Rosenzweig (2009)) and with theories that incorporate intrinsic motivations such as altruism or anticipated guilt on breaking a social norm (e.g. Altonji, Hayashi and Kotlikof (1992); Ravallion and Dearden (1988); Cox (1987); Cox, Eser and Jimenez (1998); Cox and Fafchamps (2007)).

Network and group structure and formation have also been analyzed in models of microcredit. Who groups with whom when group loans with joint liability are offered, how this process is affected by individual preferences and the nature of the contract on offer, and how it may in turn affect the efficacy of group lending have each received considerable attention. Ghatak (1999, 2000) shows theoretically that in group lending with joint liability risk neutral people group assortatively with respect to the riskiness of their portfolios and that this mitigates the problem of adverse selection. Ahlin (2009) then extends the model to sequential group lending and finds evidence of assorting on portfolio riskiness in a Thai microcredit program. However, since social networks are not controlled for in the analysis, he cannot rule out the possibility that socially connected individuals are both more alike with respect to their risk attitudes and more likely to group together. In contrast, allowing for risk aversion and insurance motives, Sadoulet (2000) predicts and Carpenter and Sadoulet (1999) find evidence of heterogenous grouping. This suggests that risk attitudes may play a role in the group formation process not only via portfolio choice but also directly and in combination with portfolio riskiness. Some evidence of assortative grouping with respect to risk attitudes was found by Gine et al (2009) among subjects participating in series of lab-type experiments designed to simulate group lending with joint liability in Peru but only among groups facing dynamic incentives. However, the study did provide further evidence of the role of social networks in the group formation process.

In the theoretical literature on microfinance social networks assume two roles: they allow information to flow, thereby reducing information asymmetries, and they support mutual enforcement through social disapproval and the threat of exclusion (Ghatak and Guinnane (1999)). In some models the role of the network is implicit. Ghatak (1999, 2000) and Ahlin

(2009), for example, assume that borrowers have more information about each other's portfolios than lenders. In other models the role of networks is explicitly investigated. Besley and Coate (1995), for example, present a model in which more socially connected groups of borrowers display higher repayment rates. However, Chowdhury (2007) shows that when group lending is sequential and renewal is contingent, while moral hazard is lower in groups of socially connected individuals, whether socially connected individuals choose to group together depends on the discount factor.

The theoretical studies cited above highlight three determining factors in group formation: individual preferences and attitudes towards risk; pre-existing social networks; and the function that the groups are to perform conditional on their context (risk-sharing, sharing rules, enforcement, ...). They also suggest that these three factors interact in a variety of different and often complex ways. Ultimately, which are the most important factors and how they affect group formation is an empirical matter. However, the empirical evidence on these issues is very limited. This paper aims to (partially) redress this situation by analyzing the interaction between social networks and individual attitudes towards risk on group formation, while experimentally holding group function and context constant.

To this end, we use a unique database containing information on the behaviour of a large number of subjects in a version of the risk-pooling game (Barr and Genicot, 2008: Barr, Dekker, and Fafchamps, 2008) in 70 Colombian communities. Our experiment is exceptional in a number of ways. First, it can be directly linked to a household survey that provides very rich data on the experimental participants, the households to which they belong and the communities in which they live. Second, it can also be linked to data on the social ties that exist between all of the participants. Third, the experiment was designed to generate data not only on who chooses to share risk with whom, but also on individual risk attitudes. Fourth, the experimental protocol was designed to ensure that the participants were embedded within rather than isolated from their usual social environment when making their choices. And fifth, it is one of the largest (in terms of numbers of participants) experiments ever to have been undertaken. Combined, these attributes yield a unique opportunity to study the formation of risk sharing networks and groups and especially the nature of the interaction between risk attitudes and pre-existing networks in this process.

The risk-pooling game involves two rounds. In the first round, participants independently play a version of Binswanger's (1980) gamble choice game. Behaviour in this game provides information about individual attitudes towards risk. In the second round, participants play the game again but have the opportunity, prior to playing, to form risk sharing groups within which the proceeds of all members' second round gambles are divided equally. However, the group forming agreements are not enforced and group members can secretly defect from the agreement to share after finding out the outcome of their own second round gamble. Thus, group formation depends on trust. As we mention above, we have information on the network ties that exist between the experimental participants.

The main objective of this paper is to model group formation in the risk sharing game, focusing specifically on the roles of individual risk attitudes, social networks and the trust we assume they embody, and the interaction between the two. To inform our empirical analysis, we use a theoretical model in which individuals are heterogenous in terms of their levels of risk aversion and trustworthiness and are variably embedded in a trust-supporting social network. We show that individuals prefer to group with close friends and relatives with similar risk attitudes. When grouping with individuals outside their social network, untrustworthy individuals are opportunistic, defaulting on risk-sharing arrangements when it pays to do so and lying about their type, i.e., both their trustworthiness and their level of risk aversion, in order to convince others to group with them. Within this context of limited trust, individuals may prefer to group with others whose risk attitudes differ from their own and therefore have an incentive to misrepresent their risk attitudes. Hence, the assorting process may be perturbed and group formation discouraged among un-networked individuals.

Applying a dyadic regression approach we investigate whether these effects are manifest in the data from our risk-pooling game. Our empirical findings are consistent with our predictions: dyads who share a close bond of friendship or kinship are more likely to group together and to group assortatively with respect to their risk attitudes as compared to unfamiliar dyads; and, as an individual's close friends and family options increase, they are increasingly less likely to group with unfamiliar others.

Our results are among the first to show that group formation is assortative with respect of attitudes towards risk. We also show that this effect is tempered by the fact that they are operative only among individuals who know, and probably trust, each other well.

The paper is organized as follows. Section 2 describes the experimental design. The theoretical framework is introduced in Section 3. In Section 4, we present the empirical specification. Results are then discussed in Section 5. Section 6 concludes.

2. Experimental Design

The subjects. The experiment was conducted by a team of professional field researchers in 70 Colombian municipalities during the first quarter of 2006. The subjects of our experiments were all participants in a survey designed to evaluate the government of Colombia's conditional cash transfer program 'Familias en Acción' (FeA).[1]

The sampling strategy for the FeA evaluation involved: first, selecting a sample, stratified by region and level of infrastructure, of the municipalities that were to receive the FeA intervention during the evaluation phase; second, selecting a matching sample of municipalities that were not to receive the FeA intervention; and third, selecting a geographically clustered sample of households from the poorest strata in each municipality.[2] There were 122 municipalities involved in the evaluation. The experiment reported here was conducted in 70 of these. In these municipalities, each household participating in the evaluation survey was invited to send one adult, preferably the household head or his/her spouse, to the session in their municipality. A total of $2,512$ individuals took part in the experiment. The survey data is drawn from the FeA evaluation survey.

[1]The FeA program makes cash transfers to households conditional on a pledge from them that all of their children will complete primary school and that the senior woman will attend some nutrition workshops.

[2]The Colombian government assigns each and every household in the country to one of six categories according to how well off or poor they are. Social welfare programs are, then, targeted at those in the poorest one or two categories. FeA is targeted at the poorest only.

Table 1 presents some descriptive statistics for our experimental subjects. In this table, the first and second columns contain the proportions, means, and corresponding standard errors for as many of the $2,512$ subjects as we can match to the survey data in the case of each variable, and the third and fourth columns present the same statistics but for the sample upon which the dyadic regression analysis was ultimately performed.[3] Eighty seven percent were female, 77 percent were married, 29 percent were heads of households. Their average age was 42 years and, on average, they had 3.7 years of education. Thirty-four percent lived in municipal centers, i.e., the small towns or villages in which the municipal administrations are situated and the experimental sessions were conducted, while the remaining 66 percent lived in the surrounding rural clusters. The average monthly household consumption (including consumption of own farm outputs) for this sample at the time of the experiments was $430,000$ Colombian Pesos (approximately US$190). This is low and reflects the fact that only households in the poorest of six income categories defined by the Colombian government are eligible for the FeA.

The data on friendships and kinships between experimental subjects was collected during the experimental sessions. Following registration, the field researchers constructed a complete list of all those present in the session. Then, each participant was asked whether they were related to or friends with each of the other people named on the list. Approximately one quarter recognized kin among their fellow participants. One recognized as many as five. As shown in Table 1, the average participant recognized 0.3. Friendship was more commonplace. Approximately three quarters recognized friends among their fellow participants, with two recognizing as many as 16. The average participant recognized 2.4.

The gamble choice game. The experiment was based on a version of the risk-pooling game (Barr, 2003; Barr and Genicot, 2008; Barr, Dekker and Fafchamps, 2008). This game is divided into two rounds each involving a *gamble choice game* executed in strict accordance with the following protocol.

[3] 128 individuals had to be dropped from the analysis due to mismatches between the experimental and survey data and to missing data points in the survey. A further 58 were effectively dropped during the estimation because they related to either the one municipality in which all the participants formed a single risk sharing group or the one municipality in which none of the participants formed risk sharing groups.

Each subject i is called to a private meeting with a field researcher and asked to choose one gamble ℓ_i out of six gambles offered $\mathcal{L} \equiv \{1, 2, ...6\}$ ranked from the least to the most risky. Every gamble $\ell \in \mathcal{L}$ yields either a high payoff $\bar{y}_\ell$ or low payoff $\underline{y}_\ell$ each with probability 0.5. Once the gamble is chosen, the payoff is determined by playing a game that involves guessing which of the researcher's hands contains a blue rather than a yellow counter. We denote as $y_i(\ell_i)$ i's realized gamble gain. If the subject finds the blue counter, she receives the high payoff associated with the gamble of her choice, $\bar{y}_{\ell_i}$. If she finds the yellow counter, she receives the low payoff associated with that gamble, $\underline{y}_{\ell_i}$.

The six gambles are reported in Table 2 (and presented in Figure 1). The chart in the figure is also used to explain the gambles to the participants, many of whom had very little formal education or were even illiterate.The six gambles are similar but not identical to those used by Binswanger (1980). They have been adjusted to accord with the Colombian currency. On the chart, each gamble $\ell \in \{1, 2, ...6\}$ is depicted as two piles of money, the high payoff ($\bar{y}_\ell$) on a *blue* background and the low payoff ($\underline{y}_\ell$) on a *yellow* background. Table 2 presents the expected returns on each gamble, which vary from $3,000$ to $6,000$ Colombian Pesos, their standard deviations, which lie between 0 and $8,458$ Columbian Pesos, and the ranges of CRRA associated with each gamble choice.[4]

During the first round of the experiment, the gamble choice was introduced and explained to the subjects in their private meetings, where their comprehension was also tested. Once they had made their decisions and had played out the gamble of their choice, they were given a voucher for the value of their winnings and asked to sit separately from those who had not yet played to await further instructions. Their first round gamble choices provides a measure of their individual risk attitudes.

The risk-pooling game. Once everyone had played Round 1, Round 2 of the experiment was explained.

In Round 2, the participants were told that they would play the *gamble choice game* again, that is they would be called separately one by one and offered the same choice of

[4]The average earnings during the experiment were $5,841$ and $6,126$ Columbian Pesos in Rounds 1 and 2 respectively. At the time, the official exchange rate was around 2,284 Colombian Pesos per US dollar.

gambles. However, this time, before going to their meetings, the participants could choose to form 'sharing groups'. Within sharing groups, second round winnings would be pooled and shared equally. However, in their private meetings, *after* seeing the outcome of their gambles, each participant would be given the option to withdraw from their sharing group taking their winnings with them, but also forfeiting their share of the other member's winnings.

All of this was explained to the participants prior to forming and registering their groups and it was also made clear that all decisions made during private meetings between individual participants and researchers would be treated as confidential by the researchers. So, members of sharing groups could secretly leave their groups (but without knowing the choice or outcome of others' gambles), taking their second round gamble winnings with them, but forfeiting their share of the winnings of others. If one or more members withdrew from a group, the rest of the gains within the group were pooled and divided equally between the remaining group members. Following the explanations and the presentation of a number of examples designed to demonstrate the effects of grouping and the effects of group members subsequently withdrawing on both their own and fellow group members' winnings, the participants were invited to a luncheon and given one to one and a half hours to form their groups.

Denote as $\mathbf{y} \equiv y_1, ...y_n$ the vector of gamble outcomes for all participants. Their second round earnings can be represented as follows. For all subjects $i = 1, ..n$, let d_i be an indicator that takes the value 1 if i stays in the group she joined and 0 if she defects. The payoff of subject i in group S is

$$e_i = \begin{cases} \frac{\sum_{j \in S} y_j(\ell_j) d_j}{\sum_{j \in S} d_j} & if \quad d_i = 1 \\ y_i(\ell_i) & if \quad d_i = 0 \end{cases} \tag{1}$$

3. Model

In this section, we present a stylized model of the experiment that will help us interpret the results. We organize the theoretical material as follows. We first describe the components of the model in Section 3.1. Before we can derive a set of predictions relating to group formation, we need to understand the properties of the model with respect to individual choice, given their grouping decisions. This we do in Section 3.2. In section 3.3, we use the results pertaining to individual choices to characterize group formation. We study the individual's preferred choice of partner, how this may incentivize them to misrepresent their type and the stable partitions of individuals into groups. To illustrate some of the results, in Section 3.4 we provide some numerical examples. Finally, we conclude the theoretical part of the paper with a summary of the main empirical predictions of our model in Section 3.5.

3.1. **Premise of the model.** We construct an environment which is as similar as possible to the game played in the field, although we need to make some simplifying assumption for analytical tractability. We make four important simplifications that allow us to obtain some analytical results: first, we assume that individuals choose from a continuum of lotteries; second, we assume that individuals can only form groups of size two; third, we assume that subjects do not make additional transfers to each other during or after and as a result of the games and finally, we make some specific assumptions about the utility function.

