Preferences, poverty, and politics:

Experimental and survey data from Vietnam

Tomomi Tanaka
California Institute of Technology
ttanaka@hss.caltech.edu

Colin F. Camerer
California Institute of Technology
camerer@hss.caltech.edu

Quang Nguyen
University of Hawaii
quangn@hawaii.edu

Abstract

We conducted choice experiments in Vietnamese villages to investigate how wealth, political history, occupation, and other demographic variables (from a comprehensive earlier household survey) are correlated with risk, time discounting and trust measured in experiments. In villages with higher mean income, people are less loss-averse and more patient. Results from a trust game demonstrate people in the south are more altruistic toward the poor: they invest more in the poor without expecting repayment. This pattern is consistent with the idea that private norms of redistribution from rich to poor are active in the south but are crowded out in the north possibly by communist public institutions, although we observe a strong overall positive effect of communism on reciprocity across all income groups. Our findings also suggest market activities, like starting a small trade business, are correlated with trust and trustworthiness. The experiments also expand methodology by using choices that separate different aspects of risk aversion and time preferences as suggested by earlier behavioral economics experiments.

JEL keywords: C93, D64, D81, D91

April 15, 2006. This research was supported by a Behavioral Economics Small Grant from the Russell Sage Foundation, Foundation for Advanced Studies on International Development, and internal Caltech funds to author Camerer. Comments from participants at the ESA meeting (Tucson, October 2005), SEA meeting (November 2005), SJDM (November 2005), audiences at Columbia, NYU, Bocconi (Milano), Emory, Hawaii, Caltech, UCSC, and anonymous readers were helpful. Thank you to our research coordinators, Phan Dinh Khoi, Huynh Truong Huy, Nguyen Anh Quan, Nguyen Mau Dung, and research assistants, Bui Thanh Sang, Nguyen The Du, Ngo Nguyen Thanh Tam, Pham Thanh Xuan, Nguyen Minh Duc, Tran Quang Trung, and Tran Tat Nhat. We also thank Nguyen The Quan, the General Statistical Office, for allowing us to access the 2002 household survey data.

A fundamental question in development economics is the extent to which economic success is linked to basic features of human preferences, particularly in countries with less developed economic institutions. If people are extremely averse to financial risk, they may be reluctant to create businesses that may have inherently risky cash flows. If people are impatient, they may be reluctant to educate their children because education is a long-term investment in future income. Similarly, if people are not very trusting or trustworthy, business development can be inhibited. Taken together, risk-aversion, impatience, and lack of trust may explain, in part, why people are poor. Of course, our focus on individual preferences does not imply other factors, like trade and economic institutions, are not important in explaining development (they surely are). The experimental measures simply give us a relatively precise way to separate the effect of preferences from those other factors, or see their interactions among preferences and institutions.

With this goal in mind, we conducted abstract experiments in Vietnamese villages to directly measure preferences of individuals over risk and time, and their trust and trustworthiness in a simple investment game. These economic and social preferences are often linked theoretically and empirically to poverty and to other economic and demographic variables. Our approach is different than some important field experiments which measure a particular effect of randomized assignment to a treatment dictated by a specific policy concern. In contrast, we collect a wide range of experimental measures of economic and social preferences and establish tentative correlations between those preference measures and measures of demographics and economic circumstances. For that purpose, Vietnam has several advantages as a field site:

1. A 2002 living standard survey conducted in Vietnam enabled us to link survey responses from individuals directly to experimental responses by the same individuals (with little sample attrition). Having the previous survey responses also enabled us to handpick a sample of villages with a wide range of average incomes (to study the effect of cross-village income differences better than some studies without such cross-village selection have done).

2. Vietnamese villagers are mostly poor but literate. As a result, it is both easy to motivate them with modest financial stakes, and easy to ensure they comprehend experimental instructions.[1]

[1] According to the World Bank (2005), 45 percent of the rural population lives below the poverty line. So modest experimental payments, by Western standards, amount to several days' wages. At the same time, the national literacy rate is around 90 percent (and is slightly higher in our sample), There are

3. Northern and Southern Vietnam have different political histories. Villages in the north moved rapidly toward collectivization under communism in the 1950s, while people in the south resisted collectivization (even after post-war unification in the 1970s).[2] This difference gives us a way to measure whether different histories of effective communism are correlated with economic and social preferences, while controlling to some extent for ethnicity, language, and national culture which is shared by the two regions.

4. The recent rise of household businesses in the market economy has created substantial variation in occupation and in household and village income (Jonathan Haughton and Wim P.M. Vijverberg, 2002, Dominique van de Walle and Dorothyjean Cratty, 2004). This occupation and income variation can then be correlated with preference measures.

5. We have data on participation in two types of rotating savings and credit associations (ROSCAs) by the experimental subjects. ROSCAs are informal self-help financial groups found in many developing countries, (F.J.A. Bouman, 1995). In a typical ROSCA, people meet on a regular basis; all participants agree to contribute modest sums of money to a pool on a periodic schedule (e.g., every week). One person in the pool is chosen to receive all the money in each period's pool, as determined by an initial meeting which fixed the order in which people receive the total pool (a "fixed" ROSCA), or by bidding for the right to collect the total pool in each meeting (a "bidding" ROSCA). The ROSCA cycle ends when every participant received the pool once. ROSCAs are generally thought to be a saving commitment device which enables people to accumulate lump-sums to invest in businesses, livestock and education (Table A.1) in the absence of banks[3] (Siwan Anderson and Jean-Marie Baland, 2002, Mary Kay Gugerty, 2005). Our data correlate preference parameters (such as risk-aversion measures and impatience) with ROSCA participation.[4]

---

only three countries which are both poorer (lower GNP per capita) and more literate-- Kyrgyzstan, Tajikistan, and Uzbekistan (World Bank, 2005).

[2] By 1986, less than 6 percent of the farmers in the south participated in cooperatives, while about 95 percent of farmers in the north belonged to cooperatives (Prabhu Pingali and Vo-Tong Xuan, 1992, Vo-Tong Xuan, 1995).

[3] The access to bank loans is limited in Vietnam. Among 225 households surveyed in 2002 in our study villages, only fourteen households (6 percent) had bank loans.

[4] "Fixed" ROSCAs and "bidding" ROSCAs are predominantly practiced in the north and south of the country, respectively.

Of course, in any cross-sectional study like this, it's difficult to infer the direction of causality from correlation: Do preferences cause economic circumstances (e.g., through business formation), or do circumstances create preferences (as described by Samuel Bowles (1998))? An ideal study would use randomized assignment to economic circumstances, or use observable instrumental variables which are correlated with preferences but not with circumstances or vice versa. While our exploratory study was designed to measure many things, it was not designed to infer causality from correlation.

However, one fact about Vietnam can be used to infer something about causality. In Vietnam, government policies strongly penalize inter-regional migration. Migrants are not recognized as permanent residents and cannot receive health care and public education. As a result, migration is rare (only six out of the 184 subjects in our study moved into their current villages in the last ten years). To the extent that people are stuck in their villages, any observed correlation between preferences and village economic variables is consistent with the interpretation that circumstances are causing preferences, rather than the other way around. This simple observation is no substitute for randomized assignment or for a clever instrumental variable, so we are hesitant to draw strong conclusions about causality from our design. Fortunately, the capacity to revisit these villages and do more experiments in the future could create more panel data that could permit stronger inferences about the direction of causality.

Besides contributing new data, our paper makes a methodological contribution to experimental development economics (Juan-Camilo Cardenas and Jeffrey Carpenter, 2005). Most previous instruments used to measure preferences in field sites were guided by simple models of risk and time preferences that can be characterized by one parameter. These simple models have often been rejected by experimental data in Western educated populations, in favor of models with multiple components of risk and time preference (Colin F. Camerer, 2000). For example, in expected utility theory (EU), risk preferences are characterized solely by the concavity of a utility function for money. But if risky choices are expressions of prospect theory preferences (Daniel Kahneman and Amos Tversky, 1979), for example, then utility concavity is not the only parameter influencing risk preferences— nonlinear weighting of probabilities, and aversion to loss compared to gain also influence risk preferences. Our instruments are designed to measure all three preference parameters in prospect theory, rather than just one in EU.

Similarly, we measure three parameters in a general time discounting model (conventional discount rates, immediacy preference or "present bias", and the degree of hyperbolicity or dynamic inconsistency), rather than just measuring a single exponential discount rate as in most other studies. If the simpler instruments are adequate approximations, then our richer instruments will deliver parameter values which affirm the virtue of the simple instruments (and the extra parameters measured will be uncorrelated with survey variables). Our results, in fact, indicate the extra parameters typically take on values which reject the simpler theories, and those parameter values are sensibly correlated with survey variables.[5] Our tests therefore show different aspects of risk aversion, and of time preference which can potentially be separated in abstract experiments in field sites.

Before proceeding to design details and results, it's useful to discuss how our approach compares to other field experiments (e.g., Cardenas and Carpenter, 2005). Field experiments in development are powerful tools for policy evaluation because they can randomize treatments in naturally-occurring decision making to see how well a specific policy works in a specific setting with a proper control group (see Esther Duflo (2005) for a review).

Our approach is different. Our study is designed to collect several different preference measures experimentally and correlate those measures with many different demographic and economic variables (from the previous household survey). The goal is to contribute basic tools for field experimentation and to generate tentative observations about many different areas of economic interest. No single result will be as conclusive as more targeted studies which explore a single effect in one region of one country but the policy-specific approach and our broad approach are complementary. Our study contributes tentative conclusions about many different correlations. More targeted studies explore a single correlation in depth. For example, Nava Ashraf, Dean Karlan and Wesley Yin (forthcoming) found that a product which offered committed savings increased savings in a small rural bank in the Philippines. Their study is

[5] Some readers of this paper have remarked that measuring prospect theory risk parameters and hyperbolic discounting parameters is a small contribution because these phenomena are so well-understood from previous lab experiments, typically (though not exclusively) with Western college students as subjects. But other readers have said the opposite: Why go to the trouble of measuring those parameters, given the adequacy and familiarity of EU and exponential discounting? The fact that thoughtful readers can so squarely disagree, in our view, is a good reason to measure the extra parameters, to find out what values they take (and how difficult it is to measure them) and help resolve the difference of opinion and practice.

consistent with the idea that some savers discount hyperbolically, and will choose external commitment, and their choice is linked to experimentally-measured hyperbolic discounting. The study covers only one bank in one region and does not link hyperbolic discounting parameters to all the other variables measured in our survey data. Targeted studies like Ashraf et al.'s tell broader studies like ours what to look for. Broader studies like ours give a rich set of tentative results for more targeted studies like Ashraf et al.'s to explore more carefully. Accumulation of regularity will come fastest from doing both types of studies.

Our broad exploratory study therefore contributes evidence about many different links between preference measures and economic activity. To give a taste of the most important findings reported below, we focus on three patterns: (1) People in villages with higher mean income tend to be less loss-averse, but not less risk-averse (in the sense of concavity of monetary utility), and are also more patient and less present-biased. (2) Villagers in the south are more altruistic toward the poor: they invest more in the poor group without expecting repayment. This pattern is consistent with the interpretation that communist norms are internalized in higher levels of overall trust, but that crowding-out leads northerners to feel less obliged to help the poor in their village. (3) ROSCA participants differ by which type of ROSCA they participate in. Those in bidding ROSCAs (where you can pay more to receive a lump sum early) are more risk-averse, impatient, and present-biased. Those in fixed-order ROSCAs are less risk-averse, more patient, and less present-biased. This clear separation shows how measuring preferences could be useful in choosing the type of villager that a ROSCA attracts.

I. Selection of research sites and research methods

In July-August 2005, trust game, risk, and time discounting experiments were conducted with members of households who were previously interviewed during a 2002 living standard measurement survey.[6] In the 2002 survey, 25 households were interviewed in each of 142 and 137 rural villages in the Mekong Delta (in the South) and the Red River Delta (in the North, excluding villages in Hanoi City). Figure A.1 in the Appendix shows the mean income and Gini coefficient of all 279 villages surveyed in 2002. From these, we chose nine villages, five villages

[6] The 2002 living standard survey covers total 75,000 households in Vietnam. The sample design was self-weighted, that is, each household had the same probability of being selected.

in the south and four villages in the north, with substantial differences in mean income, inequality, and market access to permit statistically powerful cross-village comparisons.[7] Figure 1 shows the locations of the selected villages.[8]

Some descriptive statistics about the nine experimental village sites are given in Table 1. See Table 2 for variable definitions. The southern villages are indexed by S1, S2, S3, S4, and S5 (where S1 indexes the highest village wealth and S5 indexes the lowest), and northern villages are indexed by N1, N2, N3, and N4, respectively. Training experiments were also done with students in universities in the north and south (we refer to those data as student or non-field data, to distinguish them from the villager field data). These sessions were used to train our assistants and also provide a useful check on whether the less educated villagers' responses reflect more confusion than in student data. (They generally do not.)

Table 3 summarizes correlations between key variables. Education correlates negatively with age (-0.44 and -0.28 in the south and north), positively with income (0.11 and 0.22), and positively with government officer service (0.25 and 0.23). Income correlates negatively with farming—farmers were left behind in the economic boom in the 1990s—and, not surprisingly, income correlates strongly with overseas remittances to households (it is a large portion of income). Most of the correlations among demographic variables are not vary large, so multicollinearity between variables will not do much harm in multiple regressions.

