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RoSCAs in Egypt: A Banking Institution or a Commitment Device?

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Abstract

Rotating Savings and Credit Associations (RoSCAs) is a widely spread informal financial institution in developing countries. This paper examines how access to formal banking (or lack thereof), impatience and self-control are correlated with individuals' decisions to join RoSCAs. The paper employs an incentivized experiment to elicit impatience and a questionnaire to measure bank access, self-control and RoSCA participation among university employees in Cairo (Egypt). Findings indicate that access to formal banking significantly decreases the likelihood of RoSCA participation. In addition, behavioural attitudes partially (self-control but not impatience) correlates with the RoSCA participation decision. Conditional on RoSCA participation, behavioural attitudes towards self-control and impatience are significant correlates of whether an individual is a saver or a borrow in the informal institution.

Keywords: RoSCAs, RoSCA rank, informal banking, impatience, self-control.

JEL Classification: C91 - D14 - O17

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1 Introduction

Informal financial institutions continue to attract a significant share of individual savings in the developing world (Cull, Ehrbeck and Holle, 2014). Among these institutions, Rotating Savings and Credit Associations (RoSCAs) stand out as one of the most widespread.¹ A RoSCA is a scheme where participants make pre-determined financial contributions to a common “pot” that is received by one participant at the end of every period on a rotating basis. There are two explanations for why an individual participates in a RoSCA. First, people may not have access to formal banking, and a RoSCA thus enables them to acquire a non-divisible durable good earlier than possible under autarkic saving (Besley, Coate and Loury, 1993). Although this theory explains participation of early pot receivers, the incentive of the last receiver remains unexplained. A second explanation, which perhaps attempts to fill in this gap, traces both RoSCA participation and (implicitly) the incentive of the last receiver to both impatience and self-control, where a RoSCA acts as a savings commitment device via peer pressure (Ambec and Treich, 2007).

Although a growing body of literature has provided evidence in support of both theories, there are still limitations in the empirical evidence. First, while there is ample evidence on RoSCA participation among individuals who do not have bank access (e.g. Bouman, 1995; Mohieldin and Wright, 2000; Anderson and Baland, 2002), the question of whether bank access is negatively correlated with RoSCA participation has not been directly addressed. Second, the evidence on RoSCA as a savings commitment device is largely questionnaire-based (Aliber, 2001; Gugerty, 2007; Dagnelie and Lemay-Boucher, 2012) and thus individual time preferences and self-control are assumed rather than elicited. To the best of my knowledge, only Tanaka and Nguyen (2010) elicit time-preferences in relation to RoSCA participation. Third, the incentive of the receiver of the last RoSCA rank has not been empirically examined.

This paper attempts to fill in this gap by examining whether bank access, impatience

1. For instance, evidence from Africa shows that around half of the adult population participates in RoSCAs in the Republic of Congo (Bouman, 1995) and Kenya (Kimuyu, 1999), while participation is observed to be as high as 80 to 95% of rural populations in Togo, Ivory Coast, and Nigeria (Bouman, 1995). In Asia, incidence of participation has been estimated at 40% of households with access to microfinance in Indonesia (Morduch and Armedariz, 2005) and up to 85% of the population in Taiwan (Besley and Levenson, 1996). RoSCAs are also found in Latin America and the Caribbean (Owusu et al, 2013) and among migrants in the United Kingdom and the United States (Anderson et al., 2009). RoSCAs also have different names in different countries.

and self-control are each correlated with RoSCA participation. Furthermore, the paper examines whether the receiver of the last rank is more likely to be impatient with low self-control than other RoSCA participants. The paper draws on a lab-in-the-field experiment and a questionnaire that I conducted in Cairo, Egypt. A few distinguishing features of the Egyptian context make it particularly suitable to examine the correlates of RoSCA participation and RoSCA last rank. First, RoSCAs prevail in rural and urban Egypt since as early as the beginning of the 20th century, and its popularity remains despite the growth of the formal financial market (Ardener, 1964; Al-Ajlouni, 2018). In fact, RoSCA remains popular even among bank employees in rural Egypt, who by definition have bank access (Baydas, Bahloul and Adams, 1995). Second, RoSCAs in Egypt pay no interest (Mohieldin and Wright, 2000; El-Gamal et al., 2014), perhaps due to religious views against bank interest (Al-Ajlouni, 2018).² Third, the RoSCA rank is determined by negotiations and is known to participants before the cycle begins. This means that in order for the RoSCA to form, someone has to knowingly accept getting the pot last while receiving zero interest on his/her savings throughout the cycle.³

The sample comprises 179 subjects at the British University in Egypt who included academics, administrative personnel, and blue-collar workers with presumably varying levels of bank access. The incentivized experiment elicits individual impatience following Sutter et al. (2013). The game design involves providing subjects with choice tasks between dichotomous options paying out at different points in time. The higher incentive an individual needs to choose the later option, the higher the impatience. The post-experiment questionnaire includes a module on self-control that draws on the psychology-based index introduced by Tangney, Boone and Baumeister (2018). The questionnaire also asks if the respondents have bank access, participated in a RoSCA during the year preceding the questionnaire, and, conditional on participation, in what rank they receive(d) the pot.

I find a significant negative relationship between access to formal banking and RoSCA

2. Evidence on this argument is mixed. Al-Ajlouni (2018) reports strong views in support of Shari'ah forbidding bank interest among RoSCA participants. However, the study do not compare how the views are different among non-RoSCA participants (not included in the sample). Rabie (forthcoming), on the other hand, demonstrates that differences with regard to the acceptance or rejection of bank interest among RoSCA and non-RoSCA participants are only marginally significant.

3. The RoSCAs where the pot is allocated by ex-ante-negotiations is called *fixed* RoSCAs. Other types of RoSCAs include *random* and *bidding* RoSCAs where the pot is allocated via a lottery draw or an auction, respectively, in every period of the cycle. In this case, however, the order of receiving the pot is not known ex ante.

participation which supports the assumption of Besley, Coate and Loury (1993)’s, hereafter B-C-L, theory. However, unlike in Tanaka and Nguyen (2010), impatience is not found to be significantly different between RoSCA and non-RoSCA participants. Furthermore, I find an inverted-U relationship between self-control and RoSCA participation. This finding is in line with Basu (2011)’s argument that individuals with low self-control do not participate in RoSCAs because they cannot commit, while individuals with high self-control do not need a commitment device to save. I find that the participant in the last rank in a pot-by-negotiations RoSCA is more likely to be impatient with low self-control as modeled by Ambec and Treich (2007).