Lotteries. When taking part in the *gamble choice game*, individuals choose one out of six gambles with different expected incomes and risk (see Figure 1 in the Appendix and Table 2). For the model, we can view the gamble choice as a choice of $\sigma \geq 0$ where σ represents a lottery that earns $\bar{y}(\sigma) = b + h(\sigma)$ with a probability 1/2 and $\underline{y}(\sigma) = b - \sigma$ with a probability 1/2. Notice that, unlike in the experiment, the choice of lotteries considered here is continuous.

Groups. Consider a community I with n subjects. To participate in the second round of the experiment, subjects *partition* themselves into "sharing groups" $S_1, ...S_m$. These groups are exhaustive and mutually exclusive $\cup_{j=1,..m} S_j = I$ and $S_j \cap S_k = 0$ for $k \neq j$.

For tractability, we shall assume that these groups can be of size 1 or 2 only. However, in the actual experiment, groups of any size were allowed to form.

Let y_i be individual i's lottery gain and 1_i be an indicator that takes value 1 if i stayed in the group she joined and 0 if she defected. A subject i in group S earns a payoff as in equation 1.

PREFERENCES. In our risk pooling experiment, commitment is limited since individuals can opt out of their sharing groups. We assume that punishments are not possible and the consequences for individuals who opt out of their risk sharing groups stem only from their intrinsic motivations, i.e., from feelings of guilt.[5] We shall assume that individuals are heterogenous in terms of both their attitude towards risk and their intrinsic motivations.

We assume that individuals have constant absolute risk aversion $u_i(c) = -\frac{1}{a_i}\exp(-a_i c)$. So their attitude towards risk is captured by one parameter a_i that can be either low $\underline{a}$ or high $\bar{a}$, $0 < \underline{a} < \bar{a}$, with probability π and $1-\pi$ respectively. This parametric assumption is important in that it makes the problem much more tractable.

Individuals also differ in terms of their trustworthiness t_i that is either low $\underline{t}$ or high $\bar{t}$. A proportion $\overline{\gamma}$ of individuals are trustworthy. The guilt that an individual i feels from opting out of a group with j or lying to that person, g_{ij} is likely to depend not only on i's characteristics but also on the nature of the relationship between i and j. Among close family and friends, we expect guilt to be higher. To capture this we make the following assumptions. If i and j are *close friends and family members* (FF), g_{ij} is high enough that i would never defect on or lie to j irrespective of t_i. However, if i and j are relatively *unfamiliar* with each other, then i's type matters. *Trustworthy* individuals have a level of guilt high enough that they would not defect on or lie to a stranger. In contrast, *untrustworthy* individuals would feel no guilt from lying to or defecting on someone they are not close to ($g_{ij} = 0$ if j is unfamiliar and $t_i = \underline{t}$).

[5]If someone opts out of a group, the remaining members could potentially draw some inferences about defections from their own, shared winnings, but they could never have been certain that someone had opted out and, in groups of three or more, about whom to suspect of foul play. Moreover, other community members would not know anything about the defection and neither would other group members who also defect. So punishments would be hard to design and to enforce and, as a consequence, extrinsic commitment is very limited.

The distributions of risk attitudes, trustworthiness and ties of kinship or friendship are assumed to be independent. Let $\theta_i \equiv (a_i, t_i)$ be the type of individual i. Unfamiliar individuals do not know each other's type, they only know the proportion of people of each type in the population. We denote as r_{ij} the nature of the relation between two individuals i and j, $r_{ij} = F$ if they are close family and friends and $r_{ij} = U$ if they are unfamiliar. Moreover, we assume that everybody knows whether i and j are close friends or relatives.

Before exploring grouping behaviour, we need to understand the incentives that individuals face and the choices that they make in a given group. To this end, the next section looks at how individuals' expected utility and choices are affected by group membership.

3.2. **Lottery choice and expected utility.**

In this section, we study the choice of lottery and expected utility of individuals who stay alone and who form a group. We denote as ν_i^o the expected utility that individual i has if she stays alone and as ν_{ij}^* her expected utility in a group with j.

Autarchy. Consider an individual i with risk preference a_i who does not form a group. He will choose the lottery σ that maximizes his utility

$$v_i^o(\sigma) = \frac{1}{2}\left[u_i(b-\sigma) + u_i(b+h(\sigma))\right]. \tag{2}$$

His choice $\sigma_o(a_i)$ is such that

$$h'(\sigma_o)\exp(-a_i h(\sigma_o)) = \exp(a_i\sigma_o),$$

which gives him an expected utility $\nu^o(a_i)$.

Close family and friends. If individuals j and k are close family or friends, they would neither lie to nor defect on on each other. Hence, individual $i \in \{j,k\}$ enjoys the following expected utility as a function of her and her partner's lottery choices:

$$\begin{aligned} v_i(\sigma_i, \sigma_{-i}) \quad = \quad & \frac{1}{4}[u_i(b - \frac{1}{2}(\sigma_i + \sigma_{-i})) + u_i(b - \frac{1}{2}(\sigma_i - h(\sigma_{-i}))) + \\ & u_i(b + \frac{1}{2}(h(\sigma_i) - \sigma_{-i})) + u_i(b + \frac{1}{2}(h(\sigma_i) + h(\sigma_{-i})))], \; -i \neq i \in \{j, k\}. \end{aligned} \quad (3)$$

An equilibrium is a pair of lottery choices (σ_j^*, σ_k^*) such that $\sigma_j^* = \arg\max_\sigma v_j(\sigma, \sigma_k)$ and $\sigma_k^* = \arg\max_\sigma v_k(\sigma, \sigma_j)$. Hence, there is a unique equilibrium (σ_j^*, σ_k^*) where, irrespective of the choice of her partner, individual $i \in \{j, k\}$ with risk aversion a_i chooses lottery $\sigma^*(a_i)$ so that

$$h'(\sigma^*) \exp(-a_i \frac{h(\sigma^*)}{2}) = \exp(a_i \frac{\sigma^*}{2}).$$

Let ν_{ik}^* be the expected utility (3) evaluated at this equilibrium.

Unfamiliar individuals. People who are unfamiliar know neither each other's risk preferences nor their trustworthiness. Unfamiliar individuals make announcements to each other about their risk aversion. Consider individuals j and k who are unfamiliar with each other, $r_{jk} = U$. Given their announcements $(\widehat{a}_j, \widehat{a}_k)$, their number of "available" friend and family members (m_j, m_k) (more on this below), and the fact that they are willing to group with each other, they hold beliefs about each other's types. Let $p_\theta(m_i, m_{-i}, \widehat{a}_i, \widehat{a}_{-i})$ denote the probability with which $i \in \{j, k\}$ is thought of as being of type θ by $-i$ if he expresses a preference to form a group with her. Notice that, since trustworthy individuals do not lie, $p_{\bar{t},a}(m_i, m_{-i}, \widehat{a}_i, \widehat{a}_{-i}) = 0$ for $a \neq \widehat{a}_i$, the probability that a trustworthy individual is of a type, a, other than that which she declares, $\widehat{a}_i$, is zero.

Hence, for a given pair of announcements $\widehat{\mathbf{a}} = (\widehat{a}_i, \widehat{a}_{-i})$ and numbers of available close friends and relatives $\mathbf{m} = (m_i, m_-i)$, an *equilibrium* is a vector of lotteries $\boldsymbol{\sigma}$ whose typical element $\sigma_i(\theta)$ is the lottery chosen by individual $i \in \{j, k\}$ if her type is θ, for $i \in \{j, k\}$.

That is, if i is trustworthy $t_i = \bar{t}$, $\sigma_i(a_i, \bar{t}_i)$ is the lottery σ that maximizes

$$\begin{aligned}\widehat{v}_i(\sigma, \boldsymbol{\sigma}_{-i}) \;=\; & \sum_{a \in \{\underline{a}, \bar{a}\}} \tfrac{p_{\underline{t},a}(\mathbf{m},\widehat{\mathbf{a}})}{4} \Big[u_i(b - \tfrac{\sigma + \sigma_{-i}(a,\underline{t})}{2}) + u_i(b + \tfrac{h(\sigma) - \sigma_{-i}(a,\underline{t},\widehat{a}_i)}{2}) + \\ & u_i(b - \sigma) + u_i(b + h(\sigma)) \,\Big] + \; \tfrac{p_{\bar{t},\widehat{a}_{-i}}(\mathbf{m},\widehat{\mathbf{a}})}{4} \Big[u_i(b - \tfrac{\sigma + \sigma_{-i}(\widehat{a}_{-i},\bar{t})}{2}) + u_i(b + \tfrac{h(\sigma_{-i}(\widehat{a}_{-i},\bar{t})) - \sigma}{2}) \\ & + u_i(b + \tfrac{h(\sigma) - \sigma_{-i}(\widehat{a}_{-i},\bar{t})}{2}) + u_i(b + \tfrac{h(\sigma) + h(\sigma_{-i}(\widehat{a}_{-i},\bar{t}))}{2}) \Big] \end{aligned} \tag{4}$$

where $\boldsymbol{\sigma}_{-i}$ are the equilibrium values. While if i is untrustworthy, $\sigma_i(a_i, \underline{t}_i, \widehat{a}_{-i})$ maximizes

$$\begin{aligned}\widetilde{v}_i(\sigma, \boldsymbol{\sigma}_{-i}) \;=\; & \sum_{a \in \{\underline{a}, \bar{a}\}} \tfrac{p_{\underline{t},a}(\mathbf{m},\widehat{\mathbf{a}})}{4} \Big[u_i(b - \tfrac{\sigma + \sigma_{-i}(a,\underline{t})}{2}) + u_i(b - \sigma) \Big] + \tfrac{p_{\bar{t},\widehat{a}_{-i}}(\mathbf{m},\widehat{\mathbf{a}})}{4} \\ & \Big[u_i(b - \tfrac{\sigma + \sigma_{-i}(\widehat{a}_{-i},\bar{t})}{2}) + u_i(b + \tfrac{h(\sigma_{-i}(\widehat{a}_{-i},\bar{t})) - \sigma}{2}) \Big] + \tfrac{1}{2} u_i(b + h(\sigma)) \end{aligned} \tag{5}$$

It is implicitly assumed in the expressions in equations (4) and (5) that untrustworthy individuals (without guilt) would choose to leave upon winning their lotteries and stay upon loosing. That this would indeed be their preferred behaviour is proved in Observations 1 and 2 in the Appendix.

There may be more than one equilibrium. In case of multiplicity, we shall select the equilibrium preferred by the more risk averse trustworthy type.[6] The utility $\nu^u_{i,-i}(\mathbf{m}, \widehat{\mathbf{a}})$ that i expects from forming a group with $-i$ is then given by (4) if i is trustworthy and (5) if i is untrustworthy where these expressions are evaluated at the equilibrium.

Some features of individual behaviour of agents paired with unfamiliar individuals is noteworthy and useful when characterizing grouping behaviour. In particular, we note that a trustworthy individual with risk aversion a_i chooses a lottery that is riskier than she would choose in autarchy but safer than she would choose in a match with someone who she knows to be trustworthy, $\sigma_i(a_i, \bar{t}) \in (\sigma_o(a_i), \sigma^*(a_i))$.

We also conjecture that the more risk averse an individual – whether she is trustworthy or not – the safer her choice of lottery tends to be. Theoretically, this effect could be reversed

[6] We want to select an equilibrium so that an individual's expected utility in a group is uniquely defined and depends only on the group members' types. The particular selection criterion does not matter. Moreover, no multiplicity was found in simulated exercises.

when a trustworthy person expects her partner to choose extremely risky lotteries, but this never occurred in simulations.

We are now in a position to study individual's preferred choice of partner, to see how this may give them incentive to misrepresent their type, and characterize some features of the stable partitions of individuals in risk sharing groups.

3.3. **Grouping.**

CONSISTENT BELIEFS. We assume that every individual has an *announcement policy* $\alpha_i \in [0, 1]$ that specifies the probability that she will declare herself to be highly risk averse, $\widehat{a}_i = \bar{a}$, to someone unfamiliar. An individual's announcement policy is assumed to depend only on her type so that $\alpha_i = \alpha(\theta_i)$. Since trustworthy individuals do not lie, $\alpha(\bar{t}, \bar{a}) = 1$ and $\alpha(\bar{t}, \underline{a}) = 0$.

Consider a given partition of the population into groups Q and an announcement vector $\widehat{\mathbf{a}} = \{\widehat{a}_1, \widehat{a}_2, ...\}$. An individual is said to be "available" if he is not already matched with a close friend or relative in Q. Let m_i be the number of available close friends or relatives of i in Q. We denote as $I_{m,m',\widehat{a},\widehat{a}'}$ the set of individuals i with $m_i = m$ and $\widehat{a}_i = \widehat{a}$ who are grouped with someone with m' available friends or relatives and announcement $\widehat{a}'$.

