

ROSCA as a Saving Commitment Device for Sophisticated Hyperbolic Discounters: Field Experiment from Vietnam

Tomomi Tanaka (Arizona State University)

Quang Nguyen (Université Lumière (Lyon 2))

Abstract

This paper investigates whether the participation in rotating savings and credit associations (ROSCAs), an informal financial institution-like arrangement found in many developing countries, is correlated with risk aversion, time discounting and the level of trust and reciprocity measured in experiments. We show people who participate in fixed ROSCAs are less present-biased, have lower discount rates and are often aware of the self-control problem they would face if they had to save alone. In contrast, time preferences are not strongly related to the participation in bidding ROSCAs. The members of fixed ROSCAs are also more trustworthy, and less prone to default. Our experimental results suggest fixed ROSCAs attract sophisticated individuals who are aware of self-control problems, while bidding ROSCAs do not attract these individuals.

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I. Introduction

People living in developing countries are plagued with financial and economic challenges. They're often caught in a poverty trap, expending all they earn, saving little, if any, and having limited access to formal financial institutions for business investment. Additionally, insurance and credit markets are underdeveloped making it difficult to deal with risk.

This paper studies ROSCAs, informal self-help financial groups found in many developing countries (Bouman 1995). In a ROSCA, people meet on a regular basis and everyone contributes money to a pool on a periodic schedule (e.g., every week). Someone in the pool is then chosen to receive all the money in each period's pool. The ROSCA cycle ends when every participant receives the proceeds of the pool once. Anderson and Baland (2002) conduct a survey in Kenyan slum and show that 57.2% of households participate in ROSCAs and the average contribution to ROSCAs is equal to 20.3% of income. Aketon, Sawada and Otsuka (2006) conducted a survey with owners of small enterprises in Kenya and found ROSCAs to be the most important source of credit in terms of loan size. Kan (2000) found ROSCAs to be an important source of funds for capital accumulation in Taiwan between 1972 and 1992. Levenson and Besley (1996) show how ROSCAs helped households purchase durable goods in Taiwan.

In developing countries, it is often difficult to enforce market contracts (Arnott and Stiglitz 1990, Stiglitz 1990). As Besley (1995) points out, non-market institutions such as ROSCAs tend to have comparative advantages in monitoring and enforcement. In Jamaica, a commercial bank has started to offer a savings account, which emulates ROSCAs (Handa and Kirton 1999).

Due to its prevalence and importance as a means for saving and loans for business investment in developing countries, ROSCAs have received a considerable amount of attentions by economists who have proposed various theoretical models to explain the role of ROSCAs. Besley, Coate and Lury (1993) assume individuals join ROSCAs to finance the purchase of durable goods. Taking advantage of the intertemporal gains from

exchange between members, participants can purchase indivisible goods earlier with ROSCAs than without ROSCAs. They also compare allocative efficiency of ROSCAs and credit markets (Besley, Coate and Loury 1994).

Calomiris and Rajaraman (1998) and Klonner (2003) draw attention to the role of bidding ROSCAs as risk-sharing arrangements. Klonner (2003) constructs a model and shows that when individuals are risk averse and their income is uncertain, bidding ROSCAs outperform random ROSCAs.

Even though ROSCAs may have comparative advantages in monitoring and enforcement over formal financial institutions, ROSCAs are not sustainable if participants default after receiving a pot. Anderson and Baland (2002) show how trust fosters the likelihood of joining ROSCAs in Kenya. Besley, Coate and Loury (1993) and Honda and Kirton (1999) underscore the importance of social sanction mechanisms to deal with the problem. Kovsted and Kyk-Jensen (1999), Chiteji (2002), and Anderson, Baland and Moene (2009) construct theoretical models and evaluate the enforceability of ROSCAs. Anderson, Baland and Moene (2009) demonstrate when social sanctions are weak, the institutional structure can be designed to mitigate the enforcement problem.