My findings, therefore, support B-C-L’s model and show that the RoSCA acts as an alternative banking institution in case of formal market exclusion. The findings also support Ambec and Treich (2007)’s theory but only for the receiver of the last rank. The contribution of this paper is thus threefold. First, the paper provides empirical evidence for a long-standing assumption on formal banking exclusion in the RoSCA literature. Second, the paper shows that RoSCAs act as a savings commitment device only for those who do not pre-maturely receive the pot. Third, the paper contributes to the experimental and psychological literature on impatience and self-control, respectively, by eliciting impatience attitudes and measuring self-control levels for non-student and diverse subjects, and relating both behaviors to financial decisions.

The rest of the paper is organized as follows. Section 2 introduces the conceptual framework. Section 3 presents the empirical strategy and the experimental design. Section 4 describes the data. Section 5 presents the empirical analysis. Section 6 examines the robustness of the findings and section 7 concludes.

2 Conceptual Framework and Hypotheses

This section studies the theoretical underpinnings of the RoSCA participation decision and the incentives of the last receiver of the RoSCA pot in the case of a fixed RoSCA. In a fixed RoSCA, participants’ ranks (i.e the order of collecting the pot) are determined by negotiations and are known to all participants before the cycle begins (Baland, Guirking, and Hartwig, 2019). Furthermore, a fixed RoSCA pays no interest (Mohieldin and Wright, 2000), and thus, the pot is equal to the sum of individual con-

tributions in a given cycle.⁴ A participant who receives the pot on the first rank thus receives an interest-free loan that is equal to all his/her projected contributions in the cycle. The receiver of the last rank, on the other hand, saves up in a RoSCA with no financial return.

RoSCA Participation. Besley, Coate and Loury (1993) model RoSCA as a mechanism through which an individual acquires a non-divisible good earlier than possible under autarkic saving. This model is based on the assumption that RoSCA participants do not have access to the formal banking sector and they use RoSCAs to borrow. Therefore, my first hypothesis is:

Hypothesis 1: RoSCA participation is negatively correlated with access to formal banking.

In a fixed RoSCA, however, every participant in B-C-L's model would want to negotiate the earliest possible rank. The further in the cycle the rank is, the smaller the interest free loan the participant receives, and the later the participant acquires the durable good. This means that a participant with a middle rank, for instance, will save up in the RoSCA half the size of the pot (i.e. half the price of the durable good in B-C-L's model), and borrow the other half to make an early purchase of the durable good.

A complementary theory that provides an alternative incentive to RoSCA participation is proposed by Ambec and Treich (2007). According to them, RoSCA can act as a commitment device for impatient individuals who have self-control problems and cannot save on their own. The commitment theory of Ambec and Treich is inspired by empirical evidence provided by Aliber (2001) and Gugerty (2007) on RoSCA participants citing the need to save in a group as a primary incentive for RoSCA participation. RoSCAs, being informal, depend on close social circles for its operations. This feature gives rise to peer pressure on RoSCA participants to contribute periodically to the pot. The later the rank a participant has, the higher the amount saved up in the RoSCA. The commitment theory thus models RoSCAs as a way through which impatient individuals with self-control problems actively devote a part of their periodical income to savings. Nonetheless, Basu (2011) argues that the commitment function of RoSCA works only in the middle range of the self-control scheme. He explains that if individuals have high self-control they will

4. This is based on the assumption that no default occurs.

not need a commitment device to save in a non-interest-earning instrument. On the other hand, if they have low self-control, they may not resist the temptations to default on the periodical payments once the pot is received. Thus, according to Basu, RoSCAs are only operational and sustainable when participants have moderate self-control which gives rise to my second hypothesis as follows:

Hypothesis 2: Impatient individuals with moderate self-control are more likely to participate in RoSCAs.

The Receiver of the Last Rank. In the B-C-L model, every participant is a borrower to make a purchase. Thus, the incentives of the receiver of the last rank who would not acquire the durable good earlier than saving up for it remain unexplained. If the acquisition of the durable good is the sole incentive for participation, no one would accept the last rank and hence the RoSCA negotiations would fail to conclude. The incentives of the receiver of the last rank can thus be only explained by the commitment theory. That is, the participant in the last rank is an impatient individual with low self-control. In fact, receiving the pot last is what maximizes the utility of the person in need for commitment. According to Gugerty (2007), a person in need for commitment will suffer a disutility from receiving the pot early in the form of spending the money rather than saving it. Therefore,

Hypothesis 3: The receiver of the last rank is an impatient individual with low self-control.

It is worth noting that there is no risk of default if an individual with a low self-control join the RoSCA and get the pot last. This is the only case which is not at odds with Basu (2011)'s argument. Furthermore, since RoSCA participants know each other quite well, they can observe each other's self control levels and thus will push the negotiations towards having individuals with low self-control at the end of the cycle. Thus, we cannot disentangle whether the individual with low self-control self-selects into the last rank or it is the observability of each others that allocates people with low self-control to the last rank.

3 Empirical Strategy

The paper uses an incentivized experiment to elicit impatience and a non-incentivized post-experiment questionnaire to measure the level of self-control and to determine RoSCA participation, RoSCA rank, and the subjects' socio-economic characteristics. The experiment and the questionnaire took place in a computer laboratory at the British University in Egypt (BUE). All employees at the BUE were invited, through e-mails and brochures, to participate in the experiment and the questionnaire in November 2017. Inter-temporal payments were made until January 2018.

