Poverty, politics, and preferences:
Field experiments and survey data from Vietnam

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Abstract

We conducted field experiments 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 in Vietnam. Our experiments suggest risk and time preferences depend on the stage of economic development. In wealthier villages, people are less loss-averse and more patient. Our research also shows people who participate in ROSCAs (rotating credit associations) are more patient than non-participant, but those who participate in bidding ROSCAs are less patient and more risk averse than those who participate in fixed ROSCAs. Results from a trust game demonstrate both positive and negative effects of communism. Villagers in the South tend to invest more in low-income partners without expecting repayment. On the other hand, people in the north are more trustworthy but do not pass on more money to the poor. Our findings also suggest market activities, like starting a small trade business, are correlated with trust and trustworthiness. We also contribute to experimental methodology by using choices that separate different aspects of risk aversion and time preferences in behavioral economics specifications.

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1. Introduction

A fundamental question in development economics is the extent to which economic success of a country is linked to basic features of human preferences. If people in a country are extremely averse to financial risk, they may be reluctant to create businesses with risky cash flows. If people are impatient, they may be reluctant to educate their children for many years because education is an investment in future income. Similarly, if people are not very trusting when they make investments with imperfect contractual enforcement, their lack of trust will inhibit entrepreneurial development since pure trust and trustworthiness lubricate economic exchange. Risk-aversion, impatience, and lack of trust could therefore inhibit economic development.

In general, it is difficult to infer how much observed wealth depends on basic preferences (and their interactions with institutions). Many factors seem to influence development-- institutions [Scully 1988], political systems of corruption and redistribution [Easterly and Levine 1997, Ehrlich and Lui 1999, Mauro 1995], financial systems [King and Levine 1993, Levine and Zervos 1998], cultural and religious practices [Barro and McCleary 2003], trade practices [Ades and Glaeser 1999], and so forth. Direct measures of preference are usually not included in these studies because they are not available.

In this study, we use field experiments to directly measure preferences of individuals over risk and time, and to measure trust and trustworthiness in a simple investment game with moral hazard.[1] Few field experiments have linked wealth, demographic variables and business practices to measured preferences as doing so requires conducting careful experiments *and* collecting time-consuming survey responses.[2] A unique feature of this study is our ability to choose villagers who had been previously surveyed in a 2002 living standard survey in Vietnam, conduct experiments with those villagers, and link their responses to the earlier survey data. Having previous survey responses in hand before the experiments were designed also enabled us to choose a sample of villages with a wide range of average incomes (to study the effect of cross-village differences).

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[1] Of course, measuring individual preferences does not imply that many other factors, like trade and economic institutions, are not important too (they almost surely are); it simply gives us a relatively precise way to separate the effect of preferences from those other factors.

[2] Carter and Castillo [2002, 2003] studied the wealth impacts on trust and altruism by conducting field experiments with individuals who were subject to household surveys in South Africa and Honduras.

Our study measured risk, time and trust (social investment), because they are relatively easy to measure and it is natural to link them to development. One hypothesis is that the poor have higher time discounting (more impatience) and are more risk averse, thus reducing the likelihood they would save enough to accumulate capital, or accept the risk required to make a profitable business investment that may result in a loss. We can also see whether villagers in different occupations exhibit different time and risk preferences. In their study across 15 small-scale societies, Henrich et al. [2002, 2004] demonstrate how, in some societies, individuals exhibit self-interested behaviors while in other societies individuals reveal pro-social behaviors. Our trust games enabled us to link pro-social behaviors to inequality, relative wealth and other surveyed factors.

Vietnam has some advantages as a field site. The biggest advantage is our access to the 2002 household survey, and the ability to link those survey responses to experimental responses. Vietnam is also a poor country-- 45% of the rural population lives below the poverty line [World Bank 2005]. So modest experimental payments go a long way, and concerns about how people behave toward large experimental stakes (several days' wages) are addressed at low cost. Furthermore, despite poverty, the Vietnamese have a high literacy rate (around 90%)[3], which makes understanding instructions less challenging than field experiments in countries with lower literacy. The combination of poverty and literacy means the Vietnamese are good experimental subjects—they are highly motivated, and easy to reliably instruct.

An interesting characteristic of Vietnam is the historical differences between political systems in the north and the south. While the north moved rapidly toward collectivization under communism in the 1950s, people in the south resisted collectivization, even after unification following the Vietnam War. 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 [Pingali and Xuan 1992, Xuan 1995]. We can therefore see whether a longer history of genuine communism is correlated with social preferences, controlling to a large (though imperfect) extent for ethnicity, language and shared culture and history. There is also substantial variation in household income across villages, and a large variation in whether people have created household enterprises since the introduction of the market economy [Haughton and Vijverberg 2002, van de Walle and Cratty 2004]. Healthy variation on values of these variables enables us to identify correlations of those variables with measured preferences, if they exist.

[3] There are only three countries which are more literate and poorer (lower GNP per capita) than Vietnam, namely Kyrgyz, Tajikistan, and Uzbekistan [World Bank 2005].

We also know about individuals' involvement in rotating savings and credit associations (ROSCAs), from the household survey. ROSCAs are informal self-help financial groups found in many developing countries [Bouman 1995]. In a ROSCA, people meet on a regular basis and agree to contribute modest sums of money to a pool on a periodic schedule (e.g., every week). One person in the pool is then chosen to receive all the money in each period's pool. In Vietnam there are "fixed" ROSCAs, in which the order people draw from the ROSCA is determined at the initial meeting. There are also "bidding" ROSCAs in which people bid for the right to receive money earlier. ROSCAs are thought of as a saving commitment device which enables people to accumulate lump-sums [Anderson and Baland 2002, Gugerty 2005]. In our research sites, people use ROSCA funds to invest in household businesses, livestock, agriculture, and to fix houses and pay for education (see Table A.1 in the Appendix).[4] We will investigate if participation in ROSCAs is correlated with time discounting and other components of preference.

