Kinship, Social Preferences and Voting in Rural China: A Lab-in-the-Field Experiment

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Abstract

Economists have come to understand that human choices are not only driven by self-interest but also “social preferences” – a person’s concern over resources allocated to other people. Moreover, such preferences may be affected by the environment in which such choices are made, especially social networks and social pressure. We performed a lab-in-the-field experiment in rural China, where we recruited 162 Chinese farmers to vote in 7 variants of allocation games in randomly assigned groups and with real-world social contacts, with and without pressure. We find that social network and social pressure combined have significant yet heterogeneous effects on social preferences. The source of heterogeneity include the assignment with in-group or out-group members, membership in dominant lineages, individual characteristics as defined by age and gender, and the degree of kinship between individuals within a social group. Our study not only provide empirical evidence for the social preference theories but also urges policy makers to be careful in choosing an appropriate voting method. In addition, constraining the power of dominant lineage and having better educated villagers more involved in village affairs could be welfare improving.
1. Introduction

Economic behaviors of human beings have been modeled on the basic assumption that individuals are rational agents driven exclusively by self-interest, maximizing their own utilities defined in monetary or material terms. However, this assumption is often contradicted by casual observations in history \(^1\) as well as in the real world \(^2\). In recent years, “social preferences” – a person’s concern over resources allocated to others – have been introduced to complement self-interest \(^3\). Parallel to the theoretical modeling are lab experiment results that refute the self-interest assumption and reveal that people exhibit social preferences when making economic decisions (Guth, Schmittberger & Schwarze, 1982; Engelmann and Strobel, 2004; Bolton and Ockenfels, 2006; Messer et al., 2010). A key aspect that is missing from the literature, however, is whether or not such social preferences are dependent on social network (whose interests are involved) and social pressure (how such preferences are elicited). In this paper, we perform a lab-in-the-field experiment where we introduce dyad-level social networks (the lineage) and randomly assignment of pressure treatment into the experimental design. We invite villagers in rural China to bring in their real-world social contacts to play an array of allocation games, with and without social pressure. We find that social preferences are affected the combined force of social network and social pressure. The effects, however, are heterogeneous and vary with lineage dominance, personal characteristics, as well as distance between individuals within a lineage.

The primary objective of our study is to address the incompetence of lab experiments in identifying network-dependent social preferences. In most of the lab experiments, “the subjects enter the laboratory as equals, they do not know anything about each other and they are allocated to different roles in the experiment at random”, while in reality, “the social context, the saliency of particular agents, and the social proximity among individuals, are all likely to influence reference groups and outcomes” (Fehr and Schmidt, 1999). This is supported by a observational studies on the impact of social network characteristics on cooperative behaviors. These studies have a wide geographical and cultural coverage and show evidence from the United States (Alesina et al., 1997), India (Banerjee, Iyer and Somanathan, 2005), the United Kingdom (Bandiera et al., 2005), Kenya (Miguel and Gugerty, 2005), and China (Miquel et al., 2012). The findings generally indicate that more fragmented social network structure reduces cross-group cooperation and leads to lower level of public goods provision. Therefore, even if a lab experiment finds that people care more about fairness than total welfare (Bolton and Ockenfels, 2006), it may not be the case in the real world because in the real world people are embedded in networks instead of floating around like free atoms.

Acknowledging its importance, more recent lab studies attempt to incorporate social network into

\(^1\)Mass demonstrations to overturn dictatorships in China and Eastern Europe
\(^2\)Blood donation, volunteer activities, etc.
\(^3\)Three major types of social preferences are theoretically modeled: altruism, where people positively value material resources allocated to relevant reference agents (Andreoni, 1989; Cox et al., 2001; modeled as efficiency in Engelmann and Strobel, 2004); inequality aversion, where people prefer an equitable distribution of material resources (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), and reciprocity, where people respond to actions that are perceived to be kind in a kind manner, and to actions that are perceived to be hostile in a hostile manner (Rabin, 1993; Charness and Rabin, 2002)
their experimental designs. Their approaches of introducing networks, however, are either temporary (on-site assignment of groups within the lab) or categorical (group affiliation instead of dyad level interpersonal relationships). One example of the temporary assignment approach is Chen and Li (2009), where participants that prefer paintings by the same artists are assigned to the same social group. This “group identity” is then reinforced through a few rounds of within-group interactions. This approach, however, fails to incorporate personal histories in the real world and is likely to be rather weak. Guala and Filippin (2005), for example, manipulates the complexity of distributive tasks to show that the induced group identity is merely a framing effect that can be easily displaced by alternative decision heuristics. On the other end of the spectrum is the categorical assignment using existing social groups, for example college fraternities in Kollock (1998) and tribes in Bernhard et al. (2006). They found that group affiliation has a significant effect on distributional preferences – people favor in group members at the expense of outgroup members. The problem with this method is that it homogenizes social ties within a group and mutes the more nuanced effects of interpersonal relationships. Namely, if A and B belong to the same fraternity, they must favor everyone else in the fraternity to the same extent and treat anyone outside the fraternity with the same degree of hatred. Therefore, to more realistically characterize the effect of network on preferences, a dyad-level approach that reflects the mutual, specific, and context-bound interactions between individuals is necessary.

Bringing a community with identifiable dyad-level personal relationships into a behavioral lab is mostly unrealistic due to long travel distance and conflicting schedules of community members. We therefore decide to carry the lab to the field and invite participants to bring in their real-world social contacts to a set of experiments without having to travel from their communities. The design of our experiment (explained in detail in Section 4) will allow us to examine the nuanced dependence of social preferences on social network. We also conduct a post-experiment survey to collect information on the specifics of the interpersonal relationship between each pair of participants, which allows us to investigate (1) how participants perceive resources allocated to in-group and out-group members; (2) if members of dominant social groups have different social preference patterns; (3) if social preferences vary with personal characteristics such as gender and age; (4) if variations in social preferences can be explained by social proximity.

Another aspect that is missing from the literature is how social pressure affects social preferences, especially when such pressure interacts with social network effects. It is true that some recent economic experiments incorporate peer pressure as a form of informal sanction and find that disapproval of other agents can increase contribution to public goods (Masclet et al, 2003), and that the allocators in third-party allocation games choose less efficient but more equal distributions when recipients are identifiable (Halali et al, 2017). These lab experiments, however, still recruited independent participants and therefore failed to test how social pressure adds on to social network. Our study, on the other hand, investigates the interaction effect of social pressure and social network by randomly assigning participants into a control group, where anonymity is ensured, and a treatment group, where participants are informed that their choices will be revealed to other participants. This assignment is performed in the social network context where participants play with their social contacts and in the random assignment context where participants play with unknown members. We also interact the social pressure with social proximity between participants to test if the pressure effect depends on degree of kinship.
The current paper is, to our knowledge, the first lab-in-the-field experiment that embeds dyad level, real-world network structure into allocation games. By observing choices made by any pair of participants in our games and obtaining information on their social interaction in real life, we are able to examine the complex interplay of social preferences and social pressure in the context of the very details of social network. Our study not only serves as an empirical test for the long debated social preference theories but also provides insights at the policy level. Our results show that in any society where social interactions are frequent and personal, the design of a welfare-enhancing policy where collective action is involved (voting, donation, private provision of public goods, etc.) requires a thorough understanding of the social preference patterns of participants and how such preferences interact with the specific network structure and social norms. Without such considerations, identifying an appropriate roadmap of collective action (in the case of voting, policy makers need to choose among secret balloting, show of hands, village meeting, etc.) that yields economically efficient outcomes would be difficult.

The rest of this paper is organized as follows. In section 2, we explain the reason why we choose to carry out our experiment in rural China, including the history and characteristics of lineage networks in China; In section 3, we introduce our experimental design and procedures. In section 4, we present our regression models and empirical results. Section 5 concludes.

2. Social Network and Social Preferences in the Chinese Context

We choose to implement this experiment in rural China for three reasons, which will be elaborated in the following subsections. First of all, lineages saliently define the basic social network structure in rural China and have long been governing the economic and social behaviors of Chinese villagers (Cohen 2005; Liu and Murphy 2006). Such salience facilitates our recruitment as well as the identification of network effects. Secondly, the rich and observable variations in the patrilineal relationships in the Chinese rural society can be exploited to test how social preferences vary with personal characteristics and with the strength of social ties. Thirdly, the interplay of social network, social pressure, and social preferences is particularly relevant to recent policy changes in village governance in China and other developing countries.

2.1 Salience of Lineage Network in Rural China

Social networks exist in numerous forms, but the network in rural China that centers on patrilineal lineage ties is especially salient and deeply entrenched. A lineage is a branch of residents that descend from the same patrilineal ancestors and share the same surname. The patrilineal lineage system has over 3000 years of history form the basis of the Chinese social network (Hu, 2007). Since farmers are attached to their lands, usually the households in a lineage cluster in a settlement for generations, and this long-term connection and repeated interactions make lineage structure within a village rather stable (Coate and Ravallion, 1993). Lineages draw so much on their networks for collective activities that every aspect of village lives revolves around lineages (Cohen 2005; Liu and Murphy 2006; Lu and Tao 2017). Such stable entrenchment of qualify Chinese villages as an ideal

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4In terms of economic affairs, lineage groups have taken on governmental functions such as property protection
setting to carry out this field experiment.

2.2 Heterogeneous Effects of Lineage Network

The advantage of exploiting the lineage network structure is rural China that its rich and identifiable variations allows us to ascertain (1) how participants perceive resources allocated to in-group and out-group members; (2) if members of dominant lineages (big surnames) have different social preference patterns; (3) if social preferences vary with personal characteristics such as gender and age; (4) if variations in social preferences can be explained by social proximity (closer relationship within a lineage).

In-group vs Out-group Allocations

Community in Sociology is often defined as a “group of insider people” or called “insiders-we” compared to “outsiders-they” (Landa 1997: 110, 130). This division of in-group and out-group has been particularly evident in China, where lineage groups tend to be inwardly focused and self-interested and that ‘great inward cohesion [is] gained at the expense of equivalent outward antagonism’ 5 (Baker, 1979: 121–2). It would therefore be interesting to examine how individuals perceive resources allocated to in-group versus out-group members, especially if in-group favors would be offered “at the price of hostility towards out-group members” (Fukuyama, 2001: 8).

Lineage Dominance

Another interesting feature of the lineage system in rural China is the existence of dominant lineages; that is, a large proportion of residents share the same surname. Relying on the vast of their lands and their prestige in village history, the dominant lineages control the economic and political resources and influence village affairs heavily. Smaller lineage groups, on the other hand, are often suppressed and bullied in the form of name-calling, the vandalism of crops and property and the withholding of irrigation water by the members of the larger kinship groups in their villages (Liu and Murphy, 2006). The display of social preferences may change as the degree of lineage dominance increases (Pan, 2011). This is because in a large lineage group, a member’s selfish choice may result in more lineage members’ retaliation. Also the cost of defection potentially rises as the size of the lineage increases, since the deviant can be denied access to a greater amount of resources withheld by the large lineage (He et al, 2017). In our experiment, we will test the how social preferences vary with...
the degree of lineage dominance.

**Personal Characteristics**

The lineage ties in rural China are highly individualistic phenomenon in the sense that each tie can only be specified with reference to a particular individual. Hence, an individual’s personal characteristics, such as gender and age, can affect his or her position within the network and consequently his or her social preferences. Female members, for example, are positioned inferiorly in this patriarchal system and do not have moral authority as male members do (He 2017). Age is another factor because in the lineage system, seniority equals authority. It is therefore expected that behaviors in our games may depend on personal characteristics of the players.

