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) with random allocations of priority are more patient, but those who participate in bidding ROSCAs are less patient and weight probabilities nonlinearly. Results from trust game demonstrate the crowding-out effects of communism on the redistribution of wealth, because villagers in the South tend to invest more in low-income partners without expecting repayment. 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 with three separate dimensions of risk-aversion and time discounting, which have not been used in field settings before.

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1. Introduction

A fundamental question in development economics is the extent economic success of a country is linked to basic features of human preferences. If people in a country are extremely averse to financial risk, for example, 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 it would mean postponing 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 lubricates economic exchange. Risk-aversion, impatience, and lack of trust could therefore inhibit economic development.

In general, it's difficult to infer how much observed wealth depends on basic preferences. Many other factors seem to influence development-- institutions (Scully 1988), political systems of corruption and redistribution (Mauro 1995; Easterly and Levine 1997; Ehrlich and Lui 1999), 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 project, we used field experiments in Vietnam to directly measure preferences of individuals over risk and time, and to measures trust and trustworthiness in a simple investment game with moral hazard.[1] Few field experiments have linked wealth and other demographic variables to measured preferences since doing so requires conducting careful experiments *and* collecting time-consuming survey responses. A unique feature of our study is our ability to choose villagers who had been previously surveyed in a 2002 living standard survey, 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).

[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.

Our study measured risk, time and trust (social investment), because they are relatively easy to measure and 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 enable us to link trust and trustworthiness to inequality, relative wealth and other surveyed factors.

Vietnam has some advantages as a field site, the biggest of which 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. Despite poverty, the Vietnamese are highly literate (around 90%), which makes understanding instructions less challenging than field experiments in other less literate countries. The combination of poverty and literacy mean the Vietnamese are good experimental subjects—they are highly motivated, but also responsive to instruction.

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). Income variation and enterprise creation gives us healthy variation on these variables, enabling us to identify correlations of those variables with measured preferences, if they exist. For example, we will investigate whether risk and time preferences of those who started household enterprises are different from those who were left behind in the economic boom.

Of course, from a cross-sectional study like this one it's difficult to conclude very much about the direction of causality: Do differences in preferences cause people to stay poor, or to sort into different professions, or does the experience of poverty shape preferences? (see Henrich et al., in press). 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.

We also study individuals' involvement in rotating savings and credit associations (ROSCAs). 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 random ROSCAs, in which the order people draw from the ROSCA is determined randomly 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). We will investigate if the 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). Most instruments that have been used to measure preferences are guided by conventional simple model of preferences. These simple models have often been repeatedly rejected by experiments in Western educated populations, in favor of models with multiple components of preference. For example, in expected utility (EU) risk preferences can be fully characterized by the concavity of a utility function for money. But if risky choices are guided by prospect theory preferences, 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 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 conventional discount rates as in most 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 potentially misleading. Thus, we seek to measure time and risk preferences in the richest way, rather than be restricted to a simple historical theory 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[2] 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 150 rural villages in the Mekong Delta (in the South) and the Red River Delta (in the North). From these villages we chose five villages in the Mekong and four villages in the Red River Delta each with different levels of overall wealth, inequality and market access. Choosing villages with substantial differences in economic variables permits powerful cross-village comparisons.

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).

Table 2 summarizes correlations between key variables (see Table A.2 for variable definitions). The strongest correlations are with education, which 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). Income correlates negatively with farming—farmers were

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

left behind in the economic boom in the 1990s—and, not surprisingly, income correlates strongly with overseas remittances to households in Vietnam. Fortunately, most of the correlations among demographic variables were 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 households to the experiments.[3] Village meeting rooms or school classrooms were reserved for the experiments. Figure A.1 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 surveys.[4] Experiments started around nine in the morning, and lasted about 4 hours. 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 the same 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

[3] We also requested them to prepare one extra subjects in case the total number of subjects turns out to be an odd number (we need an even number of subjects to play 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.

[4] 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.

categories should matter) but most people in these small villages know all their neighbors and their approximate wealth.[5] Subjects were then given instructions and record sheets for each game separately. Illiterate subjects were assisted by research assistants. Subjects who had difficulty completing record sheets by themselves were also assisted 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[6], roughly 11 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 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 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. We conducted two experiments with student subjects at Can Tho University to train research assistants and an experimenter. We divided subjects by academic years (1st, 2nd and 3rd years, labeled A, B and C).[7] 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 by 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,

[5] 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.

[6] 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. Casual unskilled labor pays a daily wage of about 16,000 dong, so the average earnings are about 11 days' wages, or about $200 for a typical American worker.