A week before the experiments, research coordinators contacted local government officials in each research site, and asked them to invite one person from each of the 25 previously surveyed households to the experiments.[9] Thanks to the power of the government to encourage attendance, the response rate was high (82 percent), which limits concern about self-

[7] According to the 2002 survey, residents of the selected villages are predominantly Buddhists, except for Villages S1 and S2 where there are a considerable number of Christians.

[8] Villages S1 and S3 are in Can Tho City, Village S2 is in Ca Mau Province, Villages S4 and S5 are in Tra Vinh Province, Villages N1 and N2 are in Vinh Phuc Province, and Villages N3 and N4 are in Thai Binh Province.

[9] We also requested them to prepare one extra subject in case the total number of subjects turned out to be an odd number (because an even number of subjects are needed to play the trust game). In three out of nine villages, an odd number of subjects showed up to the experiment. In those villages, we included an additional subject in the experiment to create an even number in order to do pairwise trust game matching. We did not have 2002 survey data from these "equalizer" subjects. We followed village officials' advice on placing the additional subjects into respective income categories.

selection in participation. Figure A.2 in the Appendix shows pictures of all research sites (village meeting rooms or school classrooms).

Before the experiments, potential subjects were divided into three groups, H, M and L (high, medium, and low) based on their wealth, combining income and spending measures from the 2002 survey.[10] Experiments started at approximately at nine o'clock in the morning, and lasted about four hours.[11] For student subjects in the West, experiments are like a temporary part-time job performed for money and out of curiosity. For Vietnamese villagers, the experiments are a serious matter as experiment rewards often represent several days' income. Their motivation is helpful for doing many measurements in a single, long experimental session.

Groups H, M and L were called Groups A, B, and C in the field experiments. Subjects were assigned ID numbers upon arrival. Their IDs are numbered by A1, A2,…, B1, B2, …. C1, C2,.. Subjects in Groups A, B, C were given white, yellow, and red ID tags and folders, respectively. After all subjects arrived, we assigned them seats according to their subject IDs. Subjects in Group A, B and C were seated on the right, middle and left sides of the room, respectively. They were not told the grouping was based on wealth, because we did not want to induce demand effects (i.e., a presumption, inferred from visible categorization, that wealth categories should matter) but most people in these small villages know each other and their approximate wealth very well.[12] Subjects were then given instructions and record sheets for each game separately. Illiterate subjects (8 percent) were given verbal instruction by research assistants. Subjects who had difficulty completing record sheets by themselves were also helped by research assistants who carefully avoided giving instructions about how to answer. The

[10] To create H, M and L groups we ranked households by their total income, per capita household income and per capita expenditure using the 2002 living standard measurement, respectively. If a household is within top eight in all three criteria among 25 households, or two criteria are within the top eight and the other criterion is in the middle range (ranking between 9 and 16), then the household is categorized as Group H. If all three criteria are within the bottom 8 among the 25 potential households, or two criteria are within the bottom 8 and the other criterion is in the middle range, then the household is categorized as Group M. The rest of households are categorized as Group L.

[11] Trust game, risk and time discounting experiments took approximately two hours, one hour and one hour, respectively.

[12] If subjects did not recognize the wealth-category distinctions, then there should be no differences in their behavior toward others in different categories. As we see below, there are such differences, which is evidence for the joint hypothesis that they recognized wealth differences and the perceived differences influenced their behavior.

average experimental earning for three games was 174,141 dong (about 11 dollars[13], roughly 9 days' wages for casual unskilled labor).

In the south, experiments were conducted by an experimenter Huynh Truong Huy, who is a lecturer at Can Tho University, with the assistance of five research assistants, Bui Thanh Sang, Nguyen The Du, Ngo Nguyen Thanh Tam, Pham Thanh Xuan, and Nguyen Minh Duc (undergraduate students at Can Tho University), and two of the authors (Tanaka and Nguyen). We conducted two experiments with student subjects at Can Tho University to train the research assistants and experimenter Huy. We divided subjects by academic years (1st, 2nd and 3rd years, labeled A, B and C).[14] The two student sessions in the south are indexed by SS1 and SS2. In order to make the experimental protocol consistent in the south and north, we took four research assistants from the south to the north, and obtained two new research assistants in the north. To train new research assistants, we conducted an experiment with student subjects at Hanoi Agricultural University. This time, subjects are classified into groups A, B and C by GPAs (A corresponding to high GPA). The student session in the north is indexed by SN1. Quang Nguyen, the third author, became an experimenter in the north. We changed an experimenter to account for the differences in accents across two regions and to improve comprehension. In each session, we ran the trust game, risk experiment, and time discounting experiment in that order.

II. Risk

Ravi Kanbur and Lyn Squire (2001) describe the risk attitude of the poor as "a feeling of vulnerability." Market fluctuations and natural disasters could put these villagers in a state of having little or losing what little they have. Most previous studies of risk preferences conducted experiments with lotteries involving only gains,[15] and applied expected utility theory (EU) in their analysis (Hans P. Binswanger, 1980, 1981, Joseph Henrich and Richard McElreath, 2002,

[13] The exchange rate between Vietnamese Dong and US Dollar does not fluctuate very much. On July 23 2005, the exchange rate was 15,880 Dong for one US Dollar, while the exchange rate was 15,947 Dong for one Dollar on July 23, 2002.

[14] The group distinctions in the student sessions were not created by income categories (since we did not have income data about the students). The three groups were created just to practice the procedure with the experimental assistants.

[15] Nielsen (2001) included lotteries with losses but they were hypothetical. Wik and Holden (1998) and Yesuf ('2004) had risk games with both gains and losses.

Uffe Nielsen, 2001, Mette Wik and Stein Holden, 1998, Mahmud Yesuf, 2004). We conduct experiments with lotteries involving gains and losses (to measure loss-aversion), and consider prospect theory as an alternative theoretical framework to EU.

Empirical evidence suggests wealthier households invest in more risky productive activities, and earn higher returns (Marcel Fafchamps and John Pender, 1997, Mark R. Rosenzweig and Hans P. Binswanger, 1993). In development economics (and contract theory generally), it's usually assumed the rich landlord is risk-neutral while the poor tenant is risk-averse (Pranab Bardhan and Christopher Udry, 1999, Avishay Braverman and Joseph E. Stiglitz, 1982). However, previous field experiment studies give mixed results on wealth and risk preferences. Binswanger (1980, 1981) and Mosley and Verschoor (2005) found no significant association between risk aversion and income. Henrich and McElreath (2002) demonstrate wealthier groups are not necessarily risk-prone. Nielsen (2001) finds positive relations between wealth and risk aversion, while Wik and Holsen (1998) and Yesuf (2004) find negative correlations between wealth and risk aversion. However, they used EU and mix gain-only and gain-loss gambles in their analysis, making it difficult to tell whether risk aversion comes solely from the concavity of utility function. Observations from many experiments and the field also suggest there is a disproportionate aversion toward loss compared to equal-sized gains (e.g., Colin F. Camerer (2000)).

In EU, risk aversion is expressed solely by the concavity of utility function. Prospect theory differs from EU in two respects. First, people have non-linear decision weights over probabilities. Most experimental evidence suggests people act as if they overweight small-probability outcomes and underweight large-probability outcomes.[16] Secondly, in prospect theory, carriers of utility are the difference between outcomes and a reference point, rather than final wealth positions. Diminishing sensitivity to gain and loss magnitudes implies concavity of utility for gains (implying risk-aversion in EU), but implies convexity of disutility for losses (risk preference in the loss domains). Furthermore, there is much evidence that people dislike losses roughly twice as much as they like equal-sized gains, a regularity called "loss-aversion". We use cumulative prospect theory (Amos Tversky and Daniel Kahneman, 1992) and the one-parameter form of Drazen Prelec's axiomatically-derived weighting function (1998) as follows:

[16] James Hansen, Sabine Marx and Elke Weber (2004) illustrate the effects of subjective probabilities on farming decisions in Argentina and Florida.

$$U(x,p;y,q)=\begin{cases} w^{+}(p+q)v(x)+w^{+}(q)(v(y)-v(x)), & 0<x<y \\ w^{-}(p+q)v(x)+w(q)^{-}(v(y)-v(x)), & y<x<0 \\ w^{-}(p)v(x)+w^{+}(q)(v(y)), & x<0<y \end{cases}$$

where $v(x)=\begin{cases} x^{\sigma} & \text{for} \quad x>0 \\ -\lambda(-x^{\sigma}) & \text{for} \quad x<0 \end{cases}$

and $w(p)=\exp[-(-\ln p)^{\alpha}]$

$U(x,p;y,q)$ is the expected prospect value over binary prospects consisting of the outcome x with the probability p and the outcome y with the probability q. $v(x)$ denotes a power value function. σ represents concavity of the value function, and λ represents the degree of loss aversion. The weighting function is linear if $\alpha=1$, as it is in EU. If $\alpha<1$, the weighting function is inverted S-shaped, i.e. individuals overweight small probabilities and underweight large probabilities. If $\alpha>1$, then the weighting function is S-shaped, i.e. individuals underweight small probabilities and overweight large probabilities. We use Prelec's weighting function because it is flexible enough to accommodate the cases where individuals have either inverted-S or S-shaped weighting functions, and has fit previous data reasonably well.[17]

We designed a risk experiment which can separate the three separate parametric contributors to risk aversion, encompassed by prospect theory. If the estimated α and λ are close to one, then expected utility would have been a good approximation and future studies can save time by using simpler instruments.

To elicit the three prospect theory parameters, we designed three series of paired lotteries as shown in Table 4. Look at Series 1 first. Each row is a choice between two binary lotteries; subjects pick one of the two lotteries. The difference in expected value between the lotteries (A relative to B) is shown in the right column. Notice as one moves down the rows, the higher payoff in Option B increases and everything else is fixed. Most individuals choose Option A in

[17] Harbaugh, Krause and Vesterlund (2000), and Real (2002) show that contrary to the standard assumption of prospect theory, children and bees have S-shaped weighting functions, underweighting small-probability outcomes and overweighting large-probability outcomes. (Real's study does not control for concavity of the utility of nectar, however, and may therefore misidentify curvature of the weighting function.) Humphrey and Verschoor (2004) claim that in Ethiopia, Indian and Uganda, some individuals make choices which are consistent with S-shaped weighting functions. However, they use only three probabilities, 25 percent, 50 percent and 75 percent, and simple gambles. It is arguable whether 25 percent and 75 percent are small and large enough to identify overweighting and underweighting of probabilities.

the first row and, as the high potential payoff in Option B increases going down the rows, switch to preferring B over A. The largest payoff, 1.7 million dong (about 107 dollars), is equivalent to over 80 percent of the annual income of Group L in Village N4. Series 2 is similar, but with different payoffs and probabilities. An expected-value maximizer should switch from Options A to B in the seventh row of Series 1 and switch at the first row of Series 2. Series 3 involves both gains and losses. In this series, the amount that can be lost in Option A increases across rows and the amount that can be lost in Option B falls across rows. The later they switch from A to B, the more averse they are to losses.

The choices are carefully designed so any combination of choices in the three series determines a particular combination of prospect theory parameter values. Table 5 illustrates the combinations of approximate values of σ (parameter for the curvature of power value function), α (probability sensitivity parameter in Prelec's weighting function), and λ (loss aversion parameter) for each switching point. "Never" indicates the cases in which a subject does not switch to Option B. σ and α are jointly determined by the switching points in Series 1 and 2. For example, suppose a subject switched from Option A to B at the seventh question in Series 1. The combinations of (σ,α) which can rationalize this switch are (0.4, 0.4), (0.5, 0.5), (0.6, 0.6), (0.7, 0.7), (0.8, 0.8), (0.9, 0.9) or (1, 1). Now suppose the same subjects also switched from Option A to B at the seventh question in Series 2. Then the combinations of (σ,α) which rationalizes that switch are (0.8, 0.6), (0.7, 0.7), (0.6, 0.8), (0.5, 0.9), or (0.4, 1). By intersecting these parameter ranges from Series 1 and 2, we obtain the approximate values of $(\sigma,\alpha)=(0.7, 0.7)$.[18] Predictions of (σ,α) for all possible combinations of choices are given in Table A.2 in the Appendix.