**Network Characteristics**

The sacredness of family tree, the genealogical table that records the human relationship between lineage members, is another feature of the lineage network in rural China. A physical copy of the family tree is kept in the lineage temple, and every member is aware of his position relative to everyone else in the lineage. The strength of dyadic ties in the lineage system depends on social proximity, namely, how close the two agents are in the family tree. The closer agents may therefore display stronger social preferences and may tend to do so at greater costs to the out-group member. We also test this hypothesis in our experiment.

### 2.3 Lineage Network and Rural Democracy

Another reason why we chose rural China for implementation is because the interplay of social network and social preferences has profound policy implications for the democratization movement in recent years. Since late 1990s, the political and economic aspects of village affairs became more and more democratized. Village leaders are elected instead of nominated, and public project proposals need to be voted on before implementation. The outcomes of such collective decision making, however, largely depend on how individuals perceive the tradeoffs between selfish gains and the social optimality when making choices. It has been reported that some villages can hardly ever reach an agreement and hence have never had any public projects implemented. Welfare aids seldom reach the poorest households but end up being allocated to the dominant lineage groups.

One plausible cause, as discussed in the pages before, is that heterogeneous lineage groups often have conflicting interests and tend to only care about in-group members’ welfare. Social pressure is another plausible factor. An interesting observation we have made from our field research is that villages use various voting methods in village meetings, ranging from a secret ballot to a show of hands. The lack of anonymity may alter the pattern of social preferences displayed in

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6Confucianism supports patrimonial power and emphasizes that everyone should “respect their superiors, the young should respect the old and the old should love the young” (Hu, 2007)

7One example is the introduction of the “One Project, One Review” (“Yi Shi Yi Yi”) scheme in 2007, where villagers jointly propose public projects that they wish to implement and vote on the proposal. In addition, welfare allocations are also determined in a more decentralized way in villages nowadays. Villagers gather at village meetings to vote on which households should be provided with the rice or flour allocations from the upper level governments.
voting, for example making lineage members more fixated on in-group gains, thereby exacerbating
the inefficiency of resource allocation. Therefore, we believe carrying out this experiment in the
villages in China will help offer valuable policy insights. Moreover, our experimental results can be
expanded to other developing countries in the process of democratization, whose formal institutions
are weak and informal institutions such as lineages, tribes, or castes guide people’s behavior.

Our experimental design allows us to not only identify the effects of network and pressure on social
preferences, but also to ascertain the source of the heterogeneity of such effects (in-group vs out-
group, lineage dominance, personal and network characteristics). The identification of preference
parameters and network/pressure effects is achieved by manipulating the payoff structure of our
allocation games, whereas the identification of the source of heterogeneity is made possible by our
post-experiment questionnaire, where we obtain information on demographics of all participants
and the degree of kinship between any pair.

3. Experimental Design

We designed a series of three-person allocation games and use participants’ choices in these games
to characterize social preference patterns. To test if voters behave differently when they vote in
a network setting (i.e. with their social contacts) or under social pressure, we invite participants
to play with anonymous group members and with people from his/her social network, either with
social pressure or without. Subsection 3.1 discusses the payoff structure and assignment rules of
the experiment, and Subsection 3.2 describes recruitment and experiment procedure in detail.

3.1 Payoff Structure and Assignment Rules

Our experiment consists of 7 variants of a three-person allocation game. The baseline payoff struc-
ture of the 7 games is presented in Figure 1. Before each game, each participant receives a handout
that presents payoffs to the 3 people in his group, with payoff to himself highlighted. Participants
are informed that a 3-person group is formed to vote and decide which allocation scheme, out
of two alternatives, will be implemented. The voting follows a majority rule. That is, if two or
three people in the 3-person group vote “yes”, each of them will get paid the amount indicated
in the “Yes” column. Otherwise each individual will be paid the amount indicated in the “No”
column. No discussion is allowed. The payoff structure and voting rules have been shown to be
incentive compatible, that is, “as long as voters have strict preferences over outcomes, voting for
one’s preferred outcome is the unique trembling-hand perfect equilibrium” (Bolton and Ockenfels,
2006).
The 7 game variants in the baseline case, where the 3 members of each group are randomly assigned before each variant is played (hereafter “Round 1”), are designed to help us understand how preferences for efficiency (total payoff to all 3 players) and equity (fairness of allocation) vary with the pocketbook cost of obtaining them. In the 3 variants of Game 1, for example, overall efficiency is held constant (15 RMB in total for both Yes and No) while the degree of inequality varies across variants. Note that Person 3’s self-interest is held constant at 5 RMB between options and across variants, a design that allows us to identify the degree of inequality aversion when no self-interest is involved. For Person 2, obtaining equality requires a sacrifice. We can therefore calculate the proportion of participants willing to sacrifice x units of self-interest in exchange for equality (Person 2, x = 1, 2, 3). On the contrary, for Person 1, choosing equality is in line with his self-interest. The 4 variants of Game 2 introduce tension between efficiency and equality. The “Yes” alternative yields higher overall efficiency (18 RMB) as opposed to the “No” alternative (15 RMB). The trade-off, however, is that the “No” alternative is more equal. Note that in the first 3 variants of Game 2, Person 2’s payoff is held constant at 5 RMB. This allows us to examine the relative importance of efficiency and equality, when no self-interest is involved. Variations in the payoffs to Person 1 and Person 3, on the other hand, help us identify participants’ willingness to sacrifice x units of self-interest and 3 units of overall efficiency in exchange for equality (x = 1, 2, 3, 4, 5), and willingness to sacrifice x units of self-interest and equality in exchange for 3 units of efficiency gain (x = 1, 2, 3). Note that the way in which the 3 RMB efficiency gain is allocated differs across variants. Variant 3 represents a Pareto gain, Variant 4 represents a majority gain, whereas Variant 1 and 2 represent a majority loss.

We introduce social network in Round 2 by manipulating the 3-person group assignment rule. In the recruitment period, for each session, we recruit 3 original participants (OPs) who are required to come to the experiment with a social contact of his own choice – a family member, a relative, or a friend (We term the social contacts “Relatives” for simplicity). In addition, for each session we recruit 3 villagers who come to the experiment alone (we term them “Others”). The composition
of each session is therefore 3 OPs + 3 Relatives + 3 Others. In Round 2, instead of randomly sampling from the 9 participants in each session to form three 3-person groups as we did in Round 1, we assign any OP and the Relative he brings to the same group, plus one “Other”. “Other” remains anonymous throughout the experiment to avoid the possibility that any unobserved personal histories between the pair and the Other could affect their votes. In addition, a new “Other” is reassigned before each game, so that the pair cannot use the decision made by “Other” in the previous game to get information on his preference pattern and adjust voting strategy accordingly. We name Round 1 “Random Assignment” and Round 2 “Network Assignment” in our discussion of the experimental results.

The same 7 game variants are played in Round 2. The only difference is in the presentation of payoff tables (shown in Figure 2), where players can now identify payoffs to himself, to his Relative, and to Other. In the 3 variants of Game 1, both overall efficiency (total payoff to all 3 players) and within-group efficiency (sum payoffs of OP and Relative) are held constant. This allows us to test how many players are willing to sacrifice $x$ units of self-interest in exchange for within-group equality (OP, $x=1, 2, 3$), with the out-group member’s payoff unaffected. This proportion can also be interpreted as the percentage of subjects willing to sacrifice $x$ units in order to help a friend (“Altruism”). Note that since Other’s own payoff remains constant across 3 variants, we will be able to observe how the third-party chooses for the within-group allocation when self-interest is not involved. The 4 variants of Game 2, on the other hand, allow us to examine the tension between in-group vs overall efficiency and in-group vs overall equality. In Variant 1, the overall efficiency gain from choosing “yes” all goes to the out-group member, leaving the in-group efficiency lower in the “yes” alternative. In Variant 2, the overall efficiency gain all goes to the in-group, leaving the out-group member deprived. Variant 3 represents a Pareto gain – both in- and out-group members gain by choosing “yes”, although the “yes” allocation is less fair. Variant 4 represents an allocation where the out-group member’s welfare improves while in-group efficiency remains unaffected. This design allows us to examine how preferences for self-interest, overall efficiency and overall inequality change when participants play with in-group and out-group members.
Another dimension of our design, in addition to Random Assignment vs Network Assignment, is the social pressure treatment. While each participant plays in both rounds, the same participant will be assigned into either the Control group (no pressure) or the Treatment group (with pressure), not both. The social pressure treatment aims to test if voters reveal different patterns of social preferences when they are aware that their choices are visible to others, mirroring the potential impact of lack of anonymity in village democracy – for example the show of hands instead of secret ballot. In terms of implementation, we inform participants at the beginning of the session that their votes will be revealed to group members after all games are completed. We choose to reveal the votes at the very end of the experiment instead of after each game so that participants cannot judge the “type” of their group members and adjust strategically in the subsequent games. The combination of assignments and treatments are summarized in the table below.
3.2 Experiment Procedure

The formal experiment was implemented in July 2017 in 4 randomly selected villages in Linyi, Shandong Province in China. Before the formal experiment, we performed a pilot experiment in January 2017 in Shandong for test purposes only. Data from the pilot experiment is not used in this paper. The experiment design and consent process was reviewed and approved by the Internal Review Board (IRB) at Cornell University. We obtained oral consent from all subjects for their participation in the experiment. All experiment materials, including payoff cards and questionnaires, were presented in Chinese. Experiment instructions were read to participants in Linyi dialect to ensure understanding.

We held 18 experiment sessions with 9 subjects in each session (162 participants in total). For recruiting, we first contacted the leader of each village to explain the purpose of our study and to obtain the leader’s consent. The village leader then sent out our recruitment materials (age requirement, time, location, expected monetary payoff etc., see Appendix A) to the entire village to invite voluntary participation. Summary statistics of participants’ personal characteristics are presented in the table below. Approximately 2/3 of participants were female, plausibly due to the fact males were working in the field during most of our sessions. Age of participants ranges from 20 to 56, with an average of 41 years old. The participants on average completed 8 years of education, which is equivalent to a sophomore in junior high school. “Name Percentage” is a variable we use to capture the dominance of the lineage group each participant belongs to. For example if a participant has surname “Wang” and 80% of the village population shares the same surname, then his “Name Percentage” is indicated as 0.8. We obtained this information from village leaders and confirmed with randomly selected participants in each village. A by-village breakdown of the summary statistics is provided in Appendix A3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Percentage</td>
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<td></td>
</tr>
<tr>
<td>Age</td>
<td>41.36</td>
<td>10.38</td>
</tr>
<tr>
<td>Years of Education</td>
<td>7.929</td>
<td>2.550</td>
</tr>
<tr>
<td>Monthly Income (RMB)</td>
<td>1922.1</td>
<td>2882.5</td>
</tr>
<tr>
<td>Name Percentage</td>
<td>0.213</td>
<td>0.280</td>
</tr>
<tr>
<td>Observations</td>
<td>162</td>
<td></td>
</tr>
</tbody>
</table>

In the pilot experiment, we presented the 7 game variants in table format, as shown in Figure 1 and Figure 2. However, due to the low education level and limited literacy, a majority of our
participant had trouble reading and comprehending tables and numbers. We hence modified the presentation in our formal experiment. We use a red and a blue “plate” to represent the yes and no alternatives, as shown in Figure 4, with images of the Chinese currency (RMB) on each plate to visualize the payoffs. The yellow labels on the edges of plates indicates ownership of allocation, namely, to whom the money will be allocated (for example, “You, Member 2, Member 3” in Round 1, “You, Your Relative, Other” in Round 2). The small numbers in black under the labels are numerically equivalent to the amount of RMB presented in each row. We included them to help participants double check their counting. Participants in the formal experiment voted “red” or “blue” instead of “yes” or “no”.