Besides contributing evidence of preferences and economic variables, our paper makes a methodological contribution to experimental development economics [Cardenas and Carpenter 2005]. All previous instruments used to measure preferences in field sites like these are guided by simple models of preferences which can be characterized by one parameter. These simple models have often been rejected by experiments in Western educated populations, in favor of models with multiple components of risk preference [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 [Kahneman and Tversky 1979], for example, then 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, and the degree of hyperbolicity or dynamic inconsistency), rather than just measuring a single discount rate as in all 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. But our parameter values may also indicate simpler instruments are incomplete and blind us to sources of preference variation. Thus, we seek to measure time and risk

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

preferences in the richest way, effectively allowing the data to tell us whether adding complexity is helpful. Our tests therefore separate different aspects of risk aversion and time preference that have never been separated in previous field experiments.

2. Selection of research sites and research methods

In July-August 2005, trust game, risk, and time discounting experiments[5] were conducted with members of households who were previously interviewed during a 2002 living standard measurement survey. 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[6] (in the North). From these villages we chose five villages in the South and four villages in the North each with different levels of mean income, inequality, and market access.[7] 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 with substantial differences in income and inequality, to permit statistically powerful cross-village comparisons. Figure 1 shows the locations of the selected villages.[8]

Some descriptive statistics about the nine villages are given in Table 1. The southern villages are indexed by S1, S2, S3, S4, and S5, and northern villages are indexed by N1, N2, N3, and N4, respectively. The village numbers represent the rank of mean village household income of experimental subjects in each region (i.e., S1 is the wealthiest village in the south, S2 is the second-wealthiest, and so on; village N1 is the wealthiest village in the north, and so on). Some 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 trained our assistants and also provided a useful check on whether the less educated villagers' responses reflect confusion.

Table 2 summarizes correlations between key variables (see Table A.2 in the Appendix for variable definitions). Education correlates negatively with age (-.44 and -.28 in the south and north), positively with income (.11 and .22), and positively with government officer service (.25, .23).

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[5] Instructions are available at http://www.its.caltech.edu/~ttanaka/papers.htm

[6] We excluded villages in Hanoi City.

[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.

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). Fortunately, 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 government to encourage attendance, the response rate was high (82%). This means we do not have to worry much about self-selection artifacts. Village meeting rooms or school classrooms were reserved for the experiments. Figure A.2 in the Appendix shows pictures of all research sites.

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.

[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.

[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.

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

To study the relation between the choice of bidding ROSCAs and time preferences, we also conducted an additional experiment with bidding ROSCA participants in Chau Doc Town in the south. The 2002 household survey was conducted in Chau Doc Town, but our experimental subjects were not interviewed under the survey. The mean income of surveyed households in Chau Doc Town was 33.4 million dong, slightly lower than those of villages S1 and S2.

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 undergraduate 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

[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.

[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.

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.

3. Risk

Kanbur and Squire [2001] describe 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 [Binswanger 1980, Binswanger 1981, Henrich and McElreath 2002, Nielsen 2001, Wik and Holden 1998, Yesuf 2004]. We conduct experiments with lotteries involving gains and losses (to measure loss-aversion), and consider both prospect theory and EU as alternative theoretical frameworks.

Empirical evidence suggests wealthier households invest in more risky production activities, and earn higher returns [Fafchamps and Pender 1997, Rosenzweig and Binswanger 1993]. In development economics, it is often assumed the rich landlord is risk-neutral while the poor tenant is risk-averse [Bardhan and Udry 1999, Braverman and 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 suggest behavior toward losses and gains is distinct [e.g., 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

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

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 [Tversky and Kahneman 1992] and the one-parameter form of Prelec's axiomatically-derived weighting function [1998] as follows:

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

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

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

[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. 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%, 50% and 75%, and simple gambles. It is arguable whether 25% and 75% are small and large enough to identify overweighting and underweighting of probabilities.

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 3. 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 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, is equivalent to over 80% 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 precise combination of prospect theory parameter values. Table 4 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 (.4, .4), (.5, .5), (.6, .6), (.7, .7), (.8, .8), (.9, .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 (.8, .6), (.7, .7), (.6, .8), (.5, .9), or (.4, 1). By intersecting these parameter ranges from Series 1 and 2, we obtain the approximate values of $(\sigma,\alpha)=(.7, .7)$.[18] Predictions of (σ,α) for all possible combinations of choices are given in Table A.3 in the Appendix.

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[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

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 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%) 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 5 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 (.54, .70), (.60, .72) and (.67, .68) for student subjects, non-student subjects in the south and north, respectively. These values are similar to the corresponding means of (.48, .74) in Wu and 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 results

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$40000^{\sigma}\exp[-(-\ln.9)^{\alpha}]+30000^{\sigma}\exp[-(-\ln.1)^{\alpha}]<68000^{\sigma}\exp[-(-\ln.7)^{\alpha}]+5000^{\sigma}\exp[-(-\ln.3)^{\alpha}]$.
The ranges of σ and α that satisfy the above inequalities are .65<σ<.74 and .66<α<.74. The point (σ,α)=(.7, .7) satisfies the condition.

[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.5 in the

are shown in Table 6-(1). Looking first at σ (curvature of the utility function), the strongest effects suggest educated subjects are more risk-averse, and fishermen[22] are less risk-averse. Furthermore, bidding-ROSCA participants are more risk averse than fixed-ROSCA participants. This is consistent with Klonner's [2003] hypothesis that bidding ROSCAs are preferred to fixed ROSCAs by risk averse individuals who experience income uncertainty.[23]

The other two regressions indicate nonlinear weighting (α) and loss-aversion (λ) vary systematically as well. Male subjects have more inflected probability weights (lower α) than female subjects. This finding is contrary to Fehr-Duda et al. [2005, 2005] who observe that male students have less inflected probability weights than female students in Switzerland. It may be because Vietnamese male propensity for gambling. It is reported that many South East Asian male immigrants in the United States, including Vietnamese, gamble heavily [Petry, Armentano, Kuoch, Norinth and Smith 2003]. Table 6-(1) also shows bidding-ROSCA participants have less inflected weights than fixed-ROSCA participants. Individuals who are accustomed to bidding may be more inclined to weight probabilities linearly.

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 reflected in less aversion to losses. There is weak evidence that government officers are less loss averse, supporting our hypothesis that having secure income sources makes individuals less loss averse. The estimated value of λ is 2.59.

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.6 in the Appendix as well. We also ran regressions excluding insignificant variables for the estimations of σ, α, and λ, respectively, and confirmed that all the significant variables in the full specification remain significant after the exclusion.

