The economics of Roscas and intra-household resource allocation¤

Siwan Anderson
CentER, Department of Economics,
Tilburg University, The Netherlands
e-mail: siwan@kub.nl

Jean-Marie Baland
CRED, Department of Economics, University of Namur,
8 Rempart de la vierge, B5000 Namur, Belgium
e-mail: jean-marie.baland@fundp.ac.be

January 2000

Abstract

This paper investigates individual motives to participate in rotating savings and credit associations (roscas). Detailed evidence of roscas in a Kenyan slum (Nairobi) shows that most roscas are predominantly composed of women. To explain this phenomenon, we propose an argument based on con°ictual interactions within the household, where husbands and wives have di®erential savings patterns due to di®erent valuations of an indivisible good. We test the empirical implications of the model using data collected from the Kenyan slum.

¤Acknowledgement: We are grateful to the CRED and to the Mac Arthur Foundation for ¯nancial support, particularly for the collection of ¯eld data. We also thank members of the \Costs of inequality" research network, supported by the same Foundation, for many stimulating conversations and Patrick Francois for helpful discussions.

1. Introduction

Rotating savings and credit associations (roscas) constitute one of the most commonly found informal ¯nancial institutions, in the world, and particularly in Asian and African countries.[1] In these associations, a group of individuals, who typically live in the same community, gather for a series of meetings. At each meeting, each of them contributes a pre-determined amount into a collective `pot'. The pot is then allocated to one member. The latter is then excluded from receiving the pot in future meetings, while still contributing to the pot. The meeting process repeats itself until each member has received the pot. There is substantial variation among roscas as to the frequency of the meetings, the amount of the contribution, the number of members and the way the order of the winners is determined, whether it is random, by drawing lots, or a bidding process, through which the pot goes to the highest bidding individual (see Ardener (1964) for a detailed discussion of the various ways to allocate the pot).[2]

In the literature (see, in particular, the empirical analyses by Besley and Evenson (1996) and Evenson and Besley (1996) on Taiwan and by van den Brink and Chavas (1997) on Cameroon), roscas are usually viewed as a way for individuals with little or no access to formal credit markets to save up for the purchase of indivisible durable goods.[3] However, as there is no interest to be gained by saving in a rosca, the question is why do individuals choose to save through a rosca instead of individually accumulating savings. In their seminal contribution, Besley, Coate and Loury (1993 and 1994) argue that, on average, roscas allow individuals to receive the pot, and hence to buy the individual good, earlier than through individual savings. While, ex ante, all individuals are thus better o® by saving through a rosca, the member who receives the pot last is ex post worse o®.[4]

This paper is motivated by the evidence we collected on a sample of 520 households in a Kenyan slum, called Kibera, located on the outskirts of Nairobi. First, the majority of roscas in Kibera (there are a total of 385 in our sample) do not systematically have a random or bidding (there are none) order.[5] Instead, in most instances, there is a pre-determined order which is known before

[1] See, for example, Bouman (1977), for a list of countries in parts of Africa, Asia, the Americas, Caribbean, Middle East, and early Europe where roscas have appeared.

[2] Kovsted and Lyk-Jensen (1999) compare the performance and e±ciency of the bidding and random roscas.

[3] The work of Handa and Kirton (1999) and Gugerty (1999) similarly ¯nd evidence that rosca funds are used for durable goods purchase.

[4] In fact, at least the last member is worse o® (ex post) by joining the rosca. This follows because the savings rate (i.e., contribution) imposed by the rosca is feasible for this member if he saves on his own, but typically not optimal.

[5] In contrast, Calormis and Rajaraman (1998) ¯nd a prevalence of roscas with concurrent bidding. As a result,

the rotation cycle begins. Typically, while the original order might have been chosen randomly, the order of the winners tends to be repeated throughout the cycles: 69.2% of the roscas in our sample do not change their order after a cycle. (The median number of cycles in our sample is 3.2, and the median length of a cycle is 6.1 months.) As a result, at least after one full cycle, there is no randomness in receiving the pot. The rationale proposed by Besley, Coate and Loury (1993) does not apply here as it does not explain why the last recipient would join the rosca (and by backwards induction nobody joins), or would continue to do so after one full cycle.

Second, an overwhelming majority of rosca members are women: 84% of all rosca members are women. The gender issue of roscas has yet to be investigated.[6]

In this paper we develop a new argument based on intra-household con°ict to explain rosca participation. This argument originates from semi-open interviews conducted among women from informal groups in Kibera. In those discussions, women often saw their use of roscas as a way to hide money from their husbands (and possibly other members of the family).[7] Here are some excerpts:

> \Joining a merry-go-round (i.e., a local rosca) is the only way to save some money. If I leave it at home, it will disappear."
>
> \You cannot trust your husband. If you leave money at home, he will take it."
>
> \In our group, we have secret meetings. Members cannot talk outside. There are bad husbands who take the money, and do not provide their wives with food and basic goods ... People quarrel a lot."
>
> \We wanted only women in the group, we are more free, and we can talk and laugh. Men always want to take the lead. They are like children ... They are not interested in improving the situation of the family."

---

they suggest an insurance role for roscas instead of a device to purchase an indivisible durable good.

[6] There are several other studies which ¯nd that predominantly women join roscas. Ardener (1964) points to several case studies where roscas are composed only of women in India, Malaya, Ghana, South Africa, Sudan, and Egypt. Geertz (1962) also ¯nds that almost all women belong to several rosca groups in Eastern Java.

