Rosca Participation in Benin: a Commitment Issue*

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Abstract

In the light of first-hand data from a Beninese urban household survey in Cotonou, we investigate several motives aiming to explain participation in Rotating Savings and Credit ASsociations. We provide anecdotal pieces of evidence, descriptive statistics, FIML regressions and matching estimates which tend to indicate that most individuals use their participation in a rosca as a device to commit themselves to save money and to deal with self-control problems.

Keywords: ROSCA, self-control, commitment device, Benin

JEL Classifications: G2, O16, O17

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1 Introduction

There have been numerous studies underlining the importance of rotating savings and credit associations (roscas) in developing countries. There, roscas are commonly found in rural areas and the poorer urban neighbourhoods and drive a considerable part of individuals' savings. Bouman (1995) refers to many african countries showing high degrees of participation, from 50 to 95%, and highlights the importance of the savings mobilized in these organizations, in particular in Ethiopia, Kerala, Vietnam and Cameroon. In developed countries, these institutions are mainly used by migrants[1].

A basic description of these associations can be given as follows: A group of individuals gather on a regular basis for a cycle of meetings. At each meeting all members contribute a fixed amount of money to a common pot allocated to one of them. The latter is then excluded from the reception of the collective savings in subsequent meetings but is still obliged to contribute to the pot for the rest of the cycle. This process repeats itself until each member has received the pot, which marks the end of a cycle. The rosca may then begin another cycle or decide to break up. Groups vary widely in terms of amount of contributions, number of members and frequency of meetings. In fact some groups may function on the basis of weekly or monthly compulsory meetings whereas others which do not hold meetings send a member for collecting payments. Operating modes of roscas can differ considerably. The pot can be allocated either according to a random process[2] (*random roscas*), through a decision imposed by the governing body of the group (*decision roscas*) or through a bidding process (*bidding roscas*).

Rosca members are mainly poor individuals who have little access to formal savings and credit markets because of high transaction costs and incomplete markets.[3] In the literature roscas are usually regarded as a means for poor people to save money in order to make an indivisible expense. Empirical analysis by Handa and Kirton (1999) and van den Brink and Chavas (1997) confirm this view. Evidence we collected from a sample of 497 households in Cotonou, Benin, supports this as well.

Rosca participation implies costs. They do not provide interest rates. Moreover, members suffer from the risk of default from other members - which could eventually lead to the breakdown of the rosca -, from less flexibility than saving on their own - as the rosca saving rate is likely to differ from their optimal saving rate - and, in most cases,

[1] See among numerous references, Srinivasan (1995) and Summerfield (1995) about migrants in the UK and Bouman (1995) on the capital role of roscas among Korean migrants in Washington DC.

[2] This can be done once at the beginning of a cycle (establishing the order for its entire duration) or the random draw can be repeated at the beginning of each meeting.

[3] As an example, a small survey of Beninese banks showed us that conditions for opening an account in any public or private banks of Cotonou - such as fixed guarantee deposit, possession of an identity card (the costs of which are prohibitive) and literacy skills for the understanding of contracts - all act as strong deterrents against poor people.

from opportunity costs of time spent by taking part in the group's meetings.[4] Despite all these costs, these groups enjoy popularity which proves that it must be beneficial to their members, who, in need of a saving device, are ready to pay for it[5]. This brings the question as to why individuals would decide to join a rosca instead of saving on their own.

This important question has received various answers in the literature. Besley, Coate and Loury (1993) put forward that roscas allow individuals to receive the pot earlier than through individual saving and hence to make the desired indivisible expenses before it would have been possible in autarky. This can obviously be the case for all members except the last one in the cycle. A second motive for joining a rosca is that such associations can act as substitutes for insurance, this being particularly true in developing countries where markets for insurance are absent. These two answers appear however to be unfit for the evidence we collected in Benin. We discuss why below.

Another rationale was provided by Anderson and Baland (2002) on the role that roscas can play as a commitment device. Their work relies on intra-household conflicts in consumption decisions and on the existence of asymmetric preferences for household goods between men and women. This motive does not fit our empirical findings however because of the Beninese intra-household decision process and additional reasons presented below. However, on a related note, we observe that a minority of individuals in couple, mostly men, seem to join roscas to hide part of their income from their partner.

In the light of our evidence it appears that, in Cotonou, the main reason for enrolling in a rosca is rather the need of commitment due to self-control problems. If people have present biased preferences or suffer from short-term temptations and are aware of their consequences, it is likely that they would prefer to limit the set of options available to them. They could then be part of a rosca to bind themselves to their second best optimal saving rate thus securing part of their revenues against everyday temptations. Examined by Ambec and Treich (2007), this rationale was proposed by Aliber (2001) and Gugerty (2007). In their respective surveys they indicate that in the absence of alternative commitment saving strategies, people aware of their time inconsistency problem would turn to roscas.

Our paper distinguishes itself with respect to the main literature in two ways. First it provides original empirical findings in favour of the self-commitment argument. After

[4]Nevertheless our evidence shows that only a few members, if any, considered meeting as being valuable time wasted. It rather seems that members like meeting and spending time together. Several groups organize many activities aside from the pot distribution that allow members to get involved in various ways (meals, singing, etc). Meetings are also a precious opportunity for exchanging information although we think it is not a reason that drives membership in itself. Indeed, to the question 'What is the fundamental reason why you joined a rosca?', included in our survey, this reason was never mentioned.

[5]See in particular Rutherford (1999) on this issue of costs.

presenting the determinants of participation and of the amount contributed to roscas, we turn to matching estimations of the average effect of roscas participation on some key variables. Second, it documents the fact that Beninese spouses evolve in a non-cooperative framework and that, as a consequence, joining a rosca is an individual decision. This brings additional light along with rare studies pertaining to the West-African intra-household decision process. Furthermore, it underlines that, contrary to a widespread belief, there does not seem to be any gender effect as to rosca participation in Cotonou.

We therefore intend, in the following section, to briefly review reasons for participation previously given in the literature. We then present in section 3 field evidence that describes how husband and wife interact with each other. Section 4 investigates the self-control commitment issue, section 5 presents conjectures and section 6 describes the survey on which our analysis is based. We then proceed by offering in section 7 empirical estimates to support our conjectures. Section 8 sets out alternative explanations for joining a rosca and section 9 concludes.

2 Motives for Participation Put Forward in the Literature

2.1 Quick Financing of the Purchase of Durable Goods

As argued in Besley, Coate and Loury (1993), roscas allow individuals to receive the pot earlier than through individual saving and thus to make the desired indivisible expenses sooner than if they had saved on their own. This applies to all members except the last one in the cycle. Ex-ante, roscas having a non-predetermined order, either because they are bidding or random roscas, lead all members to be better off in expectation by saving through them. Once the indeterminacy of the entire cycle order is unraveled the last pot recipient is ex-post worse off provided that the saving rate imposed by the rosca is not optimal for her. Observations collected in Benin do not support such an hypothesis. Out of the 183 roscas included in our dataset 50% have their entire order known before the cycle begins, before any contribution has been paid. In those cases, when the cycle starts there is no uncertainty about the timing of the pot receipt. Either the order is determined by the governing body in a decision rosca according to various criteria (punctuality, good payment records, seniority, membership of the governing body, etc), either in a random rosca the entire order is chosen randomly and known at the beginning of the cycle. Thus as the cycle starts, the median cycle length being 11.54 months, the last recipient could well decide to opt out, ex-ante knowing to be in a worse situation. Backwards induction would then predict the breakdown of the rosca. [6]

[6] In our sample, 93% of all roscas change the order after each cycle is completed. The order of pot reception is therefore rarely repeated from cycle to cycle. But this does not change our argument. For half

Another piece of evidence rendering the Besley, Coate and Loury (1993) reasoning unfit to the Beninese case is that only a minority of 24% of rosca members in our sample declared that if they could choose they would prefer to receive the pot at the beginning of the cycle while a majority of rosca members (60%) preferred the end.[7] For those wishing for an early reception of the pot we do not rule out the Besley, Coate and Loury rationale but it remains that this motive is more of an exception.

2.2 Insurance

Another motive for joining a rosca is that such an association can act as a substitute for insurance. This interpretation is mainly valid for the case of bidding roscas and not for random or decision roscas. Bidding roscas is indeed the type of rosca which can best combine the allocation process and the timing of pot reception with respect to members' specific shocks. In our sample only random (64%) and decision roscas (36%) are represented, bidding roscas being seemingly absent in Cotonou. However random and decision roscas can provide insurance to a small extent. Some flexibility is indeed provided by allowing a member in need to receive the pot at an earlier round. Of all the roscas surveyed 26% stipulated in their rules that changes in the ordering were permitted and to be agreed upon by either consensus of all members or by the governing body. Moreover 44% of all roscas allow two members to change order without knowledge of the rosca's governing body or any other member. This opportunity seems to be used since 12% of the rosca members said there has been at least one exchange of place with another participant in their group during the last cycle.

Roscas can also provide insurance by offering loans to their members. Indeed 20% of all roscas offer this possibility in their rules. In the vast majority of those associations (94%) a loan can only be offered to a member who has not yet received the pot. In addition, conditions are often imposed (72% of these groups) as for what reasons the loan can be granted (disease, financial problems, funerals, accidents, etc).[8] Loans are

of the roscas having no uncertainty with respect to the order, members motivated by an early reception of the pot can still decide to opt out, whether or not the cycle order will be repeated. Interestingly, according to our characteristic variables there is no difference between a representative member of a rosca with or without uncertainty with respect to the order.

[7] 6% declared preferring to receive the pot at mid cycle and 12% were indifferent. Of those preferring to receive first in the cycle: 61% said that they would rapidly use the pot to invest and ease the payment of future contributions with the profits earned, another 25% said that they could rapidly repay debts or enjoy the benefits of having the pot. In his South African case-study, Aliber (2001) also reports a predominance of preference for being last.