Figure 4: Colored Plates to Present Payoffs

9 subjects enter the experiment room and sit in designated seats (Figure 5, O=OP, F=Relative, T=Other). The distance between seats was set to be at least 1.5 meters so that subjects cannot communicate or peek each other’s vote.
The same script of experimental instructions (in Appendix) was read out to participants in Linyi dialect by the same experimenter at every session to ensure consistency. The experimental instruction is essentially the same as described in the previous subsection. At the beginning of Round 1, the main experimenter informs subjects that 3 members will be selected at random to form a group (3 groups in total). Group members are shuffled and reassigned at the beginning of each new game and the identity of group members will not be revealed. She then proceeds to explain the distribution schemes and the “majority rule”. In the Control sessions (Session 1, 2, 5, 6, 9, 10, 13, 14, 17, 18), participants are informed that their votes will never be made public whereas in the Treatment sessions (Session 3, 4, 7, 8, 11, 12, 15, 16), participants are warned ahead of time that after all games are finished we will reveal everyone’s votes to group members. The experimenters then distribute payoff “plates” and instruct participants how to read their own payoffs and other participants’ payoffs. The majority rule is explained again and confirmation questions are asked to ensure correct understanding. For example, “if you vote red and the other two members vote blue, what would Person 3’s payoff be for this game”. For each game, we give participants 1 minute to consider before we go collect votes. Participants are instructed to point at the color of their choice instead of stating aloud so that votes remain unknown to other participants. Experimenter writes down votes on a data sheet and uses majority rule to decide which allocation to implement. Corresponding payments are made immediately to participants to provide monetary incentives. Round 2 proceeds the same way as Round 1, with the only exception that participants are informed that the pair (OP + Relative) will always be in the same group while the third member will be randomly assigned before each game and will remain unidentifiable.

After all games are completed, participants are required to fill out a questionnaire about their demographic information. The pairs (OPs and Relatives) are asked to complete an additional set of questions on their relationships, frequency of interaction, etc. Each session, including the survey completion, takes between 45 minutes and 1 hour. The total payoff to each participant ranges from 50 to 90 RMB with mean payoff targeted at 75 RMB, which is equivalent to an average participant’s daily income. We believe this provides sufficient financial incentive to participants and ensures that they take their decisions seriously.

4. Results
4.1 Descriptive Results

In this sub-section, we provide a game-by-game description of participants’ social preferences patterns exhibited in the experiment. Due to limited space, we include tables (t-test results) in Appendix B2. Entries of the tables are percentage of players voting “No”. The more rigorous econometric analysis results will be presented in sub-section 4.2.

In all the 3 variants of Game 1 where efficiency is held constant at 15RMB between “Yes” and “No”, the majority of participants (over 50% in all variants) chose the fair allocation regardless of treatment. In addition, more than half of participants were willing to sacrifice self-interest (1 RMB, 2 RMB and 3 RMB) to achieve a fair allocation. In terms of treatment effect, in Round 1 (Random Assignment) social pressure does not alter behaviors in a statistically significant manner. In Round 2 (Network Assignment), however, subjects are more willing to make sacrifices when they are under social pressure. In other words, subjects display more pro-social preferences when they are aware that their choices will be revealed to people in their social networks. The motive of such behavior changes – if it is due to stronger preferences for overall equality or within-group equality – will be tested in regression analyses.

The 4 variants of Game 2 allocate the 3 RMB overall efficiency gain differently. In Game 2 Variant 1, the efficiency gain goes exclusively to the out-group member while the in-group members lose. In the “Round 1 (Random Assignment)- Control (No Pressure)” situation, the proportion of Person 2 players (no self-interest involved) choosing efficiency and the proportion choosing fairness are almost equal. This proportion changed significantly when Person 2 players are informed that they will be paired with their partners (Round 2). Without social pressure, 27% more of them chose the option that increases in-group total payoff, although it results in a larger loss in overall efficiency.

In Game 2 Variant 2, the efficiency gain is allocated to in-group members exclusively. With self-interest neutral across options, the majority of Person 2 players chose efficiency over fairness most of the time. This ratio is only reversed in the “Round 1 (Random Assignment)- Treatment (Pressure)” situation, where 25% more of Person 2 Players chose fairness over efficiency. Interestingly, 20% more of the out-group members voted “No” when they are informed the other two are pairs, a sign that the out-group members dislike allocations where the paired players gain more.

The “Yes” option of Game 2 Variant 3 represents a Pareto gain. Most of our subjects realize this and played accordingly. The large majority of players (67%-87%) chose efficiency over equality, and this strong preference for Pareto efficiency gain is consistent across treatments and across roles. The only exception is that Person 1 players voted more for equality when they play with their partners under pressure. However even after this change, the proportion of Person 1 players choosing efficiency over equality is still as high as 2/3.

Finally, Game 2 Variant 4 represents an efficiency gain that goes to the out-group member while keeping in-group efficiency constant. In this case, in-group members (Person 1 and Person 2) consistently preferred the fair allocation, unwilling to let the efficiency gain go to the out-group member. When Person 1 players are informed that Person 2 is their Relatives, they make significantly more
sacrifices to let Person 2 earn more.

In summary, when efficiency is held constant, subjects displayed strong distaste towards inequality and are willing to sacrifice self-interest for equality even in the Random Assignment. Social pressure, when efficiency is constant, only works under Network Assignment. When there is an efficiency gain, however, behavioral change depends heavily on how the efficiency gain is allocated in-group vs. out-group. We also observe that when subjects play under Network Assignment, they become fixated on within-group gains even when doing so leads to an overall efficiency loss, and such tendency becomes more prominent when social pressure is present. A Pareto gain, on the other hand, is strongly preferred regardless of assignment and treatment.

4.2 Regression Analysis

4.2.1 Social Preferences, Network Effects, and Pressure Effects

The rich variation in payoff structure of the 7 game variants allows us to identify parameters that characterize preference for self-interest, efficiency, and inequality aversion, since these 3 components have been found to foster sharply different conduct (Rabin 1993, Fehr and Schmidt 1999, Bolton and Ockenfels 2000, Charness and Rabin 2002, Engelmann and Strobel 2004, Fehr and Schmidt 2006). While “self-interest” and “efficiency” have been consistently defined in the existing literature as payoff to oneself and the sum of payoffs to all members respectively, the definition of “equality” has been under debate. We include three measures of inequality aversion – FS, ERC, and MaxiMin – in our regression analyses since they not only form the basis of theoretical work but also are the most widely employed ones in empirical tests (Engelmann and Strobel, 2004; Messer et al, 2010).

Attempting to explain cooperative behavior by a single simple model, Fehr and Schmidt (1999, henceforth FS) model fairness as self-centered inequality aversion; namely, people do not care about inequity per se that exists among others but are only interested in the fairness of their own material payoff relative to the payoff of others. Mathematically, the utility that person $i$ generates from the game outcome is written as:

$$U_i(\pi) = \pi_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{\pi_j - \pi_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{\pi_i - \pi_j, 0\}$$

$$\alpha_i \geq \beta_i, \quad 0 \leq \beta_i < 1$$

where $\pi_i$ is the payoff to $i$ himself, $\pi_j$ is the payoff to any other player $j$, and $n$ is the total number of players. In this framework the two max terms are mutually exclusive: $\alpha_i$ measures the disutility from other members being better off (Namely, when $i$ is “Behind”), while $\beta_i$ measures the disutility from other members being worse off (namely, when $i$ is “Ahead”), $\alpha_i \geq \beta_i$ therefore captures the idea that a player suffers more from inequality that is to his disadvantage. They then tested the model on a wide array of games such as ultimatum games, market games, and public goods games. The result is mixed in that in some games (ultimatum, public goods with punishment) more cooperative behaviors are observed whereas in other games (market, public goods without punishment) subjects behave more selfishly. They therefore conclude that the distribution of social preferences depends heavily on the strategic environment of the games.
Bolton and Ockenfels (2000, “Equity, Reciprocity, and Competition”, henceforth ERC) organized a large set of laboratory games with a simple model constructed on the premise that people are motivated by both their pecuniary payoff and their relative payoff standing. In particular, individual i’s utility function is specified as:

\[ U_i = U_i(\pi_i, \sigma_i) \]

\[ c = \sum_j \pi_j \]

\[ \sigma_i = \sigma_i(\pi_i, c, n) = \begin{cases} \frac{\pi_i}{c} & \text{if } c > 0 \\ \frac{1}{n} & \text{if } c = 0 \end{cases} \]

\[ U_i(c\sigma_i, \sigma_i) = \alpha_i c\sigma_i - \beta_i \left( \sigma_i - \frac{1}{n} \right)^2 \]

\[ \alpha_i \geq 0, \beta_i > 0 \]

Namely, the utility is a function of payoff to i himself (\( \pi_i \)) and the share he gets in the total payoff (\( \sigma_i \)). Utility is assumed to be strictly concave in the “share” argument, with a maximum around the allocation at which one’s own share is equal to the average share. This implies that the egalitarian division is most preferred. In essence, the further the allocation moves from player i receiving an equal share, the higher the loss from the comparative effect. A player’s type is characterized by \( \alpha_i/\beta_i \), the ratio of weights that are attributed to the pecuniary and relative components. The authors then fit data from various games (dictator, gift-exchange, Prisoner’s Dilemma, etc.) and find that ERC equilibrium predicts people’s strategic behavior quite well.

Charness and Rabin (2002, henceforth MaxiMin) measures inequality by the payoff to the worst-off person. They designed an array of new experimental games to determine whether subjects are more concerned with increasing social welfare – sacrificing to increase the payoffs for all recipients, especially low-payoff recipients – than with reducing differences in payoffs. The multi-person MaxiMin model is specified as:

\[ U_i(\pi_1, \pi_2, ..., \pi_N) = (1 - \lambda)\pi_i + \lambda[\delta \cdot \min(\pi_1, \pi_2, ..., \pi_N) + (1 - \delta)(\pi_1 + \pi_2 + ... + \pi_N)] \]

\[ \lambda \in [0, 1] \]

That is, subjects like money but also prefer Pareto-improvements. By positing a concern for efficiency, this model helps explain why many subjects make inequality-increasing sacrifices – because these choices are Pareto-improving and inexpensive.

A number of empirical studies in the 2000s employ new game designs to compare performances of the above social preference models. Engelmann and Strobel (2004), for example, presents a set of three-person one-shot distribution experiments to examine the importance of efficiency and inequality aversion in decision-making. They also compare the relative performance of the three models mentioned above. They find that the multi-person MaxiMin model can rationalize most of the data while neither ERC or FS can explain important patterns. In response, Bolton and
Ockenfels (2006) challenged the Engelmann-Strobel design since the decision makers’ self-interest remained unaffected in most cases – namely no sacrifice was necessary. They then performed additional experiments to show that willingness to pay for efficiency is substantially lower than it is for equity. They also look more closely at the role of procedural equity by manipulating the role assignment rule in a majority voting game, and find that equal opportunity procedures can soften the tension between equality and efficiency. Messer et al (2010) uses a Random Price Voting Mechanism (RPVM) to elicit social preferences in a referenda experiment to find that the two equity based models – ERC and FS – are not supported by the data while MaxiMin performs relatively well. They conclude that a social efficiency motive may lead to economically meaningful deviations from selfish voting choices and increase the likelihood that welfare-enhancing programs are implemented.