Beliefs $\mathbf{p}$ and announcement policies $\boldsymbol{\alpha} = \{\alpha_1, \alpha_2, ..\}$ are said to be *consistent* with a vector of announcements $\widehat{\mathbf{a}}$ and a partition Q if the following conditions hold:
(1) if $\widehat{a}_i = \bar{a}$ then $\alpha_i > 0$ and if $\widehat{a}_i = \underline{a}$ then $\alpha_i < 1$;
(2) $p_{\bar{a},\bar{t}}(m, m', \underline{a}, \widehat{a}') = p_{\underline{a},\bar{t}}(m, m', \bar{a}, \widehat{a}') = 0$;
(3) if $I_{m,m',\widehat{a},\widehat{a}'} \neq \emptyset$ then

$$p_\theta(m, m', \widehat{a}, \widehat{a}') = \frac{\Sigma_{i \in I_{m,m',\hat{a},\hat{a}'} | \theta_i = \theta} 1}{\Sigma_{i \in I_{m,m',\hat{a},\hat{a}'}} 1}.$$

Condition (1) requires announcement policies and actual announcements to be consistent. Individuals can only make announcements that they have a positive probability of making, according to their announcement policy. The second condition states that trustworthy individuals are not believed to lie. Finally, condition (3) requires that one's beliefs regarding the type of an unfamiliar person who agrees to form a specific group corresponds to the actual proportion of individuals of this type in similar groups. That is, the probability with which an individual with m available close friends or relatives and an announcement $\widehat{a}$ who wants to group with someone with m' close friends or relatives and an announcement $\widehat{a}'$ is thought to be of type θ must correspond to the proportion of individuals of type θ in $I_{m,m',\widehat{a},\widehat{a}'}$ (individuals who are in similar groups). If some groupings $(m, m', \widehat{a}, \widehat{a}')$ are not observed in a partition, consistency does not restrict the beliefs for this hypothetical grouping.

Why do an individual i's beliefs regarding a potential partner j depend not only on j's announcement and situation but also on her own announcement and situation? This is because j's willingness to form a group with i can tell i something about j's type (see Chade 2006). For instance, consider a setting in which a trustworthy individual with high risk aversion would under no circumstance want to group with an unfamiliar person announcing low risk aversion. If i announces low risk aversion and j announces high risk aversion and then j wants to group, i should infer that j is untrustworthy.

Stable groups.

Consider a partition $Q \equiv \{S_1, ...S_m\}$ of the population into sharing groups of size 1 or 2. This partition along with a vector of announcements $\widehat{\mathbf{a}}$ and a set of beliefs $\mathbf{p} = \{p_\theta(m, \widehat{a})\}_{\forall m,\theta,\widehat{a}}$ generates a vector of utility $\boldsymbol{\nu} = (\nu_1, ...\nu_n)$ where $\nu_i = \nu^o(a_i)$ if $\{i\} \in Q$, $\nu_i = \nu^u_{i,j}(\widehat{a}_i, \widehat{a}_j, m_i, m_j)$ if $\{ij\} \in Q$ and $r_{ij} = U$, and $\nu_i = \nu^*_{ij}$ if $\{ij\} \in Q$ and $r_{ij} = F$.

Our concept of stability requires beliefs about unfamiliar individuals to be consistent with people's announcements and individuals not to want to change their current group membership and/or announcements. Individuals should prefer their current group to autarchy, if they are in a group, and to forming a group with another willing individual. When a pair of individuals i and j who are not together in the initial partition Q consider forming a group, we assume that in the resulting partition, denoted as $Q_{+\{ij\}}$, the people they were in groups with (if they were in groups) remain alone.

A partition Q, announcements $\widehat{\mathbf{a}}$, and associated vector of utility $\boldsymbol{\nu}$ are deemed *stable* if:
$[i]$ there is a vector of announcement policies $\boldsymbol{\alpha}$ so that $\boldsymbol{\alpha}$ and the beliefs $\mathbf{p}$ are consistent with $\widehat{a}$ and Q;
$[ii]$ there is no individual i so that $\nu^o(a_i) > \nu_i$
$[iii]$ there is no pair of individuals j and k and announcements $(\widehat{a}'_j, \widehat{a}'_k)$ so that $\nu'_{jk} > \nu_j$ and $\nu'_{kj} \geq \nu_k$ where $\nu'_{i\,-i} = v^*_{i\,-i}$ for $i, -i \in \{j,k\}$ if j and k are close friends or family $(r_{jk} = F)$, and $\nu'_{i\,-i} = v^u(\widehat{a}'_i, \widehat{a}'_{-i}, m'_i, m'_{-i})$ if they are unfamiliar $(r_{j,k} = U)$ with m'_i being the number of available close friends and relative for $i, -i \in \{j,k\}$ in $Q_{+\{jk\}}$.

Armed with these definitions we are now ready to study individual preferences over group partners and incentives to reveal their risk attitudes.

Preferences over partners.

We first show that trustworthy individuals prefer grouping with close friends or family members with the same risk attitude to any other alternative.

Proposition 1. *Trustworthy individuals strictly prefer being in a group with a close friend or family member who has the same risk preference.*

The proof for this result is in the Appendix, but the intuition is simple. The other group member's risk aversion affects an individual's utility only through their choice of lottery. When co-group members can fully trust each other and know it, they expect to share all gains. Each's lottery choice then has exactly the same effect on the other's group members' payoff. So close friend or family members with the same preferences will choose the very lottery that they would want each other to choose. Hence, neither defection nor moral hazard is an issue and individuals strictly prefer being in a group than alone. Note that the assumption of no additional transfers is important for this result.[7]

[7]As in Sadoulet (2000), Legros and Newman (2004) and Chiappori and Reny (2004) some negative assortative matching would arise with trasferable utility.

Furthermore, this consideration, together with our consistency requirement, implies that people who have friends and family available to group with but who nevertheless seek to group with unfamiliar individuals are highly likely to be and to be believed to be untrustworthy. A trustworthy individual would never defect on anybody, but faces the risk of being the victim of defection if he groups with an unfamiliar individual. In contrast, untrustworthy individuals may be tempted to group with an unfamiliar individual and thereby have the option of defecting guiltlessly rather than grouping with a close friend or relative on whom they would not defect.

Suppose that trustworthy individuals always prefer to match with friends or family members, even of different risk preference, rather than remaining alone ($v^*(a, a') \geq v^o(a)$) for all $a \neq a'$. Then, a set of consistent beliefs would hold that someone with $m > 0$ (that is, with available friends and relatives to group with) who, nevertheless, considers grouping with an unfamiliar person, is untrustworthy with probability 1. On the other hand if, for some risk preference, being alone is preferred to grouping with a close friend or family member of different risk preferences, $v^*(a, a') < v^o(a)$ for some $a \neq a'$, then there is a positive probability that someone unfamiliar with $m > 0$ is a trustworthy individuals whose available friends and relatives have different risk aversion to them. However, this probability is still going to be smaller than for an unfamiliar person with the same announcement and fewer available friends or relative.

With these beliefs, what happens if the assortative matching within close friends and family members leaves pairs of them with different risk attitude? If forming a group with each other is preferable to remaining alone, then they would do so since they would not be trusted at all by unknown individuals. Otherwise if remaining alone is preferred by one of them, they would most likely both stay alone. This is because they would be less trusted than other unfamiliar individuals without available close friend or relative, and therefore could only group with someone else in a similar situation and who is likely to be untrustworthy. In most cases, autarchy will be preferable.

Next, we analyze the preferences for different types of co-group members among unfamiliar individuals. That is, we ask the question: given that somebody forms a group with an unfamiliar individual, with whom would she prefer to group?

Incentives for truth telling.

Consider a situation where truth telling prevails, that is all individuals announce their actual risk aversion. Would trustworthy people prefer unfamiliar individuals with the same risk preference as themselves? It is not clear. Assume that a trustworthy person could choose her co-group member's lottery as well as her own. On the one hand, if he's untrustworthy she would like him to make as safe a choice as possible. This tends to favor individuals who are *more* risk averse than her. On the other hand if he's trustworthy, she would like him to choose lottery $\sigma^*(a)$. This is a more risky choice than the choice that her partner would make if he is trustworthy and has risk preference a as he would want to 'protect' himself against the possibility that she is not trustworthy. This tends to make individuals that are *less* risk averse than her attractive as co-group member. Hence, overall, among unfamiliar others, individuals would not necessarily prefer people with the same risk preferences as themselves.

To be sure, this does not rule out assortative matching. If a trustworthy person with low risk aversion prefers a safer vector of lotteries $\boldsymbol{\sigma}_{-i}$ to $\boldsymbol{\sigma}'_{-i} > \boldsymbol{\sigma}_{-i}$ then a high risk aversion person does too. This tells us that, in most case, when a low risk aversion person would rather group with a high risk aversion person, a high risk aversion would rather group with a high risk aversion person. Similarly, if a high risk aversion person would rather group with a low risk aversion person, in general a low risk aversion person would too. Hence, assortative matching would arise.

However, when individuals prefer partners of different risk aversion from themselves among unfamiliar individuals, we need to worry about the incentives for truth-telling. Indeed, untrustworthy individuals may choose to misreport their risk preference. As a result, grouping among unfamiliar individuals is less attractive and grouping will be mixed in terms of risk preferences. The following Section illustrates these effects.

3.4. **Examples of stable partitions.**

In this Section, we present two numerical examples of stable partitions that illustrate our earlier findings. For both examples, we shall consider a discrete number of lotteries – the 6 lotteries used in the actual experiment – and assume that half the population has a low risk aversion $\underline{a} = 0.02$ and the other half has a high risk aversion $\bar{a} = 0.05$ so that in autarchy they would choose gamble 3 and 2 respectively. In both examples, grouping with a close friend or relative of any risk preference is always preferred to autarchy. Hence, we set beliefs so that individuals with available close friends or relatives who seek to group with unfamiliar people are believed to be untrustworthy. It follows that in a stable partition, there will be no individual with *available* close friends or family members grouping with unfamiliar individuals. Note that close friends and relatives who are already in groups with other close friends and relatives are counted as available. Whenever possible, close friends and family members with the same risk aversion group with each other, and if they have low (high) risk aversion select gamble 5 (3). What happens among unfamiliar individuals depends on the proportion of untrustworthy in the population and differs across the examples.

The proportion of trustworthy individuals, $\overline{\gamma}$, is assumed to be 85% in example 1 while in example 2, we set $\overline{\gamma} = 50\%$.

Example 1. Consider a stable partition with truth-telling. In this case, all individuals with high risk aversion $\bar{a}$ (whether trustworthy or untrustworthy) in a group select gamble 3, while trustworthy individuals with low risk aversion $\underline{a}$ grouping with unfamiliar individuals select gamble 4 and untrustworthy individuals with low risk aversion $\underline{a}$ grouping with unfamiliar individuals select gamble 5.

Since, the probability of an untrustworthy partner is only 15% this has little impact on who individuals choose to group with and individuals prefer grouping with unfamiliar individuals to autarchy. Trustworthy individuals of all risk preferences prefer to group assortatively and untrustworthy individuals have no incentive to lie about their risk preference.

Hence, assortative matching among both family and friends and unfamiliar and truth-telling are stable in this example.

Example 2. This second example is identical to the first except that the proportion of untrustworthy individuals is much larger: they constitute half the population. Let's assume truth-telling to start with, that is individuals announce their real risk preferences. In all groups of unfamiliar individuals, low risk aversion individuals would select gamble 4 and high risk aversion individuals would select gamble 3. Now, trustworthy individuals with low risk aversion would prefer grouping with individuals with high risk aversion. Since individuals with high risk aversion prefer each other to people with low risk aversion, this would not be an option. With assortative matching among unfamiliar individuals, individuals with high risk aversion would form groups while individuals with low risk aversion would choose autarchy. Would this be a stable partition?

No. Untrustworthy individuals with low risk aversion would have an incentive to pretend to be of high risk aversion in order to match with a high risk aversion person. Hence a stable partition will involve some misrepresentation of risk preferences.

A stable partition in this example consists of unfamiliar individuals announcing a high risk aversion grouping with each other while others remain alone, and 10.36% of the untrustworthy with low risk aversion pretending to have high risk aversion. Hence, groups of unfamiliar individuals with different risk aversion form while we have assortative matching among close friends and family members.

3.5. **Predictions.**

The theoretical model and the examples discussed above support a number of hypotheses that may be tested using the data from the experiment.

(1) Among close family and friends grouping is relatively commonplace and strongly assortative with respect to risk attitudes.

(2) Among unfamiliar individuals grouping is relatively rare and may or may not be assortative with respect to risk attitudes. The lack of trust among unfamiliar individuals perturbs preference orderings across different types of co-group member leading to some preferring to group with individuals exhibiting risk preferences that are different to their own. In this case, untrustworthy individuals have an incentive to lie about their risk attitudes and this prevents assortative matching among unfamiliar.

(3) The likelihood that an individual will group with someone who is unfamiliar to them declines as the number of close family and friends present increases. This is because, as this number rises, the likelihood of finding close family and friends with similar risk attitudes rises and because an individual who chooses not to group with close family and friends is more likely to be and be believed to be untrustworthy by others.

We are aware that some of the assumptions underlying the model are very strong. Most importantly, in the experiment, groups could be of any size, while in the model only groups of size two were allowed. We consider this mismatch to be justifiable as, had we restricted the experimental subjects to groups of two, we may have introduced an element of artificiality that would have distracted the subjects from the underlying nature of the choices they were being asked to make.[8] And if the theoretical model is extended to larger groups, both tractability and the ease with which clear predictions can be made rapidly declines, although we believe that the intuition would carry through.

Secondly, it is unlikely that close friends and family members always trust each other and that there is a stark cutoff between close friends and family and unfamiliar individuals both in terms of the level of guilt they would feel if they defaulted and with respect to the accuracy with which they can form beliefs about each other. Again, this assumption is made for tractability reasons and we will investigate the possibility that guilt varies continuously with social distance in the empirical analysis below.