3.1 Experiment Design and Impatience Elicitation

Game Design. The impatience game, with a within subjects design, looks into subjects' choice between two sure rewards at different points of time. Subjects are presented with two lists of identical dichotomous decisions. Within each list, the incentive to wait increases monotonically from one decision to the next in increments of 30 Experimental Currency Units ($7.5 \text{ EGP} \approx 0.4 \text{ Euro}$). The two lists differ, though, on the reward waiting time. The rewards on the first list are accrued after 7 (option one) or 28 (option two) days from the experimental session, while those on the second list take place after 7 or 56 days. Three notes are in order. First, the longer waiting time on the second list is designed to check for subjects' temporal consistency. A consistent individual is expected to wait longer if and only if the incentive to wait for 49 (56 minus 7) days is at least as large as those for 21 (28 minus 7) days. Second, the fixed upfront delay of 7 days in both lists is designed to avoid any immediacy bias resulting from preferring an instantaneous reward to a deferred one. The immediacy bias usually arises because of lack of trust in receiving the deferred payout and/or transaction cost to return to the lab to collect them. By setting all potential rewards in the future, we keep constant any trust or transaction cost issues. Third, all the deferred payouts were due on the same day of the week as that of the session to avoid any weekday effect.⁵

Elicitation. A subject's degree of responsiveness to the incentive to wait indicates her/his time preferences. Specifically, within each list I am interested in identifying the decision at which the subject chooses the further future (28 or 56 days) option over the

5. See Andreoni and Sprenger (2012) for a discussion on the immediacy bias and the weekday effect.

near future (7 days) option. I refer to this point hereafter as the switching point (SP). I follow Sutter et al. (2013)’s elicitation method and I use the raw SP as a measure of impatience. Specifically, I sum up the SPs across the two lists. The bigger the measure, the higher the incentives required to wait, and the stronger the impatience.

Nevertheless, the validity of using the SP as a measure for impatience rests on two conditions: (1) a subject must have at most one SP in each list. If a subject does not choose to switch at any decision on the list, this implies that s/he prefers the near-future option at all incentives to wait. If, on the other hand, a subject decides to choose the further-future option at a certain incentive level, s/he must continue to prefer the further-future option at higher levels of incentives and must not switch back to the near-future option. Subjects who switch back to the near-future option thus have multiple SPs and are consequently dropped from the sample. This is because they presumably do not understand the game or are not paying enough attention to the tasks required.⁶ (2) the subject must be temporally consistent across the two lists. Temporally inconsistent subjects are also dropped from the sample. Those two restrictions are in line with Holt and Laury (2002)’s analysis of subjects’ performance on the similar Multiple Price List (MPL) game.⁷

Procedures. On the experiment day, subjects were presented with the short delayed list followed by the long delayed lists. Only one at-random decision in the game was cashed out. Subjects were instructed that, according to their preferences and a randomly selected task, they will re-visit the laboratory after 7, 28 or 56 days to collect their payments.⁸ To reduce the transaction cost, the laboratory is located in the center of the campus in proximity to most participating subjects, and the experimenter was always present on the day of the payment sessions to mitigate trust problems.

6. This reasoning applies to risk-free lists of the MPL. We show in a different paper that multiple switching can be a preference when the decisions are risky.

7. Holt and Laury (2002) use the MPL to elicit risk preferences where the choices along the list involve varying probabilities of winning.

8. The subjects played other games (risk game, trust game, and social preferences game) on the same day for which they got the payout right after the session. The order of the games played by the subjects was randomized.

3.2 Self-Control Measurement

This paper follows the questionnaire-based measure of self-control that is widely used in the Psychology literature. Specifically, I employ the self-control scale introduced by Tangen, Boone, and Baumeister (T-B-B) (2018). This measure has a major advantage over alternative measures for being a context-free self-control measure. It does not emphasize any one domain (health, physical strength, cognitive ability, .. etc.), and it focuses on overriding responses (control) rather than impulses (temptations). For example, it asks participants to evaluate how much they can resist temptation or how strongly they can commit to long term goals.⁹

The self-control measure as developed by T-B-B comes in two versions; a full-length and a brief version. According to them, the brief version is as good as its full-length counterpart in terms of internal consistency and test re-test reliability. As a result, this paper opted for the brief measure for its simplicity. The brief scale consists of 13 statements where participants have to choose on a scale of 1 to 5 how much each statement resembles them where 1 means *not at all*, while 5 means *very much*.

The per participant average score in the 13 questions determine the individual-level self-control index. I thus classify individuals' self-control according to their index score into 3 categories as follows:

1. *High self-control* if the individual reported a mean score that lies in the fourth quartile of the index.
2. *Moderate self-control* if the individual reported a mean score that lies in the second or third quartiles of the index.
3. *Low self-control* if the individual reported a mean score that lies in the first quartile of the index.

The self-control full index is also used as a continuous measure in the robustness checks section.

9. Economic experiments on self-control are very limited and are usually context-related. For example, Bonein and Denant-Boèmont (2015) measure self-control as temptation resistance while working on a real effort task in the absence or presence of peer pressure. Augenblick et al. (2015) measure self-control through dynamic inconsistencies in inter-temporal real effort tasks. On the other hand, the psychology literature offers a wide range of self-control measures that are widely questionnaire-based but also often context-dependent. Rosenbaum (1980) and Brandon et al. (1990) provide self-control scale measures that depend on cognitive abilities or attitudes towards health, respectively.

4 Data and Descriptive Statistics

4.1 Subjects' Characteristics and RoSCAs

RoSCA vs. Non-RoSCA Participants. The sample is compromised of 179 employees at the BUE of whom 56% participated in a RoSCA at the time or during the year preceding the questionnaire. Table 1 summarizes the subjects' characteristics across the whole sample and by RoSCA participation. Female subjects represent 48% of the sample which is not significantly different among RoSCA and non-RoSCA participants. This is unlike what is commonly argued in the literature that women are more likely to participate in RoSCAs (Aliber, 2001; Anderson and Baland, 2002; Gugerty, 2007). More than half (58%) of the subjects are married. The percentage of married subjects is significantly (Mann-Whitney p-value = 0.000) higher among RoSCA participants than among non-participants. This is in line with Anderson and Baland (2002) findings in Kenya where most of the RoSCA participants were "living in couples".