[8] In all cases no formal collateral (such as belongings) is required. The pot to be received by the member acts as such. Indeed the amount granted is often limited to the pot and deadline payment coincides with the time of pot reception or the end of the cycle. 58% of these loans are granted without payment of interest. Before granting a loan 72% of all roscas carry on investigations to check the truthfulness of each demand.

regurlarly solicited in groups offering this opportunity: during the last six months 58% of them granted at least one loan.

Decision roscas, both those imposing an order for the entire cycle and those making meeting-to-meeting decisions often consider desires and needs of members. Of all 65 decision roscas, 53% base their decision on individual member's needs.[9] Of course this insurance aspect is enhanced for roscas based on meeting-to-meeting decision. A member to whom something unexpected happened and who has not yet received the pot can come to a meeting and formulate her demand. For roscas fixing the entire ordering before the cycle begins, the insurance they can provide is limited. It can only take into account foreseen or potentially known shocks. For instance, they can take into account harsh fishing seasons and make pot reception for fishermen coincide with it.

Even though these two types of roscas have tried to incorporate some insurance aspects in their functioning, once the pot is received and a shock occurs, there is little if nothing available.[10] Beninese roscas are therefore an imperfect substitute for insurance.[11] Instead surveyed individuals tend to resort to indemnity funds[12], a major informal institution for insurance services.

2.3 Intra-household Conflicts

Anderson and Baland (2002) present a model of intra-household conflicts in consumption decisions. In their cooperative bargaining framework, men and women, sharing a common budget, exhibit asymmetric preferences for household goods. Those asymmetries drive their model of intra-household conflict for an indivisible good: women have always a larger preference for the indivisible good and therefore want to save at a higher rate than men. In Kenya, members being of an overwhelming majority female[13] would join a rosca in order to hide or secure their savings from their husband. They could then buy an indivisible good, which they prefer, whereas men would rather opt for present consumption. By joining a rosca, women thus commit part of the household's income against the husband's preferences.

[9] Other criteria for such a decision are: good payment records and punctuality (30%) and seniority (11%).

[10] Some roscas do offer additional help called 'alô jè nude ji hun enan' (24% of the roscas in our sample). One member in need can raise her hand and tell the group which kind of problem she has to cope with. The group might give her a financial help which needs not be reimbursed. This help is closer to solidarity than insurance since its granting is uncertain and its amount widely variable.

[11] Contrary to our field observations, Calomiris and Rajaraman (1998) find a prevalence of bidding roscas in an Indian city and stress their insurance role. See also Klonner (2001).

[12] LeMay-Boucher (2007) presents an analysis of those groups based on this Beninese household survey. These groups, called in Fon 'nujè mèji gbê' (a direct translation of which would be 'happiness-unhappiness funds'), offer insurance against a wide range of shocks.

[13] This bias towards female participation is also confirmed by other studies such as Ardener (1964) - offering several case studies located in India among others - Geertz (1962), Tsai (2000) and Johnson (2004) who respectively focus on Java, China and Kenya.

This does not seem to comply with the evidence we collected in Benin. On the one hand, our dataset shows that women seem to participate less in roscas than men: while they represent 51% of all adults, women form a minority (45%) of all rosca members. According to our sample, in Cotonou, 15% of the women take part in roscas, this slightly increases to 21% if in couple and 22% if working (24% if both). Compared to that, 19% of the men are members of such groups, 32% when living in couple and 31% if working (35% if both). Moreover, there is no tendency towards favouring women in group composition: 18% of all roscas surveyed were exclusively composed of women while 26% exclusively of men. For the remaining of groups composed of both genders 63% have a majority of male members. In addition, from the general groups' typology depicted from this survey, we cannot assert that roscas are primarily oriented towards women's needs. Neither do they intend to favour their membership. We met no group having clear primary objectives such as assisting women, providing for their needs or those of their children or empowering women in their interactions with their husband.[14] Our Heckman FIML regressions displayed in Section 7 confirm that this motive is not relevant to the Beninese context. Indeed neither the 'Female' nor 'Female * Couple' variables are significant in our selection in roscas regressions. This shows that gender does not seem to be a relevant variable explaining participation in roscas. As these variables are still non significant in our estimates of the monthly contributions for the members in couple, it seems that couple members do not exhibit asymmetric preferences with respect to saving decisions.

On the other hand, were roscas used as a means to put money aside from the husband, membership would have to be kept secret from the husband.[15] However, in order to avoid potential disputes concerning mainly adultery issues, 40% of the groups of our sample allowing female membership impose husband's approval for new female members. Rosca meetings are usually only open to members but groups do not insist upon secrecy showing that participants are not primarily seeking to commit money against spouses.[16] Moreover, among the 56% of groups which share the financial leftovers of

[14] In fact no group imposed spending scheme or favored goods deemed valuable to any gender or ethnic group. Latitude as to what can be bought with the pot is large: rules limiting the pot use are rarely imposed (in only 2% of all roscas).

[15] It can be argued that, once a woman joins a rosca, she could use the threat of social sanctions to convince her husband to continue allowing her to participate. However, this reasoning is valid only in the course of one cycle. Once the cycle is completed, one can freely chose to quit the group, what is commonly accepted. An unwilling husband could easily pressure his wife to quit the group at the end of a cycle without incurring social sanctions. Nonetheless, in what we observe in our sample, reasons given by members for leaving a group are not related to that motive (Dagnelie, 2007).

[16] Gugerty (2007) and Johnson (2004) find similar evidence in Kenya. In Gugerty's sample, roscas have a structure that is not designed to encourage secrecy among spouses. Gugerty and Johnson also present evidence against the intra-household conflict hypothesis. Indeed Johnson finds out that in the households she surveyed, a majority of couple members managed their money independently.

the group (mainly fines imposed on members in cases of non payment, absenteeism or misbehaviour), a majority organize at the end of a cycle (or of the year) a celebration with dances and folklore where friends and neighbours are invited. Even defiles or marches preceed those celebrations to attract attention from people in the neighbourhood, advertise the success of their association and generate new memberships.

Even if, in Benin, the motive for hiding one's income and rosca participation appears to be different from Anderson and Baland's explanation, we notice that a minority of individuals in couple conceal their participation in a rosca from their partner. Of the members in couple 15% (23/157), mostly male, admit that their spouse is not aware of their membership of a rosca. It appears from tests of difference of means and probit regressions that these members mostly join non mixed groups, which seem more appropriate for their participation to be kept secrete. Multinomial logit regressions[17] reveal that, controlling for individual income and other covariates, the individual share of the household income significantly increases the probability of taking part in a non mixed association. These results are much in line with the Beninese intra-household decision process presented in section 3. Some spouses (mostly men) indeed hide part of their income in roscas to prevent their partner from renegotiating their respective status quo level of household expenses. Moreover being secretive as to money matters does not seem to be anecdotal as 29% of the members in couple declare the contributed amount to the pot is unknown to their partner while 54% of them say the time of receiving the pot is not known. Nevertheless, hiding one's participation is the only one of the three hiding possibilities for which the individual share of the household income is significant and robust across specifications. Even if roscas can be a tool for helping secretive partners to hide money, these figures do not suggest it is a widespread motive for joining a rosca[18].

3 Secrecy and Individual Decisions within Household

During our survey, we carried out several informal meetings with residents of Vossa and Enagnon. These showed us that, regarding money matters, secrecy is the rule between spouses. An important proportion of women and men with whom we spoke declared that their spouse was unaware of the course of their occupational activities and was therefore unable to guess their income. Many said, no matter the gender or age of the respondant: 'the less he/she knows about my activities, the better it is.' Or 'I don't want him/her to know my income otherwise he/she will ask me to meet the cost

[17]The dependent variable consists of three categories: no participation, participation in a mixed group, participation in a non mixed group. These regressions tables are available upon request from the authors.

[18]In fact this answer was not given by a single of the 222 members in our sample to the question: 'What is the fundamental reason why you joined a rosca?'.

of such and such expenses.' Spouses are overwhelmingly secretive and it even seems that giving as little information as possible to their partner is quite natural. Hence, spouses rarely ask questions concerning their partner's income or inquire about their activities. It is a kind of convention allowing each member of the couple to keep her income more or less secret. The result of this is that each individual has a lot of latitude in managing personal income. Thus by being secretive, spouses avoid sharing their personal earnings or making common budget and retain the sole control over their personal expenditures.

Questions related to these observations were addressed to the 587 respondants (out of 1179) who were older than 15 and in couple. To the question 'Can you estimate your spouse's revenues?' : 79% answered no, 11% yes and 10% partially. Results were similar for: 'Do you think your spouse knows your revenues?': 76% answered no, 16% yes and 8% partially. This gives the impression that unions or couples are considered as business arrangements between partners who want the household needs in terms of public goods to be provided for.[19]

Another remarkable fact is that, in Benin, social norms determine the intra-household allocation of expenses by gender. The majority of the contributions to the household's public goods devolve on the husband who has to take care of everything related to the house (rental fees, repair costs, electricity), give money for housekeeping, pay the school fees, clothing, etc. His wife has to take care of the family, cook and pay water bills. In general, the male income is not sufficient to cover the needs of the family, so that the wife has to spend more for the household than what had been allotted to her.

As long as the basic needs of the family are fulfilled, 'selfish'[20] individuals would prefer to spend more on private goods, the utility of which is superior. Each spouse therefore tries to depart from the status-quo expenses, by passing on to the other some share of their common burden. They then enter an infinitely repeated non-cooperative game in which they try to lower their contribution to the provision of the public good as it is detrimental to their own consumption of private goods.

In order to implement this strategy, both spouses hide their income and try to give their partner a blurred image of their earnings. This implies that husband and wife also hide as much as they can their expenses which could lead their partner to have a guess at their revenues. Were agents able to know their partner could spend more for the household, they would claim to pay less. Therefore, none of the spouses gets incited to reveal the true amount of their earnings.

[19] LeMay-Boucher (2007) substantiates this dichotomy between wife and husband finances inside couples by providing an empirical analysis of the determinants of spouses' pattern of consumptions based on the same sample. He also gives a review of the anthropological literature pertaining to that issue in West-Africa; see notably Falen (2003).

[20] 'Selfish' is to be taken in the sense that the utility of one agent does not depend on any other agent's utility.

