Time preferences and commitment devices

Are Individuals with present-biased time preferences more likely to commit?

Evidence from informal groups in Benin.

Forthcoming in Oxford Development Studies

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Abstract:

Drawing on first-hand data collected from a household survey in urban Benin, we examine membership in two types of informal groups that display the characteristics of a commitment device: Rotating Savings and Credit Associations (roscas) and funeral groups. We investigate whether agents displaying time preferences with a present bias are more likely to commit themselves through participation in such groups. Our results provide evidence indicating that women who display such preferences are more likely to join funeral groups, but not roscas, and to save more through them. These results hold for women but not for men. We also ensure that our results cannot be explained by intrahousehold conflict issues.

Keywords:

Roscas, Funeral Groups, Time Preferences, Commitment Device, Benin, Africa

1. Introduction

With microcredit often proposed as an important tool for the fight against poverty in developing countries (see for example Morduch and Armendariz de Aghion 2005), one could be forgiven for overlooking the fact that often what the poor actually desire is the ability to save money. Consequently, their best interests might be served by merely providing access to affordable and reliable savings devices (Rutherford, 2000; Banerjee and Duflo, 2006). As such, understanding the means through which the poor manage to save and the motivations for doing so can have important policy implications; the more we know about why and how they save, the better that finance institutions can provide for their needs. Recent studies (for example Ashraf et al., 2006) based on evidence collected in developing economies have used insights from behavioural economics to emphasise the role played by self-control problems in undermining individuals' efforts to save, a problem that is often exacerbated by a lack of available and appropriate saving devices (Dupas and Robinson, 2013).

Behavioural explanations of time preferences are at the centre of increasing interest in both the theoretical and empirical literature. Individuals with preferences which have a present bias will have a tendency to over-value immediate rewards at the expense of one's long-term intentions. Someone with a present bias will thus give stronger weight to payoffs that are closer to the present time when considering trade-offs between two future moments (O'Donoghue and Rabin, 1999). Such preferences have been proposed as an explanation for poverty traps (Banerjee and Mullainathan, 2010), low technology adoption in the fields of agriculture (Duflo et al. 2011), demand for saving commitment devices (Ashraf et al., 2006; Dagnelie and LeMay-Boucher, 2012) and microcredit (Bauer et al. 2012).

This paper complements the literature by providing original evidence that agents who are present-biased are more likely to save their money through informal commitment devices such as roscas (rotating savings and credit association) or funeral groups. We use the term informal in the sense that they take place outside of the market-place and are made without any legal arrangement that could in any way be binding. As is commonly defined, a commitment device restricts an individual's own set of choices in the future, often as a means of controlling future impulsive behavior and limiting choices to those that reflect long-term goals (i.e. durable goods that require lumpy expenditures, etc.).

To our knowledge the literature has not yet shown empirically a direct link between elicited present-bias preferences and informal group membership. In the context of our study (where no use of randomized experiments is made), these members are mainly poor individuals who have little or no access to formal savings and credit offered by banks, or other microfinance institutions. This is often due to high transaction costs. As an example, a small survey of Beninese banks showed 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.

We use the results of a unique household survey to study the time preferences of 788 randomly selected individuals in two urban districts of Cotonou, Benin. Employing an elicitation strategy akin to Ashraf et al. (2006), which we explain in detail below, we find that 17% of individuals in our sample are present-biased or in our context also descripted as 'hyperbolic'. A hyperbolic individual has preferences which discount the value of rewards in the future at a factor that increases with the length of the delay. So, when considering trade-offs between two future moments, such preferences give stronger relative weight to the earlier moment as it gets closer. An example of that would be when faced with the question: Would you prefer £1,000 now or £1,100 in a week? Hyperbolic agents would choose £1,000 now and not wait an extra week. But when faced with: Would you prefer £1,000 in a year's time or £1,100 in a year and one week? The same individuals would choose £1,100 and be

willing to wait an extra week. In other words, in the short term trade-off (0/1 week), they are impatient for money now. But, in the future trade-off (52/53 weeks), they are willing to wait.

Our results relate present-biased preferences and participation in roscas and in funeral groups and contributions made to such groups. They are indicative of correlations and not of causal relationships. We find evidence that hyperbolic women are more likely to join funeral groups and to make larger contributions to, and save a larger share of their savings in funeral groups. These results do not hold for roscas. Similar to Ashraf et al. (2006) and Bauer et al. (2012) the results only hold for women. We also show that the results cannot be explained by a potential intra-household conflict in preferences, as proposed by Anderson and Baland (2002). In such context, men and women, sharing a common budget, exhibit asymmetric preferences for household goods. Those asymmetries lead to intra-household conflicts: women have always a larger preference for the public good and therefore want to save at a higher rate than men. In such cases, a female would join a rosca in order to hide or secure their savings from their husband who would rather opt for present consumption. We document that for Beninese spouses the decisions of whether to join and how much to contribute to either commitment device are individual. This, along with other econometric results enable us to discard the intra-household commitment motive and to put forward the self-control commitment rationale.