Table 1 – Subjects' Characteristics Across RoSCA and Non-RoSCA Participants

| | All Sample (N = 179) | RoSCA Participants (N = 100) | Non-RoSCA Participants (N = 79) |
|----------------|-------------------------|---------------------------------|------------------------------------|
| Female (%) | 47.69 | 47.27 | 48.24 |
| Married (%) | 56.92 | 71.82 | 37.65 |
| Age (%) | | | |
| 20 - 29 y/o | 50.77 | 45.45 | 57.65 |
| 30 - 39 y/o | 35.38 | 40.00 | 29.41 |
| 40 - 49 y/o | 8.72 | 11.82 | 4.71 |
| 50 y/o or more | 4.62 | 2.73 | 7.06 |
| Education (%) | | | |
| Vocational | 6.67 | 7.27 | 5.88 |
| Bachelor's | 65.64 | 71.82 | 57.65 |
| Master's | 17.95 | 15.45 | 21.18 |
| Doctorate | 9.74 | 5.45 | 15.29 |
| Job Type (%) | | | |
| Academic | 52.82 | 41.82 | 67.06 |
| Administrative | 32.82 | 40.91 | 22.35 |
| Blue-collar | 14.36 | 17.27 | 10.59 |

The sample is dominated by relatively young subjects who are below the age of 40 as shown in Table 1. RoSCA participation is more likely (Fisher’s exact p-value = 0.055) among middle-aged subjects in their thirties and forties. The sample is diverse in terms of education level and job type (academic, administrative, blue collar). The majority of the sample are very well educated with at least a bachelor degree. As education level increases the likelihood of participating in a RoSCA weakly decreases (Chi-square p-value = 0.064). RoSCA participation is also more common among administrative and blue collar workers in the sample (Chi-square p-value = 0.002). Since all employees at the BUE are subject to a salary structure that is a function of education and job classification with the highest paid employees being the academics with a doctorate degree, the differences in subjects’ education and job also reflect the differences in income. Table 1 thus suggests that RoSCA participants have significantly lower income, as proxied by education level and job type, than non-RoSCA participants.

RoSCA Features. All RoSCA participants reported that they knew their rank in the cycle (i.e. the timing of receiving the pot) before the cycle began. When asked about the rank allocation method, 69% of the RoSCA participants reported that they were able to negotiate their RoSCA rank, while 27% reported that the rank was set by the RoSCA manager (the one who organizes the RoSCA periodical payments). Other allocation methods also include RoSCAs in which the pot was allocated by a lottery (3%) and by order of joining (1%).

Table 2 provides the descriptive statistics of the RoSCA rank and the RoSCA cycle length (in months) in the sample by the method of pot allocation. Since the subjects participate in RoSCAs of different lengths, where the average length is 14 months, the rank on its own is not informative unless compared with the RoSCA length. The relative rank in the cycle, that is the rank over the length of a given cycle, thus provides a better description of when the participants get the RoSCA pot. As shown in Table 2, the average relative rank in different RoSCAs is 0.5 and the maximum is one. In fact, when the relative rank is at its maximum (one), the participant gets the pot last in the cycle. On average, 24% of the RoSCA participants receive the pot in the last rank.

Table 2 – RoSCA Characteristics by Pot Allocation Method

| | N | Mean | SD | Min. | Max |
|------------------------------------|-----|-------|------|------|-----|
| Rank in all RoSCAs | 92 | 6.37 | 5.79 | 1 | 48 |
| Rank by negotiations | 69 | 6.33 | 6.39 | 1 | 48 |
| Rank by manager | 24 | 6.33 | 3.87 | 1 | 12 |
| Length in all RoSCAs (in months) | 100 | 13.77 | 9.03 | 4 | 60 |
| Length by negotiations (in months) | 74 | 14.12 | 9.85 | 4 | 60 |
| Length by manager (in months) | 30 | 12.9 | 6.47 | 5 | 40 |
| Relative rank in all RoSCAs | 97 | 0.51 | 0.33 | 0.02 | 1 |
| Relative rank in by-negotiations | 64 | 0.51 | 0.33 | 0.02 | 1 |
| Relative rank in by-manager | 22 | 0.53 | 0.36 | 0.05 | 1 |
| Last rank in all RoSCAs | 91 | 0.24 | 0.43 | 0 | 1 |
| Last rank in by-negotiations | 64 | 0.25 | 0.44 | 0 | 1 |
| Last rank in by-manager | 22 | 0.27 | 0.46 | 0 | 1 |

4.2 Impatience and Self Control

The frequencies of the switching points in the impatience game is presented by Figure 1. The average SP in the longer delay list is significantly higher than that in the shorter delay list (3.96 vs. 3.10, t-test p-value = 0.000). Twenty-three percent of the sample never switched to the further future option in both lists, whereas 25% never switched to the further future only in the longer delay list.

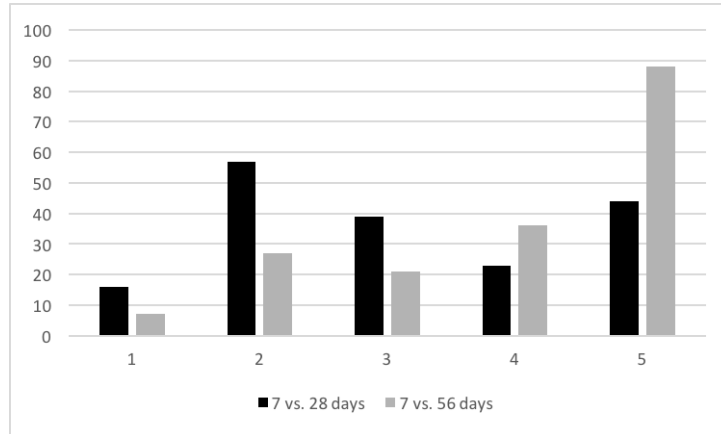


Figure 1 – Frequencies of Switching Points

The upper panel of Table 3 summarizes the impatience parameters across the whole sample, between RoSCA and non-RoSCA participants and between participants in by-negotiations versus other types of RoSCAs. The mean SP in the longer delay list is consistently higher (with a smaller standard deviation) than that in the shorter delay list satisfying our condition on the impatience measure. I thus sum up the SPs for each

individual in both sets to elicit impatience. According to a Mann-Whitney test, there are no significant differences in the impatience full measure between participants and non-participants nor between participants in different RoSCAs. I also examine impatience as a dummy variable that takes the value of one if the individual sum of SPs measure is above the mean, zero otherwise.

Figure 2 presents the frequency distribution of the self-control index in the sample. The index, which ranges from 2.31 and 5, has a mean of 3.55, and according to the Kernel density, it resembles normal distribution. The lower panel of table 3 summarizes the self-control parameters by RoSCA participation and the different types of RoSCAs. The sample of RoSCA participants is significantly more populated with individuals with moderate self-control, and less populated with individuals with low self-control than the non-RoSCA participants sample. Within the RoSCA participants, there are no significant differences across the different pot-allocation RoSCAs.