[7] Con¯dentiality of discussion and procedures matter a lot in all informal groups. Members are usually not allowed to talk about the groups they belong to with others. Such secrecy is clearly aimed at protecting members against theft or malfeasance, but also to ensure freedom of speech during the meetings, and to avoid the formation of hidden alliances outside the group meetings. In the 44 informal groups we interviewed in some depth, 6 of them have explicit written rules to punish members who violate this obligation.

We demonstrate that if men have a greater preference, relative to women, for present consumption than saving for an indivisible good, then women are better off if they save in a rosca than at home. Essentially, roscas serve the role of a forced savings mechanism for the household, which women use in their negotiation with their husbands. Roscas help to increase the saving rate that the household would otherwise choose.[8] There are also cases where ex ante the husband would not be willing to save at all even though ex post he is willing to purchase the indivisible good when his wife returns home with the full amount of the pot.[9]

That income earning women are more likely to save in roscas if they are married, provides partial empirical support for this explanation. In Kibera, the probability that a woman (18 years and older) participates in a rosca is 48.7%. If a woman is working her participation rate increases to 68.5%, and to 74.4% if she also lives in a couple. The corresponding figures for men are 10.1%, 12.4% and 9.6%.

The paper is organized as follows. The next section provides a model of conflict in the household and discusses our basic result. In Section 3, we develop a related argument, without assuming that decisions are jointly made within the household. Section 4 provides some background information and an empirical test of our theory. Section 5 concludes.

2. Disagreement in the Household

Let us consider a household composed of two individuals; husband and wife. The conflict between members of the couple centers around their differing preferences for an indivisible good, the purchase of which requires accumulated savings. Assume that, relative to men, women always have a larger preference for the good. As a result, they would like to choose a higher savings rate to purchase the good than men would. (Note that it is entirely possible that men do not want to purchase the good at all.)

Such a difference in preferences is conceivable for several types of household goods. If the good is, for instance, school fees for children, it is likely that women have a larger preference for this good

[8] Krahnen and Schmidt (1994) in their overview of informal finance in developing countries also note: "But there is another socially valuable function which Rosca members seem to value highly: in many countries and cultures the participation by individuals in such groups creates a senior claim of the participant on resources that otherwise would have been absorbed by the `sponge' of family needs." (Krahnen and Schmidt, 1994: 47). This is exactly the claim we want to investigate here.

[9] This explanation clearly does not contradict the one proposed by Besley, Coate and Loury (1993 and 1994). The two should rather be seen as complementary explanations of rosca participation.

due to gender speci¯c preferences for children. Or men may be more subject to social pressure to transfer money to outside family members, or to reveal status by conspicuous consumption, which both reduce their incentive to save relative to women. Bruce (1989) cites numerous case studies, throughout the developing world, which illustrate the tension within households over the use of income. A central conclusion is that childrens' well-being is strongly correlated with women's income relative to men's, where women consistently devote a higher proportion of their income to family needs than do men. Men withhold a proportion of their income for personal use, even when families live in or near poverty. Bruce notes that these gender-based di®erences are most explicit in Africa, where it is commonly believed that men have a right to personal spending money, which they are perceived to need or deserve, while women's income is used for collective purposes. The work of Hoddinott and Haddad (1995) empirically veri¯es the claim of numerous case studies of African households that, relative to women, men spend a greater proportion of their income on goods such as alcohol and cigarettes, whereas women are more likely to purchase goods for children and for general household consumption.[10] In the same vein, Thomas (1990) ¯nds that unearned income in the hands of a mother has a bigger e®ect on her family's health than under the control of the father; for child survival probabilities the e®ect is roughly twenty times larger.

Although, husbands and wives typically have independent incomes, as African women usually work, the di®erence in savings patterns induces a potential con°ict, as household decision making is joint.[11] As a result, a woman is forced to choose a savings rate lower than her optimum. When she contributes to a rosca instead of accumulating at home, she inhibits her husband from spending her savings by rendering them illiquid. We further assume that, when she has committed to a contribution schedule, sanctions prevent her husband from forcing her to renege on this contract. First, roscas typically do not reimburse past contributions to defaulting members. Since a man is unlikely to know when his wife initially joined, realizing this too late, it is a fait accompli. Second, social sanctions and the loss of reputation for his household may prevent him from bene¯ting from other community-based institutions.[12] Moreover, as there are a large number of roscas, we assume

[10] Di®erential spending patterns across genders is not limited to developing countries. Bourguignon et. al. (1992) and Phipps and Burton (1993) show this to be the case for Canadian men and women and Bourguignon et. al. (1993) obtain similar results for French households.

[11] Our model also allows for a situation in which the husband has complete control over all household resources. The results extend simply to such an extreme situation, even in the case where the wife can commit only her own income to the rosca.

[12] In Kibera, such social sanctions give the defaulting member a `bad name'. As information spreads quickly in

here that the she can choose the amount of the contribution, by choosing the appropriate rosca(s).

Notwithstanding these motives to join a rosca, the rationale is less transparent given that the pot is eventually taken home. (This is the case for the majority of roscas in our data where only 7.2% of the roscas directly purchase goods for the members.) Indeed the husband then has access to the money and may well decide to spend more than his wife intended, thus postponing (or preventing) the purchase of the indivisible good. We present a simple model to characterize the conditions under which this is not the case, so that she bene¯ts from joining roscas. In such a scenario, a man is made worse o® ex ante by his wife's decision to join although he is ex post in accordance with her plan to purchase the good.[13]

We introduce a model which incorporates the above considerations and further assume that although men and women both have the possibility of saving, neither have access to a formal capital market and therefore cannot borrow:

Assumption 1: Borrowing by either member of the household is not possible.