[7] 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.

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 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 them not only in a state of having little but also losing what little they have. While most previous studies of risk preferences conducted experiments with lotteries involving only gains[8], and applied expected utility theory in their analysis (Binswanger 1980; Binswanger 1981; Wik and Holden 1998; Nielsen 2001; Henrich and McElreath 2002; Yesuf 2004), we conduct experiments with lotteries involving not only gains but losses, and consider prospect theory as an alternative theoretical framework to expected utility theory.

Empirical evidence suggests wealthier households invest in more risky production activities, and earn higher returns (Rosenzweig and Binswanger 1993; Fafchamps and Pender 1997). In development economics literature, it's often assumed the rich landlord is risk-neutral while the poor tenant is risk-averse (Braverman and Stiglitz 1982; Bardhan and Udry 1999). However, previous field experiment studies give us mixed results. 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) find 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 use expected utility theory 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 expected theory risk aversion is expressed solely by the concavity of utility function. Prospect theory (Kahneman and Tversky 1979; Tversky and Kahneman 1992) differs from

[8] 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).

expected utility theory in two respects. First, people have non-linear decision weights over probabilities. Experimental evidence suggests they overweight small-probability outcomes and underweight large-probability outcomes[9]. Secondly, in prospect theory, carriers of utility are the difference between outcomes and a reference point, rather than final wealth positions[10]. 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. Furthermore, there is much evidence that people dislike losses much more than 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 utility 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 loss aversion. The weighting function is linear if $\alpha=1$, as it is in expected utility theory. 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 has only one parameter, and 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[11]. The above model reduces to expected utility theory when $\lambda=\alpha=1$.

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

[10] Rabin demonstrates that expected utility theory is not a plausible model when individuals are risk averse over modest stakes (Rabin 2000; Rabin 2000).

[11] 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

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 should use simpler instruments.

To elicit the three prospect theory parameters, we designed three series of paired lotteries as shown in Table 3. We examine 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 move down the rows, the payoffs in Option B increases. Most individuals choose Option A in the first row and, as the high potential payoff in Option B increases down the rows, switches 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 after 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.

In each of the three Series of options, most subjects switch from A to B as they move down the rows of that Series. The choices are carefully designed so any combination of choices in the three series determines a 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[12].

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),

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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's is arguable whether 25% and 75% are small and large enough to make people overweight and underweight probabilities, respectively.

[12] The approximations of σ and α were obtained by solving a system of 105 inequalities. When subjects do not switch, the approximate values at the boundaries were used.

(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 fifth question in Series 2. Then the combinations of (σ,α) which rationalizes that switch are (1, 0.6), (0.9, 0.7), (0.8, 0.8), (0.7, 0.9), or (0.6, 1). By intersecting these parameter ranges from Series 1 and 2, we obtain the approximate values of (σ,α)=(0.8, 0.8). Predictions of (σ,α) for all possible combinations of choices are given in Table A.3 in the Appendix.

The loss aversion parameter λ is determined by the switching point in Series 3. Notice λ cannot be uniquely inferred from switching in Series 3; the range of λ 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 50% chance of gains and 50% chance of losses, so the probability weighting terms drop out in calculating prospect values.

Subjects were asked at which question they would switch from Option A to Option B in each Series. They can "switch" to Option B from the first question (i.e., they can choose Option B all the way through). Also, they do not have to switch to Option B if they don't want to.[13] After they completed three series of questions with the total 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 (0.54, 0.70), (0.60, 0.72) and (0.67, 0.68) 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

[13] 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.

experiments with Western students, and are close to other estimates with slightly different functional forms.[14]

The mean values of λ are 2.55, 3.19 and 2.59 for student subjects, non-student subjects in the south and north, respectively.[15] These values are not too far from 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). There is no significant difference in σ, α, and λ among student subjects, and village subjects in the south and north (except mean σ is significantly lower for students than for northern villagers). Within individual subjects, the three parameter estimates are only weakly correlated ($r(\alpha,\lambda)= -.17$, $p<.01$, indicating a correlation of more nonlinear probability and high loss-aversion. See Figure A.2 in the Appendix). Concavity of income is also mildly linked to income ($r(\sigma,\text{income})= -.15$, $p<.04$; richer people are more risk-averse. See Figure A.3 in the Appendix).

