Università degli Studi di Milano-Bicocca
Dipartimento di Economia, Metodi Quantitativi e Strategie d'Impresa

Dottorato di Ricerca in Economia Politica
XIV ciclo
(A.A. 2008/2009 – A.A. 2012-2013)

Essays in Development Economics

Settore scientifico-disciplinare di afferenza: SECS P/01

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Acknowledgements

All errors are my own.

Contents

Introduction

Gaps in financial access remain stark in the largest part of developing countries and have relevant consequences on poor households' economic decisions, such as credit, saving and risk management. Lack of availability of formal financial services provided by either the market or public authorities (e.g in case of health insurance) have been compensated by the activity of informal groups, associations and arrangements. Old and new forms of community-based groups have been largely documented in most of developing countries and are shown to be active in several crucial economic domains. They have different levels of institutionalization as they can simply rely on social norms or can have rules and a certain degree of formalization concerning e.g. selection criteria, enforcement, sanctions. They all have in common the voluntary participation of people from the same community (village, neighbourhood, people of the same profession), the delivery of services to members, the non-profit character, the underpinning values of solidarity and mutual help. Some examples of community-based groups in Sub-Saharan Africa are analysed in this thesis: Rotating Saving and Credit Associations (roscas), funeral groups and mutual health organizations (MHOs).

The importance of studying community-based arrangements lies in the premise that interventions at the level of a local community can deliver more effective and equitable development. Moreover, examining the mechanics of the informal market is very important for two reasons. First, the strength of the informal market is important for measuring and predicting how effective specific formal sector interventions could be, in the perspective of scaling-up. Second, lessons learned in the informal markets can help shape policy in the formal (Karlan and Morduch 2009).

In chapter 1, drawing on data from a household survey in urban Benin[1], 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-inconsistent preferences are sophisticated enough to commit themselves through taking part in such groups. We provide evidence indicating that women who are hyperbolic are more likely to join these groups and to save more through them, but men displaying similar preferences appear naïve with regards membership. Moreover, we find that hyperbolic agents, irrespective of their gender, tend to restrain consumption of frivolous goods to a larger extent. Furthermore, weak evidence is provided that microcredit can be used as a device to foster self-discipline. We also ensure that our results cannot be explained by intrahousehold conflict issues.

The second chapter largely draws on Bonan J, Dagnelie O., LeMay-Boucher P. and Tenikue M. (2012) "Is it all about Money? A Randomized Evaluation of the Impact of Insurance Literacy and Marketing Treatments on the Demand for Health Microinsurance in Senegal", Working Papers 216, University of Milano-Bicocca, Department of Economics. It is based on a field work we carried out in Spring-Summer 2010 in Thies, Senegal, which I coordinated and supervised. The chapter presents experimental evidence on mutual health organizations (MHOs) in the area of Thiès, Senegal. Despite their benefits, in some areas there remain low take-up rates. We offer an insurance literacy module, communicating the benefits from health microinsurance and the functioning of MHOs, to a randomly selected sample of households. The effects of this training, and three cross-cutting marketing treatments, are evaluated using a randomized control trial. We find that our various marketing treatments have a positive and significant effect on health insurance adoption, increasing take-up by around 35%. Comparatively the insurance literacy module has a negligible impact on the take up decisions. We attempt at providing different contextual reasons for this result.

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[1] Data were collected in Benin between 2004 and 2006 by P.LeMay-Boucher, Olivier Dagnelie and Vincent Somville. I thank all of them for granting me the use of their dataset.

The third chapter is an extension of the second and draws on the same dataset. We measure the willingness to pay (WTP) for MHOs premiums in a Senegalese urban context. WTP valuations can help both policy makers and existent MHOs in better understanding the characteristics of the demand of microinsurance products. This chapter considers the role of individual and household socio-economic determinants of willingness to pay for a health microinsurance product and add to the previous literature evidence of the role of income, wealth and risk preferences on individual WTP. We find that richer, more wealthy and more risk-averse head of households are more likely to reveal a higher WTP for health microinsurance. Conscious of the potential limits of our elicitation strategy (bidding game), we incorporate the existent literature on the effects of 'preferences anomalies' (Watson and Ryan 2007) and estimate WTP accounting for structural shift in preferences (Alberini et al. 1997), anchoring effect (Herriges and Shogren 1996) and the two effects together (Whitehead 2002). We find evidence of slight underestimation of the median WTP if preferences anomalies are not taken into consideration. However, the extent of such difference is far from being relevant. Previous results on the determinants of WTP are robust to the effect of such preference anomalies. We also provide an analysis of the predictive power of WTP on the actual take-up of insurance following our offering of membership to a sample of 360 households. WTP appears to have a positive and significant impact on actual take-up.

Chapter 1

1. Are Hyperbolic Agents Sophisticated? An Investigation into Rosca and Funeral Group Membership in Benin

Abstract

Drawing on data 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-inconsistent preferences are sophisticated enough to commit themselves through taking part in such groups. We provide evidence indicating that women who are hyperbolic are more likely to join these groups and to save more through them, but men displaying similar preferences appear naïve with regards membership. Moreover, we find that hyperbolic agents, irrespective of their gender, tend to restrain consumption of frivolous goods to a larger extent. Furthermore, weak evidence is provided that microcredit can be used as a device to foster self-discipline. We also ensure that our results cannot be explained by intrahousehold conflict issues.

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 what the poor actually desire is the ability to save money; 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 finance institutions can provide for their needs. Recent studies (for example Ashraf et al., 2006) based on evidence collected in developing economies use insights from behavioural economics to emphasise the role of 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, forthcoming).

Behavioural explanations of time preferences are at the centre of increasing interest in both the theoretical and empirical literature. Present-biased preferences have been proposed as an explanation of poverty traps (Banerjee and Mullainathan, 2010), low technology adoption in 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 displaying self-control problems are more likely to save their money through commitment devices such as roscas or funeral groups.

We study the time preferences of 788 individuals randomly selected in two urban districts of Cotonou, Benin. Employing an elicitation strategy akin to Ashraf et al. (2006), we find that 23% of individuals in our sample exhibit a preference reversal, which allows us to identify them as time inconsistent, the majority of which (17%) are present-biased. Our work relates present-biased preferences and key financial decisions, namely i) participation in roscas[2]; ii) participation in funeral groups; iii) contributions made to such groups iv) frivolous expenditures and v) obtaining a loan.

If agents have present-biased preferences or suffer from short-term temptations and are aware of the consequences (termed as 'sophisticated' as opposed to 'naïve'), then it is likely they will prefer to limit the set of options available to them. This rationale was proposed by, among others, Aliber (2001) and Gugerty (2007), who indicate that in the absence of alternative commitment saving strategies, those who were mindful of their time-inconsistency problem would turn to roscas. The same rational is applicable to funeral groups. The functioning of both groups and the features that make their design akin to commitment devices are outlined below.

If agents opt for a commitment device to deal with their self-control problems, we would expect this to be reflected in their expenditure on non-essential (frivolous) goods. Sophisticated agents might wish to participate in roscas and funeral groups as their long-term self would prefer to reduce impulsive spending and save money by making indivisible payments. If this assertion is correct, we should be able to isolate the effect of sophistication on group membership and on non-essential (frivolous) expenses. We complement our investigation with an analysis of such frivolous expenditures.

Our findings indicate that present-biased agents are more likely to belong to either of the two commitment devices studied. Similar to Ashraf et al. (2006) and Bauer et al. (2012) the results only hold for women. We find mild evidence that hyperbolic women make larger contributions to, and save a larger share of their savings in roscas and funeral groups. Furthermore hyperbolic agents, irrespective of gender, appear to spend less on frivolous items than their non-hyperbolic counterparts. We also find that hyperbolic women are more likely to get a loan and potentially use microcredit as a self-discipline tool. These results are suggestive of a degree of sophistication among women, whilst men appear largely naïve.

Our article contributes to the literature in several ways. Firstly we present original evidence that hyperbolicity is positively correlated to rosca and funeral group participation, which to our knowledge has not yet been documented, and negatively correlated to frivolous expenditures. We also show that the results with regards rosca membership cannot be explained by a potential intra-household conflict in preferences, as proposed by Anderson and Baland (2002) for a sample in Kenya. We document that Beninese spouses act in a non-cooperative framework and that as a consequence, the decisions to join and how much to contribute to either commitment device are individual. This, along with other econometric results enables us to discard the intra-household commitment motive and to put forward the self-control commitment rationale.

The remainder of the paper is organized as follows. Section two reviews the relevant literature on roscas and funeral groups. The following section presents our measure of frivolous expenditures and introduces some testable hypotheses. Section four describes the Beninese context and discusses how roscas and funeral groups operate locally. Section five elaborates on our survey and discusses some descriptive statistics. Section six presents our empirical estimates while section seven discusses some alternative motives for membership in commitment devices. Section eight concludes.

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[2] We observed only *decision* and *random* roscas. Bidding roscas were seemingly absent from the region surveyed.

2. Commitment Devices

Development literature has recently turned its attention towards commitment devices [3]. In a randomized control study in the Philippines, Ashraf et al. (2006) show that women who display time inconsistent preferences and who are sophisticated enough, desire commitment savings devices. They are more likely to take up a pure commitment savings product (a bank account with restricted access to deposits without compensation for this restriction), which leads to higher savings levels. A study by Dupas and Robinson (forthcoming) shows that overcoming time-inconsistent preferences requires a savings mechanism with strong commitment features such as a rosca. They propose access to four innovative savings devices with an increasing degree of commitment, finding that those displaying time-inconsistent preferences benefit in terms of higher savings and health preventive investments only with the saving devices offering higher degrees of commitment (credit and social commitment to make deposits). Bauer et al. (2012) find a positive correlation between present-biased preferences and the use of microcredit products for women, arguing that the microcredit repayment process is similar to committing to save and can therefore be viewed as a commitment device for agents displaying time-inconsistent preferences.

In the context of our study (where no use of randomized experiments is made), members of either roscas or funeral groups are mainly poor individuals who have little access to formal savings and credit because of high transaction costs and incomplete markets. These groups are often regarded as a means for the poor to save money in order to make an indivisible expense (Besley et al. 1993) and the importance of roscas in developing countries is underlined in numerous studies (see notably Bouman, 1995). Discussions in the literature about funeral groups however are scarce. Roth (1999) offers some evidence concerning such groups in South Africa, whilst LeMay-Boucher (2009) studies their existence in Ethiopia and Benin. Rutherford (2000) documents that insurance mechanisms for funerals can be found across the developing world. Not only has their presence in many areas been proven, but funeral expenditure in many developing countries tends to represent a significant proportion of households' monthly income.

Roscas

A rosca consists of a group of individuals who gather on a regular basis for a cycle of meetings at which individuals contribute a fixed amount of money to a common pot that is subsequently allocated to one member. He or she is then excluded from the reception of the collective savings in subsequent meetings, but is still obliged to contribute to the pot for the remainder of the cycle, the end of which is marked when every member has received the pot once. The rosca may then begin another cycle or decide to disband. Beyond these basic defining features, the modes of operation can vary. Groups differ widely in terms of the number of members, size of contributions and the frequency of meetings. Some may function on the basis of regular, compulsory meetings, whereas others do not hold meetings, instead sending a member to collect payments. 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 (bidding roscas).

Roscas do not offer interest on savings and participation therein implies costs (transport, time, etc.) and members face the risk of default from others, thus raising the issue of enforcement (Anderson et al. 2009). Furthermore, the savings rate in a rosca is likely to differ from each member's optimal rate; thus participants experience less flexibility than if they were to save on their own. Yet despite these

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[3] Bryan et al. (2010) define commitment device "as an arrangement entered into by an agent which restricts his or her future choice set by making certain choices more expensive, perhaps infinitely expensive, while also satisfying two conditions: (a) the agent would, on the margin, pay something in the present to make those choices more expensive, even if he or she received no other benefit for the payment; and (b) the arrangement does not have a strategic purpose with respect to others."

costs, roscas are popular in several developing regions; 15% of agents (116 out of 788) in our sample are members of at least one such group. A prominent reason discussed in the literature for membership is that roscas seem able to respond to the need for commitment against one's time inconsistent preferences and temptations.

In the absence of alternative commitment savings strategies, people that have self-control problems and are sophisticated (aware of the problem and its consequences) may turn to roscas; they would indefinitely renegotiate with themselves if trying to save on their own. People may therefore join a rosca in order to bind themselves to their second best optimal savings rate and in doing so limit the set of available options by securing part of their revenues against everyday temptations. This rationale was proposed by Aliber (2001) and Gugerty (2007) who in their respective surveys, indicate that the absence of alternative commitment saving strategies might lead sophisticated individuals to turn to roscas. Basu (2011) develops a model showing hyperbolic discounters will prefer to remain in roscas even in the absence of sanctions, in order to exploit the commitment features of such groups.

Roscas also seem able to respond to a need for commitment against one's time inconsistent preferences and temptations. Based on a dataset collected in 2004 in Cotonou, Dagnelie and LeMay-Boucher (2012) show that rosca members spend on average 13.3% to 24.4% less on 'temptation goods' 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 on savings and non-essential (frivolous) expenditures. 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-biasness and memberships in commitment devices.

Funeral Groups

Whilst funeral groups vary across regions in their both 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 usually specify a list of shocks eligible for insurance as well as the corresponding amount of indemnity offered. For some of these groups the only eligible shocks are the costs associated with funerals (of close relatives and occasionally of members of the extended family). Before allocating an indemnity, groups usually perform checks on claims; once cleared, all other members must provide an equal amount of cash. A recipient's indemnity is thus the sum of all other 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.

In Benin these groups offer insurance to members by providing indemnities for a wide range of shocks, most commonly 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 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 groups fix a limited number of indemnities that can be received by any one member (this number is identical for all members). Once a member has attained 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 each 'happy' and 'unhappy' event. 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).

The aforementioned 'happy' events are of course more anticipatable than the 'unhappy' ones; membership can therefore be perceived as a means to save in advance or commit money for such occurrences. Regular contributions to a group present an opportunity to render savings illiquid towards those coming 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. Yet the nascent literature on funeral groups has not proposed an analysis of self-discipline in relation with membership. Our data allows light to be shed on this intriguing question.

3. Frivolous expenditure

Theories of temptation have been proposed as complementary explanations to time inconsistency in order to justify the preference for commitment. Temptation goods are defined as those whose consumption yields utility in the present but whose future consumption yields no utility. O'Donoghue and Rabin's theoretical model (1999) predicts that sophisticated individuals procrastinate over the consumption of tempting goods, whereas naïve people tend to over-indulge. According to Gul and Pesendorfer (2001), agents undergoing short-term temptations that conflict with their long run self-interest would be 'unambiguously better off when *ex ante* undesirable temptations are no longer available'. Thus, preference for commitment arises from a desire to avoid temptation rather than from a change in preferences. Banerjee and Mullainathan (2010) argue that temptation goods act as a tax on saving which affects poorer agents to a greater degree than the richest [4]. This leads to a poverty trap situation in which poor people face a higher 'temptation tax' and therefore have lower incentives to save (in order to limit current available liquidity) than do rich people. A further consequence of the model is once again the preference for illiquid forms of saving such as roscas (Bryan et al. 2010).

Several surveys in developing countries have shown that poor people spend significant shares of budget on frivolous goods such as alcohol and tobacco: 4.1% in Papua New Guinea, 5% in some

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[4] Another way of interpreting the model is to assume that temptation goods have higher discount rates. Evidence of different good-specific discount rates is provided by Ubfal (2011)

Indian regions, 6% in Indonesia and 8% in Mexico (Banerjee and Duflo, 2006). Our survey shows a smaller share in the Beninese context, at about 2%. We define frivolous expenses as the sum of expenditures made on beverages (alcohol, fizzy drinks, etc.), cigarettes and meals out. Whether this represents a good proxy for temptation goods is debatable; as such we use a broader definition as part of robustness checks below.

The relationship of interest here is that between displaying time inconsistent preferences and one's share of frivolous expenditure relative to total consumption. This may show the extent to which people are aware of their time inconsistency and the effect of this on their subsequent actions. Banerjee and Duflo (2006) provide a qualitative study of the awareness of their vulnerability to temptations arising from frivolous goods. In an Indian survey, respondents were asked to identify those expenses that they would like to cut; 44% of those who named at least one item, desired to cut expenditure on alcohol or tobacco. However the authors claim that this self-knowledge is unlikely to affect savings decisions (and therefore any restraining behaviour). Our survey did not include any such questions on awareness and coping strategies.

As pointed out by Bryan et al. (2010), self-awareness is critical to the questions of design and take-up of commitment devices. We can hence formulate a series of hypothesis to test the validity of the assumption that present-biased individuals are sophisticated and not naive:

Hypothesis 1: Hyperbolic agents, if sophisticated, are more likely to commit to saving by joining a rosca or funeral group than if they are naïve.

Hypothesis 2: Hyperbolic agents, if sophisticated, are more likely to contribute more to a saving commitment device than if they are naïve.

Hypothesis 3: Hyperbolic agents, if sophisticated, are more likely to restrain their current frivolous expenditures than if they are naïve.

These hypotheses do not represent an exhaustive list of necessary conditions to identify sophistication, nor are they sufficient conditions for sophistication. It is not our intention to address the question of how people achieve or manage sophistication. The ways by which one's self-awareness is raised, or how people actually succeed in constraining themselves as yet remain unknown to us (mental accounting has been proposed as one example; see Dupas and Robinson, forthcoming).

4. The Beninese Context

A large proportion of men and women with whom we spoke during informal meetings 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 seems quite natural to divulge as little information as possible to one's partner. Hence, spouses rarely ask questions concerning their partner's income or inquire about their activities. It is a kind of a tacit convention allowing each member of the couple to keep her 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 may indicate that unions or couples are considered as business arrangements between partners who desire the household needs in terms of public goods to be provided for.

The result of such a 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.[5] 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.

LeMay-Boucher and Dagnelie (2012) substantiate this dichotomy between the husband and wife's finances within a couple by carrying out an empirical analysis of the determinants of spouses' consumption patterns based on data collected in Cotonou in 2004. They and Falen (2011) also document that social norms play an important role in determining the intra-household allocation of expenses by gender in Benin. The majority of the contributions to the household's public goods are devolved to the husband, who, as the breadwinner must take care of everything related to the house (rental fees, repair costs, electricity), give money for housekeeping, pay the school fees, purchase clothing, etc. His wife must take care of the family, cooking and the payment of water bills. In general however, the male's income is not sufficient to cover the needs of the family, so the wife is required to spend more for the household than what allocated to her personal expenditure. So long as the basic needs of the family are provided for, 'selfish' individuals (in the sense that the utility of one agent does not depend on that of another) would prefer to spend more on private goods, the utility of which is higher. That is not to say that spouses do not interact with regards the provision of public goods. A minimum level of common management is required to determine the respective roles of both members in a couple.

4.1 Commitment Groups in Benin

Roscas

Besides rendering the current savings illiquid and safe, roscas both restrict one's set of future options (provided that the end of the cycle has not been reached) and compel an individual to continue saving. Through direct questions addressed to the 116 members (out of 788) of our 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 mean 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. Interestingly however, only 7% of all participants mentioned 'buying a durable good' (a larger proportion can be found in, for example, Besley and Levenson, 1996 and Handa and Kirton, 1999).

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.[6] 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

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[5] A large fraction of couples do not interact during working hours as their work brings them to different parts of the city. Therefore expenditure on meals, transportation, medicines, transfers to relatives or colleagues, gifts for funerals and on luxuries such as cigarettes and alcohol can easily be concealed. Indeed larger expenses still can be kept from the knowledge of one's spouse.

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

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. Thus it is worth noting that the observed preference for late reception may actually be explained by a simple case of an agents' risk aversion toward their own default and increased punishment, rather than by the need for a commitment device.[7]

Whilst we would expect that salaried individuals, that is, those who receive a regular and certain income, are less risk averse than non salaried in our sample, we actually find that both types of agents have similar preferences with respect to the timing of the pot receipt. That said, we still argue that both debt aversion and the willingness to save 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 successfully complete a cycle. The threat of sanctions and credibility of said are not only important factors influencing preferences on the timing of pot receipt but also key elements that make roscas good commitment devices.

Were members to place too much value on potential sanctions there would exist greater incentives to quit the rosca and try to save on their own; as such we would notice high turnovers. This is not however what we observe: the average membership duration of all those who wished to minimise the threat of sanctions is 52 months. This indicates that for a substantial number of individuals the benefits from an early receipt of the pot are outweighed by a mix of risk, debt aversion and the need for commitment.

Funeral Groups

The vast majority of the 114 members of our dataset stated that the main motive for joining a funeral group was to 'get indemnity in case of need' or to 'make sure that I have enough money 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.[8] What is interesting to highlight here is that whilst about three quarters of all groups ask that regular premiums be paid, members do not view insurance funds solely as a commitment device for disciplining savings, as they do roscas.

As LeMay-Boucher (2012) documents 'death of a member's close relative', 'death of a member' and 'illness of a member' represent the most cited coverage offered. For some groups, the first is their *raison d'être*: they started by only offering indemnities for funerals before expanding the range of coverage provided. Accordingly coverage for funerals is the largest; out of the 788 individuals that were surveyed, 42 per cent made payments related to funerals and/or illness during last six months. Individuals spent on average 2000 FCFA per month on funerals and 1000 FCFA on illness (averages made over the last six months); average monthly income over the same period was 46000 FCFA (median 33000 FCFA). These two expenses together represent 6.5 per cent of monthly income. Such figures show the importance of the expenditures for which funeral groups cater for. In terms of enforcement mechanisms, leaving a group before the end of a cycle leads to sanctions comparable to the ones imposed by roscas.

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[7] See Anderson et al. (2009) for a study on the role of social sanctions in facing enforcement issues in Roscas
[8] In order to get a very rough idea of what funeral expenses can represent: buying a standard coffin in Cotonou amounts to about 90 000 CFA, an almost compulsory beef for celebration 100 000 CFA and standard hearse costs 30 000 CFA. 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.

5. Data

We use data 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. Vossa is located near an inner bay of fresh water and is encircled by stagnating waters and swamps which represent an important vector of disease. It comprises 63 hectares. Enagnon, a dense slum of similar size located on the Atlantic Ocean shore, has also received little attention and important sanitary problems have not yet been addressed. Both districts are near to downtown Cotonou, where a large proportion of their inhabitants commute to every day for work. A very limited number of (private or public) formal savings and investment institutions such as banks and NGOs were present in these districts at the time of our survey.

We surveyed 386 households of which around a quarter are located in Vossa and the remainder in Enagnon. Selection of each household was done according to a random process (our survey methodology is described in appendix A). The first wave of interviews was aimed at creating contacts, gathering housing information and obtaining information on individual characteristics of each member: religion, activity, education, work, etc. For all members older than eighteen, enumerators were required to fill out 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 of interviews was required for members of informal groups, during which the enumerators collected detailed information on the group(s) they participated in. For maximal accuracy, all members of each household were interviewed separately throughout the successive waves of our survey so that delicate issues related to expenses or income were tackled in private. Particular attention was thus put on confidentiality, which was strictly followed by our enumerators. We are left with a total sample of 788 individuals aged eighteen or older.

Table 1 provides descriptive statistics for the overall sample and two different subsamples: female and male. 54% of respondents are female and the mean age is 36.5 years. Half of those surveyed live in a couple[9] 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. On average, males are significantly more likely to have this higher level of education. Average monthly individual income is around 46000 FCFA (USD90) and is significantly higher for males. 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. Males are more likely to be employed in the formal sector (public or private) and receive a fixed monthly salary. 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. There is a significant difference in membership of funeral groups across gender but none for roscas.

[Table 1 here]

We also collected information on total expenditure, computed as monthly extrapolations from the sum of all expenditures made on durable and non-durable goods, including savings and transfers made. Not surprisingly, total expenditure is larger than income. This suggests that income underreporting may be an issue, however we alternatively replace monthly personal income with monthly personal total expenditures in the regression presented below and find similar results. Savings are defined as the sum

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[9] An individual lives in a couple if he/she has 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.

of money invested in different savings vehicles, namely money collectors, roscas, funeral groups and formal savings accounts (banks and microfinance institutions); both variables are expressed as a share of total individual monthly expenditure, which includes personal and household items. Women tend to save more than men, whilst the latter spend more on frivolous goods than women[10].