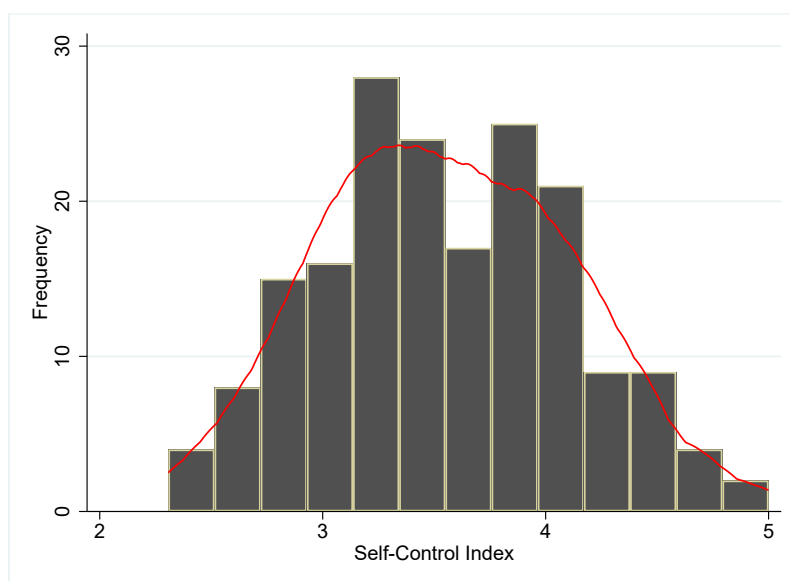


Figure 2 – Frequency Distribution of the Self-Control Index

The pairwise correlation coefficient between the self-control index and the impatience measure is .05 indicating very weak correlation between the two measures.

5 Empirical Analysis

The empirical analysis tests: (1) if the RoSCA participation decision is correlated with: (a) access to formal banking, and/or (b) impatience and self-control, and (2) if

Table 3 – Mean Impatience and Self-Control by RoSCA Participation and Rank Method

| | All Sample (N = 179) | RoSCA Participants (N = 100) | Non-RoSCA Participants (N = 79) | RoSCAs by Negotiations (N=69) | Other RoSCAs (N=31) |
|-----------------------|-------------------------|---------------------------------|------------------------------------|----------------------------------|------------------------|
| Time Preferences | | | | | |
| $SP_{shorterdelay}$ | 3.13 (1.36) | 3.13 (1.36) | 3.11 (1.31) | 3.25 (1.30) | 2.87 (1.48) |
| $SP_{longerdelay}$ | 3.96 (1.25) | 3.91 (1.30) | 4.01 (1.19) | 4.03 (1.21) | 3.65 (1.47) |
| imp (full measure) | 7.07 (2.39) | 7.04 (2.50) | 7.13 (2.60) | 7.26 (2.33) | 6.52 (2.80) |
| imp dummy | 0.45 (0.50) | 0.46 (0.50) | 0.44 (0.50) | 0.51 (0.50) | 0.36 (0.49) |
| Self-Control | | | | | |
| Self-Control Index | 3.56 (0.56) | 3.59 (0.51) | 3.52 (0.62) | 3.57 (0.50) | 3.64 (0.54) |
| Low Self-Control | 0.24 (0.43) | 0.19 (0.39) | 0.30* (0.46) | 0.19 (0.39) | 0.19 (0.40) |
| Moderate Self-Control | 0.47 (0.50) | 0.53 (0.50) | 0.40** (0.49) | 0.52 (0.50) | 0.53 (0.51) |
| High Self-Control | 0.30 (0.46) | 0.29 (0.46) | 0.31 (0.47) | 0.29 (0.46) | 0.28 (0.46) |

Standard deviations are in parentheses. Wilcoxon Rank-Sum (Mann-Whitney) test's p-value across RoSCA and Non-RoSCA participants: **p < 0.05 , *p < 0.1. Note: Impatience (full index) has a minimum value of 2 and a maximum of 10. Self-Control index has a minimum value of 2.31 and a maximum value of 5 in the full sample.

impatience and self-control correlates with being the receiver of the last RoSCA rank conditional on RoSCA participation.

5.1 Empirical Specification

This paper examines two main outcomes. First, RoSCA participation which is measured by a dummy variable that takes the value of one if the individual was participating in a RoSCA at the time or during the year before the questionnaire, zero otherwise. Second, the RoSCA last rank which is another dummy variable that equals one if the RoSCA participant receives the pot in the last rank, zero otherwise. I run the following regression models:

RoSCA Participation

$$rp = \beta_0 + \beta_1 bank_access + \beta_2 impatient + \beta_3 mod_sc + \beta_4 high_sc + \beta_5 impatient \times mod_sc + \beta_6 impatient \times high_sc + X'\gamma + \epsilon \quad (1)$$

where rp stands for RoSCA participation. $bank_access$ is a dummy variable that takes the value of one if the individual has bank access, zero otherwise. $impatient$ is a dummy variable if the individual is impatient, zero otherwise. mod_sc and $high_sc$ are dummy variables that equals one if the individual has moderate and high self-control, respectively, and zero otherwise. $impatient \times mod_sc$ and $impatient \times high_sc$ are interaction terms and X is a vector of control variables that include individual socio-economic characteristics.

RoSCA Last Rank

$$lr = \alpha_0 + \alpha_1 impatient + \alpha_2 mod_sc + \alpha_3 high_sc + \alpha_4 impatient \times mod_sc + \alpha_5 impatient \times high_sc + X'\delta + u \quad (2)$$

where lr stands for last rank.

5.2 Results

5.2.1 RoSCA Participation

Table 4 presents the regression results of equation 1 on the correlates of the RoSCA participation decision. Columns 1 and 2 show the results of regressing RoSCA participation on bank access without and with controls, respectively. In support of hypothesis 1, I find a strongly significant negative relationship between having access to formal banking and the probability of RoSCA participation. An individual who thus wants to make a purchase while short in money can borrow in a RoSCA as a replacement for bank borrowing as suggested by Besley, Coate and Loury (1993). Therefore, my first finding is:

Finding 1: There is a negative relationship between RoSCA participation and access to formal banking.