Recently, increasing attention has been also given to the role of ROSCAs as a saving commitment device. For instance, Ambec and Treich (2007) develop a model to explain how ROSCAs can help people cope with self-control problems. Gugerty (2007) and Anderson and Baland (2002) provide some evidences that ROSCA are regarded as a saving commitment device. The self-control problem arises when people put excessive weight on today's consumption rather than future consumption (Laibson 1997, Laibson, Repetto and Tobacman 1998), though people may or may not be aware of the self-control problem (O'Donoghue and Rabin 1999, 2001).

As discussed above, trust, risk sharing and self-control motivation are considered major reasons why people in developing countries participates. We conducted experiments to measure risk preference, time preference and the levels of trust and reciprocity with ROSCA participants and non-ROSCA participants in rural Vietnam, and investigated whether these preferences correlate with the participation in fixed and

bidding ROSCAs, two major ROSCAs prevalent in developing countries. We also conducted a survey to see whether ROSCA participants were aware of the self-control problems they would face if they had to save by themselves.

Our key findings are people who participate in fixed ROSCAs are less present-biased, have lower discount rates and are often aware of the self-control problem. In contrast, time preferences are not strongly correlated with the participation in bidding ROSCAs. The members of fixed ROSCAs are also more trustworthy and default less, while bidding ROSCAs do not attract these individuals.

The results of this study show how preference measurement can provide suggestions for institutional design. The design of ROSCAs requires some knowledge of the preferences and motives of potential participants.

II. ROSCAs in Vietnam

Two types of ROSCAs, namely “fixed” ROSCAs and “bidding” ROSCAs”, are primarily practiced in Vietnam. Under “fixed” ROSCAs, the order in which people receive a pot is determined at the initial meeting. In “bidding” ROSCAs, members submit sealed bids for the right to receive money in every meeting. “Fixed” ROSCAs are mainly practiced in the north, and “bidding” ROSCAs are observed mainly in the south. We conducted a survey with our experimental subjects who participate in ROSCAs or whose spouses participate ROSCAs and asked how the order of receipt is decided in their ROSCAs. Table 1 summarizes their responses. In the north, 75.6% of the subjects reported that the order of receiving the pot was decided by negotiation during the first meeting. In the south, 94.1% of the subjects reported that the order was determined by bidding. We do not know why only one type of ROSCAs is dominant in each region. Bouman (1995) hypothesizes that bidding ROSCAs have evolved to meet the need for

greater control over the timing of receipt. Table 2 summarizes how the money was used. In the north, the most popular ways of using the fund among ROSCA participants are business investment, livestock investment and fixing or buying houses. In the south, people tend to use the fund to invest in either agriculture or livestock production.

ROSCAs in the north and south differ in many other aspects. In the north, more than half of the ROSCA participants reported that their ROSCA meetings are held every 6 months, and no one reported the meeting of less than once a month (see Table 1). In contrast, in the south, more than half of the ROSCA participants reported that their ROSCA meetings are held every 3 months, and daily and weekly ROSCAs are also conducted. The average numbers of members in each ROSCA are 13.6 and 23.8 in the north and south, respectively. The average sizes of the pot received in the last cycle are 7.7 and 4 million dong, which are 50% and 16% of their annual income in the north and south, respectively. 13.3 and 23.8 percents of the respondents have ever failed to make a contribution in the past, in the north and south, respectively. In sum, ROSCAs are practiced with a smaller number of members with a larger pot in the north. They meet less frequently and defaulted less compared with their counterparts 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. In each meeting, the one who submits the highest sealed-bid wins the pot, and the members who have not won the pool pay the full fixed amount minus the winning bid. Those who win the pot in earlier meetings get no discount, thus contribute the full amounts. The winner receives the pot, and pays a commission to the host. The cycle ends when the last member receives the pool. The winning bid of the last

receiver is zero since he/she is the only bidder. Thus, the last member receives the full amount of contribution from each of other members.