[8]In Zimbabwe, subjects playing a version of the game in which people could form groups of at most two likened (in post play discussions) the game to a dance or being required to walk in pairs when at school, whereas they likened the current game to the forming of funeral societies and various forms of cooperative.

4. Empirical Strategy

4.1. **Empirical specifications.**

To test these predictions, we combine the data from the experiment with the network data on friendship and kinship and survey data on the individuals' characteristics. To test the three predictions discussed above, we apply the dyadic analysis techniques developed in Fafchamps and Gubert (2007) and Arcand and Fafchamps (2008).

In dyadic analyses each possible pair or dyad of individuals in a dataset is treated as an observation. Thus, in the current context, a dyadic approach allows us to investigate who chooses to group with whom during the second round of the experiment and how those choices are affected by both any pre-existing relationships between dyad members and their individual preferences and characteristics.

Let $m_{ij} = 1$ if individual i forms a risk pooling group with individual j, and 0 otherwise. The network matrix $M \equiv [m_{ij}]$ is symmetrical since $m_{ij} = m_{ji}$ by construction and, as noted by Fafchamps and Gubert (2007), this implies that the explanatory variables must enter the regression model in symmetric form. So, to test our first two predictions we start by estimating the following model:

$$m_{ij} = \beta_0 + \beta_1 f_{ij} + \beta_2 |l_i^1 - l_j^1| + \beta_3 (f_{ij} * |l_i^1 - l_j^1|) + s_{ij} + u_{ij} \tag{6}$$

where f_{ij} indicates that i and j are close family or friends, l_i^1 denotes the gamble chosen by individual i in the first round — our proxy for their risk preferences, s_{ij} is a vector of session (and municipality) fixed effects, u_{ij} is the error term and β_1 to β_3 are the coefficients to be estimated.

Regression model (6) can be used to test predictions 1 and 2. In particular, a significantly positive coefficient β_1 can be taken as evidence that close family and friends are more likely to group together. The regressor $|l_i^1 - l_j^1|$ is the difference in gamble choices in Round 1, our proxy for differences in risk attitudes. A significantly negative coefficient β_2 can be taken as evidence of assortative grouping based on risk attitudes among unfamiliar dyads. A significantly negative coefficient β_3 can be taken as evidence that close family and friends assort more strongly with respect to risk attitudes than those who are unfamiliar to one another. And the significance of the sum of β_2 and β_3 tells us whether this assorting is an important determinant of grouping decisions among close family and friends.

Of course, differences in risk attitudes and social proximity are unlikely to be the only determinants of group formation. Other individual and dyadic characteristics and environmental factors may also affect the group formation process and, only when these are controlled for in the model, can we be sure that the observed results are not due to omitted variable bias. Therefore, to test the robustness of any results obtained by estimating the model above, we expand it to include a number of additional controls and more information regarding the nature of the relationships of friendship and kinship:

$$\begin{aligned} m_{ij} &= \beta_0 + \beta_{11} f_{1ij} + \beta_{21} f_{2ij} + ... + \beta_{h1} f_{hij} + \beta_2 |l_i^1 - l_j^1| + \beta_3 (f_{ij} * |l_i^1 - l_j^1|) \\ &+ \beta_4 |z_i - z_j| + \beta_5 (z_i + z_j) + \beta_6 (l_i^1 + l_j^1) + s_{ij} + u_{ij} \end{aligned} \tag{7}$$

where z_i is a vector of other potentially relevant characteristics of individual i and f_{1ij} to f_{hij} are refinements of the family and friends variable indicating whether a friendship or a kinship was recognized and whether the tie was reciprocally identified. β_4 to β_6 are additional coefficients to be estimated.

Among the refinements to the family and friends indicator variable, we expect those identifying reciprocally recognized ties to bear larger, positive coefficients. Further, and more importantly, if similarities in risk preferences are associated with genetic or social closeness, the inclusion of these controls could reduce or eliminate the significance of the interaction term. Put another way, apparent assorting on risk attitudes among close family and friends could be due to similarities in risk preferences being associated with the degree of closeness and it is only by controlling for that closeness that we can isolate the pure assorting effect.

While our model does not have any predictions relating to β_4, it is worth noting that significantly negative elements in this vector can be taken as evidence of assorting on individual characteristics other than risk attitudes, i.e. the tendency for more similar individuals to group (Jackson (2008), Currarini, Jackson and Pin (2008)). Significant elements in β_5 identify individual characteristics that are associated with an increased likelihood of group formation and the formation of larger groups. To see why, suppose that individuals with a large value of z form larger groups. This implies that $E[m_{ij}]$ is an increasing function of $z_i + z_j$ – and hence that β_5 is positive. And, by the same logic, a significantly negative β_6 can be taken as evidence that less risk averse individuals are less likely to enter into risk sharing groups.

The dyadic models are estimated using a logit. When estimating the models it is essential to correct the standard errors for non-independence across observations. Non-independence arises in part because residuals from dyadic observations involving the same individual i are correlated, negatively or positively, with each other. Standard errors can be corrected for this type of non-independence by clustering either by dyad as proposed by Fafchamps and Gubert (2007), or by municipality (and, hence, experimental session). The second approach corrects for possible non-independence not only within dyadic pairs sharing a common element but also across all the dyads participating in the same experimental session. Because we have data from 70 municipal sessions we are able to apply the second, more conservative approach. In addition, we include municipality fixed effects to control for all municipality-level unobservables, including possible variations in the level of background or generalized trust.

The estimation of models (6) and (7) allows us to test predictions 1 and 2. To test the third prediction, namely that the probability of two individuals that are unfamiliar belonging to the same group depends negatively on the number of family and friends each member of the dyad has available, we restrict the sample to the dyads of unfamiliar individuals and introduce the number of family and friends available to the dyad as the additional variable of interest in the estimation.

4.2. **Identifying close family and friends.**

Before we can estimate models (6) and (7), we need to decide how to identify dyads that are made up of close family or friends. Recall that in the theory this label was applied to pairs who had considerable information about each other and could trust each other. What type and degree of closeness is required for this to be true is an empirical question. Our data can support three alternative definitions of close family and friends. First, we can treat as close family and friends all dyads in which one or both members indicated a tie of friendship or kinship, the assumption being that all ties of friendship and kinship are close enough. Second, we can treat as close family and friends dyads in which both members indicated a tie of friendship or kinship, the idea being that the reciprocated recognition of the tie is an indication of closeness. And third, we can treat as close family and friends all dyads in which one or both members indicated a tie of friendship or kinship and the dyad members' dwellings are geographically proximate, the idea being that only geographically proximate family and friends will have sufficient information about one another to know each others levels of trustworthiness. Below, we explore each of these three alternative definitions.

5. Results

5.1. **Experimental data.**

The data generated by the experiment is presented in Table 3. In this table, the first and second columns contain the proportions, means, and corresponding standard errors for all $2,512$ participants and the third and fourth columns present the same statistics but for the sample upon which the dyadic regression analysis was ultimately performed.

The modal gamble choice, Gamble 4, was chosen by 29 percent of the participants in both rounds of the experiment. However, there is evidence of a shift towards more risk-taking in the second round: 35 percent chose either Gamble 5 or 6 in the second round as compared to 26 percent in the first round. Eighty-six percent of the experimental participants chose to join a risk-sharing group and on average chose four co-group members. The mode of two co-group members was selected by 19 percent of the sample, with one co-group member, i.e., groups of two, being almost as prevalent (18 percent).

Eight percent of the participants subsequently defected, six percent after finding out that they had won their gambles and two percent after finding out that they had lost their gambles. Note that since individuals do not know their co-group members' gamble realizations before deciding whether to stay in or defect, it can be rational for some people to leave having lost their own gamble. Indeed, an individual who is very risk averse at low levels of consumption – for instance because of subsistence constraints – but not at higher levels of consumption may be happy to form a group with a trustworthy, risk loving person and leave the group when loosing. If he were to stay in the group upon losing his gamble, he would run the risk to have to share his already small gain with his partner. We illustrate this by an example in Appendix A.

5.2. **Dyadic characteristics.**

We report the proportions, means and standard deviations for the dyadic variables in Table 4. Here, we focus on the sample of 87,038 within session dyads upon which the dyadic analysis is ultimately performed.[9]

Thus, we see that nine percent of all the possible within-municipality dyads grouped together. This proportion is low despite the large proportion of individuals joining groups because average group size was small. So, the dependent variable m_{ij} in (6) and (7) equals one in nine percent of cases and zero in 91 percent of cases.

The average difference in gamble choices was two. This difference corresponds to, for example, one member of the dyad choosing the modal Gamble 4 and the other choosing either Gamble 2 or Gamble 6. In nine percent of dyads the difference in gamble choices was four or five, indicating that either one of the dyad members chose Gamble 1 and the other Gamble 5 or 6 or one chose Gamble 6 and the other Gamble 1 or 2.

In ten percent of the dyads one or both of the members recognized that they shared a tie of kinship or friendship. However, kinship between dyads is extremely rare, with a kinship tie being recognized by both individuals in less than half a percent of dyads and being recognized by one individual in an additional three quarters of a percent of dyads.

[9]The experiment involved between 11 and 90 individuals per municipality or session. Thus, there are between 110 and $8,010$ dyads per municipality. Inter-municipality dyads could not group together because they were not present in the same session. So, they are not included in the sample.

Friendships are less rare, being mutually recognized in over two percent of dyads and by one individual in a further seven percent of dyads. It is worth noting that, while these proportions are very small, because of the size of our dyadic sample, they relate to large numbers of observations: kinships were mutually recognized by 396 dyads and by one member of a further 626 dyads; and friendships were mutually recognized by 2,132 dyads and by one member of a further 6,170 dyads.[10]

We do not have data on the precise location of the dwelling of each of the experimental subjects. However, we do know whether they live in the small town or village in which the municipal government is located or in the surrounding rural hinterland. Further, because the sample was clustered and the clustering was captured in the data, we know which of those living in the rural hinterland are geographically proximate to one another and which not. In the following analysis we treat dyads in which both live in the municipal centre and dyads in which both live in the same rural cluster as geographically proximate. Applying this definition to the family and friends dyads (reciprocated and unreciprocated ties) we find that about half are geographically proximate. So, five percent of the full sample of dyads are geographically proximate family and friends. Table 4 also presents the average differences in and sums of individual characteristics for the dyads.[11]

5.3. **Graphical analysis.**

Before moving to the regression analysis, it is useful to investigate predictions 1 and 2 graphically. Figure 2 shows how the proportion of dyads choosing to group together varies with the difference in their first round gamble choices. Three graphs are presented, each associated with a different possible division of the full sample into two sub-samples, the first relating to one of the definitions of close family and friends described above and the second relating to all the other dyads in the full sample.

In the top graph, close family and friends are defined as all those dyads in which one or both members recognized a tie of friendship or kinship. In the middle graph, close

[10]In social network data it is not unusual for only one member of a dyad to recognize a tie.

[11]We do not report the difference in household headship and the number of household heads and neither do we use these variables in the dyadic regressions as headship and gender are highly correlated in our sample (Chi-squared statistic = 401).

family and friends are defined as all those dyads in which a tie of friendship or kinship was reciprocally recognized. In the bottom graph, close family and friends are defined as geographically proximate dyads in which one or both members recognized a tie of friendship or kinship.

The top graph suggests that dyads within which one or both recognized a tie of kinship or friendship are more likely to group than dyads within which no tie of kinship or friendship exists. It also suggests that there may be assorting on risk attitudes among family and friends.

The middle graph suggests that dyads within which either both recognized a tie of kinship or friendship or one recognized a tie of friendship and the other kinship are even more likely to end up in the same risk sharing group. In addition, assorting on risk attitudes among these close, i.e. reciprocated tie, family and friends is more apparent.

Finally, the bottom graph suggests that geographically proximate dyads in which one or both recognized a tie of kinship or friendship fall somewhere between the preceding two in terms of the likelihood of them ending up in the same risk sharing group, but appear as, if not more, likely to group assortatively on risk attitudes than those sharing a reciprocated tie as defined in the preceding paragraph.

5.4. **Dyadic Logit analysis.** The significance and robustness of the patterns identified in the graphical analysis can be investigated more formally by estimating the dyadic models described in Section 4. Table 5 presents the results we obtain when estimating equation (6). Each column of the Table corresponds to a different definition of f_{ij}, the variable that identifies 'close family and friends'. In column 1, f_{ij} takes the value 1 if one or both members of the dyad recognized a tie, friendship or kinship. In column 2, f_{ij} takes the value 1 if both members of the dyad recognized a tie, friendship or kinship. And in column 3, f_{ij} takes the value 1 if the members of the dyad are geographically proximate and one or both members of the dyad recognized a tie, friendship or kinship. Municipality fixed-effects are included in all specifications and reported standard errors have been adjusted by clustering at the municipality level. In the tables, rather than the coefficients of the logit model we report marginal effects. Therefore each number describes by how much the probability that a dyad is part of a group changes when changing the relevant variable by one unit.

We see that all three definitions of f_{ij} are associated with a significantly higher likelihood of grouping together.[12] In particular, a dyad ij is 20% more likely to be part of the same risk sharing group if at least one of them identifies the other as 'family or friend'. When we restrict the definition of family and friend to dyads where both individuals recognize each other as such, the estimates in column 2 imply that the probability of ij being in the same group goes up by 40%. In column 3, where f_{ij} is one if ij live in the same neighborhood and at least one of them identifies the other as family or friend, the probability of group membership goes up by 30%.