5.1 Eliciting Time Discounting

We measure 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 respectively an average of three and four and a half days of work.

[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'), represent 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 share of time preferences across surveyed individuals does not differ considerably from what others who employed more sophisticated elicitation techniques have found (see Bauer et al., 2012; Ashraf et al., 2006).

Our methodology does not involve the use of real payments, relying solely on hypothetical questions. A series of papers has shown that no significant differences arise in discount rates elicited through these alternative techniques (Ubfal 2011, Benhabib et al. 2010, Frederick et al. 2002), however, the evidence is mixed and no general consensus has yet emerged (See among others Andersen et al., 2011). For this reason we are cautious about the validity of our results. 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 avoid proposing a choice between a certain amount today and a higher one a week from now. Instead, the choice is between one week and five weeks. This is designed to involve 'front end delay,' in the sense that no reward is ever obtained without some minimal delay, allowing us to compare two uncertain choices and to avoid a possible bias toward the present and certain option. In order to limit the importance of framing in time preference elicitation, the two questions were asked in separate sections of the questionnaire (Frederick et al. 2002).

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[10] Such differences in patterns of expenditures have been found in several developing countries (i.e.: Hoddinott and Haddad, 1995 who use data from Ivory Coast).

6. Results

6.1 Determinants of time preferences

Differences in individual and household characteristics across the hyperbolic and non-hyperbolic samples are presented in table 3. We find that a greater proportion of hyperbolic agents are male, and that hyperbolic agents spend significantly less than non-hyperbolic on frivolous goods. Hyperbolicity does not appear to drive any significant differences in demographic or socio-economic characteristics such as income, family and employment status, age, level of education, total expenditure and saving.[11]

[Table 3 here]

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 4 we analyse the determinants of the three main time preference patterns: always patient, always impatient (both time-consistent) and present biased (time inconsistent), finding that females are more likely to be patient than males and males more hyperbolic than females. Males in a couple are more patient than single men. Patience is also increasing (at a decreasing rate) in income and negatively correlated to household size. These results are in line with most studies linking discount rates to wealth in both developed and developing countries, where richer individuals are also found to be more patient (Harrison et al., 2002; Yesuf, 2004; Tanaka et al., 2010). Finally 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 preference for patience. Geographical location matters: people living in the neighbourhood of Vossa are more patient for a reason (independent of the enumerator used) that escapes us.

[Table 4 here]

6.2 Membership to saving commitment devices

Hypothesis 1: Hyperbolic agents, if sophisticated, are more likely to commit to saving by joining a rosca or funeral group than if they are naïve.

We use a Probit 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:

$$Y_i = \beta_0 + \beta_1 hyper_i + \beta_2 time\ pref_i + \beta_3 \boldsymbol{X}_i + \varepsilon_i$$

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. *hyper* 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), *time pref*

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[11] It is probable that less educated people found it difficult to answer questions on time preferences, however the attendance of secondary school or higher does not relate to time preferences in any of the specifications.

comprises two dummy variables: always patient and always impatient. X_i represents a vector of pertinent controls (education, age, income, etc.) and ε_i represents the error term.[12]

[Table 5 here]

Table 5 displays the results for three different subsamples: total, female and male respectively. For the total sample we use clustered standard errors at the household level. Our results are indicative of correlations and not of causal relationships. In Panel A we find that hyperbolic individuals are less likely to belong to a rosca. The positive and similar coefficient attached to the interaction term of female and hyperbolic shows that whilst hyperbolic women are just as likely as non-hyperbolic women to be member of roscas, this is not the case for men. Males with hyperbolic preferences are less likely to belong to rosca than non-hyperbolic ones (columns 9 to 12). Results for the female subsample are displayed in columns 5 to 8.

Panel B shows that hyperbolic females are more likely to participate in funeral groups. This is confirmed by the coefficient of the interaction term of *female* times *hyperbolic* in columns 1 to 4 and the positive coefficient for hyperbolic in the female subsample (columns 5 to 8). We combine participation to both commitment devices in Panel C. For all three panels we formally 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 tables). This hypothesis is rejected in Panel B and C. Hyperbolic women thus appear more likely to be involved in saving commitment devices compared to men (both hyperbolic and non-hyperbolic).

The results are robust to the introduction of dummy variables for rosca or funeral group membership in 2004[13], which are always significantly and positively correlated to participation in 2006. Our results also hold if we vary the reference group related to time preferences, by controlling instead for those who are always patient or always impatient[14].

Our results are indicative of a positive correlation between hyperbolic preferences and the use of commitment devices (except the case of roscas alone), suggesting that females are sophisticated to a certain degree. Results are also suggestive of gender differences in dealing with self-control problems. Time inconsistent males make less frequent use of roscas and funeral groups, and seem to be less aware of their inconsistent preferences.

Results on the other covariates (not reported, but available upon request) 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)[15]. Income stability (i.e. whether someone has held her/his current job for at least 24 months) positively explains membership in funeral groups but not in Panel C (roscas and funeral groups combined). Rosca participation is largely uncorrelated with work in the formal sector (providing regular salaries), except for the female subsample. We find similar interaction effects in our

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[12] A variable that is commonly not directly controlled for in studies on roscas (Anderson and Baland, 2002; Dagnelie and LeMay-Boucher, 2012) is the availability of rosca for each individual. Our dummies for neighbouring fixed effect account for part of this effect but one can make a case for a better variable. We believe that in the context of our study this is not likely to be a key determinant: the two urban neighbourhoods of Vossa and Enagnon offer a similar density of roscas which hold meeting within walking distant.

[13] As explained in appendix A, 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 for instrumentation.

[14] Results are similar if we control for different measures of time preferences found in table 2: 'patient short-term', 'impatient long-term', etc.

[15] Specifying income in logs does not alter this result and the positive relationship is confirmed

probit models if we estimate them following the procedure suggested by Ai et al. (2003) and Norton et al. (2004). Our results also hold if we use a linear probability model.

6.3 Patterns of contributions in commitment devices

Hypothesis 2: Hyperbolic agents, if sophisticated, are more likely to contribute more to a saving commitment device than if they are naïve.

We investigate the relationship between the level of saving in commitment devices and time preferences using a Tobit model. As in the previous section, we consider contributions to roscas, funeral groups and the two together in three different panels.[16] Table 6 shows that hyperbolic and non-hyperbolic females contribute similar amounts to roscas, whereas hyperbolic men appear to contribute significantly less. Panel B shows that hyperbolic women contribute significantly more to funeral groups, whereas coefficients of hyperbolic preferences for men are not significant. When we consider the sum of contributions (Panel C), we find a positive correlation between being a hyperbolic female and the level of contributions. 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 and 4. Former participation is positively related to the level of contributions. Income has a positive and concave relationship with the level of contributions.[17]

[Table 6 here]

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.). Results (not shown) using a Tobit model (or OLS for the subsample of non-zero contributions) indicate a positive correlation between hyperbolicity for women and the share of saving in commitment device. This result is consistent with females being sophisticated and therefore putting a larger share of their savings into commitment device. Of course we cannot discard the fact that availability issues could explain this relationship. That is, commitment devices are simply more accessible to some than others.

The decision to join a saving or funeral 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 influence both the likelihood of joining and the size of contributions. It is therefore necessary to tackle the problem of selection bias that leads to 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 commitment groups in 2006) and structural equations (level of 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 (not shown) with the Heckman two-step procedure are similar.

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[16] The censoring level for panels A, B and C are respectively 85%, 87% and 77.5%.

[17] Again, these results are not shown, but are available upon request.

6.4 Patterns of frivolous expenditure

Hypothesis 3: Hyperbolic agents, if sophisticated, are more likely to restrain their current frivolous expenditures than if they are naïve.

We estimate frivolous expenditure (expressed as a share of total individual expenditure) with a model similar to that presented in section 6.2. This model has been used with extensions by, among others, Hoddinott and Haddad (1995) and Quisumbing and Maluccio (2003). Given the relatively high censoring levels (43%) in the dependent variable, we use a Tobit model. We control for time preferences, personal characteristics (income, its square[18], gender, family status, age, education, past memberships) and employment characteristics (whether an individual is salaried, and if he or she has been in continuous employment for the last two months). We also control for a number of household characteristics, namely household size, if they are a homeowner and the female's share of a couple's income.

The analysis is conducted first on the whole sample (Table 7, columns 1-4), which is then subdivided by gender (columns 5-8 for women; 9-12 for men). We produced robust standard errors by clustering at the household level for estimations based on the whole sample. Despite spouses having private economic spheres, we cannot rule out that errors are uncorrelated across members of the same household. We are also aware that personal income is likely to be endogenous. Other variables contained in the error term such as tastes and preferences, which among other things would reflect an inclination to consume goods rather than leisure, could also be correlated with this regressor. Consequently, we deal with endogeneity by instrumenting for personal income below.

A first look at the descriptive statistics (see table 3) shows that individuals with present-biased preferences spend significantly less (730 FCFA) than non-hyperbolic ones (1130 FCFA). Our first set of results displayed in table 7, (which do not address the problem of endogeneity) confirm this negative correlation between time inconsistent preferences and the consumption of frivolous expenditure for the overall sample and both female and male subsamples.[19] Membership of either commitment group in 2004, which we employ as a proxy for one's past attitude for saving and commitment is negatively correlated with the share of frivolous expenditure for the total and male samples. Frivolous expenditures are also positively correlated with income stability and negatively with age. Furthermore, we observe that household size is positively correlated to frivolous expenditure in the female subsample.

[Table 7 here]

Results from IV estimations are shown in table 8 where we instrument for the potentially endogenous variable, income, using the amount spent on funerals between 24 and six months before our survey[20]. The suitability of this instrument lies with the fact that funeral expenditure occurs after random shocks due to deaths in the family or in the larger network of relatives and is therefore likely to be correlated with income, but not with tastes linked to frivolous goods. When a death occurs within the extended family, members are often requested or even expected to contribute to funeral expenses in line with their wealth. In the case of Benin, ethnographic and anecdotal evidence suggest that such funeral expenses are usually made at the individual level. In our sample, about 42% of individuals declared

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[18] Results are similar if we use log of total expenditure.
[19] We also ran OLS regressions on the sub-sample of those who report non-zero frivolous expenditures. The negative relationship between hyperbolic preferences and share of frivolous expenditure holds only in the female sub-sample, but vanishes in the male one.
[20] This instrument covers 18 months of funeral expenditures starting six months prior to the survey. This way we avoid incorporating expenditures close to the time of our survey, which could be linked to contemporary tastes included in the error term.

that they had made some funeral expenditure in the last six months; the correlation between income in 2006 and funeral expenditures is 0.36. We also use another instrument: the level of individual income registered in a previous survey conducted in 2004. Given that this is a two-period lag of the contemporaneous value for income, the two are likely to be highly correlated yet it is reasonable to expect that it is unrelated to current tastes or temptations on frivolous goods.

These intuitions do not however guarantee a successful identification of the second-stage estimation. Our estimates may indeed suffer an important bias if the instrument is only weakly correlated with the endogenous variable. We test the validity of our instruments by implementing weak instrument-robust tests. Comparing the Cragg-Donald F-statistic to the critical values for weak instrument tests tabulated by Stock and Yogo (2002), we see that our F-stats are high enough to allow us to rule out the possibility that the instruments are weak. When we employ the two instruments together, Hansen J-statistic tests fail to reject the null hypothesis of valid instruments. We also check if income suffers from endogeneity by using the Anderson-Rubin F-test of significance of endogenous regressors. According to our results we fail to reject the null that the specified endogenous regressor (income) can actually be treated as exogenous for the female and male subsamples but we reject the null for the overall sample.

[Table 8 here]

Table 8 shows the results when income is instrumented with funeral expenditure (Panel A), with individual income in 2004 (Panel B) and the two together (Panel C). All specifications include a similar set of controls to the previous estimations. Once again, the negative correlation between being hyperbolic and the share of frivolous expenditure is confirmed. Results on the other covariates reinforce the previous finding that income is negatively related to frivolous expenditure. This result is in line with the assumption of declining temptations, which implies that the fraction of the marginal dollar spent on temptation goods decreases in overall consumption (Banerjee and Mullainathan, 2010). As an additional check, we repeat the estimations using IVTobit and weak instruments-robust tests for IVTobit as proposed by Finlay and Magnusson (2009). All previous results are confirmed[21].

6.5 Microcredit and Commitment

Recent work by Bauer et al. (2012) argues that microcredit constitutes a support to foster self-discipline in financial behaviour in that the process of repayment microcredit is similar to saving in commitment devices. The authors find that loans that require repayment in small and very frequent instalments are attractive to people displaying present-biased preferences.

They consider Indian "self-help groups" (SHG) which are based on relatively small groups of low-income individuals who subscribe voluntarily, gather regularly (typically weekly), pool saving and borrow collectively from banks. The commonly observed practice of continual, repeat borrowing such that customers have outstanding loans nearly all the time, combined with repayments in regular, frequent instalments make this process very close to that of building up savings in regular increments followed by regular lump-sum withdrawals.

Our data also allow us to explore the relationship between individual loan decisions and time preferences. If hyperbolic agents are sophisticated and loan repayment is a means of committing to save, we would expect their likelihood of borrowing to be larger. This should be the case, particularly for loans with frequent repayment instalments. We consider such loans that are borrowed from formal

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[21] Results are not reported but are available upon request

microfinance institutions (MFIs) and itinerant bankers[22]. Loans granted by MFIs require repayment in monthly instalments whilst those offered by itinerant bankers need to be repaid more frequently, usually on a weekly but sometimes on a daily basis.

[Table 9 here]

About 11% (87 out of 788) of our sample claimed to have obtained a loan in the past 24 months, 57% (50 out of 87) of which were from MFIs and 43% (37 out of 87) from itinerant bankers. We use a model similar to that used in section 6.2 for membership in roscas and funeral groups. Table 9 shows the regression results for borrowing from an MFI (columns 1 to 6) and for all loans (including those from itinerant bankers) in columns 7 to 12. We find that the more impatient is an individual, the more likely he is to borrow. This is in line with standard economic intuition: patient individuals will save more whereas the impatient are more likely to borrow. We also find a positive correlation between hyperbolic preferences and the probability of having obtained loan from MFIs in the female sub-sample, a result that is confirmed when we also consider loans from itinerant bankers (columns 9 and 10). These results need to be qualified by the fact that we do not have information as to whether or not loans have been repeated and if so, for how long. In that sense our results can only present mild evidence with respect to the issue of microcredit and commitment. Contrary to Bauer et al. (2012), data restrictions do not allow us to identify the customers who have outstanding loans nearly all the time.

7. 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) put forward the need for a commitment device against intra-housold allocation problems as a motivation for rosca participation. Wives who have greater preferences for the indivisible good will want to save more than husbands. In a case of such conflict between partners, a wife can use roscas as a way to avoid claims by her husband for immediate consumption and protect her savings. As shown in Dagnelie and LeMay-Boucher (2012), however this motive seems unfit for our Beninese context.

The results presented here corroborate this finding. Our data shows that women and men are more or less equally as likely to participate in roscas: women represent 54% of all adults surveyed and constitute 51% of all rosca members. According to our sample in Cotonou, 14% of all women take part in roscas, increasing slightly to 15.5% if in couple and 17.3% if working (15% if both). In comparison, 15.4% of the men are members of such groups, 21% if living in couple and 21.8% if working (22.8% if both). Moreover, there is no tendency towards favouring women in group composition: 13% of all roscas surveyed were exclusively composed of women and 18% exclusively of men; 37% have a majority of male members. Additionally, from groups' rules we cannot assert that roscas are primarily oriented towards women's needs, nor do they intend to favour their membership. We encountered no groups that had clear primary objectives such as assisting women, providing for their needs (or those of their children) or empowering women in interactions with their spouse.

Probit regressions in table 10 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-

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[22] Itinerant bankers have different names in different countries. For instance, they are usually called tontinier in Benin, susu in Ghana and esusu in Nigeria. They are more generally known as mobile bankers in West Africa and deposit collectors in India. Itinerant bankers charge a fee in exchange for collecting the savings of their clients. It usually represents a fixed proportion: one out of thirty. So for example, after one month or daily contributions, the clients recover their savings minus the fee, which is equal to one deposit (one day).

making, is not significant in explaining membership. 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 participation. These variables remain not significant in our estimates of the monthly contributions for the sub-sample of members in couple. Such results are in line with the fact that the vast majority of husbands and wives in our sample do not pool income, as shown above, and as is documented in detail in LeMay-Boucher and Dagnelie (2012).

Finally, were roscas used as a means to put money aside from one's husband, membership would have to be kept a secret from him.[23] However, in order to avoid potential disputes (concerning mainly adultery issues), about half the groups in our sample allowing a female to join do so only with the approval of her husband. Rosca meetings are usually only open to members but groups do not insist upon secrecy, highlighting that participants are not primarily seeking to place money out of the reach of their spouses. Gugerty (2007) finds similar evidence with her Kenyan sample.

From the secrecy framework depicted beforehand, one could imagine that roscas are simply used to help spouses reduce their contribution to the provision of household 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 goods that the household is faced with. The variable 'number of dependents' is a good proxy for such public good expenses. However we find no support for this rationale, as said variable is never significant in our regressions. Moreover, the variable 'in a couple' is not significant either; as such this does not seem to drive rosca participation.

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 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 and in a large variety of ways. Demands might also come from the spouse; commitment devices could help insure agents against such claims, but the household budget structure and secrecy are such that this kind of claim is rare. 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.[24] In our sample, 22% and 1% of members mentioned that they joined a rosca or funeral group respectively to protect their savings. It can mean two things which cannot be discriminated: protection against potential income sharing and social pressure from relatives.

Protection of one's savings can also ensure protection against the risks of theft, fire or other catastrophes that were mentioned 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 commitment device, which would serve as a means to protect earnings against such adversity. Whilst this is far from being the most prominent answer explaining members' participation, the fact that one out of five members emphasizes protection gives a degree credit to this alternative rationale.

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[23] It can be argued that once a woman joins a rosca, she could use the threat of social sanctions to convince her husband to allow her continued participation. However, this reasoning is valid only during the course of a cycle. Once the cycle is completed, it is commonly accepted that one can freely chose to quit the group. 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 this motive

[24] Brune et al. (2011) found evidence that saving commitment accounts help Malawian farmers shield funds from the social network.

8. Conclusion

Where more formal institutions are unavailable, arrangements such as roscas or funeral groups provide the poor with an affordable and reliable means to save. 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 sophistication and subsequent willingness to commit to a savings group in order to foster self-discipline. Results suggest that females displaying time-inconsistent preferences are more likely to join such a group and will contribute more on average, indicating a degree of sophistication. Males on the other hand seem less aware of their hyperbolic preferences and are as such less likely to join a rosca or funeral group in order to save. As such they appear largely naïve. To the best of our knowledge, none has yet documented the existence of such sophistication amongst hyperbolic agents in developing countries.

A third hypothesis considers the relationship between hyperbolic preferences and expenditure on frivolous goods. The results shown appear to convey that significant differences exist between hyperbolic and non-hyperbolic agents with respect to patterns of such expenditure, even after controlling for several individual and household characteristics. Gender again turns out to be an important factor: whilst both men and women displaying hyperbolic preferences spend less on frivolous goods, females spend a smaller amount in comparison and therefore show a greater degree of sophistication.

Furthermore we find weak evidence that hyperbolic agents are more likely to have obtained a loan from a microfinance institution or an itinerant banker. Our results need to be qualified by the fact that we do not have information as to whether or not loans have been repeated and if so, for how long. In that sense, and contrary to Bauer et al. (2012), our results can only present mild evidence with respect to the issue of microcredit and commitment.

Tables

Table 1: Descriptive statistics

	All		Female (A)		Male (B)		Difference (A-B)
	Mean	se	Mean	se	Mean	se	
Age	36,72	0,51	36,46	0,69	37,02	0,77	-0,56
Secondary school or above	0,28	0,02	0,20	0,02	0,38	0,03	-0,18***
Household size	5,02	0,10	5,10	0,13	4,92	0,16	0,18
In couple	0,50	0,02	0,48	0,02	0,53	0,03	-0,05
Income	45,99	2,07	36,33	1,90	57,29	3,81	-20,96***
House owner	0,80	0,01	0,81	0,02	0,79	0,02	0,02
Same job for 24 months or more	0,62	0,02	0,64	0,02	0,61	0,03	0,03
Salaried	0,14	0,01	0,06	0,01	0,23	0,02	-0,17***
Rosca member	0,15	0,01	0,14	0,02	0,15	0,02	-0,01
Member of funeral group	0,14	0,01	0,12	0,02	0,17	0,02	-0,04*
Ethnic group: Fon	0,21	0,01	0,21	0,02	0,22	0,02	-0,01
Ethnic group: Popo	0,31	0,02	0,32	0,02	0,30	0,02	0,01
Ethnic group: Goun	0,36	0,02	0,38	0,02	0,34	0,02	0,05
Ethnic group: Peul	0,05	0,01	0,04	0,01	0,07	0,01	-0,03**
Neigh==Vossa	0,22	0,01	0,21	0,02	0,23	0,02	-0,03
Location: Enagnon-plage	0,78	0,01	0,79	0,02	0,77	0,02	0,03
Monthly individual total expenditure	55,28	2,66	44,82	2,52	67,52	4,89	-22,7***
Frivolous expenditure	1,10	0,06	0,59	0,05	1,71	0,10	-1,12***
Savings	8,28	0,71	9,20	1,02	7,21	0,99	1,98
Always patient	0,51	0,02	0,56	0,02	0,44	0,03	0,12***
Always impatient	0,27	0,02	0,24	0,02	0,31	0,02	-0,07**
Hyperbolic	0,17	0,01	0,15	0,02	0,20	0,02	-0,05*
Number of observations	788		425		363		

Note: All money amounts are monthly, individual and expressed in 1000 of CFA.
Individuals younger than 18 years are excluded

Table 2: Tabulation of responses to time preference questions

	a) 2000 francs in 1 year	b) 3000 francs in 13 months	Total
a) 2000 francs in 1 Week	211 26.78% Always Impatient	135 17.13% Hyperbolic	346 43.91% Impatient short-term
b) 3000 francs in 5 weeks	43 5.46% Future-biased	399 50.63% Always Patient	442 56.09% Patient short-term
Total	254 32.23% Impatient long term	534 67.76 % Patient long term	788 100% Total

Note: Individuals younger than 18 years are excluded

Table 3. Test of difference in means: hyperbolic vs non-hyperbolic

	All		Hyperbolic (A)		Non-Hyperbolic (B)		Difference (A-B)
	Mean	se	Mean	se	Mean	se	
Female	.539	.017	.474	.043	.552	.019	-.078*
Age	36.71	.514	36.63	1.19	36.73	.569	-.096
In couple	.498	.017	.533	.043	.491	.019	.041
Household size	5.01	.101	5.30	.220	4.95	.112	.345
Secondary school or above	.280	.016	.281	.038	.280	.017	.001
Income	45.98	2.06	47.55	5.83	45.66	2.18	1.88
House owner	.802	.014	.844	.031	.793	.015	.051
Same job for 24 months or more	.623	.017	.622	.041	.623	.018	-.001
Salaried	.138	.012	.103	.026	.145	.013	-.041
Rosca member	.147	.012	.103	.026	.156	.014	-.052
Rosca contribution in 1000FCFA	1.64	.227	1.14	.618	1.74	.243	-.594
Member of funeral group	.144	.012	.162	.031	.141	.013	.022
Contribution to funeral group in 1000FCFA	.314	.045	.357	.085	.306	.052	.051
Ethnic group: Fon	.213	.014	.237	.036	.208	.015	.028
Ethnic group: Popo	.310	.016	.355	.041	.301	.017	.053
Ethnic group: Goun	.360	.017	.348	.041	.362	.018	-.014
Ethnic group: Peul	.052	.007	.022	.012	.058	.009	-.035*
Neigh==Vossa	.219	.0147	.2	.034	.223	.016	-.023
Location: Enagnon	.614	.017	.511	.043	.635	.018	-.124***
Location: Enagnon-plage	.780	.014	.8	.034	.776	.016	.023
Monthly individual total expenditure	55.27	2.65	54.44	5.12	55.44	3.03	-1.01
Frivolous expenditure	1.10	.056	.759	.117	1.17	.064	-.413***
Savings	8.28	.713	6.24	1.13	8.70	.828	-2.46
Number of observations	788		135		653		