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

[23] Henrich and McElreath [2002] and Nielsen [2001] find, using simple utility function calibration, that people living in wealthier villages are more risk-averse. Table A.5 in the Appendix shows that omitting 26 subjects with no interior switching point increases the estimated village-income effect from -.002 to -.007 and makes it significant at $p<.05$, which replicates the earlier results.

It is close to the 2.25 estimated by Tversky and Kahneman [1992] and to other studies at many different levels of analysis (e.g., Ho, Lim and Camerer, in press).[24]

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 [Holt and Laury 2002]. The range of the coefficient for each switching point in Series 1 and 2 is shown in Table A.4 in the Appendix. r>0, r=0, and r<0 implies risk-loving, risk-neutral, and risk-aversion, respectively. Table 6-(2) shows the interval estimation results of the CRRA coefficients for Series 1 (r_1) and Series 2 (r_2). In Figure 2, 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 .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=.10 and r_2=.61. This implies that most subjects are considered risk-neutral in Series 1 and risk-averse in Series 2 under EU. The regression results in Table 6 suggest the signs and significance of many estimated coefficients are comparable between σ (the curvature of the utility function) under prospect theory and for r_1 (the CRRA coefficients) under EU (keep in mind the signs should be opposite since $1-r_1=\sigma$) However, r_1 is positively correlated with relative income in Series 1, suggesting that subjects who are relatively wealthier than their fellow villagers tend not to gamble on small probabilities compared with their fellow villagers with lower income. But notice that the r_2 measure does not pick up most of the significant coefficients detected by r_1 and σ.

The estimation results indicate the potential 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 these studies cannot separate concavity and loss-aversion. In our regressions using prospect theory, the effect of village income shows up in loss-aversion. Since village income is linked to the degree of loss-aversion and not to concavity of utility, it is plausible that the poor do not fear income variation—they fear loss.

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[24] 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 (.36, .28, .30) for σ, (.31, .32, .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.

4. 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 $\delta^t (e^{-rt})$ (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 means more impatience.

There are many studies linking discount rates to wealth in both developed and developing societies. Hausman [1979], Lawrence [1991] and Harrison, Lau and Williams [2002] found discount rates to be negatively related with wealth in the United States and Denmark (i.e., wealthier people act more patiently).[25] Studies in developing societies have yielded more mixed results. Pender [1996], Nielsen [2001] and Yesuf [2004] find a negative relation between wealth and r in India, Madagascar, and Ethiopia, respectively; they attribute it to limited access to credit markets for the poor. Kirby et al. [2002] and Anderson et al. [2004] did *not* find significant correlations between discounting and wealth in Bolivia and Vietnam. However, their studies used only two villages with similar characteristics, so they may not have had enough income variation to find a relation between income and discounting. Since our villages were handpicked to have large between-village income variation, we have a better chance of finding any income-discounting relation if one exists.

Most earlier studies use exponential discounting [Anderson, Dietz, Gordon and Klawitter 2004, Nielsen 2001, Pender 1996], which has often been used to explain consumption (Deaton 1972, 1991). Only one field study estimated hyperbolic discounting [Kirby, Godoy, Reyes-Garcia, Byron, Apaza, Leonard, Perez, Vadez and Wilkie 2002]. We estimate a more general model which 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 [Frederick, Loewenstein and O'Donoghue 2002]. Discount rates tend to decline over time[26] and exhibit a "present bias" or preference for immediate reward.[27] 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

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[25] Becker and Mulligan [1997] constructed a model which predicts how wealth affects time preferences, making richer people more patient.

[26] See Thaler [1981], Benzion et al. [1989], Loewenstein and Prelec [1992], and Pender [1996].

[27] See Laibson [1997], Laibson et al. [1998], O'Donoghue and Rabin [1999], and Angeletos et al. [2001].

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 [Bernheim, Skinner and Weinberg 2001, DellaVigna and Malmendier 2006, Diamond and Koszegi 2003, Laibson, Repetto and Tobacman 1998, O'Donoghue and Rabin 1999, O'Donoghue and Rabin 2001].

In our experiments, we give a long series of choices between small rewards delivered today, and larger delayed rewards (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 exponential discounting. When θ=2 and β=1, it reduces to true hyperbolic discounting. When θ=1 and β is free, it reduces to quasi-hyperbolic discounting. When θ>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, 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.

Non-linear estimation results of exponential discounting, hyperbolic discounting, quasi-hyperbolic discounting models and Equation (1) are given in Table 7.[28] In order to obtain robust variance estimates with repeated observations on individual subjects, we specified that the observations are independent across subjects, but not within subjects. We included dummy variables for field experiments (non-student subjects) and the field experiment in the south. Estimating the full model (1) with unrestricted θ gives a high value of θ (5.2 and 5.3). This is surprising but similar to Benhabib et al's [2004] estimates. However, since weakening the restriction $\theta=1$ to the estimate around 5.2 only increases adjusted R^2 very slightly, we suspect θ is just not identified very well.

Table 7 shows that dummy variables for field and South have little influence, which suggests the results are generally robust to student versus villager subjects and in the South and North.

Table 8 shows the results from regressing estimates of r and β against demographic variables for village subjects.[29] The largest effects are on discount rates r. Farmers, fishermen, and wealthier village subjects 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. Viscusi and

[28] We consider middle points as indifferent points. We dropped data of 3 subjects from the field experiment, since they totally randomized their choices.

[29] The estimates exclude 312 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.) 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.

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: Participants in fixed ROSCAs are more patient (lower r) and have less present bias (higher β); but participants in bidding-ROSCAs have the opposite pattern, less patience (higher r) and more present bias (lower β).