Furthermore, the significant negative coefficient on the interaction terms in each of the specifications indicates that among close family and friends, irrespective of how the sub-sample is defined, group formation is assortative with respect to risk attitudes. However, among the relatively unfamiliar, assorting on risk attitudes is not observed.[13] Finally, F-tests indicate that the sum of the coefficient on the difference in gamble choice and the interaction term is significantly negative, although as we might expect looking at the coefficients, the levels of significance vary markedly, five percent in the first two columns and 0.1 percent in the third.

These findings suggest that close friendship and kinship is associated with a higher likelihood of grouping and more assorting on risk attitudes and that this finding is robust across three different definitions of close family and friends. However, we need to test

[12]In the theoretical model, this prediction derived from the assumptions that friends and kin knew each other's type and would never default on each other. These assumptions are supported by the data. In groups of two geographically proximate friends and family never default, while in 11% of unfamiliar groups of two one defaults and in 1 percent both default. In larger groups defaults are lower the higher the density of the friends and family network, although the effect declines with group size. See Appendix Table A2.

[13]We find limited evidence of assortative grouping with respect to risk attitudes among relatively unfamiliar dyads. Replacing 'Difference in gamble choice (round 1)' with a variable that equals 1 if that difference is greater than 3 and zero otherwise returns a significant negative coefficient. However, the significance of the coefficient on the interaction term in the model in column 1 is lost. See Appendix Table A3.

whether these findings are robust to the inclusion of other controls and the disaggregated family and friends indicators in accordance with specification (7).[14]

The additional controls render the coefficients on the interaction terms in Columns 1 and 2 of Table 5 insignificant, while those in Column 3 are pretty much unchanged. For brevity, in Table 6 we present the estimates for model (8) applying only the geographically proximate family and friends definition of f_{ij}. [15]

The first column in Table 6 presents the estimates relating to model (7). 'Geographically proximate friends and family' continues to bear a significant, positive coefficient, which implies an increase in the probability of participating in the same group of 5%, which is much lower than what we observed in the specification without control. However, the interaction between this variable and the 'Difference in gamble choice' variable continues to bear a significant, negative coefficient. In addition, reciprocated friendship ties bear a large positive coefficient. The coefficients on reciprocated kinship ties and ties viewed as friendships by one party and kinships by the other are also positive and large. Unreciprocated ties bear smaller but nevertheless highly significant positive coefficients.[16]

In column 2 we present an estimated model for the sub-sample of dyads that are geographically proximate family and friends. In this model the coefficient on the 'Difference in gamble choice' variable is negative and highly significant and we see that, among geographically proximate family and friends, reciprocated friendship ties and reciprocated

[14]The disaggregated family and friends indicators control for the possibility that dyads sharing ties of close friendship or kinship may be more alike with respect to risk attitudes. Another way of exploring this possibility is to regress the dyadic difference in first round gamble choice on each of our indicators of close family and friends and on the disaggregated friends and family indicators. Doing this we find that none of our definitions of close family and friends are associated with significantly more similar risk attitudes, although mutually recognised friendships are. None of the results reported here are significantly altered by taking dyads with mutually recognised friendships out of the analysis.

[15]The proportions, means, and standard deviations for all the sub-samples defined and explored during the analysis are presented in Appendix Table A1. The model estimations relating to f_{ij} defined as all friends and family can be found in Appendix Table A4. And the model estimations relating to f_{ij} defined as dyads in which both members recognized a friendship or kinship can be found in Appendix Table A5.

[16]To check whether these findings are driven purely by who chooses to group with anyone rather than who chooses to group with whom, we reran all of the estimates in Table 6 on the sub-sample of dyads in which both members chose to group with at least one other person, though not necessarily the other member of that dyad. The results, presented in Appendix Table A5, are almost indistinguishable indicating that the findings reported in Table 6 are not driven by the decision to group irrespective of with whom.

ties that are recognized as a friendship by one and kinship by the other are particularly strongly associated with grouping.

In column 3 we present an estimated model for the sub-sample of geographically distant family and friends and unrelated dyads. Here, the coefficient on the 'Difference in gamble choice' variable is insignificant, while we see that, ties of friendship and kinship remain important even when they are not also backed up by geographic proximity.

Before moving away from Table 6, a number of other significant findings are worthy of note. Grouping is assortative on gender and household consumption among geographically distant family and friends and unrelated dyads, but not among geographically proximate family and friends. Also among geographically distant family and friends and unrelated dyads, municipal centre dwellers and rural hinterland dwellers tend not to group with each other, while the latter tend to engage in more grouping than the former, and those who received high winnings in the first round were less likely to group. Finally, in both sub-samples those who received high and low winnings in the first round were less likely to group together.

Finally, as a first look at our third theoretical prediction, unfamiliar dyads are less likely to group together the more close family and friends they have available to group with, we re-estimate the model for the sub-sample of geographically distant family and friends and unrelated dyads, while introducing three additional variables: the number of close (geographically proximate) friends and family options that the members of the dyad had when choosing whether and how to group; the interaction between this and the 'Difference in gamble choice' variable; and, as a control, the difference in the number of close friends and family options that the members of the dyad had. Table 7 shows that the 'Number of geographically proximate family and friends options' bears a significant negative coefficient as predicted.[17] However, while the coefficient on the interaction between this variable and the difference in gamble choice' variable is negative, it is insignificant.

[17]This variables also bears a significant negative coefficient when included in the estimation on the sub-sample of dyads who are geographically proximate family and friends. However, it is less significant. This is consistent with more options implying a reduced likelihood of grouping with any particular one.

6. Conclusion

Our objective in this paper was to investigate the effects of risk attitudes and social networks on group formation in a risk pooling experiment.

A simple theoretical model in which individuals are heterogenous in terms of their risk attitudes and guilt levels and can form pairs to pool risk, led to the following predictions about who would choose to group with whom within the experiment: close friends and family are more likely to group together; among close family and friends, individuals with similar risk attitudes are more likely to group together; and the more friends and family member one has the less likely one is to group with an unfamiliar person.

A dyadic analysis based on experimental data on risk attitudes and risk pooling group formation, social network data, and data from a survey provides evidence supporting these predictions. Among close family and friends grouping is relatively commonplace and strongly assortative with respect to risk attitudes. Among unfamiliar individuals grouping is much less common and is, at most, weakly assortative with respect to risk attitudes. Individuals are less likely to group with someone who is unfamiliar the more close family and friends are available. Finally, the analysis indicated that geographical proximity is the dimension of closeness that matters in this context. This is consistent with the notion that geographical proximity leads to more interaction and that in turn leads to greater knowledge about the trustworthiness of others.

Thus, we conclude that when risk pooling agreements are enforced only by intrinsic motivations, bonds of friendship and kinship are important. They facilitate information flows and promote trustworthy behaviour and thereby support group formation and allow individuals to construct groups in which incentives are aligned and the problem of moral hazard is minimized. When no such bonds exist, individuals have to rely on their beliefs about how trustworthy people are in general and endeavour to interpret the signals people send in combination with the context in which they find themselves. The consequence is less group formation, less assorting and, consequentially lower utility.

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Figure 1: Decision card for the gamble choice game

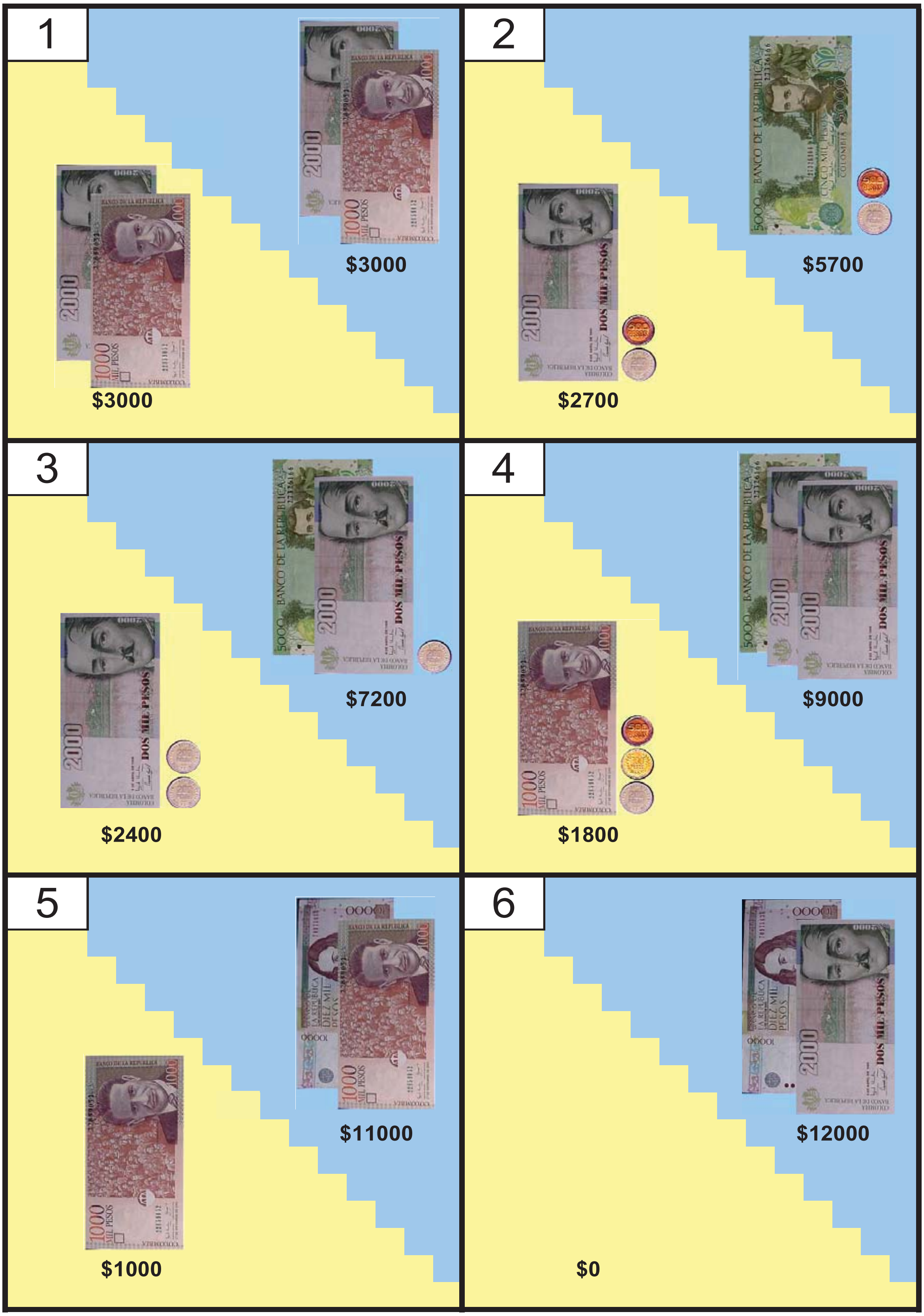
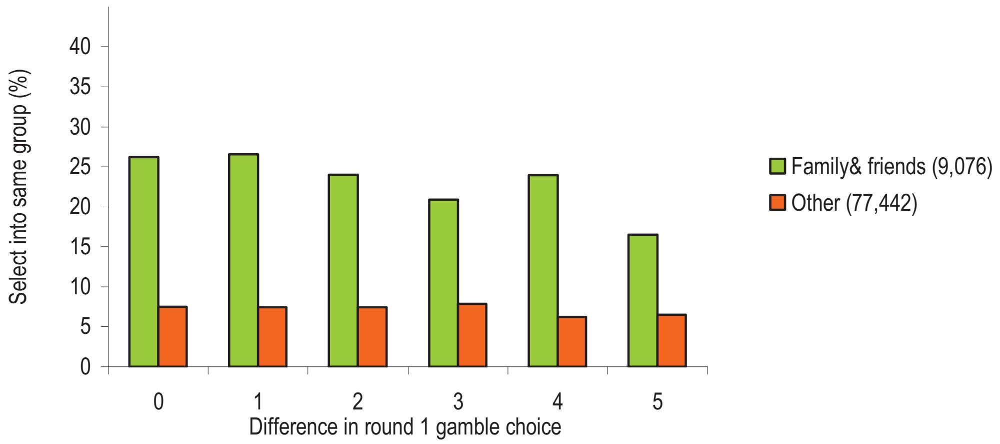
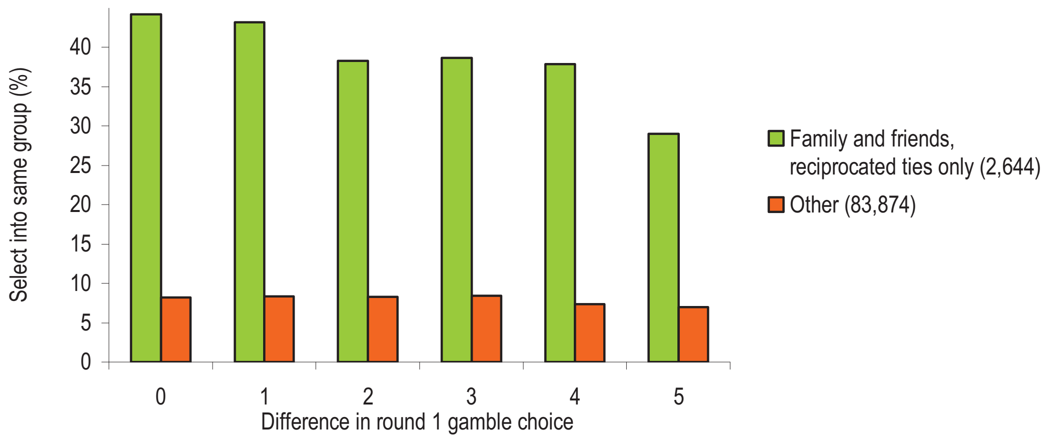