All money amounts are monthly, individual and expressed in 1000 of CFA; Individuals younger than 18 years are excluded ; *** p<0.01, ** p<0.05, * p<0.1

Table 4. Determinants of time preferences

Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Always patient			Always impatient			Hyperbolic		
	All	Female	Male	All	Female	Male	All	Female	Male
Female	0.52***			-0.25			-0.47***		
	(0.147)			(0.167)			(0.170)		
In couple	0.16	-0.11	0.45**	-0.07	0.09	-0.33*	-0.10	0.14	-0.08
	(0.146)	(0.136)	(0.179)	(0.152)	(0.147)	(0.188)	(0.174)	(0.167)	(0.196)
Female*In couple	-0.20			0.05			0.35*		
	(0.176)			(0.196)			(0.211)		
Income	0.00*	0.01*	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)	(0.002)	(0.006)	(0.003)
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	-0.01**	-0.00	-0.01	0.01	0.00	0.00	0.00
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.004)	(0.007)	(0.006)
Secondary school or above	0.02	-0.01	0.05	-0.09	0.03	-0.15	-0.04	-0.28	0.11
	(0.109)	(0.173)	(0.156)	(0.126)	(0.193)	(0.167)	(0.125)	(0.233)	(0.168)
Same job for 24 months or more	-0.29**	-0.30*	-0.39**	0.19	0.06	0.42**	0.07	0.11	0.04
	(0.124)	(0.169)	(0.188)	(0.141)	(0.179)	(0.209)	(0.147)	(0.211)	(0.209)
Salaried	0.09	0.43	-0.06	0.06	-0.65*	0.28	-0.26	-0.23	-0.29
	(0.150)	(0.298)	(0.169)	(0.155)	(0.351)	(0.181)	(0.176)	(0.396)	(0.200)
House owner	0.20	0.08	0.37*	-0.17	-0.10	-0.26	0.08	0.07	0.09
	(0.158)	(0.179)	(0.197)	(0.172)	(0.197)	(0.214)	(0.188)	(0.220)	(0.226)
Houesehold size	-0.07***	-0.08***	-0.06**	0.03	0.02	0.05**	0.02	0.09***	-0.03
	(0.019)	(0.027)	(0.027)	(0.022)	(0.028)	(0.026)	(0.029)	(0.029)	(0.028)
Ethnic group: Fon	0.07	0.18	-0.16	-0.41	-0.47	-0.17	0.56*	0.87*	0.31
	(0.241)	(0.288)	(0.323)	(0.315)	(0.310)	(0.341)	(0.315)	(0.478)	(0.377)
Ethnic group: Popo	0.06	0.10	-0.08	-0.25	-0.14	-0.27	0.51*	0.77	0.38
	(0.235)	(0.276)	(0.294)	(0.306)	(0.286)	(0.302)	(0.300)	(0.469)	(0.346)
Ethnic group: Goun	0.18	0.26	0.01	-0.40	-0.29	-0.43	0.36	0.58	0.26
	(0.236)	(0.270)	(0.292)	(0.310)	(0.281)	(0.294)	(0.297)	(0.471)	(0.338)
Ethnic group: Peul	0.24	0.36	0.16	0.00	-0.18	0.11	-0.10	0.58	-0.62
	(0.328)	(0.435)	(0.382)	(0.385)	(0.444)	(0.393)	(0.472)	(0.632)	(0.566)
Neigh==Vossa	0.73***	0.75***	0.76***	-0.83***	-0.58***	-1.20***	-0.24	-0.42**	-0.06
	(0.158)	(0.176)	(0.195)	(0.235)	(0.207)	(0.245)	(0.194)	(0.206)	(0.206)
Constant	-0.30	0.17	-0.02	-0.05	-0.23	-0.40	-1.29***	-2.20***	-1.02**
	(0.280)	(0.353)	(0.399)	(0.341)	(0.373)	(0.421)	(0.359)	(0.486)	(0.469)
Observations	788	425	363	788	425	363	788	425	363

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Individuals younger than 18 years are excluded

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Table 5. Determinants of participation in commitment devices

Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		All				Female				Male		
Panel A: Participation to rosca in 2006												
Hyperbolic	-0.55**	-0.60**	-0.70**	-0.62**	0.09	-0.01	-0.03	0.07	-0.61**	-0.58**	-0.70**	-0.68**
	(0.276)	(0.267)	(0.288)	(0.274)	(0.269)	(0.243)	(0.290)	(0.259)	(0.292)	(0.276)	(0.317)	(0.298)
Always patient	0.00		-0.15		0.05		-0.20		-0.07		-0.06	
	(0.139)		(0.163)		(0.198)		(0.216)		(0.205)		(0.246)	
Always impatient		-0.13		-0.04		-0.24		-0.10		-0.03		-0.04
		(0.144)		(0.167)		(0.211)		(0.227)		(0.208)		(0.252)
Member of rosca in 2004			1.45***	1.43***			1.27***	1.23***			1.66***	1.66***
			(0.146)	(0.146)			(0.207)	(0.206)			(0.214)	(0.215)
Female*Hyperbolic	0.64**	0.64**	0.72**	0.73**								
	(0.315)	(0.315)	(0.352)	(0.349)								
Female	0.15	0.12	0.42*	0.37								
	(0.202)	(0.199)	(0.234)	(0.227)								
Chi2 of hyp a	0.600	0.332	1.705	2.054								
Panel B: Participation to funeral group in 2006												
Hyperbolic	-0.14	-0.20	-0.07	-0.07	0.36	0.32	0.57*	0.55*	-0.09	-0.18	-0.04	-0.06
	(0.246)	(0.238)	(0.288)	(0.273)	(0.280)	(0.232)	(0.313)	(0.297)	(0.267)	(0.248)	(0.342)	(0.335)
Always patient	0.05		-0.06		0.04		-0.01		0.07		-0.10	
	(0.168)		(0.210)		(0.223)		(0.278)		(0.227)		(0.274)	
Always impatient		-0.10		-0.15		-0.07		-0.10		-0.13		-0.24
		(0.174)		(0.208)		(0.237)		(0.272)		(0.234)		(0.293)
Member of funeral group in 2004			2.04***	2.04***			2.14***	2.14***			2.44***	2.44***
			(0.174)	(0.173)			(0.251)	(0.251)			(0.258)	(0.273)
Female*Hyperbolic	0.53*	0.53*	0.67*	0.67*								
	(0.276)	(0.276)	(0.375)	(0.374)								
Female	0.31	0.30	0.77**	0.71**								
	(0.239)	(0.237)	(0.338)	(0.330)								
Chi2 of hyp a	5.289**	4.192**	10.77***	9.462***								
Panel C: Use of commitment device (rosca or funeral group) in 2006												
Hyperbolic	-0.44**	-0.50**	-0.47**	-0.43*	0.24	0.13	0.24	0.30	-0.53**	-0.50**	-0.61**	-0.50*
	(0.225)	(0.219)	(0.238)	(0.225)	(0.241)	(0.211)	(0.256)	(0.232)	(0.248)	(0.234)	(0.282)	(0.263)
Always patient	0.04		-0.09		0.09		-0.11		-0.05		-0.16	
	(0.137)		(0.156)		(0.186)		(0.202)		(0.201)		(0.228)	
Always impatient		-0.09		-0.03		-0.17		-0.03		0.00		0.03
		(0.145)		(0.163)		(0.193)		(0.205)		(0.207)		(0.240)
Member of rosca in 2004			1.03***	1.02***			1.01***	0.99***			1.01***	1.01***
			(0.155)	(0.155)			(0.215)	(0.215)			(0.218)	(0.218)
Member of funeral group in 2004			1.13***	1.13***			1.10***	1.09***			1.39***	1.39***
			(0.159)	(0.159)			(0.214)	(0.214)			(0.232)	(0.234)
Female*Hyperbolic	0.67**	0.67**	0.73**	0.73**								
	(0.263)	(0.263)	(0.296)	(0.295)								
Female	0.38**	0.37**	0.77***	0.74***								
	(0.192)	(0.189)	(0.226)	(0.220)								
Chi2 of hyp a	4.922**	4.188**	10.88***	11.84***								
Observations	788	788	693	693	425	425	360	360	363	363	333	333

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; *** 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.

Table 6. Tobit estimates of contributions to commitment devices

Tobit	1	2	3	4	5	6	7	8	9	10	11	12
			All				Female				Male	
Panel A: Contributution to rosca in 2006												
Hyperbolic	-13.69**	-15.18***	-15.34***	-14.72***	2.63	0.95	1.56	2.98	-14.49**	-15.93**	-15.25***	-16.49**
	(5.787)	(5.780)	(5.390)	(5.193)	(5.566)	(5.501)	(5.623)	(5.970)	(6.022)	(6.503)	(5.617)	(6.366)
Always patient	0.78		-1.69		0.86		-2.94		0.76		0.66	
	(2.748)		(2.764)		(3.670)		(3.828)		(4.211)		(4.048)	
Always impatient		-3.10		-1.25		-4.28		-1.77		-2.82		-2.37
		(2.901)		(2.937)		(3.958)		(3.893)		(4.348)		(4.287)
Member of rosca in 2004			21.81***	21.64***			16.99***	16.43***			26.37***	26.35***
			(3.738)	(3.719)			(4.128)	(4.026)			(6.561)	(6.529)
Female*Hyperbolic	16.42**	16.57**	17.35**	17.53**								
	(8.064)	(8.071)	(8.526)	(8.518)								
Female	1.45	1.08	4.77	4.13								
	(3.842)	(3.786)	(3.935)	(3.825)								
F-stat of hyp a	0.421	0.138	1.006	0.940								
Panel B: Contribution to funeral group in 2006												
Hyperbolic	-0.97	-1.20	-1.08	-1.03	2.00**	1.40**	2.17***	1.67**	-1.31	-1.31	-1.59	-1.10
	(1.153)	(1.023)	(1.279)	(1.026)	(0.792)	(0.686)	(0.696)	(0.678)	(1.468)	(1.208)	(1.679)	(1.236)
Always patient	-0.08		-0.57		0.58		0.45		-0.63		-1.45	
	(0.781)		(0.904)		(0.657)		(0.553)		(1.324)		(1.547)	
Always impatient		-0.90		-1.01		-0.75		-0.72		-1.19		-1.34
		(0.742)		(0.658)		(0.713)		(0.566)		(1.123)		(0.956)
Member of funeral group in 2004			5.44***	5.44***			4.06***	4.06***			6.20***	6.27***
			(0.834)	(0.824)			(0.465)	(0.466)			(1.186)	(1.185)
Female*Hyperbolic	3.02**	3.02**	3.52**	3.53**								
	(1.202)	(1.196)	(1.480)	(1.474)								
Female	1.32	1.18	2.02**	1.67*								
	(0.913)	(0.903)	(0.948)	(0.899)								
F-stat of hyp a	7.538***	6.304***	12.80***	11.56***								
Panel C: Contribution to commitment device in 2006												
Hyperbolic	-9.06***	-10.46***	-10.00***	-9.92***	4.38	2.31	4.17	4.37	-10.28***	-10.93***	-10.61***	-10.84***
	(3.284)	(3.302)	(3.175)	(3.014)	(4.143)	(4.001)	(4.309)	(4.540)	(3.696)	(3.982)	(3.529)	(3.826)
Always patient	1.03		-0.82		1.77		-0.89		0.04		-0.67	
	(2.015)		(1.971)		(2.523)		(2.542)		(3.136)		(2.959)	
Always impatient		-2.41		-1.34		-3.31		-1.32		-1.89		-1.92
		(2.122)		(2.086)		(2.659)		(2.581)		(3.136)		(3.042)
Member of rosca in 2004			13.37***	13.26***			10.67***	10.44***			14.99***	14.94***
			(2.313)	(2.305)			(2.762)	(2.715)			(3.576)	(3.542)
Member of funeral group in 2004			8.52***	8.56***			7.25***	7.22***			9.86***	9.95***
			(2.318)	(2.320)			(2.694)	(2.708)			(3.540)	(3.598)
Female*Hyperbolic	13.00***	13.06***	14.01**	14.10**								
	(5.009)	(5.000)	(5.708)	(5.694)								
Female	3.35	3.14	6.16**	5.69**								
	(2.801)	(2.764)	(2.912)	(2.837)								
F-stat of hyp a	2.225	1.355	3.848**	3.332*								
Observations	788	788	693	693	425	425	360	360	363	363	333	333

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; *** 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. The dependent variables are expressed in 1000 FCFA.

Table 7. Tobit estimates of frivoulous expenditure, as a share of total expenditure

Tobit Share of frivolous expenditure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All				Female				Male			
Hyperbolic	-0.03***	-0.03***	-0.03***	-0.03***	-0.01	-0.02***	-0.01	-0.02**	-0.03***	-0.03***	-0.03***	-0.03***
	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)
Always patient	0.00		0.00		0.01*		0.01**		-0.01		-0.00	
	(0.006)		(0.005)		(0.007)		(0.006)		(0.007)		(0.007)	
Always impatient		0.00		-0.00		-0.01		-0.01*		0.01		0.00
		(0.007)		(0.006)		(0.008)		(0.007)		(0.008)		(0.007)
==1 if member of rosca or CMB in 2004			-0.01**	-0.01**			-0.01	-0.01			-0.01**	-0.01**
			(0.004)	(0.004)			(0.006)	(0.006)			(0.005)	(0.005)
Female	-0.04***	-0.04***	-0.04***	-0.04***								
	(0.007)	(0.007)	(0.006)	(0.006)								
Female*Hyperbolic	0.01	0.01	0.02	0.02								
	(0.013)	(0.013)	(0.012)	(0.012)								
In couple	-0.02*	-0.02*	-0.02*	-0.02*	0.00	0.00	0.01	0.01	-0.02	-0.02	-0.01	-0.01
	(0.009)	(0.009)	(0.009)	(0.009)	(0.017)	(0.017)	(0.016)	(0.016)	(0.010)	(0.010)	(0.010)	(0.010)
Income	-0.00	-0.00	0.00	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)	(0.000)	(0.000)	(0.000)
Income squared	0.00	0.00	-0.00	-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)	(0.000)	(0.000)	(0.000)
Female share of couple income	0.06	0.06	0.05	0.05	0.17***	0.18***	0.15**	0.15**	-0.00	-0.01	-0.01	-0.01
	(0.040)	(0.039)	(0.040)	(0.040)	(0.065)	(0.064)	(0.063)	(0.063)	(0.043)	(0.044)	(0.043)	(0.044)
Female share of couple income squared	-0.05	-0.04	-0.05	-0.04	-0.11*	-0.11*	-0.09	-0.09	0.01	0.01	0.00	0.00
	(0.040)	(0.040)	(0.040)	(0.040)	(0.064)	(0.063)	(0.061)	(0.062)	(0.051)	(0.052)	(0.048)	(0.049)
Age	-0.00***	-0.00***	-0.00***	-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)	(0.000)	(0.000)	(0.000)
Secondary school or above	-0.00	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00
	(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)
Same job for 24 months or more	0.01	0.01	0.01	0.01	-0.00	-0.00	-0.00	-0.00	0.01	0.01	0.01	0.01
	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Salaried	0.02***	0.02***	0.02***	0.02***	0.02	0.02	0.02**	0.02*	0.02***	0.02***	0.02***	0.02***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.011)	(0.010)	(0.011)	(0.010)	(0.006)	(0.006)	(0.006)	(0.006)
House owner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Household size	-0.00	-0.00	-0.00	-0.00	0.00*	0.00*	0.00**	0.00**	-0.00	-0.00	-0.00	-0.00
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.06***	0.06***	0.05***	0.06***	-0.01	-0.00	-0.02	-0.01	0.04**	0.04*	0.05**	0.05**
	(0.019)	(0.017)	(0.019)	(0.018)	(0.021)	(0.020)	(0.017)	(0.018)	(0.021)	(0.020)	(0.020)	(0.019)
Ethnic group and location effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	788	788	693	693	425	425	360	360	363	363	333	333

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8. IV estimates of frivolous expenditure, as a share of total expenditure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All				Female				Male			
Panel A: Share of frivolous expenditure				IV; Instrument: Funeral expenditure								
Hyperbolic	-0.02***	-0.02***	-0.02***	-0.02***	-0.01*	-0.01***	-0.00	-0.01**	-0.02***	-0.01***	-0.02***	-0.02***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.003)	(0.006)	(0.005)	(0.006)	(0.005)
Always patient	0.00		0.00		0.00		0.01		-0.00		-0.00	
	(0.004)		(0.003)		(0.004)		(0.003)		(0.005)		(0.005)	
Always impatient		0.00		0.00		-0.00		-0.00		0.01		0.00
		(0.004)		(0.004)		(0.004)		(0.004)		(0.006)		(0.006)
==1 if member of rosca or CMB in 2004			-0.00	-0.00			-0.00	-0.00			-0.01*	-0.01*
			(0.003)	(0.003)			(0.004)	(0.004)			(0.004)	(0.004)
Female	-0.02***	-0.02***	-0.02***	-0.02***								
	(0.004)	(0.004)	(0.004)	(0.004)								
Female*Hyperbolic	0.01	0.01	0.01**	0.01**								
	(0.006)	(0.006)	(0.006)	(0.006)								
Cragg-Donald F statistic	50.55	51.06	37.31	37.64	14.43	14.69	8.665	8.827	25.63	25.76	20.76	20.80
Observations	788	788	693	693	425	425	360	360	363	363	333	333
Panel B: Share of frivolous expenditure				IV; Instrument: Income in 2004								
Hyperbolic	-0.02***	-0.02***	-0.02***	-0.02***	-0.00	-0.01**	-0.00	-0.01**	-0.02***	-0.02***	-0.02***	-0.02***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.003)	(0.006)	(0.005)	(0.006)	(0.005)
Always patient	0.00		0.00		0.01		0.01		-0.00		-0.00	
	(0.003)		(0.003)		(0.003)		(0.003)		(0.005)		(0.005)	
Always impatient		0.00		0.00		-0.00		-0.00		0.00		0.00
		(0.004)		(0.004)		(0.004)		(0.004)		(0.006)		(0.006)
==1 if member of rosca or CMB in 2004			-0.00**	-0.00*			-0.00	-0.00			-0.01**	-0.01*
			(0.002)	(0.002)			(0.003)	(0.003)			(0.003)	(0.003)
Female	-0.02***	-0.02***	-0.02***	-0.02***								
	(0.004)	(0.004)	(0.004)	(0.004)								
Female*Hyperbolic	0.01**	0.01**	0.01**	0.01**								
	(0.006)	(0.006)	(0.006)	(0.006)								
Cragg-Donald F statistic	164.9	164.3	160.0	159.3	87.77	88.03	73.43	73.01	76.33	76.00	76.95	76.61
Observations	693	693	693	693	360	360	360	360	333	333	333	333
Panel C: Share of frivolous expenditure				IV; Instruments:Funeral expenditure and Income in 2004								
Hyperbolic	-0.02***	-0.02***	-0.02***	-0.02***	-0.00	-0.01**	-0.00	-0.01**	-0.02***	-0.02***	-0.02***	-0.02***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.003)	(0.006)	(0.005)	(0.006)	(0.005)
Always patient	0.00		0.00		0.01		0.01		-0.00		-0.00	
	(0.003)		(0.003)		(0.003)		(0.003)		(0.005)		(0.005)	
Always impatient		0.00		0.00		-0.00		-0.00		0.00		0.00
		(0.004)		(0.004)		(0.004)		(0.004)		(0.006)		(0.006)
==1 if member of rosca or CMB in 2004			-0.00*	-0.00*			-0.00	-0.00			-0.01*	-0.01*
			(0.002)	(0.002)			(0.003)	(0.003)			(0.003)	(0.003)
Female	-0.02***	-0.02***	-0.02***	-0.02***								
	(0.004)	(0.004)	(0.004)	(0.004)								
Female*Hyperbolic	0.01**	0.01**	0.01**	0.01**								
	(0.006)	(0.006)	(0.006)	(0.006)								
Cragg-Donald F statistic	92.07	91.94	89.60	89.43	45.80	46.01	38.44	38.29	43.21	43.08	43.92	43.78
Hansen J statistic	0.146	0.118	0.189	0.155	0.0276	0.0646	0.0255	0.0625	0.000333	0.000451	0.00674	0.00621
p-value of Hansen J statistic	0.703	0.731	0.664	0.694	0.868	0.799	0.873	0.803	0.985	0.983	0.935	0.937
Observations	693	693	693	693	360	360	360	360	333	333	333	333

Note: Robust standard errors in parenthesis. For the whole sample standard errors are also clusters at household level; *** $p<0.01$, ** $p<0.05$, * $p<0.1$; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Individuals younger than 18 years are excluded. All regressions include the following set of controls: female (only for whole sample), in couple, age, secondary school or above, same job for 24 months or more, salaried, household size, ethnic group and location dummies

Table 9. Probit estimates of borrowing

Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Loan from IMF						Loan from IMF and itinerant bankers			
	All		Female		Male		All		Female		Male	
Hyperbolic	-0.26	0.08	0.23	0.54**	-0.37	-0.01	0.04	0.31	0.41*	0.68***	0.10	0.14
	(0.384)	(0.364)	(0.256)	(0.240)	(0.526)	(0.440)	(0.320)	(0.302)	(0.222)	(0.205)	(0.407)	(0.362)
Always patient	-0.42**		-0.36		-0.46		-0.33**		-0.34*		-0.10	
	(0.185)		(0.219)		(0.331)		(0.164)		(0.184)		(0.328)	
Always impatient		0.34*		0.30		0.28		0.23		0.23		-0.03
		(0.197)		(0.217)		(0.341)		(0.170)		(0.187)		(0.331)
Female*Hyperbolic	0.48	0.49					0.36	0.37				
	(0.439)	(0.436)					(0.362)	(0.360)				
Female	0.68**	0.66**					1.14***	1.12***				
	(0.319)	(0.315)					(0.314)	(0.312)				
In couple	-0.02	-0.02	0.12	0.12	0.80	0.72	0.43	0.43	0.33*	0.33**	0.96**	0.93**
	(0.321)	(0.317)	(0.192)	(0.190)	(0.547)	(0.529)	(0.303)	(0.300)	(0.167)	(0.165)	(0.468)	(0.461)
Female*In couple	0.29	0.27					-0.11	-0.12				
	(0.359)	(0.358)					(0.341)	(0.338)				
Income	0.02***	0.02***	0.02***	0.02***	0.04***	0.04***	0.01***	0.01***	0.01**	0.01**	0.03***	0.03***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.011)	(0.011)	(0.004)	(0.004)	(0.006)	(0.005)	(0.009)	(0.009)
Income squared	-0.00***	-0.00***	-0.00**	-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)	(0.000)	(0.000)	(0.000)
Age	0.02**	0.02**	0.02**	0.02**	0.01	0.02	0.02***	0.02***	0.02***	0.02***	0.02	0.02
	(0.007)	(0.007)	(0.008)	(0.008)	(0.015)	(0.015)	(0.005)	(0.005)	(0.006)	(0.006)	(0.013)	(0.013)
Secondary school or above	-0.13	-0.13	0.01	0.02	-0.73*	-0.79*	0.20	0.20	0.44*	0.45**	-0.73**	-0.77**
	(0.203)	(0.203)	(0.245)	(0.243)	(0.399)	(0.415)	(0.166)	(0.166)	(0.225)	(0.222)	(0.337)	(0.351)
Same job for 24 months or more	-0.01	0.02	-0.06	-0.03	0.38	0.40	0.23	0.25	0.20	0.23	0.73	0.75
	(0.219)	(0.221)	(0.240)	(0.242)	(0.482)	(0.474)	(0.195)	(0.195)	(0.214)	(0.214)	(0.500)	(0.498)
Salaried	0.10	0.11	-0.44	-0.46	0.49	0.55	-0.23	-0.22	-0.97**	-1.00**	0.26	0.28
	(0.225)	(0.227)	(0.452)	(0.454)	(0.337)	(0.358)	(0.217)	(0.220)	(0.450)	(0.451)	(0.294)	(0.307)
House owner	0.21	0.20	0.30	0.31	-0.05	-0.08	-0.03	-0.03	-0.09	-0.09	0.16	0.16
	(0.271)	(0.269)	(0.307)	(0.305)	(0.431)	(0.421)	(0.249)	(0.248)	(0.232)	(0.232)	(0.377)	(0.382)
Household size	0.03	0.03	0.04	0.05	-0.04	-0.03	-0.00	0.00	0.01	0.02	-0.08	-0.08
	(0.026)	(0.026)	(0.032)	(0.031)	(0.050)	(0.048)	(0.029)	(0.028)	(0.031)	(0.031)	(0.058)	(0.057)
Constant	-3.61***	-3.97***	-2.84***	-3.18***	-5.58***	-5.93***	-3.51***	-3.79***	-2.41***	-2.72***	-5.57***	-5.61***
	(0.502)	(0.505)	(0.455)	(0.481)	(1.236)	(1.221)	(0.455)	(0.481)	(0.413)	(0.428)	(1.093)	(1.054)
Ethnic group and location effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	788	788	425	425	363	363	788	788	425	425	363	363
Chi2 stat for hyp a	5.278**	9.117***					16.44***	21.62***				