In order to study the relation between the participation of bidding ROSCAs and time preferences in more detail, experiments were conducted with thirty female ROSCA participants in daily, weekly and monthly ROSCAs in Chau Doc Town in the South. Bidding ROSCAs practiced in the south are so-called "discount bidding ROSCAs" [Kovsted and Lyk-Jensen 1999]. A winning bid turns into a discount to the other bidders who have not received the pool. Figure A.3 in the Appendix shows the amounts contributed and received by each participant with different stakes and time scales, along with winning bids. For example, the top panel is a 10,000 dong ROSCA held every day for 91 days, with 91 participants. On the first day, the winning bid is 3,000 dong (the right axis). The winning bidder collects 10,000-3,000 dong from each of the other 90 participants (and pays 10,000 to the host[30]), netting 620,000 dong. On the second day, the winning bid is 3,000 dong again.[31] The winning bidder collects 10,000-3,000 dong from each of the other 89 participants, and 10,000 dong (full amount of contribution) from the participant who received the pool on the previous day (and pays 10,000 to the host), netting 623,000 dong. The ROSCA cycle ends when every participant received the pool once. The first person who received the pool received 620,000 dong and contributed 900,000 dong in total during the cycle, making her daily interest rate .90%. The daily interest rates of the first receivers in the 20,000-dong daily ROSCA, 300,000-dong weekly ROSCA, 1 million-dong monthly ROSCA, and 2 million-dong monthly ROSCA were .88%, .56%, .17% and .10%, respectively.

The estimation results of demographic influences on r and β are shown in Table 9. More educated participants tend to have less present bias (higher β). As is often speculated in development economics, this suggests a way in which education might conceivably influence

[30] Under bidding ROSCAs, the host collects commissions. When somebody fails to make a contribution, the host covers it out of the commissions. Under fixed ROSCAs, the host does not collect commissions, and does not make up deficits even if someone fails to make contributions.

[31] The winning bid was tie for 14 participants on the first day. These individuals negotiated the order of recipients, and winning bids remained 3,000 dongs for the first 14 days.

development— by shaping discount rates (cf. Becker and Mulligan [1997]). Table 9 shows that those who bid in weekly ROSCAs are more present biased (lower β), and those bidding in monthly ROSCAs are more patient and less present biased than those who participate in daily ROSCAs, respectively.

Taken together, the results in Table 8 and 9 show a strong correlation between both time preference parameters measured by the experimental instruments, and ROSCA participation. Bidding ROSCA participants, and those bidders who enter shorter-term (daily or weekly) ROSCAs rather than monthly ones, are more impatient. These results validate the experimental measures because they match up with important economic behavior in an interpretable way.

The results also suggest how experimental measurement can provide insights to institutional design. Creating ROSCAs that villagers will participate in 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.

5. Trust Game

We focus on one aspect of social preferences, trust, since it is considered a key element of social capital [Dasgupta 2005, Durlauf and Fafchamps 2004, Knack and Keefer 1997]. We conducted the trust game of Berg, Dickhaut and McCabe [1995], a continuous relative of the binary trust game introduced earlier by Camerer and Weigelt [1988].

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 reputational 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. Ashraf, Bohnet and Piankov [2004], Carter and Castillo [2002], and Holm and 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.[32]

In our trust game, the 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.

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.[33] 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. 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.

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[32] 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 .45 in 2004, and and the Vietnam national figure was .36 in 1998 (CIA factbook http://www.cia.gov/cia/publications/factbook/fields/2172.html). Worldwide, national Gini's range from around .25 (in Japan and western Europe) to .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.

[33] 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.

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% and 40% 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]).[34] However, the fractions sent by Player 1's in our student experiments, 52%, are compatible to other studies in US, Russia, Tanzania and Sweden [Ashraf, Bohnet and Piankov 2004, Berg, Dickhaut and McCabe 1995, Holm and Danielson 2005]. Figure 3 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 3, the x-axis point on each cdf which 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 with H groups. In the south, Player 1 sent more money to lower income groups, with the exception of village S2. Notice from Table 1, the Gini coefficient of Village S2 is small, .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. 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 are also the most communized, historically).

Keep in mind that investments are not necessarily expectations of reciprocal repayment. Ashraf, Bohnet and Piankov [2004] showed that trusting investments might also just reflect altruistic giving to other players, when there is an investment-tripling multiplier that encourages giving. Indeed, expected returns do not match up well with investments (see Figure 4). 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 that this pattern is less evident in the North suggests an effect of political institutions crowding out private

[34] 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 [2005], and Schechter [2005].

transfer—in the North, communist redistribution equalizes resources, but in the South, villagers redistribute income from rich to poor on their own.

Table 10 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 that individuals with household business are much wealthier in the north. In all of the north villages, 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, while this redistribution trend is present but much weaker in the north, another statistical indication of a crowding-out effect of political institutions on private transfers.

Figure 5 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). In 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 that they are not underprivileged.

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[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.

Table 11 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 reciprocal. 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 12 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. 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 that we do not find significant relations between risk and time discounting in our study suggests that our subjects felt secure about the delayed money delivery.

Ashraf, Bohnet, and Piankov [2004] and Eckel and Wilson [2004] also do not find significant relations between risk and trust, while 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.

6. Conclusion

We conducted field experiments to investigate whether wealth, political history and the choice of occupation are correlated with fundamental preferences. A main feature of our study is the ability to link theses preference measures to survey data on a wide range of demographic variables. These results are exploratory and the experimental measures are not perfect. Of course, from a cross-sectional study like this one it is also difficult to conclude very much about the direction of causality: Do differences in preferences cause people to become poor, or to sort into different

professions, or does one's economic experience shape preferences? (see Henrich et al., in press). 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. One can speculate that as a result, 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, the South subjects tend to give more to the poor L group and less to the wealthy H group (Figure 3). Their investment, however, is not expected to be repaid (Figure 4). 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 by communist public institutions, although we observe a strong overall positive effect of communism on reciprocity across all income groups.

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 6). 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. Village income is also correlated with lower discount rates (r) but is not correlated with present bias (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 s). This result is consistent with discussions in the empirical literature considering bidding ROSCAs as insurance devices when people face income uncertainty [Calomiris and Rajaraman 1998, Klonner 2003]. Furthermore, those who participate in bidding ROSCAs, compared to fixed ROSCAs, and those bidding-ROSCA participants in short-term rather than longer-term 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 6 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 because their political ties and power cushion them in downturns. Tables 10-11 show villagers engage in trade— usually modest roadside businesses— are both more trusting and more trustworthy. This result is reminiscent of the finding of Henrich et al [2004], based on a large cross-site study of small-scale societies, that market integration is correlated with fair sharing in ultimatum games.