We use participants’ choices in each game and the associated payoff structures to estimate preference parameters in the above 3 models respectively. Specifically, we fit the ERC, FS, Maximin utility functions using a binary logit regression as in Charness and Rabin (2002) and Engelmann and Strobel (2004). Assuming that all individuals choose “yes” or “no” to maximize their utilities, the probability of individual $i$ voting “yes” can be written as:

$$P(yes_i) = \frac{e^{U_i(yes_i)}}{e^{U_i(yes_i)} + e^{U_i(no_i)}}$$

Utility is assumed to be separately additive in three elements: self-interest, social efficiency, and inequality (using ERC, FS and MaxiMin one at a time). Note that when empirically applying the theoretical model specified in Fehr and Schmidt (1999), multi-colinearity is unavoidable since $FS\ AHEAD = FS\ BEHIND + Efficiency - 3 \times Self\ -\ Interest$. To overcome this problem, we follow Engelmann and Strobel (2004) by using two approaches. In a first approach, we exclude self-interest (we term it the “FS” model when presenting regression results). In a second approach, we employ Engelmann and Strobel’s strict version by specifying $FS\ Strict = FS\ AHEAD + FS\ BEHIND$. This new measure is essentially an aggregation of inequality where equal weights are assigned to disadvantageous and advantageous inequality (we term it the “FS Strict” model when presenting regression results).

<table>
<thead>
<tr>
<th>Utility Specification in Regressions</th>
</tr>
</thead>
</table>

$$P(yes_i) = \frac{e^{U_i(yes_i)}}{e^{U_i(yes_i)} + e^{U_i(no_i)}}$$

Table 2: Utility Specification in Regressions

<table>
<thead>
<tr>
<th>Utility Function of Person $i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC $\alpha_i^{SELF,ERC} \pi_i + \beta_i^{EFF,ERC} \sum_j \pi_j + \beta_i^{ERC}</td>
</tr>
<tr>
<td>FS $\beta_i^{EFF,FS} \sum_j \pi_j + \beta_i^{FS,AHEAD} \frac{1}{N-1} \sum_{j \neq i} \max(\pi_i - \pi_j, 0) + \beta_i^{FS,BEHIND} \frac{1}{N-1} \sum_{j \neq i} \max(\pi_j - \pi_i, 0)$</td>
</tr>
<tr>
<td>FS Strict $\alpha_i^{SELF,FS} \sum_j \pi_j + \beta_i^{EFF,FS} \sum_j \pi_j + \beta_i^{FS,ST} \frac{1}{N-1} \left[ \sum_{j \neq i} \max(\pi_j - \pi_i, 0) + \sum_{j \neq i} \max(\pi_i - \pi_j, 0) \right]$</td>
</tr>
<tr>
<td>Maximin $\alpha_i^{SELF,MM} \pi_i + \beta_i^{EFF,MM} \sum_j \pi_j + \beta_i^{MM} \cdot \min(\pi_1, \ldots, \pi_N)$</td>
</tr>
</tbody>
</table>

The design of our experiment, especially the Assignment-Treatment Combinations as shown in
Figure 3, allows us to identify two effects. “Network effect” characterizes if participants display different degree of preferences for self-interest, efficiency, and equality when they are assigned to the same group as their social contacts, with or without pressure. “Pressure effect”, on the other hand, characterizes if participants display different degree of preferences for self-interest, efficiency, and equality when they are under social pressure, with or without social contacts in their groups. Mathematically, the utility function used to identify network effect, without social pressure ($P = 0$) and with social pressure ($P = 1$) is specified as:

$$U_i(P = 0) = \alpha_{i,P=0}^{N0} \pi_i + \beta_{i,P=0}^{N0} \sum_j \pi_j + \gamma_{i,P=0}^{N0} d_i + \alpha_{i,P=0}^{N1} \pi_i \cdot 1_N(i) + \beta_{i,P=0}^{N1} \sum_j \pi_j \cdot 1_N(i) + \gamma_{i,P=0}^{N1} d_i \cdot 1_N(i)$$

$$U_i(P = 1) = \alpha_{i,P=1}^{N0} \pi_i + \beta_{i,P=1}^{N0} \sum_j \pi_j + \gamma_{i,P=1}^{N0} d_i + \alpha_{i,P=1}^{N1} \pi_i \cdot 1_N(i) + \beta_{i,P=1}^{N1} \sum_j \pi_j \cdot 1_N(i) + \gamma_{i,P=1}^{N1} d_i \cdot 1_N(i)$$

where $\pi_i$ represents self-interest, $\sum_j \pi_j$ represents the efficiency measure, $d_i$ represents any inequality measure (ERC, FS, FS Strict, or MaxiMin), and $1_N(i)$ is an indicator function that takes value 1 if the choice made by individual $i$ is observed from the Network Assignment. We are interested in testing which of the two network effects – network effect without social pressure (which we term “Network Effect A”, identified as $\alpha_{i,P=0}^{N1}$, $\beta_{i,P=0}^{N1}$, and $\gamma_{i,P=0}^{N1}$) and network effect with social pressure (which we term “Network Effect B”, identified as $\alpha_{i,P=1}^{N1}$, $\beta_{i,P=1}^{N1}$, and $\gamma_{i,P=1}^{N1}$) – is statistically significant.

Similarly, the utility function used to estimate pressure effect, in the Random Assignment ($N = 0$) and Network Assignment ($N = 1$), is specified as:

$$U_i(N = 0) = \alpha_{i,N=0}^{P0} \pi_i + \beta_{i,N=0}^{P0} \sum_j \pi_j + \gamma_{i,N=0}^{P0} d_i + \alpha_{i,N=0}^{P1} \pi_i \cdot 1_P(i) + \beta_{i,N=0}^{P1} \sum_j \pi_j \cdot 1_P(i) + \gamma_{i,N=0}^{P1} d_i \cdot 1_P(i)$$

$$U_i(N = 1) = \alpha_{i,N=1}^{P0} \pi_i + \beta_{i,N=1}^{P0} \sum_j \pi_j + \gamma_{i,N=1}^{P0} d_i + \alpha_{i,N=1}^{P1} \pi_i \cdot 1_P(i) + \beta_{i,N=1}^{P1} \sum_j \pi_j \cdot 1_P(i) + \gamma_{i,N=1}^{P1} d_i \cdot 1_P(i)$$

where $1_P(i)$ is an indicator function that takes value 1 if the choice made by individual $i$ is observed from the Treatment Group (with social pressure). We are interested in testing which of the two pressure effects – pressure effect under Random Assignment (which we term “Pressure Effect A”, identified as $\alpha_{i,N=0}^{P1}$, $\beta_{i,N=0}^{P1}$, and $\gamma_{i,N=0}^{P1}$) and pressure effect under Network Assignment (which we term “Pressure Effect B”, identified as $\alpha_{i,N=1}^{P1}$, $\beta_{i,N=1}^{P1}$, and $\gamma_{i,N=1}^{P1}$) – is statistically significant.

The above 4 effects are summarized in Table 3 and Table 4. Each 4 columns present a set of results using the 4 inequality measures respectively – ERC, FS Strict, FS, and Maximin. Column (1) - (4) of Table 3 examines Network Effect without social pressure (Network Effect A); Column (5) - (8) of Table 3 examines Network Effect under social pressure (Network Effect B); Column (1) - (4) of Table 4 examines Pressure Effect in random assignment (Pressure Effect A); Column (5) - (8) of Table 4 examines Pressure Effect in network assignment (Pressure Effect B). The logic of our result presentation is summarized in Figure 6. We also performed a balance covariates check to make sure the demographics of participants in the control and treatment groups do not differ significantly. The result is presented in Appendix B1. Age is the only covariate that differs across control and
treatment, and the difference is rather weak (at p=0.1). We are therefore confident to say that the
treatment assignment is indeed random.

Figure 6: Regression Tables Illustration

<table>
<thead>
<tr>
<th></th>
<th>No Pressure</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>Random Assignment without Social Pressure</td>
<td>Random Assignment with Social Pressure</td>
</tr>
<tr>
<td>Network</td>
<td>Network Assignment without Social Pressure</td>
<td>Network Assignment with Social Pressure</td>
</tr>
</tbody>
</table>

The upper panel of the first 4 columns of Table 3 characterizes the baseline (no social pressure, no network effects) social preference patterns displayed by our participants. Results are robust across the 4 model specifications in the sense that all social preference parameters are statistically significant and are of the expected signs. Subjects strongly prefer (p<0.01) higher payoffs to themselves (self-interest) and higher total payoffs to the group (efficiency). In the mean time, players display significant inequality aversion regardless of the measurement used. We also observe that the “FS Behind” parameter is (in absolute value) twice the size of the “FS Ahead” parameter, meaning that subjects suffer more from inequality that is to their disadvantage. This is in line with the theoretical prediction in Fehr and Schmidt (1999). The lower panel of the first 4 columns reveals that when participants are not under social pressure, network effect is statistically insignificant. In other words, when participants are informed that their votes will not be made public, playing with their relatives does not change their preference patterns.

The upper panel of columns (5)-(8) of Table 3 characterizes social preference patterns when participants play in Random Assignment under social pressure. Very similar pattern is revealed here as in the baseline case. The lower panel of columns (5)-(8), however, shows very strong Network Effect. That is, when participants are aware that their votes will be revealed to other players, assigning them to play with their relatives will significantly alter their social preference patterns. The change is particularly obvious in inequality aversion, in that players display much stronger distaste for unfair distributions and stronger willingness to help the worst-off person.
Table 3: Network Effects: Without and With Social Pressure