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Hyp a: the sum of coefficients of hyperbolic, female and female*hyperbolic is equal to zero.
Individuals younger than 18 years are excluded.The dependent variables are dummies which equalo ne if the individual has a loan at IMF or a loan in general with regular instalments for repayment

Table 10. Determinants of rosca participation

Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Rosca Participation 2006		All				Female				Male		
Hyperbolic	-0.52*	-0.58**	-0.70**	-0.62**	0.07	-0.03	-0.02	0.08	-0.63**	-0.61**	-0.73**	-0.70**
	(0.279)	(0.268)	(0.291)	(0.274)	(0.270)	(0.240)	(0.287)	(0.256)	(0.292)	(0.275)	(0.321)	(0.295)
Always patient	0.03		-0.14		0.06		-0.20		-0.04		-0.06	
	(0.139)		(0.164)		(0.198)		(0.218)		(0.204)		(0.250)	
Always impatient		-0.14		-0.04		-0.24		-0.09		-0.02		-0.01
		(0.145)		(0.169)		(0.211)		(0.229)		(0.210)		(0.259)
Member of rosca in 2004			1.47***	1.46***			1.31***	1.27***			1.67***	1.68***
			(0.150)	(0.149)			(0.213)	(0.211)			(0.213)	(0.213)
Female*Hyperbolic	0.58*	0.58*	0.71**	0.71**								
	(0.316)	(0.316)	(0.352)	(0.350)								
Female	0.37	0.36	0.60*	0.58*								
	(0.310)	(0.308)	(0.357)	(0.351)								
In couple	0.09	0.07	0.19	0.14	-0.31	-0.30	-0.37	-0.37	-0.00	-0.02	0.25	0.23
	(0.258)	(0.257)	(0.292)	(0.288)	(0.395)	(0.395)	(0.440)	(0.433)	(0.376)	(0.372)	(0.433)	(0.427)
Female*In couple	-0.25	-0.24	-0.33	-0.32								
	(0.298)	(0.297)	(0.341)	(0.337)								
Income	0.03***	0.03***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.03***	0.03***	0.02***	0.02***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)
Income squared	-0.00***	-0.00***	-0.00***	-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)	(0.000)	(0.000)	(0.000)
Female share of couple income	-0.76	-0.71	-0.66	-0.59	0.51	0.50	0.98	0.92	1.83	1.88	0.46	0.49
	(1.099)	(1.099)	(1.195)	(1.185)	(1.709)	(1.718)	(1.796)	(1.787)	(2.319)	(2.332)	(2.476)	(2.471)
Female share of couple income squared	0.41	0.34	0.43	0.33	-0.59	-0.58	-1.01	-0.98	-4.60	-4.65	-3.10	-3.13
	(1.166)	(1.167)	(1.272)	(1.265)	(1.660)	(1.668)	(1.760)	(1.747)	(3.767)	(3.808)	(3.947)	(3.956)
Age	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.010)	(0.010)
Secondary school or above	-0.24	-0.24	-0.27	-0.27	-0.28	-0.27	-0.19	-0.16	-0.14	-0.14	-0.41	-0.42
	(0.156)	(0.157)	(0.176)	(0.176)	(0.231)	(0.236)	(0.266)	(0.271)	(0.218)	(0.218)	(0.254)	(0.254)
Same job for 24 months or more	0.04	0.05	0.04	0.06	-0.22	-0.21	-0.25	-0.23	0.30	0.31	0.37	0.38
	(0.154)	(0.155)	(0.182)	(0.182)	(0.223)	(0.223)	(0.244)	(0.242)	(0.245)	(0.246)	(0.299)	(0.301)
Salaried	0.06	0.07	-0.12	-0.12	-0.81*	-0.84*	-0.87	-0.92	0.18	0.19	0.05	0.05
	(0.175)	(0.175)	(0.195)	(0.196)	(0.464)	(0.465)	(0.568)	(0.570)	(0.209)	(0.210)	(0.243)	(0.244)
House owner	-0.04	-0.04	-0.17	-0.19	-0.03	-0.03	-0.21	-0.21	-0.05	-0.06	-0.18	-0.19
	(0.160)	(0.159)	(0.186)	(0.184)	(0.231)	(0.229)	(0.262)	(0.255)	(0.236)	(0.236)	(0.275)	(0.274)
Number of dependent	0.02	0.02	-0.05	-0.05	0.05	0.05	-0.05	-0.04	-0.04	-0.04	-0.05	-0.04
	(0.031)	(0.031)	(0.037)	(0.036)	(0.044)	(0.044)	(0.050)	(0.050)	(0.048)	(0.048)	(0.053)	(0.052)
Ethnic group and location F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.64***	-1.55***	-1.78***	-1.80***	-1.25***	-1.14**	-1.05**	-1.13**	-2.17***	-2.18***	-2.43***	-2.45***
	(0.331)	(0.335)	(0.379)	(0.392)	(0.473)	(0.495)	(0.524)	(0.541)	(0.486)	(0.499)	(0.691)	(0.730)
Observations	788	788	693	693	425	425	360	360	363	363	333	333

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Appendix : 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 lot 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 clockwise 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. We compensated every household for their precious time by donating around 1000 francs CFA. Finally, we attended regular meetings or met members of their governing body in order to get a better understanding of roscas and funeral groups functioning.

An initial survey of 497 households was carried out in spring 2004 which focused on informal groups memberships but did not included questions related to time preferences. A follow-up on 386 households was done during spring 2006. It allowed us to collect panel data and we included a section on eliciting time preferences. Given the availability of variables on time preferences, our paper is based on the cross-section information contained in the 2006 survey. Some information from the 2004 survey is used for instrumenting income in the section 'Pattern of frivolous expenditures' (Table 8) and to control for past memberships (roscas and funeral groups) in Tables 5, 6 ,7 and 9. By looking at our different variables no pattern emerges when we compared households which were lost due to attrition between the two waves and the ones we could survey a second time in 2006.

Chapter 2

2. Impact Evaluation of Insurance Literacy and Marketing Treatments on the Demand for Health Microinsurance in Senegal

Abstract

Mutual health organizations (MHOs) have been present in the city of Thiès in Senegal for years. Despite their benefits, in some areas take-up rates remain low. We offer an insurance literacy module, which communicates the benefits of health microinsurance and the functioning of MHOs to a randomly selected sample of households in the city of Thiès. The effects of this training and three cross-cutting marketing treatments, are evaluated using a randomized control trial. The results from our various marketing treatments indicate that although liquidity constraints significantly reduce demand, they have a positive and significant effect on health insurance adoption, increasing take-up by around 35%. The insurance literacy module has a negligible impact on the take up decisions and we attempt to provide different contextual reasons for this result.

1. Introduction

Poor people in developing countries face high costs when accessing health care and need to insure themselves against health shocks. However, given that formal health insurance is prohibitively expensive, they must often, with proven success, use informal ways of insuring themselves (see among many others Makinen et al. 2000, Fafchamps et al. 2003). The imperfect nature of this informal insurance entails severe consequences for their aptitudes in dealing with risk, smoothing their consumption and the formation of human capital (Gertler and Gruber, 2002). Indeed health shocks lead to direct expenditures for medicine and treatment, which typically require out-of-pocket payments (OOP) and also entail indirect costs related to a reduction in productivity. One WHO study (WHO; 2007) estimated that OOP payments can often exceed 50% of total health care spending in some low-income countries (particularly for some African nations), where national health systems are still nascent at best and only a small proportion of the population own private health insurance.

Public health funding in Senegal has remained stable over recent years while overall per capita health expenditures have been increasing in the same period (World Bank, WDI). The lessening of the state's ability to meet health care needs has rendered it unable to provide universal insurance for the population. This has led to the emergence of many community-based health insurance schemes (CBHIS) in Senegal. At the same time, the market has been ineffective in providing health insurance to low-income people, even in urban environments. Private insurers are often faced with significant adverse selection problems and high transaction costs, rendering the cost of their contracts prohibitive to many. Poor people can thus only resort to expedient transfers from relatives, self-insurance (selling assets, using precautionary savings, etc.) or health insurance schemes rooted in local organizations. CBHIS are expected to play an important role in health protection and universal coverage strategies and policies in certain African countries (Diop et al. 2006). They offer a form of insurance that allows members to pay regular affordable premiums to reduce OOP payments for healthcare upon falling ill. These schemes vary in design and implementation but are all not-for-profit organizations based on voluntary participation, underpinned by the concepts of mutual aid and social solidarity at the community level.

The literature analysing the factors influencing demand for CBHIS, based on household data, has burgeoned in recent years; Jütting (2003), Berthelet (2005), Smith et al. (2008) and Ito and Kono (2010) represent just a few such empirical studies in developing countries. Our project aims to complement this literature by incorporating randomized control trials of the impact of insurance literacy and marketing options on the demand for health insurance from households.

A pilot project in the village of Fandene in 1990 (in the vicinity of Thiès), spurred the expansion of CBHIS in the region and at the national level (Jütting, 2003). CBHIS are locally known as '*mutuelles de santé*' or mutual health organizations (MHOs). The number of MHOs in Senegal grew from 13 in 1993 to more than 140 in 2007. The first law defining the juridical framework of MHOs was issued in 2003 and a strategic plan for the development of MHOs (Plan Stratégique de Développement des Mutuelles de Santé) was initiated by the Minister of Health in 2004. Despite this growth, estimates from 2004 show that the take-up rate in the greater region of Thiès, which is composed of three departments: Thies, Tivaouane, and Mbour, was close to a mere 5% (Smith et al., 2008).

Recent studies have used randomized control trials to look at the role of financial literacy and marketing on the take-up of rainfall insurance products (Cole et al., 2013; Gaurav et al., 2011). The primary contribution of this paper is that it is one of just a handful to investigate the roles that such literacy and marketing have on the take-up of health microinsurance (see Thornton et al. 2010, Dercon et al. 2011). In particular, we investigate the roles played by a lack of knowledge of these MHOs and a lack of financial literacy amongst locals. We also investigate the effect of marketing techniques that alleviate the potential financial barriers to entry. We surveyed 360 randomly selected households across the city and from this, half of the sample was offered an insurance literacy training program. Independent of this assignment, all 360 households were randomly selected to receive one of three marketing treatments. These treatments took the form of redeemable vouchers, described in greater detail below, offering different monetary compensations upon joining an MHO. We find that our various marketing treatments have a positive and significant effect on health insurance adoption, increasing take-up by 35% for the overall sample. By interacting the marketing treatments with income we find that this effect is significant only for the households in the two poorest income quintiles. Comparatively, the

insurance literacy module has a negligible impact on the take up decisions. We attempt to provide different contextual reasons for these results, which indicate that liquidity constraints and not lack of information hinder demand.

The next section elaborates on various reasons explaining low take-up rates in the context of our study. Section 3 presents the supply side of health microinsurance in Thiès. Section 4 describes our survey and offers descriptive statistics. This is followed by a presentation of the study design in Section 5. Section 6 introduces the empirical strategy taken, followed by a discussion of our results in Section 7. Section 8 concludes.

2. Explaining low take-up rates

Our sample of 360 heads of households shows that 32% of them have health insurance of various forms, for all or a fraction of their members (on average 73% of all household members). The largest share (19%) represents households which have health insurance compulsorily provided by their employer in both public and private sectors. Only 3% of the households subscribe to a private health insurer while membership in MHOs appears relatively modest at 10%. The next section elaborates on each of these health insurance products.

Such low take-up rates of health insurance are expected to have effects on the use of health facilities. Scheil-Adlung et al. (2006), referring to Senegal, report that most people (85%) in the poorest income quintile state that economic constraints are the main reason for not seeking care, while unavailability of health services and facilities is secondary. This may at least partly explain why health providers using modern medical means often compete against the relatively cheaper services provided by traditional healers (*marabou*). Indeed, 45% of respondents in our sample declared to consult traditional healers (but non-exclusively) for minor health problems such as headaches, stomach ache or toothache. Conversely, a little over 55% declared to make use of modern medicine only. There appears to be an overall willingness to use modern means on the part of the heads of households as they are widely perceived as more efficient. To the question: 'in case of health problem related to malaria in your household, how much are you likely, out of ten, to use the services of a traditional healer?', only 11% gave 6 or more as an answer. Despite this, and the relatively high costs of modern medical means, we find a low MHO take up rate.

In our sample, the main justifications mentioned for lack of membership to MHOs were linked to the following: lack of information about the products they offer and their existence (55%); liquidity constraints (16%)[1]; lack of interest (5%); and lack of trust and confidence (2%). Our investigation focuses on what appears to be the two most important reasons at play, in our context, in explaining low take-up rates. Our cross-cutting treatments (discussed in detail in Section 5) are designed and implemented accordingly.

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[1] It is likely that individuals in our sample were reluctant to admit lack of funds to justify the fact that they were not members. This figure may thus be biased downward.

2.1 Lack of information

Cai et al. (2009) highlight that many farmers in China refuse to purchase heavily subsidized insurance, partly due to the fact that some are unaware programs on offer. Jütting (2003), whose evidence is drawn from a rural region surrounding Thiès, notes that the concept of insurance is alien to a large proportion of people, suggesting that an information campaign might be useful in this respect. A related issue is the lack of knowledge and understanding of insurance principles (Chankova et al. 2008); referring to rainfall insurance in India, Giné et al. (2007) report that 'the most common reason given by those interviewed was that they did not understand the product'. Limited understanding of rainfall insurance mechanisms in rural India is also highlighted by Cole et al. (2013) and Gaurav et al. (2011). Pratt et al. (2010) show similar evidence with their sample of observations on Ethiopian and Malawi farmers.

2.2 Liquidity constraint

Whether poor populations can afford microinsurance schemes is a crucial question. Jütting (2003) finds that the poorer segment of the population is represented to a lesser extent than people with an average or high income in MHOs. Chankova et al. (2008) find similar results using data from Ghana, Mali and Senegal. Giné et al. (2008) also show that take-up rates of rainfall insurance increases with household wealth in rural Andhra Pradesh. Cole et al. (2013) explain low take-up rates of rainfall insurance by, among others, the fact that the insurance is expensive.

The fact that liquidity constraints are mentioned by only 16% of individuals in our survey as the reason for their non-membership does not come as much of a surprise, especially if we compare their willingness to pay (WTP) to the actual premiums imposed by MHOs. Based on the same dataset used for this paper, Bonan (2013) applies the contingency valuation method to measure the uninsured respondents' WTP for MHOs' premiums and the number of individuals from their household they are willing to insure at that price. With an average of about 300 CFAF (1 USD is approximately equal to 500 CFAF), WTP is similar to the average premiums of a subset of prevailing MHOs for which we have information. Lack of means could also imply that credit constraints are an obstacle for individuals to pay for the initial membership fees. We discuss this issue below in light of our estimation results.

2.3 Lack of Trust

Trust can also play an important role in individual decision-making with regards insurance. Cai et al (2009) show that the very low take-up by Chinese farmers of a government sponsored insurance for sows may be explained, among other reasons, by the lack of trust toward governmental institutions. Cole et al. (2013) show that endorsement from a third party makes people 40% more likely to purchase rainfall insurance. Dercon et al. (2011) suggest that limited credibility of the insurer contributes to reduce the demand for insurance.

Trust is likely to play an important role in both the sustainability of MHOs and their capacity to attract new members. Recent history in Thiès has shown that some rare MHOs have ceased their activities or been temporarily unable to provide their members with insurance (Ferrera-Domingo,

2002) lists some cases of defaulting MHOs). As claimed by Karlan (2005), answers on trust in General Social Surveys have predictive power on financial decisions at the household level, such as repayment rates and saving patterns, and are a good proxy of the capacity to enter into binding relationships. A set of questions in our questionnaire were related to this issue. We asked individuals to weight their trust on different items by putting aside marbles out of a maximum of ten on an increasing scale. Each answer was rescaled with regards the trust given to the mother and the family respectively. For the sample of non-members who were aware of the existence of MHOs, we find that in both cases the median relative trust on MHOs given was eight out of ten. This tends to show that these grassroots movements benefit from a largely positive *a priori* knowledge from locals and appear as trustworthy. This might explain why trust does not appear to be an important factor in explaining the low take-up rates observed.

3. The supply side

Health care in Thiès is organized according to a tiered system consisting of health huts (staffed by community health workers), health posts (staffed by nurses and certified midwives), and health centres (staffed by medical doctors, nurses, and certified midwives). The health district of Thiès has one regional public hospital and one privately run mission hospital (St-Jean de Dieu). Data for this region shows that the ratio of inhabitants to health centres is seven times greater than WHO standards, but the ratio of inhabitants to health posts is in line with international norms (ANSD, 2008).

As mentioned above, in the absence of universal public health care[2], only three forms of health insurance are present in our sample. The first, and of relatively little importance, is offered by private insurers. They provide insurance according to different scales and often require their clients to open a saving account within their own institution (PAMECAS, SALAMA and Crédit Mutuel du Sénégal). The second type refers to compulsory insurance provided by employers with a minimum number of employees. Employees contribute a fraction of their wage to their firms' health fund known as *Institution de Prévoyance Maladie* (IPM), which is then used for partial cover when health problems occur. Public servants have access to a more generous type of IPM where they, their spouse and often up to two children (under 18), are partially insured in case of health related expenditures. The third type consists of MHOs. Their appeal lies in the fact that they require the payment of affordable monthly premiums, mostly ranging from 150 to 350 FCFA per person covered[3]. MHOs are particularly attractive to the large numbers of self-employed and informal sector workers who are price discriminated against by private insurers. The MHOs we surveyed did not operate any selection amongst potential candidates. The only screening involved takes the form of a 'period of observation' that is imposed by all MHOs. Once new members have paid their membership fees they are asked to contribute for three months, during which they are not entitled to any claim. This three-month period is designed to minimize adverse selection by testing if new members can commit to a strict monthly schedule of contributions. Any arrears on premiums can lead to exclusion for that member from coverage

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[2] There exists an ill-functioning insurance for individuals aged higher than 60. Various reports from users and hospital workers have indicated that this programme, known as CESAME, is delivering very little results.
[3]Out of the 37 households already member: monthly contribution to MHOs amounts to 1.2% of the head of household's income

by the MHO. Whilst the rules are strict, the administrators of some MHOs have admitted allowing for a degree of flexibility. These not-for-profit, grassroots schemes are managed by a non remunerated governing body headed by a president and have written rules. Members are expected to pay their premiums during a monthly visit to the finance officer who occasionally organizes a collection for late payments. Upon entry, new members must pay fixed membership fees covering the costs of registering. This includes receipt of a booklet listing all household members being registered which acts as an official document when visiting a health provider.

Most MHOs cover primary care offered at health huts, posts and centres (Diop, 2005). Data from 2004 show that MHOs covered approximately 62000 individuals or 4.8% of the whole region of Thiès population (Smith et al. 2008)[4]. The different MHOs covering the city are relatively well spread across its territory so that most neighbourhoods have access to one. There is no obligation to join the closest MHO and one can opt for any MHO. Differences with respect to their insurance schemes are minor. For these reasons we consider distance to the headquarters of the closest MHO as unlikely to have explanatory power over take-up.

Once insured by one of the three schemes described above, members can directly access specified health facilities and are required to pay a fraction of the fees. The remainder of the fees are covered by the insurer. Such transactions have at their core agreements (or conventions) negotiated between each respective health provider (huts, posts or the two centres) and MHOs operating in Thiès. As such the agreement of the insurer, prior to a consultation or the treatment of a particular patient, is not required. The array of interventions covered and the extent of the coverage varies from one MHO to the other. However they generally cover 25-75% of consultation costs and between 50-100% of medical exams, hospitalizations, and various inpatient care fees at both the regional and St-Jean de Dieu hospitals.

As IPMs do not offer full coverage for consultation or inpatient care and do not cover all members of a household, there is ample scope to complement this coverage with that of an MHO. Twenty-one households (9% of all households exposed to the marketing treatment) responded positively to our marketing treatment, even if they already had a form of health insurance (see section 6 for more details on this). This suggests the intention to either complement existing means of insurance or to cover additional members of the household, kin or both. In particular, of the 21 households, seven complemented an IPM insurance, 11 an existing MHO insurance and three another private form of health insurance.

4. Our survey

In early 2010 we developed a partnership with GRAIM (Groupe recherche d'appui aux initiatives mutualistes), a Senegalese NGO promoting the work of local MHOs active in greater Thiès. GRAIM was initiated in 1997 by the Ministry of Health and Prevention as part of the Ministry's first program to support MHOs. As such, GRAIM acts as a regional coordinator and

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[4] Smith and Sulzbach (2008) present data of 2004 which refer to the region of Thies, which is composed by three departments: Thies,Tivaouane, and Mbour. The reported rate of MHO membership is lower than what we found for the city of Thies (10%). However, the spread of MHO initiatives in the last decade and its higher density in urban context may justify such difference.

the intermediary for most MHOs in negotiating conventions with health providers. This partnership meant we could draw on its knowledge to design and deliver our educational modules. Thiès was chosen for two main reasons. Firstly, it is one of the largest cities in Senegal with a population of about 240,000 inhabitants. Secondly, some of the local MHOs are the oldest in Senegal, having been active for fifteen years; as such the city possesses a well established supply of MHOs.

We use data collected during the spring of 2010 on 360 randomly selected households across the whole territory covered by the city authorities, which represents an area of approximately 20 square km. We sampled the number of surveyed households across all fifteen Thiès neighbourhoods according to their respective share of the overall population estimates (based on the 2002 census). An official map of the city was used to select a number of streets spread across each neighbourhood. Each street was assigned a number of households according to its length and density. For every street we used a pseudo-random process by which every fifth lot according to a specific direction was picked. Since many households live on the same lot in semi-detached rooms, enumerators randomly selected one room by lot according to a clock-wise selection varying from lot to lot. In the case where a lot was found empty or the head of household was not present, enumerators were instructed to set appointments and revisit the household later[5]. Given the small number of households sampled from such a relatively large area, we argue that spillovers within the sample are unlikely.

Our baseline survey aimed to obtain information on each household member's religion, level of education and health problems (sickness and chronic diseases). We also gathered information from the head of household concerning work, income, and a number of other factors which we describe below in greater detail. In the context of the households we surveyed, and this can safely be extended to the broader national level, the husband is generally considered to be the breadwinner and the head of the house. As such he is expected to provide insurance for the members of his household. This should provide ample justification as to why we collected these key variables affecting health insurance intake from the head. In what follows we therefore use data at the household level.

In order to carry out our survey, we employed twelve local, independent and qualified enumerators who conducted the survey in local language (wolof). All enumerators had previous experience with surveys and field work and received 2 days training in survey design and questionnaire administration by the research team.