This is not to say that spouses do not interact as to the provision of public goods. A minimum of common management is required with respect to their respective role in the couple. Nevertheless, it remains that spouses avoid disclosing information on their income and their expenditures, the latter of which seeming more difficult. However, a large fraction of couples do not interact during working hours as their work brings them in different parts of the city. It means that meal expenses, transportation or medicines, transfers to relatives or collegues, gifts for funerals and luxury spending such as alcohol and cigarette can easily be concealed. Moreover, even larger expenses can be kept away from spouse knowledge. As we show in Table 2 almost half of the rosca members invest the pot in their small business. A woman buying stocks of provisions for storing can conceal them in her shop, taxi drivers paying for regular motorcycle or car repairs or fishermen buying new equipment can easily hide their investments.

Secrecy - as strategic information transmission (Crawford and Sobel, 1982) - prevents the household from benefitting from efficiency gains usually reachable with the repetition of the game. In this case, as neither incomes nor strategies are observable, detection of fraud or deviation from a cooperative agreement is in fact rendered impossible. This can explain why agents may be stuck in a pareto-inferior equilibrium, supported by social norms[21]. In these conditions, both spouses have no incentives to reveal their real income or personal expenses - which could lead to rough estimations of their earnings.

We observed that these behaviours are widespread and accepted to such an extent that few are those who try to break this tacit rule and inquire about their partner's income. A selfish spouse will thus individually decide whether or not to join a rosca. This decision depends on their available income net of public goods expenses and on other relevant individual characteristics.

4 Commitment Device Against Self-control Problems

Two different economic theories suggest that agents might prefer to commit themselves and limit the set of options available to them. Gul and Pesendorfer (2001 and 2004) present a dynamic consistent preferences explanation of this phenomenon, namely the temptation theories. According to their theory, agents undergoing short term temptations in conflict with their long run self interest would be 'unambiguously better off when ex ante undesirable temptations are no longer available' (Gul and Pesendorfer,

[21]The means of pressure of the partners consist mainly of threats of reputation losses: wives can complain to their parents-in-law (and then to their own parents) about their son, unable to provide decent living conditions to his family. Her husband endowed by custom with most of the burden is able to force his wife to provide a bigger share in the family budget. Would she refuse to make efforts she in last resort could be repudiated.

2001, p.1406). And even if they do not expect to succumb to the temptation in the future, individuals with self-control problems will expend resources to remove tempting alternatives from their choice sets (ibidem, p.1420). In this case, preference for commitment arises from a desire to avoid temptation rather than from a change in preference.

The second approach, well known in the literature[22], departs from the dynamic consistent preferences hypothesis and corresponds to a reversal of preferences when the date of decision-making approaches. It appears from psychological experiments that people tend to have present-biased preferences - the shape of which is roughly hyperbolic - and discount time at a non constant rate - higher in the very short than in the longer term[23]. An individual having self-control problems and being sophisticated - aware of the problem and its consequences - would prefer to commit herself. Her current self may want to restrict the choice set available to her future selves to overcome such time-inconsistencies.

Even if the underlying motives are slightly different according to each of the two theories presented above, their implications appear similar in terms of rosca participation. Roscas seem indeed to respond to a need of commitment against one's time inconsistency preferences and temptations. According to Gugerty (2007), in the absence of alternative commitment savings strategies, people having self-control problems and being sophisticated turn to rosca since they would indefinitely renegotiate with themselves[24] if trying to save money on their own. This is supported by empirical evidence from a randomized control methodology study in the Philippines. In fact, Ashraf et al. (2006) show that women with time inconsistent preferences desire commitment savings devices. They are indeed more likely to take up the SEED product which is a pure commitment savings product (bank account with restricted access to deposits without compensation for this restriction), this leading to higher savings levels. Moreover, Ashraf et al. show that poorly educated individuals with hyperbolic preferences are more likely to join roscas.

Besides rendering the current savings illiquid and safe, roscas restrict the set of future options as long as the end of the cycle is not reached, compelling the individual to go on saving. Unfortunately we are unable to identify if individuals in our dataset suffer from time inconsistency. Hence we cannot formally test the hypothesis according to which individuals having hyperbolic preferences are more likely to join roscas. However, matching estimates of expenditures made on goods generating temptations, presented in section 7.2, allow us to indirectly test this hypothesis. Moreover, we have a series of empirical evidence which suggest the need of a commitment device as a motive for membership. Indeed 89% of the rosca members (198 out of 222), answered that they

[22] see among many others, Laibson (1996, 1997), O'Donoghue and Rabin (1999)

[23] where $\delta \leq 1$ and $0 < \beta < 1$ in $U^t(u_t, u_{t+1}, \ldots, u_T) = \delta^t u_t + \beta \sum_{\tau=t+1}^{T} \delta^\tau u_\tau$

[24] At each period, the current self would have present-biased preferences towards consumption and would renegotiate the savings decision made by the previous selves.

joined a rosca to discipline themselves to save. 'Discipline' or 'the willingness to force savings' being by far the most cited answers suggest that a vast majority of members use the rosca as a mean to commit themselves to save.[25] Despite the evidence we provide in Table 2, according to which all members use the pot for indivisible expenses, the answer 'buying a durable good' came short as only 22.5% of all participants mentioned it as the reason of their membership.

Moreover the fact that 60% of rosca members prefer to receive the pot at the end of a cycle provides an additional argument.[26] Of all those who preferred being at the end 78% said it was because they did not want to feel indebted towards the group. They consider receiving in the early turns of a cycle as a debt towards the group to be repaid by future contributions to the pot and as a situation that they would prefer to avoid (this answer was provided without any proposed list of answers). Such debt aversion certainly confirms the incentive and disciplining role of the group which is exerted through pressure from the peers towards a defaulting member. As Aliber (2001) writes: 'The debtor-creditor relationships created by roscas between members are characterized by an uncomfortable sense of obligation by the former towards the latter.' An early reception of the pot means that an individual faces the risk of a negative shock throughout the cycle which might make him unable to repay the effective 'loan'. Moreover, in case of default, leaving prematurely the rosca can be costly. Indeed, sanctions are more severe towards a defaulting member once he has received the pot.[27] Thus preference for late reception may simply be due to the agents' risk aversion towards their own default and increased punishment and not by the need of a commitment device. In this respect, we expect that in our sample, salaried individuals, who receive a regular and certain income, are less risk averse than non salaried. However we find that both types of agents have similar preferences with respect to the timing of the pot receipt. Furthermore, the most important pot use among the people preferring an early pot reception is 'small business' investment (46%)[28] which is the only risk bearing pot use (see Table 2). This piece of evidence gives more credit to the commitment story. Still we argue that both reasons are likely to be intertwined. Many members told us in informal interviews that apart from minimizing the threat of sanctions, receiving the pot at the end of a cycle provides in itself additional motivation to make payments and complete successfully a cycle. Fear of sanctions and credibility of threats are important factors

[25] Multiple answers could be provided by participants to the open-ended question 'What is the fundamental reason why you joined a rosca?'. Even then we still find that discipline is the most cited motive representing 52% of all answers. Aliber (2001) and Gugerty (2007) also reports that a majority of respondents in South Africa and Kenya gave similar answers highlighting the need of discipline.

[26] This preference is not correlated to the duration of the group membership and therefore not likely to be related to any learning effect.

[27] Further details on those sanctions can be found in Appendix B.

[28] Around 30% of the members investing in their business prefer to receive the pot at the beginning of the cycle. This value is the maximum for early reception preference among the different pot uses.

influencing preferences on the timing of pot receipt[29]. At the same time, they are key elements for making a rosca a good commitment device. Would members put too much value on potential sanctions they would quit the rosca and try to save on their own and we would notice high turnovers. It is however not what we observe: the average membership duration of all those who provided this answer is 47 months, and only 4.4% said that they joined the group for a fixed number of cycles (the vast majority not knowing how long they were to stay member). All this tend to demonstrate that for a substantial number of individuals, benefits from an early receipt of the pot are outweighed by a mix of risks and debt aversions and the need of commitment.

5 Conjectures

Important implications can be derived from the intra-household consumption behaviour that we depicted earlier. It allows us to put forward a conjecture that we intend to confront with our empirical findings. We claim that each individual makes decision about his/her own consumption and saving. Secrecy protects individual earnings to a large extent from spouse pressure and gives husband and wife a very limited ability to bias his/her partner's choice. In the absence of a common decision over an aggregated household budget, spouses have the latitude to make decisions about their savings as if they were single. They both have the ability to manage their income according to their respective will. We can thus formulate a conjecture that would not allow us to test of the commitment hypothesis, but rather the intra-household conflict hypothesis :

Conjecture 1 *The probability of joining a rosca does not depend on whether an individual is single or in a couple.*

A great deal of latitude is left to both husband and wife in terms of managing their income net of public goods expenses and deciding if they are going to join a rosca. Thus the probability of joining a rosca boils down to a function of individual characteristics: income, age, schooling, stability of one's job and the number of dependents. Simple predictions can be made on the effects of these variables. As saving is a normal good[30], income will positively influence the probability of joining. However we expect that rich individuals would rather opt for a formal and less risky vehicle of savings. A bank account in either a private bank or a public institution[31] offers more flexibility and a

[29] Multinomial logit regressions show that important sanctions (seizure, police) and worse sanctions after pot reception increase the probability of preferring the end of the cycle.

[30] LeMay-Boucher (2007) empirical investigations based on the same sample tend to support this view as individuals' savings are rising in income in a convex manner.

[31] The Beninese National Post Service, the CLCAM (a National Co-op offering loans and saving accounts) are, among others, public institutions present in Cotonou.

more secure vehicle than roscas informal arrangements. So for high levels of income we expect the probability of joining to fall having thus an overall inverted-U shape curve with respect to income.[32] Age would also follow a quadratic pattern: the needs to save would be maximum for middle age individuals establishing a family or small commercial activities (petty retail, fishing, etc.) and would be expected to diminish as age increases. The effect of the number of dependents on the probability of joining a rosca is a priori ambiguous. A larger number of children would give higher incentives to parents for saving in order to face future indivisible expenses, conversely more children would involve additional expenses and reduce potential savings. Variables describing job's stability[33] would be positively linked to the probability of joining. Individuals with more stable income flows over the past indeed expect to be able to commit themselves more easily to regular payments to the pot.