If agents have present-biased preferences, then it is likely that they will prefer to limit the set of options available to them. This rationale was proposed for informal groups, but not formally tested, by Gugerty (2007) and Dagnelie and LeMay-Boucher (2012). They show that in the absence of alternative commitment saving strategies, those who have such preferences would turn to roscas. In our context, this same rationale is also applicable to funeral groups. The functioning of both groups and the features that make their design akin to commitment devices are outlined below.

The remainder of the paper is organized as follows. Section two presents the informal groups. Section three describes the Beninese intra-household context. The following section presents our data. Section five introduces our testable hypotheses and discusses our empirical estimates. Section six concludes.

2. Informal groups and commitment

Roscas

Roscas: A rosca consists of a group of individuals who gather on a regular basis for a cycle of meetings, at which members contribute a fixed amount of money to a common pot. This is subsequently allocated to one member, who is then excluded from the reception of the collective savings in subsequent meetings. However, he or she is still obliged to contribute to the pot for the remainder of the cycle. Each cycle ends once every member has received the pot once. The rosca may then begin another cycle or decide to disband. Groups differ widely in terms of the number of members, size of contributions and the frequency of meetings. In our Beninese context, groups meet on a regular basis with compulsory meetings. The pot can be allocated either according to a random process (random roscas), through a decision imposed by the governing body of the group (decision roscas) or through a bidding process. We observed only decision and random roscas.

Roscas do not offer interest on savings and participation therein implies costs (transport, time, etc.); members also face the risk of default from others, thus raising the issue of enforcement. Furthermore, the savings rate in a rosca is likely to differ from each member's optimal rate; participants therefore experience less flexibility than if they were to save on their own. Yet despite these costs, roscas are relatively popular in several developing regions.

Rosca as a commitment device : A significant motive discussed in the literature for membership is that roscas seem able to respond to the need for commitment against one's present biased preferences. In the absence of alternative commitment savings strategies, individuals that have such problems may turn to roscas; they would otherwise indefinitely renegotiate with themselves if trying to save on their own. Individuals may therefore join a rosca in order to bind themselves and in doing so limit the set of available options by securing part of their revenues against everyday temptations (Gugerty, 2007; Dagnelie and LeMay-Boucher, 2012).

Based on a dataset collected in 2004 in Cotonou, Dagnelie and LeMay-Boucher (2012) show that rosca members spend on average less on 'temptation goods' (alcohol, fizzy drinks, sweets, cigarettes, meals out and entertainment) than non-members, implying that the groups do indeed help agents to discipline themselves to save. Their findings are from an indirect test of the hypothesis of commitment against self-control problems using matching estimates of the average effect of rosca participation. The authors did not however elicit a measure of time discounting and thus could not formally test the hypothesis according to which hyperbolic discounters are more likely to join roscas. Using the follow-up longitudinal survey completed in 2006, in which a time discounting measure was elicited, we complement their work by formally obtaining correlations with present-bias and memberships in commitment devices.

Through direct questions addressed to the 116 members (out of 788) of our 2006 sample who belonged to a rosca, we have empirical evidence suggesting the need for a commitment device as a motive for membership. 'Discipline' or 'the willingness to force savings' were by far the most popular answers, implying that a vast majority of members use the rosca as a means to commit themselves to save. Indeed 73% of rosca members (85 out of 116) stated that they joined in order to discipline themselves into saving (only 7% mentioned 'buying a durable good').

Additional evidence supporting commitment as a motive for joining roscas lies with the fact that 55% of members (64 out of 116 members) preferred to receive the pot at the end of a cycle. This preference is not correlated to the duration of group membership and is therefore unlikely to be related to any learning effect. Of those who preferred being at the end of the cycle, 78% (50 out of 64) said it was because they did not want to feel indebted towards the group. They considered receiving the pot in the early stages of a cycle as a debt towards the group to be repaid by future contributions, a situation that they would prefer to avoid (this answer was provided unprompted). Such debt aversion largely confirms the incentive and disciplining role of the group, exerted through peer pressure towards a defaulting member. Moreover, leaving a rosca prematurely can be costly in case of default and sanctions are more severe towards a member who defaults after having received the pot. Many members told us in informal interviews that, aside from minimizing the threat of sanctions, receiving the pot at the end of a cycle provides in itself additional motivation to make payments and successfully complete a cycle. The threat - and credibility of - sanctions are not only important factors influencing preferences on the timing of pot reception, but also key elements that make roscas good commitment devices.

Funeral Groups

Funeral groups: Discussions in the literature about funeral groups are scarce. Roth (1999) offers some evidence concerning such groups in South Africa, Dercon et al. (2006) for Ethiopia and Tanzania, and LeMay-Boucher (2009) considers their existence in Benin. Whilst funeral groups vary across regions in both their form and function to a greater extent than roscas, some common traits define them. Members typically gather on a regular basis and during a meeting those who have suffered an adverse shock can put in a claim to the group for an indemnity, according to the nature of the shock. The rules of each group specify a list of shocks eligible for insurance as well as the corresponding amount of the

indemnity offered. Before allocating an indemnity, groups usually perform checks on claims. A recipient's indemnity is thus the sum of members' individual contributions. These contributions are made up of regular premiums paid by each member (usually weekly). The large majority of groups require such premiums (whereas a minority require on-the-spot payment). Variation is observed in traits such as the number of members, frequency of meetings, list of shocks for which indemnity is offered, terms of payment and in operating modes.