In a period in which the indivisible good is not purchased, the utility of a woman is represented by the following utility function:

$$U_{wt} = u(c_t) \tag{2.1}$$

where c_t is current consumption by the household in period t and u(¢) is increasing and concave. Her utility in a period where the indivisible good, D, is purchased is given by:

$$U_{wt} = u(c_t) + D \tag{2.2}$$

the village, such a sanction e®ectively implies that he loses access to other informal groups. Indeed, new membership is never automatically granted, it is a decision taken by the general assembly of all members. It is usually preceded by (i) a discussion among all members about the new applicant, (ii) an enquiry and application approval by the governing body, and, often, by (iii) the acceptance by a member to sponsor the new applicant, for a speci¯ed period of time. If the applicant/new member defaults during this period, the sponsor is ¯nancially responsible for all of the obligations (due contributions, repayments, membership fees, etc.) the defaulting member has contracted towards the group. Such schemes illustrate the degree of care exercised by those groups, which makes `social sanctions' particularly e®ective. Note also that in many roscas, a new member is often given the last number for some cycles, in order to test his trustworthiness.

[13]Given this, there is the question as to why sellers (or schools) cannot accumulate the women's savings for her instead of a rosca. There are several reasons for why this may not be the case, such as in°exibility in the expenditure that such a scheme implies (for example, in case of an unexpected shock, one cannot change the nature of the good which will be purchased) and trust in an unfamiliar agent (and, if the buying of more than one good is considered, it requires trust in a corresponding number of traders). Additionally, the Besley et. al. argument still holds for at least some people who receive the pot earlier each cycle.

We assume here that the indivisible good yields services in only one period. An alternative specification, used in Besley et. al. (1993), considered that services yielded by the indivisible good extend to more than one period. The results discussed here are, however, robust to such alternative specifications.

Similarly, the utility of a husband is defined as:

$$U_{ht} = u(c_t) \tag{2.3}$$

and,

$$U_{ht} = u(c_t) + \pm D \tag{2.4}$$

in a period where the indivisible good is purchased, where $\pm$ represents his relative preference for the indivisible good. We assume that $\pm < 1$ to reflect his lower preference for the indivisible good than his wife. Note also that, for expositional simplicity, we assume husbands and wives have identical preferences with respect to present household consumption. We thus abstract from issues arising from the potentially conflictive allocation of current consumption goods across family members, to better focus on the conflict arising from differential preferences over a household indivisible good. It should be clear, however, that our argument would a fortiori hold in such alternative settings. We also normalize the cost of the indivisible good, D, to equal one.

To present our argument in a stark way and differentiate our results from those of the previous literature, we consider here the decision making in a household which knows that, if it participates in a rosca, it is last to receive the `pot'.[14]

The structure of the game can now be described as follows:

- Stage 1: the woman chooses her contribution to the rosca in each period t, $0 \quad s_R \quad 1$ and the duration of the rosca, T_R. (If she decides not to participate in a rosca then, $s_R = T_R = 0$:)
- Stage 2: the husband and wife jointly choose household savings in each period t, $s_{Ht} \, , \, 0$.
- Stage 3: when $t = T_R$, the women receives the pot and the household decides its use.

If the household does not participate in a rosca, the husband and wife jointly decide whether or not to purchase the indivisible good, and thus choose the appropriate household saving rate,

[14] Clearly, receiving the `pot' earlier would only provide additional motivation to join a rosca, following the rationale of Besley et. al. (1993 and 1994).

$s_{Ht} \geq 0$, by maximizing a weighted sum of their individual utility:

$$U_H = \sum_t \phi^t (U_{ht} + \psi U_{wt}) \tag{2.5}$$

where $\phi < 1$ is the discount factor and ψ represents the weight given to the wife's welfare in the household joint decision making, subject to the following budget constraint:

$$Y_w + Y_h = c_t + s_{Ht} \tag{2.6}$$

where Y_w and Y_h reflect the income received by the wife and her husband respectively each period. These incomes are assumed to remain constant throughout their lifetimes. Additionally, if the indivisible good is purchased, the accumulated savings must add to the cost of the indivisible good:

$$\sum_t^{T_H} s_{Ht} = 1 \tag{2.7}$$

where T_H represents the date at which accumulated savings equal one. Given this maximization problem, the saving pattern $\{s_{Ht}\}$, if positive, satisfies the following first order condition:

$$\frac{u'(c_t)}{u'(c_{t+1})} = \phi; \tag{2.8}$$

which implies that savings, when positive, are increasing through time: $s_{Ht} < s_{Ht+1}, \forall t < T_H - 1$.

We assume that each woman has an incentive to save, as otherwise she would not consider joining a rosca, and our discussion would be pointless. This is the case if:

Assumption 2: There always exists a sequence $\{s_{wt}\}$ such that,

$$\sum_{t=0}^{\infty} \phi^t u(Y_h + Y_w - s_{wt}) + \phi^{T_w} D > \sum_{t=0}^{\infty} \phi^t u(Y_h + Y_w). \tag{2.9}$$

where $\{s_{wt}\}$ is the optimal flow of savings she would choose. Since a woman has more incentive to save, the saving pattern the household jointly chooses is always smaller than the one she prefers:

Lemma 1. Since $\psi < 1$, $s_{wt} > s_{Ht}$, $\forall t$, and $T_w < T_H$, where T_w represents the date at which her accumulated savings equal one.