The loss aversion parameter λ is determined by the switching point in Series 3. Notice that λ cannot be uniquely inferred from switching in Series 3; the range of λ values that are implied by each switching point depends on the utility curvature σ. However, questions in

---

[18] When a subject switches from Option A to B at the seventh questions in both Series 1 and 2, the following inequalities should hold.

$$40000^{\sigma}\exp[-(-\ln.3)^{\alpha}]+10000^{\sigma}\exp[-(-\ln.7)^{\alpha}]>125000^{\sigma}\exp[-(-\ln.1)^{\alpha}]+5000^{\sigma}\exp[-(-\ln.9)^{\alpha}],$$

$$40000^{\sigma}\exp[-(-\ln.3)^{\alpha}]+10000^{\sigma}\exp[-(-\ln.7)^{\alpha}]<150000^{\sigma}\exp[-(-\ln.1)^{\alpha}]+5000^{\sigma}\exp[-(-\ln.9)^{\alpha}],$$

$$40000^{\sigma}\exp[-(-\ln.9)^{\alpha}]+30000^{\sigma}\exp[-(-\ln.1)^{\alpha}]>65000^{\sigma}\exp[-(-\ln.7)^{\alpha}]+5000^{\sigma}\exp[-(-\ln.3)^{\alpha}],$$

and $$40000^{\sigma}\exp[-(-\ln.9)^{\alpha}]+30000^{\sigma}\exp[-(-\ln.1)^{\alpha}]<68000^{\sigma}\exp[-(-\ln.7)^{\alpha}]+5000^{\sigma}\exp[-(-\ln.3)^{\alpha}].$$

The ranges of σ and α that satisfy the above inequalities are $0.65<\sigma<0.74$ and $0.66<\alpha<0.74$. The point $(\sigma,\alpha)=(0.7, 0.7)$ satisfies the condition.

Series 3 were constructed to make sure that λ takes similar values across different levels of σ. The probability sensitivity parameter, α, plays no role in Series 3 since all prospects involve equal (50 percent) chances of gain and loss, so the probability weighting terms drop out in calculating prospect values.

We enforced monotonic switching by asking subjects at which question they would "switch" from Option A to Option B in each Series. They can switch to Option B starting with the first question (i.e., they can choose Option B in every row). Also, they do not have to switch to Option B at all.[19] After they completed three series of questions with the total of 35 rows, we draw a numbered ball from a bingo cage with 35 numbered balls, to determine which row of question will be played for real money. We then put back 10 numbered balls in the bingo cage and played the selected lottery.

Table 6 shows the distributions of choices made by subjects. Notice in the field experiments, there are a number of subjects who did not switch in one or more of the three groups of questions. The mean values of (σ, α) are (0.52, 0.72), (0.59, 0.74) and (0.63, 0.74) for student subjects, non-student subjects in the south and north, respectively. These values are similar to the corresponding means of (0.48, 0.74) in George Wu and Richard Gonzalez (1996) laboratory experiments with Western students, and are close to other estimates with slightly different functional forms.[20]

We estimated nonlinear weighting (α) and curvature of the utility function (σ) by OLS regressions of individual-specific parameter estimates against demographic variables, and loss-aversion (λ) by interval regressions using maximum likelihood techniques.[21] The regression

---

[19] The instructions gave three examples. In one example a subject switches at the sixth question, in one example the subject chooses option A for all questions, and in one example the subject chooses Option B for all questions. The three examples were given to help ensure that subjects do not feel that they are forced to switch.

[20] Tversky and Kahneman's (1992) estimated values of σ and α are 0.88 and 0.61, respectively, using a different weighting function than we used (the single-parameter TK version) and a very different procedure. However, Prelec's weighting function and the TK weighting function yield nearly identical results.

[21] We conducted OLS and interval regressions using robust (Huber/White/sandwich) standard error estimates. The interval estimation was conducted using the 'intreg' command in STATA 9. Table A.3 in the Appendix reports regressions for σ and α in which 26 subjects who never switch either in series 1 or 2 are omitted. Omitting the nonswitchers never changes the signs of coefficient estimates and does not change significance in important ways. Separate regressions for North and South data are shown in Table A.4 in the Appendix as well. We also ran regressions excluding insignificant variables for the

results are shown in Table 7. Looking first at σ (curvature of the utility function), the strongest effects suggest subjects who are more educated, elder and those living far from markets are more risk-averse, and fishermen[22] are less risk-averse.[23] Furthermore, bidding-ROSCA participants are more risk averse than fixed-ROSCA participants.[24] This is consistent with Stefan Klonner's (2003) hypothesis that bidding ROSCAs are preferred to fixed ROSCAs by risk averse individuals who experience income uncertainty.

The other two regressions indicate nonlinear weighting (α) and loss-aversion (λ) vary systematically with economic and demographic parameters as well. Male subjects have more inflected probability weights (lower α) than female subjects and subjects in wealthier villages have more inflected weights.[25] The interval regression of λ shows village mean income is correlated with reduced loss aversion, and living in the south is correlated with higher loss aversion. Wealthy villages may be able to provide "social insurance" which spreads risks of loss among villagers. The significant coefficients of the "South" dummy variable suggest the possible influence of political regime. People in the north worked on collective farms for many years, and the government provided them with food for subsistence, so the social safety net may be

---

estimations of σ, α, and λ, respectively, and confirmed that all the significant variables in the full specification remain significant after the exclusion.

[22] Håkan Eggart and Peter Matinsson (2003) found that Swedish fishermen act as if they have linear monetary utility.

[23] To compare the predictions of risk preferences under Prospect Theory and EU, we also calculated the CRRA (Constant Relative Risk Aversion) coefficient r under the assumption of the utility function $U(x) = x^{1-r}/(1-r)$, which is commonly used in the expected utility theory literature (Charles A. Holt and Susan K. Laury, 2002). The range of the coefficient for each switching point in Series 1 and 2 is shown in Table A.5 in the Appendix. r>0, r=0, and r<0 implies risk-loving, risk-neutral, and risk-aversion, respectively. Table A.6 shows the interval estimation results of the CRRA coefficients for Series 1 (r_1) and Series 2 (r_2). In Figure A.3, r_1 and r_2 pairs are plotted taking r_1 as the x-axis and r_2 as the y-axis. Each subject contributes one point to the plot. Although r_1 and r_2 are correlated (correlation coefficient is 0.495 and $r_2 > r_1$, for all but one subject), the mean estimated values of r_1 and r_2 differ quite significantly, i.e., r_1=0.10 and r_2=0.61. This implies that most subjects are considered risk-neutral in Series 1 and risk-averse in Series 2 under EU.

[24] Fixed ROSCAs and bidding ROSCAs are practiced in the north and south, respectively. The results from separate regressions for each region (see Table A.4) show that ROSCA participants are not significantly different from non-participants in each region. However, when we pool data across two regions, we find that bidding-ROSCA participants in the south are more risk averse than fixed-ROSCA participants in the north.

[25] Fehr-Duda et al. (2005a,b) report the opposite gender effect for Swiss students. The difference may be due to the fact that Vietnamese males are known to like to gamble (see Petry et al. (2003), on Southeast Asian immigrants to the US, and Margot Cohen (2001) on urban lottery participation).

reflected in less aversion to losses. There is weak evidence that government officers are less loss averse, consistent with the hypothesis that having secure income sources makes individuals less loss averse. The predicted value of λ from the interval regression is 2.63. It is close to the 2.25 estimated by Tversky and Kahneman (1992) and to other studies at many different levels of analysis, ranging from capuchin monkeys exchanging tokens for food, to resistance to trade reforms (e.g., Tech H. Ho, Noah Lim and Colin Camerer, in press).[26]

The estimation results indicate the potential value of separating the sources of risk-aversion into the three components suggested by prospect theory. A few other studies have shown the poor to be more risk-averse, but those studies cannot separate concavity and loss-aversion. In our regressions using prospect theory, the effect of village income is evident in reduced loss-aversion but not in less concavity of utility. Perhaps village wealth cushions against loss, rather than fluctuation.

III. Time discounting

Time discounting is another fundamental preference which may affect wealth accumulation. In the conventional exponential model, goods received at time t are weighted $(\frac{1}{1+r})^t$ or δ^t (e^{-rt}) (in the continuous form), where r is a discount rate and δ is the associated discount factor. A higher value of r means future rewards receive less weight; higher r implies greater impatience.

Most studies linking discount rates to wealth in both developed and developing societies show richer people are more patient (lower r).[27] Jerry Hausman (1979), Emily C. Lawrence (1991) and Glenn W. Harrison, Marten I. Lau and Melonie B. Williams (2002) report this relation in the United States and Denmark; John L. Pender (1996), Nielsen (2001) and Yesuf (2004) also report it in India, Madagascar, and Ethiopia, respectively (and attribute it to limited

[26] There is little education effect on the variations of the estimated parameters across subjects. The standard deviations of σ, α, and λ for the group of individuals with less than 6 years of school education (69 subjects), 6 to 8 years of education (59 subjects) and more than 8 years of education (53 subjects) are (0.36, 0.28, 0.30) for σ, (0.31, 0.32, 0.32) for α, and (1.33, 1.42, 1.49) for λ, respectively. This indicates that subjects who are less likely to be confused are not giving less variable responses, which gives us some assurance that subjects were not confused in general.

[27] Gary S. Becker and Casey B. Mulligan (1997) constructed a model which predicts how wealth affects time preferences, making richer people more patient.

access to credit markets for the poor). Kris N. Kirby et al. (2002) and C. Leigh Anderson et al. (2004) did *not* find a wealth-patience relation in Bolivia and Vietnam, but their villages did not have as much income variation as we were able to design in by handpicking villages.

Most earlier studies use exponential discounting (C. Leigh Anderson, et al., 2004, Uffe Nielsen, 2001, John L. Pender, 1996), which has often been used to explain consumption (Angus Deaton, 1991, 1972). Only one field study estimated hyperbolic discounting (Kris N. Kirby, et al., 2002). The general model we estimate allows us to test both exponential, "quasi-hyperbolic discounting", and a more general form. Exploring a more general specification could be insightful because there are many experimental regularities that cannot be explained by exponential discounting (Shane Frederick et al., 2002). For example, measured discount rates tend to decline over time[28] and exhibit a "present bias" or preference for immediate reward.[29] David Laibson (1997) proposed an elegant (β, δ) "quasi-hyperbolic" discounting model in which current rewards get a weight of one and future rewards receive a weight of $\beta\delta^t$. The two parameters separate present bias and tradeoff between future time points. This simple formulation has been used to study procrastination, retirement planning, deadlines, addiction, and gym membership (B. Douglas Bernheim et al., 2001, Stefano DellaVigna and Ulrike Malmendier, 2006, Peter Diamond and Botond Koszegi, 2003, David I. Laibson, et al., 1998, Ted O'Donoghue and Matthew Rabin, 2001, 1999).

In our experiments, we give a long series of choices between small rewards delivered today, and larger rewards delivered at specified times in the future (see Table A.7 in the Appendix). This battery of pairwise choices permits estimation of a clever three-factor model developed by Benhabib, Bisin and Schotter (2004). The model values a reward of y at time t according to yD(y,t) where

$$yD(y,t) = \begin{cases} y & if \quad t = 0 \\ \beta(1-(1-\theta)rt)^{\frac{1}{1-\theta}} y & if \quad t > 0 \end{cases} \qquad (1)$$

The three factors r, β and θ separate conventional time discounting (r), present-bias (β) and hyperbolicity (θ) of the discount function. When θ=1 and β=1, the equation reduces to

[28] See Richard Thaler (1981), Uri Benzion et al. (1989), George Loewenstein and Drazen Prelec (1992), and John L. Pender (1996).

[29] See David Laibson (1997), David Laibson et al. (1998), Ted O'Donoghue and Matthew Rabin (1999), and George-Marios Angeletos et al. (2001).

exponential discounting. When $\theta=2$ and $\beta=1$, it reduces to true hyperbolic discounting. When $\theta=1$ and β is free, it reduces to quasi-hyperbolic discounting. When $\theta>2$ the function is "hyper-hyperbolic"—the second derivative of the discount factor $D(y,t)$ is even higher than for a hyperbolic. The three-parameter form enables a way to compare three familiar models at once.

We used 15 combinations of y and t in the experiments, i.e. 30,000, 120,000 and 300,000 dong with the delays of one week, one month and three months, and 60,000 and 240,000 dong with the delays of three days, two weeks and two months (see Table A.7 in the Appendix for all combinations). The largest amount of y, 300,000 dong (about 19 dollars), is equivalent to 15 days of wage in the rural north.

For each (y,t) combination, we asked five questions, with x equal to 1/6, 1/3, 1/2, 2/3, and 5/6 of the value of y. Subjects were presented with a total of 75 choices between two options:

Option A: Receive x dong today.

Option B: Receive y dong in t days.

Subjects gave a switching point from preferring B to A in each series of five questions. Before subject made choices, we suggested a trusted agent who would keep the money until delayed delivery date to ensure subjects believed the money would be delivered. The selected trusted persons were usually village heads or presidents of women's associations. In some villages, the trusted agents were also experimental subjects. Agreement letters of money delivery were signed between the trusted agents and the first author. We cannot be certain that the money amounts were delivered as promised. However, if villagers thought they could get the money earlier, they would act very patiently, and they did not. After subjects completed all 75 questions, we put 75 numbered balls in the bingo cage and drew one ball to determine which pairwise choice would be paid. The option chosen for that question (i.e. A or B) determined how much money was delivered, and when.

Table 8 shows the results from regressing estimates of Equation (1), allowing r (or ß) to depend on demographic variables.[30] For each subject, there are fifteen observations. We pooled

[30] We consider middle points as indifferent points. We dropped data of 3 subjects, since they totally randomized their choices. The estimates also exclude 315 observations which included inconsistencies. Inconsistency means that a subject would accept a longer delay of a larger amount y, rather than taking x earlier, but would not wait for a shorter delay for the same y and x. (For example, if an agent chooses 10,000 dong today over 60,000 dong with three days of delay, but is willing to wait 2 months to receive 60,000 dong rather than receiving 10,000 dong today, their answers are inconsistent.).

data across all subjects and estimated Equation (1). In order to obtain robust variance estimates with repeated observations on individual subjects, we specified that the observations are independent across observations, but not within subjects. The estimated value of θ is around 5.3, which is similar to Benhabib et al.'s (2004) estimates.