Table 4 – RoSCA Participation
Dependent Variable: rp , dummy variable equals 1 if RoSCA participant, zero otherwise

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|--------------------------------|----------------------|----------------------|---------------------|---------------------|---------------------|--------------------|----------------------|
| bank_access | -0.188*** (0.056) | -0.173*** (0.050) | | | | | -0.181*** (0.052) |
| impatient | | | 0.017 (0.071) | -0.005 (0.068) | | | -0.207* (0.110) |
| mod_sc | | | | | 0.210** (0.080) | 0.171* (0.087) | 0.128 (0.089) |
| high_sc | | | | | 0.108 (0.114) | 0.057 (0.096) | -0.117 (0.123) |
| impatient=1 \times mod_sc=1 | | | | | | | 0.154 (0.132) |
| impatient=1 \times high_sc=1 | | | | | | | 0.436*** (0.126) |
| Constant | 0.692*** (0.067) | 0.415*** (0.083) | 0.551*** (0.070) | 0.294*** (0.085) | 0.429*** (0.108) | 0.203** (0.082) | 0.399*** (0.129) |
| Controls | No | Yes | No | Yes | No | Yes | Yes |
| N | 179 | 179 | 179 | 179 | 179 | 179 | 179 |
| Adjusted R^2 | 0.024 | 0.166 | -0.005 | 0.141 | 0.018 | 0.157 | 0.194 |

OLS regression. Standard errors clustered by experimental session are in parentheses. Controls include gender and married dummies, and age and job type (academic, administrative, blue-collar) categorical variables. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Next, I find that impatience on its own does not explain RoSCA participation (columns 3 and 4 of Table 4) but self-control does. In line with Basu (2011), individuals with moderate self-control are significantly more likely to participate in RoSCAs, as shown in columns 5 and 6, compared to those with low self-control.¹⁰ However, this result is different when self-control categories are interacted with impatience. Column 7 shows that there is no differential importance in explaining RoSCA participation for individuals with moderate self-control across varying impatience levels (i.e. the coefficients of *mod_sc* and *mod_sc * impatient*), and therefore the data at hand does not support my second hypothesis.

Finding 2: Individuals with moderate self-control do not significantly differ with regards to RoSCA participation based on their impatience levels.

In contrast, I find that impatient individuals with low self-control (the reference self-control category) are weakly less likely to participate in RoSCAs, as measured by the coefficient of *imp* in column 7 of Table 4, which is also in line with Basu (2011). On the other hand, I find that impatient individuals with high self-control (*impatient * high_sc*) are strongly more likely to participate in RoSCAs. Although this finding is at odds with the commitment theory of RoSCA as modeled by Ambec and Treich (2007), I argue that this finding can be explained by the informal nature of RoSCAs and its reliance on close social ties to ensure participants' compliance with the periodical payments through peer pressure, as emphasized by Anderson, Baland and Moene (2009). Close social ties mean that potential RoSCA participants are able to observe each other's attitudes towards impatience and self-control.¹¹ Since impatience coupled with low self-control may lead to default on the RoSCA pot payments after receiving the pot, those individuals may be labeled as "high risk" by other potential participants and thus would be excluded from RoSCA negotiations unless they receive the pot last. Impatient individuals with high self-control, on the other hand, are not regarded as risky and can use RoSCAs to save. Therefore, the commitment theory of RoSCA may still apply to the receiver of the last rank, whom risk of default is zero due to the termination of the cycle, which I test next.

10. Individuals with moderate self-control are also more likely to participate in RoSCAs compared to those with high self-control.

11. Stiglitz (1990) illustrates the importance of peer screening for the success of RoSCAs.

5.2.2 RoSCA Last Rank

Table 5 presents the regression results of equation 2 to examine whether impatience and self-control are correlated with the last RoSCA rank. In columns 1 and 2 (without and with controls, respectively), I examine if impatience is correlated with being the last receiver of the pot in a RoSCA cycle. Although the coefficient of *impatient* has the expected positive sign as shown in columns 1 and 2, it is very small and insignificant showing no correlation between the two variables in question. In contrast, individuals with moderate or high self-control are found, in columns 3 and 4, to be significantly less likely to receive the pot last compared to those with low self-control (omitted). Same result holds on the self-control of the patient individuals (reference group) when the impatience and the self-control dummies are interacted in columns 5 and 6. So far, however, there is no evidence in support of hypothesis 3 or the commitment theory of Ambec and Treich (2007).

Yet restricting the sample to RoSCAs where the pot is allocated by negotiations yield different results. In column 7 of Table 5, impatient individuals with low self-control are strongly more likely to receive the last rank conditional on participating in by-negotiations RoSCAs. Thus, while the unrestricted sample does not lend support to this paper’s third hypothesis, the restricted sample does. Therefore, the data supports Ambec and Treich (2007)’s commitment theory of RoSCAs under two conditions. First, it explains the incentives of the last receiver of the pot conditional on RoSCA participation rather than the participation decision per se. Second, this only holds in by-negotiations RoSCAs. Therefore,

Finding 3: The receiver of the last rank is more likely to be an impatient individual with low self-control. This finding only holds in by-negotiations RoSCAs.

This finding supports my argument that potential RoSCA participants observe each other’s attitudes and negotiate the RoSCA rank in a way that mitigates the default risk. Other RoSCAs in the unrestricted sample include RoSCAs in which the manager allocates the ranks (85%) and random RoSCAs where the ranks are determined through a lottery (15%). While it is obvious why the hypothesis on the last rank may not hold in the case of a random RoSCA, rank-by-manager RoSCAs are more puzzling. A RoSCA manager

Table 5 – RoSCA Last Rank

Dependent Variable: lr , dummy variable equals 1 if the individual is a receiver of the last rank, zero otherwise