Should the commitment motive be valid, we would expect rosca participation and rosca contributions to raise with individual income. It is likely however that both of them are concave in income as less risky opportunities become available. A similar prediction on commitment is also proposed by Ambec and Treich (2007) who theoretically investigate the formation of stable informal agreements in developing countries. However we have to admit that this would be a necessary but not sufficient condition for certifying our commitment hypothesis. We make the point clear below that this result could also comply with other motivations for rosca participation. The intuition would be that as income rises agents tend to further protect themselves against increasing temptations. Moreover, sophisticated individuals would want to overcome time-inconsistencies by restricting the set of choices available to their future selves. This forms a second conjecture:

Conjecture 2 *At least at low levels of income, payments made to roscas by individuals in need of a commitment device will be positively linked to income.*

In the next section we present the survey on which our analysis is based, then in section 7 we confront our conjectures with empirical findings.

6 Description of our Survey

We use data we collected during the first three months of 2004 in the two districts of Vossa and Enagnon located on the outskirts of Cotonou (a city of about 1.1 million inhabitants). They are known to the city's authority as being the poorest. Vossa is located

[32] Our data show that, for the first income quantiles, practically no individual has a bank account contrarily to a maximum of 26% of individuals in the highest quantile.

[33] To check this, we use two binary variables: one takes value 1 if one individual keeps her job for 24 months or more and one takes value 1 if she receives a regular wage.

near an inner bay of fresh water and has a community of fishermen. Its 63 hectares are encircled by stagnating waters and swamps which represent an important vector of disease. This district has not yet been divided into plots, though a long term project has been launched during our stay. Vossa is let to itself: the authorities of Cotonou have not yet paved any of its roads even its principal axis. The recurrent and important problem of floods has not been dealt with even if it critically and annually paralyses the area during a few months. Enagnon, a dense slum located on the Atlantic Ocean shore, has also received low attention and important sanitary problems have not been tackled yet. Half of its area of 60.1 hectares has been divided into plots in 1998. Enagnon encompasses an adjacent slum called Enagnon-plage which is inhabited with a majority of fishermen living in huts on the beach. Vossa and Enagnon are near downtown Cotonou where a large part of their inhabitants work and commute everyday. No formal saving and investment institutions, either public or private, such as banks and NGOs are present in these two districts, the selection of which dates back to a first mission in 2002 that revealed that many informal groups such as insurance funds and roscas were active there.

We surveyed 497 households: 110 in Vossa and 387 in Enagnon (of which 114 are located in Enagnon-plage). Selection of each household was done randomly. The first wave of interviews aimed at creating contacts, getting housing information and obtaining information on each member: religion, activity, education, work, etc. For all members older than fifteen, we required enumerators to fill in a sheet detailing their expenses on durable goods incurred during the last six months and to carefully report their expenses on non-durable goods for the week previously ended. A second round was needed for members of informal groups. During this visit enumerators collected detailed information on the group(s) they belong to. For a maximal accuracy, all members of each household were interviewed separately throughout the successive waves of our survey so that tricky issues related to expenses or income were only tackled privately. Particular attention was thus put on confidentiality which was strictly followed by our enumerators. Further details on our survey methodology can be found in Appendix A.

We present, in Table 1, basic information on roscas according to their gender composition. Roscas composed only of women or men have memberships of similar median size. However the median duration (in months) for male only living roscas is larger than female only roscas. Female only roscas tend to have a shorter length of cycle and a smaller monthly contribution. Male only roscas make their payments more frequently on a monthly basis and fewer of them were started by a group of friends or relatives. With respect to the way the pot is allocated, either randomly or by a decision, and with ethnicity composition there is not much of a difference between female and male roscas. It is to be noted that a large majority of roscas are not designed along ethnic or religious patterns. About one group out of five has one alternative function. These groups, beside

	All roscas	Women only	Men only	Mixed
Number of members (median)	22	19	20	28
Months existed (median)	36	12	24	60
Monthly contribution (median)	8667	4800	6000	8667
Length of cycle (median. in months)	11.54	6.92	15	11.54
Contribute every day	0.0055	0.0312	0	0
Contribute every 4 days	0.11	0.125	0	0.16
Contribute every week	0.36	0.28	0.28	0.42
Contribute every 10 days	0.016	0.06	0	0.01
Contribute every 2 weeks	0.09	0.09	0.09	0.1
Contribute every month	0.39	0.34	0.64	0.29
Group comprises only women	0.17	1	0	0
Group comprises only men	0.26	0	1	0
All members are same ethnicity	0.22	0.31	0.36	0.125
Fixed order	0.36	0.25	0.32	0.4
Random order	0.64	0.75	0.68	0.6
Order is unchanged each cycle	0.07	0.1	0.09	0.05
Order known for the entire cycle	0.5	0.625	0.47	0.47
Order known for the entire cycle when fixed	0.34	0.375	0.27	0.36
Order known for the entire cycle when random	0.65	0.79	0.625	0.61
Constrained utilisation of the 'pot'	0.02	0	0.04	0.02
Started group with friends/relatives/neighbours	0.73	0.78	0.57	0.78
Group has a secondary role	0.19	0.16	0.11	0.23
Number of observations	183	32	47	104

Table 1: Group Characteristics.

organizing regular rosca activities, offer mainly insurance services (17% of all roscas), only three roscas (1.6% of all roscas) reported holding investment or credit activities. In all cases, these functions are clearly separated from the ones roscas usually perform. Investment or credit services would require separate contributions and accounts. Insurance schemes take the form of separate informal groups namely indemnity funds. Participation to parallel indemnity funds is voluntary although often restricted to rosca members. Those funds have distinct contributions schemes, meetings, rules and organization.[34]

[34]Some of the 183 roscas in our sample represent the secondary activity of an indemnity fund. Since both functions clearly demark themselves we did not make any difference in our analysis as respect to this

	All members	Women	Men
Do not know yet	0.02	0.01	0.03
Tuition fees	0.07	0.06	0.07
Health expenses	0.02	0.02	0.02
Financial aid / debt	0.05	0.07	0.02
Luxury expenses	0.05	0.08	0.03
Party / funeral	0.03	0.02	0.03
Brideprice	0.00	0.00	0.01
Plot purchase	0.11	0.10	0.12
House repair / building	0.18	0.08	0.26
Small business	0.49	0.72	0.30
Travel expenses	0.02	0.01	0.02
Other durable good	0.14	0.03	0.23
Other	0.02	0.03	0.01
Number of observations	222	97	125

Table 2: Pot Uses (multiple answers).

While the quick financing rationale is unfit for our data as we saw previously, saving through roscas is done in order to make an indivisible expense. As displayed in Table 2, this appears to be the case from our investigations even though as evoked before, it is far from being the most mentioned motive for joining a rosca[35]. We proceeded by asking all rosca members what they did with the pot during the present cycle or what they intended to do with it if their turn was to come. Nearly all of them reported that they bought or were willing to make an indivisible expense: 49% mentioned investment in their small business (buying important stocks of provisions for stores, motorcycle or car repairs for taxis, equipment for fishing, etc), 18% planned to repair or build a house, 11% reported plot purchasing, 7% paid for school tuitions [36], 5% planned to reimburse a personal debt and 14% to buy a durable good. What is meant by 'other durable good' is any type of object or commodity such as tv set, radio, mobile phone, etc.

primary/secondary role and considered all roscas on an equal basis.

[35]Gugerty (2007) finds, in her kenyan sample, that more than half of rosca participants use rosca winnings for two or more purposes, offering thus evidence that roscas are not formed only to purchase lumpy durable goods. We however observe that only 14% of rosca members intended to use the pot for more than one purpose.

[36]The fact that school fees represent such a low percentage is explained by the fact that a majority of public schools ask for very small tuition fees. For other selective schools, flexibility is allowed by which high fees can be paid in several instalments.

	Total Sample				Women				Men			
	All		Rosca memb.		All		Rosca memb.		All		Rosca memb.	
Participates in Rosca	0.17	(0.03)	1	(0)	0.15	(0.02)	1	(0)	0.19	(0.03)	1	(0)
Total monthly rosca contribution	1804	(256)	10492	(1452)	1646	(259)	10898	(1617)	1969	(274)	10161	(1329)
Female	0.51	(0.00)	0.45	(0.02)								
Age	33.1	(0.25)	39.8	(0.97)	32.9	(0.49)	39.7	(1.09)	33.3	(0.05)	39.8	(0.87)
In couple	0.52	(0.04)	0.74	(0.07)	0.52	(0.04)	0.69	(0.09)	0.52	(0.04)	0.79	(0.06)
Primary degree	0.28	(0.02)	0.23	(0.07)	0.18	(0.01)	0.12	(0.05)	0.40	(0.02)	0.32	(0.09)
Salaried	0.12	(0.01)	0.19	(0.02)	0.03	(0.01)	0.05	(0.03)	0.22	(0.01)	0.30	(0.02)
Monthly individual income	48223	(2672)	86377	(5235)	40554	(1739)	69386	(2673)	56237	(3720)	100212	(12663)
Monthly individual expenditures	30789	(2912)	47682	(2075)	27671	(2711)	43746	(3289)	34049	(3124)	50888	(859)
Number of dependents	1.91	(0.19)	3.18	(0.30)	2.05	(0.12)	3.37	(0.11)	1.77	(0.27)	3.02	(0.48)
House owner	0.70	(0.02)	0.72	(0.04)	0.70	(0.02)	0.77	(0.05)	0.70	(0.02)	0.68	(0.05)
Number of months, same job	85	(2)	159	(19)	82	(2)	155	(16)	87	(5)	163	(22)
Number of months, same block	191	(15)	226	(12)	174	(19)	183	(12)	209	(11)	261	(11)
Native Language : Ashanti	0.01	(0.00)	0.01	(0.01)	0.00	(0.00)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Native Language : Fon	0.33	(0.14)	0.29	(0.13)	0.31	(0.12)	0.23	(0.07)	0.34	(0.16)	0.34	(0.18)
Native Language : Popo	0.35	(0.05)	0.43	(0.09)	0.37	(0.04)	0.48	(0.13)	0.33	(0.07)	0.38	(0.08)
Native Language : Yoruba	0.04	(0.01)	0.04	(0.01)	0.04	(0.02)	0.06	(0.02)	0.04	(0.01)	0.03	(0.01)
Native Language : Fulani	0.03	(0.03)	0.03	(0.03)	0.02	(0.02)	0.02	(0.02)	0.04	(0.04)	0.04	(0.04)
Native Language : Goun	0.23	(0.12)	0.19	(0.14)	0.24	(0.10)	0.18	(0.13)	0.22	(0.14)	0.19	(0.14)
Vossa	0.58	(0.38)	0.53	(0.37)	0.58	(0.38)	0.56	(0.37)	0.58	(0.38)	0.51	(0.38)
Enagnon	0.31	(0.34)	0.25	(0.29)	0.31	(0.34)	0.23	(0.27)	0.31	(0.35)	0.27	(0.30)
Beach	0.11	(0.15)	0.22	(0.26)	0.11	(0.15)	0.22	(0.26)	0.10	(0.14)	0.22	(0.26)
Number of observations	1179		222		604		97		575		125	

standard errors in parentheses
statistics corrected with sampling weights

Table 3: Individual characteristics with respect to rosca participation.