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
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<td>No Pressure</td>
<td>No Pressure</td>
<td>Pressure</td>
<td>Pressure</td>
<td>Pressure</td>
<td>Pressure</td>
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<tr>
<td></td>
<td>ERC</td>
<td>FS Strict</td>
<td>FS</td>
<td>MM</td>
<td>ERC</td>
<td>FS Strict</td>
<td>FS</td>
<td>MM</td>
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<tr>
<td>Self-Interest</td>
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<td>0.156***</td>
<td>0.158***</td>
<td>0.231***</td>
<td>0.226***</td>
<td>0.229***</td>
<td>0.229***</td>
<td>0.229***</td>
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<tr>
<td></td>
<td>(0.0407)</td>
<td>(0.0406)</td>
<td>(0.0410)</td>
<td>(0.0471)</td>
<td>(0.0470)</td>
<td>(0.0476)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>0.296***</td>
<td>0.258***</td>
<td>0.305***</td>
<td>0.189***</td>
<td>0.170***</td>
<td>0.233***</td>
<td>0.300***</td>
<td>0.157***</td>
</tr>
<tr>
<td></td>
<td>(0.0538)</td>
<td>(0.0569)</td>
<td>(0.0554)</td>
<td>(0.0471)</td>
<td>(0.0602)</td>
<td>(0.0639)</td>
<td>(0.0624)</td>
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<td>ERC</td>
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<td>-0.131***</td>
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<td>(0.0194)</td>
<td>(0.0222)</td>
<td>(0.0447)</td>
<td>(0.0678)</td>
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<tr>
<td>FS</td>
<td>-0.122***</td>
<td>-0.127***</td>
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<td></td>
<td>(0.0194)</td>
<td>(0.0222)</td>
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<tr>
<td>FS Ahead</td>
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</tr>
<tr>
<td>FS Behind</td>
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<td>MM</td>
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<td>0.399***</td>
<td>0.403***</td>
<td>0.403***</td>
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<td>(0.0543)</td>
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<td>Self × Network</td>
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<td>-0.0586</td>
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<td>(0.0575)</td>
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<td>(0.0704)</td>
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<td>Efficiency × Network</td>
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<td>0.0317</td>
<td>0.0109</td>
<td>0.0165</td>
<td>0.135</td>
<td>0.157*</td>
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<td>(0.0787)</td>
<td>(0.0669)</td>
<td>(0.0878)</td>
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<tr>
<td>ERC × Network</td>
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<td>-0.0211</td>
<td>-0.283***</td>
<td>-0.0915***</td>
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<tr>
<td></td>
<td>(0.0841)</td>
<td>(0.0277)</td>
<td>(0.103)</td>
<td>(0.036)</td>
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<tr>
<td>FS × Network</td>
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<td>-0.0211</td>
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<td>-0.0915***</td>
<td>-0.206***</td>
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<td>(0.036)</td>
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<tr>
<td>FS Ahead × Network</td>
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<td>FS Behind × Network</td>
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<td>-0.00177</td>
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<td>-0.155*</td>
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<td>(0.0700)</td>
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<tr>
<td>MM × Network</td>
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<td>0.150*</td>
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<td>(0.0778)</td>
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<td>(0.0901)</td>
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</tbody>
</table>

Observations 2,520 2,520 2,520 2,520 2,016 2,016 2,016 2,016

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The upper panel of the first 4 columns of Table 4 is exactly the same as that of Table 3 – it summarizes the baseline (no social pressure, no network effects) social preference patterns. In addition, all parameters in the lower panel of the first 4 columns are statistically insignificant, indicating that when group members are randomly assigned and anonymous, adding social pressure does not alter participants’ social preference patterns.

The upper panel of columns (5)-(8) of Table 4 presents social preference patterns when participants play in Network Assignment without social pressure. Consistent with results shown in all the upper panels in the previous discussion, all social preference parameters are significant and are of the expected signs. The lower panel of columns (5)-(8) shows statistically significant Pressure Effect in most of our specifications. Participants display stronger inequality aversion (in ERC, FS Strict, and FS) when they are aware that their votes will be revealed to their relatives.
In summary, Table 3 and Table 4 combined reveal that in addition to self-interest, participants consistently display preference for social efficiency and distaste for inequality. Such social preferences are intrinsic and robust against alternative specifications. Moreover, social network or social pressure alone cannot alter behaviors. Social preference patterns, in particular inequality aversion, change only when the two forces are combined.

One thing to note is that the above analyses have pooled choices made by all participants, including the pair and the “Other”. One may suspect that by doing so, preference patterns of the “Others” may have weakened Network Effects and Pressure Effects, since “Others” came alone and are hence less susceptible to judgment made by their social contacts. As a robustness check, we excluded “Others” from our analyses and only kept choices made by the pairs. The results and conclusions
are unchanged.

4.2.2 In-group vs Out-group Allocations

As introduced in Section 2, one key feature of the Chinese lineage networks is the clear division of “insiders-we” and “outsiders-they”. In this subsection, we examine how people in a network setting perceive resources allocated to in-group members (relatives) as opposed to out-group members (Others).

We introduce three new variables: In-group Efficiency, which measures the total payoff to the pair \((\pi_{OP} + \pi_{Relative})\); In-group Inequality, which measures the absolute difference in payoffs between the pair \((|\pi_{OP} - \pi_{Relative}|)\); and Distance, which measures how far the Other’s payoff is away from the average payoff of the pair\((|\pi_{Other} - \frac{1}{2}(\pi_{OP} + \pi_{Relative})|)\). We only use data from the Network Assignment, because the division of in-group and out-group does not exist in Random Assignment. In addition, we separate observations of the pairs (in-group members) and the Others (out-group members), because they may behave differently facing the division and social pressure. Specifically, utility function of the in-group members is specified as a separately additive function of 4 elements: self-interest, overall efficiency, in-group efficiency, and in-group inequality; utility function of the out-group members is specified as a separately additive function of 3 elements: self-interest, overall efficiency, and distance. The results are presented in Table 5.

The upper panel of Table 5 presents preferences for in-group measures in the network setting without social pressure. The pairs (in-group members) do not seem to be concerned with self-interest nor overall efficiency in this case. Since in-group efficiency is included in the regression, this can also be interpreted as their disregard of the payoffs to the out-group member. Instead, all that they care about are in-group measures – in-group efficiency and in-group inequality. Such fixation on in-group measures is exacerbated by social pressure, as we observe from the lower panel of column (1). Imposing social pressure on the pair does not increase their concern for the group as a whole (or for the welfare of the out-group member). Instead it makes them more averse toward in-group inequality.

Column (2) characterizes social preference patterns of the out-group member. Compared to the pairs, out-group members care more about overall efficiency. Since self-interest is included in the regression, this means that the out-group member actually prefer higher payoff to the pair. They also dislike distance. Namely, the greater the difference between their own payoffs and the pairs’ average payoff, the unhappier they feel. Moreover, social pressure does not significantly alter their preference patterns.
Table 5: In-group Measures (Pairs and Others)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pairs</td>
<td>Others</td>
</tr>
<tr>
<td>Self-Interest</td>
<td>0.0116</td>
<td>0.199*</td>
</tr>
<tr>
<td>(0.0539)</td>
<td>(0.108)</td>
<td></td>
</tr>
<tr>
<td>Overall Efficiency</td>
<td>0.0916</td>
<td>0.304***</td>
</tr>
<tr>
<td>(0.0649)</td>
<td>(0.118)</td>
<td></td>
</tr>
<tr>
<td>In-group Efficiency</td>
<td>0.320***</td>
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</tr>
<tr>
<td>(0.0676)</td>
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<td></td>
</tr>
<tr>
<td>In-group Inequality</td>
<td>-0.210***</td>
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</tr>
<tr>
<td>(0.0361)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td></td>
<td>-0.327***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.121)</td>
</tr>
<tr>
<td>Self-Interest × Pressure</td>
<td>0.0919</td>
<td>0.226</td>
</tr>
<tr>
<td>(0.0878)</td>
<td>(0.172)</td>
<td></td>
</tr>
<tr>
<td>Overall Efficiency × Pressure</td>
<td>0.157</td>
<td>-0.0602</td>
</tr>
<tr>
<td>(0.101)</td>
<td>(0.179)</td>
<td></td>
</tr>
<tr>
<td>In-group Efficiency × Pressure</td>
<td>-0.0590</td>
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</tr>
<tr>
<td>(0.101)</td>
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</tr>
<tr>
<td>In-group Inequality × Pressure</td>
<td>-0.155**</td>
<td></td>
</tr>
<tr>
<td>(0.0615)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance × Pressure</td>
<td></td>
<td>-0.141</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.186)</td>
</tr>
</tbody>
</table>

Observations 1,512 756

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.2.3. Social Preferences of Dominant lineages

A major feature of the lineage network in rural China is that the dominant lineages control the economic and political resources and influence village affairs heavily. In this section, we examine the social preference pattern of members in dominant lineages as opposed to that of members in non-dominant lineages.

The dominance of the lineage that person \( i \) belongs to is measured by variable “Name”, which is defined as the percentage of villagers that share the same surname as person \( i \). Greater value of “Name” indicates larger lineage group, hence greater power in village affairs. The regressions we perform in this section include both main effects and “Name” interaction effects controlling for other personal characteristics (gender, age, education, and income). Namely, utility function is specified as

\[
U_i = \sum_k \beta_k \cdot X_{ik} + \sum_k \theta_k X_{ik} \cdot Name_i + \sum_{lk} \delta_{lk} \cdot X_{ik} Z_i
\]

where \( X_{ik} \) is the elements of social preference measures presented in each game (self-interest, efficiency, plus one set of inequality measure), and \( Z_i \) is the vector of personal characteristics of person.
i. To save space, in this section we only present the parameters of “Name” interaction effects, namely $\theta_k$ in different scenarios.

Columns (1) to (4) in Table 6 characterize “Name” interaction effects in Randomly Assignment. We observe that none of them is significant, indicating that when voting with randomly assigned unknown members, members of dominant lineages do not behave differently compared to members of non-dominant lineages. When it comes to Network Assignment, however, columns (5) to (8) in Table 6 reveal different patterns. We notice that the interaction effect for ERC is positive, indicating that members of larger lineages care less about inequality. More importantly, they seem to feel better about inequality that is to their advantage.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Interest $\times$ Name</td>
<td>-0.158</td>
<td>-0.145</td>
<td>-0.143</td>
<td>0.178</td>
<td>0.205</td>
<td>0.222</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency $\times$ Name</td>
<td>0.153</td>
<td>0.201</td>
<td>0.161</td>
<td>0.199</td>
<td>-0.289</td>
<td>-0.241</td>
<td>-0.171</td>
<td>-0.215</td>
</tr>
<tr>
<td>ERC $\times$ Name</td>
<td>0.227</td>
<td>(0.202)</td>
<td>(0.196)</td>
<td>(0.191)</td>
<td>(0.192)</td>
<td>(0.206)</td>
<td>(0.199)</td>
<td>(0.168)</td>
</tr>
<tr>
<td>FS $\times$ Name</td>
<td>0.0392</td>
<td>(0.0667)</td>
<td>0.0894</td>
<td>(0.0713)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Ahead $\times$ Name</td>
<td>-0.0226</td>
<td>(0.155)</td>
<td>0.313*</td>
<td>(0.164)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Behind $\times$ Name</td>
<td>0.173</td>
<td>(0.170)</td>
<td>0.0417</td>
<td>(0.181)</td>
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<td></td>
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<tr>
<td>MM $\times$ Name</td>
<td>-0.112</td>
<td>(0.186)</td>
<td>-0.272</td>
<td>(0.195)</td>
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</tbody>
</table>