We collected the records of winning bids, the amounts contributed and received by each participant from 5 bidding ROSCAs in Chau Doc Town in the south. Figure 1 shows the amounts contributed and received by each participant along with their winning bids in five ROSCAs. We sorted the participant by the order they received a pot from left to right. Figure 1-(1) shows the amount contributed and received and the winning bid for each participant for a daily ROSCA of 10,000 dong with 91 members. The winning bid in the first meeting was 3,000 dong. The winner received 7,000 dong (10,000 dong minus 3,000 dong) from each of 90 other members and paid 10,000 dong to the host. So, the winner received 620,000 dong in total in the first meeting. The host receives 10,000 dong from a winner in each meeting, and is supposed to make up for default if any member fails to make a contribution. In the second meeting, the winning bid was 3,000 dong as well. The winner received 7,000 dong (10,000 dong minus 3,000 dong) from each of 89 other members and 10,000 dong from the member who won the pot in the first meeting, and paid 10,000 dong to the host. Thus, the second receiver received 623,000 dong in total. In the third meeting, the winning bid was 3,000 dong again. The winner received 7,000 dong (10,000 dong minus 3,000 dong) from each of 88 other members and 10,000 dong from two members who won the pot in earlier meetings, and paid 10,000 dong to the host. Hence, the third receiver received 626,000 dong in total. The later ROSCA members win the pot, the higher their net return from participating in ROSCAs becomes. As shown in Figure 1-(1), the contributions made by first 45 members who received the pot in early meetings exceed the amounts of money they received, making them net

borrowers. On the contrary, the last 46 receivers of the pot collected more money than their contributions they made throughout the cycle, making them net lenders. Tables 1- (2), (3), (4) and (5) show the amount contributed and received and the winning bid for each participant for a 20,000-dong daily ROSCA, 300,000-dong weekly ROSCA, 1 million-dong monthly ROSCA, and 2 million-dong monthly ROSCA. The daily interest rates of the first receivers in these ROSCA are 0.90%, 0.88%, 0.56%, 0.17% and 0.10%, respectively.

As shown above, bidding ROSCAs are designed in the way that first receivers become net borrowers and last receivers become net lenders. In contrast, fixed ROSCAs collect the same amount of contribution from all members and the size of the pot is the same in each meeting, regardless of the order of receipt. Thus, the interest rate is zero in fixed ROSCAs for all participants.

III. Predictions

Having understood the features of ROSCAs in Vietnam, we can now propose some hypotheses about the relation between ROSCA participation and preferences.

Fixed ROSCAs in the north tend to be organized with a smaller number of members and allocate a larger size of pots. We expect ROSCA members to be more trusting and trustworthy than non-ROSCA members. The fixed ROSCAs in the north meet less frequently than the bidding ROSCAs in the south, and the order of receiving the pot is predetermined. Thus, we predict that members of fixed ROSCAs are patient, i.e., they are less present-biased and have lower discount rates. We do not expect fixed ROSCA members to be more risk averse than non-ROSCA participants, since the order

of receiving the pot is decided in the first meeting, making it difficult to use ROSCA as insurance against income shock. We also expect them to be aware of self-control problems and use ROSCAs as a saving commitment device, since the order of receiving the pot is predetermined.

We hypothesize bidding ROSCAs in the south attract people who are risk averse since Bidding ROSCAs are assumed to work as risk-sharing arrangements (Calomiris and Rajaraman 1998, Klonner 2003). Bidding ROSCAs may attract present-biased individuals, since members can obtain the pot in early meetings by submitting high bids. We conjecture the levels of trust and trustworthiness are low among bidding ROSCA members, since the default rate is high and the host is supposed to compensate for default if any member fails to make a contribution.¹ Besley and Levenson (1996) describe a high level of default among bidding ROSCA members in Taiwan.

IV. Selection of research sites and research methods

In July-August 2005, trust game, risk, and time discounting experiments were conducted with members of households who were previously interviewed during a 2002 living standard measurement survey.² In the 2002 survey, 25 households were interviewed in each of 142 and 137 rural villages in the Mekong Delta (in the South) and the Red River Delta (in the North, excluding villages in Hanoi City). From these, we

¹ Besley and Levenson Besley, Timothy, and Alec R. Levenson, "The role of informal finance in household capital accumulation: Evidence from taiwanthe role of informal finance in household capital accumulation: Evidence from taiwan," *Economic Journal*, 106 (1996). describe a high level of default among bidding ROSCA members in Taiwan.