The largest effects are on discount rates r. Farmers, fishermen, and government officers are more patient (lower r). Village mean income is negatively correlated with the discount rates. This suggests in wealthier villages, people are more patient. On the other hand, relative income within the village is positively correlated with the discount rates. W. Kip Viscusi and Michael J. Moore (1989) assert that risky but high-paying jobs attract individuals with high discounting. It may be that individuals with high time discounting did not miss opportunities to make profits during the transition to the market economy.

Looking at the discount rate r and the present bias β together shows an interesting pattern for ROSCA participants: ROSCA participants are more patient (lower r) and have less present bias (higher β) than non-participants; but participants in bidding-ROSCAs are less patient (higher r) and more present biased (lower β) than fixed-ROSCA participants.

The results suggest how experimental measurement can provide insights to institutional design. Creating ROSCAs in which villagers will participate requires some knowledge of their preferences and motives. Bidding ROSCAs may facilitate risk pooling, especially when people face income uncertainty, because the order of receipts of money is not prearranged. But they also seem to attract impatient people.

IV. Trust Game

We focus on one aspect of social preferences, trust, since it is considered a key element of social capital (Partha Dasgupta, 2005, Steven Durlauf and Marcel Fafchamps, 2004, Stephen Knack and Philip Keefer, 1997). We conducted the trust game of Joyce Berg, John Dickhaut and Kevin McCabe (1995), a continuous relative of the binary trust game introduced earlier by Colin C. Camerer and Keith Weigelt (1988).

We also conducted regressions for the south and north, separately. The estimation results or these separate samples, and included the inconsistent observations, are shown in Tables A.8 and A.9 in the Appendix. Including the inconsistent ones rarely changes coefficient signs but adds noise and typically lowers significance.

In the trust game, one player, an "investor", is endowed with capital she can keep or invest. If she invests, there is a productive return—in our experiments, the investment triples. A "trustee" then decides how much of the tripled investment to keep and how much to repay. There is no contractual enforcement or reputation forces so self-interested trustees will keep all the money; anticipating this, an investor who thinks trustees are self-interested (and is not altruistic) will invest nothing. The trust game therefore captures a simple kind of investment with moral hazard. Societies which manage to cultivate pure trust among strangers are probably more economically efficient (e.g., Knack and Keefer (1997)) because pure trust is a substitute for contractual enforcement, violence, and law.

There are many studies using trust games. An important difference between our study and others is that we divided subjects into wealth groups, and observed whether behavior changes depending on the wealth levels of the other party. Nava Ashraf, Iris Bohnet and Nikita Piankov (2004), Michael R. Carter and Marco Castillo (2002), and Håkan J. Holm and Anders Dalienson (2005) demonstrated how trusting behavior can be largely explained by altruism, because trusting investors often do not expect to have much money repaid. We are interested in how altruism is correlated with wealth and inequality. We use the Gini coefficient of the community as a proxy for inequality.[31]

After an experimenter reads the instruction, the subjects solved a quiz. Illiterate subjects and subjects who had difficulty understanding the game were helped by research assistants.[32] After having solved the quiz, subjects went out of the room, one by one, and drew numbered balls in a bingo cage. The subjects who drew odd numbers were assigned the roles of Player 1. Subjects who drew an even number were assigned the role of Player 2.

---

[31] The Gini coefficient is the relative area between a 45-degree line and a Lorenz curve. A Lorenz curve graphs the cumulative proportion of income against cumulative population proportion, cumulating from poorest to richest. Zero represents perfect equality, and 1 represents perfect inequality (one person owns everything). For comparison, the national Gini coefficient for the US was 0.45 in 2004, and the Vietnam national figure was 0.36 in 1998 (CIA fact book http://www.cia.gov/cia/publications/factbook/fields/2172.html). Worldwide, national Gini's range from around 0.25 (in Japan and western Europe) to 0.60 (mostly in Latin American and central Africa). So inequality within the Vietnamese villages (see Table 1) are relatively equal in income compared to many cross-country inequality in many countries.

[32] Since the waiting time was long for the subjects who could not finish the quiz quickly, we had enough time to explain the game to those slow subjects. Eventually, all subjects passed the quiz.

Player 1 was endowed with 20,000 dong, which was roughly equivalent to the daily wage in rural north. Player 1 is then given a chance to send some money to Player 2 (in multiples of 2,000 dong). The experimenter triples the amount sent before it reaches Player 2. Player 2 is then given a chance to send back as much money as he wants. We used the strategy method, asking Player 1 how much they would send to Player 2 if Player 2 was in Group H, M and L, respectively, so there is a within-subject comparison of how investor Player 1's react to player 2's in different income groups. In addition, we asked them to report how much they expect to get back from Player 2 in Group H, M and L, respectively. We used the strategy method for Player 2 as well, asking how much they would send back to Player 1 for each of the 10 possible positive investments. Subjects were helped by research assistants when making decisions. We made sure subjects could not hear each other when making decisions. After filling out the record sheet, each subject was given a questionnaire to fill in, and kept away from subjects who had not yet played the game. Figure A.4 in the Appendix illustrates the experimental procedures.

The mean amounts sent by Player 1 were 10,324, 5,707 and 7,841 dong for student subjects, and field experiments in the south and north, respectively. The fractions sent by Player 1's in the south and north field sites, 28 percent and 40 percent respectively, are a little lower than other studies conducted in Zimbabwe, South Africa, Honduras, Tanzania, Kenya, Bangladesh, Peru, Uganda, and Paraguay (see Cardenas and Carpenter (2005)).[33] However, the fractions sent by Player 1's in our student experiments, 52 percent, are compatible to other studies in US, Russia, Tanzania and Sweden (Nava Ashraf, et al., 2004, Joyce Berg, et al., 1995, Håkan J. Holm and Anders Danielson, 2005). Figure 2 graphs the amounts sent as cumulative distribution functions (cdf's), aggregating across north and south village sites. (Figure A.5 in the Appendix contains student and village-specific cdf's). In Figure 2, the x-axis point at which each cdf intersects the horizontal line p=.5 is the median investment. Focusing attention on where the different H, M and L cdf's intersect the p=.5 line enables your eye to quickly see median differences. The most striking difference is in the south where there is a substantial gap between median investments to groups H, M and L; investors invest more with L groups than they do for

[33] See Barr (1999, 2001), Ensminger (2000), Carter and Castillo (2002, 2003), Mosley and Vershoor (2003), Johansson-Stenman et al. (2004), Holm and Danielson (2005), Karlan (forthcoming), and Schechter (2005).

H groups. This pattern is visible in all the villages in the south except S2 (Figure A.5).[34] We observe similar patterns in villages N1 and N2 in the north, i.e. Player 1 sent more to lower income groups. However, we do not see significant difference in the amounts sent to different income groups in village N3 and N4, the poorest villages (which historically are also the most communized).

Keep in mind investments are not necessarily expectations of reciprocal repayment. Ashraf, Bohnet and Piankov (2004) showed trusting investments might also just reflect altruistic giving to other players, because the investment-tripling multiplier means investing a small amount creates a much larger amount the second player could keep. The expected return ratio is calculated as the expected amount of money back divided by the amount of money sent (tripled amount). Both in the South and North, Player 1 tend to expect higher returns from group H and lower returns from group L. A natural interpretation of the tendency in the south therefore is the subjects give more to the poor (the L group), and less to the rich (the H group) because they are redistributing wealth, not because they expect repayment. The fact this pattern is less evident in the North suggests an effect of political institutions crowding out private transfer—in the North, communist redistribution equalizes resources, but in the South, villagers redistribute income from rich to poor on their own.

Table 9 shows the results of linear regressions on the amount sent by Player 1 for field experiments. We first conducted regressions for the south and north separately, and then ran regressions, pooling data from both regions.[35]

Player 1's who engage in trading activities also sent significantly higher amount of money to Player 2 in both regions when we conduct regressions separately. However, the estimated coefficients are not significant when we pool the data from both regions. Player 1 who engages in family businesses sent less money to Player 2, especially in the north. Recall individuals with household business are much wealthier in the north. In all of the north villages,

[34] However, notice from Table 1 that the Gini coefficient of village S2 is small, 0.19, and the mean income of groups M and L are close. It may have been difficult for the subjects to recognize any difference in wealth between groups M and L.

[35] Since there are repeated observations on individual subjects, we specified that the observations are not independent within subjects. We also ran regressions with the survey responses to the GSS questions on trust, fairness and helpfulness, but they were not significant.

there are only five subjects who receive remittance from their oversea relatives. They send significantly more money to Player 2, an indication of private communal sharing of remittances.

The estimated coefficients of mean income of the community are weakly significant in both regions but are positive in the south, and negative in the north. The negative correlation between the income levels of the community and the amount sent by Player 1 in the north may be due to collectivism. In poor villages in the north, experimental subjects are predominantly farmers who had worked on collective farms for many years. The Gini coefficient is negative and significant in the south, and is also significant for the pooled data estimations. Our findings support Knack and Keefer's (1997) conclusion that trust is positively correlated with equality. In the south, Player 1 sends significantly larger amount of money to Player 2 in Groups M and L. This redistribution trend within villages is much weaker in the north, another statistical indication of a crowding-out effect of political institutions on private transfers.

Figure 4 illustrates the amount of money sent back by Player 2 in each session. Generally, trust pays off among student subjects and non-student subjects in the north in most villages and across all income groups (because the amount returned is greater than the amount sent). By contrast, in the south, Player 2 sent back more than Player 1 sent them only for group L members in Villages S1 and S2, the wealthiest villages. It may be that Group L in these wealthy villages felt they needed to prove they are not underprivileged.

Table 10 presents the results of linear regressions on the proportion of money sent back by Player 2 in the field experiments. Coefficients of relative income are positive in all regressions. This implies wealthy individuals are more inclined to reciprocate. The poor in wealthy communities are also significantly more reciprocal in the south. Older and male subjects and those who engage in trading activities also repay more. The total number of government officers in the experiment has positive impacts on the proportion of money sent back when we ran regressions separately for each region. This implies the presence of government officers, who are often communist party members, enhances social norms. Also, the dummy variable for South is negative and significant, confirming positive effects of stronger communism on reciprocity in the North. Contrary to our expectation, ROSCA participants in the north reciprocate less.

Table 11 shows the relation between risk parameters (α, σ, and λ), time discounting, and trust. Time discounting is measured as the mean discount factor, D(y,t), across 15 combinations

of y and t. Vital Anderhub et al. (2001) find negative relations between risk aversion and time discounting. In our study, we do not find a significant correlation between risk parameters and time discounting. As Anderhub et al. point out, subjects' risk aversion is sensitive to the experimental procedure. The fact we do not find significant relations between risk and time discounting in our study suggests our subjects felt secure about the delayed money delivery.

Ashraf, Bohnet, and Piankov (2004) and Catherine C. Eckel and Rick K. Wilson (2004) do not find significant relations between risk and trust, while Laura Schechter (2005) finds positive relations between risk and trust. In our experiments, risk aversion is not correlated with trust but we find positive relations between trust and probability weighting. Player 1 with inflected probability weights send more money to Player 2. This is consistent with the idea that they treat a trusting investment as a gamble and overweight the chance of winning.

We also find a weak positive relation between the curvature of value function and the curvature of the weighting function, as well as loss aversion. This implies subjects who are less risk-averse exhibit more linear weighting and are less loss-averse.

V. Conclusion

We conducted abstract experiments in Vietnam to investigate whether village wealth, political history, the choice of occupation, and other surveyed variables are correlated with fundamental preferences. Our study is unique in its ability to link many different experimental measures of preferences to a wide range of previously-surveyed demographic variables. These results are exploratory and the experimental measures are not perfect. Further, as noted in the introduction, in a cross-sectional study it's difficult to conclude very much about the direction of causality between preferences and economic circumstances because the study was not designed to do so. Nonetheless, we can identify certain patterns that could be explored in further work and investigated in other field sites.

South/North: People in the north had worked on collective farms for many years, and the government had provided them with food for subsistence. As a result, one can speculate that villagers in the south are more loss averse (higher λ) than those in the north. At the same time, there is no evident difference in time preference parameters in the two regions.

It seems people in the south are more altruistic toward the poor: In trust games villagers in the south invest more in the poor L group and less in the wealthier H group (Figure 2), but not expect to be repaid more by the L group (Figure 3). This pattern is consistent with the idea that private norms of redistribution from rich to poor are active in the South but are crowded out in the North possibly by communist public institutions, although we observe a strong overall positive effect of communism on reciprocity across all income groups.[36]

Village income: Previous experiments show inconsistent results on whether wealth is positively or negatively correlated with risk-aversion. Our results show people in poorer villages are not necessarily more risk-averse, but they are more loss-averse (Table 7). This difference is a reminder that in EU, the only source of risk-aversion is concavity of utility over monetary outcomes. Prospect theory suggests three dimensions of risk-aversion, and only loss-aversion is correlated with village income. Mean village income is also correlated with lower discount rates (r) and less present bias (higher β). This data suggests economic development could influence preferences; the wealthier the villages become, the less loss averse and more patient their villagers are.