We further break down the “Name” interaction effects in Network Assignment to Pairs and Others. The results are presented in Table 7. We notice that almost all parameters in the first 4 columns (Pairs) are statistically significant, while none of them is significant in the last 4 columns (Others). In other words, members of dominant lineage groups behave differently only when the interest of their relatives are involved. They care more about self-interest and less about the welfare of the group as a whole (Efficiency). Members of dominant lineages are also less concerned about inequality. In fact, they do not feel as bad when the inequality is to their advantage (FS Ahead). This result is consistent with phenomena reported in the literature, where larger kinship groups exploit their control of economic and political resources to suppress smaller groups.
Table 7: Social Preferences of Dominant lineages (Pairs and Others)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
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<tbody>
<tr>
<td></td>
<td>Pairs</td>
<td>Pairs</td>
<td>Pairs</td>
<td>Others</td>
<td>Others</td>
<td>Others</td>
<td>Others</td>
<td>Others</td>
</tr>
<tr>
<td>Self-Interest × Name</td>
<td>0.398**</td>
<td>0.449**</td>
<td>0.483***</td>
<td>-0.446</td>
<td>-0.170</td>
<td>-0.153</td>
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</tr>
<tr>
<td></td>
<td>(0.174)</td>
<td>(0.176)</td>
<td>(0.179)</td>
<td>(0.462)</td>
<td>(0.407)</td>
<td>(0.363)</td>
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</tr>
<tr>
<td>Efficiency × Name</td>
<td>-0.371*</td>
<td>-0.475*</td>
<td>-0.311</td>
<td>-0.423**</td>
<td>-0.0710</td>
<td>0.207</td>
<td>0.150</td>
<td>0.182</td>
</tr>
<tr>
<td></td>
<td>(0.219)</td>
<td>(0.246)</td>
<td>(0.234)</td>
<td>(0.201)</td>
<td>(0.476)</td>
<td>(0.445)</td>
<td>(0.439)</td>
<td>(0.373)</td>
</tr>
<tr>
<td>ERC × Name</td>
<td>0.538**</td>
<td>0.246</td>
<td>0.234</td>
<td>0.201</td>
<td>0.564</td>
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<tr>
<td></td>
<td>(0.240)</td>
<td>(0.240)</td>
<td>(0.234)</td>
<td>(0.201)</td>
<td>(0.745)</td>
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<tr>
<td>FS × Name</td>
<td>0.192**</td>
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<td></td>
<td></td>
<td>-0.0366</td>
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<td></td>
<td>(0.0850)</td>
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<td>(0.180)</td>
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<tr>
<td>FS Ahead × Name</td>
<td>0.670***</td>
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<td></td>
<td>(0.213)</td>
<td></td>
<td></td>
<td></td>
<td>(0.326)</td>
<td></td>
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</tr>
<tr>
<td>FS Behind × Name</td>
<td>0.0746</td>
<td></td>
<td></td>
<td></td>
<td>0.0402</td>
<td></td>
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<tr>
<td></td>
<td>(0.195)</td>
<td></td>
<td></td>
<td></td>
<td>(0.548)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>MM × Name</td>
<td></td>
<td>-0.715***</td>
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<td></td>
<td>0.146</td>
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<tr>
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<td>(0.249)</td>
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<td>(0.390)</td>
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<td>1,442</td>
<td>742</td>
<td>742</td>
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<td>742</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2.4. Social Preferences and Personal Characteristics

Compared to the networks in western societies, the lineage ties in rural China are highly individual, in the sense that any interpersonal relationship are affected heavily by the individuals’ personal characteristics. In this subsection, we examine how gender, age, education and income interact with social preference patterns.

The results are presented in Table 8. Overall we observe that personal characteristics interaction effects ($\delta_{lk}$) do not differ greatly across Random Assignment and Network Assignment. Female (Gender=1) consistently display greater inequality aversion compared to male, especially when the inequality is to their disadvantage. Interestingly, female displayed greater concern for overall efficiency and the welfare of the worst-off member under Random Assignment, but such concern disappears when they are in Network Assignment. Although we do not have direct evidence to explain this phenomenon, we reason that female are by nature more caring and compassionate especially towards the deprived. However, when the interests of their relatives are involved, such nature is suppressed and outweighed by in-group concerns. In the Age panel, we observe that compared to the young, senior participants are less concerned with self-interest and inequality in both Random Assignment and Network Assignment. They seem to be less sensitive to every element in the utility function and behaves in a more neutral manner.

The interaction effects in the Education and Income panels are apparently weaker. In Network Assignment, better educated participants display greater concern for overall efficiency and tend to feel worse when the inequality is to their advantage. Such pattern, however, is not present in Random Assignment. The effect of income is almost non-existent.
Table 8: Social Preferences and Personal Characteristics (All Observations)

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Gender</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Self-Interest × Gender</td>
<td>0.115 (0.0977)</td>
<td>0.102</td>
<td>0.138</td>
<td>0.157</td>
<td>0.143</td>
<td>0.136</td>
<td>0.136</td>
<td></td>
</tr>
<tr>
<td>Efficiency × Gender</td>
<td>0.0925 (0.125)</td>
<td>0.186</td>
<td>0.219*</td>
<td>0.121</td>
<td>0.0625</td>
<td>0.104</td>
<td>0.085</td>
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</tr>
<tr>
<td>ERC × Gender</td>
<td>-0.284** (0.144)</td>
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<td></td>
<td></td>
<td>-0.272*</td>
<td>(0.154)</td>
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<tr>
<td>FS × Gender</td>
<td>-0.122*** (0.0470)</td>
<td></td>
<td></td>
<td></td>
<td>-0.123**</td>
<td>(0.0516)</td>
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</tr>
<tr>
<td>FS Ahead × Gender</td>
<td>-1.174 (0.110)</td>
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<td></td>
<td></td>
<td>-0.146</td>
<td>(0.121)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Behind × Gender</td>
<td>-0.321*** (0.114)</td>
<td></td>
<td></td>
<td></td>
<td>-0.348***</td>
<td>(0.125)</td>
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<td></td>
</tr>
<tr>
<td>MM × Gender</td>
<td>0.399*** (0.130)</td>
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<td></td>
<td></td>
<td>0.221</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Age</td>
<td>-0.0109*** (0.00371)</td>
<td>-0.0104***</td>
<td>-0.00854***</td>
<td>-0.0118***</td>
<td>-0.0109***</td>
<td>-0.00923**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency × Age</td>
<td>-0.00105 (0.00444)</td>
<td>-0.00342</td>
<td>-0.00634</td>
<td>0.00240</td>
<td>0.00188</td>
<td>0.000126</td>
<td>0.00046</td>
<td>0.00040</td>
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<tr>
<td>ERC × Age</td>
<td>0.0153** (0.00525)</td>
<td></td>
<td></td>
<td></td>
<td>0.0163***</td>
<td>(0.00570)</td>
<td></td>
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<tr>
<td>FS × Age</td>
<td>0.00496*** (0.00169)</td>
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<td></td>
<td>0.00608***</td>
<td>(0.00182)</td>
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<tr>
<td>FS Behind × Age</td>
<td>0.0165*** (0.00455)</td>
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<td>0.0198***</td>
<td>(0.00491)</td>
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<td>MM × Age</td>
<td>-0.00930** (0.00464)</td>
<td></td>
<td></td>
<td></td>
<td>-0.0144***</td>
<td>(0.00490)</td>
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<td>Education</td>
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</tr>
<tr>
<td>Self-Interest × Education</td>
<td>0.0163 (0.0149)</td>
<td>0.0133</td>
<td>0.0137</td>
<td>0.00230</td>
<td>-0.0247</td>
<td>-0.0222</td>
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<tr>
<td>Efficiency × Education</td>
<td>0.0183 (0.0191)</td>
<td>0.00764</td>
<td>0.0106</td>
<td>0.00209</td>
<td>0.0376*</td>
<td>0.046*</td>
<td>0.0310</td>
<td>0.0329*</td>
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<tr>
<td>ERC × Education</td>
<td>-0.0286 (0.0218)</td>
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<td></td>
<td></td>
<td>-0.0334</td>
<td>(0.0241)</td>
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</tr>
<tr>
<td>FS × Education</td>
<td>-0.00258 (0.00700)</td>
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<td>-0.0104</td>
<td>(0.00761)</td>
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<tr>
<td>FS Ahead × Education</td>
<td>0.00438 (0.0155)</td>
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<td>-0.0365**</td>
<td>(0.0168)</td>
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<tr>
<td>FS Behind × Education</td>
<td>-0.0128 (0.0185)</td>
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<td></td>
<td></td>
<td>-0.00290</td>
<td>(0.0201)</td>
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<td></td>
</tr>
<tr>
<td>MM × Education</td>
<td>-0.00630 (0.0194)</td>
<td></td>
<td></td>
<td></td>
<td>0.0246</td>
<td>(0.0201)</td>
<td></td>
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</tr>
<tr>
<td>Income</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency × Income</td>
<td>1.33e-05 (1.82e-05)</td>
<td>2.67e-05</td>
<td>1.37e-05</td>
<td>2.35e-05</td>
<td>3.75e-05</td>
<td>4.84e-05</td>
<td>3.63e-05</td>
<td>3.50e-05</td>
</tr>
<tr>
<td>ERC × Income</td>
<td>-2.33e-05 (3.56e-05)</td>
<td></td>
<td></td>
<td></td>
<td>-5.82e-06</td>
<td>(3.82e-05)</td>
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<tr>
<td>FS × Income</td>
<td>-8.62e-06 (1.07e-05)</td>
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<td></td>
<td>-6.61e-06</td>
<td>(1.27e-05)</td>
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<tr>
<td>FS Ahead × Income</td>
<td>-3.49e-05* (1.99e-05)</td>
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<td></td>
<td>-3.85e-05</td>
<td>(2.50e-05)</td>
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</tr>
<tr>
<td>FS Behind × Income</td>
<td>-3.30e-06 (2.92e-05)</td>
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<td></td>
<td>1.13e-05</td>
<td>(3.39e-05)</td>
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<tr>
<td>MM × Income</td>
<td>4.28e-05 (3.01e-05)</td>
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<td></td>
<td>-5.51e-06</td>
<td>(3.20e-05)</td>
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</tr>
<tr>
<td>Observations</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
<td>2.184</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