Funeral groups as a commitment device: In Benin these groups offer insurance to members by providing indemnities for a wide range of shocks, including for funeral expenses. For a more detailed description of these groups see LeMay-Boucher (2012). In the local dialect, these groups are called 'nuje me ji gbe', a direct translation of which is 'happiness-unhappiness funds'. 'Happy' events, which are covered by the vast majority of groups, include the costs linked to a ceremony for celebrating a birth, baptism, marriage, diploma or anniversary and 'unhappy' events comprise death or illness (both of members and member their relatives), loss of job, and destruction of professional or household belongings.

There are two key features that differentiate Beninese funeral groups from the strict definition of an insurance group. Firstly, 'premiums' paid by one individual in a funeral group are accumulated and kept until a pay-out is required from the group. As such this differs from the usual definition of a premium, which represents an amount of money charged by (for example) an insurance group or a company for active coverage. If no claim is made during a period, the premiums are lost. Furthermore, provided that premiums are paid, such insurance groups or companies will permit an unlimited number of pay outs for every valid claim that has been introduced, irrespective of timing. However in order to equilibrate the total amount of payments allocated between members, indemnities are usually allocated cyclically. About three groups in every four limit the number of indemnities that can be received by any one member (this number is identical for all members). Once a member has reached the ceiling she must wait until all other members have also received this number of indemnities to be eligible for further assistance. As such, cycles have no fixed duration in time. The typical ceiling that we observed was between two and four indemnities for a combination of 'happy' or 'unhappy' events. These limitations can be viewed as a mechanism to provide some sort of balanced reciprocity (see Platteau, 1997), guaranteeing each member a certain degree of equivalence between what is paid in and what is received in indemnities. This process continues until all members have received a fixed number of indemnities, thereby completing a whole cycle. Groups may then decide to discontinue or to begin another cycle (none of the groups surveyed stopped their activities after a pre-determined number of cycles).

What is key is that the aforementioned 'happy' events are all anticipatable, whereas only some 'unhappy' are, to a limited extent. Membership can therefore be perceived as a means to save in advance or to commit money for such occurrences. Regular contributions to a group present an opportunity to render savings illiquid towards those foreseeable expenditures. Given their mode of operation, the regularity of premiums paid and the strict accounting performed by members on both the premiums and indemnities allocated (so that what goes in and out of the cashbox is carefully registered at the individual level), funeral groups display the basic features of a commitment device.

The vast majority of the 114 members of our dataset stated that the main motive for joining a funeral group was to 'save and get indemnity in case of need'. Whilst this clearly underlines the need for insurance, it can also be interpreted as a need for a commitment device in order to put money aside for future occurrences that will require substantial financial contributions. In terms of enforcement mechanisms, leaving a group before the end of a cycle leads to sanctions comparable to the ones imposed by roscas.

Out of the 788 individuals that were surveyed, 42% made payments related to funerals and/or illness during last six months, spending on average 2000 FCFA and 1000 FCFA per month respectively (averages made over the last six months). Average monthly income over the same period was 46000 FCFA (median 33000 FCFA), this represents USD 90 at the time of the survey (USD 1 is approximately 500 FCFA). These two expenses together represent 6.5% of monthly income. Such figures show partially the importance of the expenditures for which funeral groups cater for. Our data also show total expenses for a funeral ceremony can easily amount 6 to 10 times one's monthly income. In Roth (1999) it is said that the poor in South Africa spend approximately 15 times their average monthly income on funerals.

The operation of roscas differs from that of informal insurance groups. In roscas, the timing of the reception of the pot is not based on insurance needs whereas in insurance groups, indemnities are offered only in case of a precise adverse shock. Roscas allocate the pot to members in rotation but this is not the case for benefits (or payouts) in insurance groups, where one member can make successive claims. Furthermore, the time duration of a cycle is fixed in roscas but not specified in insurance groups. A large proportion of premiums imposed by insurance groups are small, and larger contributions are expected upon request. Thus, contrary to roscas, the periodicity of important payments is not known in the majority of groups.

3. Intrahousehold decision process

A large proportion of men and women with whom we spoke during our pilot survey declared that their spouse was unaware of the course of their occupational activities and was therefore unable to guess their income. Many (irrespective of age or gender) stated '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 of such and such expenses.' Spouses were overwhelmingly secretive, indeed it even seemed quite natural to divulge as little information as possible to one's partner. As a result, spouses rarely ask questions concerning their partner's income or inquire about their activities. It is a kind of tacit convention allowing each member of the couple to keep their income more or less secret. Questions related to these observations were addressed to the 381 respondents aged older than 18 and in a couple. To the question 'Can you estimate your spouse's revenues?' 86% answered no, 4% yes and 9% partially. Results were similar for 'Do you think your spouse knows your revenues?' where 83% answered no, 5% yes and 11% partially. This indicates that couples can be considered as business arrangements between partners who desire the household needs in terms of public goods to be provided for.