ROSCAs: ROSCA participation is correlated with risk and time preferences in two interesting ways. Participants in bidding ROSCAs are more risk-averse (higher σ). This result is consistent with discussions in the empirical literature considering bidding ROSCAs as insurance devices when people face income uncertainty (Charles W. Calomiris and Indora Rajaraman, 1998, Stefan Klonner, 2003). Furthermore, those who participate in bidding ROSCAs, compared to fixed ROSCAs, are more impatient.

Occupation: There are some interesting scattered effects of occupation. While these results do not cohere into patterns across parameters and analyses, they are worth noting as a guide to future research, and in aggregating results across many studies. Furthermore, occupations and preference are important for development if shepherding the poor into some occupations are likely to inculcate preferences which are good for later growth (such as patience and trust). Table 7 shows that fishermen are less risk-averse, probably a selection effect because fishing is inherently risky (but also profitable). Government officers are less loss-averse, perhaps

[36] Terry A. Rambo (1973) reports that Northern villages have traditionally acted as autonomous political units. It is possible that stronger social norms had already developed in the north before the communist regime.

because their political ties and power cushion them in downturns. Tables 9-10 show villagers engage in trade— usually modest roadside businesses— are both more trusting and more trustworthy. This result is consistent with finding of Joseph Henrich et al (2005), based on a study across 15 small-scale societies, that market integration is correlated with fair sharing in ultimatum games.

By using richer instruments, we were able to separate different aspects of risk aversion and time preferences. While our broad experiment was not designed to study the efficacy of specialized policy instruments, the results show some potential policy implications which differ from those of other studies which use simpler preference models. For example, the results indicate the people living in poor villages are not necessarily afraid of uncertainty, in the sense of income variation; instead, they are averse to loss. On the other hand, villagers in the north who had worked on collective farms and received food from the government on a regular basis are less averse to loss. To the extent that preferences are shaped by circumstances and traditions, the first pattern implies that increasing village wealth will reduce aversion to loss (and alleviate the need for policies that limit income fluctuation).

By decomposing time preferences into conventional discount rates and present bias, we found the mean village income was correlated with lower discount rates and with less present bias. People who are present-biased, and are sophisticated about their bias, realize the need for external commitment. Thus, these results suggest that policy could usefully focus not on increasing patience or subsidizing savings, per se, but on providing more present-biased villagers with external commitment (as in Ashraf, Karlan and Yin (forthcoming)).

The results also show how preference measurement can provide suggestions for institutional design. The design of ROSCAs requires some knowledge of the preferences and motives of potential participants. Bidding ROSCAs may facilitate risk pooling, especially when people face income uncertainty, because the order of receipts of money is not prearranged. But bidding ROSCAs also seem to attract impatient people.

As noted throughout, these results are exploratory and need to be replicated in these sites, and compared with results in other sites (as in Cardenas and Carpenter's (2005) important meta-analysis). An advantage of the low mobility in the Vietnamese villages, and government control, is that in principle we can revisit these villages in the future, conduct the same experiments with

the same people (and add other measures), to create panel experimental data which are better suited to establishing selection effects than this cross-sectional study can.

Finally, we hope one contribution of our study is to show some advantages of expanding measurements of risk and time preferences beyond expected utility and exponential discounting, replacing those simple approximations with prospect theory and the Benhabib et al. three-parameter discounting model. In a poor, highly literate country, our subjects made comprehensible choices in a large battery of tasks while highly motivated to earn money. While these experiments take time, but subjects in these sites are often eager to participate and their opportunity cost of participating is low. As a result, and as in most anthropology experiments (Joseph Henrich, et al., 2005), these subjects will sit patiently and answer questions studiously while many dimensions of their economic life are measured, the experimental facts that are produced, and the interesting correlations that result, suggest that these instruments could be used in many other sites as well.

References

Anderhub, Vital; Guth, Werner; Gneezy, Uri and Sonsino, Doron. "On the Interaction of Risk and Time Preferences - an Experimental Study." *German Economic Review*, 2001, *2*(3), pp. 239-53.

Anderson, C. Leigh; Dietz, Maya; Gordon, Andrew and Klawitter, Marieka. "Discount Rates in Vietnam." *Economic Development and Cultural Change*, 2004, *52*(4), pp. 873-88.

Anderson, Siwan and Baland, Jean-Marie. "The Economics of Roscas and Intrahousehold Resource Allocation." *Quarterly Journal of Economics*, 2002, *117*(3), pp. 963-95.

Angeletos, George-Marios; Laibson, David; Repetto, Andrea; Tobacman, Jeremy and Weinberg, Stephen. "The Hyperbolic Consumption Model: Calibration, Simulation, and Empirical Evaluation." *Journal of Economic Perspectives*, 2001, *15*(3), pp. 47-68.

Ashraf, Nava; Bohnet, Iris and Piankov, Nikita. "Is Trust a Bad Investment?" Harvard University Working Paper, 2004.

Ashraf, Nava; Karlan, Dean S. and Yin, Wesley. "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines." *Quarterly Journal of Economics*, forthcoming.

Bardhan, Pranab and Udry, Christopher. *Development Microeconomics*. Oxford: Oxford University Press, 1999.

Barr, Abagail. "Familiarity and Trust: An Experimental Investigation," Oxford University Center for the Study of African Economies Working Paper, 1999.

Barr, Abigail. "Trust and Expected Trustworthiness: An Experimental Investigation," University of Oxford Centre of the Study of African Economics Working Paper, 2001.

Becker, Gary S. and Mulligan, Casey B. "The Endogenous Determination of Time Preference." *Quarterly Journal of Economics*, 1997, *112*(3), pp. 729-58.

Benhabib, Jess; Bisin, Alberto and Schotter, Andrew. "Hyperbolic Discounting: An Experimental Analysis," New York University Department of Economics Working Paper, 2004.

Benzion, Uri; Rapoport, Amnon and Yagil, Joseph. "Discount Rates Inferred from Decisions - an Experimental-Study." *Management Science*, 1989, *35*(3), pp. 270-84.

Berg, Joyce; Dickhaut, John and McCabe, Kevin. "Trust, Reciprocity and Social History." *Games and Economic Behavior*, 1995, *10*, pp. 122-42.

Bernheim, B. Douglas; Skinner, Jonathan and Weinberg, Stephen. "What Accounts for the Variation in Retirement Wealth among U.S. Households?" *American Economic Review*, 2001, *91*(4), pp. 832-57.

Binswanger, Hans P. "Attitudes toward Risk: Experimental Measurement in Rural India." *American Journal of Agricultural Economics*, 1980, *62*, pp. 395-407.

____. "Attitudes toward Risk: Theoretical Implications of an Experiment in Rural India." *Economic Journal*, 1981, *91*(364), pp. 867-90.

Bouman, F.J.A. "Rotating and Accumulating Savings and Credit Associations: A Development Perspective." *World Development*, 1995, *23*(3), pp. 371-84.

Bowles, Samuel. "Endogenous Preferences: The Cultural Consequences of Markets and Other Economic Institutions." *Journal of Economic Literature*, 1998, *36*(1), pp. 75-111.

Braverman, Avishay and Stiglitz, Joseph E. "Sharecropping and the Interlinking of Agrarian Markets." *American Economic Review*, 1982, *72*(4), pp. 695-715.

Calomiris, Charles W. and Rajaraman, Indora. "The Role of Rsocas: Lumpy Durables or Event Insurance?" *Journal of Development Economics*, 1998, *56*, pp. 207-16.

Camerer, Colin F. "Prospect Theory in the Wild," D. Kahneman and A. Tversky, *Choices, Values and Frames.* Cambridge: Cambridge University Press, 2000,

Camerer, Colin F. and Weigelt, Keith. "Experimental Tests of a Sequential Equilibrium Reputation Model." *Econometrica*, 1988, *56*(1), pp. 1-36.

Cardenas, Juan-Camilo and Carpenter, Jeffrey. "Experiments on Equipment: Lessons from Labs in the Field around the World," Universidad de los Andes Facultad de Economia Working Paper, 2005.

Carter, Michael R. and Castillo, Marco. "The Economic Impacts of Altruism, Trust and Reciprocity: An Experimental Approach to Social Capital," University of Wisconsin-Madison Agricultural & Applied Economics Staff Paper, 2002.

____. "An Experimental Approach to Social Capital in South Africa," University of Wisconsin-Madison Agricultural & Applied Economics Staff Paper, 2003.

Dasgupta, Partha. "The Economics of Social Capital," University of Cambridge Working Paper, 2005.

Deaton, Angus. "Saving and Liquidity Constraints." *Econometrica*, 1991, *59*(5), pp. 1221-48.

____. "Wealth Effects on Consumption in a Modified Life-Cycle Model." *Review of Economic Studies*, 1972, *39*(4), pp. 443-53.

DellaVigna, Stefano and Malmendier, Ulrike. "Paying Not to Go to the Gym." *American Economic Review*, 2006, *forthcoming*.

Diamond, Peter and Koszegi, Botond. "Quasi-Hyperbolic Discounting and Retirement." *Journal of Public Economics*, 2003, *87*, pp. 1839-72.

Duflo, Esther. "Field Experiments in Development Economics," *World Congress.* London, 2005.

Durlauf, Steven and Fafchamps, Marcel. "Social Capital," NBER Working Paper, 2004.

Eckel, Catherine C. and Wilson, Rick K. "Is Trust a Risky Decision?" *Journal of Economic Behavior and Organization*, 2004, *55*(4), pp. 447-65.

Eggert, Håkan and Martinsson, Peter. "Are Commercial Fishers Risk Lovers?" Göteborg University Working Paper, 2003.

Ensminger, Jean. "Experimental Economics in the Bush: Why Institutions Matter," C. Menard, *Institutions and Organizations.* London: Edward Elgar, 2000,

Fafchamps, Marcel and Pender, John. "Precautionary Saving, Credit Constraints, and Irreversible Investment: Theory and Evidence from Semiarid India." *Journal of Business and Economic Statistics*, 1997, *15*(2), pp. 180-94.

Frederick, Shane; Loewenstein, George and O'Donoghue, Ted. "Time Discounting and Time Preference: A Critical Review." *Journal of Economic Literature*, 2002, *40*(2), pp. 351-401.

Gugerty, Mary Kay. "You Can't Save Alone: Commitment in Rotating Savings and Credit Associations in Kenya," University of Washington Working Paper, 2005.

Hansen, James; Marx, Sabine and Weber, Elke. "Expectations and Forecasts in Farmer Decision Making: The Argentine Pampas and South Florida," New York: International Research Institute for Climate Prediction (IRI), 2004.

Harbaugh, William T.; Krause, Kate and Liday, Steve. "Children's Bargaining Behavior: Differences by Age, Gender, and Height," University of Oregon Working Paper, 2000.

Harrison, Glenn W.; Lau, Morten I. and Williams, Melonie B. "Estimating Individual Discount Rates in Denmark: A Field Experiment." *American Economic Review*, 2002, *92*(5), pp. 1606-17.

Haughton, Jonathan and Vijverberg, Wim P.M. "Household Enterprises in Vietnam: Survival, Growth, and Living Standards," World Bank Working Paper, 2002.

Hausman, Jerry. "Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables." *Bell Journal of Economics*, 1979, *10*(1), pp. 33-54.

Henrich, Joseph; Boyd, Robert; Bowles, Samuel; Camerer, Colin; Fehr, Ernst; Gintis, Herbert; McElreath, Richard; Alvard, Michael; Barr, Abigail; Ensminger, Jean, et al. "'Economic Man' in Cross-Cultural Perspective: Ethnography and Experiments from 15 Small-Scale Societies." *Behavioral and Brain Sciences*, 2005, *28*, pp. 795-855.

Henrich, Joseph and McElreath, Richard. "Are Peasants Risk-Averse Desicion Makers?" *Current Anthropology*, 2002, *43*(1), pp. 172-81.

Ho, Tech H.; Lim, Noah and Camerer, Colin. "'Modeling the Psychology of Consumer and Firm Behavior with Behavioral Economics." *Journal of Marketing Research*, 2006, *43*(3).

Holm, Håkan J. and Danielson, Anders. "Tropic Trust Versus Nordic Trust: Experimental Evidence from Tanzania and Sweden." *Economic Journal*, 2005, *115*(503), pp. 505-32.

Holt, Charles A. and Laury, Susan K. "Risk Aversion and Incentive Effects." *American Economic Review*, 2002, *92*(5), pp. 1644-55.

Humphrey, Steven J. and Verschoor, Arjan. "The Probability Weighting Function: Experimental Evidence from Uganda, India and Ethiopia." *Economics Letters*, 2004, *84*(3), pp. 419-25.

Johansson-Stenman, Olof; Mahmud, Minhaj and Martinsson, Peter. "Trust, Trust Games and Stated Trust: Evidence from Rural Bangladesh," Göteborg University Department of Economics Working Paper, 2004.

Kahneman, Daniel and Tversky, Amos. "Prospect Theory - Analysis of Decision under Risk." *Econometrica*, 1979, *47*(2), pp. 263-91.