26
Table 9 breaks down personal characteristics interaction effects in the Network Assignment into Pairs and Others. We observe that female participants in the pairs behave more selfishly compared to female participants playing the role of Others – they care more about self-interest and feel worse when the inequality is to their disadvantage. Education affects the pairs’ preferences but not the Others. In particular, better educated pairs are less selfish, more averse to inequality, especially when inequality is to their advantage, and care more about the welfare of the worst-off person. Age and Income interaction effects, on the other hand, are not different across pairs and Others in an observable way.
Table 9: Interaction with Personal Characteristics (Pairs and Others)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Pairs</th>
<th>(2) Pairs</th>
<th>(3) Pairs</th>
<th>(4) Others</th>
<th>(5) Others</th>
<th>(6) Others</th>
<th>(7) Others</th>
<th>(8) MM</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>ERC</td>
<td>ERC</td>
<td>FS</td>
<td>MM</td>
<td>ERC</td>
<td>FS</td>
<td>MM</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Gender</td>
<td>0.212*  (0.119)</td>
<td>0.199*  (0.118)</td>
<td>0.189  (0.122)</td>
<td>0.182  (0.358)</td>
<td>0.321  (0.304)</td>
<td>0.148  (0.273)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency × Gender</td>
<td>-0.0177 (0.155)</td>
<td>0.0261  (0.172)</td>
<td>-0.0065 (0.162)</td>
<td>0.0299 (0.137)</td>
<td>0.229  (0.371)</td>
<td>0.327 -0.0366 (0.331)</td>
<td>0.324 (0.281)</td>
<td></td>
</tr>
<tr>
<td>ERC × Gender</td>
<td>0.223  (0.170)</td>
<td>0.232  (0.578)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS × Gender</td>
<td>-0.0801 (0.0590)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Ahead × Gender</td>
<td>-0.0241 (0.150)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Behind × Gender</td>
<td>-0.300** (0.132)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM × Gender</td>
<td>0.0831  (0.171)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Age</td>
<td>-0.0116** (0.00464)</td>
<td>-0.0108*** (0.00459)</td>
<td>-0.0111** (0.00473)</td>
<td>-0.0175 (0.0115)</td>
<td>-0.0172* (0.00917)</td>
<td>-0.0104 (0.00792)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency × Age</td>
<td>-2.36e-05 (0.00536)</td>
<td>-0.00180 (0.00603)</td>
<td>-0.00499 (0.00584)</td>
<td>0.0117  (0.00500)</td>
<td>0.0510  (0.00960)</td>
<td>0.006618 (0.00936)</td>
<td>0.00994</td>
<td></td>
</tr>
<tr>
<td>ERC × Age</td>
<td>0.0156** (0.00630)</td>
<td>0.0183  (0.0171)</td>
<td></td>
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<tr>
<td>FS × Age</td>
<td>0.00526** (0.00218)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>FS Ahead × Age</td>
<td>0.00304 (0.00510)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>FS Behind × Age</td>
<td>0.0180*** (0.00544)</td>
<td></td>
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<tr>
<td>MM × Age</td>
<td></td>
<td></td>
<td>-0.0145** (0.00636)</td>
<td></td>
<td>-0.0140* (0.00842)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Education</td>
<td>-0.0321 (0.0205)</td>
<td>-0.0352* (0.0206)</td>
<td>-0.0265 (0.0211)</td>
<td>-0.0637 (0.0458)</td>
<td>0.0546  (0.0342)</td>
<td>-0.0478 (0.0298)</td>
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<tr>
<td>Efficiency × Education</td>
<td>0.0264 (0.0255)</td>
<td>0.0414  (0.0288)</td>
<td>0.0296  (0.0273)</td>
<td>0.0383  (0.0234)</td>
<td>0.0547  (0.0378)</td>
<td>0.0420  (0.0351)</td>
<td>0.0238  (0.0338)</td>
<td>0.0394</td>
</tr>
<tr>
<td>ERC × Education</td>
<td>-0.0507** (0.0285)</td>
<td>0.0183  (0.0641)</td>
<td></td>
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</tr>
<tr>
<td>FS × Education</td>
<td>-0.0213** (0.0101)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>FS Ahead × Education</td>
<td>-0.0641** (0.0254)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Behind × Education</td>
<td>-0.0172 (0.0231)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>MM × Education</td>
<td>0.0749** (0.0296)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>-0.0342</td>
</tr>
<tr>
<td>Income</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Income</td>
<td>-2.99e-05 (2.71e-05)</td>
<td>-3.20e-05 (2.48e-05)</td>
<td>-4.70e-05 (2.98e-05)</td>
<td>-3.57e-05 (0.000113)</td>
<td>1.13e-05 (8.99e-05)</td>
<td>-1.69e-05 (7.98e-05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency × Income</td>
<td>3.55e-05 (2.46e-05)</td>
<td>5.21e-05 (2.83e-05)</td>
<td>2.34e-05 (2.75e-05)</td>
<td>2.04e-05 (2.22e-05)</td>
<td>0.000113 (0.000110)</td>
<td>0.0000149 (0.0000180)</td>
<td>0.000152 (9.94e-05)</td>
<td>9.73e-05</td>
</tr>
<tr>
<td>ERC × Income</td>
<td>-2.73e-06 (3.89e-05)</td>
<td></td>
<td>-7.06e-06 (0.000175)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FS × Income</td>
<td></td>
<td></td>
<td>7.12e-07 (1.25e-05)</td>
<td>-3.46e-05 (4.03e-05)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FS Ahead × Income</td>
<td>-2.10e-05 (2.42e-05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS Behind × Income</td>
<td>2.12e-05 (3.45e-05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM × Income</td>
<td>4.33e-05 (3.42e-05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.47e-05</td>
</tr>
<tr>
<td>Observations</td>
<td>1,442</td>
<td>1,442</td>
<td>1,442</td>
<td>1,442</td>
<td>742</td>
<td>742</td>
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<td>742</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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4.2.5. Social Preferences and Network Characteristics

The last set of results (Table 10) looks at how social preferences vary with network characteristics, namely how close the pairs are in terms of their relationship within the lineage network. We construct a “Relation” variable – a Coefficient of Human Relationships – to numerically express this degree of kinship in human genealogy.

The Coefficient of Human Relationships is defined over a scale of 0 to 1, where greater value indicates closer relationship. In the patriarchal lineage system in rural China, married couples form the basic units of the society, the coefficient for spouses is set to be 1. An offspring carries half the genes of each parent, so the coefficient for parent-offspring relationship is 0.5. Calculation of the coefficients for other relationships is provided in the Appendix.

Since the concept of network or relationship does not exist in Random Assignment, our analysis focuses on behaviors in Network Assignment. Moreover, since the relationship variable can only be calculated for the pairs, we exclude Others from our sample. We focus on in-group measures of social preferences in this subsection, because those are likely to be what in-group members are most concerned with and are more naturally affected by relationship. As a robustness check, we repeated the analysis using overall measures of preferences and included the results in the Appendix. They reveal almost identical pattern.

The upper panel of Table 10 presents relationship interaction effects. We observe that when voting with closer relatives, in-group members care less about self interest. We also notice that closer social relationship makes in-group members care more about both overall efficiency and in-group efficiency. In addition, in-group members playing with closer Relatives are more averse to in-group inequalities that are to their advantages. Namely, their sense of guilt increases with social proximity. The lower panel of Table 10 presents the triple interaction effects with relationship and with social pressure. The only statistically significant triple interaction effect is the one with in-group efficiency, meaning that pressure effect is more prominent on preference for in-group efficiency when the pair is closer. Since both overall efficiency and in-group efficiency are included in the regression, this also indicates that social pressure makes the more intimate pairs more fixated on their within-group gains even at the cost of the out-group member.
Table 10: Within Measure Relationship Interaction (Round 2- Pairs Only)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Within Strict</th>
<th>(2)Within</th>
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</thead>
<tbody>
<tr>
<td>Self-Interest × Relation</td>
<td>-0.178* (0.107)</td>
<td></td>
</tr>
<tr>
<td>Overall Efficiency × Relation</td>
<td>0.247** (0.125)</td>
<td>0.247** (0.125)</td>
</tr>
<tr>
<td>In-group Efficiency × Relation</td>
<td>0.289** (0.128)</td>
<td>0.200* (0.117)</td>
</tr>
<tr>
<td>In-group Inequality × Relation</td>
<td>-0.0907 (0.0729)</td>
<td></td>
</tr>
<tr>
<td>In-group Inequality (Ahead) × Relation</td>
<td>-0.180** (0.0878)</td>
<td></td>
</tr>
<tr>
<td>In-group Inequality (Behind) × Relation</td>
<td>-0.00180 (0.0928)</td>
<td></td>
</tr>
<tr>
<td>Self-Interest × Relation × Pressure</td>
<td>-0.0962 (0.226)</td>
<td></td>
</tr>
<tr>
<td>Overall Efficiency × Relation × Pressure</td>
<td>-0.310 (0.260)</td>
<td>-0.310 (0.260)</td>
</tr>
<tr>
<td>In-group Efficiency × Relation × Pressure</td>
<td>0.524** (0.267)</td>
<td>0.476* (0.244)</td>
</tr>
<tr>
<td>In-group Inequality × Relation × Pressure</td>
<td>0.175 (0.156)</td>
<td></td>
</tr>
<tr>
<td>In-group Inequality (Ahead) × Relation × Pressure</td>
<td>0.127 (0.184)</td>
<td></td>
</tr>
<tr>
<td>In-group Inequality (Behind) × Relation × Pressure</td>
<td>0.223 (0.200)</td>
<td></td>
</tr>
</tbody>
</table>

Observations 1,512 1,512

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

Economists in the past two decades have come to realize that human choices are not only driven by self-interest but also “social preferences” – a person’s concern over resources allocated to other people. Moreover, such preferences may be affected by the environment in which such choices are made, especially social networks and social pressure. To overcome the difficulties of identifying causal effects in observational studies and the lack of interpersonal relationships in lab experiments, we performed a lab-in-the-field experiment in rural China, where the lineage network structure is salient and relevant, and invited villagers to bring in their real-world social contacts to play an array of three-person allocation games. The variations in payoffs and the randomization of social pressure treatment allows us to identify social preference patterns as well as network effects and pressure effects. Our post-experiment survey collects information on demographics and the specifics of the interpersonal relationship between each pair of participants, which allows us to investigate (1) how participants perceive resources allocated to in-group and out-group members; (2) if members of dominant social groups have different social preference patterns; (3) if social preferences vary
with personal characteristics such as gender and age; (4) if variations in social preferences can be explained by social proximity.

Consistent with evidence shown in prior literature, we find that (a) in addition to self-interest, participants consistently display preference for social efficiency and distaste for inequality. Such social preferences are intrinsic and robust against alternative specifications. Moreover, social network or social pressure alone cannot alter behaviors. Social preference patterns, in particular inequality aversion, change only when the two forces are combined; (b) In-group members tend to be fixated on in-group gains and disregard the welfare of out-group members, and such fixation is often exacerbated by social pressure; (c) When playing with people in their networks, members of larger lineage groups, especially those in the position of pairs, tend to be less concerned with overall efficiency and inequality. They also seem not to feel as bad when the inequality is to their advantage; (d) Social preference patterns also vary with personal characteristics, such as gender, age, and education; (e) Closer social relationship makes in-group members care more about efficiency and inequality. Moreover, social pressure makes the more intimate pairs more fixated on within-group gains even at the cost of the out-group member.

This study is to our knowledge the first lab-in-the-field experiment that embeds both real-world social network and social pressure into allocation games. Our results not only provide empirical evidence for the social preference theories but also offer policy insights for the developing world. The democratization progress of many developing countries in Asia and Africa has been complicated by social network structures, especially when the in-group out-group division is salient. In this case, recognizing the possibility that in-group preferences may outweigh out-group preferences and yield economically inefficient outcomes is essential. Since social pressure and social network tend to have a combined effect that reinforces each other, policy makers must be careful in choosing an appropriate voting method. Secret ballot instead of show of hands, for example, may help alleviate in-group members’ fixation on in-group gains when they are under social pressure, and may help improve the welfare of the out-group members. In addition, since members of the dominant lineages consistently displayed less pro-social tendencies during the experiment, constraining the power they can wield in the decision-making process is important in enhancing the performance of rural democracy projects. Last but not least, since better educated participants are more pro-social during our experiment – they care more about overall efficiency and the welfare of the worst-off member and are more averse to inequalities that are to their advantages – having them more involved in village decision making could be beneficial.
References:


Appendix A: Experiment Materials

A1. Recruitment Material

Cornell University/Shandong University of Finance and Economics
Survey on Rural Social Networks and Preference for Public Goods
Participants Recruitment Material

<table>
<thead>
<tr>
<th>Study Name</th>
<th>Voting Games – A Social Network Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Type</td>
<td>Lab-in-the-Field Experiment</td>
</tr>
<tr>
<td></td>
<td>After obtaining village leader’s consent, we ask the village leaders to send out notices to households in the village and ask if they would like to participate in an experiment to earn some cash (50-90 RMB in total depending on their performance). If they agree, we will read them the oral consent and ask them to go to the specified location at the designated time.</td>
</tr>
<tr>
<td>Pay</td>
<td>All participants will earn cash payments ranging from 50RMB to 90RMB, depending on performance in the experiment</td>
</tr>
<tr>
<td>Duration</td>
<td>45- 60 minutes</td>
</tr>
<tr>
<td>Abstract</td>
<td>Play as voters in a series of allocation games</td>
</tr>
<tr>
<td>Description</td>
<td>To participants: In this experiment you and the other 8 participants will be asked to vote on a series of allocation plans. The experiment will take at most 45 minutes and will be followed by a short survey (where we ask for some basic information about yourself and your social interactions) that will take 15 minutes at most. Please feel free to bring along a relative or a friend of your own choice to the experiment. You can also come alone, and this will not affect your potential earning. Throughout the experiment you will get a compensation of 50 – 90 RMB, depending on your performance. The information you provide in the experiment as well as the survey will not be identifiable and will remain confidential.</td>
</tr>
<tr>
<td>Eligibility Requirements</td>
<td>Permanent resident of the sampled village. 18 to 65 years old. A balanced sample of male and female. Mentally and physically healthy.</td>
</tr>
<tr>
<td>Experimenter</td>
<td>Xin Gao (PhD student at Cornell University), <a href="mailto:xg68@cornell.edu">xg68@cornell.edu</a></td>
</tr>
<tr>
<td>Deadlines</td>
<td>Sign-Up: 1 hour(s) before the appointment</td>
</tr>
<tr>
<td></td>
<td>Cancellation: 24 hour(s) before the appointment</td>
</tr>
</tbody>
</table>
A2. Experiment Instruction

Rural Social Network and Preferences in Voting

Experiment Instructions

First of all, we would like to welcome you to today’s experiment. The experiment is a research project of our university that aims to understand how villagers make choices in voting.