Incidently if we look at answers provided by women, we find that 72% of them made (or intend to) an investment in their business. Men's answers are more diversified; they mainly use the pot for business, house repair or building, other durable goods and plot purchase. One can notice the significant difference between male and female expenditures on small business, other durable goods[37] and on house repair and building which is likely related to the customary expenses pattern.

Besley and Levenson (1996) tested a hypothesis according to which, controlling for income, the rosca members would possess more durable goods than non members. We ran similar tests on the durable goods possessed by the households (such as fridge, freezer, stoves, tv set, vcr, stereo system, radio, bed, clock, watch, telephone, mobile phone) but obtained no significant differences between members and non members. A look at Table 2 tells us that a large majority of pot uses do not lead to durable goods purchases for the household, for which we tested the Besley-Levenson hypothesis. Indeed durables purchases appear in the categories 'other durable good' or 'luxury expenses', which represent only 19% of all pot uses. The majority of pot uses being targeted towards indivisible expenses do not translate into accumulation of such goods. One could argue that small business expenses, being the most common answer, would eventually enhance profits, improve living condition and potentially lead to durable purchases. Our tests, however, do not allow us to highlight such spill over effects.

All the 497 households we surveyed represent 2083 individuals of which 894 are aged less than sixteen, we are thus left with a sample of 1179 individuals divided in 604 women and 575 men. We show in Table 3 relevant statistics according to gender and participation status. These are used as variables on which is based our econometric analysis. One can find a detailed description of some of these variables in Appendix C. We see an important difference in terms of age: mean age of total sample is significantly (at 5%) lower than those of rosca members. Women seem less educated than men as a significantly smaller proportion of them got a primary degree. There is also a larger proportion of male salaried, this being true whatever the participation status. Differences in monthly income show that rosca members are significantly richer than non members, this remains valid in the female subsample and in the male subsample for monthly expenses. It appears as well that female rosca members are in charge of larger households than female non members.

[37] The large difference between 'small business' and 'other durable good' with respect to men and women is likely to be exaggerated since answers provided by a proportion of men could be counted in both categories.

7 Empirical Results

7.1 Heckman FIML

We check the validity of our conjectures with our data by estimating participation and contributions with a single procedure: Heckman Full Information Maximum Likelihood[38]. As people self-select their participation to a group, the observations taken into account in the structural equation are not a random sample. In fact, we suspect unobserved individual characteristics to influence both the probablility to join and the amount contributed. We have therefore to tackle the problem of selection bias, producing inconsistent estimates, induced by the correlation between the error term and the regressors. Heckman FIML addresses this problem by simultaneously estimating the selection and structural equations, allowing residuals to be correlated.

As FIML rests upon a hypothesis of independence of observations which is not guaranteed by the design of our survey carried in three different areas, we introduced fixed effects removing the area-specific component from the residuals and eliminating the endogeneity caused by unmeasured area characteristics. As errors within the surveyed households are likely not to be independent, we used cluster effects taking account of correlation between observations coming from the same environment. This produces robust standard errors which would have been wrongly estimated without this correction. Furthermore, the design of our survey was such that the probability of being selected in our sample was different in the three studied areas which could lead to inconsistent estimates. We therefore introduced sampling weigths for our estimates to be independent of the sample design (Deaton, 1997).[39]

The first part of Table 4 gives empirical estimates with respect to participation, the dependent variable of the first step[40]. We regress alternatively on the whole sample and on a subset incorporating only members of a couple. The only difference between the first two columns and the last two is the addition of two regressors namely female share of household income and its square.

[38] We preferred this technique to the Ahn and Powell semi parametric estimator (whose finite sample properties are barely known) as it is likely not to perform better than Heckman FIML in such a sample (around 1200 observations and a level of censoring about 80%). (see Fernández Sainz, Rodriguez-Poo and Villanúa Martín, 1999) Moreover, the Ahn and Powell estimator does not produce a 1st step estimate which is of primary importance in our analysis.

[39] Even if we think that the corrections for cluster and sampling effects are appropriate in this case, our results do not depend on these features.

[40] Although both equations are estimated simultaneously, for clarity, we will use 1^{st} and 2^{nd} step to refer respectively to the selection and structural equations.

HECKMAN FIML ESTIMATES OF PARTICIPATION AND MONTHLY CONTRIBUTION

	All sample		In couple		All sample		In couple	
1st step: participation								
Female	-0.200	(0.236)	-0.058	(0.205)	0.200	(0.587)	-0.058	(0.205)
Couple	-0.098	(0.213)			0.447	(0.595)		
Female * Couple	0.200	(0.229)			-0.205	(0.595)		
Individual income (1000 CFA)	0.008 ***	(0.002)	0.006 **	(0.002)	0.007 ***	(0.002)	0.006 **	(0.003)
(Individual income)^2	-7.10e-06***	(2.67e-06)	-5.07e-06 *	(2.61e-06)	-7.16e-06 **	(2.80e-06)	-5.11e-06 *	(2.78e-06)
Female share of household income					-2.080	(2.370)	-2.416	(2.247)
(Female share of household income)^2					1.677	(2.366)	1.988	(2.279)
Age	0.102 ***	(0.034)	0.038	(0.046)	0.105 ***	(0.034)	0.040	(0.047)
(Age)^2	-1.12e-03***	(3.95e-04)	-4.36e-04	(5.10e-04)	-1.14e-03***	(4.00e-04)	-4.48e-04	(5.24e-04)
Number of dependents	0.018	(0.040)	0.019	(0.048)	0.017	(0.042)	0.017	(0.050)
Primary degree	0.109	(0.259)	0.104	(0.343)	0.106	(0.239)	0.099	(0.313)
Same job for 24 months or more	0.393 **	(0.158)	0.414 **	(0.182)	0.400 **	(0.164)	0.423 **	(0.191)
Salaried	0.301	(0.263)	0.292	(0.309)	0.320	(0.260)	0.332	(0.313)
House owner	0.183	(0.157)	0.077	(0.195)	0.181	(0.154)	0.079	(0.194)
Ashanti	0.289	(0.520)	0.782	(0.593)	0.079	(0.542)	0.593	(0.609)
Fon	-0.166	(0.320)	0.130	(0.350)	-0.155	(0.317)	0.155	(0.329)
Goun	-0.157	(0.298)	0.204	(0.344)	-0.156	(0.295)	0.214	(0.326)
Popo	0.033	(0.299)	0.392	(0.338)	0.026	(0.296)	0.386	(0.317)
Fulani	0.390	(0.390)	-0.327	(0.597)	0.384	(0.389)	-0.322	(0.590)
Vossa	-0.525 ***	(0.169)	-0.582 ***	(0.206)	-0.548 ***	(0.165)	-0.624 ***	(0.202)
Enagnon	-0.641 ***	(0.142)	-0.785 ***	(0.172)	-0.660 ***	(0.144)	-0.825 ***	(0.180)
Constant	-3.239 ***	(0.684)	-1.998 **	(0.918)	-3.258 ***	(0.678)	-1.380	(1.117)

2nd step: monthly contribution (1000 CFA)												
Female	5.160	*	(3.000)	0.163		(1.602)	0.361		(6.520)	0.102		(1.573)
Couple	0.876		(2.242)				-0.555		(7.203)			
Female * Couple	-4.731		(3.320)				0.009		(6.650)			
Individual income (1000 CFA)	0.061	**	(0.028)	0.064	**	(0.028)	0.065	**	(0.027)	0.069	**	(0.031)
(Individual income)^2	-6.41e-05	**	(2.76e-05)	-6.78e-05	**	(2.93e-05)	-6.70e-05	**	(2.82e-05)	-7.17e-05	**	(3.23e-05)
Female share of household income							1.779		(26.507)	0.457		(27.390)
(Female share of household income)^2							3.045		(23.566)	4.455		(23.789)
Age	-1.153		(0.825)	-0.545		(0.735)	-1.186		(0.832)	-0.598		(0.786)
(Age)^2	0.013		(0.009)	0.006		(0.008)	0.013		(0.009)	0.006		(0.008)
Number of dependents	-0.419		(0.309)	-0.348		(0.403)	-0.436		(0.321)	-0.357		(0.421)
House owner	-0.596		(1.694)	-1.338		(2.035)	-0.577		(1.740)	-1.281		(2.068)
Ashanti	-5.624	**	(2.819)	-7.120	*	(3.944)	-4.053		(2.974)	-5.832		(4.016)
Fon	0.387		(2.835)	-3.012		(3.092)	0.519		(2.889)	-2.720		(3.433)
Goun	0.314		(2.407)	-1.295		(2.663)	0.431		(2.439)	-1.063		(2.925)
Popo	-1.277		(2.097)	-1.965		(2.690)	-1.019		(2.224)	-1.525		(2.970)
Fulani	-4.600		(3.146)	1.892		(4.291)	-4.334		(3.337)	2.804		(4.619)
Vossa	7.029	**	(3.092)	7.460	*	(3.824)	7.204	**	(3.372)	7.750	*	(4.414)
Enagnon	4.165		(2.861)	4.487		(3.481)	4.247		(3.068)	4.680		(3.953)
Constant	32.717		(20.739)	22.421		(19.264)	33.289		(20.714)	22.226		(19.055)
Number of observations	1179			587			1174			582		
Number of censored observations	957			530			953			426		
Number of uncensored observations	222			157			221			156		

standard errors in parentheses,
**** significant at 1%, ** significant at 5%, * significant at 10%*

Table 4: Heckman FIML.