Kanbur, Ravi and Squire, Lyn. "The Evolution of Thinking About Poverty," G. M. Meier and J. E. Stiglitz, *Frontiers of Development Economics.* Oxford: Oxford University Press, 2001,

Karlan, Dean S. "Using Experimental Economics to Measure Social Capital and Predict Financial Decisions." *American Economic Review*, forthcoming.

Kirby, Kris N.; Godoy, Ricardo; Reyes-Garcia, Victoria; Byron, Elizabeth; Apaza, Lilian; Leonard, William; Perez, Eddy; Vadez, Vincent and Wilkie, David. "Correlates of Delay-

Discount Dates: Evidence from Tsimane' Amerindians of the Bolivian Rain Forest." *Journal of Economic Psychology*, 2002, *23*, pp. 291-316.

Klonner, Stefan. "Rotating Savings and Credit Associations When Participants Are Risk Averse." *International Economic Review*, 2003, *44*(3), pp. 979-1005.

Knack, Stephen and Keefer, Philip. "Does Social Capital Have an Economic Payoff? A Cross-Country Investigation." *Quarterly Journal of Economics*, 1997, *112*(4), pp. 1251-88.

Laibson, David. "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics*, 1997, *112*(2), pp. 443-77.

Laibson, David I.; Repetto, Andrea and Tobacman, Jeremy. "Self-Control and Saving for Retirement." *Brookings Papers on Economic Activity*, 1998, (1), pp. 91-196.

Lawrance, Emily C. "Poverty and the Rate of Time Preference: Evidence from Panel Data." *Journal of Political Economy*, 1991, *99*(1), pp. 54-77.

Loewenstein, George and Prelec, Drazen. "Anomalies in Intertemporal Choice: Evidence and an Interpretation." *Quarterly Journal of Economics*, 1992, *107*(2), pp. 573-97.

Mosley, Paul and Verschoor, Arjan. "The Development of Trust and Social Capital in Rural Uganda: An Experimental Approach," University of Sheffield Working Paper, 2003.

Mosley, Paul and Verschoor, Arjan. "Risk Attitudes and the 'Vicious Circle of Poverty'." *European Journal of Development Research*, 2005, *17*(1), pp. 59-88.

Nielsen, Uffe. "Poverty and Attitudes Towards Time and Risk - Experimental Evidence from Madagascar," *Royal Veterinary and Agricultural University of Denmark Department of Economics and Natural Resources.* 2001.

O'Donoghue, Ted and Rabin, Matthew. "Choice and Procrastination." *Quarterly Journal of Economics*, 2001, *116*(1), pp. 121-60.

____. "Doing It Now or Later." *American Economic Review*, 1999, *89*(1), pp. 103-24.

Pender, John L. "Discount Rates and Credit Markets: Theory and Evidence from Rural India." *Journal of Development Economics*, 1996, *50*, pp. 257-96.

Petry, Nancy M.; Armentano, Christoff, Kalina; Kuoch, Theanvy; Norinth, Thonguan and Smith, Lien. "Gambling Participation and Problems among South East Asian Refrees to the United States." *American Psychiatric Association*, 2003, *54*(8), pp. 1142-48.

Pingali, Prabhu and Xuan, Vo-Tong. "Vietnam: Decollectization and Rice Productivity Growth." *Economic Development and Cultural Change*, 1992, *40*(4), pp. 697-718.

Prelec, Drazen. "The Probability Weighting Function." *Econometrica*, 1998, *66*(3), pp. 497-527.

Rambo, A. Terry. *Comparison of Peasant Social Systems of Northern and Southern Viet-Nam: A Study of Ecological Adaptation, Social Succession, and Cultural Evolution*. Center for Vietnamese Studies, Southern Illinois University, 1973.

Rilling, James K.; Gutman, David A.; Zeh, Thorsten R.; Pagnoni, Gluseppe; Berns, Gregory S. and Kilts, Clinton D. "A Neural Basis for Social Cooperation." *Neuron*, 2002, *35*(2), pp. 395-405.

Rosenzweig, Mark R. and Binswanger, Hans P. "Wealth, Weather Risk and the Composition and Profitability of Agricultural Investments." *Economic Journa l*, 1993, *103*(416), pp. 56-78.

Schechter, Laura. "Traditional Trust Measurement and the Risk Confound: An Experiment in Rural Paraguay." *Journal of Economic Behavior and Organization*, 2005, *forthcoming*.

Thaler, Richard. "Some Empirical-Evidence on Dynamic Inconsistency." *Economics Letters*, 1981, *8*(3), pp. 201-07.

Tversky, Amos and Kahneman, Daniel. "Advances in Prospect-Theory - Cumulative Representation of Uncertainty." *Journal of Risk and Uncertainty*, 1992, *5*(4), pp. 297-323.

van de Walle, Dominique and Cratty, Dorothyjean. "Is the Emerging Non-Farm Market Economy the Route out of Poverty in Vietnam?" *The economics of transition*, 2004, *12*(2), pp. 237-74.

Viscusi, W. Kip and Moore, Michael J. "Rates of Time Preference and Valuation of the Duration of Life." *Journal of Public Economics*, 1989, *38*(3), pp. 297-317.

Wik, Mette and Holden, Stein. "Experimental Studies of Peasant's Attitutes toward Risk in Northern Zambia," Agricultural University of Norway Department of Economics and Social Sciences Working Paper, 1998.

Wu, George and Gonzalez, Richard. "Curvature of the Probability Weighting Function." *Management Science*, 1996, *42*(12), pp. 1976-690.

Xuan, Vo-Tong. "Rice Production, Agricultural Research, and the Environment," B. J. T. Kerkvliet and D. J. Porter, *Vietnam's Rural Transformation.* Boulder: Westview Press, 1995,

Yesuf, Mahmud. "Risk, Time and Land Management under Market Imperfections: Applications to Ethiopia," Göteborg University Department of Economics Working Paper, 2004.

Table 1: Descriptive statistics

	S1	S2	S3	S4	S5	N1	N2	N3	N4
Number of Subjects									
Total	22	16	18	22	22	18	22	24	20
Group H (High income)	6	5	7	7	7	5	8	8	6
Group M (Middle income)	9	7	7	9	9	6	7	9	9
Group L (Low income)	7	4	4	6	6	7	7	7	5
Mean household income in 2002 (in 1 million dong)									
Total	36.6	35.8	20.3	18.5	15.0	28.0	17.5	9.1	6.8
Group H	80.6	51.9	26.1	32.6	29.5	49.0	29.2	14.4	13.5
Group M	21.3	29.9	19.9	14.9	11.8	26.8	13.4	7.8	5.0
Group L	18.4	26.1	10.6	6.9	5.3	14.0	8.2	4.7	2.1
Age (mean)	47.7	44.6	48.8	43.1	48.3	54.1	42.5	49.9	48.6
(std. dev.)	13.0	11.9	13.1	10.9	13.2	13.3	10.5	11.6	16.4
Gender (1=male) (mean)	0.59	0.88	0.83	0.68	0.82	0.44	0.36	0.50	0.50
Education (mean) (years)	7.2	7.1	8.4	5.8	5.0	7.8	8.0	4.8	7.6
(std. dev.)	3.2	4.2	4.2	3.9	3.5	4.1	2.5	3.4	4.3
Literacy rate	0.95	0.94	0.95	0.95	0.91	0.89	0.95	0.83	0.90
Acquaintance ratio (mean)	0.42	0.86	0.76	0.74	0.82	0.62	0.91	0.98	0.90
Main occupation of the subject in percent (multiple answers allowed)									
Farming	0	13	17	91	77	6	0	83	75
Livestock	5	19	56	50	32	6	45	54	10
Fishery	0	94	22	9	9	0	0	17	0
Trade	36	0	0	5	5	28	14	8	5
Business	23	0	17	0	5	6	14	8	10
Government officer	9	19	22	14	14	22	18	25	10
Casual work	27	0	11	5	14	0	5	17	10
Not working	23	0	17	0	9	50	9	8	15
No. of ROSCA contributors	14	44	17	64	41	39	55	83	35
Village-level data from the 2002 Living Standard Measurement Survey (sample: 25 households)									
Village Gini coefficients	0.44	0.19	0.30	0.36	0.38	0.29	0.38	0.28	0.36
Distance to nearest market	0.0	5.0	0.0	4.2	0.0	0.0	1.0	3.0	0.3
Number of households receiving remittance from overseas									
	7	2	1	1	0	5	2	0	0
Daily wage for male labor for harvesting (1000 dong)									
	-	-	30	30	30	18	18	20	20

Table 2: Variable definitions

Variable name	Description
Age	Age of the subject
Gender	Gender of the subject, 1=male
Education	Number of years the subject attended school
Acquaintance ratio	Number of other subjects the subject knows by name divided by the total number of subjects in the session
Farm/livestock	Subject's main occupation is farming or raising livestock
Fishery	Subject's main occupation is fishing
Trade	Subject's main occupation is trading
Business	The subject is engaged in household business
Government officer	The subject works for a local government
Relative income	Subject's household income divided by the mean household income of the village
Mean village income	Mean household income of the village (million dong)
Gini coefficient	Gini coefficient of the income among 25 households surveyed in 2002
Distance to market (Table 7)	Distance to the nearest local market (km)
ROSCA	1=the member of ROSCA, 0=otherwise
ROSCA*Bidding (Table 8)	1=the member of Bidding ROSCA, 0=otherwise
Trusted agent	The subject is a trusted agent of delayed delivery of money
Log (savings)	Logged savings. Savings is measured as the total value of savings in cash, gold and savings accounts.
Exp/income ratio (Table 9)	Household expenditure divided by household income per year
Oversea remittance	Whether the subject is receiving remittance from overseas, 1=Yes
Number of officers	Number of local government officers in the session
Receiver M	1=Player 2 is in Group M
Receiver L (Table 10)	1=Player 2 is in Group L
Group M	1=Player 2 is in Group M
M*Mean village income	The cross effect of Mean village income and Player 2 being in Group M
Group L	1=Player 2 is in Group L
L*Mean village income	The cross effect of Mean village income and Player 2 being in Group L

Table 3: Correlations between key variables

(1) Age, gender, education, and income

Total	Age	Gender	Education	Income
Age	1.00			
Gender	0.01	1.00		
Education	-0.36***	0.13*	1.00	
Income	-0.06	-0.01	0.13*	1.00
South	Age	Gender	Education	Income
Age	1.00			
Gender	0.04	1.00		
Education	-0.44***	0.16	1.00	
Income	-0.11	-0.12	0.11	1.00
North	Age	Gender	Education	Income
Age	1.00			
Gender	0.05	1.00		
Education	-0.28***	0.14	1.00	
Income	0.11	-0.06	0.22**	1.00

(2) Occupations, oversea remittance, ROSCA participation and key variables

Total	Age	Gender	Education	Income
Farm/livestock	-0.13*	-0.03	-0.17**	-0.21***
Fishery	-0.09	0.08	-0.10	0.18**
Trade	0.08	0.04	0.01	-0.03
Business	0.09	-0.08	0.00	0.14*
Government officer	-0.12	0.12	0.24***	-0.03
Overseas remittance	-0.05	-0.07	0.02	0.49***
ROSCA member	-0.13*	-0.16**	0.01	-0.07
South	Age	Gender	Education	Income
Farm/livestock	-0.10	0.03	-0.05	-0.15
Fishery	-0.12	0.09	-0.09	0.18*
Trade	0.20**	0.08	0.18*	-0.06
Business	0.10	0.04	0.07	0.12
Government officer	-0.20**	0.22**	0.25**	-0.07
Overseas remittance	-0.13	-0.15	0.04	0.46***
ROSCA member	-0.23**	-0.06	0.04	0.02
North	Age	Gender	Education	Income
Farm/livestock	-0.17	-0.04	-0.33***	-0.35***
Fishery	0.00	-0.09	-0.13	-0.03
Trade	-0.06	0.00	-0.01	0.03
Business	0.08	-0.22**	-0.10	0.22*
Government officer	-0.05	0.07	0.23**	0.09
Overseas remittance	0.07	-0.03	0.00	0.62***
ROSCA member	-0.09	-0.11	-0.03	-0.09

Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

Table 4: Three series of pairwise lottery choices

Option A	Option B	Expected payoff difference (A-B)
Series 1		
3/10 of 40,000 and 7/10 of 10,000	1/10 of 68,000 and 9/10 of 5,000	7,700
3/10 of 40,000 and 7/10 of 10,000	1/10 of 75,000 and 9/10 of 5,000	7,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 83,000 and 9/10 of 5,000	6,200
3/10 of 40,000 and 7/10 of 10,000	1/10 of 93,000 and 9/10 of 5,000	5,200
3/10 of 40,000 and 7/10 of 10,000	1/10 of 106,000 and 9/10 of 5,000	3,900
3/10 of 40,000 and 7/10 of 10,000	1/10 of 125,000 and 9/10 of 5,000	2,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 150,000 and 9/10 of 5,000	-500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 185,000 and 9/10 of 5,000	-4,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 220,000 and 9/10 of 5,000	-7,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 300,000 and 9/10 of 5,000	-15,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 400,000 and 9/10 of 5,000	-25,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 600,000 and 9/10 of 5,000	-45,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 1,000,000 and 9/10 of 5,000	-85,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 1,700,000 and 9/10 of 5,000	-155,500
Series 2		
9/10 of 40,000 and 1/10 of 30,000	7/10 of 54,000 and 3/10 of 5,000	-300
9/10 of 40,000 and 1/10 of 30,000	7/10 of 56,000 and 3/10 of 5,000	-1,700
9/10 of 40,000 and 1/10 of 30,000	7/10 of 58,000 and 3/10 of 5,000	-3,100
9/10 of 40,000 and 1/10 of 30,000	7/10 of 60,000 and 3/10 of 5,000	-4,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 62,000 and 3/10 of 5,000	-5,900
9/10 of 40,000 and 1/10 of 30,000	7/10 of 65,000 and 3/10 of 5,000	-8,000
9/10 of 40,000 and 1/10 of 30,000	7/10 of 68,000 and 3/10 of 5,000	-10,100
9/10 of 40,000 and 1/10 of 30,000	7/10 of 72,000 and 3/10 of 5,000	-12,900
9/10 of 40,000 and 1/10 of 30,000	7/10 of 77,000 and 3/10 of 5,000	-16,400
9/10 of 40,000 and 1/10 of 30,000	7/10 of 83,000 and 3/10 of 5,000	-20,600
9/10 of 40,000 and 1/10 of 30,000	7/10 of 90,000 and 3/10 of 5,000	-25,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 100,000 and 3/10 of 5,000	-32,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 110,000 and 3/10 of 5,000	-39,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 130,000 and 3/10 of 5,000	-53,500
Series 3		
5/10 of 25,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	6,000
5/10 of 4,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	-4,500
5/10 of 1,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	-6,000
5/10 of 1,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -16,000	-8,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -16,000	-10,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -14,000	-11,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -11,000	-13,000

Table 5: Switching point (question at which preference switches from option A to option B) and approximations of σ, α and λ under Prospect Theory

Series 1 (Question 1-14)

σ \ α	.4	.5	.6	.7	.8	.9	**1**
.2	9	10	11	12	13	14	**never**
.3	8	9	10	11	12	13	**14**
.4	7	8	9	10	11	12	**13**
.5	6	7	8	9	10	11	**12**
.6	5	6	7	8	9	10	**11**
.7	4	5	6	7	8	9	**10**
.8	3	4	5	6	7	8	**9**
.9	2	3	4	5	6	7	**8**
1	1	2	3	4	5	6	**7**

Series 2 (Question 15-28)

σ \ α	.4	.5	.6	.7	.8	.9	**1**
.2	never	14	13	12	11	10	**9**
.3	14	13	12	11	10	9	**8**
.4	13	12	11	10	9	8	**7**
.5	12	11	10	9	8	7	**6**
.6	11	10	9	8	7	6	**5**
.7	10	9	8	7	6	5	**4**
.8	9	8	7	6	5	4	**3**
.9	8	7	6	5	4	3	**2**
1	7	6	5	4	3	2	**1**

Bold indicates choices compatible with EU (α=1) and risk-aversion.

Series 3 (Question 29-35)

Switching question	σ=.2	σ=1
1	λ>0.14	λ>0.29
2	.14<λ<1.26	.29<λ<1.53
3	1.26<λ<1.69	1.53<λ<1.88
4	1.69<λ<2.24	1.88<λ<2.42
5	2.24<λ<3.62	2.42<λ<4.32
6	3.62<λ<4.76	4.32<λ<5.43
7	4.76<λ<9.13	5.43<λ<9.78

Table 6: Number of subjects by switching points

(1) Series 1 and 2

Student Subjects	Switching point (question) in Series 1																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Never	Total	
Series 2 1		1			1	1		***1***		***1***						***2***	7
2																	0
3																	0
4					1							***1***					2
5										***1***						***1***	2
6																	0
7							1	***3***	***3***	***1***				***1***		***1***	10
8		1				1		***1***	***1***	***1***	***1***	***1***					7
9									***1***	***1***	***1***						3
10									2				1				3
11						1	1			1			2				5
12							1	2						2			5
13														1	1	1	3
14												1	1				2
Never		1					1			1						3	6
Total		3	0	0	2	3	4	7	7	7	2	3	4	4	1	8	55

Field Experiments	Switching point (question) in Series 1																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Never	Total	
Series 2 1		6		2	1	1	5	***2***	***3***	***2***	***2***	***1***				***8***	33
2					1		1	***1***	***1***								4
3			1	1					***1***		***1***						4
4							1	***1***		***1***	***1***					***3***	7
5				2	2	2	1	***3***	***1***	***1***		***1***				***1***	14
6			1		1	3	2			***2***							9
7		2				1	2	***8***	***2***		***1***	***1***				***3***	20
8					1		2	***4***	***7***	***2***	***1***					***2***	19
9							2	***3***	***4***	***2***	***3***	***3***				***1***	18
10								1		2			1				4
11							1	2		1	2	2	2				10
12							1	1	1			3	1				7
13									1			1	1				3
14						1			1					1			3
Never		1		1			3	2	5	1	3	2				11	29
Total		9	2	6	6	8	21	28	27	14	14	14	5	1	0	29	184

Bold italics indicates choices compatible with EU (α=1) and risk-aversion.

(2) Series 3

Switching point (question) in Series 3	1	2	3	4	5	6	7	Never	Total
Student Subjects	8	15	7	7	9	2	0	7	55
Field Experiments	38	26	27	29	26	6	3	29	184

Table 7: Determinants of dimensions of risk aversion

	α (Weighting function)	σ (Value function)	λ (Loss aversion)
Age	-0.001	-0.005**	0.038
	(0.002)	(0.002)	(0.030)
Gender (1=male)	-0.090**	-0.031	-0.585
	(0.044)	(0.055)	(0.751)
Education	-0.002	-0.017**	0.166
	(0.007)	(0.007)	(0.105)
Farm/livestock	-0.071	0.039	-1.063
	(0.053)	(0.071)	(0.986)
Fishery	-0.021	0.318***	-0.311
	(0.074)	(0.092)	(1.456)
Trade	0.020	-0.036	1.375
	(0.055)	(0.074)	(1.058)
Business	-0.030	0.023	-0.225
	(0.080)	(0.087)	(1.389)
Government officer	0.051	0.049	-1.814*
	(0.051)	(0.078)	(1.046)
Relative income	0.028	-0.041	-0.478
	(0.022)	(0.025)	(0.385)
Mean village income	-0.007**	-0.000	-0.151***
	(0/003)	(0.004)	(0.052)
Distance to market	0.010	-0.043**	0.089
	(0.016)	(0.017)	(0.255)
ROSCA	-0.084	0.117*	-0.355
	(0.057)	(0.070)	(1.067)
ROSCA*Bidding	0.170*	-0.189**	-0.114
	(0.096)	(0.097)	(1.569)
South	0.034	0.014	2.176**
	(0.058)	(0.081)	(0.948)
Constant	0.996***	0.988***	3.198
	(0.058)	(0.170)	(2.328)
Observations	181	181	181
R^2	0.08	0.14	
Log pseudolikelihood			-429

Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. Robust standard errors are in parentheses.

Table 8: Estimation results of Equation (1)

	Demographic variables for r	Demographic variables for β
r (Discount rate)	0.280	0.107
	(0.224)	(0.070)
β (Present bias)	0.899***	0.723**
	(0.017)	(0.305)
θ	5.344***	5.314***
	(0.469)	(0.596)
Age	-0.003*	0.003
	(0.002)	(0.002)
Gender (1=male)	-0.087**	0.049
	(0.043)	(0.061)
Education	0.005	-0.005
	(0.005)	(0.008)
Acquaintance ratio	-0.023	-0.131
	(0.048)	(0.133)
Trusted agent	-0.045	0.064
	(0.048)	(0.131)
Farm/livestock	-0.029*	0.061
	(0.016)	(0.087)
Fishery	-0.112***	0.059
	(0.037)	(0.109)
Trade	-0.060	-0.036
	(0.038)	(0.079)
Business	0.230	-0.128
	(0.249)	(0.103)
Government officer	-0.063**	-0.019
	(0.031)	(0.074)
Relative income	0.067**	-0.011
	(0.029)	(0.042)
Mean village income	-0.004**	0.009*
	(0.002)	(0.005)
Distance to market	0.010	0.001
	(0.010)	(0.022)
ROSCA	-0.122**	0.148*
	(0.053)	(0.085)
ROSCA*Bidding	0.230**	-0.268**
	(0.112)	(0.125)
Log (savings)	-0.001	0.007
	(0.005)	(0.009)
Exp/income ratio	0.002	-0.002
	(0.002)	(0.002)
South	-0.014	-0.021
	(0.047)	(0.079)

Observations	2355	2355
R^2	0.79	0.78

Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. We conducted robust regressions, and adjusted standard errors for correlations within individuals. 312 data points with inconsistent answers are excluded from the estimations. Robust standard errors are in parentheses.

Table 9: Determinants of amount sent by Player 1

	South	North	Total
Age	-156***	-22	-45
	(35)	(58)	(38)
Gender (1=male)	358	2314	1520
	(740)	(1749)	(1012)
Education	-257**	203	14
	(102)	(211)	(122)
Oversea remittance	114	14050***	3912*
	(891)	(3140)	(2131)
Acquaintance ratio	1731*	3149	1651
	(971)	(6840)	(1561)
Farm/livestock	-1257	-700	-1439
	(1009)	(1490)	(1088)
Fishery	-2992*	-4252	-1414
	(1520)	(2641)	(1704)
Trade	4129***	4131*	1448
	(505)	(2178)	(1164)
Business	-889	-6627**	-2670***
	(876)	(2534)	(761)
Government officer	-1653	1351	53
	(1065)	(1751)	(1194)
Relative income	-180	-656	-273
	(399)	(1242)	(602)
Mean village income	147*	-212*	12
	(54)	(109)	(60)
Gini coefficient	-18012**	-30440	-17318*
	(6879)	(27674)	(9022)
Number of officers	180	468	114
	(110)	(919)	(139)
Receiver M	1859***	634	1305***
	(398)	(540)	(323)
Receiver L	2576***	1366*	2032***
	(603)	(716)	(452)
ROSCA	-	1335	1260
		(1699)	(1557)
ROSCA*Bidding	-1506	-	-2390
	(1026)		(1944)
South	-	-	-1114
			(1028)
Constant	15174***	13596**	11969***
	(4096)	(10224)	(4682)
Observations	147	123	270
R^2	0.44	0.38	0.26

Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. We conducted robust regressions, and adjusted standard errors for correlations within individuals. Robust standard errors are in parentheses.

Table 10: Determinants of the proportion sent back by Player 2

	South	North	Total
Age	0.001	0.005***	0.003**
	(0.002)	(0.001)	(0.001)
Gender (1=male)	0.025	0.184***	0.092***
	(0.046)	(0.030)	(0.029)
Education	0.000	-0.003	-0.001
	(0.007)	(0.004)	(0.005)
Oversea remittance	-0.005	0.054	0.037
	(0.060)	(0.034)	(0.055)
Acquaintance ratio	0.000	-0.001	0.004
	(0.005)	(0.003)	(0.003)
Farm/livestock	-0.004	-0.046	0.020
	(0.052)	(0.035)	(0.037)
Fishery	-0.197*	0.031	-0.066
	(0.113)	(0.051)	(0.055)
Trade	0.104	0.145***	0.129**
	(0.109)	(0.038)	(0.063)
Business	0.209***	-0.087*	-0.001
	(0.072)	(0.048)	(0.063)
Government officer	-0.074	0.025	-0.001
	(0.094)	(0.028)	(0.056)
Relative income	0.062***	0.112***	0.075***
	(0.020)	(0.028)	(0.018)
Mean village income	-0.004	-0.005*	-0.005
	(0.005)	(0.003)	(0.003)
Gini coefficient	-0.423	0.007	-0.162
	(0.452)	(0.379)	(0.310)
Number of officers	0.108**	0.028**	0.018
	(0.049)	(0.013)	(0.018)
Group M	-0.072	0.147**	-0.018
	(0.201)	(0.055)	(0.071)
M*Mean village income	0.007	-0.006*	0.005
	(0.007)	(0.003)	(0.003)
Group L	-0.318	0.112	-0.086
	(0.236)	(0.094)	(0.086)
L*Mean village income	0.018**	-0.002	0.011***
	(0.008)	(0.005)	(0.004)
ROSCA	-	-0.133***	-0.064
		(0.034)	(0.052)
ROSCA*Bidding	-0.011	-	0.069
	(0.047)		(0.067)
South	-	-	-0.103**

			(0.047)
Constant	0.123	0.007	0.141
	(0.354)	(0.177)	(0.181)
Observations	490	420	910
R^2	0.22	0.51	0.27

Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. We conducted robust regressions, and adjusted standard errors for correlations within individuals. Robust standard errors are in parentheses.

Table 11: Correlation between risk, time discounting and trust

	σ	λ	Mean discount factor	Mean amount sent (Player 1)	Mean return rate (Player 2)
α	0.19**	0.03	-0.09	-0.26**	-0.06
σ		-0.13*	-0.05	-0.15	-0.00
λ			-0.05	-0.11	-0.11
Mean discount factor				-0.02	-0.02

Note: * Significant at the 10% level. ** Significant at the 5% level.