As noted throughout, these results are preliminary and needed to be replicated in these sites, and compared with results in many others sites (as in Cardenas and Carpenter's [2005] meta-analysis). A major issue, which we can say little about, is whether economic and political circumstances result from preferences, or cause preferences. Perhaps natural experiments (such as forced relocation or instrumental variable estimation) can do more to establish the direction of causality. Finally, we hope one contribution of our study is to show some advantages of expanded measurements of risk and time preferences beyond expected utility and exponential discounting, replacing these simple models with prospect theory and the Benhabib et al. three-parameter discounting model. In a highly literate, but poor country, our subjects made comprehensible choices in a large battery of tasks while highly motivated to earn money. These experiments take time, but subjects in these sites are often eager to participate and their opportunity cost of participating is low. These facts, and the results they suggest, imply that these instruments can be used in many other sites.

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Table 1: Basic 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
Gender (1=male) (mean)	.59	.88	.83	.68	.82	.44	.36	.50	.50
Education (mean) (years)	7.2	7.1	8.4	5.8	5.0	7.8	8.0	4.8	7.6
Number of illiterate subjects	1	1	1	1	2	2	1	4	2
Acquaintance ratio (mean)	.42	.86	.76	.74	.82	.62	.91	.98	.90
Main occupation of the subject (multiple answers, %)									
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
Data from the 2002 Living Standard Measurement Survey (sample: 25 households)									
Village Gini coefficients	.44	.19	.30	.36	.38	.29	.38	.28	.36
Distance to nearest market	.0	5.0	.0	4.2	.0	.0	1.0	3.0	.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: Correlations between key variables

(1) Age, gender, education, and income

Total	Age	Gender	Education	Income
Age	1.00			
Gender	.01	1.00		
Education	-.36***	.13*	1.00	
Income	-.06	-.01	.13*	1.00
South	Age	Gender	Education	Income
Age	1.00			
Gender	.04	1.00		
Education	-.44***	.16	1.00	
Income	-.11	-.12	.11	1.00
North	Age	Gender	Education	Income
Age	1.00			
Gender	.05	1.00		
Education	-.28***	.14	1.00	
Income	.11	-.06	.22**	1.00

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

Total	Age	Gender	Education	Income
Farm/livestock	-.13*	-.03	-.17**	-.21***
Fishery	-.09	.08	-.10	.18**
Trade	.08	.04	.01	-.03
Business	.09	-.08	.00	.14*
Government officer	-.12	.12	.24***	-.03
Overseas remittance	-.05	-.07	.02	.49***
ROSCA member	-.13*	-.16**	.01	-.07
South	Age	Gender	Education	Income
Farm/livestock	-.10	.03	-.05	-.15
Fishery	-.12	.09	-.09	.18*
Trade	.20**	.08	.18*	-.06
Business	.10	.04	.07	.12
Government officer	-.20**	.22**	.25**	-.07
Overseas remittance	-.13	-.15	.04	.46***
ROSCA member	-.23**	-.06	.04	.02
North	Age	Gender	Education	Income
Farm/livestock	-.17	-.04	-.33***	-.35***
Fishery	.00	-.09	-.13	-.03
Trade	-.06	.00	-.01	.03
Business	.08	-.22**	-.10	.22*
Government officer	-.05	.07	.23**	.09
Overseas remittance	.07	-.03	.00	.62***
ROSCA member	-.09	-.11	-.03	-.09

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

Table 3: 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 4: 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>.14	λ>.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 5: 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 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 6: Determinants of risk aversion

(1) Prospect Theory

	α (Weighting function)	σ (Value function)	λ (Loss aversion)
Age	-.002	-.003 *	.035
Gender (1=male)	-.125 **	-.004	-.607
Education	.002	-.021 ***	.163
Farm/livestock	-.029	.004	-1.005
Fishery	.051	.244 ***	-.205
Trade	-.003	-.010	1.294
Business	.010	-.032	-.170
Government officer	.010	.082	-1.771 *
Relative income	.027	-.034	-.477
Mean village income	-.005	-.002	-.406 ***
Distance to market	-.007	-.027 *	-.145
ROSCA	-.092	.123 *	-.406
ROSCA*Bidding	.200 **	-.206 **	-.029
South	.047	-.000	2.114 **
Constant	.960 ***	1.012 ***	3.255
Observations	181	181	181
R^2	.08	.15	
Log pseudolikelihood			-429

(2) Expected Utility Theory

	r_1 (Series 1)	r_2 (Series 2)
Age	.005	.007 **
Gender (1=male)	-.072	.135
Education	.020	.019
Farm/livestock	-.193	.018
Fishery	-.492 ***	-.320 **
Trade	.117	.024
Business	-.140	-.002
Government officer	.030	-.076
Relative income	.103 ***	.005
Mean village income	-.011	.006
Distance to market	.077 **	.028
ROSCA	-.310 **	-.032
ROSCA*Bidding	.557 ***	.038
South	.018	-.053
Constant	-.034	-.055
Observations	181	181
Log pseudolikelihood	-444	-455

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

Table 7: Comparison of time-discounting models

			Quasi-hyperbolic discounting		Equation (1)	
	Exponential discounting	Hyperbolic discounting	Dummy variables for r	Dummy variables for β	Dummy variables for r	Dummy variables for β
r (Discount rate)	.023***	.049***	.008***	.008***	.107**	.089**
Dummy (Field)	-.001	-.002	-.000		-.011	
Dummy (South)	-.001	-.002	-.000		-.006	
β (Present bias)	(β=1)	(β=1)	.631***	.621***	.831***	.806***
Dummy (Field)				.015		.021
Dummy (South)				.006		.006
θ	(θ=1)	(θ=2)	(θ=1)	(θ=1)	5.310***	5.231***
Observations	4446	4446	4446	4446	4446	4446
R^2	.64	.70	.75	.75	.76	.76

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.
Inconsistent responses are excluded from the regressions.

Table 8: Estimation results of Equation (1) for field experiments

	Demographic variables for r	Demographic variables for β
r (Discount rate)	.280	.103
β (Present bias)	.898***	.720**
θ	5.334***	5.287***
Age	-.002*	.003
Gender (1=male)	-.087**	.048
Education	.005	-.005
Acquaintance ratio	-.022	-.131
Trusted agent	-.045	.065
Farm/livestock	-.028*	.059
Fishery	-.112***	.059
Trade	-.059	-.036
Business	.228	-.126
Government officer	-.062**	-.018
Relative income	.067**	-.012
Mean village income	-.004**	.009*
Distance to market	.010	.001
ROSCA	-.121**	.147*
ROSCA*Bidding	.227**	-.265**
Log (savings)	-.001	.007
Exp/income ratio	.002	-.001
South	-.014	-.022
Observations	2358	2358
R^2	.79	.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.