The result of such practice is that each individual has a lot of leverage in managing his or her personal income. Thus by acting in a secretive way, spouses avoid sharing their personal earnings or contributing to a common budget and retain the sole control over their personal expenditures. Being aware of this particular feature, we designed our survey to account for the fact that the household is a collection of separate economic spheres. We therefore surveyed each husband, wife or other adult member of a household in isolation, giving us data at the individual level on group membership, contributions, income, etc. Falen (2011) and LeMay-Boucher and Dagnelie (2014) substantiate this dichotomy between the husband and wife's finances within a couple. They also document that social norms play an important role in determining the intra-household allocation of expenses by gender in Benin.

4. Data

Our unique, first-hand dataset was collected in 2006 in the districts of Vossa and Enagnon located in Cotonou, Benin (a city of about 1.1 million inhabitants). They are known to the city's authority as the poorest districts. Both districts are near to downtown Cotonou, where a large proportion of their inhabitants commute every day for work. No formal savings and investment institutions such as banks and NGOs were present in these districts at the time of our survey. Selection of our 386 households was done according to a random process (our survey methodology is described in Elven and LeMay-Boucher, 2016). For maximal accuracy, all members of each household were interviewed separately so that delicate issues related to expenses or income were tackled in private. Particular attention was thus placed on confidentiality. We are left with a total sample of 788 individuals aged eighteen or older.

Table 1 provides descriptive statistics for the overall sample. 54% of respondents are female and the mean age is 36.7 years. Half of those surveyed live in a couple and the average household comprises 5 members. The level of schooling is identified through a dummy variable which is equal to one if the individual has attended at least secondary school and zero otherwise. Average monthly individual income is around 46000 FCFA. Each individual's monthly income is the sum of all income-generating activities; i.e. work in the formal and informal sector, self-employed activities, earnings from interest on loans made, rents from property owned and transfers received. 62% of all respondents claimed to have been employed in their current job for at last two years. 15% and 14% of respondents declared to be members of roscas and funeral groups, with an average monthly contribution of about 1600 and 300 FCFA respectively.

[Table 1 here]

Eliciting Time Discounting

We measured time preferences by asking agents to choose between accepting a small reward soon or a larger reward with some delay. We complement this by asking a similar question involving similar rewards and delays, but shifted forward in the future. We refer to the first question as the '*short-term frame*': 'Which option would you prefer: 2000 FCAF in 1 week or 3000 FCAF in five weeks?' and the second question as the '*long-term frame*': 'Which option would you prefer: 2000 FCFA in one year or 3000 FCFA in 13 months?'. This framework allows us to identify the presence of time preference reversal and represents a simplified version of the one used in Ashraf et al. (2006). 2000 and 3000 FCFA represent an average income for three and four and a half days of work respectively.

[Table 2 here]

As can be seen in Table 2, the group of individuals who prefer to receive money earlier in both frames, ('Always Impatient'), represents 26.78% of the overall sample. Those who prefer to receive money later in both time frames (50.63%) are labelled 'Always Patient'. People displaying time preference reversal represent roughly a quarter of the sample (22.6%). We define those preferring the immediate amount in the short-term frame and the larger reward in the long-term frame as hyperbolic; they constitute 17.13% of our sample. There is also a small group of 'future biased' individuals i.e. 5.4%, whose preferences correspond to patience in the short term and impatience in the long-term frame. Their behaviour could be rationalized by considering an individual not constrained by liquidity in the short run but who foresees a shock in the future, although given the small number of agents in this group we cannot rule out the possibility that the survey question was misunderstood. If we look at comparable categories, namely a one-month discount rate of 50%, our shares for different time preferences across surveyed individuals do not differ considerably from what others who employed slightly different elicitation techniques have found (see Bauer et al., 2012; Ashraf et al., 2006). As in

these two papers, our methodology does not involve the use of real payments, relying solely on hypothetical questions. Our elicitation strategy allows us to reduce the effect of seasonality on time preferences, as the future choice is shifted forward by exactly one year. In the short-term frame, we avoided proposing a choice between a certain amount today and a higher one a week from now. Instead, the choice offered was between one week and five weeks. In the sense that no reward is ever obtained without some minimal delay, allowing us to compare two choices and to avoid a possible bias toward the present immediate option. In order to limit the importance of framing in time preference elicitation, the two questions were asked in separate sections of the questionnaire. In this literature, the elicitation of time discounting is done independently from the notion of risk and so our analysis is not done in parallel with any elicitation of risk preferences. The idea behind this simple design was to obtain a measure comparable to other published papers in this literature. However, by using a relatively crude measure, our survey is likely to miss out on some individuals. Using a richer measure, with several time horizons and rewards offered, might yield a more convincing analysis. Thus, responses elicited to our time preference questions cannot be unambiguously viewed as revealing the respondents' true preferences. The narrowness of our measure of time preferences thus requires us to emphasise that we need to interpret the results presented below with a degree of caution.