We control for ethnic affiliation even though we think that it plays a minor role in rosca participation in Cotonou as only a minority of groups are designed along ethnic patterns. These variables can be seen as very rough proxies for social identification and networking[41]. A look at all the regression results show that ethnic identity is never significant which confirms our impression that native language or ethnic affiliations are not a major determinant of rosca participation. We include additional regressors such as the number of dependents, as a proxy for household expenses. Since this variable is not significant, none of the two contradicting interpretations presented before are confirmed. We checked whether education would have any effect: it appears not to have any as the variable 'Primary degree' is not significant for any regression. Stability in one's job, which we measure by whether one has kept one's present job for at least 24 months, affects positively and strongly the probability to join a rosca. Being salaried (not self-employed) and house owner are however both non-significant. The district fixed effects, Vossa and Enagnon, are strongly significant suggesting that unobserved factors specific to each neighbourhood are important.

Most importantly, these estimates allow us to validate our first conjecture. In the first column the coefficients displayed show that neither couple nor the interaction variable between female and couple are significant. An alternative regression displayed in the third column confirms these results. Indeed it strengthened the validation of our first conjecture by showing that the variables female share of household income and its square are not significant at 10% controlling for the same individual characteristics. This certainly provides evidence in favour of our framework where the decision to join a rosca is individual and independent of marital status considerations[42].

As anticipated, rosca participation is quadratic in income. However the maximum is reached at a very high level of income indicating that for most of our sample the probability increases in income. Indeed only five individuals out of 1179 have a larger income than the maximum of this quadratic function. The income variable used in all our regressions is a measure of individual earned income including transfers. Our inverted-U shape prediction concerning age is also verified when regressing on the whole sample, the relationship beginning to decrease at 51 years of age. This tends to confirm that demand for indivisible expenditures is increasing among young agents and decreases as

[41]Time spent in a neighbourhood could also represent a proxy for trustworthiness. However problems of convergence with FIML technique prevented us from using this variable. When used in the traditional Heckman two-step estimation, it was always far from being significant. It is to be noted that individuals in our sample tend to have a rather long stay in their respective neighbourhoods with a mean of almost sixteen years: see variable 'Number of months same block' in Table 3. Movements across neighbourhoods and migration are more of an exception.

[42]We also ran two tests of joint significance on the coefficients of couple and female * couple and on female share and its square. Results do not allow us to reject joint non-significance at a 10% level for both tests.

they get older[43]. The significance of the pair of age variables disappears when restricting the sample to the individuals in couple. This could be explained by very similar distributions of age among individuals in couple and rosca members as confirmed by kernel density estimates.

The second part of Table 4 displays estimates with respect to monthly contributions expressed in 1000 CFA francs.[44] The dependent variable is the monthly equivalent of the contributions given to all the roscas in which a member participates. Regressors such as ethnic dummies and district fixed effect are overall non significant. Other personal characteristics: age, female share of household income, house ownership and the number of dependents have no significant effect on contributions. However significant at 10% in the first specification, as a whole gender seems to have no effect on contribution.[45]

Clearly from our four different regressions only two variables are robust in influencing rosca contributions: income and income square. These results are intuitive knowing that both decisions of joining and contributing are independent as we show below. Once an individual has decided to join a group based on her characteristics, she will decide the amount to contribute according only to economic variables. Higher income would potentially lead an agent to save more and thus make larger contributions whereas a very wealthy agent would at some point turn to formal banking and reduce her rosca contribution. Rosca contributions are quadratic in income, and only two rosca members have an income larger than the maximum value of its inverted-U shaped curve. Overall, income has thus a positive effect on contribution for the members of our sample[46] and this confirms our second conjecture. As income increases one individual in need of commitment will raise the total amount of her contribution. It is only at very high level of incomes that alternative saving opportunities appear to be so interesting that the contributed amount could decrease with income. This result provides one additional argument in our advocacy of the need for commitment. However it does not allow us to discriminate between the different reasons underlying the need of a commitment device. Even if descriptive statistics and field evidence tend to show that individuals

[43]Note that 2005 estimates for the life expectancy at birth in Benin is 55 years. (Worldbank, 2007).

[44]Monthly contributions will vary from one individual to another. They often have the choice among several roscas to choose from, each requiring a different contribution. Moreover individuals can decide to belong to several roscas, which is the case for only 6% of all rosca members in our sample. Additionally a member can give multiple contributions in one rosca and thus receive the pot more than once during the same cycle. This is allowed in 29% of the roscas in our sample.

[45]For the first specification, joint non-significance with the variable 'Female * Couple' could not be rejected. Related regression analyses and descriptive statistics suggest that females who are not in couple make higher contributions than the other members. This could at least partly drive the results in the whole sample case, as confirmed by the regressions restricted to the individuals in couple.

[46]Even if two members have such a large income that they are in the decreasing phase of the curve, the net effect of their income is still positive (close to 0 for the richest) on their monthly contributions.

want to commit themselves to deal with self-control problems, these regressions cannot rule out alternative motives for committing: protection of savings against social pressure and risk of theft[47]. Matching estimates presented in the next subsection provide additional evidence in favour of the self-control hypothesis. Another explanation of this result could be that agents make different kinds of expenses at different levels of income (e.g. richer individuals would tend to buy more expensive goods). However, this does not seem to be the case. Indeed there is no clear income pattern with respect to the type of expenses made with the pot[48]. Moreover, whatever their income, members do not claim to have joined a rosca for buying specific durable goods and only 2% of the groups impose spending agreements.

Empirical results of the second step are in accordance with our two conjectures: secrecy and non-cooperation allow spouses to make individual decisions concerning their expenditures net of public good spending and hence to commit themselves according to their available revenues. The decisions to join as well as to how much to contribute are undoubtedly individual. As robustness checks, we ran other regressions, changing the specification and also using the traditional Heckman two-step procedure. Our conjectures were always verified.

Aside from the FIML estimations we ran tests on the independence of residuals between both equations (the first and second step). The hypothesis that both equations residuals are independent is never rejected in all our different specifications. This suggests that the decision to join a rosca and the amount one will contribute in such a device are independent. We believe that individuals have the choice among a few roscas in their neighbourhood and others known through colleagues, friends or relatives. After this filter, the selection in this small set is likely to be made with respect to the amount contributed. The optimal saved amount can then be reached by having several 'hands' - paying several contributions - in the rosca or by joining other roscas. Being familiar with other members seems to be the predominant criterion in group selection. In our sample, 68% of all rosca members indeed said that they had selected the group they were in because they knew or had links with other members. The second most cited answer to 'why did you choose this specific rosca?' is because its president was known for well managing the group (14%). Following in importance are answers related to the

[47] We present these motives in detail in section 8.

[48] Even if descriptive statistics do not show any income effect in the pot uses, we cannot exclude that agents buying a plot or building/repairing a house are in general wealthier than the rest of the members. Indeed, we also ran multinomial logit regressions and in some specifications with the pot uses as dependent variable, the income coefficient is positive and significant. However, once we consider the size of the pot, the coefficient of income becomes insignificant even for plot purchase and house repair/building. This would tend to show that poorer agents could afford large expenses by joining large groups. These estimates lack however robustness and need to be taken with reserve given the recoding of the dependent variable. Indeed, we had to attribute only one pot use per member and aggregate in a single category the items rarely cited.

amount of contribution (12%) and the strictness of the rules (10%). Once individuals have identified groups in which they are familiar with some or all members and likely to trust them, they will join the one(s) more suitable to their saving preferences.

It can be argued that rosca participation can influence one's income, not directly since savings placed in a rosca bear no interest but indirectly through social connections or other beneficial side effects and through returns on investment made with the pot. About 26% of all 222 members answer that they experienced some extra economical advantages by participating in a rosca: 18% say that fellow members prefer to buy at their shop or doing business with them and 6% say that they have met their employer (past or present) in the group. These answers tend to confirm that roscas provide social connectedness and that they can bring additional advantages. However measuring the importance of these side effects is practically impossible. To account for such potential benefits on income and thus endogeneity with respect to the probability of joining a group we carried out other regressions, replacing income with expenditures on non durable goods (mainly food and other weekly expenses such as gas for cooking, transportation, etc). This way we proxy income by a variable which can be considered as independent of such extra benefits. Results from FIML regressions confirm our two conjectures on the whole sample.[49]

7.2 Average Effects of Rosca Participation

If agents join roscas to deal with their self-control problems and to discipline their saving behaviour, their expenditure pattern is expected to reflect this phenomenon. Sophisticated agents might participate in roscas since their long term self would prefer them not to make non essential (frivolous) expenditures, to save and make indivisible expenses. If this assertion is correct, we should be able to find an effect of rosca participation on the proportion of individual frivolous expenses (i.e. alcohol, cigarettes, meals out, entertainment, etc.) and savings in the monthly total money uses[50]. Alternatively, the difference of given transfers between members and non members of roscas could show us whether members use their participation as a means to protect their savings against pressure from their relatives or friends.

As people self-select their rosca participation and we do not have experimental, longitudinal data or valid instruments, the only way to evaluate the impact of rosca participation is to turn to matching, selecting on observables. The idea is to create counterfactuals by matching observations presumed to differ only in their treatment status after controlling for covariates. Two conditions have to be satisfied for this approach to be

[49] With FIML, we need to assume a linear effect of expenditures on the contributions to get significance of expenditures in the second step.