For the sake of expositional simplicity, let us temporarily assume that she has access to total household income when choosing whether to participate in a rosca. We discuss, at the end of this section, the case where she has only the use of her own income. When deciding whether or not to join a rosca, a woman takes her household's optimal savings into consideration. It is worthwhile for her to accumulate savings through a rosca as long as she knows that, once she receives her accumulated savings, they will be used jointly by the household to purchase the indivisible good instead of ¯nancing current and future consumption. In other words, it must be the case that, when the household is given an extra income of 1, in a given period, the household prefers to buy the indivisible good immediately, than use this extra income for increased consumption over the future. This is the case if the following incentive compatibility condition is satis¯ed:

$$(\pm + °)D + \sum_{t=0}^{1} ¢^t(1 + °)u(Y_h + Y_w) > \sum_{t=0}^{1} ¢^t(1 + °)u(Y_h + Y_w + m_t^¤); \tag{2.10}$$

where $m_t^¤$ represents the optimal pattern of increased consumption in subsequent periods and $\sum_{t=0}^{1} m_t^¤ = 1$. Under this condition, she decides to join a rosca:

Proposition 1. If the incentive compatibility condition (2.10) is satis¯ed, then, in the subgame perfect equilibrium, a woman decides to join a rosca, where $s_R > s_{H0}$ and $T_R > T_H$. Her welfare improves while that of her husband is lower.

Proof: There always exists a positive amount of saving, s_R, with s_R su±ciently small, such that condition (2.10) is satis¯ed:

$$\sum_{t=0}^{1} ¢^t (1 + °)\, u(Y_h + Y_w ¡ s_R) + ¢^{T_R} (\pm + °)\, D > \sum_{t=0}^{1} ¢^t (1 + °)\, u(Y_h + Y_w + m_t^¤) \tag{2.11}$$

where $\sum_{t=0}^{1} m_t^¤ = 1$. Let us distinguish two cases.

Case 1: The household is not willing ex ante to accumulate savings in order to purchase the indivisible good and prefers to spend all its income on current consumption. That is, for any $\{s_{Ht}\}$, where $\sum_{t=0}^{T_H} s_{Ht} = 1$, the following holds:

$$\sum_{t=0}^{1} ¢^t (1 + °)\, u(Y_h + Y_w ¡ s_{Ht}) + ¢^{T_H} (\pm + °)\, D < \sum_{t=0}^{1} ¢^t (1 + °)\, u(Y_h + Y_w): \tag{2.12}$$

In this case, a woman will always decide to save a positive amount through a rosca, which is compatible with condition (2.10) and with her own optimal saving pattern , (2.9), where $s_{w0} < s_R < s_{wT_w}$, provided s_{w0} does not exceed the maximum amount of savings compatible with condition (2.10). Once she is given the `pot', her husband will then be willing to buy the indivisible good even though, at time t = 0, he did not want to save for it. If rosca contributions are not too high, so that the incentive compatibility constraint does not bind, it is entirely possible that, in the last periods, the household will even decide to accumulate some extra savings, allowing an earlier purchase of the indivisible good.

Case 2: The household is willing to save in order to buy the indivisible good, at time T_H. Necessarily, given (2.8), savings at time $t = T_H$ are larger than at t = 0; $s_{HT_H} > s_{H0}$. Moreover, s_{HT_H} must satisfy condition (2.10) since the household deliberately saves in order to buy the indivisible good at time T_H, and is therefore willing to buy the good at that time. A woman can, however, do better by saving an amount s_R in a rosca, which is greater than s_{H0} and compatible with condition (2.10), since she was willing to save a sequence $\{s_{wt}\}$ with $s_{w0} > s_{H0}$.

Two subcases can then arise: (i) s_R can be very high, so that $s_R \geq s_{HT_H}$, and the household, given the amount saved to the rosca, does not save anything more in any other period; or (ii) $s_R < s_{HT_H}$, in which case, after some time, the household will even be willing to contribute some voluntary savings of its own, which will then add to the amount saved through the rosca. In the very least, the household will be willing to add $s_{HT_H} - s_R$ to the rosca savings in the last period. The saving pattern of the household is time consistent and the utility function is time separable, so that, at time T_R, since an amount of $(1 - s_{HT_H})$ has already been accumulated, the household is prepared to save s_{HT_H} to buy the indivisible good. The woman anticipates this, so that, by subgame perfection, her total accumulated savings through the rosca is smaller than one, the price of the indivisible good. ¥

In all the cases in which the household chooses to save for the indivisible good, the incentive compatibility condition is necessarily satisfied, and the woman always chooses to join a rosca and

saves at a higher rate than the household optimum. But there also exist situations in which, even though ex ante the household does not want to save (condition (2.12)), ex post, once the household has saved enough through a rosca, it prefers to buy the indivisible good than to spend the accumulated savings on extra consumption (incentive compatibility condition (2.10)). Such situations may arise when, for example, the discount factor, ¢; is low so that the future discounted value of the indivisible good is too low to justify positive current savings. A low discount factor simultaneously reduces the attractiveness of future consumption relative to current consumption of the indivisible good, thereby making the incentive compatibility condition more likely.