5. Results and discussion

Determinants of time preferences

In table 3 we analyse the determinants of the three main time preference patterns: always patient, always impatient and present biased. From column 7, we find that male are more likely to be hyperbolic. Apart from gender and being in couple, being hyperbolic does not appear to be driven by demographic or socio-economic characteristics such as income, employment status, age, level of education, total expenditure and saving. Hyperbolic agents represent only 10% of rosca members (14 out of 116). No significant differences are uncovered when comparing hyperbolic and non-hyperbolic rosca members with respect to both individual (age, in a couple, income etc.) and group characteristics (contribution, random vs. decision order), reasons for membership and preference over the timing of pot reception (beginning vs. the end of the cycle). A similar lack of significant differences is found with regards to funeral group membership.

In table 3, we also find that females are more likely to be patient than males. Males in a couple are more patient than single men. We find that job stability (a dummy equal to one if the respondent declared to have kept their current job for at last two years) is negatively related to a preference for patience. Geographical location appears to matter: those living in the neighbourhood of Vossa are more patient for a reason (independent of the enumerator used) that escapes us.

[Table 3 here]

Patience is also increasing (at a decreasing rate and only mildly, at the 10% level) in income and negatively correlated with household size. Tanaka et al. (2010) also find that richer individuals are more patient. However, income is not significantly correlated with being hyperbolic, nor with impatience. Furthermore, if we consider the likelihood of being hyperbolic across our various income quintiles we do not find any significant differences (see online Appendix A for a table of results related to this). This suggests that the proportion of hyperbolic individuals is not significantly different between the poorest, richest and other quintiles of income. From these various results we cannot conclude that richer individuals (either female, male or both combined) exhibit less present bias; it appears from our sample that being hyperbolic does not seem to be correlated with income.[1] This

[1] In addition to monthly income, we also use monthly income net of monthly contributions to roscas and funeral groups combined. With identical specifications as in Table 3 we find similar results: income net of group monthly contributions is

shows that, in our context, individuals exhibiting an apparent present bias are unlikely to do so because they face liquidity constraints now which they expect to be eased in the future.

Hyperbolic discounting, membership and contribution

We test two hypotheses which are conditional on individuals displaying hyperbolic preferences.

Hypothesis 1: Hyperbolic agents are more likely to commit to save by joining a rosca or funeral group.

We use a linear probability model in order to test our first conjecture by looking at the relationship between hyperbolic preferences and the likelihood of being a member of roscas and funeral groups, whilst controlling for other covariates. Our model is expressed as:

$$Y_i = \beta_0 + \beta_1\, hyperbolic_i + \beta_2\, always\ patient_i + \beta_3\, X_i + \varepsilon_i$$

where Y_i is a dummy variable equal to one if individual i is a member of either a rosca, funeral group or both in 2006. *hyperbolic* is a dummy variable equal to one if the respondent displays hyperbolic preferences (i.e. is impatient in the short-term frame and patient in the long-term frame). X_i represents a vector of relevant controls (education, age, income, etc.). We also use dummies for neighbourhood fixed effects and ε_i represents the error term.[2] We believe that in the context of our study the two urban neighbourhoods of Vossa and Enagnon offer a similar density of roscas that hold meetings within walking distance. We also include *always patient*. *Future-biased*, one of our four time preference categories, represents only 5.4% of the overall sample and is thus merged with the category *always impatient* as the benchmark. Our results are similar if we exchange *always patient* for *always impatient* in the specification above.

[Table 4 here]

Panel A of Table 4 displays the results for the overall sample, for which we use robust standard errors. Our results are indicative of correlations and not of causal relationships. We show participation in both commitment devices separately and combined. Our results on the coefficient for *hyperbolic* clearly reject hypothesis 1. We also test the hypothesis that the sum of coefficients attached to *hyperbolic*, *female*hyperbolic* and *female* is equal to zero (denoted as 'Hyp a' in the table). This hypothesis is rejected (at the 10% level) for funeral groups but not for roscas alone. When we combine both memberships, we get a borderline p-value of 0.104 in model 5 and a clear rejection in model 6. These results indicate that hyperbolic women appear more likely to be involved in one of the saving commitment devices (funeral groups) compared to men. Our results also hold if we use a probit model or bivariate probit model. We find similar interaction effects in our models if we estimate them following the procedure suggested by Norton et al. (2004).

Our results are indicative of a positive correlation between hyperbolic preferences and the use of funeral groups for females. Results are also suggestive of gender differences in dealing with self-control problems. Hyperbolic males make less frequent use of roscas and funeral groups. One reason

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only significant for the 'always patient' category and not for the 'always impatient' and 'hyperbolic'. This seems to show that people who join informal groups and thus may be liquidity constrained precisely because they have money locked up in these groups, are not more likely to appear hyperbolic in the responses to cash trade-off questions.

[2] Our regressions are likely to suffer from omitted variable bias due to some unobserved heterogeneity. While there may be more, we can think of the following two: 'preferences for saving devices' and 'number of groups available to a given member' which are not directly measured. Whilst aware of this issue of identification, we are not able to provide a correction for this endogeneity problem. Thus, this represents a limitation in interpreting our results.

that could explain this is that they may be less aware of their preferences. We offer additional reasons below. Results on the other covariates show that rosca and funeral group participation is quadratic in income and the maximum is reached at very high levels (above the 90th income percentile). Specifying income in logs does not alter this result and the positive relationship is confirmed. Income stability (i.e. whether someone has held her/his current job for at least 24 months) is not significantly related to membership in any group. The results are robust to the introduction of dummy variables for rosca or funeral group membership in 2004[3], which are always significantly and positively correlated with participation in 2006. Our results are also robust when we add a second interaction term, *always patient*female.* Moreover, our results are on the whole similar if we include *always patient* and *always patient*female* or *always impatient* and *always impatient*female* in the specification.