Correlations of the three risk-aversion parameters for village subjects were estimated using OLS regressions of individual-specific parameter estimates against demographic variables. The regression results are shown in Table 6.[16] Looking first at σ (curvature of the utility function), the strongest effects suggest educated Southern subjects are more risk-averse, and fishermen[17] and bidding-ROSCA participants are less risk-averse. However, the other two regressions indicate nonlinear weighting (α) and loss-aversion (λ) vary systematically as well. Males and ROSCA bidders have more inflected probability weights (lower α), and Southern villagers have less inflected weights. The interval regression of λ[18] shows village mean income

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[14] In Tversky and Kahneman (1992), estimated values of σ, α, and λ are 0.88, 0.61, and 2.25, respectively, using a different weighting function than we used (the single-parameter TK version). However, Prelec's weighting function and the TK weighting function yield nearly identical results.

[15] For estimating λ, we used the mean points in the ranges of λ as proxies when λ is bounded. When λ is unbounded (i.e. subjects choose Option A or B for all questions), the boundary values are used as proxies.

[16] Table A.4 in the Appendix reports regressions for σ and α in which 26 subjects who never switch either in series 1 or 2 are omitted. In the Table 6 regressions, the parameter estimates of these nonswitchers are set at the boundary values. 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.5 in the Appendix as well.

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

[18] We conducted interval regressions, allowing the dependent variable (λ) to be either censored, left-censored or right-censored data.

reduces loss aversion[19], and there is weak evidence that living in the South increases 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, for all three parameters, suggest the possible influence of political regime. People in the north have worked on collective farms for many years, and the government has provided them with food for subsistence. One can speculate as a result, that villagers in the South who are accustomed to assuming risks are more inclined to weight probabilities more linearly, but act as if utility is more concave and more kinked for losses.

The 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, the effect of village income shows up in loss-aversion. Since village income is linked to the degree of loss-aversion rather than concavity of utility, it's plausible that the poor do not fear income variation—they fear loss.

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 $(1/1+r)^t$ (or δ^t), or 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).[20] Studies in developing societies have yielded more mixed results. Pender (1996), Nielsen (2001) and Yesuf (2004) also find a negative relation between

[19] 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.4 in the Appendix shows that omitting 26 subjects with no interior switching point increases the estimated village-income effect from -.002 to -.006 and makes it significant at $p<.05$, which replicates the earlier results.

[20] Becker and Mulligan (1997) constructed a model which predicts how wealth affects time preferences, making richer individuals more patient.

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, 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 (Pender 1996; Nielsen 2001; Anderson et al. 2004), which has often been used to explain consumption (Deaton 1972, 1991). One field studied estimated hyperbolic discounting (Kirby et al. 2002). We estimate a more general model which allows us to test both exponential, "quasi-hyperbolic discounting", and a more general form[21]. Exploring a more general specification could be insightful because there are many experimental regularities that cannot be explained by exponential discounting (Frederick et al. 2002). Discount rates tend to decline over time[22] and exhibit a "present bias" or preference for immediate reward.[23] 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 $\beta\delta^t$. time discounting model. The two parameters β 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 (Laibson et al. 1998; O'Donoghue and Rabin 1999; Bernheim et al. 2001; O'Donoghue and Rabin 2001; Diamond and Koszegi 2003; DellaVigna and Malmendier 2006).

In our experiments, we give a long series of choices between small rewards delivered at earlier times, and larger delayed rewards (see Table A.6 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

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[21] Laibson named the (β, δ) formulation of time discounting "quasi-hyperbolic discounting" (Laibson 1997). It assumes the presence of present-bias and constant discount rates thereafter.

[22] See (Thaler 1981; Benzion et al. 1989; Loewenstein and Prelec 1992; Pender 1996).

[23] See (Laibson 1997; Laibson et al. 1998; O'Donoghue and Rabin 1999; Angeletos et al. 2001).

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

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, ye^{-rt} (by taking the limit as $\theta \to 1$). When θ=1 it reduces to quasi-hyperbolic discounting. When θ=2, it reduces to true hyperbolic discounting y(1/(1+rt)). 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.

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.

We used 15 combinations of y and t in the experiments, i.e. 30,000, 120,000 and 300,00 dong with the delays of 1 week, 1 month and 3 months, and 60,000 and 240,000 dong with the delays of 3 days, 2 weeks and 2 months (see 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 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. 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.

Estimation results of restricted non-linear regressions are given in Table 7[24]. The table reports restrictions for exponential discounting (θ=β=1) and the (β, δ) formulation of quasi-

[24] We dropped data of 3 subjects, since they totally randomized their choices.

hyperbolic discounting (θ=1). 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 surprisingly high value of θ (6.6, similar to Benhabib et al's estimates) and influences estimates of r and β but does not add any R^2 so we focus attention to the exponential and (β, δ) models (see Table 7 note for details). Table 7 does show dummy variables for field and South have little influence in the quasi-hyperbolic model 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.[25] The largest effects are on discount rates r. Farmers, fishermen, and wealthier village subjects are more patient (lower r). There is no effect of the risk aversion parameters or a Southern village dummy. Looking at the discount rate r and the present bias β together shows an interesting pattern for ROSCA participants: Participants in random-allocation 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).