[Table 1 here]

Table 1 reports summary statistics for the main socio-economic characteristics we consider in our study and which will be included in our empirical estimations. The majority of household heads are male and live in a couple. The average household comprizes over six members. 46% of heads attended secondary school or had higher levels of education (above six years of schooling). We measure the extent to which people know about principles of health insurance through a

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[5] Random controls by senior enumerator were implemented in order to limit enumerators potential discretionary selection

series of seven true-false questions[6]. We sum up correct answers in an index ranging from 0 to 7. Average score is 2.25, however it is very polarized, as 52% scored zero or could not answer to any question, whereas 43% scored 4 or above. As mentioned previously, 32% of the sample already has some form of insurance. In particular, 19% are member of IPM, 10% already belong to some MHO, 3% have a private health insurance. Household head's income is used as a proxy for households' economic welfare. It represents the sum of all sources of monthly income (labour income or wage, rent and received transfers). Due to the sensitivity of questions related to income, and the reticence to provide exact amounts, answers were in most cases (68% of all answers) collected according to intervals. An aggregated measure of income was constructed by adding the midpoint values for the ten income intervals, or exact values when given, to rents and transfers. The mean of monthly head of household income is 133591 CFA (this represents around 270 USD given the current exchange rate of 1 USD for 500 CFA). Another variable (household's income) was similarly computed by adding spouse's income (mean of 222340 CFA). We then categorized both of these variables into quintiles. Our results are robust to the use of this variable instead. We also computed a synthetic measure of durable assets owned by the households as a proxy for wealth. This represents the sum of a list of items comprising, amongst others, a series of kitchen and home appliances, mobile phone, bicycle, motorcycle, car, sewing machine, different pieces of furniture, etc. We also computed a wealth index based on principal component analysis. As a proxy for income stability we use a dummy identifying if the head of household is working for a public institution. We also include a dummy for self-employed individuals (the benchmark group are employed by private firms)[7]. The intuition is that with respect to wages earned in informal activities (petty retailing, craftsmen, transport, etc.), public servants and formal employees of the private sector are likely to have a steadier stream of income and thus find it easier to commit to the payment of monthly premiums. Around 20% of heads in our sample work for the state. We also measure with dummy variables if households are using one of three saving devices: ROSCAs, banks, or microfinance institutions. Having access to a saving device might help a household to buffer health shocks by alleviating credit constraints and may render MHOs less attractive. Alternatively, it may help households to pay for membership fees and premiums and make MHOs membership more feasible: being a member of a ROSCA might imply some discipline in saving which could in turn help an individual in committing to an MHO's premiums (see the first chapter of this thesis for an analysis of ROSCAs as saving commitment device). With regards the health status of the household, 67% of heads reported one of their household members having been sick in the previous twelve months. More sickness is likely to lead to greater demand for health care and hence for health insurance.[8] The mean of health-related monthly expenditure for a household is 8320 CFA, which represents around 3.7% of mean household income.

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[6] The following true-false questions were asked: 1. Insurance premium is not reimbursed if one does not get sick 2. The insurer makes expenses just in case of sickness 3. In case of sickness I can get a consultation at health structures at reduced prices, as the insurer pays part of the price. 4. If insured, one can receive a payment in case of death 5. The insurer can help reimbursing loans 6. If I am not insured and I get sick, I am in charge of all healthcare expenditure originated by that illness 7. If I have a health insurance, after one year I start receiving money

[7] Our results hold if we use a single dummy variable regrouping all formal sector employees, working in either the private or public sector.

[8] Some empirical studies focusing on developed countries show that advantageous selection into health insurance may arise as a consequence of higher preventive care (Fang et al, 2008). To the best of our knowledge no studies found such phenomenon in developing contexts, where adverse selection appears to be a problem for health microinsurance programs (Wang et al., 2006; Spenkuch, 2012).

Two additional dummies were included as controls in our regressions. The first variable takes a value of one if the household head is strongly risk averse (which is the case for 56% of them), i.e. always opted for the certain outcome when presented with a set of choices between gambles and certain gains and losses, using a similar methodology as Voors et al. (2012). In this part of our survey, each individual had to choose between certain outcomes (gain/loss of 200, 250 and 300 CFA francs) and simple gambles with probability 1/4 to win/lose 1000 CFA francs and probability 3/4 to win/lose nothing. We ran this exercise with the same amounts multiplied by a factor of ten. Before answering this set of 12 questions, each household head was informed that, after completion of this section, a lottery would be picked out, amongst the ones offering potential gains, by the enumerator who, in accordance with the preference of the player, would either give the certain outcome or play the selected lottery for real money. We also turned to the methodology put forward in Voors et al. (2012) to elicit discount factors. In this case, household heads had to choose from a list of different amounts to be received in one month, the one that would make them indifferent from receiving 10000 CFA francs today. The list of amounts used in this question is as followings: 10500, 11000, 12500, 15000, 17500, 20000, 25000 and 30000 CFAF, representing the respective discount factors at one month: 5%, 10%, 25%, 50%, 75%, 100%, 150%, 200%. We then generated a binary variable taking a value of one when the individual belonged to the more patient half of our sample. Neither the risk aversion variable nor the time preference variable appear to significantly influence uptake of our microinsurance product. This result is robust to different definitions of time and risk preferences. For risk preferences we consider the subsamples of risk-averse agents (always opting for the certain amount) for small and large stakes, for gains and losses. For time preferences we employ different time horizons and stakes, namely we elicit two days, two weeks, one month and six months discount factors for small (1000 CFA) and large (10000 CFA) stakes and we construct a dummy taking a value of one when the individual belonged to the more patient half of our sample.

5. Study design

Treatment was randomly assigned at the household level. Half of the 360 households were invited to attend an insurance literacy module, held on a non-working day in the city centre before our marketing treatment went ahead. Invitations were directly handed to heads of household. The module consisted of a three-hour educational presentation offered by the GRAIM on health microinsurance and specifically on MHO functioning (including the differences across various active MHOs in the city of Thies) and their origins in the region. A lesson on personal financial management exploring the notions of savings, risk and insurance was also given. Case studies looking at health expenditures of different MHO members and non-member households were given to illustrate the different concepts introduced. Sessions were held in groups containing a maximum of 20 individuals at a time. GRAIM has been running a training program for several years for small communities eager to set up their own MHO and was therefore in a position to run this module. It was thus slightly modified in order to be presented to randomly selected households. The same individual was in charge of running all the sessions, during which interactions with the participants were encouraged. Since the city covers a sizeable area, we reimbursed transportation costs for all individuals who had attended in order to minimize disincentives to attend. We gave 1000 CFA to every individual, which in Thies, is the

exact fare for two taxi journeys from any corner of the city to where the meetings were held.[9] Households were informed that transportation costs would be covered at the time of the invitation. The comparison group of 180 households received nothing. This randomization allowed us to measure the causal impact of the effect of insurance literacy training on the purchase of insurance with MHOs. This way we can assess the module's impact whilst also screening out other effects such as each individual's inherent propensity to opt for insurance.

After the insurance literacy training was completed and independent of this assignment, the 360 households were split into three randomly chosen subsamples (of 120 households each) with each receiving an additional marketing treatment in the form of one of three vouchers. So for the 180 households invited to attend the insurance literacy module, 60 received voucher 1, 60 voucher 2 and 60 voucher 3 (the same distribution applies for the 180 households who did not received an invitation to the module). Voucher 2 offered a full refund of membership fees in an MHO, which represented on average an amount of 1750 CFA (membership fees for the MHO joined by voucher holders ranged from 1000 to 3000 CFA). Voucher 3 provided a full refund of membership fees (equivalent to voucher 2) plus a refund of 250 CFA/month per new member covering fees linked to the observation period of three months (refunds were made for each new member for up to 3000 CFA, which is the equivalent of three months' premium for four people at 250 CFA/month). The refunds offered with voucher 2 and 3 were such that respondents did not have to pay cash up-front and then wait for a reimbursement. The vouchers actually reduced the initial cash outlay as these refunds were directly transferred to MHOs treasuries. Voucher 1 had no monetary value attached, instead representing a simple invitation to the GRAIM in the event that the household was keen to know more about MHOs and the insurance products offered. The recipients had a period of two months to redeem the voucher by visiting the GRAIM and filling in an application form to join the MHO of their choice.

[Table 2 here]

Table 2 shows the tests for random assignments of treatments across samples. Randomization with respect to voucher assignment appears satisfactory. However, there are a number of significant differences between those who were invited and those not. Heads of households that were not invited to the module are on average richer (a smaller proportion in the first quintile of income and larger proportion in the fourth quintile) and wealthier, according to the number of durables owned. Non-invited individuals also appear to be significantly more likely to be employed by a public institution and more knowledgeable about insurance and its basic concepts. We measure baseline knowledge as the sum of correct answers to a series of seven true or false questions on the nature of insurance.[10] Finally, the subsample of not invited is significantly better insured against health expenditures (through MHOs, IPMs, etc.). The reason that we observe these significant differences leads us to think that they simply come from "bad luck" in the

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[9] We made sure that the individuals who got their transportation reimbursed did actually pay for transport. We have thus no evidence that opportunism can explain participation in the session (i.e. individuals attending just to obtain a little additional income).

[10] The seven questions are: 1. Is the insurance premium reimbursed if one does not get sick? 2. Does the insurer make expenses just in case of sickness? 3. In case of sickness can one member consult a health provider at reduced prices, as the insurer covers part of the fees? 4. If insured, can one receive a payment in case of death? 5. Can the insurer help repaying any sorts of loans? 6. If I am not insured and I get sick, am I in charge of all healthcare expenditure originated by that illness? 7. If I have health insurance, do I start receiving money after one year?

randomisation, due to small sample size. None of our enumerators showed strategic behaviour in selecting households and our assignment of treatments was conducted in a proper way that should have prevented this outcome. We discuss the potential impact of these differences on our econometric results below.

5.1 A first look at the experimental outcomes

Table 3 decomposes take-up according to our various types of treatment: educational and marketing. One notices that our compliance rate for the educational treatment is relatively low; only 105 out of the 180 (58%) invited actually attended the module. It also shows that, for the subsample of households invited to the module, the difference in terms of take-up between those who attended the insurance literacy training and those who did not is negligible (24 versus 17). The table shows that voucher 1 had almost no impact on increasing take-up, with 89 out of 91 new uptakes being generated by either voucher 2 or 3. It is also interesting to note that 21 out of the 91 who took insurance already possessed some health insurance (11 MHO, 7 IPM and 3 private insurers), indicating that MHO membership can complement current health insurance by covering additional members or by topping up existing insurance.

[Table 3 here]

6. Empirical strategy

6.1 Reduced form model

The design of the experiment allows us to identify estimates of the impact of our treatments at different levels of precision. On the one hand, for the marketing treatment (vouchers), we are able to identify the Average Treatment Effect (ATE) on the effective uptake of microinsurance. On the other hand, the educational module suffers from partial compliance, as not all who were invited actually participated the session. Therefore, we are able to estimate the Intention To Treat (ITT) effect and the Local Average Treatment Effect (LATE) (Angrist and Imbens 1994). Let us discuss the effects of the two treatments separately.

Let us define $Y_i(D_i, Z_i)$ the potential outcome of individual i, where Z identifies the assigned treatment status (or eligibility criterion) while D is the effective treatment status. In the case of vouchers, since nobody in the treatment group ($Z_i = 1$) refused to receive the randomly assigned voucher, we have full compliance and $D_i = Z_i$. The random assignment of treatment leads to independence of the treatment from the potential outcome ($Y_{0i} \perp D_i$) and solve the selection problem. Therefore we obtain the Average Treatment Effect on the Treated (ATT) which is equal to ATE, given the randomized design:

$$ATE = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 0] = E[Y_{1i} - Y_{0i}] \qquad (1)$$

where Y_{1i} and Y_{0i} are potential outcome under treatment and control, respectively. This can be estimated in our sample as:

$$Y_i = \alpha + \delta Voucher_i + \varepsilon_i \tag{2}$$

Where Y_i a dummy variable which takes the value one if the household subscribes to an MHO following one of our treatments. $Voucher$ is a dummy variable which equals one if the household was given either voucher 2 or 3; ε_i is an individual error term; δ identifies the ATE. A household subscribes if it simply redeems its voucher. Unfortunately, we could not collect information on how long households stayed member once they redeemed their voucher. Subscription is thus not measured in terms of how long they remained enrolled for.

In the case of the financial literacy treatment, an issue of compliance arises, as only 58% of those invited to the training session actually participated allowing for a self-selection problem. Therefore, OLS estimates of the effect of effective participation to the literacy module on microinsurance purchase may be biased. Let us denote the invitation to the training session Z_i which equals one for those invited and zero for those not-invited whereas D_i is a dummy indicating whether the individual actually participated.

We Z_i use it as instrument for D_i. The properties of the instrument are respected: first, the assignment is random and therefore uncorrelated with potential outcome and individual characteristics [11]; second, it is correlated with the effective treatment, as $E[D_i|Z_i = 1] > E[D_i|Z_i = 0]$. Therefore we can compute:

$$\beta = \frac{E[Y_i|Z_i = 1] - E[Y_i|Z_i = 0]}{E[D_i|Z_i = 1] - E[D_i|Z_i = 0]} \tag{3}$$

where the denumerator represents the first stage while the numerator is the reduced form indicating the ITT effect, β is the LATE. It has to be noticed that, since there is partial compliance, the denominator is less than one, so that the ITT effect tends to underestimate LATE.

It can be the case that the causal effect is heterogeneous across individuals (Angrist, Imbens and Rubin 1996) and the LATE is not meaningful as it picks the effects of the subpopulation of compliers, "always takers" and "defiers". However, our design assures that that partial compliance is one-way only, as $\Pr(D_i = 1|Z_i = 0) = 0$. This rules out the presence of "always-taker" and "defier" individuals. Moreover, we were able to check that only invited people could participate the session. Therefore, $\Pr(D_i = 1|Z_i = 1) = P_C$ where P_C is the probability of being complier and the treated population is represented entirely by compliers. Hence, the LATE in (3) corresponds to the Treatment on the Treated Effect (TTE).

To assess the impact of our two different treatments we estimate the reduced-form:

$$Y_i = X_i'\beta + \alpha Z_i + \delta Voucher_i + \mu_i \tag{4}$$

being Y_i a dummy variable which takes the value one if the household subscribes to an MHO following one of our treatments. A household, indexed by the subscript *i,* subscribes if it simply redeems its voucher. Unfortunately, we could not collect information on how long households stayed members following redemption of the voucher. Subscription is thus not measured in terms

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[11] In our context this hypothesis takes the stronger form of exclusion restriction, as we assume that there is a unique channel for causal effect of the instrument (Angrist and Chen 2007): invitation to the educational session impacts on effective microinsurance uptake only through actual participation to the training.

of how long they remained enrolled for.[12] To ensure that our dependent variable was accurately constructed, we phoned all households who did not redeem their voucher one month after the redemption date to ask if in the meantime they had joined an MHO but not used their voucher. This allowed us to account for the membership of two additional households. Z_i is a dummy variable which equals one if the household was invited to the insurance literacy module. *Voucher* is a dummy variable which equals one if the household was given either voucher 2 or 3. In order to gain precision and control for characteristics which may not be perfectly balanced across treatment and control group which may be considered as confounding variables, we also introduce a set of household and individual characteristics at the baseline, contained in the vector X_i. Among covariates we find: household heads' characteristics (gender, education, income, and employment status), an indicator of household wealth, a proxy for the status of the household's health and the household's level of insurance literacy. α measures the ITT effect, i.e. the effect of being invited to attend on the probability of joining an MHO. The first stage of our instrumental variable procedure, represented by the denominator in (3), is:

$$D_i = X_i' \pi_0 + \pi_1 Z_i + \epsilon_i \tag{5}$$

where D_i is a dummy equal to one if the individual participated to the training session; we add the same exogenous covariates as in (4) as controls, since they are measured at the baseline.
We estimate ATT effect of attending the educational session by implementing 2SLS procedure.

6.2 Heterogeneous effects model

So far, we discussed constant effects models: the impact of treatments are considered homogeneous across individuals and its characteristics. However, the effects may be heterogeneous and be more or less intense depending on certain individual characteristics.
To allow for heterogeneous effects, we introduce interaction terms between the random treatment D_i and covariates X_i. In the case of voucher, expression (2) becomes:

$$Y_i = X_i' \beta + \delta Voucher_i + Voucher_i X_i' \varphi + \varepsilon_i \tag{6}$$

The ATE of $Voucher$ on the outcome is now equal to $\delta + \varphi' X_i$.
We apply the same reasoning for the case of endogenous treatment (participation to the training session, D_i) and its instrument (invitation to the session, Z_i). In this case, the second stage has multiple endogenous variables:

$$Y_i = X_i' \beta + \rho_0 D_i + D_i X_i' \rho_1 + \mu_i \tag{7}$$

where ρ_0 identifies the main effects and ρ_1 is a vector of interaction terms coefficients. Multiple first stage equations are then introduced, as many as endogenous variables:

$$D_i = X_i' \pi_{00} + \pi_{01} Z_i + Z_i X_i' \pi_{02} + \epsilon_{0i} \tag{8}$$

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[12] This also means that we could not study the actual increase in access to and use of health services that MHO membership provided.

$$D_i X_i = X_i' \pi_{10} + \pi_{11} Z_i + Z_i X_i' \pi_{12} + \epsilon_{1i} \tag{9}$$

The result of 2SLS estimation gives a covariate-specific LATE, given by $\rho_0 + \rho_1' X_i$.

7. Results

7.1 Experimental results

Columns 1 to 5 in Table 4 show the results of our ordinary least squares (OLS) model with the marginal effect of covariates on the probability of take-up. Results obtained with a probit model are similar. In columns 1, 3 and 4, the dummy 'voucher', which takes the value one if a household receives either voucher 2 or 3, has a significant positive impact on the probability of take-up. This result shows that providing financial incentives to households increases the demand for health microinsurance. Receiving vouchers 2 or 3 increases the probability of uptake by around 35 percent[13]. Columns 2 and 5 show the decomposed effects by vouchers. One interesting result to note: voucher 3 does not have a significantly larger impact than that of voucher 2. In terms of efficiency, this result (which is consistent across all specifications), indicates that a campaign with limited means should resort solely to voucher 2; similar increases in take-up are likely to be observed with voucher 2 which is significantly less costly than voucher 3.

[Table 4 here]

The ITT effect of insurance literacy training is not significant. The result is confirmed if we consider the ATT effect obtained through the IV procedure (columns 6 and 7). As expected, the effect on the treated is larger than the ITT and negative, however it is still not significant. This result is only slightly surprising given that only 55% of all 360 households noted that the lack of information and knowledge was the reason they had not joined an MHO. Several other reasons may explain the lack of a significant effect in our context. One such explanation could be that insurance literacy was already sufficiently high and that most people we invited to the training grasped the basic concepts and the need for health microinsurance. 51% of the heads randomly invited to attend the module had mentioned dearth of information as the reason explaining their lack of membership; only 58% of these actually attended. Several other reasons may explain the lack of a significant effect in our context. It could also be that the product offered by MHOs is easy enough to understand without the need for training. Indeed, Gaurav et al. (2011) found that their educational module treatment on rainfall insurance in the state of Gujarat in India improved take-up by just 5.3%. With data from the same country Giné et al. (2007) emphasize the role of insurance literacy for rainfall insurance take-up. The complexity of rainfall insurance makes it more likely to benefit from an insurance literacy module. However, this remains debatable as Cole et al (2013) find no significant effect (and surprisingly negative coefficients) of attending an educational module on rainfall insurance take-up in India.

The quality of the educational module could also have played a role. For that matter we did not test participants' financial literacy after their exposure to the module and are thus unable to

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[13] Thornton et al. (2010) report similar figures with a substantially larger subsidy. They offer a 6-month (worth 96 USD) voluntary health insurance subsidy, which on average induced a 30% increase in take-up.

formally test this. However, we know that the person in charge of organizing the module had been running several dozen similar programs over recent years and was a senior member of staff at GRAIM. Moreover, our compliance rate was relatively low: only 58% of people invited turned up to the offer of insurance literacy training. We discuss this issue in greater detail below. We know that for most households, the head attended the information sessions. However, even if (s)he is convinced by the benefits of such membership this does not necessarily translate into membership as he/she may have relatively little bargaining power within the household. Finally, our inference on the effect of information may be lacking power. Our computations show that the power of our test for α could detect an effect size of 7% or larger with a power above 70%. For size effects comparable to the one we have for voucher 2, our power is above 95%. So for a relatively small effect size, (less than 6%), one could argue that our test is lacking power.

The lack of significance from the information treatment might also indicate that expectations about the product were overly optimistic and that once the details and fees were known, such insurance became clearly uninteresting or unaffordable. Such results can also be found in Thornton et al. (2010) who study a voluntary health insurance program for informal sector workers in Nicaragua, finding that a treatment involving the distribution of an informational brochure alone reduces the likelihood of enrolment in the insurance program by five percentage points relative to the control group who received nothing. Cole et al. (2011) offers financial subsidies among the unbanked in Indonesia, which significantly increased the share of households that opened a bank savings account within the subsequent 2 months. They also offer an orthogonal treatment providing a financial literacy module, which has no effect on the likelihood of opening a bank savings account for their overall sample.

Despite these results, we do not claim that information is of little importance if one wants to increase MHO membership and the uptake of micro-health insurance. Information may be more likely to have a significant impact if it is targeted towards the neediest and in different contexts. What we want to highlight is that for the cost it represents, such informational sessions, at least in our context, appear to be less cost-effective [14] in increasing uptake than voucher 2. An invitation to the information module represents three types of costs: transportation costs of 1000 CFAF, minimal fees for distributing the invitation (around 100 CFAF per household) and costs of about 500 CFAF per attendee to pay for the individual in charge of running the module, making an overall cost of 1600 CFAF per household. Voucher 2 costs on average 1750 CFAF for membership fees alongside some minimal fees for voucher distribution (around 100 CFAF per household), making an overall cost of around 1850 CFAF per household. When compared, the impact of voucher 2 is greater than twice the absolute value of the impact of the informational session for less than twice its cost.

In a separate specification (not shown) we interact our treatments. We add the interaction term of having been invited to the insurance literacy module and having received either voucher 2 or 3 (so the variable 'invited to the module' times the variable 'voucher'). Results remain similar: overall the module has no significant impact and a marginal change in the variable 'voucher' alone increases the probability of uptake by about 30 percentage point.

We henceforth highlight other results of interest in Table 4. The level of education has no effect on MHO take-up: households whose heads have attended primary school, secondary school, or

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[14] See Dhaliwal et al. (2011) on cost-effectiveness analysis of policies in developing countries.

more, are not more likely to join an MHO than those who have never attended school. If there is any impact from the education variable it is likely to come indirectly through income earned. Poor households from the first four income quintiles are significantly more likely to take-up MHO insurance than the richest households (the benchmark group is the richest quintile). This result is not in line with other related papers on the determinants of participation to MHOs (notably Jütting, 2003 and Jowett, 2003). The poorest appear not to be excluded from subscribing to an MHO and the richest are likely to use other means to insure themselves (private insurer, own funds, etc.). This result is also consistent with the fact that liquidity constraints were only mentioned by 16% of the households surveyed in explaining lack of membership. However, whether a head of household is self employed or works as a public servant, has no significant impact (the benchmark group is to be employed by a private firm). This appears to indicate that the stability of one's source of income is irrelevant. Male headed households, as well as bigger households, are more likely to join MHOs. We also included a dummy variable 'already insured' which takes the value one if the head has health insurance (IPM, MHO or private). This variable appears to have no significant impact.[15] This is not surprising if we consider the discussion at the end of Section 3. Most IPMs, MHOs and private insurers do not offer full coverage for consultation and inpatient care fees and do not cover all members of a household. There is thus scope to complement this coverage with that of an MHO. Other market imperfections such as credit constraints can suppress poor households' demand for microinsurance. In this respect, we use the dummy 'saving device' (taking the value one if the households are using one of three saving devices: ROSCAs, banks or microfinance institutions), which allows us to measure the impact on uptake of having access to financial institutions that can alleviate credit constraints. Our results show that this variable has no significant impact. Moreover, our synthetic measure of durable assets owned by a household as proxy for wealth is not significant in explaining uptake either. These two results seem to indicate that credit constraints do not represent an important obstacle to uptake.[16] It is also interesting to note that with respect to membership fees and monthly contributions, the vast majority of the groups with whom we discussed allowed their members some flexibility. Members can pay in delayed instalments, which may attenuate liquidity and credit constraints. It was expected that more knowledgeable heads of households would be more likely to join an MHO. Our results indicate that this is not the case, as their insurance score testifies. Finally, in a region prone to various chronic and recurrent infections such as malaria, it was expected that households who host unhealthy members would be more likely to join an MHO. However, the results indicate that households who reported recent episode of sickness (measured by the variable 'reported sickness' which takes value one for an household if one of its member has been sick in the previous twelve months from any sickness) are not more inclined to join MHOs. This tends to indicate that adverse selection is not likely to be an issue in the context of this study. Neither the risk aversion variable nor the time preference variable appear to significantly influence uptake of our microinsurance product. This result is robust to different definitions of time and risk preferences. For risk preferences we consider the subsamples of risk-averse agents (always opting for the certain amount) for small and large stakes, for gains and losses. For time preferences we employ different time horizons and stakes, namely we elicit two days, two weeks, one month and six months discount factors for small

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[15] Our main results hold if we restrict the sample to those without insurance at the baseline.