For a given discount factor, a very low ±, the husband's valuation of the indivisible good, implies that it is never optimal to purchase the latter. However, if ± is high enough, one can always ¯nd values of °, the wife's weight in the household objective, such that both conditions (2.12) and (2.10) are simultaneously satis¯ed. For very high values of ± and °, condition (2.12) does not hold and the household would decide to save anyway. A woman then decides to join a rosca to accelerate the purchase of the indivisible good.[15]

Not only the participation decision, but also the equilibrium amount saved through the rosca, depends on the value of the indivisible good for the husband, ±. First note that, for very low values of ±; condition (2.10) is not satis¯ed if ° is low enough, so that the household never buys the indivisible good; a woman has no motivation to save through a rosca and $s_R = 0$: With higher values of ±, the household would ex post decide to buy the indivisible good, even though ex ante it would not, so that she saves through a rosca. Moreover, in this situation, s_R is increasing in ±, as a higher ± implies that she can impose, in the last period, a higher level of forced savings without violating condition (2.10). At the other extreme, if ± = 1, the household saving decision is identical to hers, and saving through a rosca is useless. If ± is marginally smaller than one, so that $s_{H0} < s_{w0}$ and $s_{H1} > s_{w0}$, then a woman will set $s_R = s_{w0}$; and the household, from time t = 1 onwards, contributes additional savings. For a smaller ±, voluntary household savings in the initial periods are smaller than s_{w0}. But since $s_{w0} < s_{w1} < s_{w2} < ¢¢¢$, and that the household, at least in the initial periods, will not save more than the rosca contribution, a woman will choose $s_R > s_{w0}$. As ± continues to fall, rosca savings increase, as long as condition (2.10) is satis¯ed. With a very low ±, the incentive compatibility condition, (2.10), will bind, and, as discussed above, s_R falls with

[15] In the Appendix are expressions of the two conditions to illustrate this discussion.

α. The impact of a falling α on s_R has therefore an inverted-U shaped, when s_R is positive.

To put it another way, three effects come into play when α rises. First, a higher α allows greater savings in the last period which satisfy the incentive compatibility constraint: we call this an incentive compatible effect. Second, beyond a given value, it also increases the household propensity to save; a saving effect. Third, saving in the rosca implies, for a woman, a rigid pattern of saving through which a constant amount is saved in each period: which we call a rigidity effect. For low values of α, the incentive compatibility effect dominates, and rosca savings increase with α. For higher values of α, the saving effect dominates, and to reduce the inefficiency caused by the rigidity effect, a woman chooses to reduce her rosca savings as she correctly anticipates that, in some future period, the household will jointly decide to accumulate some extra savings. An analogous discussion can be carried out for the impact of increasing θ, a wife's relative weight in household decisions. Hence, the following proposition ensues:

Proposition 2. The subgame perfect equilibrium savings in a rosca, if positive, are an inverted-U shape function of α; the man's valuation of the indivisible good, and of θ, the woman's relative weight in household decision making.

By contrast, one would expect a lower discount factor to unambiguously reduce rosca savings. Indeed, a lower ϕ reduces both the household and the woman's propensity to save. However, if the household propensity to save is low, while a woman wants to save a lot, the incentive compatibility constraint binds. The main effect of a lower discount factor is then to reduce the utility of future consumption relative to the current value of the indivisible good. As the maximal amount of saving satisfying the incentive compatibility constraint rises, a woman increases her saving in the rosca.

Lastly, let us consider the situation in which she has access to her own income only. (For the sake of clarity, we assume in the discussion that total household income remains constant.) For small levels of income, she saves all her income through the rosca. If her income rises, rosca saving rise by exactly the same amount. This remains true as long as the amount she would optimally save through the rosca exceeds her own income. When $Y_w < s_R^*$, a rise in her income has no impact on the amount she contributes to the rosca, as she is already saving her optimal amount. This is the pure income constraint effect.

However, one may argue that, holding household income constant, a rise in Y_w also brings

about a rise in the bargaining position of the woman in the joint household decision making. As, for low levels of her income such that $Y_w < s^{\alpha}_R$, rosca savings increase with Y_w while, for $Y_w \geq s^{\alpha}_R$, the impact of her weight in the household is as in the above proposition, where equilibrium rosca savings, s^{α}_R , are an inverted-U shaped function of a woman's income, Y_w.

3. Independent Household Decision Making

If we suppose that husbands and wives do not make joint decisions (but still have di®erent valuations of current consumption relative to savings), then an alternative motivation for rosca participation is simply that husbands take money from their wives. This notion may seem far fetched, but anecdotal evidence from the interviews suggests that women seriously consider this matter. More generally, it is common in Africa for women to accumulate assets independently and unbeknown to their husbands.

Suppose a woman faces a probability, p, of being robbed of her savings if she leaves it at home with her husband (and, as before, no one has access to formal credit markets). To keep the discussion simple, assume that a woman saves a constant amount s for t periods in order to purchase an indivisible good which costs D, hence D = ts. She has a choice between accumulating savings at home or joining a rosca. Although it seems clear that, when putting her savings in a rosca, the money is safe from being stolen, however, what is still a concern is that when she returns home with the pot, she risks losing the entire sum of her savings. This expected loss is equal to pD.

If a woman were to save at home, her expected loss in the last period is similarly equal to pD. However, in addition to this risk, her expected loss in each period t is equal to at least ps. This expected loss would be larger, for example, if in the ¿ previous periods her savings were not stolen, then the risk of loss in period ¿ + 1 is equal to p((¿ + 1)s). Therefore the total expected loss over all periods is necessarily larger than pD. In consequence, it is always worthwhile to join a rosca. Note that we are assuming that the probability of theft, p, is independent of the amount. But it is clear from the above reasoning that this assumption is immaterial to our main point.

With a positive discount rate, however, the optimal saving rate is increasing, whereas in a rosca the savings rate is constant. Therefore given the in°exibility of the saving scheme under a rosca, one might argue that joining a rosca is not worthwhile if the probability of theft is su±ciently low.