ROSCAs

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 ROSCA practiced in the south is so-called "Discount bidding ROSCA" (Kovsted and Lyk-Jensen 1999). A winning bid turns into a discount to the other bidders who have not received the pool. Figure 1 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

[25] 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 choose 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, 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.6 and A.7 in the Appendix. Including the inconsistent ones rarely changes coefficient signs but adds noise and typically lowers significance.

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), netting 620,000 dong. On the second day, the winning bid is 3,000 dong again.[26] 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. On the third day, the winning bid is 3,000 dong again. The winning bidder collects 10,000-3,000 dong from each of the other 88 participants, and 10,000 dong from each of the two participants who received the pool on the previous days (and pays 10,000 to the host), netting 626,000 dong. The ROSCA cycle ends when every participant received the pool once. The first parson who received the pool received 620,000 dong and contributed 900,000 dong in total during the cycle, making her daily interest rate 0.90%. 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 0.88%, 0.56%, 0.17% and 0.10%, 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 development— by shaping discount rates (cf. Becker and Murphy, 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 both more impatient (higher r) and more present biased (lower β). 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 inform institutional design. Creating ROSCAs that villagers will participate in requires some knowledge of their preferences

[26] In 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.

and motives. Random and bidding ROSCAs both enable people to pool group funds to buy indivisible capital goods (like expensive livestock). But the bidding ROSCAs also allow impatient people to borrow and lend by making large bids for early payments or waiting and making low bids for later payments. Random ROSCAs could be quite unpopular with impatient and present-biased villagers, while short-run (e.g., weekly) bidding ROSCAs could be wildly popular.

5. Trust Game

We focus on one aspect of social preferences, trust, since it is considered as the key element of social capital (Knack and Keefer 1997; Durlauf and Fafchamps 2004; Dasgupta 2005). 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. Then a "trustee" 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, 1990) because pure trust substitutes 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 change depending on the wealth levels of the other party. Ashraf, Bohnet and Piankov (2003), Carter and Castillo (2002), and Holm and Dalienson (2005) demonstrated how trusting behavior can be largely explained by altruism. 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.[27]

[27] 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 the

In our trust game, the Player 1 endowment was 20,000 dong, which was 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 players in different wealth 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 read the instruction, the subjects solved a quiz. Illiterate subjects and subjects who had difficulty understanding the game were assisted by research assistants[28]. 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 assisted 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 the other 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 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, 2004)[29]. However, the fractions sent by Player 1's in our student

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Vietnam national figure was .36 in 1998 http://www.cia.gov/cia/publications/factbook/fields/2172.html CIA factbook. 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.

[28] 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.

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

experiments, 52%, are compatible to other studies in US, Russia, Tanzania and Sweden (Berg et al. 1995; Ashraf et al. 2003; Holm and Danielson 2005).

Table 10 shows the mean amount sent by Player 1 and the expected returns by Player 2's group. The expected returns are calculated as the expected amount of money back divided by the amount sent.

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 shows student cdf's). In Figure 2, 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 that in the South, there is a substantial gap between median investments to groups H, M and L; investors invest more with L groups than with H groups. The Appendix shows cumulative distributions for each village separately. 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, 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. 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).

Interestingly, expected returns do not match up with investments (see Table 10). In the South, Player 1 tend to expect higher returns from Group H and lower returns from Group L, in contrast to the fact that they sent less money to Group H and more money to Group L. Keep in mind that investments are not necessarily expectations of reciprocal repayment; as Ashraf, Bohnet and Piankov (2003) showed, trusting investments might also just reflect altruistic giving to other players, when there is an investment-tripling multiplier that encourages giving. 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 transfer—in the North, communist redistribution equalizes resources, but in the South villagers redistribute income from rich to poor own their own.

Table 11 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. We also ran regressions with the survey responses to the GSS questions[30].

The coefficients of expected returns are negative and sometimes significant. This is consistent with our earlier observations that Player 1 send most to Group L and expect least from them, while they send least to Group H and expect most from them. In the north, there are only five subjects who receive remittance from their oversea relatives[31]. They send significantly more money to Player 2, another indication of private communal sharing of remittances. 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 form both regions. It may be because it's correlated with the mean income of community. 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.