² The 2002 living standard survey covers total 354,360 households in Vietnam. The sample design was self-weighted, that is, each household had the same probability of being selected.

chose nine villages, five villages in the south and four villages in the north, with substantial differences in mean income, inequality, and market access.

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. Thanks to the power of the government to encourage attendance, the response rate was high (82 percent), which limits concern about self-selection in participation. Eighty-three and Ninety-eight subjects participated in the experiment in the north and south, respectively. Among those subjects, forty-three and twenty-four subjects are ROSCA members. Also there are five and eleven subjects whose spouses are members of ROSCAs in the north and south, respectively. We estimated risk and time preferences of spouses of ROSCA participants, and found that their preferences are not significantly different from preferences of neither non-ROSCA participants nor ROSCA participants. Thus, we pooled them into the data as non-ROSCA members in following regressions and analysis. Table 3 summarizes the characteristics of ROSCA participants and non-ROSCA participants in both regions. ROSCA participants are younger than non-ROSCA participants and more likely to be engaged in livestock production in the south.

We designed a risk experiment that can separate risk aversion from loss aversion and probability weighting under prospect theory. See Tanaka, Camerer and Nguyen (forthcoming) for detailed discussions on the experimental design. We use cumulative prospect theory and the one-parameter form of Drazen Prelec (1998)'s axiomatically-derived weighting function. The values of prospects are $v(y) + \pi(p)(v(x) - v(y))$ (for $xy > 0$ and $|x| > |y|$) or $v(y) + \pi(p)v(x) + \pi(q)v(y)$ where p and q are the probabilities of outcomes x

and y . We assume a piecewise power function for value, $v(x)=x^\sigma$ for gains $x>0$ and $v(x)=-\lambda(-x)^\alpha$ for losses $x<0$. The probability weighting function is $\pi(p)=1/\exp[\ln(1/p)]^\alpha$.

Parameters σ , α , and λ represent concavity of the value function (risk aversion), probability weighting and the degree of loss aversion, respectively. If a subject is risk averse, σ is low. If he overweights small probabilities and underweights large probabilities, α will be low. If he is afraid of loss, then λ will be high. The model reduces to EU (with a reflected utility function at zero) if $\alpha=1$ and $\lambda=1$.

In our time discounting experiment, subjects make seventy-five choices between smaller rewards delivered today, and larger rewards delivered at specified times in the future as follows: Option A: Receive x dong today; or Option B: Receive y dong in t days. The reward x varies between 30,000 to 300,000 and the time delay t varies between three days to three months. Using the same data set, Tanaka, Camerer and Nguyen (forthcoming) find the quasi-hyperbolic discounting model (Laibson 1997) fits the data best. Hence, we estimate present-bias (β) and discounting rate (r) under the quasi-hyperbolic discounting model. We estimate the lower bounds and upper bounds of β and r for each subject, and use the middle points.

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.

Player 1 was endowed with 20,000 dong, which was roughly equivalent to the daily wage. 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.

In trust game, we divided subjects into Groups H, M and L in accordance with their relative income within the village. 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. We use the amount sent to Group M (medium income group) by player 1 as the proxy of trust.

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. We average the mean proportion of money sent back from Player 2 to Player 1 across 10 possible investments and use it as a proxy of reciprocity. Each subject played trust game only as player 1 or player 2.

V. Results

Table 4 shows simple correlation between ROSCA participation (equal 1 if the subject participate in ROSCA, and equal zero otherwise) and preference parameters. ROSCA participants reciprocate more than non-ROSCA participants in the north, as we

predicted. Time discounting and risk preference parameters did not come out to be significant.

Next, we run a probit model regression to investigate whether we observe correlations between preference parameters and the probability of joining ROSCAs in each region, after controlling for demographic variables. We did not include trust and reciprocity as explanatory variables since we have data for trust and reciprocity for only half of the subjects (subjects played the role of either player 1 or player 2 in trust game).