Table 9: Determinants of Present Bias and discount rates among bidding ROSCA participants (Non-linear regressions)

	+ Demographic variables for r	+ Demographic variables for β
r (Discount rate)	.269	.113
β (Present bias)	.931***	.476
θ	3.865***	4.398***
Age	-.003	.006
Education	-.009	.035**
Relative order	.058	-.295
Weekly ROSCA	.661	-.318***
Monthly ROSCA	-.115	.459**
Observations	387	387
R^2	.79	.79

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. 18 data points with inconsistent answers are excluded from the estimations.

Table 10: Determinants of amount sent by Player 1

	South	North	Total
Age	-156***	-22	-44
Gender (1=male)	358	2314	1519
Education	-257**	203	14
Oversea remittance	114	14050***	3912*
Acquaintance ratio	1731*	3149	1651
Farm/livestock	-1257	-700	-1439
Fishery	-2992*	-4252	-1414
Trade	4129***	4131*	1448
Business	-889	-6627**	-2670***
Government officer	-1653	1351	53
Relative income	-180	-656	-273
Mean village income	147*	-212*	12
Gini coefficient	-18012**	-30440	-17318*
Number of officers	180	468	114
Receiver M	1959***	634	1305***
Receiver L	2576***	1365*	2032***
ROSCA		1335	1260
ROSCA*Bidding	-1506		-2390
South			-1114
Constant	15174***	13596**	11969***
Observations	147	123	270
R^2	.44	.38	.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.

Table 11: Determinants of the proportion sent back by Player 2

	South	North	Total
Age	.001	.005 ***	.003**
Gender (1=male)	.025	.184 ***	.092***
Education	.000	-.003	-.001
Oversea remittance	-.005	.054	.037
Acquaintance ratio	.000	-.001	.004
Farm/livestock	-.004	-.046	.020
Fishery	-.197 *	.031	-.066
Trade	.104	.145 ***	.129**
Business	.209 ***	-.087 *	-.001
Government officer	-.074	.025	-.001
Relative income	.062 ***	.112 ***	.075***
Mean village income	-.004	-.005 *	-.005
Gini coefficient	-.423	.007	-.162
Number of officers	.108 **	.028 **	.018
Group M	-.072	.147 **	-.018
M*Mean village income	.007	-.006 *	.005
Group L	-.318	.112	-.086
L*Mean village income	.018 **	-.002	.011***
ROSCA		-.133 ***	-.064
ROSCA*Bidding	-.011		.069
South			-.103**
Constant	.123	.007	.141
Observations	490	420	910
R^2	.21	.51	.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.

Table 12: Correlation between risk, time discounting and trust

	σ	λ	Mean discount factor	Mean amount sent (Player 1)	Mean return rate (Player 2)
α	0.12	0.02	-0.08	-0.26**	-0.09
σ		-0.12	-0.05	-0.14	0.04
λ			-0.05	-0.12	-0.14
Mean discount factor				-0.02	-0.02

Figure 1: Locations of research sites

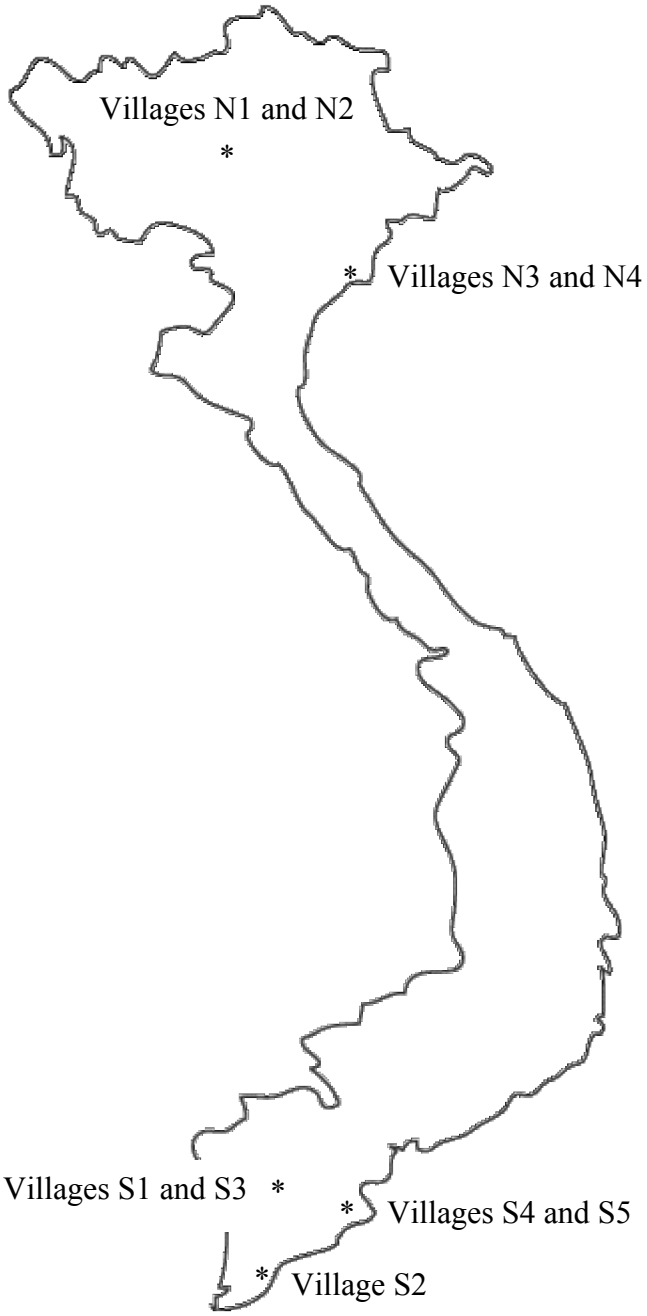


Figure 2: Estimated relative risk aversion parameters for Series 1 (r_1) and Series 2 (r_2)