Figure 1: Locations of research sites

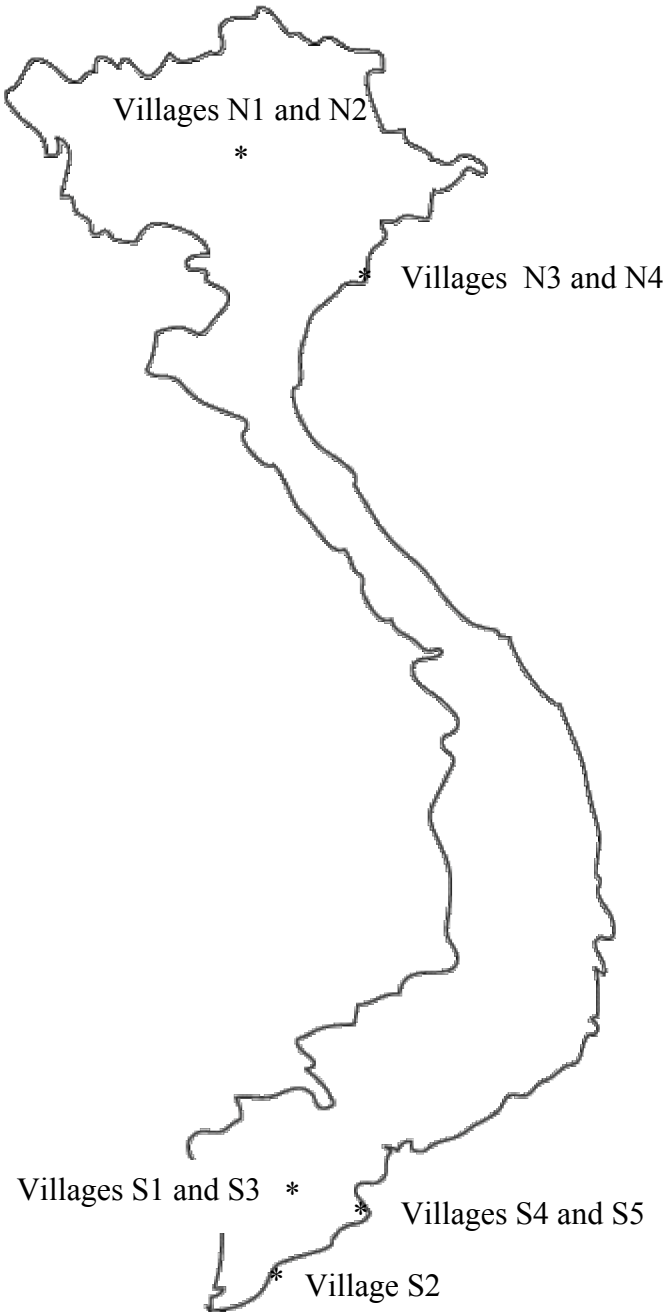
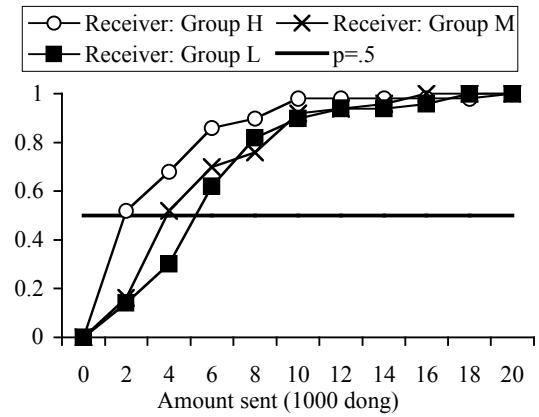


Figure 2: Cumulative distribution of amount sent by Player 1 (by group of receiver). Players in South send less (lower medians) and send more to group L than to groups M and H, compared to players in North.

South



North

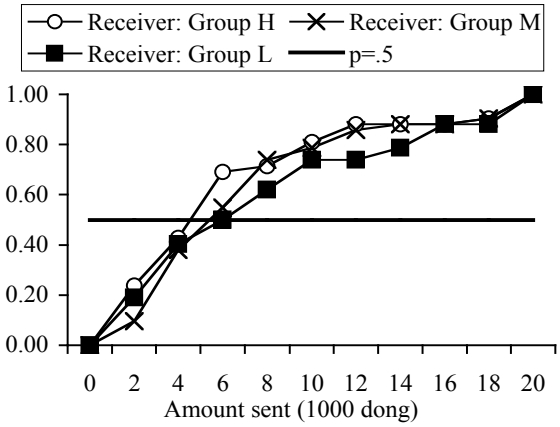


Figure 3: The ratio of expected return by Player 1 (by high, medium, low (H, M, L) group of receiver Player 2)

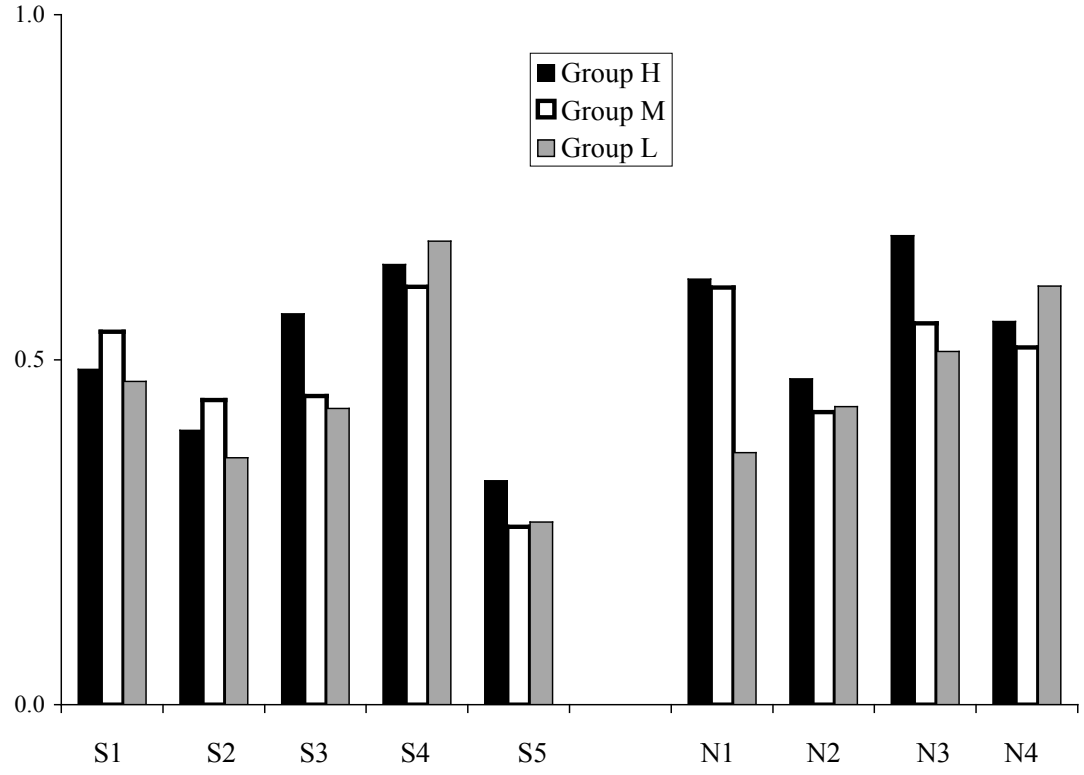
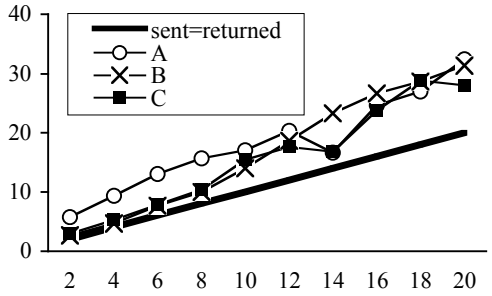


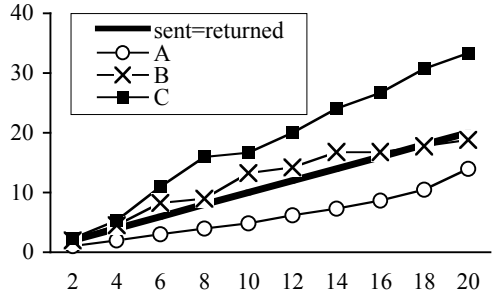
Figure 4: Amounts sent back by Player 2 (1000 dong)

Student subjects

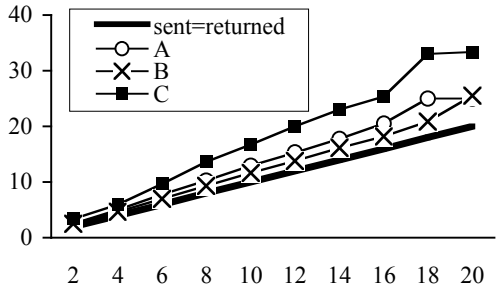
SS1



SS2

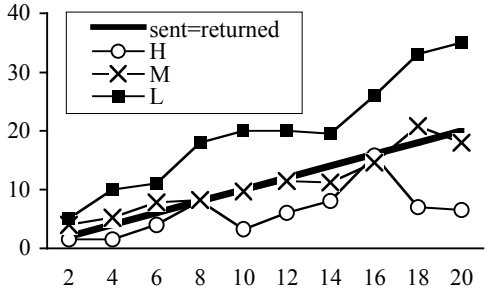


SN1

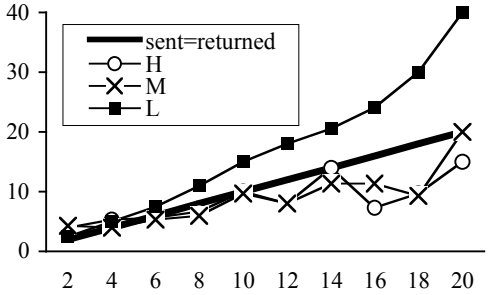


South

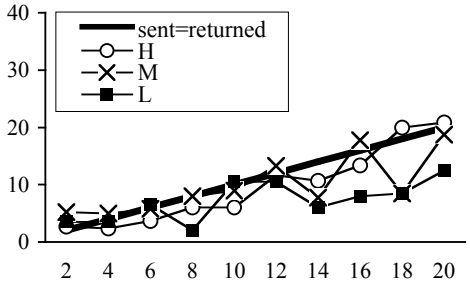
S1



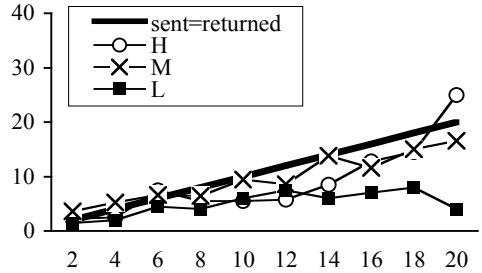
S2



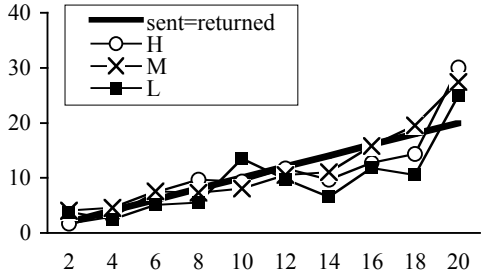
S3



S4

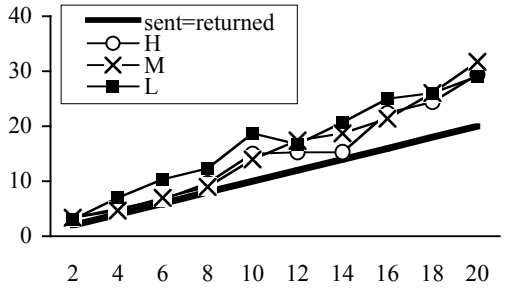


S5

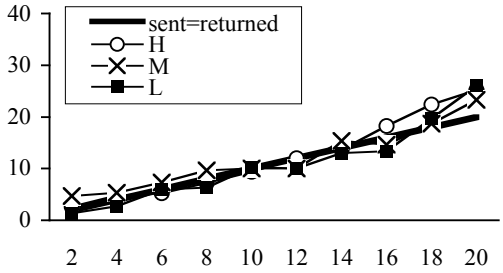


North

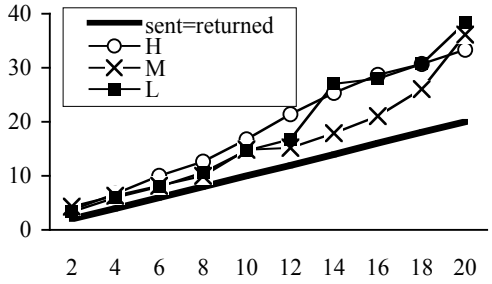
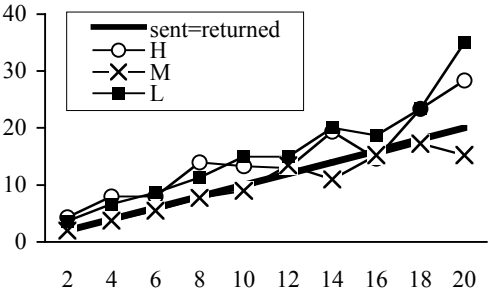
N1



N2



N3



N4