Table 5 shows the regression results. We report marginal effect, instead of coefficients. In the north, higher relative income within the village is weakly correlated with the probability of joining ROSCAs, indicating fixed ROSCA participants are wealthier than non-ROSCA participants within the village. Lower mean village income is also correlated with the probability of joining ROSCAs. Poorer villages are more likely to organize ROSCAs than richer villages. It may be due to the difference in the access to formal financial institutions in poor and rich villages.

Street vendors are more likely to join ROSCAs in the north, which is consistent with early observation that people tend to use the fund for business investment in the north. Individuals with less present bias and lower discount rates are more likely to join ROSCAs, which is consistent with our hypothesis. People who have access to bank loans are less likely to join the ROSCAs. Our result is consistent with Aketon, Sawada and Otsuka (2006). ROSCAs may be working as a substitute to formal loans.

In the south, people who are engaged in livestock production are more likely to join ROSCAs. This result is consistent with our earlier observation that our subjects in

the south are likely to use the fund to invest in livestock. The probability of joining ROSCAs is not significantly correlated with neither risk nor time discount parameters.

Table 6 summarizes the motivation for joining ROSCAs among the subjects who participate in ROSCAs. In the north, more than half of the subjects joined ROSCAs to commit saving. In the south, saving commitment and income uncertainty are top reasons for joining the ROSCAs. This suggests ROSCA participants in the north are more motivated to join ROSCAs to commit saving compared with the ROSCA participants in the south.

We conducted risk and time experiments with 60 participants of daily ROSCAs in Chau Doc Town to find out whether the timing of receiving the pot correlates with risk and time preferences. Table 7 shows correlation between preference parameters and the timing of receiving the pot. The variable “timing of receiving the pot” was calculated by the subject order of receiving the pot divided by the total number of participants in their ROSCAs. The smaller the variable “timing of receiving the pot” is, the earlier the subject received the pot. We expect people who receive the pot earlier in the ROSCA cycle to be more present-biased or impatient (lower discount rate). However, people who receive the pot earlier are not necessarily less present biased or have lower discount rates. Instead, they tend to be more loss averse and have more biased subjective probability.

VI. Conclusion

We investigate whether the participation in rotating savings and credit associations (ROSCAs), informal financial institutions found in many developing

countries, is correlated with risk preferences, time discounting and the level of trust and reciprocity by conducting experiments with participants and non-participants of ROPSCAs in Vietnam. We show people who participate in fixed ROSCAs are less present-biased, have lower discount rates and are often aware of the self-control problem they would face if they had to save alone. In contrast, time preferences are not strongly related to the participation in bidding ROSCAs. The members of fixed ROSCAs are also more trustworthy, and default less.

Our experimental results suggest fixed ROSCAs attract sophisticated individuals who are aware of self-control problem, while bidding ROSCAs do not attract these individuals.

The results 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. However, bidding ROSCAs do not attract people who are patient and trustworthy, as fixed ROSCAs do.

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Table 1 Descriptions of ROSCAs in the north and south

	North	South
Method of determining the order of recipients (%)		
- Random	15.6	0.0
- Bidding	2.2	94.1
- Negotiation	75.6	2.9
- Decision by leader	6.7	2.9
Total	100.0	100.0
Frequency of meetings (%)		
- Everyday	0.0	8.8
- Every week	0.0	11.8
- Every 2 weeks	0.0	11.8
- Monthly	24.4	8.8
- Every 3 months	17.8	58.8
- Every 6 months	55.6	0.0
Total	100.0	100.0
Average number of members in each ROSCA	13.6	23.8
Average size of the pot received in the last cycle (mil dong)	7.7	4.0
Have ever defaulted in the past?		
Yes (%)	13.3	23.5
Average years of experience in participating in ROSCAs	4.3	2.5

Note: Number of respondents in the north and south are 45 and 34, respectively.

Table 2 Use of funds

	North	South
Business investment	12	4
Investment in agriculture	6	11
Investment in livestock	12	13
Investment in aquaculture	0	4
Invested in other income-generating activities	0	2
Durable goods (TV, VCR, Motorbike)	8	5
Food	2	1
Education	10	7
Paying off debts	1	6
Saving	4	4
Cloth, shoes, household items	4	8
Wedding, funeral	1	2
Medical expenses	2	2
Fixing or buying houses	12	5
Buying land	1	2
Paying tax	0	7

Note: Number of respondents in the north and south are 45 and 34, respectively.
Multiple answers were allowed.