[16] Our sample shows that 33% of household heads tried to borrow from the formal sector in the past and the vast majority of them (94%) obtained the desired loan. Our data also show that it is the relatively richer households who attempted to get a loan. Nevertheless, it shows that, to a certain extent, credit is available in Thies.

(1000 CFA) and large (10000 CFA) stakes and we construct a dummy taking a value of one when the individual belonged to the more patient half of our sample. The coefficients were not significant in any combination of the time and risk variables. Results are not shown, but are available upon request. Given that we have a measure of trust only for the subsample of non-members aware of the existence of MHOs we did not include this variable in our model. It would have significantly reduced the size of our sample for estimation.

7.2 Heterogeneity of treatments effects

We are interested in evaluating heterogeneous effects of our treatments along different household characteristics. This is an important step allowing to gain precision in the estimates and external validity (Duflo et al. 2008). Indeed, we can obtain information on the way our treatments impacted as function of household characteristics. We first implement a general test for the presence of heterogeneous effects by inserting interactions term of each treatment variable with all covariates included in X and testing the null of no heterogeneous effects through an F-test[17]. While we cannot reject the null in the case of the invitation to the educational module (F-test=1.37), we can reject it for the marketing treatment "voucher" (F-test=1.74).
First, we focus our attention to the heterogeneous effects generated by the assignment of vouchers. We introduce those interaction terms which mainly drove the result of the previous test, resulting significant in the full model with all possible interactions: they are income and the dummy for the head being self-employed. The reduced-form of (6) is estimated with OLS. Results are presented in Table 5.

[Table 5 here]

Two interesting results can be highlighted from Table 5. We measure the impact of the variable 'voucher' for different levels of income by interacting it with income quintiles. Columns 2 and 4 show that it has an additional positive and significant effect only for the first and second quintiles (compared to the fifth income quintile, the omitted category). However, differences between the four reported interaction terms' coefficients are not significant (F-stat=0.53). Moreover, column 3 shows that voucher appears to also have an additional positive impact for the self-employed, however such effect vanishes in the general model in column 4. This shows that vouchers 2 and 3 appear to have an additional impact on poorer households and those that are self-employed (i.e. have no access to IPM insurance). These results tend to show that such households are more likely to be liquidity constrained.
No significant effects were found from the interaction of income variables with the invitation to the educational module.

7.3 Further Discussion

It is possible that our result regarding the insurance literacy treatment is biased by the significant differences we highlighted for some variables across samples in Table 2 under the columns 'not invited' and 'invited'. Households not invited to attend the insurance literacy training appear to

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[17] The procedure is implemented by the command "film" (fully interacted linear matching) in STATA

be significantly richer, more likely to be employed by a public institution and to have health insurance and more knowledgeable about insurance and its basic concepts. However, the introduction of such variables in the model as controls guarantees that our literacy treatment is independent of the potential outcome, conditioned on these covariates. Moreover, if anything these biases would lead to an over-estimation of the effect of the treatment. Our educational module is more likely to impact positively on the take-up rate if addressed to less insured and knowledgeable agents.[18] Thus, our finding which shows that the educational module has no significant impact on take-up rates is likely to hold despite these sample differences.

[Table 6 here]

Out of the 180 invited households only 105 (58%) attended our educational module. This is despite the fact that invitations where directly handed to heads of household and we followed them up by calling to further advertise the module. Table 6 shows the determinants of attendance at our educational module (the independent variables include all control variables from Table 4 except 'voucher' which was distributed after the training was completed). We find that the variables related to head's employment type, income, household's size and health status are not significant. Not surprisingly, the more knowledgeable a household head is of basic insurance principles (the higher our variable insurance score is), the less likely (s)he is to attend the module. We also look at the determinants of which MHOs new subscribers decided to join. There seems to be no particular pattern between household characteristics, the voucher received (either 2 or 3) and if they were invited to the module (or attended) with the MHOs they decided to join in terms of membership fees, premiums and coverage. This partially comes from the fact that the MHOs selected are relatively similar.

8. Conclusion

We offered a customized insurance literacy module communicating the need for and benefits arising from personal health insurance and the functioning of the MHOs to randomly selected households in the city of Thiès. At the same time we aimed at measuring the effect of three cross-cutting marketing treatments using a randomized control trial.

Our findings show that the insurance literacy module has no significant impact on health insurance take-up while our marketing treatments have a large and positive significant impact on the households' purchase decisions. What appears from our various descriptive statistics, and results from our econometric analysis, is that the crucial element driving new membership is the allocation of either voucher 2 or 3. Crudely interpreted, these results suggest that what really matters is not education, but rather compensation in the form of reduced fees relating to membership and the period of observation. If the state or the city authorities wanted to increase take-up rates, the most efficient way would be to alleviate liquidity constraints and the financial barriers to entry by offering voucher 2. This voucher is significantly less costly than voucher 3

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[18] One can argue that such over-estimation is not likely to be the case given that we invited significantly poorer households. They are likely to be less trusting of these insurance schemes and even with information on it they may remain unwilling to take it up. However this effect is unlikely to be present: our measure of trust in MHOs shows that it is consistently high across all levels of income and not significantly different across quintiles.

and shows a similar impact on uptake. If information is to be provided, it would have to be targeted and given more conveniently. We nevertheless remain cautious of such results by emphasising that they are based on a relatively small sample. Unfortunately, our study does not touch upon the critical issue of membership sustainability over time once membership has been acquired.

MHOs could represent a unique way to reach relatively poor people and informal workers who do not have access to an IPM. The networks they represent in those districts should be considered a serious asset. Because they are well established and experienced institutions, they could potentially reach underprivileged households at a relatively low cost. What our results also suggest is that projects favouring the establishment of new insurance services, or expanding existing ones, should only require payments of low entry fees if they are to be accessible to the poor. This way the neediest could be reached and MHOs would be able to raise the relatively low level of participation that we observed. Increasing membership size could in turn bring positive side effects: pooling the risk of more individuals is likely to lead to a reduction in premiums and potentially to an improvement in the extent of insurance provided.

Tables

Table 1. Summary Statistics

	Mean	s.d.
Head is male	0.733	0.443
Head lives in couple	0.817	0.387
Head attended primary school	0.2	0.401
Head attended secondary school or more	0.461	0.499
Household size	6.731	3.212
Already insured	0.325	0.469
IPM	0.19	0.39
MHO	0.10	0.30
Private insurer	0.03	0.17
Insurance score (0-7)	2.250	2.440
Head is public employed	0.197	0.398
Head is self employed	0.428	0.495
Durables	6.597	3.109
Head monthly income (1000 CFA)	133.591	109.645
Household monthly income (1000 CFA)	222.339	197.624
Household monthly total health expenditure (1000 CFA)	8.318	17.884
Saving device	0.569	0.496
Reported sickness	0.669	0.471
Strongly risk averse	0.561	0.497
Patient	0.414	0.493
N	360	

Table 2. Random Assignment of Treatments

	Not Invited		Invited			Voucher 1		Voucher 2		Voucher 3		
	Mean	s.d.	Mean	s.d.	Difference	Mean	s.d.	Mean	s.d.	Mean	s.d.	F-test*
Head is male	0.750	0.434	0.717	0.452	0.033	0.758	0.430	0.700	0.460	0.748	0.436	0.510
Head lives in couple	0.844	0.363	0.789	0.409	0.056	0.792	0.408	0.825	0.382	0.840	0.368	0.650
Head attended primary school	0.2	0.401	0.2	0.401	0	0.166	0.374	0.215	0.412	0.218	0.415	0.62
Head attended sec. school or more	0.489	0.501	0.433	0.497	0.056	0.517	0.502	0.400	0.492	0.471	0.501	1.560
Household size	6.533	2.903	6.928	3.490	-0.394	7.100	3.460	6.350	3.143	6.748	3.009	1.610
Already insured	0.406	0.492	0.244	0.431	0.161**	0.358	0.482	0.300	0.460	0.319	0.468	0.430
Insurance score (0-7)	2.550	2.529	1.950	2.317	0.600**	2 417	2 410	2 067	2 445	2 286	2 474	0.570
Head is public employed	0.233	0.424	0.161	0.369	0.072*	0.208	0.408	0.200	0.402	0.185	0.390	0.090
Head is self employed	0.433	0.497	0.422	0.495	0.011	0.425	0.496	0.413	0.494	0.445	0.499	0.13
Durables	7.078	3.262	6.117	2.878	0.961***	6 717	3 131	6 358	2 961	6 731	3 251	0.530
1st Income quintile	0.139	0.347	0.283	0.452	-0.144***	0.208	0.408	0.217	0.414	0.202	0.403	0.150
2nd Income quintile	0.244	0.431	0.239	0.428	0.006	0.233	0.425	0.242	0.430	0.244	0.431	0.000
3rd Income quintile	0.161	0.369	0.178	0.383	-0.017	0.142	0.350	0.167	0.374	0.202	0.403	0.670
4th Income quintile	0.222	0.417	0.133	0.341	0.089**	0.217	0.414	0.167	0.374	0.160	0.368	0.730
5th Income quintile	0.233	0.424	0.167	0.374	0.067	0.200	0.402	0.208	0.408	0.193	0.397	0.040
Saving device	0.617	0.488	0.522	0.501	0.094*	0.600	0.492	0.525	0.501	0.588	0.494	0.730
Reported sickness	0.700	0.460	0.639	0.482	0.061	0.675	0.470	0.658	0.476	0.681	0.468	0.070
Strongly risk averse	0.567	0.497	0.555	0.498	0.011	0.608	0.490	0.479	0.502	0.596	0.493	2.50*
Patient	0.383	0.487	0.444	0.498	-0.061	0.391	0.490	0.463	0.501	0.386	0.489	0.90
N	180		180			120		121		119		

Notes: Column "Difference" reports the difference between Not Invited and Invited. Column "F-test" reports the values of a test of joint significance of the coefficients of a regression with the row variable as explanatory and dummies for vouchers as regressors; *** p<0.01, ** p<0.05, * p<0.1

Table 3. Uptake Distribution across Treatments

	N	Number of Uptakers (n)	Take up rate % (n / N)	Take up rate % (n / 360)
Already had some form of insurance	117	21	18	6
MHO members	37	11	30	3
IPM members	69	7	10	2
Private insurance	11	3	27	1
Educational treatment				
Invited to Educational Session	180	41	23	11
Attendants	105	24	23	7
of which already insured	27	6	22	2
Non-Attendants	74	17	23	5
of which already insured	17	4	24	1
Not Invited to Educational Session	180	50	28	14
of which already insured	73	11	15	3
Marketing treatments				
Voucher 1	120	2	2	1
of which already insured	43	0	0	0
Voucher 2	121	38	31	11
of which already insured	36	8	22	2
Voucher 3	119	51	43	14
of which already insured	38	13	34	4
Voucher 2+3	240	89	37	25
of which already insured	74	21	28	6
Whole Sample (#obs)	360	91	25	25

Table 4. Determinants of Insurance Take-up

Dependent variable =1 if a hh subscribes to an MHO	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) IV	(7) IV
Invited to the education session	-0.0500	-0.0494	-0.0699	-0.0700	-0.0702		
	(0.0424)	(0.0422)	(0.0447)	(0.0453)	(0.0453)		
Present at the education session						-0.124	-0.124
						(0.0786)	(0.0784)
Voucher	0.354***		0.361***	0.364***		0.357***	
	(0.0334)		(0.0346)	(0.0352)		(0.0351)	
Voucher 2		0.298***			0.313***		0.305***
		(0.0439)			(0.0465)		(0.0468)
Voucher 3		0.412***			0.412***		0.408***
		(0.0471)			(0.0476)		(0.0462)
Gender (Male=1)			0.0984*	0.0973*	0.0941*	0.0935*	0.0901*
			(0.0517)	(0.0525)	(0.0516)	(0.0513)	(0.0503)
Head attended primary school			-0.0320	-0.0325	-0.0366	-0.0310	-0.0353
			(0.0619)	(0.0618)	(0.0613)	(0.0612)	(0.0606)
Head attended secondary school or more			-0.0464	-0.0440	-0.0508	-0.0491	-0.0561
			(0.0616)	(0.0623)	(0.0622)	(0.0606)	(0.0603)
Household size			0.0124*	0.0116*	0.0111*	0.0114*	0.0109*
			(0.00641)	(0.00644)	(0.00648)	(0.00626)	(0.00629)
Already insured			-0.0902	-0.0947	-0.0932	-0.0866	-0.0851
			(0.0608)	(0.0603)	(0.0595)	(0.0582)	(0.0572)
Insurance score (0-7)			0.0142	0.0144	0.0134	0.0122	0.0112
			(0.0102)	(0.0103)	(0.0103)	(0.0103)	(0.0104)
Head is public Employed			0.0974	0.0939	0.0975	0.0942	0.0980
			(0.0662)	(0.0662)	(0.0668)	(0.0641)	(0.0646)
Head is self employed			0.0615	0.0632	0.0595	0.0610	0.0572
			(0.0490)	(0.0500)	(0.0500)	(0.0491)	(0.0491)
Durables			0.00533	0.00409	0.00371	0.00602	0.00563
			(0.00804)	(0.00821)	(0.00819)	(0.00793)	(0.00792)
1st income quintile			0.232***	0.229***	0.223***	0.254***	0.248***
			(0.0794)	(0.0795)	(0.0795)	(0.0820)	(0.0820)
2nd income quintile			0.241***	0.238***	0.231***	0.245***	0.238***
			(0.0707)	(0.0709)	(0.0709)	(0.0696)	(0.0697)
3rd income quintile			0.189***	0.193***	0.184**	0.204***	0.194***
			(0.0710)	(0.0711)	(0.0719)	(0.0692)	(0.0699)
4th income quintile			0.152**	0.156**	0.154**	0.159**	0.157**
			(0.0627)	(0.0631)	(0.0625)	(0.0619)	(0.0612)
Saving device			0.0238	0.0283	0.0240	0.0331	0.0287
			(0.0510)	(0.0513)	(0.0511)	(0.0503)	(0.0499)
Reported sickness over the year			-0.0404	-0.0368	-0.0372	-0.0407	-0.0411
			(0.0454)	(0.0456)	(0.0455)	(0.0449)	(0.0448)
Strongly risk averse				0.0422	0.0331	0.0367	0.0272
				(0.0438)	(0.0440)	(0.0433)	(0.0437)
Impatient				0.00474	0.0106	0.0112	0.0173
				(0.0457)	(0.0456)	(0.0460)	(0.0460)
Constant	0.0417	0.0413	-0.316***	-0.335***	-0.308***	-0.342***	-0.314***
	(0.0260)	(0.0259)	(0.115)	(0.118)	(0.118)	(0.116)	(0.116)
Observations	360	360	360	360	360	360	360
R-squared	0.151	0.162	0.209	0.212	0.220	0.197	0.206

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.

Table 5. Heterogeneous treatment effects for vouchers

Dependent variable =1 if a hh subscribes to an MHO	(1) OLS	(2) OLS	(3) OLS	(4) OLS
Invited to the education session	-0.0700	-0.0637	-0.0668	-0.0614
	(0.0453)	(0.0455)	(0.0451)	(0.0454)
Voucher	0.364***	0.199***	0.315***	0.162**
	(0.0352)	(0.0603)	(0.0466)	(0.0673)
1st income quintile * Voucher		0.249***		0.235**
		(0.0954)		(0.0951)
2nd income quintile * Voucher		0.258***		0.253***
		(0.0890)		(0.0888)
3rd income quintile * Voucher		0.155		0.155
		(0.118)		(0.118)
4th income quintile * Voucher		0.146		0.123
		(0.106)		(0.106)
Head is self-employed * Voucher			0.115*	0.108
			(0.0672)	(0.0660)
Gender (Male=1)	0.0973*	0.0930*	0.101*	0.0968*
	(0.0525)	(0.0528)	(0.0523)	(0.0526)
Head attended primary school	-0.0325	-0.0284	-0.0319	-0.0270
	(0.0618)	(0.0626)	(0.0617)	(0.0624)
Head attended secondary school or more	-0.0440	-0.0392	-0.0415	-0.0363
	(0.0623)	(0.0627)	(0.0623)	(0.0627)
Household size	0.0116*	0.0124*	0.0114*	0.0122*
	(0.00644)	(0.00655)	(0.00646)	(0.00656)
Already insured	-0.0947	-0.0999	-0.0908	-0.0964
	(0.0603)	(0.0609)	(0.0606)	(0.0611)
Insurance score (0-7)	0.0144	0.0150	0.0145	0.0153
	(0.0103)	(0.0106)	(0.0103)	(0.0105)
Head is public Employed	0.0939	0.0904	0.0888	0.0852
	(0.0662)	(0.0661)	(0.0667)	(0.0666)
Head is self employed	0.0632	0.0652	-0.0123	-0.00571
	(0.0500)	(0.0498)	(0.0375)	(0.0344)
Durables	0.00409	0.00389	0.00400	0.00384
	(0.00821)	(0.00822)	(0.00812)	(0.00815)
1st income quintile	0.229***	0.0560	0.235***	0.0714
	(0.0795)	(0.0600)	(0.0804)	(0.0606)
2nd income quintile	0.238***	0.0628	0.239***	0.0678
	(0.0709)	(0.0500)	(0.0715)	(0.0497)
3rd income quintile	0.193***	0.0878	0.191***	0.0855
	(0.0711)	(0.0685)	(0.0716)	(0.0673)
4th income quintile	0.156**	0.0564	0.156**	0.0713
	(0.0631)	(0.0506)	(0.0631)	(0.0508)
Saving device	0.0283	0.0291	0.0291	0.0296
	(0.0513)	(0.0516)	(0.0513)	(0.0515)
Reported sickness over the year	-0.0368	-0.0403	-0.0428	-0.0457
	(0.0456)	(0.0469)	(0.0456)	(0.0468)
Strongly risk averse	0.0422	0.0414	0.0435	0.0433
	(0.0438)	(0.0448)	(0.0438)	(0.0449)
Impatient	0.00474	0.00449	0.00441	0.00349
	(0.0457)	(0.0461)	(0.0455)	(0.0460)
Constant	-0.335***	-0.227*	-0.306***	-0.206*
	(0.118)	(0.117)	(0.116)	(0.115)
Observations	360	360	360	360
R-squared	0.212	0.222	0.215	0.225

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 6. Determinants of participation to the educational module

Dependent variable =1 if a household participates to the educational session	(1) OLS	(2) Probit
Gender (Male=1)	-0.0529	-0.0556
	(0.0921)	(0.0967)
Head attended primary school	-0.0153	-0.0158
	(0.105)	(0.111)
Head attended secondary school or more	-0.0913	-0.101
	(0.106)	(0.110)
Household size	-0.00257	-0.00174
	(0.0116)	(0.0123)
Already insured	0.141	0.141
	(0.108)	(0.108)
Insurance score (0-7)	-0.0330*	-0.0346*
	(0.0187)	(0.0199)
Head is public Employed	0.00877	0.00316
	(0.121)	(0.123)
Head is self employed	-0.0311	-0.0345
	(0.0895)	(0.0916)
Durables	0.0304**	0.0356**
	(0.0137)	(0.0162)
1st income quintile	0.320**	0.337***
	(0.129)	(0.110)
2nd income quintile	0.0940	0.111
	(0.142)	(0.137)
3rd income quintile	0.117	0.133
	(0.134)	(0.127)
4th income quintile	0.0132	0.0241
	(0.144)	(0.141)
Saving device	0.0764	0.0913
	(0.0807)	(0.0856)
Reported sickness over the year	-0.0742	-0.0869
	(0.0792)	(0.0818)
Strongly risk averse	-0.0609	-0.0733
	(0.0737)	(0.0771)
Impatient	0.0895	0.0973
	(0.0773)	(0.0792)
Constant	0.403*	
	(0.220)	
Observations	180	180
R-squared/ Log pseudolikelihood	0,08125	-110.8771

Marginal effects of probit are shown
Robust standard errors in parentheses; *** p<0.01, ** p<0.05, p<0.

Chapter 3

3. Measuring willingness to pay for mutual health organizations insurance premiums and its impact on actual take-up: evidence from a field experiment in Senegal

Abstract

Mutual Health Organizations (MHOs) have been present in the region of Theis, Senegal for many years. Yet despite the clear benefits they offer, take-up rates remain low. This paper measures the willingness to pay (WTP) for MHO premiums in such contexts. Our results highlight the roles of income, wealth and risk preferences as determinants of WTP. We also provide an analysis of the predictive power of WTP on the actual take-up of insurance following our offering of membership to a sample of 360 households. Results show that WTP has a positive and significant impact on actual take-up.

1. Introduction

Health shocks in developing countries can lead to large unexpected expenditures often funded by out-of-pocket (OOP). payments. Such spending constitutes the most important mechanism for financing healthcare expenditure in several developing countries (ILO 2008, WHO 2011) but are also 'the least equitable form of health funding' (WHO 2010) due to their regressive nature. It has been shown that the cost of major illness has severe consequences on consumption (Wagstaff 2007, Gertler and Gruber 2002) and can even lead to impoverishment (see among others Bredenkamp et al. 2011, Van Doorslaer et al. 2007, Wagstaff and Van Doorslaer 2003). This is particularly pertinent to the more vulnerable categories of workers; those employed in the informal sector and in rural areas are less likely to be involved in mandatory social security schemes as would be the case for public servants and workers in the formal private sector.

The last two decades have seen stagnating, if not decreasing budgetary support for health care services in many developing countries which has led to the prevalence of low quality public healthcare services. Whilst public health funding in Senegal has been stable over recent years, overall per capita health expenditures have been increasing in the same period (World Bank, WDI). The shrinking of the state's ability to meet health care needs renders it unable to provide universal insurance for its population, which has led to the emergence of many community-based health insurance schemes

(CBHIS) or mutual health organizations (MHOs) in Senegal. At the same time, the market has been ineffective in providing health insurance to low-income people even in urban environments. Private insurers are often faced with significant adverse selection problems and high transaction costs; as a result the costs of their contracts are often prohibitive. Poor people can thus only resort to expedient transfers from relatives or health insurance schemes rooted in local organizations; MHOs are now at the core of health protection and universal coverage strategies and policies in many African countries (Diop et al. 2006). MHOs offer a form of insurance that allows members to pay monthly, affordable premiums to reduce health care payment at the point of service. They are not-for-profit, grassroots organizations based on voluntary participation and underpinned by the concepts of mutual aid and social solidarity. Several studies have shown that participation in MHOs helps to mitigate OOP expenditures, generates an increase in modern healthcare utilization and improves healthcare outcomes (Shimeles 2010, Wang et al. 2009, Jutting 2003, Ekman 2004 for a review).