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|--------------------------------|---------------------|------------------|----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
| impatient | 0.071 (0.091) | 0.085 (0.092) | | | 0.288 (0.266) | 0.245 (0.311) | 0.721*** (0.211) | 0.702*** (0.161) |
| mod_sc | | | -0.377*** (0.134) | -0.401*** (0.140) | -0.308* (0.161) | -0.364** (0.165) | -0.276 (0.190) | -0.227 (0.164) |
| high_sc | | | -0.315** (0.146) | -0.361** (0.143) | -0.462*** (0.143) | -0.517*** (0.155) | -0.463** (0.191) | -0.520*** (0.172) |
| impatient=1 \times mod_sc=1 | | | | | -0.292 (0.288) | -0.191 (0.329) | -0.586** (0.246) | -0.601*** (0.205) |
| impatient=1 \times high_sc=1 | | | | | 0.027 (0.288) | 0.075 (0.312) | -0.267 (0.238) | -0.173 (0.220) |
| irregular | | | | | | | | 0.139 (0.098) |
| new_part | | | | | | | | 0.410*** (0.113) |
| Constant | 0.208*** (0.059) | 0.110 (0.098) | 0.529*** (0.123) | 0.475*** (0.140) | 0.462*** (0.143) | 0.392** (0.165) | 0.172 (0.181) | -0.095 (0.155) |
| Controls | No | Yes | No | Yes | No | Yes | Yes | Yes |
| N | 91 | 91 | 91 | 91 | 91 | 91 | 64 | 64 |
| Adjusted R^2 | -0.004 | 0.033 | 0.087 | 0.146 | 0.110 | 0.166 | 0.309 | 0.410 |

OLS regression. Robust standard errors are in parentheses. Controls include gender and married dummies, and age and job type (academic, administrative, blue-collar) categorical variables.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

does not only allocate the ranks and organize the pot collection, but he/she also acts as the lender of last resort in case any of the participants can not service their periodical RoSCA obligations (Handa and Kirton, 1999; Dagnelie and Boucher, 2012). The presence of a RoSCA manager thus eliminates default risk exposure for all the participants except the manager himself/herself who may willingly take the risk if he/she shares very strong ties with the impatient and low self-control individual.

To check the robustness of my argument on the importance of pre-screening in negotiating RoSCA ranks in the absence of a manager, I examine if there exists variations in the probability of receiving the pot last based on the participants' reported frequency of joining RoSCAs. Participants thus fall in one of three categories; regular participants (reference group), repeated but irregular (referred to as *irregular*), and new participants who rarely or never participated in a RoSCA before (referred to as *newpart*). I control for the frequency of participation and re-run equation 2 for the by-negotiations RoSCA sample. The results are reported in column 8 of Table 5. While finding 3 still holds, I find that new participants are significantly more likely to receive the pot in the last rank compared to the regulars. This suggests that, the more regular a participant is, the more his/her attitudes are revealed to the rest of the group, and the earlier the person can receive the pot if the person passed the screening stage. Further robustness checks are carried out in the following section.

6 Robustness Checks

6.1 RoSCA Participation

I test the robustness of findings 1 and 2 in two ways. First, I re-run equation 1, with impatience and self-control dummies, using a probit regression. Second, I replace the impatience and self-control dummies in equation 1 with the impatience and self-control full indices, respectively, and run a linear probability model.

6.1.1 Probit Regression

The probit regression results are presented in Table 6 and the post-probit marginal effects of the main regressors are reported in Table 7. The coefficient of *bank* remains negative and strongly significant. This means that access to formal banking is negatively

correlated with RoSCA participation which supports my first hypothesis and confirms the first finding.

Table 6 – Robustness Check: RoSCA Participation (Probit)
Dependent Variable: *rp*, dummy variable equals 1 if participant in a RoSCA, zero otherwise

| | (1) |
|---------------------------|----------------------|
| RoSCA Participation Dummy | |
| bank_access | -0.523*** (0.170) |
| impatient | 0.105 (0.233) |
| mod_sc | 0.596*** (0.226) |
| high_sc | 0.330 (0.295) |
| Constant | -0.293 (0.355) |
| Controls | Yes |
| N | 179 |

Probit regression. Standard errors are clustered by session. Controls include gender and married dummies, and age and job type (academic, administrative, blue-collar) categorical variables.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Impatience also remains positive, small in value and statistically insignificant while moderate self-control remains positively and strongly significant compared to other levels of self-control with respect to RoSCA participation. These results confirm the OLS results presented earlier on RoSCA participation, and therefore, no evidence in support of hypothesis 2 is found.

Table 7 – Marginal Effects After Probit: RoSCA Participation

| | drp / dx | St. Errors |
|-------------|------------|------------|
| bank_access | - 0.183*** | 0.056 |
| impatient | 0.037 | 0.082 |
| mod_sc | 0.208** | 0.079 |
| high_sc | 0.115 | 0.102 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.1.2 Full Indices

Table 8 presents the OLS regression results of equation 1 where impatience and self-control dummies are replaced with the full indices measures. Furthermore, the self-control index is also introduced in a quadratic form. Columns 1 and 4 support my first finding on the negative relationship between bank access and RoSCA participation. Furthermore, using the full indices, column 2 of Table 8 shows that there is a quadratic relationship between self-control and the RoSCA participation decision. This relationship is also shown using Figure 3 where an inverted-U relationship between self-control and RoSCA participation is displayed.

Column 3 of Table 8 shows the interaction between impatience and self-control and its relationship with RoSCA participation. To interpret the significant positive coefficient of $imp_index * sc_index$, I calculate the marginal effects of the change in RoSCA participation resulting from a one-unit increase in the self-control index at different levels of the impatience index. The marginal effects are presented in Table 9 and show that the increase in self-control is positively correlated with the probability of RoSCA participation when individuals are impatient which also confirms finding 2.

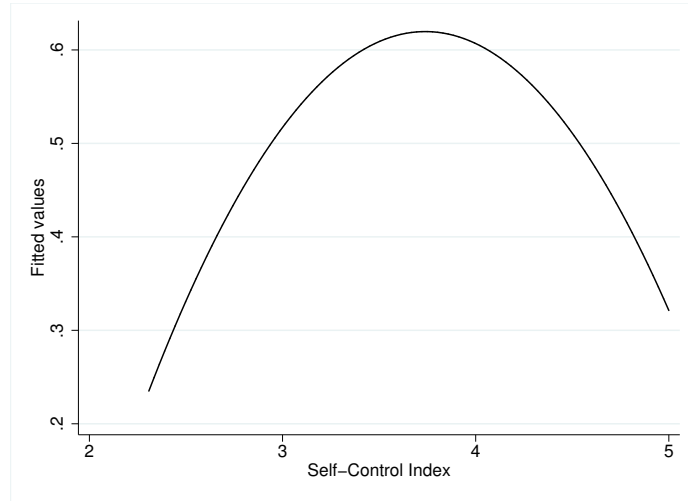


Figure 3 – RoSCA Participation and Self Control

6.2 RoSCA Relative Rank

To test the robustness of finding 3, I replace the last rank dummy, lr , (outcome) in equation 2 with a measure of an individual's relative rank, rr , in the RoSCA cycle i.e. rank