Table 3 Characteristics of ROSCA participants and non ROSCA participants in the north and south

	North		South	
	Non-ROSCA participants	ROSCA participants	Non-ROSCA participants	ROSCA participants
Number of Subjects	43	40	74	24
Age (mean)	49.9	47.4	48.1	41.3**
Gender (mean) (male=1)	0.51	0.40	0.77	0.71
Education (mean)	7.0	6.8	6.6	6.9
Income (mean)	15.9	13.5	24.7	25.8
Relative Income within village (mean)	-0.09	0.14	-0.03	0.11
Occupation (%)				
- Not working	25.6	12.5	10.8	8.3
- Agriculture	37.2	50.0	43.2	62.5
- Livestock	27.9	35.0	14.9	54.2***
- Aquaculture	2.3	7.5	14.9	29.2
- Street vender	9.3	17.5	16.2	4.2
- Family business	9.3	10.0	12.2	4.2
- Government officer	18.6	17.5	14.9	8.3
- Private sector	2.3	5.0	1.4	0.0
- Casual work	4.7	12.5	14.9	4.2

Note: ** Significantly different between ROSCA participants and non-ROSCA participants at 5% by the Mann-Whitney test.

Table 4 Mean of preference parameters by ROSCA participation and region

	North		South	
	Non-ROSCA participants	ROSCA participants	Non-ROSCA participants	ROSCA participants
Present bias (β)	0.70	0.69	0.63	0.61
Discount rate (r)	0.013	0.005	0.006	0.003
Risk aversion (σ)	0.58	0.68	0.60	0.55
Probability weighting (α)	0.76	0.72	0.73	0.82
Loss aversion (λ)	2.51	2.77	3.32	2.80
Trust	7058.8	8500.0	6390.2	4250.0
Reciprocity (Trustworthiness)	1.22	1.52*	1.05	0.88

Note: ** Significantly different between ROSCA participants and non-ROSCA participants at 5% by the Mann-Whitney test.

Table 5 Determinants of ROSCA participation

	North		South	
Age	0.002	(0.005)	-0.009	(0.004) *
Gender	-0.126	(0.129)	0.012	(0.095)
Education	0.015	(0.021)	-0.010	(0.011)
Relative income	0.134	(0.073) *	-0.016	(0.036)
Mean income	-0.025	(0.012) **	0.011	(0.006) *
Agriculture	-0.174	(0.168)	0.152	(0.117)
Livestock	-0.055	(0.142)	0.382	(0.137) ***
Aquaculture	0.084	(0.325)	0.023	(0.127)
Street vender	0.342	(0.143) **	-0.107	(0.082)
Family business	0.003	(0.224)	-0.109	(0.079)
Government officer	0.042	(0.183)	-0.086	(0.084)
Private sector	0.261	(0.220)	-	-
Casual work	0.341	(0.197)	-0.149	(0.068)
Present bias (β)	0.507	(0.308) *	-0.001	(0.168)
Discount rate (r)	-4.886	(2.654) *	-4.589	(5.256)
Risk aversion (σ)	0.323	(0.207)	-0.104	(0.104)
Loss aversion (λ)	0.023	(0.023)	-0.010	(0.012)
Probability weighting (α)	-0.486	(0.256) *	0.195	(0.154)
Loan	-0.248	(0.135) *	0.004	(0.077)
Number of observation	83		97	
Pseudo R2	0.195		0.294	

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

Table 6 Motivations for joining ROSCAs (%)

	North	South
To prepare for unexpected events	6.8	27.3**
To invest in businesses	25.0	24.2
To commit saving	54.5	33.3*
To profit from high returns	13.6	15.2

Note: * and **: Significantly different between ROSCA participants in the north and south at 1% and 5% by the Mann-Whitney test, respectively.