The willingness to pay (WTP) for participating to MHOs and the socio-economic determinants of said have been estimated by several studies in different developing countries (Dror et al. 2006, Dong et al. 2003a, Dong et al. 2005, Onwujekwe et al. 2010, Donfouet et al. 2011 and Wang et al. 2005). Such valuations can aid both policy makers and existent MHOs to better understand the characteristics of the demand for microinsurance products. This paper considers the role of the individual and household socio-economic determinants of willingness to pay for a health microinsurance product. It adds to the existing literature by providing evidence on the role of income, wealth and risk preferences on WTP. Conscious of the potential limits of our elicitation strategy, we incorporate the existent literature on the effects of 'preferences anomalies' (Watson and Ryan 2007) and estimate the WTP accounting for a structural shift in preferences (Alberini et al. 1997), an anchoring effect (Herriges and Shogren 1996) and the two effects combined (Whitehead 2002).

An additional contribution of our paper to the literature arises from the fact that we can assess the role of WTP in predicting the effective take-up of MHO product. As Bhatia and Fox-Rushby (2003) emphasise, studies assessing criterion validity in the health sector are scarce. They found that there was no discrepancy at the aggregate level between hypothetical WTP elicited through a bidding game method and actual demand of treated mosquito nets in Gujarat, India. Furthermore, Ashraf et al. (2010) find a positive relationship between WTP and actual purchases of drinking-water disinfectant. To the best of our knowledge, our study represents a first attempt at evaluating the predictive power of WTP on the actual take-up of health microinsurance products. In order to do so, we first measured WTP before offering the opportunity to join a MHO scheme to 360 randomly selected households in the city of Thies, Senegal. This was done via a randomized field experiment, described in detail below.

This paper proceeds as follows. After a discussion on the different techniques for eliciting WTP, section 3 outlines our study design and empirical strategy. Section 4 presents our results on the impact of different controls on WTP and section 5 looks at the impact of WTP on the actual uptake of CBHI. Section 6 concludes.

2. Study design

In early 2010 we established a partnership with GRAIM (*Groupe recherche d'appui aux initiatives mutualistes*), a Senegalese NGO promoting the work of local MHOs active in greater Thiès. MHOs are locally known as '*mutuelles de santé*'. This partnership allowed us to get information on the current situation of MHOs. Thiès was chosen for two main reasons. Firstly, it is one of the largest cities in Senegal with a population of about 240,000 inhabitants and secondly, some of the local MHOs are the oldest in Senegal, having been active for fifteen years; as such the city possesses a well established supply of MHOs.

Our data was collected from 360 randomly selected households throughout the city of Theis during the spring of 2010. The territory covered by the city authorities represents an area of approximately 20 square km. We sampled the number of surveyed households across all fifteen Thiès neighbourhoods according to their respective share of the overall population estimates (based on the 2002 census). An official map of the city was used to select a number of streets spread across each neighbourhood. A number of households were then selected from each street, according to its length and density. For every street we used a pseudo-random process by which every fifth lot was picked, according to a specific direction. Since many households live on the same lot in semi-detached rooms, enumerators randomly selected one room by lot according to a clock-wise selection, which varied from lot to lot. In the case where a lot was found empty or the head of household was not present, enumerators were instructed to set appointments and revisit the household later. Given the small number of households sampled from such a relatively large area, we argue that spillovers within the sample are unlikely.

Our baseline survey aimed to obtain information on each household member's religion, level of education and health problems (sickness and chronic diseases). We also gathered information from the head of household concerning work, income, and a number of other characteristics, which are described in greater detail below. In the households we surveyed, (and this can safely be extended to the broader national level), the husband is generally considered to be the breadwinner and the head of the house. As such he is expected to provide insurance for the members of his household. This should provide ample justification as to why we collected these key variables affecting health insurance intake from the head. Therefore in what follows, we use data at the household level.

In order to obtain information on WTP, we follow the bidding game strategy, as used in other works aimed at eliciting WTP for MHOs (e.g. Dror et al. 2006, Onwujekwe et al. 2010, Dong et al. 2005). A discussion on the different techniques for eliciting WTP follows this section. We offered a hypothetical health insurance product covering 80% of consultations at health posts and 50% of expenses at a hospital or health centre to all heads of house surveyed.[1] Such contractual conditions are similar to those proposed by several MHOs present in the city, but with some slight variations[2]. We asked how much the household head would be willing to pay for a monthly per capita premium for such a product. Starting bids were randomly assigned[3] in order to mitigate the risk of starting point bias (Mitchell and Carson 1989, Onwujekwe and Nwagbo 2002). The amount of increments/decrements is 50 FCFA; no upper or lower limits to the possible bids were introduced. We adopted follow up questions with two degrees of certainty 'definitely sure' and 'probably sure'; this approach has been shown to remove the hypothetical bias both in laboratory and field experiments (Blumenschein et al. 1998, 2002, 2008). We focus our attention only on those who answered 'definitely sure'. Out of our sample of 360 households, 36 were already members of an MHO at the time of the survey and were thus excluded from the sample. As such the following analysis is based on a sample of 324 households.

3. Eliciting WTP

As mentioned above, to obtain the WTP of household heads we employ the contingent valuation (CV) method, through the 'bidding game' elicitation strategy. The use of stated-preference methods through

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[1] Health care in Thiès is organised according to a tiered system consisting of health huts (staffed by community health workers), health posts (staffed by nurses and certified midwives), and health centres (staffed by medical doctors, nurses, and certified midwives). The health district of Thiès has one regional public hospital and one privately run mission hospital (St-Jean de Dieu). Data for this region shows that the ratio of inhabitants to health centres is seven times greater than WHO standards, while the ratio of inhabitants to health posts is in line with international norms (ANSD, 2008).
[2] For example, *An Fagaru*, a popular MHO in Thies, proposes the following coverage: 80% of consultation at health posts, 50% of expenses at health centres and hospitals (the regional hospital and Saint Jean de Dieu hospital). The monthly per capita premium is 200 FCFA, the entry fee is 1000 FCFA and the observation period is three months.
[3] Starting bids are randomly drawn from 100, 150, 200, 250 or 300 FCFA.

contingent valuation is common in studies aiming to identify the value of health products and outcomes, public goods and environmental amenities (see Dror et al. 2006 for a list of papers). Despite its prevalence, CV, in its simpler form[4] presents several limitations. The major problem arises from incentive compatibility in telling the truth due to hypothetical bias, with the consequence that hypothetical responses overestimate real decisions[5] (Cummings et al. 1995, Johannesson et al. 1997, 1998, Harrison and Rutström 2008). As a response to this problem, several strategies have been proposed in order to align hypothetical and real decisions. Firstly, the use of a dichotomous choice, i.e. asking 'Are you willing to pay XY for this particular item?' gives more consistent results compared to open-ended questions and payment scale formats (Donaldson et al. 1997, Frew et al. 2004). Furthermore, dichotomous choice CV methods might follow a 'take-it-or-leave-it' or 'bidding game' approach. In the former, the respondent is asked to respond 'yes' or 'no' to a proposed price; in the latter, if the interviewee agrees upon a certain price, the interviewer increases the bid of a certain amount up to the point the respondent says 'no'. WTP is therefore estimated to correspond to the last amount before the 'no'. If the respondent says 'no' to the first bid, the interviewer decreases the following bid and stops when the respondent says 'yes'. WTP corresponds to the amount the individual agrees upon.

The advantage of the bidding game approach lies with the possibility of obtaining more precise and reliable estimates of WTP (Dong et al. 2003). Moreover, such an approach is suggested in the context where prices are variable (McNamee et al. 2010), as is the case for MHO schemes. It should also be noted that if starting-point bids do not cover the distribution of WTP, then bidding game methods increase the efficiency of estimates (Whitehead 2002).

The bidding game approach can be considered within the context of multiple bounded contingent valuation methods. Several limits to this class of elicitation approach have been pointed out by the literature as a consequence of the introduction of follow-up questions. Firstly, the presence of a proposed initial bid may hinder one's true answers, leading to biased WTP elicitation due to starting point bias (Mitchell and Carson, 1989). The respondent might interpret the initial proposed bid as indicative of the true value of the good and may 'anchor' his answers accordingly (Herriges and Shogren, 1996). Secondly, agents may not report their true WTP due to incentive incompatibility, so that stated values after the first bid might be shifted systematically by a certain parameter (Alberini et al. 1997). Intuitively, this may occur if the respondent feels he is in a position to bargain or that he might lose the good once an agreement is reached on price (through a yes-response to the first answer). This 'preference anomaly' (Watson and Ryan 2007) may lead to an optimal no-response to the follow-up questions (negative shift), although it might also be the case that the shift is positive, due to 'yea-saying' behaviour (Kanninen, 1995). Whitehead (2002) suggests that the phenomena of shift (incentive incompatibility) and anchoring (starting point bias) need to be considered together. Moreover, the consistency of the elicitation method is threatened by the possibility that responses to the first and subsequent questions are drawn from different distributions (Cameron and Quiggin 1994, McFadden 1994). We consider these potential problems in our estimations below.

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[4] The simpler way of eliciting WTP with CV method is an open question asking the maximum amount one is willing to spend for a real (hypothetical) product.

[5] The reason why one may overestimate the willingness to pay in a hypothetical context compared to a real one, lies in the fact that proposing a large WTP increases the perceived likelihood of provision, irrespective of one's preferences toward this good.

4. Theoretical framework and empirical strategy

4.1 Theoretical framework

WTP is elicited through a series $t = 1, 2, \ldots, T$ of questions proposing an amount A_t. The respondent answers 'yes' if $WTP_t \geq A_t$ and 'no' otherwise. By stating this, we assume that WTP does not change with follow-up questions, i.e. $WTP_1 = WTP_2 = \cdots = WTP_T$. However, this assumption is violated in the case of structural shift and anchoring problems due to incentive incompatibility and starting point bias.

According to the model introduced by Alberini et al. (1997), answers to follow-up questions may be untruthful due to incentive incompatibility. In particular, true WTP, which we assume to correspond to that elicited at the first bid (WTP_1), is shifted by a structural parameter δ:

$$WTP_{t>2} = WTP_1 + \delta \tag{1}$$

Different explanations are possible dependent on the sign of δ. In particular, a negative value of δ means that the respondent is less likely to accept the second bid and so the final WTP might be underestimated. On the one hand, a negative structural shift is consistent with theoretical and behavioural models such as prospect theory (DeShazo, 2002), incentive incompatibility (Carson and Groves 2007), or 'guilt and indignation' (Bateman et al., 2001). On the other hand, a positive δ can be explained by yea-saying behaviour (Kanninen, 1995) leading to upwardly biased estimations. Some intuitive explanations of the issues are presented in Carson and Groves (2007).

Herriges and Shogren (1996) claim that WTP elicited with follow-up questions may suffer from an anchoring effect. Respondents reveal a WTP that is the average of the starting bid and the true (initial) WTP. This is equal to:

$$WTP_{t>2} = (1 - \gamma)WTP_1 + \gamma A_1 \tag{2}$$

With $0 \leq \gamma \leq 1$. For every given follow-up question A_t, the respondent accepts the bid if $(1 - \gamma)WTP_1 + \gamma A_1 \geq A_t$. Therefore, a yes response is expected if

$$WTP_1 \geq \frac{A_t - \gamma A_1}{1 - \gamma}$$

Consequently, in the presence of anchoring ($\gamma > 0$), after an initial yes response, i.e. with $A_t > A_1$, the likelihood of accepting the second bid decreases. This is due to the fact that the prior on WTP has changed due to the information provided by the initial bid. This results in the underestimation of true WTP. Conversely, after an initial no response ($A_t > A_1$), anchoring leads to a higher probability of accepting the second bid, with a consequent overestimation of WTP. The choice of initial bids is thus crucial at determining WTP over/underestimation.

Whitehead (2002) integrates the two previous models, considering the case where structural shift and anchoring to the initial bid hold together. Answers to follow-up questions follow:

$$WTP_{t>2} = (1 - \gamma)WTP_1 + \gamma A_1 + \delta \tag{3}$$

and will be 'yes' if

$$WTP_1 \geq \frac{A_t - \gamma A_1 - \delta}{1 - \gamma}$$

This results in an amplified effect of anchoring if $\delta < 0$, whereas no clear prediction arises if $\delta > 0$.

4.2 Empirical strategy

We estimate WTP under the assumption of WTP distribution consistency across responses, meaning that respondents having the same underlying WTP will react in the same way to bids (McNamee et al. 2010). This assumption implies perfect correlation and the absence of systematic errors across responses to different bids. This allows us to employ the OLS estimator.[6] We first estimate a base model as follows:

$$WTP_i = \alpha + \beta A_{1i} + X_i\gamma + \varepsilon_i \tag{4}$$

where WTP_i is the final elicited value of individual i, A_{1i} is the initial bid, X_i is a vector of individual and household characteristics, and ε_i is an individual error term.
The presence of a structural shift in WTP is estimated as follows:

$$WTP_i = \alpha + \beta_1 A_{1i} + \beta_2 D_i + X_i\gamma + \varepsilon_i \tag{5}$$

Where D is a dummy variable taking the value zero when the respondent answered only one follow-up question, meaning that they either accepted the first bid and refused the second one or rejected the first bid and accepted the second. D is equal to 1 otherwise. This variable allows us to identify whether there exist structural differences among those responding to one or more questions.
The anchoring effect is accounted for through the following augmentation:

$$WTP_i = \alpha + \beta_1 A_{1i} + \beta_3 D_i * A_{1i} + X_i\gamma + \varepsilon_i \tag{6}$$

where the interaction term captures the effect of anchoring in follow-up questions. If anchoring is present, β_3 is expected to be positive. Finally, the shift and anchoring model allows for the possibility of two effects driving WTP:

$$WTP_i = \alpha + \beta_1 A_{1i} + \beta_2 D_i + \beta_3 D_i * A_{1i} + X_i\gamma + \varepsilon_i \tag{7}$$

We obtain estimates both in log and level terms.

5. Results

5.1 Descriptive statistics

Table 1 reports summary statistics for the socio-economic characteristics considered in our study that will be included in our specifications as controls. Almost three in every four heads of household are male. The average size of a household is more than six members. 46% of household heads attended secondary school or a higher level of education (above six years of schooling), 20% have only primary education, 34% never attended school. 'Household income', which represents the sum of all sources of monthly income (labour income or wages, rent and transfers received) across all members of the household, is used as a proxy for households' economic conditions. Due to the sensitivity of questions related to income and the reticence to provide exact amounts, answers were, in most cases (68% of all

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[6] This is a standard assumption in the literature that focuses on the determinants of WTP for health microinsurance (see among others Dong et al., 2003).

answers), collected according to intervals. An aggregated measure of income was constructed at the individual level by adding intervals' midpoint values for the ten income intervals or exact values when given to rents and transfers nominal values. Income was then categorized into quintiles. We also computed a synthetic measure of assets owned by the households as proxy for wealth (denoted as 'durables'). This is simply the sum of a list of items comprising amongst others, a series of kitchen and home appliances, mobile phones, bicycles, motorcycles, cars, sewing machines, different pieces of furniture, etc. As part of robustness checks we also use alternative ways of expressing wealth; these are discussed below.

[Table 1 here]

We use a dummy taking the value one if the head of household works for a public institution; this serves as a proxy for income stability. We also include a dummy for self-employment (the benchmark group are employed by private firms). The intuition is that with respect to wages earned in informal activities (petty retailing, craftsmen, transport, etc.), public servants are likely to have a steadier stream of revenues. Around 20% of heads in our sample work for the state. We also incorporate dummy variables to capture the effects of households that use one of three saving devices: ROSCAs, banks or microfinance institutions. Having access to a savings device might help a household to buffer health shocks by alleviating credit constraints and may render MHOs less attractive. Alternatively, it may help households to pay for membership fees and premiums, thus making MHO membership more likely. Also being a member of a ROSCA may imply some discipline in saving which could in turn help an individual in committing to an MHO's premiums. With regard to the health status of the household, 67% of heads reported one of their household members having been sick in the previous twelve months. More sickness is likely to lead to greater demand for health care and hence for health insurance.

Two additional dummies are added as controls in our regressions. The first takes a value of one if the household head is strongly risk averse, i.e. always opted for the certain outcome when presented with a set of choices between gambles and certain gains and losses, using a similar methodology as Voors et al. (2012). In this part of our survey, each individual had to choose between certain outcomes (gain/loss of 200, 250 and 300 CFA francs) and simple gambles with probability 1/4 to win/lose 1000 CFA francs and probability 3/4 to win/lose nothing. We also ran this exercise with the same amounts multiplied by a factor of ten. Before answering the set of 12 questions, each household head was informed that after completion of the section, a lottery would be drawn (amongst the scenarios offering potential gains) by the enumerator, who, in accordance with the preferences of the player, would either award the certain outcome or play the selected lottery for real money. We also looked to the methodology proposed in Voors et al. (2012) to elicit discount factors. In this case household heads had to choose, from a list of different amounts to be received in one month, the one that made them indifferent from receiving 10000 CFA francs today. The list of amounts used in this question is the following: 10500, 11000, 12500, 15000, 17500, 20000, 25000, 30000, representing the respective discount factors at one month: 5%, 10%, 25%, 50%, 75%, 100%, 150%, 200%. We then generated a binary variable taking a value of one when the individual belonged to the more impatient half of our sample.

The second dummy variable 'already insured' takes the value one if the head already has health insurance[7]. The variable 'insurance score' represents the number of correct answers given to a series of

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[7] Only three forms of health insurance are present in our sample. The first, and of relatively little importance, is offered by private insurers. They provide insurance according to different scales and often require their clients to open a savings account within their own institution (PAMECAS, SALAMA and Crédit Mutuel du Sénégal). The second type refers to compulsory insurance provided by employers of a minimal size (with a minimum number of employees). Employees are this way contributing a fraction of their wage to their firms' health fund known as *Institution de Prévoyance Maladie* (IPM). This fund is then used to cover employees when health problems occur. Public servants have access to a more generous type of IPM where they, their spouse, and often up to two children (under 18), are insured in case of health related

seven true or false questions on the nature of insurance. The more knowledgeable a household is of basic insurance principles, the higher our variable insurance score is. Household total expenditure on health is the sum of payments for treatments, drugs, consultations and hospitalization for both recurrent and chronic illness, across all household members[8].

Tables 2 and 3 show that WTP is positively related to the level of income, calculated both at individual head and household level. In both cases, WTP is significantly higher in the fifth quintile and significantly lower in the first. No significant difference arises between the second and third income quintiles. Similarly, a positive and significant relationship is found between WTP and levels of wealth. Moreover, risk preferences appear to be related to WTP; strongly risk averse individuals declared a significantly higher WTP than those who were less risk averse.

[Table 2 and 3 here]

5.2 WTP and starting point bids

Given that most MHOs charge 200 FCFA for premiums we decided to distribute our initial bids between 100 and 300 FCFA, thus providing an equal difference above and below the true market price. Table 4 shows the random assignment of initial bids across household characteristics. One can notice an uneven distribution of initial bids: 42.5% received an initial bid less than 200 FCFA (corresponding to the amounts 100 and 150) and 33.3% received an amount greater than 200FCFA (250 and 300). However, our randomization appears satisfactory across most household characteristics. We measure the success of randomization through the F-test of joint significance of coefficients in a regression with the household characteristic as the dependent variable and four dummies (out of a total of five categories) for different starting bids as regressors. A significant difference in means across starting bids arises for already insured, wealth (however not for alternative indices), education and income (although total expenditure, which can be taken as a proxy of total income, shows otherwise). We control for all these variables in our estimations for WTP.

[Table 4 here]

Table 5 displays the response pattern to the initial question on WTP by starting bid. As expected, the proportion of individuals saying yes to the first offer is decreasing in the amount of the first bid: 92% of respondents declared to be willing to pay at least 100 FCFA, 75% at least 200 FCFA and only 35% stated a final WTP greater than 300 FCFA. This is consistent with a downward sloping demand curve. However, there seem to be no clear pattern for the follow-up answers. On average 23% of household heads answered only two questions. The average final elicited WTP is superior to the initial proposed bid, except for those who were offered 300 FCFA who, on average, declared to have a WTP of 282 FCFA. No clear trend can be easily identified between the initial bid and the final value of WTP. The role of initial bids on final WTP is taken into greater consideration in the analysis that follows.

[Table 5 here]

A very similar product is supplied by a local MHO at a monthly premium of 200 FCFA. One in five individuals declared a WTP corresponding to this actual market value. On average, these respondents

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reached the value of 200 FCFA after two bids. Around 40% of respondents declared a WTP very close to the true value, i.e. between 150 and 250 FCFA. Figure 1 shows the distribution of the final WTP, according to the initial bid. All five formats seem to have similar patterns: spikes are concentrated at 100, 200 and 500 FCFA across the initial bids.

[Figure 1 here]

5.3 Determinants of WTP

Table 6 displays the results of WTP estimates using OLS[9] under each of the four different models described above, following McNamee et al.'s (2010) specification strategy. We show the results in levels, however the use of logarithms yields similar results. Column 1 shows that the amount of the starting bid does not play a significant role in predicting final WTP. Column 2 highlights the presence of a positive shift parameter, suggesting that those with more follow-up bids had a higher final WTP. Results in column 3 indicate the presence of anchoring; the positive sign of the interaction term suggests that those with more follow-up questions and higher bids declared higher WTP. However, this result may be biased due to omitted variables, as the shift parameter is not included, although significant. Indeed, a look at the R-squared indicates that there seems to be a loss in the goodness of fit of the Anchoring model compared to the Shift model. Column 4 shows the results when the model encompasses both shift and anchoring effects. The latter model seems to fit the data better, as measured by the improvement in R-squared. The positive shift is confirmed and becomes even stronger, whereas the anchoring effect disappears, as the associated coefficient turns negative.

[Table 6 here]

Income appears to have a positive and statistically significant impact on the WTP, shown by the positive and increasing coefficients of household income quintiles (the first quintile is the omitted category). Household head wealth is positively and significantly related to WTP, as indicated by the coefficient of our index for wealth.[10] Households with larger numbers of children younger than 5 years old are also more willing to pay. Heads reporting episodes of sickness over the last twelve months appear to have a smaller WTP in the specification in levels, suggesting that households that have been more exposed to illness are not willing to pay more to be insured. That is a somewhat surprising result, as we would have expected such households to be more willing to purchase insurance in the face of health expenditures. Risk-averse individuals have a significantly greater WTP. Our variable related to the discount factor ('impatient') appears to have no significant impact across the models.[11]

As we can see from table 6, our results hold if we use different specifications of preference anomalies and estimation strategies. Using our different models we can obtain predicted median values of WTP. There is evidence of a slight underestimation of the median WTP if preference anomalies are not taken into consideration. However, the extent of such difference does not appear to be relevant: 5% when the

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[9] Tobit estimates (not shown, but available upon request) are qualitatively similar.

[10] We also use alternative ways of expressing wealth: 1) the DHS Wealth index (Filmer and Pritchett, 2001; Rutstein and Johnson, 2004) which is a synthetic index obtained by the first principal component derived from the principal component analysis on the answers on housing and dwellings; 2) quintiles of the DHS Wealth Index. Our results hold when we use either one of these measures.

[11] These results are robust to different definitions of time and risk preferences. For risk preferences we consider the sub samples of risk averse agents (always opting for the certain amount) for small and large stakes, for gains and losses. For time preferences we employ different time horizons and stakes, namely we elicit two days, two weeks, one month and six months discount factors for small (1000 CFA) and large (10000 CFA) stakes and we construct a dummy taking a value of one when the individual belonged to the more patient half of our sample. We use these different combinations of time and risk variables. Results are not shown, but are available upon request.

full model is estimated in log (from 238.8 to 250.9 FCFA) and less than 3% when estimated in levels (from 289.5 to 296.3 FCFA).