However, this is not the case since she is still strictly better o® by joining a rosca for which the contribution is equal to her optimal ¯rst period savings, (i.e., the lowest amount), while accumulating increasing excess savings at home. In such a scenario, the risk of theft is thereby reduced.

The above discussion could also be re-interpreted as, instead of being robbed, an individual risks facing compulsive and unanticipated expenses, such as an unexpected claim for help from a relative. Participation in a rosca is then a way to render her savings illiquid and to resist such claims in a more acceptable way.

4. Rosca participation in Kibera: an empirical test

The central claim of our theoretical analysis is that a woman's participation in roscas is a strategy she employs to render her savings illiquid, to protect her income against claims by other household members for immediate consumption and, thus, to bias household choices towards her own preferences. It was demonstrated that this motive can be at work in both cases of joint decision making (Proposition 1) and independent decision making (Section 3). The main empirical implication to be drawn from the above exposition is that women's relative power and earnings within the household is positively related to her rosca participation. Moreover, as Proposition 2 demonstrates, her actual contribution is also related to her relative position, and is inverted U-shaped. Her actual contribution is a positive and concave function of her income. (It will be inverted-U shaped only through the presumed e®ect of woman's earnings on her status in the household.)

We can test for these direct implications. To this end, there are several components of a woman's relative status that should be related to her rosca participation. For one, women who work are arguably more likely to participate than those who do not (recalling that these are households who are essentially below the poverty level and hence the fact that higher status women can a®ord not to work should be irrelevant), particularly relative to their husband's employment status. Secondly, the higher her relative share of household income, the more likely a woman will participate and the higher her contribution.

4.1. Description of the data

The data used in the estimation were collected in 1996-7 in the slum of Kibera which is situated on the outskirts of Nairobi and is one of the largest in Kenya. It extends over 225 hectares of land

and houses a population of approximately half a million people. The inhabitants are very poor. They live with enormous risks to their health and income, with no access to formal insurance or credit institutions. There is little intervention by the State to improve the well-being of the slum population. As a result, individuals are left to their own devices to satisfy their most basic needs. These circumstances have given rise to the formation of numerous informal credit groups such as roscas, health insurance groups, funeral groups, saving and credit groups, and collective investment groups.

We interviewed 520 households, all living in the same area of Kibera, namely the village of Kianda. Households, selected though a random process, were interviewed over the course of 4 months during the spring 1997 period. All household members were first surveyed for information on their education, work activity, and income. Households expenditures were carefully recorded over a week, with frequent visits by one of the enumerators. During the second round, each member was asked detailed information on all informal groups which they belong to. From this process, we collected information on 620 groups, of which 385 are roscas.[16] (We carried out separately semi-open interviews with the governing bodies of 44 informal groups, to obtain more precise information on their internal functionings.) The following table lists some background information on these roscas:

[16] One fourth of the roscas in the sample perform additional functions, such as health insurance schemes, long term investment projects, and self-employment schemes. Such functions are almost always clearly demarcated from the rosca itself: typically, rosca contributions are distinct from contributions to the other activities of the group, and payments for the former are often made along a different pattern than payments for the latter. As a result, we have decided to consider all groups with a rosca as one of their activities in our sample. The alternative would have been to consider groups which are only roscas, but this could have led to a serious bias. In particular, in the survey, all possible alternative functions of the groups were carefully mentioned, even when the latter was clearly of secondary concern for the respondent.

Variable	Mean
Number of members	15.77
Months existed	27.80
Contribute every day (% of roscas)	0.10
Contribute every week	0.35
Contribute every 2 weeks	0.06
Contribute every month	0.49
Length of cycle (median, in months)	6.07
Number of cycles (median, in lifetime of rosca)	3.21
Group comprises only women (% of roscas)	0.65
Group comprises only men	0.06
Group comprises both men and women	0.30
All members are same ethnicity	0.37
Order is unchanged each cycle	0.69
Started group with friends/relatives/neighbors	0.85
Group has secondary role (investment/insurance)	0.25

TABLE 1: Basic information on roscas

Implicit in our theory of rosca participation, and in the rest of the literature, is that a rosca serves as a saving mechanism in order to purchase an indivisible good. An empirical prediction of this relationship, as Besley and Levenson (1996) have investigated with data from Taiwan, is that, controlling for income, households who participate in roscas exhibit higher ownership rates (or expenditure levels) of durable goods. This is strictly supported (for all income levels, expenditure and ownership were higher) in our data for most durable goods and some results are presented in the graphs below.[17]

[17] Note that the relationship was not well supported for samples that were extremely small (such as camera ownership) and for some goods for which close substitutes exist, such as charcoal burners and gas cookers. The relationship was perfectly supported for 12 out of 18 durable good categories.

FIGURES 1-5: Rosca Participation and expenditures on durable goods

It is interesting to note that, out of all the indivisible expenditures, school fees are the largest expenditure: school fees account for 36% of total non-food expenditures, other large expenses include rent at 22%, medical costs of 12%, and clothing is 18%.[18] This coincides with the notion that women are saving for their children which in turn corresponds to the cited literature of women's larger relative preference for the well being of their children.

Let us brie°y examine the broad characteristics of the individuals who participate in roscas. The 520 households interviewed represent approximately 2300 individuals. After omitting all individuals aged less than 16 years, we are left with a sample of roughly 1300. A table of summary statistics is listed below.