[50] This variable includes expenses made on durable and non durable goods, money put in savings vehicles and transfers given.

valid: assignment to treatment must be independent on outcomes, conditional on the covariates - i.e. conditional independence assumption (CIA)[51] - and the probability of treatment must be bounded away from 0 and 1 - i.e. overlap or support assumption.

We estimate the average effect of treatment for the treated (ATT), τ^t, i.e. :

$$\tau^t = \mathbb{E}[Y_i(1) - Y_i(0)|W_i = 1]$$

where $Y_i(1)$ and $Y_i(0)$ are respectively outcomes when receiving and not receiving treatment and W is the treatment variable, in this case, rosca participation. Even though this technique does not eliminate completely the selection bias, controlling for a large set of covariates (X) should reduce it greatly. What ultimately matters to estimate the average effect for the treated is the following condition:

$$Y_i(0) \perp W|X.$$

If unobservables explain the treatment status but are not related to the outcomes to estimate, the conditional independence assumption is still valid (Imbens, 2004)[52]. Although this assumption allowing identification is not directly testable, we acknowledge that it may be a strong assumption in our case. Hence, we check to which extent our results depend on the CIA by running a sensitivity analysis on the ATT estimates when the latter assumption is relaxed as put forward by Ichino et al. (2006) and Nannicini (2007). As is common in similar analyses, they consider that the CIA does not hold unless an unobserved binary variable, U, is introduced in a way that:

$$Y_i(0) \perp W|(X, U).$$

Ichino et al. (2006) use Monte Carlo simulations to show that their two simplifying assumptions, a binary U and the conditional independence of U with respect to X, do not drive the results of their sensitivity analysis.[53] The distribution of this binary variable is defined by the four probabilities that $U = 1$ in the four groups characterized by the treatment status and outcome value.[54] U is then added to the set of covariates X for estimating the propensity score and computing the ATT. Simulating different distributions of U therefore allows us to test the sensitivity of the ATT estimates in different cases of the CIA failure.

[51] This assumption is also known in the literature as unconfoundedness assumption, ignorable treatment assignment, ignorability assumption.

[52] Imbens also puts forward that 'almost any evaluation of a treatment involves comparisons of units who received the treatment with units who did not'. The question is therefore which observations to match, 'which units best represent the treated units had they not been treated' and 'not whether such a comparison should be made'. (2004, p. 7)

[53] They show that if this sensitivity analysis confirms the robustness of the ATT estimates under the failure of the CIA with a binary unobserved variable, a fortiori, the same conclusion would be reached in the case of a continuous unobserved variable.

[54] In our case, we use a binary transformation of our continuous outcome.

We limit this sensitivity analysis to using confounders which could, even in the absence of a true causal relationship between Y and W, drive the ATT results obtained without any confounder. These simulated confounders threatening the baseline estimate (with no confounder) are characterized by simultaneously positive outcome and selection effects. Ichino et al. (2006) demonstrate that these two effects are indirectly defined by $d = p_{01} - p_{00}$, the difference of $Pr(U = 1)$ according to outcome values in case of no treatment, and $s = p_{1.} - p_{0.}$, the difference of $Pr(U = 1)$ between the treated and the controls.[55] Table 6, presented in Appendix D, shows that the point estimates of the ATT are quite stable and significant. Moreover very large outcome and selection effects are required to induce important variations in the ATT estimations compared to the baseline estimate. As the existence of such a confounder is not plausible, the validity and robustness of our results are confirmed. It is very unlikely that, in our context, selection on unobservables drives the results derived under the CIA.

The dependent variables of interest, in monthly equivalent, are: the proportion (in total money uses) of frivolous expenses, of savings[56] and of given transfers.

We consider several estimators of the average treatment effect on the treated: the bias corrected matching estimator put forward by Abadie and Imbens (2007), and three others based on propensity score matching: local linear regressions (Heckman et al., 1998), biweight kernel estimation and nearest neighbour with random replacement. The controls used for constructing the propensity score - i.e. the conditional probability of receiving the treatment - or for bias correcting are the variables included in the first step of our Heckman FIML estimations with the exception of ethnic affiliations variables which violate the balancing properties. All our estimates respect the balancing and common support properties[57].

As 284 non rosca members present no frivolous expenses and therefore do not need to commit against temptations or time inconsistent preferences, we decided to exclude these observations from the sample of interest. It is to be noted that using the whole sample never produced contradictory results. While the results are confirmed (and of larger magnitude) by the 'Abadie and Imbens' estimator, they are not significant with propensity score matching methods unless the estimates are restricted to the region of thick support (Black and Smith, 2004).[58] In this case, only the observations having

[55] As U is associated with $Y_i(0)$ and W, the effects of U on the potential outcome in case of no treatment (Γ) and on the selection into treatment (Λ) have to be evaluated after controlling for X. More details are provided in Appendix D.

[56] Contributions to roscas, informal insurance funds, money put in the bank and in money collectors are taken into account in this variable.

[57] This property ensures that no observation with a propensity score tending towards 0 or 1 is included in the possible match samples. It guarantees that each observation is matched to close enough observations.

[58] As selection on unobservables is more likely to occur in the tails of the propensity score distributions, Black and Smith suggest, as a robustness check, to restrict the analysis to the region where the estimated propensity score is included in (0.33, 0.67). Under some conditions, they show that the selection bias is

$0.33 < \widehat{Pr}(W = 1|X) < 0.67$ are taken into account. This produces larger and very significant effects which, in this region, are likely not to be driven by self selection. As income is likely to be of crucial importance, we created another sample including all the adults of our survey whose individual income belongs to the restricted set of rosca members income, removing the 5% richest and poorest rosca members. The same conclusions apply to this case.

We ran similar estimations on the sample of individuals in couple which corroborate the results presented in Table 5. Whichever the estimator[59] and the sample used, our results prove quite robust. As bootstrap does not seem to be valid to estimate the variance of matching estimators (Abadie and Imbens, 2006), all these estimations use analytical variances[60].

	Matching[a]	Biweight kernel[b]	LLR[c]	NNM[d]
Ratio of frivolous exp.	-0.011(0.003)***	-0.006(0.003) **	-0.006(0.003) **	-0.009(0.003)***
Ratio of savings	0.116 (0.012)***	0.103 (0.012) ***	0.101 (0.012)***	0.116 (0.014)***
Ratio of given transfers	0.010 (0.005) *	0.005 (0.005)	0.005 (0.005)	0.007 (0.006)
Total money uses	-3.237(6.440)	0.309 (6.422)	1.112 (6.632)	1.764 (7.581)
Number of observations	895			
Controls		673	673	162
Treated		218	218	222

standard errors in parentheses

**** significant at 1%, ** significant at 5%, * significant at 10%*

[a] Bias corrected matching estimator a la Abadie & Imbens - Stata command: nnmatch

[b] Biweight kernel based on propensity score - Stata command: psmatch2

[c] Local linear regression with biweight kernel and propensity score - psmatch2

[d] Nearest neighbour with random draw, replacement and propensity score - pscore

Table 5: Matching estimations of average effect of rosca participation.

As displayed in Table 5, the total money uses variable (1000 CFA), denominator of the three ratio variables, appears not to differ significantly between members and non members. Hence, we can directly compare the different ratios between members and non members and attribute the ratio differences to rosca participation. These estimations show that the proportion of frivolous expenses in total money uses is significantly lower for rosca participants. The magnitude of this effect is evaluated between 0.6 and 1.1 percentage points while the estimated average for non members is 4.5%. It means

indeed strongly reduced in the region of thick support.

[59] We also used blocking-on-the-propensity-score estimations which produced the same results.

[60] Our results however do not depend on this feature; bootstrapped standard errors produce similar results.

that rosca members spend, on average, 13.3% to 24.4% less on goods generating temptations, which we suppose their long term self would prefer not to buy.[61] As to the proportion of individual savings in total money uses, our results exhibit clearly that rosca members save around 10 percentage points more than non members (the estimated average saving rate of non members being 12.7%). From these two results, added to our previously displayed body of evidence, one is incited to believe that roscas indeed help agents to discipline themselves to save.

Regarding the ratio of given transfers, if rosca members were to use their participation as a protection from requests from friends and relatives, the estimated ratio difference should be negative. As the only weakly significant estimated effect displays a positive sign, this possibility seems to have to be discarded. These estimates seem indeed difficult to reconcile with the protection from relatives hypothesis. It rather brings additional credit to our self-commitment rationale. One could indeed object that our result is only a matter of simple accounting since if one item rises, within a fixed budget, an equivalent decline in one or several others should be observed. As the share of given transfers tends to increase with rosca participation, this mechanical justification does not seem at work here.

8 Alternative Explanations for Joining a Rosca

From the secrecy framework depicted before, one could imagine that roscas are simply used to help spouses reduce their contribution to the provision of public goods. Once put in a rosca, money would not be available for the household's needs. In this case we would expect the probability of joining to increase with the expenses on public good that the household has to face. The variable number of dependents is a good proxy for such public good expenses. This rationale is however not supported since this variable is never significant in all the regressions. Moreover, the variable 'in couple' is not significant either and therefore does not seem to drive the participation in roscas. We do not entirely discard this motive for rosca participation but would rather think that people use this commitment device against self-control problems.