We can offer two additional reasons as to why hyperbolic women are more likely to use a commitment device while hyperbolic men are not. It may be partially coming from their greater willingness to invest in the public good of the household and thus have a more long term view than their partner or other single males. LeMay-Boucher and Dagnelie (2014) use a similar Beninese sample to ours and show that women spend a larger share of their income budget than men on goods that are more likely to benefit the household and less on private goods such as meals out, alcohol and cigarettes (temptation goods). It may also be that women experience greater difficulty saving. This is one of the reasons proposed by Bauer et al (2012) in their study based on Indian data, which highlights that present-biased women are more likely to borrow from MFIs. This could also partially apply in our context. Women who find it harder to save may be more tempted to opt for a commitment device than present-biased males.

Hypothesis 2: Hyperbolic agents are expected to contribute more to a saving commitment device.

We investigate the relationship between the level of saving in commitment devices and time preferences using a Tobit model. This estimation strategy is necessary due to high censoring levels in the dependent variable (77.5%). As in the previous section, we consider contributions to roscas and funeral groups alone and combined. Our results on to the coefficient for hyperbolic, in Panel B of table 4, clearly reject hypothesis 2. However, our estimates show a positive correlation between being a hyperbolic female and the level of contributions in funeral group and funeral group and/or rosca combined, but not for rosca alone. That is to say, we reject the null that the sum of the coefficients of hyperbolic, female and female*hyperbolic are equal to zero at the 10% in columns 3, 4 and 6 (denoted as 'Hyp a' in the table). Former participation is positively related to the level of contributions. Income has a positive and concave relationship with the level of contributions.

We repeat this exercise, expressing contributions as a share of total savings. Total savings is defined as the sum of money invested in four different savings vehicles, namely itinerant bankers, funeral groups, roscas and formal savings accounts (banks, post offices etc.)[4]. Results (not shown) using a Tobit model (or OLS for the subsample of non-zero contributions) indicate a positive correlation between being hyperbolic for women and the share of saving in commitment devices. These results indicate that, for females, being hyperbolic leads to putting a larger share of their savings into commitment device.

[3] Data from 2006 represents the second wave of a longitudinal data collection process which was initiated in 2004. A section on eliciting time preferences was added to the follow-up in 2006. Given the availability of variables on time preferences, our paper is based on the cross-sectional information contained in the 2006 survey. Some information from the 2004 survey is used.

[4] Both formal savings accounts and itinerant bankers do not strictly require a member to follow a fixed schedule of contributions and as such there is no penalty for not abiding. Moreover, these two devices do not offer peer pressure, which is central to the design of both funeral groups and roscas. Because our current focus is on commitment devices we do not bundle use of a formal savings account and itinerant banker with roscas and funeral groups in the dependent variable of our empirical analysis.

The decision to join a group and the amount contributed are not likely to be independent. Since participation in a group is self-selected, the observations taken into account in the structural equation are not drawn from a random sample. As such, we suspect that unobserved heterogeneity influences both the likelihood of joining and the size of contributions. It is therefore necessary to tackle the problem of selection bias that leads to potentially inconsistent estimates induced by the correlation between the error term and the regressors. To deal with this problem, we use a sample-selection model (Heckman two-step estimation), which allows for possible dependence between the selection (participation to groups in 2006) and structural equations (contributions to those groups). The exclusion restrictions we implement in the structural equation involve ethnic affiliations. Whilst ethnic affiliation is a determinant of group participation, it does not relate significantly to the level of contributions. Furthermore we observe no systematic differences in many economic variables across ethnic groups. Results from the Heckman two-step procedure (shown in Appendix B available online) confirm some of our previous conclusions. They show a positive correlation between being a hyperbolic female and being a member of a funeral group, and funeral group and /or rosca combined, but not for roscas alone. However, they only show a very mild link between being a hyperbolic female and the level of contributions in a funeral group and/or rosca combined, but not for roscas or funeral groups alone. This can be seen in model 6, for which we are on the threshold of rejecting hypothesis a (with a p-value of 0.109).

Additional Motives for Membership

The use of roscas or funeral groups as a tool for self-discipline is not the only motive given in the literature for participation. Anderson and Baland (2002) propose the need for a commitment device against intra-household allocation problems. Wives who have greater preferences for an indivisible good will want to save more than husbands. In the case of such conflict between partners, a wife can use a rosca as a way to avoid claims by her husband for immediate consumption and protect her savings. However, as shown in Dagnelie and LeMay-Boucher (2012), who employ data from 2004 in a similar context to ours, this motive seems unfit for our Beninese setting. Our probit regressions results confirm that this motive is not relevant to the Beninese context; the share of female income (expressed as a percentage of spouses' total income, and its square), which is suggested by Anderson and Baland (2002) as a proxy for the women's weight in household decision-making, is not significant in explaining membership in both groups (results not shown). Results also show that the coefficients for the variables '*female*' and *'female*couple*' are not significant, individually and jointly. This suggests that neither gender nor being part of a couple holds any explanatory power over rosca and funeral group participation. These variables remain insignificant in our estimates of the monthly contributions for the sub-sample of members in a couple.