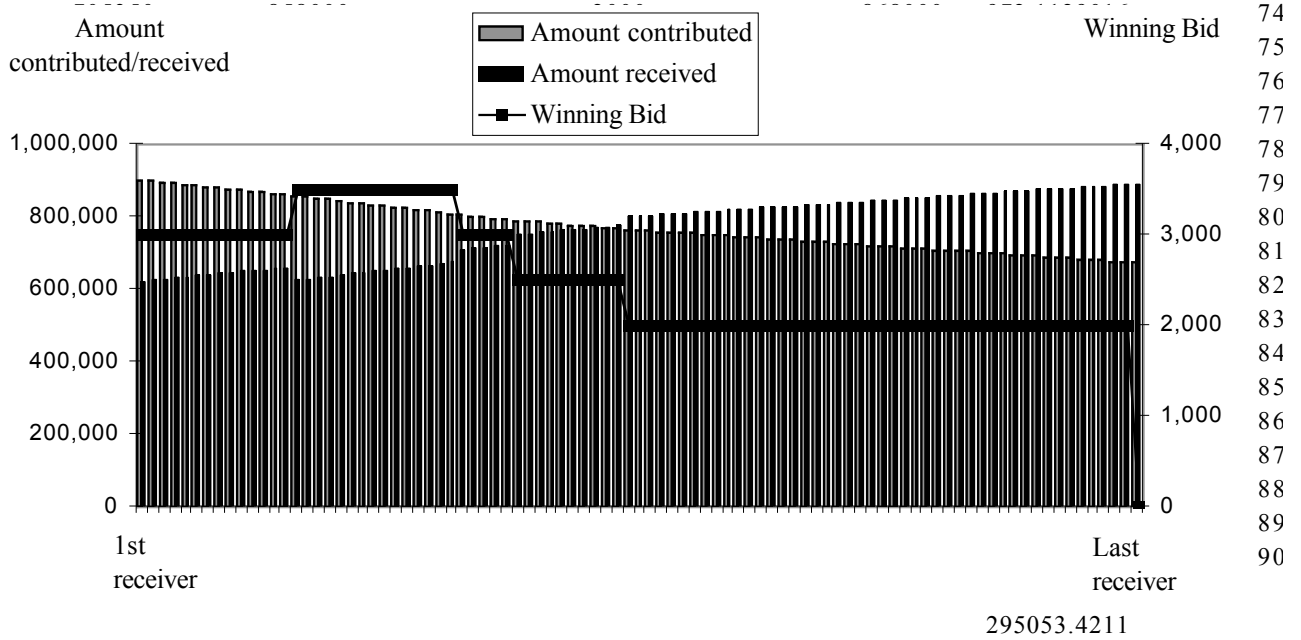
Table 7 Correlation between “timing of receiving the pot” and their preference parameters in daily ROSCAs

Preference parameter	Correlation coefficient
Present bias (β)	0.003
Discount rate (r)	-0.047
Risk aversion (σ)	-0.032
Loss aversion (λ)	0.220*
Probability weighting (α)	-0.265**

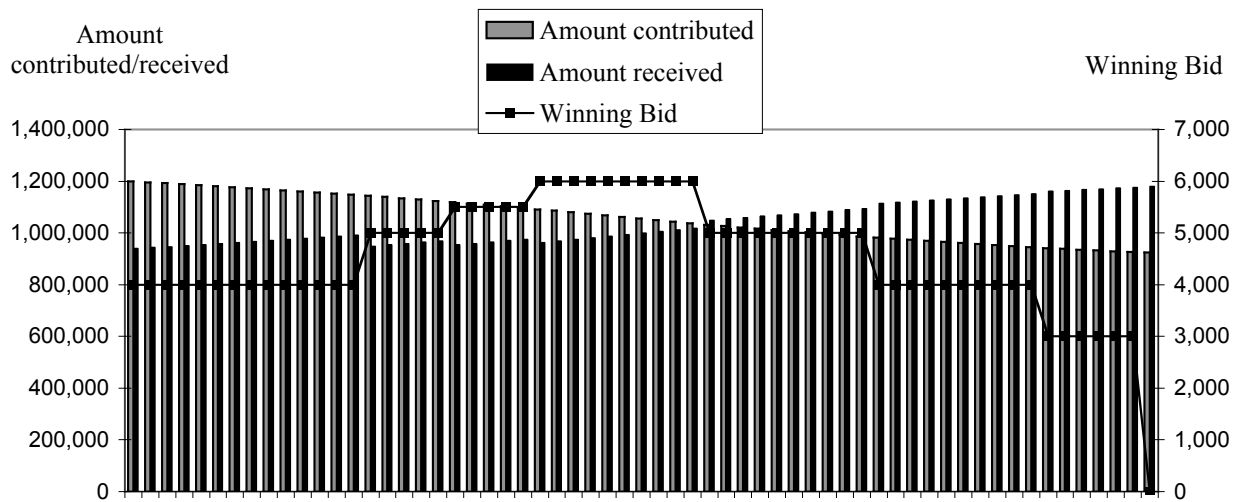
Note: * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level.