	All sample		Rosca members	
Variable	Mean	St. error	Mean	St. error
Participates in a rosca	0.25	0.44		
Total monthly rosca contribution			702	821
Female	0.53	0.50	0.84	0.37
Age	29.4	9.6	32.5	8.4
Married	0.59	0.49	0.71	0.46
Earns labor income	0.58	0.49	0.76	0.43
Has at least primary school	0.57	0.49	0.47	0.50
Monthly ind. income, if working	5389	5406	5290	6714
Total hhold monthly income	8009	9207	8427	9454
Monthly food expenditures	5250	3031	4976	2761
Monthly luxury expenditures	368	723	367	702
Monthly children expenditures	1761	2550	1862	2902
Household size	5.05	2.14	4.8	2.1
Number of children	2.21	1.63	2.3	1.6
Years in Kibera	9.34	7.30		
Number of observations	1269		322	

TABLE 2: Characteristics of the population and of rosca participants

The most noteworthy di®erences between the two types of individuals are that the proportions of females, of working and of married individuals are much larger for rosca participants than for the average individual in the sample. By contrast, the average number of children and the average income level are the same across the two groups. The next table illustrates the di®erences between women who join roscas and those who do not.

[18]School fees in this area are paid as a lump sum, usually each semester. Some delays in the payment of the fees are typically allowed by the school administrators, which help parents to schedule the payments according to their turn in the roscas.

Variable	In roscas		Not in roscas	
	Mean	S. D.	Mean	S. D.
Age	32.16	8.32	25.05	8.96
Married	0.70	0.46	0.42	0.49
Years in Kibera	10.01	7.07	8.77	7.63
Earns labor income	0.73	0.45	0.30	0.46
Monthly individual income if works	5019.51	7115.10	3181.88	3546.15
Have at least primary school	0.44	0.50	0.49	0.50
Total monthly income incl. net transfers	8997.96	9330.36	8030.34	9337.08
Monthly food expenses	5030.47	2786.97	5377.49	3038.22
Monthly luxury expenses	324.01	670.40	307.26	665.21
Monthly children expenses	1891.84	2778.00	1867.13	2597.89
Household size	4.96	2.01	5.20	2.12
Number of children	2.41	1.55	2.24	1.57
Number of observations	270		407	

TABLE 3 Comparison between women participating in roscas and those who do not

Most notably, while women in the two groups enjoy a comparable total household income, women participating in roscas tend to on average, be married, work more often, and earn a higher individual income. They are also older. By contrast, the number of children, the household size, and education levels do not differ much between the two groups.

4.2. Empirical estimates

We examine the implications of our model by estimating two main equations: the probability that an individual participates in a rosca, and their monthly rosca contribution. We alternatively could have used a Tobit estimation where it would have been implicit that a zero rosca contribution is equivalent to choosing not to participate in a rosca. This procedure seems somewhat restrictive given that the decision to join a rosca can be a separate phenomenon to simply making very small contributions. This coincides with our discussion above, where women must go against their husbands wishes to join a rosca and also generally incur a fixed cost in terms of meeting attendance.[19]

Our theory predicts that gender should be a significant determinant of rosca participation, but, more importantly, if a woman belongs to a couple then she should be more likely to join a rosca. Additionally, our analysis predicts that a woman with a higher bargaining position within

[19] It is worthwhile to note that our main results are essentially unchanged in a Tobit estimation.

the household, relative to her husband, is more likely to join a rosca and pay higher monthly contributions. To this end, we employ as one of our regressors, female's share of couple income. We also run the estimations using alternative measures of household power, such as the work status of females and their individual income, the results of which are presented in the Appendix and discussed at the end of this section.

The following table reports the results from a probit estimation of the probability that an individual belongs to at least one rosca group. Since the functionings of roscas depend heavily on the trustworthiness of its members, years spent in Kianda (the particular area that we surveyed in Kibera) enters into the estimation to proxy for sufficient time to elapse for individuals to establish such bonds with other residents. Additional regressors include expenses on children and luxury goods which should be positively related to rosca participation. The greater luxury good expenditures, (presumably purchased by the husband since they include drinks, cigarettes, and eating or drinking in hotels and bars), the larger the need to join a rosca, in terms of a forced savings motive. Similarly, the greater the expenditure on children and number of children, the greater should be the need to join a rosca. Household income should also be positively related to rosca participation, in the sense that there exists the means by which to do so.[20] Additional individual characteristics are included in the estimation, such as age and education.

[20] Total income in the estimation includes net transfers. Additional estimations were run with transfers entering into the regression independently of income. The results for total income were essentially unchanged and transfers on their own entered into the estimations insignificantly.

Variable	$\frac{\partial F}{\partial X}$	Standard Error	P-value
Female	0.216	0.040	0.000
Couple	-0.132	0.050	0.007
Female£Couple	0.232	0.073	0.001
Total Household Income	1.5e-06	1.7e-06	0.384
(Total Household Income)^2	-5.0e-11	4.42e-11	0.257
Female share of Couple Income	0.267	0.082	0.001
Years in Kibera	4.5e-03	5.6e-03	0.420
(Years in Kibera)^2	-2.8e-04	-2.3e-04	0.229
Children Expenses	6.1e-06	5.4e-06	0.256
Luxury Expenses	2.2e-05	1.6e-05	0.168
Number of children	-0.015	0.008	0.075
Primary school degree	-0.046	0.026	0.080
Age	0.059	0.008	0.000
(Age)^2	-6.8e-04	1.2e-04	0.000
Number of Observations	1264		
Â^2 - statistic	380.47		
Pseudo R^2	0.26		