A significant proportion of members we interviewed declared that it was impossible to save money if they were to leave it at home. Savings would quickly evaporate due to all sorts of social pressures and demands coming from family, friends, neighbours and the spouse. By joining for a rosca or a funeral group, one opts for a socially accepted alibi to protect one's savings against all types of social pressures (Brune et al., 2011, finds such evidence amongst Malawian farmers). In our sample, 22% and 1% of members mentioned that they joined a rosca or funeral group respectively to protect their savings. It can thus mean two things which cannot be discriminated: 1) protection against potential income sharing and pressure from relatives and 2) protection against the risks of theft, fire or other catastrophes that were mentioned during informal interviews.

6. Conclusion

Where formal institutions are unavailable, arrangements such as roscas or funeral groups provide the poor with an affordable and reliable means to save or freeze money for future use. Whilst a range of motives for participation in such groups have been discussed in the literature, first hand evidence from a household survey in Benin shows that individuals might actually do so as a result of self-control problems. Having identified the portion of our sample displaying hyperbolic preferences, we are able to test two hypotheses with regards their willingness to commit to a group in order to foster self-discipline. Results suggest that females displaying hyperbolic preferences are more likely to join such a group (in our case funeral groups but not roscas) and will contribute more on average. Males on the other hand seem less aware of their hyperbolic preferences and are as such less likely to join a group in order to save.

Tables

Table 1: Descriptive statistics

	Mean	se
Age	36.72	0.51
Secondary school or above	0.28	0.02
Female	0.539	0.017
Household size	5.02	0.10
In couple	0.50	0.02
Income	45.99	2.07
House owner	0.80	0.01
Same job for 24 months or more	0.62	0.02
Salaried	0.14	0.01
Rosca member	0.15	0.01
Member of funeral group	0.14	0.01
Ethnic group: Fon	0.21	0.01
Ethnic group: Popo	0.31	0.02
Ethnic group: Goun	0.36	0.02
Ethnic group: Peul	0.05	0.01
Location: Vossa	0.22	0.01
Location: Enagnon	0.78	0.01
Always patient	0.51	0.02
Always impatient	0.27	0.02
Hyperbolic	0.17	0.01
Number of observations	788	

Note: All money amounts are monthly, individual and expressed in FCFA (000's).
Individuals younger than 18 years are excluded

Table 2: Responses to time preference questions

	a) 2000 FCFAs in a year	b) 3000 FCFA in 13 months	Total
a) 2000 FCFA in 1 Week	211 (100) 26.8% (23.5%) *Always Impatient*	135 (64) 17.1% (15.1%) *Hyperbolic*	346 (164) 44.9% (38.6%) *Impatient short-term*
b) 3000 FCFA in 5 weeks	43 (22) 5.4% (5.1%) *Future-biased*	399 (239) 50.6% (56.2%) *Always Patient*	442 (261) 55.1% (61.3%) *Patient short-term*
Total	254 (122) 32.2% (28.7%) *Impatient long term*	534 (254) 67.7 % (59.8%) *Patient long term*	788 (425) 100% *Total*

Figures in parentheses show statistics related to the female subsample of 425.
Example: There are 100 females who are 'Always Impatient' so 23.5% of the 425.