5.4 Predictive power of WTP on actual take-up

The purpose of our first visit to households was to gather information related to household characteristics and obtain their WTP. During our second visit we carried out a randomized control trial to test the impact of two different treatments.[12] We first offered an insurance literacy module, which communicated the benefits of health microinsurance and the functioning of MHOs, to a randomly selected sample of households. 163 of the 324 households were invited to attend the insurance literacy module to be held on a non-working day in the city centre before our marketing treatment, described below, went ahead. Invitations were handed directly to heads of household. The module consisted of a three-hour educational presentation on health microinsurance, with a specific focus on the functioning of MHOs. A lesson on personal financial management exploring the notions of savings, risk and insurance was also given. Case studies of different MHO member and non-member households were presented in order to illustrate the different concepts introduced. Sessions were delivered to groups with a maximum of 20 individuals at a time. The comparison group of 161 households received nothing. This randomization allows us to measure the causal impact of the effect of insurance literacy training on the purchase of insurance with MHOs. This way we can assess the module's impact while screening out other effects such as each individual's inherent propensity to opt for insurance. 'E' is thus a dummy variable equal to one if the household was invited to the insurance literacy module.

After the insurance literacy training was completed (and independent of this assignment), the households were split into three randomly chosen sub samples, with each receiving an additional marketing treatment in the form of one of three vouchers. So for the 163 households invited to attend the insurance literacy module, 53 received voucher 1, 55 voucher 2 and 55 voucher 3 (a similar distribution applies for the 161 households who did not receive an invitation to the module). Voucher 2 offered a full refund of membership fees in a MHO. That represented average an amount of 1750 CFA (membership fees for the MHO joined by vouchers holders ranged from 1000 to 3000 CFA). Voucher 3 provided a full refund of membership fees (equivalent to voucher 2) plus a refund of 250 CFA/month per new member covering fees linked to the observation period of three months (a refund was made for each new member for up to 3000 CFA which is the equivalent of three months' premium for four people at 250 CFA/month). The refunds offered with voucher 2 and 3 were such that respondents did not have to pay cash up-front and then wait for a reimbursement. The vouchers actually reduced the initial cash outlay as these refunds were directly transferred to the MHO treasuries. Voucher 1 had no monetary value attached, instead representing a simple invitation to the GRAIM in the event that the household was keen to know more about MHOs and the insurance products offered. The recipients had a period of two months to redeem the voucher by visiting the GRAIM and filling in an application form to join the MHO of their choice. In the equation below the variable 'Voucher' is a dummy equal to one if the household was given either voucher 2 or 3.[13]

Therefore in our analysis, a household subscribes if it simply redeems its voucher. Unfortunately we could not collect information on how long households stayed members once they had redeemed their voucher. Subscription is thus not measured in terms of how long they remained enrolled for. To ensure that our dependent variable was correctly constructed, we phoned all households who did not redeem their voucher one month after the redemption date to ask them if in the meantime they had joined an

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[12] Additional details on our different treatments can be found in Appendix 1.

[13] Tests for random assignments of treatments across samples are provided in Bonan et al. (2012). Randomization with respect to voucher assignment appears satisfactory. However, there are a number of significant differences between the invited and not invited samples which are discussed in this paper.

MHO but not used their voucher. This allowed us to account for the membership of two additional households.

The determinants of the decision to subscribe to MHOs are analysed through an OLS estimate run on two different subsamples: those who were not yet members of MHOs (n=324) and those who were not members and who also declared WTP at the baseline (n=312). It is important to note that the focus of this paper is not on the impact of our randomized treatments but rather on the influence that WTP has on the take-up of MHO membership. A more extensive discussion of these treatments and their impacts can be found in Bonan et al. (2012). What follows hence focuses on the impact of WTP on the decision of whether or not to actually purchase health insurance.

In order to evaluate the effect of elicited WTP on the effective purchase of a health microinsurance product, we estimate the following model:

$$Y_i = \alpha + \beta_1 WTP_i + X_i\gamma + \beta_2 E_i + \beta_3 Voucher_i + \varepsilon_i \tag{8}$$

where Y is a dummy variable equal to one if the head of household, indexed by i, has decided to subscribe his/her household to a MHO. **X** is a vector of covariates containing: household heads' characteristics (gender, education, income, employment status, if (s)he is impatient and strongly risk averse), size of the household, an indicator of household wealth, whether the household already has health insurance, a dummy if the household uses a saving device (rosca, bank, MFI), a proxy for the status of the household's health (using either total household health expenditures during the last year, or if the household reported a sickness during the last year) and the household's level of insurance literacy. E is a dummy variable equal to one if the household was invited to the insurance literacy module and *Voucher* is a dummy variable that equals one if the household received either voucher 2 or 3.

[Table 7 here]

Table 7 displays our results using OLS estimation. The results are similar if we use probit techniques[14]. Contingent valuation of WTP has a positive effect on microinsurance uptake. The result is significant at the 10% confidence level for all specifications (column 1 to 4) and is robust to the use of different indicators of household income and wealth. It is worth emphasising that even after controlling for household and individual characteristics and for our two treatments we find a significant impact of WTP on uptake. The impact of our different controls and treatments (*voucher* and *invitation to insurance literacy module*) are discussed in detail in Bonan et al. (2012). The positive effect of WTP on effective purchase is stronger and more significant if we consider the subsample of those who were not members of a MHO at the time of the survey. This indicates that for people less familiar with MHOs, the expression of interest in microinsurance products through high contingent valuation seems to translate into a higher propensity to buy the product. The positive effect of WTP holds (at the 10% level) in two of the four models shown if we consider the subsample of non-members with a positive WTP (n=312). We do not find any heterogeneous effect of WTP when combined with our two treatments.

6. Discussion

The presence of a positive and significant shift parameter leads to rejection of the hypothesis of incentive incompatibility (Alberini, Kannien and Carson, 1997) and suggests the presence of yea-saying behaviour (Kanninen, 1995). McNamee et al. (2010) uncover similar results. In the fields of psychology and sociology, response acquiescence is termed 'yea saying' and it implies the tendency to

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[14] Results are not reported but available upon request

agree with questions regardless of content. Mitchell and Carson (1989) define yea saying in the context of CV as "the tendency of some respondents to agree with an interviewer's request regardless of their true views".[15] As in other studies, the anchoring effect vanishes if the shift parameter is taken in the same specification (Watson and Ryan 2007, McNamee et al. 2010).

Our estimation results on the determinants of WTP are in agreement with the existent literature. In particular, the positive effect of income is confirmed in other studies such as Dror et al. (2007), Wang et al. (2005), Prabhu (2010) and Donfouet et al. (2011). The coefficient for risk aversion conforms to the standard expected utility model of choice under risk. The positive coefficient linked to the number of children in the household, together with the negative coefficient on household size might suggest that in many cases insurance is conceived as a form of protection for the members of the household most at risk with their health. Amongst those heads who were already members of MHOs in our sample, slightly fewer than half insured the entire family (100% of members). Moreover, in response to the question 'who would you buy the health insurance for at that price?' around 60% of heads claimed to be willing to cover every member of the household. In many cases the head stated that he gave priority to the coverage of young children over himself and his spouse. Finally, despite evidence of preference anomalies in the form of a positive structural shift in preferences, the distribution of estimated WTP does not change significantly across specifications.

By performing this simulated market experiment, we find that elicited WTP is a key explanatory variable in predicting the effective purchase of the insurance product and is thus informative of individual behaviour. Our estimation results indicate that after having controlled for our different treatments and a series of other variables, WTP remains an important predictor of actual purchase behaviour. As such this result presents some evidence for the reliability and validity of eliciting WTP through contingent valuation. We also find that 62% of heads who opted to purchase MHO insurance had a WTP larger than or equal to the contribution actually charged by the MHO they joined. This proportion is in line with that uncovered by Bhatia and Fox-Rushby (2003) who found that 66% of agents had a WTP greater than or equal to the value of the treated mosquito net that they actually bought. Such similarities are interesting to notice given the different contexts. Bednets represent a one-off expenditure that is not comparable to the health microinsurance product we offer which requires monthly contributions. However, as emphasised by Bhatia and Fox-Rushby (2003), studies assessing criterion validity in the health sector are scarce and in that sense our results provide some interesting evidence.

Several concerns may be expressed on the exercise of eliciting WTP. One reason why an agent may respond untruthfully to hypothetical questions lies with the belief that answers might potentially influence the actions of rulers or policymakers. The consequence is strategic answering aimed at maximizing agent welfare (Carson and Groves 2007). In order to minimize this impact, our enumerators emphasised that the survey was neither carried out on behalf of a public agency nor linked to a public campaign designed to increase insurance coverage. Households were assured that the answers provided would not bear any consequence on their access to MHO insurance.

Another concern that could lead to misreporting of true values lies in the possible misunderstanding of the question by the respondent. This is frequent in the case of non-marketed and hypothetical goods (Carson and Groves 2007). However, our question on WTP refers to a product that is already present in the market and can be easily understood with a basic knowledge of some straightforward insurance principles. It is widely recognised that familiarity with the proposed good induces well-formed preferences (McCollum and Boyle 2005). Conversely, when respondents have relatively little experience or knowledge about the good being valued, they may provide invalid responses. As such we control for respondents' knowledge of insurance, but the corresponding variable does not hold any

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[15] One may argue that enumerators' ability in conducting the survey and personal characteristics may drive part of such results. However, when we include enumerators fixed effects, the previous results do not change.

explanatory power over willingness to pay in our models. This can indicate that in our sample, all respondents possessed at least a basic understanding of the product and as such, knowledge about insurance did not undermine the validity of the WTP figures elicited.

Finally, access to basic health services is not likely to be a factor in our case. Health huts and posts are evenly distributed across neighbourhoods and are located within a short distance from all households' residences we surveyed. Furthermore, all are situated within two kilometres from either of the two health centres (the regional public hospital and the mission hospital *St-Jean de Dieu*). Nevertheless, we attempt to control for such possible heterogeneity across neighbourhoods by introducing neighbourhood fixed effects.

7. Conclusion

WTP valuations can help both policy makers and MHOs in better understanding the characteristics of the demand for microinsurance products. This paper measures the different individual and household socio-economic determinants of WTP for a health microinsurance product. We find that richer, more wealthy and more risk-averse heads of household tend to display a higher WTP for health microinsurance. Conscious of the potential limits of our elicitation strategy (bidding game), we draw from the existing literature on the effects of 'preference anomalies' (Watson and Ryan 2007) and estimate WTP after having accounted for a structural shift in preferences, an anchoring effect and the two effects together. We find evidence of a slight underestimation of the median WTP if preference anomalies are not taken into consideration. However the size of these differences appears irrelevant. Our results on the determinants of WTP are robust to the effect of such preference anomalies

We also measure the influence of WTP in predicting the effective take-up of MHO product. To do so we offered 360 randomly selected households the opportunity to join a MHO scheme. This was done according a randomized field experiment. We find that contingent valuation of WTP has a positive effect on subscription. This effect is robust to the use of different indicators of household income and wealth. The positive effect of WTP on effective purchase is stronger and more significant for those who were not members of MHOs at the time of the survey. This indicates that when people are less familiar with MHOs, the expression of interest towards microinsurance products through high contingent valuation translates into a higher propensity to buy the product. Our results therefore suggest that contingent valuation of WTP is a relevant and valid measure to use when analysing the demand for health microinsurance products in developing contexts.

Tables

Table 3. Summary Statistics

	Mean	s.d.
Head is male	0.737	0.440
Head attended primary school	0.185	0.389
Head attended secondary school or more	0.451	0.498
Household size	6.768	3.249
Number of children younger than 5 years	0.636	0.955
Already insured	0.247	0.432
Insurance score	1.987	2.411
Head is public employed	0.191	0.393
Head is self employed	0.419	0.494
Saving device	0.552	0.498
Durables	6.530	3.198
Household income, in 1000 FCFA	22.652	19.667
Head income, in 1000 FCFA	12.935	10.325
Household total expenditure on health, in 1000 FCFA	10.181	10.325
Reported sickness	0.669	0.471
Strongly risk averse	0.565	0.496
Patient	0.414	0.493
Final WTP (in FCFA)	304.4	299.3
N	324	

Table 2. Comparison of WTP across household total income, head income and wealth quintiles

Household total income			Head income			Durables		
Quintile (n)	Mean WTP	se	Quintile (n)	Mean WTP	se	Quintile (n)	Mean WTP	se
1 (n=72)	172.92	(13.91)	1 (n=72)	209.72	(16.30)	1 (n=91)	234.62	(20.89)
2 (n=68)	272.06	(26.60)	2 (n=78)	254.49	(27.88)	2 (n=49)	260.20	(27.15)
3 (n=58)	279.31	(31.39)	3 (n=55)	256.36	(23.67)	3 (n=86)	266.86	(25.51)
4 (n=62)	338.71	(32.71)	4 (n=56)	334.82	(36.54)	4 (n=45)	300.00	(32.59)
5 (n=64)	476.56	(58.46)	5 (n=63)	489.68	(59.08)	5 (n=53)	530.19	(68.85)
F-test	10.34***		F-test	9.84***		F-test	10.48***	

Table 3. Comparison of WTP across risk preferences

Strongly risk averse	Mean WTP	se
0 (n=141)	253.90	(16.50)
1 (n=183)	343.44	(26.19)
F-test	7.26***	

Table 4. Random assignment of starting bids, by household characteristics

Starting bid (in FCFA)	100		150		200		250		300		
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	F-test
Gender (Male=1)	0.69	0.46	0.69	0.47	0.75	0.44	0.84	0.37	0.75	0.44	1.10
Head attended primary school	0.14	0.34	0.29	0.46	0.13	0.34	0.18	0.39	0.22	0.42	1.90
Head attended secondary school or more	0.47	0.50	0.29	0.46	0.47	0.50	0.56	0.50	0.45	0.50	2.24*
Already insured	0.15	0.36	0.26	0.44	0.29	0.46	0.36	0.49	0.20	0.40	2.50**
Knowledge of insurance principle	1.93	2.39	2.24	2.44	1.91	2.41	2.22	2.50	1.69	2.37	0.53
Household size	6.65	3.42	6.64	2.97	6.73	3.52	6.71	3.42	7.18	2.74	0.28
Number of children younger than 5 years	0.69	1.08	0.64	1.02	0.60	0.81	0.58	0.96	0.65	0.91	0.14
Head is public Employed	0.14	0.34	0.14	0.35	0.21	0.41	0.25	0.44	0.24	0.43	1.26
Head is self employed	0.49	0.50	0.43	0.50	0.37	0.49	0.42	0.50	0.36	0.49	0.80
Saving device	0.53	0.50	0.50	0.50	0.55	0.50	0.65	0.48	0.55	0.50	0.78
Household total revenues, in 10000 FCFA	16.52	11.56	23.73	22.86	22.12	21.85	25.56	22.94	22.47	17.98	2.15*
Durables	5.79	2.91	6.55	3.13	6.55	3.26	7.53	3.72	6.58	2.85	2.47**
DHS Wealth Index	-0.47	2.02	0.01	2.06	0.09	2.32	0.56	2.92	-0.09	2.05	1.76
Reported sickness over the year	0.70	0.46	0.50	0.50	0.67	0.47	0.65	0.48	0.73	0.45	2.10*
Household total expenditure on health, in 10000 FCFA	12.37	22.37	8.69	21.51	12.58	28.70	6.17	8.43	9.27	19.16	0.99
Strongly risk averse	0.54	0.50	0.62	0.49	0.64	0.48	0.55	0.50	0.45	0.50	1.36
Impatient	0.33	0.47	0.43	0.50	0.48	0.50	0.45	0.50	0.38	0.49	1.05
N	81		58		75		55		55		
(%)	(25)		(17.9)		(23.2)		(17)		(17)		

Table 5. WTP by initial starting bid

Starting bid (in FCFA)	100 %	150 %	200 %	250 %	300 %	Average
Said "yes" to the first bid	91.35	79.31	73.33	54.54	38.18	
Final elicited WTP (FCFA)	241.97	352.58	324.66	323.63	299.09	304.4
Number of bids:						
Two bids	19.75	25.86	33.33	27.27	12.73	24.07
Three bids	16.05	32.76	22.67	20.00	27.27	23.15
Four bids	19.75	8.62	9.33	12.73	12.73	12.96
Five bids	4.94	12.07	5.33	7.27	20.00	9.26
Six	24.69	1.72	2.67	10.91	16.36	11.73
More than six	14.81	18.97	26.67	21.82	10.91	18.83

Figure 1. WTP distribution by starting bid
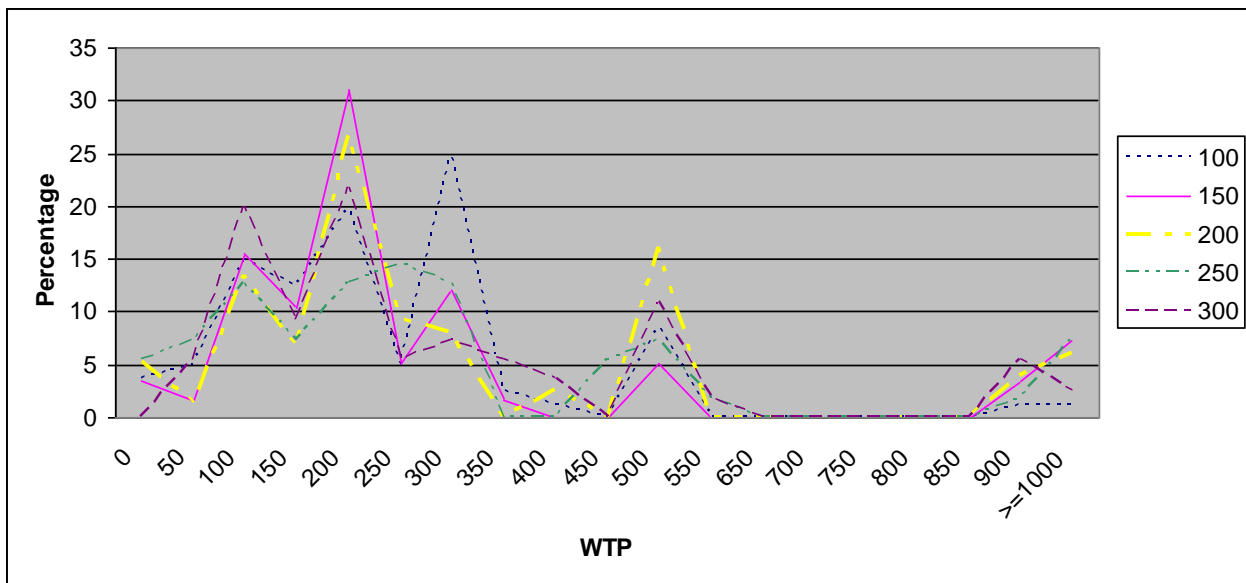
Table 6. OLS Estimates of WTP (in levels), under different models

	(1)	(2)	(3)	(4)
				WTP (Shift
		WTP	WTP	and
	WTP	(Shift)	(Anchoring)	anchoring)
Starting bid	0.06	0.06	-0.45**	0.68***
	(0.204)	(0.198)	(0.200)	(0.252)
D		150.00***		295.77***
		(22.421)		(74.233)
Starting bid * D			0.63***	-0.77**
			(0.114)	(0.369)
Gender (Male=1)	15.77	22.94	19.89	24.88
	(26.804)	(26.282)	(26.350)	(26.320)
Head attended primary school	31.99	32.07	31.56	32.67
	(40.667)	(39.367)	(39.849)	(39.191)
Head attended secondary school or more	-20.14	-18.95	-21.71	-15.88
	(37.269)	(36.549)	(36.669)	(36.971)
Household size	-7.87*	-6.85	-7.70*	-6.06
	(4.378)	(4.230)	(4.279)	(4.205)
Already insured	35.31	17.93	17.96	22.22
	(52.798)	(51.433)	(52.037)	(52.204)
Knowledge of insurance principle	7.23	6.88	6.48	7.45
	(6.773)	(6.321)	(6.422)	(6.365)
Head is public Employed	1.01	-7.88	-8.89	-4.43
	(66.584)	(65.567)	(65.851)	(65.063)
Head is self employed	8.89	-2.03	-2.24	0.95
	(35.573)	(35.269)	(35.598)	(35.170)
Saving device	38.15	38.02	39.72	35.98
	(38.943)	(37.582)	(38.004)	(37.608)
Impatient	-2.07	12.86	11.51	10.79
	(34.063)	(33.365)	(33.729)	(33.618)
Number of children younger than 5 years	21.34	22.38*	25.45*	18.36
	(13.807)	(13.174)	(13.234)	(13.600)
Reported sickness over the year	-31.87	-30.61	-30.24	-31.38
	(28.675)	(27.874)	(28.016)	(27.938)
Strongly risk averse	65.00**	72.00**	71.71**	70.60**
	(29.217)	(28.613)	(28.801)	(28.593)
2nd household income quintile	72.94**	48.83	57.85*	43.83
	(30.230)	(29.883)	(30.037)	(29.888)
3rd household income quintile	60.40	27.15	35.60	25.13
	(40.813)	(40.119)	(40.391)	(39.984)
4th household income quintile	73.83	50.32	64.68	38.65
	(46.074)	(43.929)	(44.377)	(45.046)
5th household income quintile	165.17**	119.96*	132.48**	115.94*
	(65.296)	(64.317)	(65.407)	(63.464)
Durables	20.71***	22.22***	22.21***	21.85***
	(7.354)	(6.963)	(7.051)	(7.029)
Constant	52.89	-58.95	59.83	-176.11**
	(70.187)	(70.533)	(68.303)	(71.587)
Observations	324	324	324	324
R-squared	0.196	0.238	0.226	0.243
F statistic	4.331	5.697	4.890	6.008
Predicted median WTP	293.6	304.9	300.8	306.8

Table 7. The role of WTP in predicting effective purchase

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Take-up (non-members of MHO)				Take-up (WTP>0 & non-members of MHO')			
WTP, in 1000 FCFA	0.15*	0.16*	0.19**	0.20**	0.13	0.14	0.17*	0.18*
	(0.083)	(0.083)	(0.092)	(0.091)	(0.088)	(0.088)	(0.097)	(0.095)
Voucher	0.36***	0.36***	0.35***	0.35***	0.36***	0.36***	0.35***	0.35***
	(0.038)	(0.038)	(0.038)	(0.038)	(0.039)	(0.039)	(0.039)	(0.039)
Invitation to insurance literacy module	-0.07	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07
	(0.050)	(0.050)	(0.050)	(0.050)	(0.052)	(0.052)	(0.052)	(0.052)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household income quintiles	Yes	Yes	No	No	Yes	Yes	No	No
Household income in FCFA	No	No	Yes	Yes	No	No	Yes	Yes
Wealth index 1	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Wealth index 2	No	Yes	No	No	No	Yes	No	No
Neighbourhood F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	324	324	324	324	312	312	312	312
R-squared	0.242	0.241	0.211	0.285	0.240	0.239	0.208	0.283

Appendix

Survey methodology

Insurance Literacy Module

GRAIM acts as a regional coordinator and the intermediary for most MHOs in negotiating conventions with health providers. Our partnership meant we could draw on its knowledge to design and deliver our educational modules. GRAIM has been running a training program on demand for several years for small communities eager to set up their own MHO and was therefore in a position to run the information module. It was thus slightly modified in order to be presented to randomly selected households. The same individual was in charge of running all the sessions during which interactions with the participants were encouraged.

The module consisted of a three-hour educational presentation on health microinsurance and specifically on MHO functioning (including the differences across various active MHOs in the city of Thies) and their origins in the region. A lesson on personal financial management exploring the notions of savings, risk and insurance was also given. Case studies looking at health expenditures of different MHO members and non-member households were presented in order to illustrate the different concepts introduced. Sessions were held in groups containing a maximum of 20 individuals at a time.

Since the city covers a sizeable area, we reimbursed transportation costs for all individuals who had attended in order to minimize disincentives to attend. We gave 1000 CFA to every individual, which in Thies, is the exact return fare for a taxi journey from any corner of the city to where the meetings were held. Households were informed that transportation costs would be covered at the time of the invitation. We made sure that the individuals who got their transportation reimbursed did actually pay for transport. We have thus no evidence that opportunism can explain participation in the session (i.e. individuals attending just to obtain a little additional income).

The comparison group received nothing. This randomization allowed us to measure the causal impact of the effect of insurance literacy training on the purchase of insurance with MHOs. This way we can assess the module's impact whilst also screening out other effects such as each individual's inherent propensity to opt for insurance.

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