Figure 1: Amount contributed and received by ROSCA participants

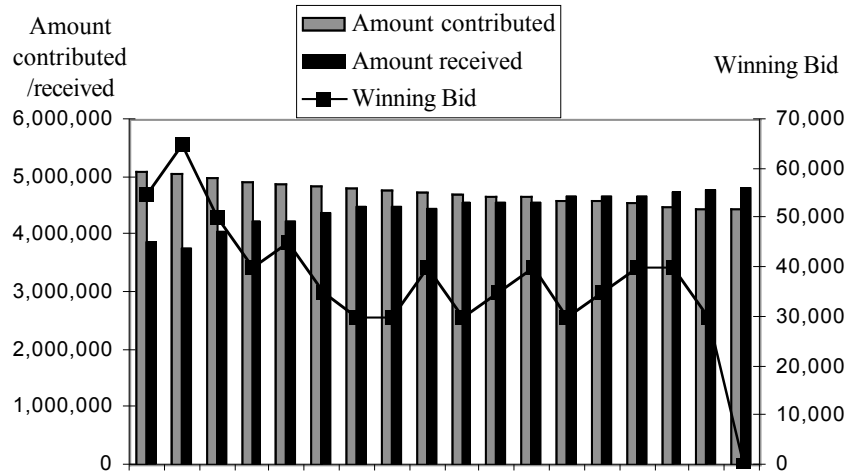
(1) Daily bidding ROSCA (10,000dong – 91 days)



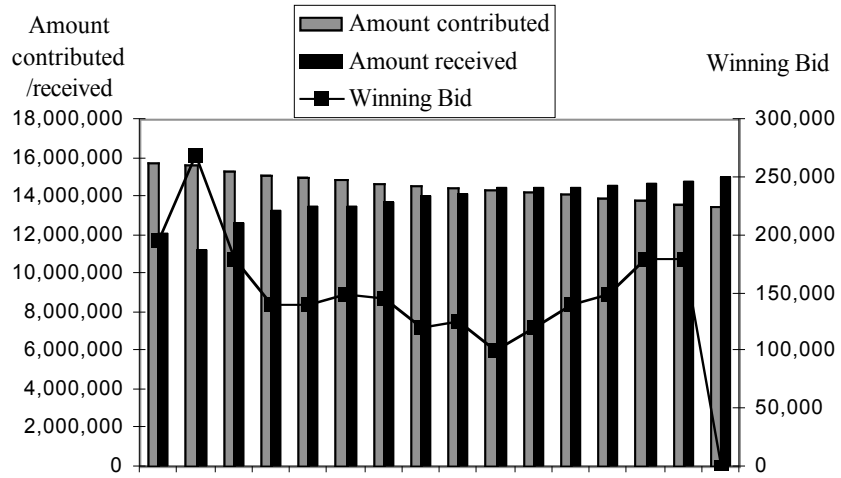
(2) Daily bidding ROSCA (20,000dong – 61 days)



(3) Weekly bidding ROSCA (300,000dong – 18 weeks)



(4) Monthly bidding ROSCA (1,000,000dong – 17 months)



(5) Monthly bidding ROSCA (2,000,000dong – 19 months)