Figure 2: Assortative match with respect to risk attitudes by different types of dyad





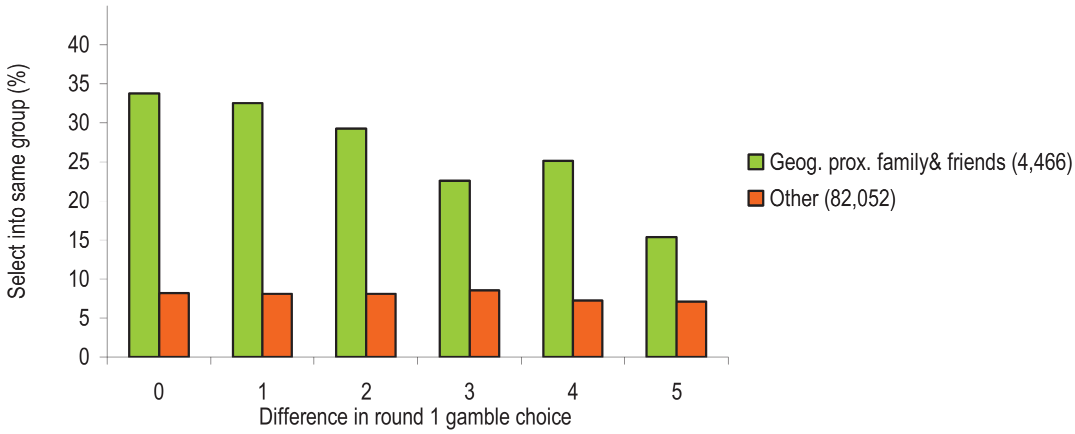


Table 1: Experimental subjects

	Full Sample			Sample used in dyadic analysis		
	Obs.	Mean/Prop	s.d.	Obs	Mean/Prop	s.d.
Female	2420	87.52%		2321	87.20%	
Age (years)	2396	41.78	11.39	2321	41.72	11.37
Education (years)	2397	3.70	3.12	2321	3.70	3.13
Household head	2423	28.64%		2321	28.78%	
Married	2420	77.11%		2321	77.73%	
Lives in municipal centre	2478	33.86%		2321	34.38%	
Household consumption ('000 Pesos/month)	2478	433.64	254.90	2321	427.29	249.91
Log household consumption per month	2478	12.82	0.58	2321	12.81	0.58
Household size	2452	7.34	3.19	2321	7.27	3.13
No. of kin recognized in session	2506	0.316	0.662	2321	0.322	0.671
No. of friends recognized in session	2506	2.391	2.572	2321	2.421	2.575

Table 2: Gamble choices

Gamble Choice	Low payoff on yellow background	High payoff on blue background	Expected value	Standard Deviation	Risk aversion class	CRRA range
Gamble 1	3,000	3,000	3,000	0	Extreme	infinity to 7.49
Gamble 2	2,700	5,700	4,200	2,121	Severe	7.49 to 1.73
Gamble 3	2,400	7,200	4,800	3,394	Intermediate	1.73 to 0.81
Gamble 4	1,800	9,000	5,400	5,091	Moderate	0.81 to 0.46
Gamble 5	1,000	11,000	6,000	7,071	Slight-neutral	0.46 to 0.00
Gamble 6	0	12,000	6,000	8,485	Neutral-negative	0 to -ve infinity

Table 3: Experimental data

	Full Sample		Sample used in dyadic analysis	
	Mean/Prop	s.d.	Mean/Prop	s.d.
Gamble choice in round 1				
Gamble 1 (safe option)	8.74%		8.75%	
Gamble 2	17.76%		17.66%	
Gamble 3	18.20%		18.31%	
Gamble 4	29.29%		29.17%	
Gamble 5	11.25%		11.12%	
Gamble 6 (riskiest)	14.76%		14.99%	
Won gamble in 1st round	54.71%		54.55%	
Winnings in 1st round ('000 Pesos)	5.842	3.832	5.835	3.838
Joined a group	86.23%		86.90%	
Number of co-group members	4.128	5.760	3.618	3.863
Gamble choice in round 2				
Gamble 1 (safe option)	6.03%		5.99%	
Gamble 2	12.85%		12.76%	
Gamble 3	17.68%		17.76%	
Gamble 4	28.94%		28.75%	
Gamble 5	17.21%		17.33%	
Gamble 6 (riskiest)	17.29%		17.41%	
Won gamble in 2nd round	57.72%		57.72%	
Reneged…	8.02%		8.19%	
having won gamble	6.26%		6.42%	
having lost gamble	1.76%		1.77%	
Winnings in 2nd round ('000 Pesos)	6.134	4.046	6.133	4.052
Observations	2506		2321	

Table 4: Dyadic variables

	All dyads	
Dyadic variable	Mean/Prop	s.d.
Joined same group in round 2	9.21%	
Difference in gamble choice (round 1)	1.639	1.265
Sum of gamble choices (round 1)	7.179	2.123
Friends and family: One or both recognized friendship or kinship	10.49%	
Both recognized friendship	2.43%	
Both recognized kinship	0.45%	
One recognized friendship, other kinship	0.18%	
One recognized friendship	6.90%	
One recognized kinship	0.53%	
Strangers	89.51%	
Geographically proximate friends and family	5.16%	
One lives in the municipal centre, one not	30.95%	
Different genders	20.54%	
Difference in age (years)	12.404	9.682
Difference in education (years)	3.235	2.770
Difference in marital status	34.68%	
Difference in household consumption ('000s Pesos/month)	232.840	227.244
Difference in log household consumption per month	0.589	0.489
Difference in household size	3.111	2.907
Difference in round 1 winnings ('000 Pesos)	4.182	3.213
Number who live in the municipal centre	0.715	0.780
Number of females	1.750	0.482
Sum of ages (years)	83.673	16.012
Sum of education (years)	7.352	4.512
Number married	1.550	0.592
Sum of household consumption ('000s Pesos/month)	850.188	359.942
Sum of log household consumption per month	25.621	0.845
Sum of household sizes	14.568	4.529
Sum of round 1 winnings ('000s Pesos)	11.708	5.484
Observations	86518	

Table 5: Dyadic analysis of assortative matching on risk attitudes

	All dyads		
	1	2	3
Difference in gamble choice (round 1)	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Friends and family	0.204 ***		
	(0.031)		
Diff. in gamble choice x Friends and family	-0.005 *		
	(0.003)		
Friends and family, reciprocated ties only		0.412 ***	
		(0.050)	
Diff. in gamble choice x Friends and family, reciprocated ties		-0.008 *	
		(0.004)	
Geograpically proximate friends and family			0.295 ***
			(0.049)
Diff. in gamble choice x Geog. proximate friends and family			-0.012 ***
			(0.004)
Municipality dummy variables included	yes	yes	yes
Number of observations	86518	86518	86518
Pseudo R-suqared	0.143	0.140	0.131

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level.

Table 6: Dyadic analysis focusing on geographically proximate family and friends as the high trust dyads

	All dyads	Geographically proximate friends and family	Other dyads
	1	2	3
Difference in gamble choice (round 1)	$4.45e^{-4}$	-0.021 ***	$-4.63e^{-5}$
	(0.001)	(0.008)	(0.001)
Geograpically proximate friends and family	0.048 ***		
	(0.019)		
Diff. in gamble choice 1 x Geog. prox. friends and family	-0.011 ***		
	(0.003)		
Both recognised friendship	0.362 ***	0.298 ***	0.358 ***
	(0.034)	(0.065)	(0.042)
Both recognised kinship	0.259 ***	0.302 ***	0.180 ***
	(0.047)	(0.095)	(0.055)
One recognised friendship, other kinship	0.254 ***	0.211 *	0.257 ***
	(0.066)	(0.112)	(0.095)
One recognised friendship	0.087 ***	0.019	0.084 ***
	(0.015)	(0.059)	(0.015)
One recognised kinship	0.090 ***		0.051
	(0.034)		(0.038)
One lives in municipal centre, other not	-0.013 ***		-0.011 ***
	(0.004)		(0.003)
Different genders	-0.012 **	-0.065	-0.011 ***
	(0.005)	(0.056)	(0.004)
Difference in age	$-9.43e^{-5}$	0.001	$-1.08e^{-4}$
	$(1.30e^{-4})$	(0.002)	$(1.20e^{-4})$
Difference in years of schooling	$-2.67e^{-4}$	-0.003	$-2.80e^{-4}$
	(0.001)	(0.006)	(0.001)
Difference in marital status	0.002	0.036	0.001
	(0.003)	(0.029)	(0.003)
Difference in log household consumption	-0.007 **	-0.030	-0.005 *
	(0.003)	(0.030)	(0.003)
Difference in household size	0.001	-0.004	0.001
	(0.001)	(0.006)	$(4.90e^{-4})$
Diff. in round 1 winnings	-0.001 ***	-0.015 ***	-0.001 **
	$(4.20e^{-4})$	(0.006)	$(3.70e^{-4})$
Sum of gamble choices (round 1)	0.001	0.002	0.001
	(0.001)	(0.006)	(0.001)
Number who live in municipal centre	-0.004	-0.005	-0.006 **
	(0.003)	(0.018)	(0.003)
Number of females	-0.005	-0.034	-0.005
	(0.005)	(0.044)	(0.004)
Sum of ages	$8.09e^{-5}$	-0.002 **	$1.51e^{-4}$
	$(1.20e^{-4})$	(0.001)	$(1.20e^{-4})$
Sum of years of schooling	$2.87e^{-4}$	$-2.24e^{-4}$	$2.98e^{-4}$
	$(4.80e^{-4})$	(0.003)	$(4.70e^{-4})$
Number who are married	0.004	0.081 **	0.002
	(0.003)	(0.033)	(0.003)
Sum log household consumption	-0.001	-0.001	-0.001
	(0.002)	(0.019)	(0.002)
Sum of household sizes	$-1.51e^{-4}$	0.002	$3.24e^{-4}$
	$(3.10e^{-4})$	(0.004)	$(2.80e^{-4})$
Sum of round 1 winnings	-0.001 **	-0.001	-0.001 **
	$(4.60e^{-4})$	(0.003)	$(4.60e^{-4})$
Municipality dummy variables included	yes	yes	yes
Number of observations	86518	4440 #	82052
Pseudo R-suqared	0.160	0.183	0.139

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level; # - 4 additional municipalities were dropped from this regression because, in one, all of the dyads joined the same group and, in three, none of the dyads joined the same group.

Table 7: Dyadic analysis of geographically distant family and friends and unrelated dyads and including friends and family options

	Geographically distant friends and family and unrelated dyads 1
Difference in gamble choice (round 1)	-0.001
	(0.001)
Number of geog. prox friends and family options	-0.003 *
	(0.002)
Diff. in gamble choice x No. geog. prox. friends and family options	$2.21e^{-4}$
	$(3.10e^{-4})$
Difference in friends and family options	$-3.78e^{-4}$
	(0.002)
Both recognised friendship	0.359 ***
	(0.042)
Both recognised kinship	0.181 ***
	(0.056)
One recognised friendship, other kinship	0.260 ***
	(0.095)
One recognised friendship	0.086 ***
	(0.015)
One recognised kinship	0.051 *
	(0.037)
Other control variables included#	yes
Municipality dummy variables included	yes
Number of observations	82052
Pseudo R-suqared	0.140

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level. # - Controls included: One lives in municipal centre, one not, Different genders, Difference in age, Difference in years of schooling, Difference in marital status, Difference in log household consumption, Difference in household size, Difference in round 1 winnings, Sum of gamble choices, Number who live in municipal centre, Number of females, Sum of ages, Sum of years of schooling, Number who are married, Sum log household consumption, Sum of household sizes, Sum of round 1 winnings.

APPENDIX: MATERIAL NOT FOR PUBLICATION

A. Deviations upon loosing one's gamble.

This Appendix shows that since individuals do not know the other's realization before deciding whether to stay or not, it may be rational for them to leave their group after having lost their lottery. An individual who is very risk averse at low levels of consumptions – for instance because of subsistence constraints – but not at higher levels of consumption may be happy to form a group with a trustworthy risk loving person and leave the group when loosing. By taking a fairly safe lottery and leaving in the event of loosing, she can be sure that her consumption does not fall below a certain level but being matched with a risk taker she get access to the higher expected payoff from more risky lotteries. We illustrate this point with the following example.

Consider individual 1 who has the following utility function. She has linear utility for consumption levels greater or equal to 27 but infinitely negative utility at consumption levels below 27. She could be in a match with 2 who has a very high guilt so that he would never defect.

$$u(c) = \begin{cases} c & if \quad c \geq 27 \\ -\infty & \quad\quad c < 27 \end{cases} \tag{8}$$

In this case, in autarchy 1 would choose lottery 2 (which earns 27 or 57 with probability 1/2) and get utility $u^a = [27 + 57]/2 = 42$.

Assume that 1 is in a group with 2 who chooses lottery 5 (which earns 10 or 110 with probability 1/2). In this case, 1 would choose to leave her group upon loosing her gamble because she would have a consumption of at most 20 (if she chooses lottery 1 that earns 30 for sure) when they both loose their lottery. However, if she stays with 2 when she wins her lottery and leaves when she looses it, she would choose lottery 2 and get utility

$$\frac{1}{2}u(27) + \frac{1}{4}u\left(\frac{57+10}{2}\right) + \frac{1}{4}u\left(\frac{57+110}{2}\right) = \frac{1}{4}[54 + 33.5 + 83.5] = 42.75.$$

This is better than autarchy.