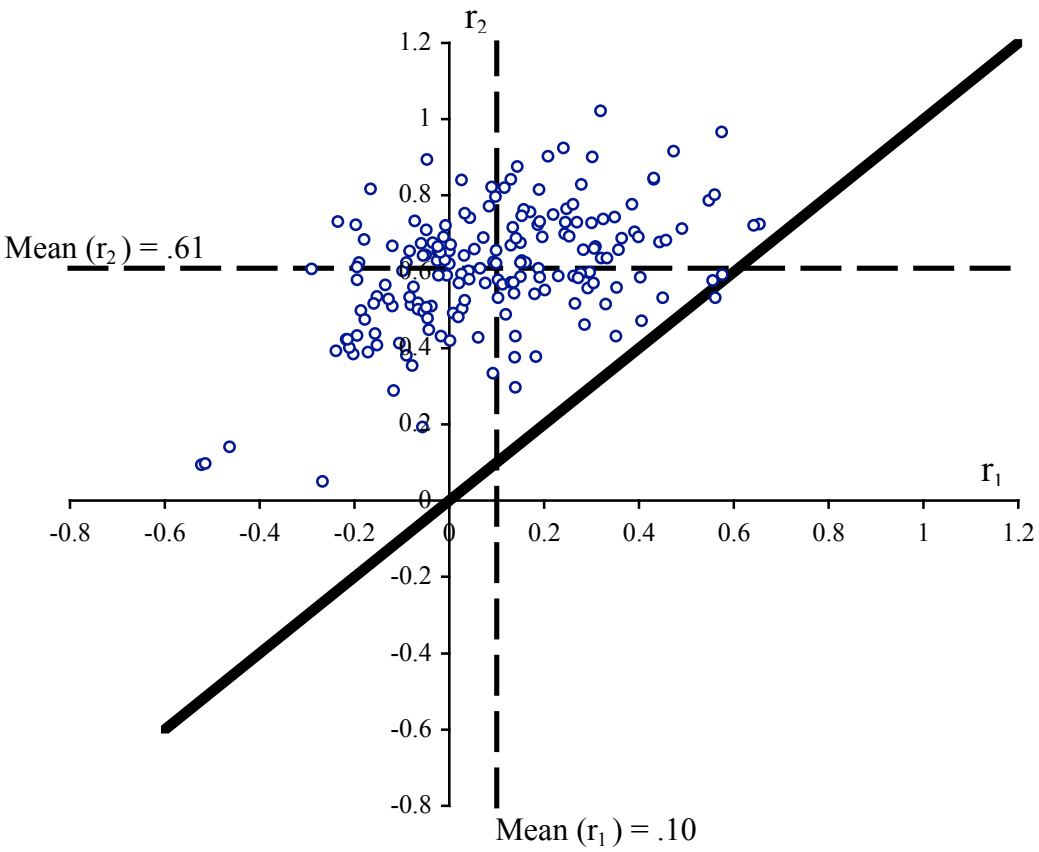
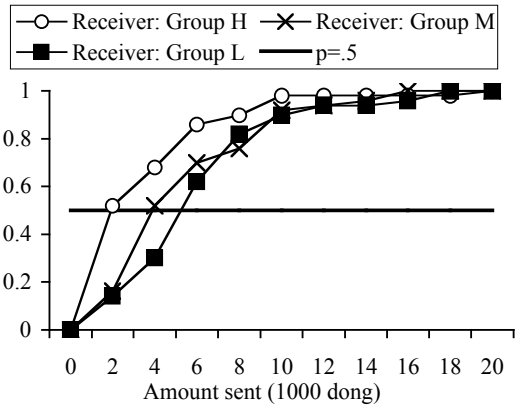


Figure 3: Cumulative distribution of amount set by Player 1 (by group of receiver)

South



North

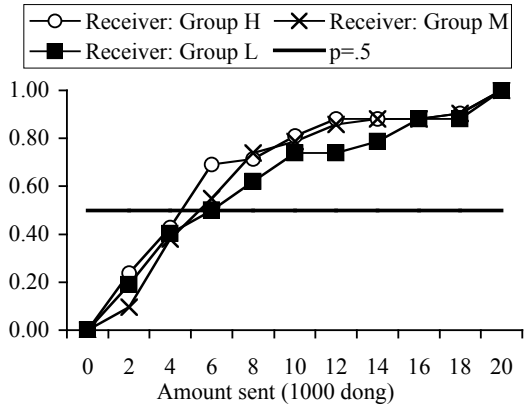


Figure 4: The ratio of expected return by Player 1 (by group of receiver)

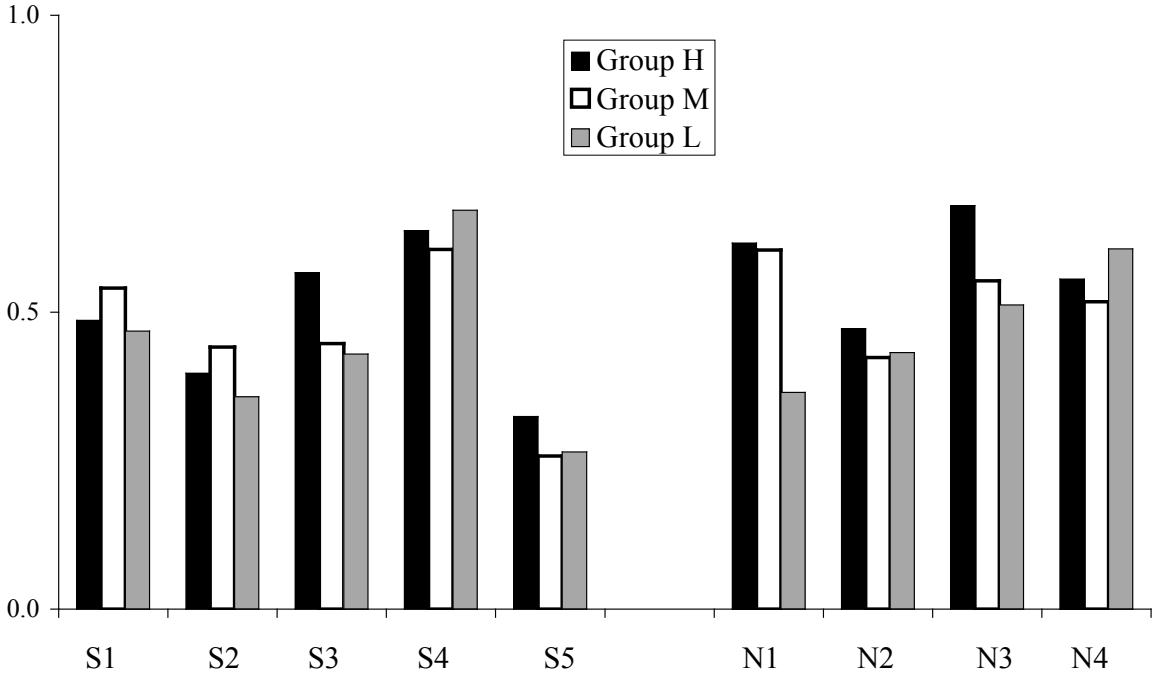
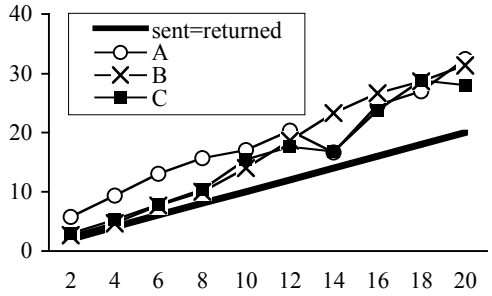