A significant proportion of members we interviewed, declared that it was impossible to save money if they were to leave it at home. Indeed, it would disappear in various expenses. Savings would quickly evaporate due to all sorts of social pressures and demands coming from the entire family, friends and neighbours. Ranging from financial help for a friend, payment for medicines for an uncle, to unexpected claims by children, financial help can be requested on a regular basis. Demands could as well come from the spouse and roscas would help agents commit against those claims, but

[61] As frivolous expenses is a small budget item, the magnitude of this effect cannot solely explain rosca participation.

the household budget structure and secrecy are such that this kind of claims is greatly reduced. By opting for a rosca, one opts for a socially accepted alibi to protect one's savings against all types of social pressures (see Platteau, 2000). In our sample, 20% of members mentioned that they joined a rosca to protect their savings. It can mean two things that can not be discriminated: on the one hand, protection against potential income sharing and social pressure from relatives. However, estimates of the preceding subsection tend to give a lesser weight to this motive. On the other hand, it can also mean protection against risks of theft, fire or other catastrophies which were also evoked during informal interviews. This protection motive is difficult to test empirically. To reduce risks people would prefer not to save at home and put money out of reach in a rosca which would serve as a means to protect earnings against such adversity. Far from being the most important answer explaining members' participation, the fact that one out of five members emphasizes protection gives credit to this alternative rationale. Moreover protection of savings is a motive for participation which also satisfies our second conjecture. Indeed, an individual facing a fixed probability of theft and an increasing demand from relatives in income can be strictly better off by joining a rosca at higher levels of income (Anderson et al. 2002).

Although our evidence leads us to think that people join a rosca to commit themselves to deal with self-control problems, we cannot rule out that their participation may be also driven by the need to protect savings from hazards: theft, fire, etc.

9 Conclusion

Our empirical evidence shows that rosca participation is not a gender issue in Cotonou. Given secrecy and the household budget structure, each spouse retains the control over his/her spendings and therefore decides individually to join a rosca. This feature, probably pervasive in West Africa, should be taken into account before implementing policies designed to favour any gender.

Recent studies have emphasized that roscas can be used as a commitment device against two categories of potential threats. Individuals could join roscas to protect themselves against external threats such as pressure from their spouse stemming from asymmetric preferences, from the household expenses pattern or social pressure (assistance to relatives or friends). Alternatively, agents could be willing to secure their income against internal threats such as temptation and present-biased preferences, both hindering their saving.

Our investigations lead us to think that, in Cotonou, even if a minority of individuals in couple join roscas to hide part of their income from their partner, most of the agents participate in roscas to discipline themselves to save. Although no direct question diagnosing time inconsistent preferences was included in our survey, our body of

evidence and matching estimates suggest that self-control problems are widespread and that people, living in the poor districts covered by our survey, value savings commitment mechanisms such as roscas. Projects favouring the establishment of formal saving and commitment vehicules in Vossa and Enagnon, and certainly in other poor districts of Cotonou, would therefore most probably meet with success.

APPENDIX

A Survey Methodology

We selected households according to a random process. In Enagnon we succeeded in obtaining a map of the city and performed a simple selection of a parcel according to an implemented random process. In these two districts it often happens that many households live on the same lot in semi-detached rooms. Enumerators selected one room on a lot according to a clock-wise selection varying from lot to lot (for the first lot of the day they selected the first room clock-wise, for the second one the second room clock-wise and so on). In Enagnon-plage and Vossa we used a pseudo-random process by which every tenth lot according to a specific direction was picked and then room selections were done in a similar fashion as in Enagnon. Overall only 3 households categorically refused to be surveyed and were replaced by other randomly selected households. Enumerators were asked to pass several times and at different moments of the day, until contacts were established in such a way that none of the selected household was skipped. The most qualified of our enumerators also acted as a supervisor and visited many households already interviewed in order to check the accuracy of the responses. Other than that we analysed every completed questionnaire closely. Several appointments were held with each team of enumerators and in case of incoherence or lack of answers we regularly sent them back on the field. Questionnaires often needed successive rounds of checks until final approval. As mentioned above we emphasized the fact that the interview with every single household member had to be carried in his/her sole presence in order to get as precise and reliable information as possible. Fear of divulging information in front of other members would have led individuals to lie or to refuse to answer. On average our four teams of two enumerators completed two questionnaires a day. The taking account of intra-household secrecy greatly lengthened the survey by requiring specific appointments with each adult member. Another time consuming factor was the detailed part of our questionnaire concerning groups: we often needed more than an hour for a single group. We compensated every household for their precious time by donating 1500 francs CFA. Finally, with two previous missions, in 2002 and 2003, we carried out about eighty group interviews. We attended regular meetings or met members of their governing body in order to get a better understanding of their functioning.

B Groups Functionings

Groups have different ways of coping with payment problems depending on if the member in default has received or not the pot already. Before reception one default on contribution would lead to the following sanctions: fine (40% of groups) and deduction of contribution from the pot upon reception (28%). Several defaulting payments before pot reception mean more important sanctions: 35% of groups would expel member with full reimbursement of contributions, 23% would charge him a fine and 16% would not allow the member to receive the pot and reimburse contributions at the end of the cycle. Once the pot is received sanctions are more stringent. For one defaulting payment: 47% of group charge a fine, 23% give an additional delay after public warnings and 17% seize a good of equivalent worth to the pot's value. Several defaults after pot reception lead to: seizure (34%), call for police of chief of district (20%) or additionnal fine (16%). By comparing rules we found that 60% of all groups have more severe sanctions on members who had received the pot. We only gave here the most important means of sanctions and it is to be noted that a significant proportion of groups use more than one of those in combination. Sanctions do not only have a financial impact: a defaulting member will often feel ashamed by facing public warning or reprimands. This information will spread rapidly in the neighborhood and may prevent him from joining other groups in the district. Indeed, before accepting a new member, 82% of all groups carry an investigation on applicant's social behavior (theft, act of violence, etc) and on previous memberships. Sanctions such as warnings and fines made publicly can thus have long lasting 'social' impact by giving applicant a bad reputation. Moreover to prevent defaults three groups out of four require the applicant to be sponsored by a member. The sponsor being financially responsible for the new member if he were to default in the first cycle. Rules in 60% of groups impose that applicants must be known by at least one member to be accepted. The decision process varies and depends heavily on rosca's structure: either the president decides alone (28%), the governing body (42%) or all members (30%). In order to check their trustworthiness and provide greater insurance against potential defaults, 20% of rosca place new members at the end of the cycle.

C Definitions of Key Variables

Live in couple: Individual having a partner (married or not) who is member of the household. Those who were engaged in a couple for whom the spouse was not living in the household and for whom we did not have any data were not considered to live in couple.

Salaried: Individual is salaried if he/she receives a salary on a regular basis (either

daily, weekly, bi-weekly, monthly, bi-monthly, etc) in the formal or informal sector. Only 12% of all individuals are salaried and there is an important gender difference: 22% of men are salaried and only 3% of women. Women are massively self-employed in our sample.

Individual income: Monthly sum for each individual of all income-generating activities including those from formal and informal sectors and those from self-employed activities. It also included earnings from interest on loans made, rents on house or apartment and received transfers. In our overall sample only 10% work in the formal sector, being either employed privately or by the state.

Number of dependents: Total number of people within the household depending financially on either member of the head couple. It is thus the sum of children (aged less than sixteen years), young adults having no revenues or any other depending relatives. For example a member of the extended family moving in the household and relying on its members for a living is counted as such.

Job length: Indicates that one individual has had his/her present principal income generating activity for at least twenty four months.

Primary degree: Indicates that one individual has completed primary school.

Individual share in couple income: Each individual's income divided by the sum of both spouses'income.

Expenditures: Monthly extrapolations from the sum of all expenditures made on non durable goods during one week. It includes 1) all expenditures on food (including expenses on heating and cooking such as coal or gas) and 2) luxury expenditures such as cigarettes, alcohol, eating and drinking in hotels and restaurants.

D Sensitivity Analysis

In Table 6, we present point estimates of the average treatment for the treated to be compared to the baseline estimate with no confounder. This analysis aims at making vary $d = p_{01} - p_{00}$ and $s = p_{1.} - p_{0.}$, which determine Γ and Λ, to see the effect of the simulated confounders on the ATT estimates. Then, according to the magnitudes of the outcome and selection effects required for the ATT estimates to be driven to zero or to deviate from the baseline estimate, the plausibility of the ATT under CIA is assessed.

Γ and Λ are the average odds ratios of U and respectively represent the outcome and the selection effect of the simulated confounder. Γ is the effect of U on the relative probability to have a positive outcome in case of no treatment. Λ is the effect of U on the relative probability to be assigned to the treatment controlling for the set of covariates X.

In our context, one could imagine that the unobserved variable represents the discipline of the agent. Hence, as explained in Ichino et al. (2006), moving to the right

across each row of Table 6, discipline has a greater influence on the selection into treatment (keeping the outcome effect fixed). On the contrary, moving down each column, discipline has a greater influence on the untreated outcome (keeping the selection effect fixed).

Compared to the baseline estimate of -0.009 (s.e. 0.003), we see that a strong perturbation of the ATT is only observed if both effects are combined and quite strong. We therefore think that the results obtained under the CIA are robust to plausible failures of this assumption.

		s = 0.1 $\Lambda \in [1.7, 2.27]$	s = 0.2 $\Lambda \in [2.62, 3.45]$	s = 0.3 $\Lambda \in [4.09, 5.77]$	s = 0.4 $\Lambda \in [6.4, 9.64]$	s = 0.5 $\Lambda \in [10.68, 17.5]$	s = 0.6 $\Lambda \in [23.25, 41.09]$
d = 0.1	$\Gamma \in [1.61, 1.78]$	-0.007	-0.008	-0.008	-0.008	-0.009	-0.010
		(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
d = 0.2	$\Gamma \in [2.54, 3.09]$	-0.008	-0.008	-0.009	-0.011	-0.011	-0.013
		(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
d = 0.3	$\Gamma \in [4, 5.27]$	-0.008	-0.009	-0.011	-0.012	-0.014	-0.016
		(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
d = 0.4	$\Gamma \in [6.48, 10.39]$	-0.009	-0.011	-0.012	-0.014	-0.017	-0.02
		(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)
d = 0.5	$\Gamma \in [11.03, 25.4]$	-0.010	-0.011	-0.014	-0.017	-0.020	-0.025
		(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)
d = 0.6	$\Gamma \in [21.71, 138.4]$	-0.011	-0.013	-0.016	-0.020	-0.024	-0.029
		(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)

Standard errors in parentheses
ATT estimates - Stata command: sensatt (Nannicini, 2007)

Table 6: Sensitivity analysis on the share of frivolous expenses

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