B. Proofs.

OBSERVATION **1.** *Untrustworthy individuals in a match with an unfamiliar person prefer leaving to staying upon winning their lottery.*

Proof. Assume that individual 1 is without guilt and in a group with an individual 2 who with a probability λ selects lottery $\widehat{s}_2$ and stays in the sharing group; with probability

$(1-\lambda)p$ selects lottery $\widetilde{s}_2$ and leaves upon winning; and with probability $(1-\lambda)(1-p)$ selects s_2' and leaves upon winning. If individual 1 finds it optimal to choose lottery s_1 and strictly prefers to stay in the group irrespective of the outcome of her lottery, it must be that at $(s_1, \widehat{s}_2, \widetilde{s}_2, s_2')$, 1 must prefer her strategy to leaving upon winning her lottery. Therefore, it follows that

$$\frac{-1}{2a}\left[\lambda[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})] + (1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2}) + (1-p)\exp(a\frac{s_2'}{2}) \right.$$
$$\left. + \exp(-a\frac{h(s_1)}{2})]\right] > \frac{-1}{a}\exp(-a\frac{h(s_1)}{2}). \tag{9}$$

Note that for any $z_2 \in \{\widetilde{s}_2, s_2'\}$, $u(\frac{h(s_1)}{2}) - u(\frac{-s_1}{2}) \geq u(\frac{-z_2}{2}) - u(\frac{-s_1}{2})$ or

$$(-\exp(-a\frac{h(s_1)}{2})) - (-\exp(a\frac{s_1}{2})) \geq (-\exp(a\frac{z_2}{2})) - (-\exp(a\frac{s_1}{2})).$$

Using this in conjunction with inequality (9) implies that

$$\frac{-1}{2a}\left[\lambda[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})] + (1-\lambda)[\exp(a\frac{s_1}{2}) + \exp(-a\frac{h(s_1)}{2})]\right]$$
$$> \frac{-1}{2a}\left[2\lambda\exp(-a\frac{h(s_1)}{2}) + (1-\lambda)[\exp(-a\frac{h(s_1)}{2}) + \exp(a\frac{s_1}{2})]\right],$$

so that

$$\frac{-1}{2a}\left[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})\right] > \frac{-1}{a}\exp(-a\frac{h(s_1)}{2}). \tag{10}$$

This inequality requires $\widehat{s}_2 > s_1$.

Since $u(\frac{h(s_1)}{2}) \geq u(\frac{h(s_1)-s_1}{2}) \geq \frac{1}{2}[u(h(s_1)) + u(-s_1)]$ and $h(\frac{\widehat{s}_2}{2}) \geq \frac{h(\widehat{s}_2)}{2}$, inequality (10) implies that

$$\frac{-1}{2a}\left[\exp(-ah(\frac{\widehat{s}_2}{2})) + \exp(a\frac{\widehat{s}_2}{2})\right] > \frac{-1}{2a}\left[\exp(-ah(s_1)) + \exp(as_1)\right]. \tag{11}$$

Moreover, it follows from the concavity of u and h that

$$\frac{1}{2}[u(\frac{h(\widehat{s}_2/2)}{2}) + u(\frac{\widehat{s}_2}{4})] \geq \frac{1}{2}[u(\frac{h(\widehat{s}_2)}{2}) + u(\frac{\widehat{s}_2}{2})].$$

This inequality, along with (10), means that

$$\frac{-1}{2a}[\exp(-a\frac{h(\widehat{s}_2/2)}{2}) + exp(a\frac{\widehat{s}_2}{4})] > \frac{-1}{2a}\left[\exp(-a\frac{h(s_1)}{2}) + \exp(a\frac{s_1}{2})\right]. \tag{12}$$

However, if individual 1 finds it optimal to choose lottery s_1 rather than himself choosing lottery $\frac{\widehat{s}_2}{2}$ given $(\widehat{s}_2, \widetilde{s}_2, s_2')$, it must be that

$$\frac{-1}{4a}\left[\exp(-a\frac{h(s_1)}{2}) + \exp(a\frac{s_1}{2})\right]\left[\lambda[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})] + (1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2}) + (1-p)\exp(a\frac{s_2'}{2})]\right] - \frac{1}{4a}[\exp(-ah(s_1)) + \exp(as_1)] \geq -\frac{1}{4a}\left[\exp(-ah(\frac{\widehat{s}_2}{2})) + \exp(a\frac{\widehat{s}_2}{2})\right]$$
$$-\frac{1}{4a}\left[\exp(-a\frac{h(\widehat{s}_2/2)}{2}) + \exp(a\frac{\widehat{s}_2}{4})\right]\left[\lambda[\exp(-a\frac{h(\widehat{s}_2)}{2}) + \exp(a\frac{\widehat{s}_2}{2})] + (1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2}) + (1-p)\exp(a\frac{s_2'}{2})]\right].$$

This inequality cannot hold given (11) and (12) and therefore we have a contradiction. ■

Observation **2.** *An untrustworthy person would not leave the group upon loosing and would not stay upon winning her lottery.*

Proof.

Consider an individual 1 without guilt and with risk aversion a. Assume that 1 is in a group with an individual 2 2 who with a probability λ selects lottery $\widehat{s}_2$ and stays in the sharing group; with probability $(1-\lambda)p$ selects lottery $\widetilde{s}_2$ and leaves upon winning; and with probability $(1-\lambda)(1-p)$ selects s_2' and leaves upon winning. If individual 1 finds it optimal to choose lottery s_1 and leave upon loosing her lottery but stay when winning her lottery, the following two inequalities must hold:

[*i*] At $(s_1, \widehat{s}_2, \widetilde{s}_2, s_2')$, 1 must prefer her strategy to autarchy (she could only do better in autarchy by choosing σ_1^o):

$$w_1(s_1, \widehat{s}_2, \widetilde{s}_2, s_2') \equiv \frac{-1}{4a}\{\left[\lambda[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})] + (1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2}) + (1-p)\exp(a\frac{s_2'}{2}) + \exp(-a\frac{h(s_1)}{2})]\right]\exp(-a\frac{h(s_1)}{2}) + 2\exp(as_1)\} \geq v_1^o(s_1)$$

; [*ii*] she must prefer it to staying in the group (again she could only do better when staying by re-optimizing her choice of lottery.):

$$w_1(s_1, \widehat{s}_2, \widetilde{s}_2, s_2') > v_1(s_1, \widehat{s}_2, \widetilde{s}_2, s_2').$$

The first inequality implies that

$$-\frac{1}{2}\left[\lambda[\exp(a\frac{\widehat{s}_2}{2}) + \exp(-a\frac{h(\widehat{s}_2)}{2})] + (1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2}) + (1-p)\exp(a\frac{s_2'}{2}) + \exp(-a\frac{h(s_1)}{2})]\right]$$
$$\geq -\exp(-a\frac{h(s_1)}{2})$$

while the second requires that

$$-\frac{1}{2}\left[\lambda[\exp(a\frac{\widehat{s}_2}{2})+\exp(-a\frac{h(\widehat{s}_2)}{2})]+(1-\lambda)[p\exp(a\frac{\widetilde{s}_2}{2})+(1-p)\exp(a\frac{s_2'}{2})+\exp(-a\frac{h(s_1)}{2})]\right]$$
$$<-\exp(-a\frac{s_1}{2}).$$

This is a contradiction since $-\exp(-a\frac{h(s_1)}{2})\geq-\exp(-a\frac{s_1}{2})$.

Since this is true for any $\widehat{s}_2$, $\widetilde{s}_2$, s_2', p and λ, it proves our claim. ■

Proof of Proposition 1. Consider a trustworthy individual i with risk preference a_i grouped with an unfamiliar individual j with announcement $\widehat{a}_j$. Let σ_i and $\boldsymbol{\sigma}_j$ be the equilibrium choices of lottery for i and for j's different types, so that i's utility is given by $\widehat{v}_i(\sigma_i,\boldsymbol{\sigma}_j)$.

Now, notice that i's utility can only be improved if she could choose her partner's lotteries as well as her own:

$$max_{s_i,\mathbf{s}_j}\widehat{v}_i(s_i,\mathbf{s}_j)\geq\widehat{v}_i(\sigma_i,\boldsymbol{\sigma}_j). \tag{13}$$

i would always prefer the safest lottery possible ($\sigma=0$) for her partner if he is untrustworthy. Using this in (4), we can rewrite the left-hand-side of inequality (13) as

$$\phi(\gamma)\equiv\max_{s_i,s_{-i}}(1-\gamma)w_i(s_i)+\gamma v_i(s_i,s_{-i}).$$

where $w_i(s_i)=\frac{1}{4}\left[u_i(b-\frac{\sigma}{2})+u_i(b+\frac{h(\sigma)}{2})+u_i(b-\sigma)+u_i(b+h(\sigma))\right]$, $\gamma=p_{\bar{t},\widehat{a}_j}(j,\widehat{a}_j)$ is the probability that j is trustworthy and v_i is the utility that i would have in a group with a close friend or family member as in (3). Moreover, the inequality in (13) is strict when $\gamma<1$ as an untrustworthy j would choose some amount of risk.

Notice that $\phi(\gamma)$ is increasing in γ. Indeed, i can always select $s_{-i}=s_i$ and for any s $v_i(s,s)\geq w_i(s_i)$.

Looking at $\gamma=1$,

$$\phi(1)=\max_{\sigma,\sigma'}v_i(\sigma,\sigma'),$$

it is easy to check that i would choose $\sigma=\sigma'=\widetilde{\sigma}(a_i^*)$. This is the same maximization and therefore the same choice of lotteries that a group of friends or family with the same level of risk aversion a_i would select. Since there is a unique equilibrium and $\widetilde{\sigma}(a')\neq\widetilde{\sigma}(a_i^*)$ for any $a_i'^*$, i's utility is strictly higher when paired with a close friend or family member j with the same risk aversion $a_j=a_i$. Moreover, it follows that i strictly prefers grouping with j than staying alone $\phi(1)=\nu_{ij}^*>\nu^o(a_i)$. ■

Table A1: Dyadic variables, means, proportions, and standard deviations for various sub-samples

	Friends and family dyads		Unrelated dyads		Friends and family dyads, reciprocated ties only		Unrelated dyads and dyads with unreciprocated friends and family ties		Geograpically proximate family and friends		Unrelated and geograpcially distant friends and family dyads	
Dyadic variable	Mean	s.d.	Mean	s.d	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Joined same group in round 2	24.55%		7.41%		40.85%		8.21%		29.47%		8.11%	
Difference in gamble choice (round 1)	1.670	1.271	1.636	1.264	1.582	1.247	1.641	1.265	1.682	1.266	1.637	1.265
Sum of gamble choices (round 1)	7.161	2.151	7.181	2.119	7.156	2.153	7.180	2.122	7.056	2.132	7.186	2.122
Friends and family: One or both recognized friendship or kinship	100.00%		-		100.00%		7.67%		100.00%		5.62%	
Both recognized friendship	23.14%		-		79.43%		-		29.02%		0.98%	
Both recognized kinship	4.32%		-		14.83%		-		5.46%		0.18%	
One recognized friendship, other kinship	1.67%		-		5.75%		-		2.02%		0.08%	
One recognized friendship	65.78%		-		-		7.12%		57.77%		4.13%	
One recognized kinship	5.09%		-		-		0.55%		5.73%		0.25%	
Strangers	-		100.00%		-		100.00%		-		100.00%	
Geographically proximate friends and family	49.21%		-		61.65%		3.38%		100.00%		-	
One lives in the municipal centre, one not	18.62%		32.40%		13.09%		31.51%		-		32.64%	
Different genders	17.12%		20.94%		16.11%		20.68%		16.57%		20.75%	
Difference in age (years)	11.407	9.143	12.521	9.736	11.168	8.856	12.443	9.704	11.481	9.141	12.454	9.708
Difference in education (years)	3.126	2.743	3.247	2.773	3.066	2.717	3.240	2.772	2.633	2.413	3.267	2.785
Difference in marital status	32.48%		34.94%		32.83%		34.74%		30.72%		34.90%	
Difference in household consumption ('000s Pesos/month)	235.132	230.627	232.572	226.844	227.262	211.972	233.016	227.707	226.585	213.672	233.181	227.955
Difference in log household consumption per month	0.599	0.495	0.588	0.488	0.594	0.494	0.589	0.489	0.583	0.474	0.590	0.490
Difference in household size	2.987	2.903	3.126	2.908	3.013	2.926	3.114	2.907	2.803	2.688	3.128	2.918
Difference in round 1 winnings ('000 Pesos)	4.197	3.202	4.180	3.215	4.040	3.191	4.187	3.214	4.079	3.122	4.188	3.218
Number who live in the municipal centre	0.757	0.869	0.710	0.769	0.809	0.913	0.712	0.776	1.161	0.987	0.691	0.760
Number of females	1.761	0.499	1.749	0.480	1.756	0.518	1.750	0.480	1.765	0.499	1.749	0.481
Sum of ages (years)	83.976	15.632	83.638	16.055	83.817	15.443	83.669	16.029	84.456	15.432	83.631	16.042
Sum of education (years)	7.411	4.642	7.345	4.496	7.477	4.703	7.348	4.506	6.710	4.229	7.387	4.524
Number married	1.577	0.585	1.547	0.593	1.584	0.575	1.549	0.592	1.595	0.582	1.548	0.592
Sum of household consumption ('000s Pesos/month)	853.465	392.601	849.804	355.919	844.372	376.013	850.372	359.424	850.359	391.465	850.179	358.149
Sum of log household consumption per month	25.597	0.916	25.623	0.837	25.583	0.912	25.622	0.843	25.601	0.911	25.622	0.842
Sum of household sizes	14.376	4.544	14.590	4.527	14.225	4.518	14.578	4.529	14.114	4.404	14.592	4.535
Sum of round 1 winnings ('000s Pesos)	11.746	5.499	11.704	5.483	12.069	5.485	11.697	5.484	11.524	5.504	11.718	5.483
Observations	9076		77442		2644		83874		4466		82052	

Table A2: Group-level analysis of defections: Dependent variable = proportion of members that default

	Groups of 2 or 3	All groups	
[1] Density of close friends and family network within group	-0.062 *	-0.032	-0.156 ***
	(0.035)	(0.031)	(0.052)
[2] Number of group members	0.027	0.001	-0.004
	(0.032)	(0.004)	(0.004)
[1] x [2]			0.040 **
			(0.016)
Average gamble choice	0.008	0.011	0.011
	(0.015)	(0.009)	(0.009)
Proportion of females	0.116 *	0.033	0.032
	(0.068)	(0.039)	(0.039)
Average age	-0.000	-0.000	-0.000
	(0.002)	(0.001)	(0.001)
Proportion living in municipal centre	0.042	0.027	0.017
	(0.055)	(0.028)	(0.030)
Average years of education	-0.010 *	-0.010 **	-0.010 ***
	(0.006)	(0.004)	(0.004)
Proportion married	0.003	-0.005	-0.008
	(0.061)	(0.038)	(0.038)
Average log household consumption	-0.006	-0.024	-0.023
	(0.040)	(0.029)	(0.029)
Average household size	0.001	0.005	0.005
	(0.007)	(0.005)	(0.005)
Constant	-0.102	0.276	0.287
	(0.456)	(0.329)	(0.330)
Municipality dummies	no	no	yes
Observations	252	527	527

Notes: Linear regression coefficients reported. Standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level.