Today’s experiment has 2 Rounds, with 1 Practice Game and 6 Games in each round. The experiment will take anywhere between 30 and 45 minutes. In each game, you will be assigned to a 3-person group along with two other people in this room to vote on a payoff allocation plan. The voting outcome of your group will determine your final monetary payoff in this experiment, so we encourage you to consider your decisions carefully. Please do not talk to other participants during the experiment. Please raise your hand and let us know if you have questions.

Round 1

We now begin Round 1 of the experiment. In this round, we will randomly assign any 3 people in this room to form a group. You will not know who your group members are, and your group members will not know who you are. In each game, you will receive 2 “plates”: a Red Plate and a Blue Plate. You will see yellow labels indicating ownership – who will get what amount of money if a certain plate is chosen – on the plates. For example, the row that is labelled “You” shows your payoffs if Red or Blue is chosen. The two rows labelled “Other” show payoffs to the other two members in your group if Red or Blue is chosen. We have also included the numerical values of payoffs in the brackets underneath the yellow labels.

The rules are as follows. In each game, the 3-person group will vote on an allocation plan by choosing either Red or Blue. The voting game follows a majority rule. Namely, if two or more than two members in a 3-person group voted for Red, then for this group we will implement the allocation plan shown on the Red Plate. That is, every member in this 3-person group will get the amount labelled “you” on the Red Plate. Similarly, if two or more members in a 3-person group voted for Blue, then for this group we will implement the Blue Plate. That is, every member in this 3-person group will get the amount labelled “you” on the Blue Plate. After each game, the experimenters will calculate votes and distribute payoff in cash to each participant.

Read to the Control Group. After each game, we will reassign group members to the 3-person group. Namely, in each game you will be voting with different group members and you will not know who they are. We will not reveal the votes of anyone at any time during or after the experiment, so no one will know what other participants voted for.

Read to the Treatment Group. After each game, we will reassign group members to the 3-person group. Namely, in each game you will be voting with different group members and you will not know who they are. After all games are finished, we will post the “result sheet” at the entrance of the room for participants to view. The result sheet has all participants’ votes in all games on it, which means your vote will be known to everyone at the end of the experiment.

Let us play a Practice Game now. It is “practice” in the sense that we will provide more explanations, but we will still make cash payments according to the voting outcome of your group. The 3 experimenters will now explain the game rules again individually (experimenters distribute Plates for Game 0, and explain rules again to OPs, Relatives, and Others respectively). Explanation script:

- Members of each 3-person group are randomly assigned; No one knows who the other members are;
- Indicate payoffs to “you” and “other” on both plates;
- Majority rule: If two other members voted for Blue while you voted for Red, you will get the allocation on the Blue Plate;
- Talking is prohibited. The plates you get are probably different from your neighbor’s so there’s no point talking or peeking;
- We will pay cash after each game;

We will now collect votes. Please do not say anything. Use your fingers to point out the plate of your choice (Red or Blue). The experimenters will write down each participant’s vote and calculate outcome for each group using the majority rule.

Experimenters calculate results and pay out cash.

We have now finished the Practice Game. Please let us know if you have questions.

Now let us proceed to the 6 formal games of Round 1.
**Round 2**

We now proceed to **Round 2** of the experiment. Different from the group assignment rule of Round 1, villagers that brought in relatives or friends will be assigned to the same group as their relatives/friends throughout the experiment, while the third member of the 3-person group will be randomly assigned before each game. Namely, the structure of any 3-person group is:

You       Your Relative/Friend       A Third Person (Unknown)

Similar to Round 1, each participant will see a Red Plate and a Blue Plate in each game. You will still see yellow labels indicating ownership, but they are slightly different from Round 1. The row that is labelled “You” shows your payoffs in Red and Blue. The row labelled “Your Relative” shows payoff to your relative or friend in Red/Blue, while the row labelled “Other” indicates payoff to the third unknown member in your group. We have also included the numerical values of payoffs in the brackets underneath the yellow labels.

We still follow the majority rule to determine voting outcome for each group. Namely, if two or more than two members in a 3-person group voted for Red, then for this group we will implement the allocation plan indicated by the Red plate. Similarly, if two or more members in a 3-person group voted for Blue, then for this group we will implement the Blue plate. After each game, the experimenters will calculate votes and distribute payoff in cash to each participant.

**Read to the Control Group:** Same as Round 1, we will not reveal the votes of anyone at any time during the experiment or after the experiment, so no one will know what other participants voted for.

**Read to the Treatment Group:** Same as Round 1, after all games are finished, we will post the “result sheet” at the entrance of the room for participants to view. The result sheet has all participants’ votes in all games on it, which means that your vote will be known to your relative/friend and the other member at the end of the experiment.

We start Round 2 with a “Practice Game”. Again, it is “practice” in the sense that we will provide more explanations, but we will still make cash payments according to the voting outcome of your group. The 3 experimenters will now explain the game rules individually (experimenters distribute Plates for Game 0, and explain rules again to OPs, Relatives, and Others respectively). *Explanation script:*

- Members of each 3-person group are: You, your relative/friend, and a third member that will be randomly assigned every game;
- Indicate payoffs to “you”, “relative” and “other” on both plates;
- Majority rule: If two other members voted for Blue while you voted for Red, you will get the allocation on the Blue Plate;
- We will pay cash after each game;

We will now collect votes. Please do not say anything. Use your fingers to point out the plate of your choice (Red or Blue). The experimenters will write down each participant’s vote and calculate outcome for each group using the majority rule.

*Experimenters calculate results and pay out cash.*

We have now finished the Practice Game. Please let us know if you have questions.

Now let us proceed to the 6 formal games of Round 2.

**Questionnaire**

*Experimenters distribute questionnaires*
### Table 11: Summary Statistics by Village

<table>
<thead>
<tr>
<th></th>
<th>Village 1</th>
<th>Village 2</th>
<th>Village 3</th>
<th>Village 4</th>
</tr>
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<tbody>
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<td>0.83</td>
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<td>0.59</td>
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<td>Age</td>
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<td>42.67</td>
<td>47.44</td>
<td>41.41</td>
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<td>8.08</td>
<td>7.72</td>
<td>7.56</td>
<td>8.00</td>
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<tr>
<td>Income</td>
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<td>816.67</td>
<td>1431.48</td>
<td>3055.56</td>
</tr>
<tr>
<td>Name Percentage</td>
<td>0.20</td>
<td>0.14</td>
<td>0.30</td>
<td>0.25</td>
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<tr>
<td>N</td>
<td>90</td>
<td>18</td>
<td>27</td>
<td>27</td>
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Appendix B: Supplementary Analysis

B1. Balance Check

Table 12: Covariate Balance (Control vs Treatment)

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<tr>
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<th>(1) Control</th>
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<th>(2) Treatment</th>
<th></th>
<th>(3) Difference</th>
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<th>t-Statistics</th>
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</thead>
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<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Difference</td>
<td>t-Statistics</td>
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<td>(-0.86)</td>
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<tr>
<td>Age</td>
<td>42.92</td>
<td>10.46</td>
<td>39.22</td>
<td>9.75</td>
<td>3.70*</td>
<td>(2.31)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
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<td>2.43</td>
<td>8.06</td>
<td>2.72</td>
<td>-0.22</td>
<td>(-0.53)</td>
<td></td>
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<tr>
<td>Income</td>
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<td>1924.64</td>
<td>1898.61</td>
<td>3728.06</td>
<td>31.16</td>
<td>(0.07)</td>
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<td>0.23</td>
<td>0.29</td>
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B2. Game-by-Game Comparison

Figure 7: Game 1 Variant 1

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<th>Round 2</th>
</tr>
</thead>
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<td>(2) Pressure</td>
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<tr>
<td>Person 1</td>
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<td>87.50%</td>
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<tr>
<td>Person 2</td>
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<td>Person 3</td>
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<th>(4)-(3) Change</th>
<th>p-value</th>
<th>(3)-(1) Change</th>
<th>p-value</th>
<th>(4)-(2) Change</th>
<th>p-value</th>
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<td>0.3173</td>
<td>3.33%</td>
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<td>0.0961</td>
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<td>6.67%</td>
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<td>0.3819</td>
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Figure 8: Game 1 Variant 2

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<th>Round 2</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Person 1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Person 2</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Person 3</td>
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<td>5</td>
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<th>Change</th>
<th>p-value</th>
<th>Change</th>
<th>p-value</th>
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<tr>
<td>5.83%</td>
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<td>12.50%</td>
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Figure 9: Game 1 Variant 3

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<tr>
<td>Person 1</td>
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</table>
### Figure 10: Game 2 Variant 1

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<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>No Pres</td>
<td>Pressure</td>
</tr>
<tr>
<td>Person 1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Person 2</td>
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</tr>
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<td>p-value</td>
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### Figure 11: Game 2 Variant 2

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<table>
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<td>Change</td>
<td>p-value</td>
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<td>0.7144</td>
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<td>30.00%</td>
<td>0.0285</td>
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Figure 12: Game 2 Variant 3

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</tr>
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Figure 13: Game 2 Variant 4

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<td>No</td>
</tr>
<tr>
<td>Person 1</td>
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<td>5</td>
</tr>
<tr>
<td>Person 2</td>
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<td>Person 3</td>
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B3. Coefficient of Human Relationship

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<th>Coefficient</th>
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<tr>
<td>Parent in-law and offspring in-law</td>
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<tr>
<td>Grand-parent and grand-son/daughter</td>
<td>0.25</td>
</tr>
<tr>
<td>Siblings</td>
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</tr>
<tr>
<td>In-law siblings</td>
<td>0.25</td>
</tr>
<tr>
<td>Parent’s siblings/ offspring’s siblings</td>
<td>0.125</td>
</tr>
<tr>
<td>Spouse’s sibling’s offspring</td>
<td>0.125</td>
</tr>
<tr>
<td>Cousins</td>
<td>0.0625</td>
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<tr>
<td>Non-relatives (neighbors, friends, etc.)</td>
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