Table 3: Determinants of time preferences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Always patient			Always impatient			Hyperbolic		
OLS results	All	Female	Male	All	Female	Male	All	Female	Male
Female	0.20***			-0.09*			-0.11***		
	(0.051)			(0.046)			(0.039)		
In couple	0.06	-0.13	0.17**	-0.02	0.11	-0.10	-0.03	-0.03	-0.02
	(0.052)	(0.105)	(0.066)	(0.047)	(0.088)	(0.062)	(0.041)	(0.095)	(0.054)
Female*In couple	-0.08	0.09		0.02	-0.09		0.09*	0.06	
	(0.066)	(0.105)		(0.059)	(0.089)		(0.051)	(0.094)	
Income	0.00**	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Income squared	-0.00**	-0.00	-0.00*	0.00	0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.00	0.00	-0.00**	-0.00	-0.00	0.00	0.00	0.00	0.00
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Secondary school or above	0.01	-0.00	0.02	-0.02	0.01	-0.04	-0.01	-0.05	0.03
	(0.043)	(0.064)	(0.058)	(0.039)	(0.058)	(0.052)	(0.032)	(0.046)	(0.046)
Same job for 24 months or more	-0.11**	-0.11*	-0.14**	0.06	0.02	0.13*	0.02	0.03	0.01
	(0.044)	(0.063)	(0.069)	(0.040)	(0.053)	(0.066)	(0.034)	(0.046)	(0.057)
Salaried	0.03	0.13	-0.02	0.02	-0.14**	0.09	-0.06	-0.04	-0.07
	(0.053)	(0.096)	(0.063)	(0.048)	(0.064)	(0.061)	(0.039)	(0.065)	(0.049)
House owner	0.07	0.03	0.13*	-0.05	-0.03	-0.08	0.02	0.02	0.03
	(0.048)	(0.067)	(0.071)	(0.045)	(0.059)	(0.070)	(0.036)	(0.046)	(0.058)
Household size	-0.02***	-0.03***	-0.02**	0.01	0.01	0.02*	0.00	0.02**	-0.01
	(0.007)	(0.010)	(0.010)	(0.006)	(0.009)	(0.008)	(0.005)	(0.007)	(0.008)
Location: Vossa	0.27***	0.27***	0.29***	-0.22***	-0.15***	-0.32***	-0.06*	-0.09*	-0.02
	(0.046)	(0.059)	(0.071)	(0.037)	(0.050)	(0.057)	(0.036)	(0.045)	(0.056)
Constant	0.39***	0.56***	0.50***	0.46***	0.39***	0.36**	0.11	-0.04	0.16
	(0.098)	(0.131)	(0.148)	(0.093)	(0.121)	(0.144)	(0.069)	(0.068)	(0.118)
Observations	788	425	363	788	425	363	788	425	363
R-squared	0.08	0.08	0.09	0.07	0.05	0.13	0.03	0.04	0.03
Ethnic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust se in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Individuals younger than 18 years are excluded; All models are controlled for ethnic affiliations.

Table 4: Determinants of participation in commitment devices

PANEL A: OLS estimates for the use of commitment device in 2006

Panel A: Membership	(1)	(2)	(3)	(4)	(5)	(6)
OLS estimates	Rosca		Funeral group		Rosca and/or Funeral group	
Hyperbolic	-0.09**	-0.08*	-0.01	0.02	-0.07	-0.05
	(0.042)	(0.040)	(0.045)	(0.037)	(0.049)	(0.042)
Always patient	0.01	-0.01	0.02	-0.00	0.02	-0.01
	(0.029)	(0.029)	(0.027)	(0.024)	(0.033)	(0.031)
Female*Hyperbolic	0.09	0.09	0.09	0.08	0.13*	0.13*
	(0.062)	(0.066)	(0.067)	(0.060)	(0.074)	(0.071)
Female	0.00	0.04	0.02	0.06**	0.04	0.11***
	(0.034)	(0.036)	(0.027)	(0.028)	(0.037)	(0.038)
Member of rosca in 2004		0.42***				0.31***
		(0.043)				(0.046)
Member of funeral group in 2004				0.53***		0.36***
				(0.042)		(0.047)
Constant	0.15*	0.07	-0.10	-0.13**	0.05	-0.02
	(0.086)	(0.084)	(0.071)	(0.062)	(0.094)	(0.087)
Observations	788	693	788	693	788	693
R-squared	0.10	0.28	0.17	0.47	0.18	0.39
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Hyp a (F-stat)	0.0081	0.63	3.10	6.88	2.66	7.24
Hyp a (p-value)	0.93	0.43	0.079	0.0089	0.104	0.0073

PANEL B: Tobit estimates for contribution to commitment devices in 2006

Panel B: contribution	(1)	(2)	(3)	(4)	(5)	(6)
Tobit estimates	Rosca		Funeral group		Rosca and/or Funeral groups	
Hyperbolic	-14.10**	-14.40***	-1.11	-1.19	-9.36***	-9.31***
	(5.632)	(5.094)	(1.140)	(1.257)	(3.312)	(3.074)
Always patient	0.70	-1.49	-0.09	-0.58	0.99	-0.71
	(2.755)	(2.751)	(0.756)	(0.881)	(1.979)	(1.923)
Female*Hyperbolic	16.29*	17.62**	3.00**	3.51**	12.95**	14.14**
	(8.328)	(8.288)	(1.428)	(1.574)	(5.440)	(5.628)
Female	1.65	4.41	1.39	2.07**	3.50	5.90**
	(3.714)	(3.869)	(0.913)	(0.950)	(2.705)	(2.839)
Member of rosca in 2004		22.43***				13.81***
		(3.869)				(2.360)
Member of funeral group in 2004				5.43***		8.44***
				(0.813)		(2.320)
Constant	-34.98***	-36.29***	-11.24***	-11.37***	-29.48***	-29.65***
	(9.143)	(9.465)	(2.578)	(2.982)	(7.131)	(7.199)
Observations	788	693	788	693	788	693
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Hyp a (F-stat)	0.38	1.26	7.29	10.68	2.23	4.18
Hyp a (p-value)	0.54	0.26	0.0071	0.0011	0.14	0.041

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Individuals younger than 18 years are excluded.
All regressions include the following set of controls: in couple, income, income square, age, secondary school or above, same job for 24 months or more, salaried, house owner, Household size, ethnic group and location dummies.
Hyp a: the sum of coefficients of hyperbolic, female and female*hyperbolic is equal to zero.
For PANEL B: the dependent variables is expressed in FCFA (000's).

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