Table A3: Dyadic analysis of assortative matching on risk attitudes using a dichomomized gamble choice variable

	All dyads		
	1	2	3
Difference in gamble choice (round 1) > 3	-0.127 ***	-0.011 ***	-0.010 **
	(0.004)	(0.004)	(0.004)
Friends and family	0.183 ***		
	(0.023)		
Diff. in gamble choice >3 x Friends and family	-0.002		
	(0.010)		
Friends and family, reciprocated ties only		0.371 ***	
		(0.037)	
Diff. in gamble choice >3 x Friends and family, reciprocated		-0.014	
		(0.013)	
Geograpically proximate friends and family			0.237 ***
			(0.035)
Diff. in gamble choice >3 x Geog. proximate friends and fam			-0.024 **
			(0.011)
Municipality dummy variables included	yes	yes	yes
Number of observations	86518	86518	86518
Pseudo R-suqared	0.143	0.140	0.131

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level.

Table A4: Dyadic analysis focusing on all family and friends and adding control variables

	All dyads	Friends and family	Other dyads
	1	2	3
Difference in gamble choice (round 1)	$1.49e^{-4}$	-0.003	$-4.66e^{-4}$
	(0.001)	(0.005)	(0.001)
Friends and family			
Diff. in gamble choice x Friends and family	-0.004 *		
	(0.002)		
Both recognised friendship	0.438 ***	0.272 ***	
	(0.043)	(0.055)	
Both recognised kinship	0.323 ***	0.200 ***	
	(0.077)	(0.069)	
One recognised friendship, other kinship	0.334 ***	0.195 **	
	(0.056)	(0.092)	
One recognised friendship	0.122 ***	0.009	
	(0.022)	(0.042)	
One recognised kinship	0.135 ***		
	(0.045)		
One lives in municipal centre, other not	-0.016 ***	-0.055 **	-0.010 ***
	(0.004)	(0.022)	(0.003)
Different genders	-0.012 **	-0.013	-0.013 ***
	(0.005)	(0.032)	(0.004)
Difference in age	$-7.77e^{-5}$	0.001	$-1.16e^{-4}$
	($1.30e^{-4}$)	(0.001)	($1.20e^{-4}$)
Difference in years of schooling	$-3.13e^{-4}$	$4.00e^{-4}$	$-1.95e^{-4}$
	(0.001)	(0.004)	(0.001)
Difference in marital status	0.002	0.006	0.001
	(0.003)	(0.016)	(0.003)
Difference in log household consumption	-0.007 **	-0.018	-0.005
	(0.003)	(0.015)	(0.003)
Difference in household size	$4.87e^{-4}$	$-2.97e^{-4}$	0.001 *
	(0.001)	(0.003)	($4.70e^{-4}$)
Diff. in round 1 winnings	-0.001 ***	-0.010 ***	-0.001
	$4.87e^{-4}$	(0.002)	($3.70e^{-4}$)
Sum of gamble choices (round 1)	0.001	0.005	$1.60e^{-4}$
	(0.001)	(0.004)	(0.001)
Number who live in municipal centre	-0.003	0.013	-0.005 **
	(0.003)	(0.013)	(0.002)
Number of females	-0.005	0.010	-0.008 *
	(0.005)	(0.023)	(0.004)
Sum of ages	$7.55e^{-5}$	-0.001 *	$1.57e^{-4}$
	($1.20e^{-4}$)	(0.001)	($1.10e^{-4}$)
Sum of years of schooling	$2.77e^{-4}$	0.002	$1.08e^{-4}$
	($4.90e^{-4}$)	(0.002)	($4.50e^{-4}$)
Number who are married	0.004	0.030 *	0.001
	(0.003)	(0.017)	(0.003)
Sum log household consumption	-0.001	-0.001	-0.001
	(0.002)	(0.012)	(0.002)
Sum of household sizes	$-1.41e^{-4}$	-0.002	-1.85
	($3.1e^{-4}$)	(0.002)	($2.80e^{-4}$)
Sum of round 1 winnings	-0.001 **	-0.001	-0.001 **
	($4.60e^{-4}$)	(0.002)	($4.70e^{-4}$)
Municipality dummy variables included	yes	yes	yes
Number of observations	86518	9050 #	77442
Pseudo R-suqared	0.148	0.161	0.130

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level; # - 4 additional municipalities were dropped from this regression because, in one all of the dyads joined the same group and in all the others none of the dyads joined the same group.

Table A5: Dyadic analysis focusing on reciprocated ties of kinship and friendship and adding control variables

	All Dyads	Family and friends reciprocated ties only	Other dyads
	1	2	3
Difference in gamble choice (round 1)	$-2.35e^{-4}$	-0.011	-0.001
	(0.001)	(0.014)	(0.001)
Family and friends - reciprocated ties only	0.326 ***		
	(0.082)		
Diff. in gamble choice x Family and friends reciprocated ties only	-0.006 *		
	(0.004)		
Both recognised friendship	0.038 *	0.081	
	(0.027)	(0.052)	
Both recognised kinship	0.003		
	(0.018)		
One recognised friendship, other kinship		-0.017	
		(0.076)	
One recognised friendship	0.107 ***		0.098 ***
	(0.015)		(0.015)
One recognised kinship	0.118 ***		0.109 ***
	(0.041)		(0.039)
One lives in municipal centre, other not	-0.016 ***	-0.087	-0.013 ***
	(0.004)	(0.055)	(0.003)
Different genders	-0.012 **	-0.038	-0.013 ***
	(0.005)	(0.073)	(0.005)
Difference in age	$-7.73e^{-5}$	$1.15e^{-4}$	$-7.29e^{-5}$
	$(1.30e^{-4})$	(0.002)	$(1.30e^{-4})$
Difference in years of schooling	$-3.13e^{-4}$	0.002	$-3.52e^{-4}$
	(0.001)	(0.010)	(0.001)
Difference in marital status	0.002	0.028	0.002
	(0.003)	(0.053)	(0.003)
Difference in log household consumption	-0.007 **	-0.039	-0.006 **
	(0.003)	(0.037)	(0.003)
Difference in household size	$4.81e^{-4}$	0.004	0.001
	(0.001)	(0.007)	(0.001)
Diff. in round 1 winnings	-0.001 ***	-0.021 ***	-0.001 **
	$(4.20e^{-4})$	(0.005)	$(3.70e^{-4})$
Sum of gamble choices (round 1)	0.001	0.002	$4.10e^{-4}$
	(0.001)	(0.007)	(0.001)
Number who live in municipal centre	-0.003	0.032	-0.005
	(0.003)	(0.026)	(0.003)
Number of females	-0.005	0.074	-0.008 *
	(0.005)	(0.053)	(0.005)
Sum of ages	$7.40e^{-5}$	-0.002	$1.39e^{-4}$
	$(1.20e^{-4})$	(0.001)	$(1.20e^{-4})$
Sum of years of schooling	$2.81e^{-4}$	-0.005	$4.36e^{-4}$
	$(4.90e^{-4})$	(0.005)	$(4.80e^{-4})$
Number who are married	0.004	0.070	0.002
	(0.003)	(0.053)	(0.003)
Sum log household consumption	-0.001	$-3.91e^{-4}$	-0.001
	(0.002)	(0.027)	(0.002)
Sum of household sizes	$-1.43e^{-4}$	-0.006	$-1.88e^{-4}$
	$(3.10e^{-4})$	(0.006)	$(3.00e^{-4})$
Sum of round 1 winnings	-0.001 **	0.003	-0.001 ***
	$(4.60e^{-4})$	(0.004)	$(4.40e^{-4})$
Municipality dummy variables included	yes	yes	yes
Number of observations	86518	2608 #	83874
Pseudo R-suqared	0.159	0.139	0.133

Notes: Marginal effects reported. Corresponding standard errors (in parentheses) adjusted to account of non-independence within municipalities by clustering; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level; # - 7 additional municipalities were dropped from this regression because, in 5 all of the dyads joined the same group and in 2 none of the dyads joined the same group.

Table A6: Dyadic analysis focusing on geographically proximate family and friends, non-groupers excluded

	All dyads	Geographically proximate friends and family	Other dyads
	1	2	3
Difference in gamble choice (round 1)	0.001	-0.019 **	$2.75e^{-4}$
	(0.001)	(0.009)	(0.001)
Geograpically proximate friends and family	0.399 ***		
	(0.036)		
Diff. in gamble choice 1 x Geog. prox. friends and family	0.267 ***		
	(0.070)		
Both recognised friendship	0.309 ***	0.336 ***	0.382 ***
	(0.053)	(0.064)	(0.042)
Both recognised kinship	0.106 ***	0.353 ***	0.217 ***
	(0.018)	(0.092)	(0.064)
One recognised friendship, other kinship	0.099 ***	0.226 *	0.255 ***
	(0.035)	(0.121)	(0.088)
One recognised friendship	0.059 ***	0.033	0.104 ***
	(0.024)	(0.066)	(0.018)
One recognised kinship	-0.012 ***		0.071
	(0.004)		(0.047)
One lives in municipal centre, other not	-0.017 ***		-0.014 ***
	(0.005)		(0.004)
Different genders	-0.014 **	-0.078	-0.013 ***
	(0.006)	(0.066)	(0.005)
Difference in age	$-5.69e^{-5}$	0.002	$-7.88e^{-5}$
	$(1.70e^{-4})$	(0.002)	$(1.60e^{-4})$
Difference in years of schooling	$-3.03e^{-4}$	-0.004	$-3.68e^{-4}$
	(0.001)	(0.007)	(0.001)
Difference in marital status	0.005	0.059 *	0.003
	(0.004)	(0.035)	(0.004)
Difference in log household consumption	-0.009 **	-0.042	-0.008 **
	(0.004)	(0.036)	(0.004)
Difference in household size	$4.14e^{-4}$	-0.005	0.001
	(0.001)	(0.007)	(0.001)
Diff. in round 1 winnings	-0.002 ***	-0.020 ***	-0.001 **
	(0.001)	(0.007)	$(4.60e^{-4})$
Sum of gamble choices (round 1)	0.001	$-7.13e^{-5}$	0.001
	(0.001)	(0.008)	(0.001)
Number who live in municipal centre	-0.007 *	-0.013	-0.008 **
	(0.004)	(0.022)	(0.004)
Number of females	-0.012 ***	-0.051	-0.012 ***
	(0.004)	(0.049)	(0.004)
Sum of ages	$1.59e^{-4}$	-0.002 **	$2.35e^{-4}$ *
	$(1.40e^{-4})$	(0.001)	$(1.40e^{-4})$
Sum of years of schooling	$8.14e^{-5}$	-0.001	$1.48e^{-4}$
	(0.001)	(0.004)	(0.001)
Number who are married	0.004	0.112 ***	0.002
	(0.004)	(0.038)	(0.004)
Sum log household consumption	-0.002	-0.003	-0.002
	(0.002)	(0.023)	(0.002)
Sum of household sizes	$-1.71e^{-4}$	0.001	$-3.60e^{-4}$
	$(3.40e^{-4})$	(0.005)	$(3.20e^{-4})$
Sum of round 1 winnings	-0.001 *	$4.81e^{-4}$	-0.001 **
	(0.001)	(0.003)	(0.001)
Municipality dummy variables included	yes	yes	yes
Number of observations	70962	3622 #	67308
Pseudo R-suqared	0.157	0.171	0.133

Notes: Standard errors (in parentheses) adjusted to account of non-independence within municipalities; *** - sig. at 1% level; ** - sig. at 5% level; * - sig. at 10% level; # - 5 additional municipalities were dropped from this regression because in 1 all of the dyads joined the same group and in 4 none of the dyads joined the same group.