The estimated coefficients of mean income of the community are significant in both regions but are positive in the south, and negative in the north. The negative correlation between the wealth 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 have worked on collective farms for many years. The Gini coefficient is negative and significant in the south, and is sometimes significant for the pooled data estimations. Our findings support Knack and Keefer's conclusion that trust is positively correlated with equality (Knack and Keefer 1997). In the south, Player 1 sends significantly larger amount of money to Player 2 in Groups M and L, while this redistribution trend is weaker in the north, another statistical indication of a crowding-out effect of political institutions on private transfers. All GSS trust questions are significantly correlated with the amount sent by Player 1.

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[30] We asked the following three questions. 1) Generally speaking, would you say that people in your village can be trusted or that you can't be too careful? (GSS trust), 2) Do you think people in your village would try to take advantage of you if they got a chance, or would they try to be fair? (GSS fair) and 3) Would you say that most of the time people in your village try to be helpful, or that they are mostly just looking out for themselves? (GSS helpful)

[31] Under the 2002 household survey, there are 7 households who received overseas remittance. However, two of them did not come to the experiments.

In order to test whether risk and time preferences are correlated with trust, we also included λ, loss aversion parameter, σ, the curvature of power value function, and the number of times a subject chose immediate receipt of money in the time discounting experiment as a proxy for present bias. The coefficient on λ is significant in the north, but not in the south or in the pooled data estimation. The coefficient on σ is negative and significant, indicating risk-averse subjects send more money to Player 2. Present bias is positive and significant in the north, but not in the south and the pooled data estimation. In the total sample, most risk and time preferences are not significantly correlated with trust. The sign of risk aversion is opposite of what we expected, risk-averse people sending more money to Player 2. They may be concerned with the probability that other subjects may find out how much they send to Player 2.

Figures 5 illustrates the amount of money sent back by Player 2 in each session. Trust pays off among student subjects and non-student subjects in the north in most villages and across all income groups. In the south, Player 2 sent back more than Player 1 sent them only for Group L 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.

Table 12 presents the results of linear regressions on the proportion of money sent back by Player 2 in the field experiments. Coefficients of relative wealth are positive in all regressions. This implies wealthy individuals are more reciprocal. The poor in wealthy communities are significantly more reciprocal. Older and male subjects, and those who engage in trading activities, are also more trustworthy. 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. The GSS trust questions are not significant influences on repayment.

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.

Nonetheless, we can speculate from the results on risk and time preference, and trust, about five patterns that could be explored in further work and investigated in other field sites.

South/North: People in the north have worked on collective farms for many years, and the government has provided them with food for subsistence. One can speculate that as a result, villagers in the South who are accustomed to assessing a value to assumed risk valuing assuming risks are more inclined to weight probabilities more linearly (higher α), but act as if utility is more concave (lower σ) and more kinked for losses (higher λ). These effects are all modestly or strongly significant (Table 6). At the same time, there is no evident difference in time preference parameters in the two regions. In trust games, the South subjects tend to give more to poor L groups and less to H groups (Figure 2 and Table 11). Their investment is not expected to be repaid, however (Table 10) and, indeed, less is repaid by poor groups and in the South (Figure 3 and Table 12). In the South, it seems, people are more altruistic toward the poor. This pattern is consistent with the idea that private norms of redistribution are active in the South but are crowded out, in the North, by communist public institutions.

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 more risk-averse, but they are more loss-averse (Table 6). This difference is a reminder that in expected utility theory, 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 weight probabilities more nonlinearly (lower α) and are less risk-averse (higher σ); they are gamblers, relatively speaking. Furthermore, those who participate in bidding ROSCAs, compared to random-receipt ROSCAs, and those bidding-ROSCA participants in short-term rather than longer-term (monthly) ROSCAs, are more impatient (higher r) and more present-biased (lower β).

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 much less loss-averse, perhaps because their political ties and power cushion them in downturns. Tables 11-12 show that 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.

Gender: Because of the importance of gender in economics (e.g., wage gaps), there are many studies of gender and risk preferences and trust. We find that males are weakly more patient (Table 8) and more trustworthy, repaying more as the Player 2 trustee (Table 12), particularly in the North. We also find an effect on risk preferences, but not on the usual measure of utility concavity—instead, men have substantially more nonlinear probability weights (lower α, Table 6) than women. The latter effect shows the advantage of separate components of risk-aversion which is suppressed or confounded in expected utility analyses that locate risk preference entirely in concavity of utility.

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 the scope of measurement 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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