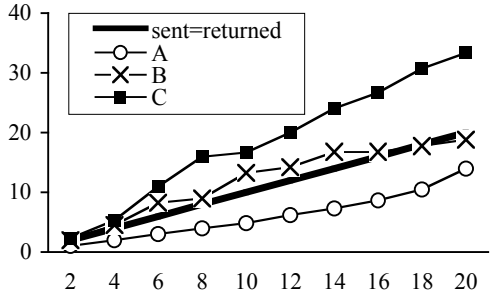
Figure 5: Amounts sent back by Player 2 (1000 dong)

Student subjects

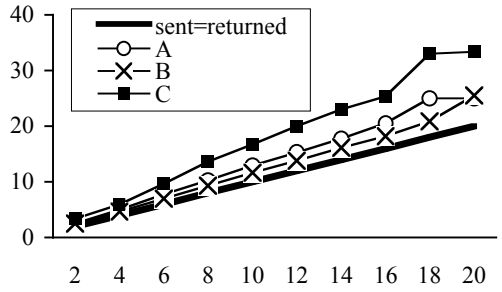
SS1



SS2

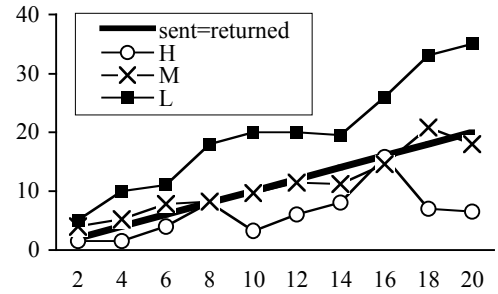


SN1



South

S1



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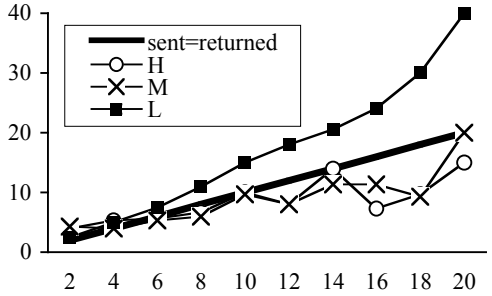

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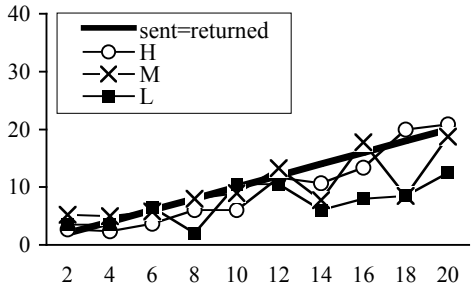
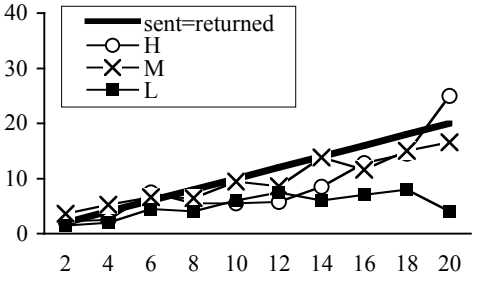
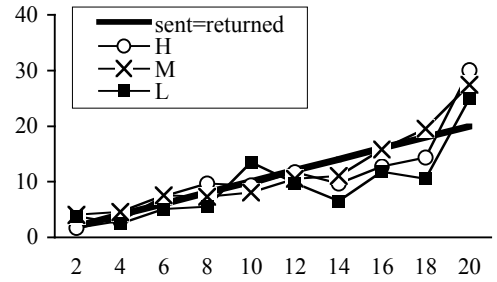


S4

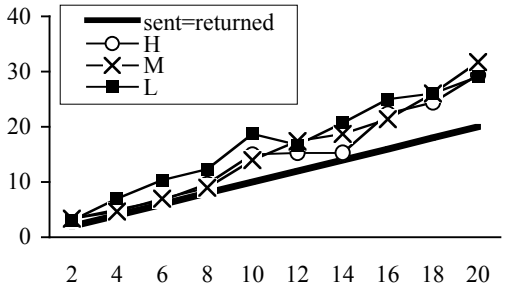


S5

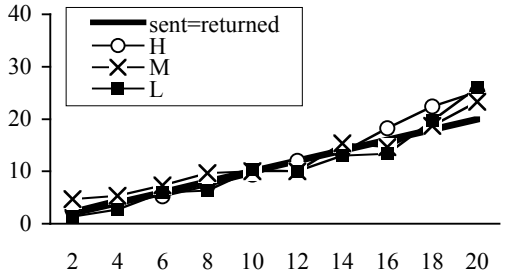


North

N1



N2



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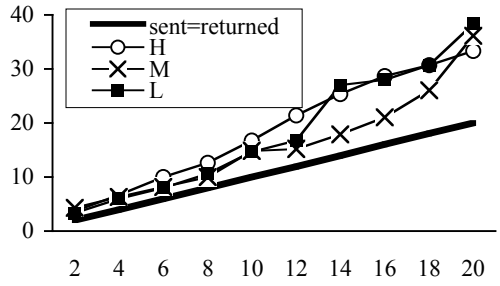

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