Table 8 – Robustness Check: RoSCA Participation (OLS)
Dependent Variable: *rp*, dummy variable equals 1 if participant in a RoSCA, zero otherwise

| | (1) | (2) | (3) | (4) |
|-----------------------------------|----------------------|---------------------|----------------------|----------------------|
| bank_access | -0.175*** (0.048) | | | -0.179** (0.060) |
| impatient_index | | -0.005 (0.013) | -0.254*** (0.085) | -0.229*** (0.063) |
| sc_index | | 1.509* (0.707) | 0.735 (0.819) | 0.603 (0.691) |
| sc_index_sq | | -0.202** (0.094) | -0.162* (0.092) | -0.137* (0.076) |
| impatient_index \times sc_index | | | 0.069*** (0.022) | 0.063*** (0.016) |
| Constant | 0.679*** (0.058) | -2.159 (1.366) | 0.100 (1.805) | 0.206 (1.502) |
| Controls | No | No | No | Yes |
| N | 182 | 179 | 179 | 179 |
| Adjusted R^2 | 0.020 | 0.012 | 0.043 | 0.100 |

OLS regression. Standard errors are clustered by session. Controls include gender dummy, and age and job type (academic, administrative, blue-collar) categorical variables. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Impatience (self-control) increases along the impatience (self-control) index.

relative to the RoSCA length. The *rr* variable is thus a continuous variable that is greater than zero and equal to one. The smaller (bigger) *rr*, the earlier (later) the rank. The receiver of the last rank has a relative rank of one. The results of regressing the relative RoSCA rank on impatience and self-control dummies, conditional on RoSCA participation, are presented in Table 10. Column 1 shows that, in all RoSCAs, while impatience is insignificantly related to the rank, individuals with moderate or high self-control gets the pot earlier than those with low self-control (the reference group). However, restricting the sample to by-negotiations RoSCAs in column 2 shows that impatient individuals with low self-control have significantly higher relative rank in the RoSCA cycle which confirms finding 3. Column 3 also supports our argument on the importance of screening in allocating the rank where individuals who are new to RoSCAs receive the pot later than those who regularly participate.

Table 9 – Marginal Effects: RoSCA Participation, Self-Control Index and Impatience Index

| at imp_index = | drp / dsc_index | st. errors |
|----------------|-----------------|------------|
| 2 | 0.75 | 0.72 |
| 3 | 0.81 | 0.70 |
| 4 | 0.87 | 0.68 |
| 5 | 0.93 | 0.67 |
| 6 | 1.00 | 0.65 |
| 7 | 1.06 | 0.63 |
| 8 | 1.12* | 0.62 |
| 9 | 1.18* | 0.60 |
| 10 | 1.25** | 0.58 |

* p < 0.10, ** p < 0.05.

Table 10 – Impatience, Self Control and Relative RoSCA Rank
Dependent Variable: *rr*, continuous variable equals to the RoSCA rank relative to the RoSCA

| | (1) | (2) | (3) |
|-------------------------|---------------------|----------------------|----------------------|
| impatient | 0.151 (0.116) | 0.458** (0.180) | 0.435** (0.167) |
| mod_sc | -0.234* (0.124) | -0.206 (0.138) | -0.195 (0.141) |
| high_sc | -0.354** (0.122) | -0.458*** (0.149) | -0.521*** (0.143) |
| impatient=1 × mod_sc=1 | -0.227 (0.136) | -0.405** (0.181) | -0.399* (0.187) |
| impatient=1 × high_sc=1 | 0.025 (0.128) | 0.017 (0.238) | 0.126 (0.219) |
| irregular | | | -0.003 (0.090) |
| new_part | | | 0.287*** (0.048) |
| Constant | 0.629*** (0.103) | 0.451*** (0.131) | 0.327* (0.180) |
| Controls | Yes | Yes | Yes |
| N | 91 | 64 | 64 |
| Adjusted R^2 | 0.193 | 0.397 | 0.518 |

OLS regression. Standard errors are clustered by session. Controls include gender dummy and age, job type (academic, administrative, or blue-collar) categorical variables.

* p < 0.10, ** p < 0.05, *** p < 0.01.

7 Conclusion

Incentives to join RoSCAs, given its informal and interest-free nature, have been a long-standing puzzle in the literature. Several explanations for the popularity of RoSCAs are documented; the most popular of which are: (1) borrowing to buy a durable good in the absence of formal bank access (the durable good theory), and (2) committing oneself to savings if an individual is impatient and suffers self-control problems (the commitment theory). This paper tests the two complementary theories for RoSCA participation. Using primary data I collected from Cairo, Egypt, I examine if and to what extent bank access, impatience and self-control explain the RoSCA participation decision. Furthermore, I examine how RoSCA participants' impatience and self-control levels are correlated with when they get the RoSCA pot i.e. RoSCA rank. Impatience is elicited using an incentivized experiment, and self-control and RoSCA participation and rank are measured through a post-experiment questionnaire.

The main findings of the paper are: (1) having access to formal banking is negatively correlated with RoSCA participation which is in support of the durable good theory. (2) the data does not lend support to the commitment theory with regards to RoSCA participation except for the participants who receive the pot last in by-negotiations RoSCAs. I thus argue that RoSCA negotiations are able to identify high risk (impatient with low self-control) individuals and allocate them to ranks that minimize any potential default risk. My argument on the relationship between screening and the RoSCA rank is supported by the finding that new participants are more likely to receive the pot last compared to regular participants.

In my analysis, however, I observe correlation rather than causation thus a design that would capture the direction of causation would help in better understanding the commitment function of RoSCA. Several financial products have been motivated by the commitment theory of RoSCAs and the postulation that impatient individuals with low self-control sign up to joining RoSCAs on the last rank to commit to savings (Ashraf, Karlan and Yin, 2006). However, this paper's findings also suggest another direction of causation where impatient and low self-control individuals are pushed in negotiations towards getting the pot on the rank that mitigates their potential default risk (i.e. the last rank). By agreeing to participate, even if they are not better off than saving in autarky, they give signals that they can commit in the hope of getting the pot earlier in

future cycles. Further research on this point is thus important for designing commitment financial products.

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