TABLE 4 - PROBIT ESTIMATION OF ROSCA PARTICIPATION

Most importantly, female, female member of a couple, and female share of couple income are all signi¯cant positive determinants of rosca participation. Married males, on the other hand, are less likely to join a rosca, as represented by the signi¯cant and negative coe±cient of the couple variable. Most of the other results have the predicted sign, except for number of children which is negatively related. Perhaps surprisingly, household income is insigni¯cantly related to rosca participation, however, it is consistent with our theory; that it is the female's share of that income which is the important determinant. The age of individuals is signi¯cantly related to the probability of joining a rosca where higher order terms enter negatively into the estimation. These results coincide with the notion that older individuals tend to be less mobile and have potential to develop more long standing relationships with others and their demand for roscas as a savings vehicle may be higher. However, this result is in contrast with some previous ¯ndings (see, for example, Levenson and Besley 1996) where it is rationalized that the demand for durables tends to be higher among younger individuals. To see more clearly the relationship between joining a rosca and the age of individuals, the probability of joining a rosca at various age levels is computed using the coe±cients from probit estimation (when lower and higher order age terms are included) and average levels of all remaining variables. The probabilities at varying ages are plotted in Figure 6 where, the

relationship is concave and begins to decrease at 35 years of age.

Figure 6: Age and Rosca Participation

The second estimation regresses similar variables on total monthly rosca contributions of individuals. Since we are analyzing the problem from the perspective of individuals rather than rosca groups, the dependent variable is the sum of contributions to all rosca groups that a given individual belongs to. Because rosca contributions form a share of total monthly income, on average equal to 13.3% of total income, we use food expenditure to represent the wealth position of the household rather than total income directly. The estimation of total rosca contributions should only be conditional on the fact that individuals belong to a rosca group, as it is only the rosca participants of the population that is of concern. Therefore, that individuals who do not participate in a rosca group are excluded from the sample should not bias our estimates of the amount of rosca contribution. The estimation of total rosca contributions is therefore considered independent of the sample selection rule of joining a rosca.[21] This would not be the case if individuals chose whether or not to join the rosca given a pre-established contribution amount. However, typically, there are many di®erent roscas to which an individual can participate, which allows for some °exibility in the amount contributed, and many roscas are formed with a small number of individuals familiar to each other who negotiate together the amount of monthly contributions.

Our theory predicts that the relative bargaining power of women (say their share in household income) increases the amount of their contribution, but it does not say anything about women in couples paying more per month, rather just more likely to join a rosca. The table below lists the results from the regression on total rosca contributions.

[21] It may be worth noting that an estimation conditional on this probability (joining a rosca), using the Heckman procedure, does not alter the results and the inverse Mill's ratio is not a signi¯cant determinant of total rosca contributions.

Variable	Coe±cient	Standard Error	P-value
Female	82.346	213.9154	0.701
Couple	274.705	248.7104	0.270
Female£Couple	-426.722	281.1667	0.130
Food Expenses	0.1163	0.0536	0.031
(Food Expenses)^2	-5.32e-06	3.41e-06	0.120
Female share of Couple Income	710.257	254.4856	0.006
Years in Kibera	-18.8188	23.6410	0.427
(Years in Kibera)^2	1.1313	0.9292	0.224
Children Expenses	-0.02127	0.01715	0.216
Luxury Expenses	0.03604	0.0758	0.635
Number of children	-33.0232	34.283	0.336
Primary school degree	5.01738	95.058	0.958
Age	77.4822	35.397	0.029
(Age)^2	-0.9925	0.4954	0.046
Constant	-1079.293	644.603	0.095
Number of Observations	321		
F - statistic	2.11		
$\overline{R}^2$	0.05		

TABLE 5 - ESTIMATION OF ROSCA CONTRIBUTION

Our theory is again supported by the data, where female share in couple income is a signi¯cant positive determinant of rosca contributions. It is interesting to note, that unlike the probit estimation, the general wealth level of the household (represented by the expenditure on food) is positively related, where higher order terms are negatively related, to the amount of the contribution. The age of rosca participants is again signi¯cant and similarly follows a concave relationship, as depicted in the plot of predicted rosca contributions of Figure 7. In contrast to the estimation of the probability of joining a rosca, gender and marital status are not signi¯cant determinants of rosca contributions.

Figure 7: Age and Rosca Contribution

We also ran identical estimations to the above, where instead of female share in couple income, we entered the work status of married females into one estimation, and married females individual income into another. Identical results ensued, where both of these indicators of females' household bargaining power entered positively and signi¯cantly into both estimations, with higher order terms of individual income negatively related to both rosca participation and the amount of contributions. These relationships with individual income are better illustrated in the plots below, where predicted values of rosca participation rates and contributions are computed for varying income levels using the coe±cients from the estimation (where higher order terms are included) and average levels of all remaining variables. The computed probabilities of joining a rosca at varying female income levels are plotted in Figure 8, where the relationship is positive and linear. The same relationship ensues for total rosca contributions, as depicted in Figure 9. Therefore, although higher order income terms enter negatively into the estimations, an inverted-U relationship between female income and rosca contributions, as predicted by the theory, does not appear in the relevant range of variation.

Figures 8 and 9: Individual Income, Rosca Participation and Rosca Contribution

5. Conclusion

The present paper is based on detailed ¯eld observations of informal saving groups in the slum of Kibera (Kenya). The starting point of our analysis is the observation that married women with a regular income earning occupation were the most likely to participate in a rosca. To explain this phenomenon, we propose a new argument based on di®erential consumption choices between wives and their husbands. If women tend to prefer higher saving rates than the one chosen by the household, they will use roscas to accumulate more savings. Even though, ex ante, her husband and other members in the family would have preferred her not to start saving through a rosca, they may ex post, once she receives the pot, agree with her plan to spend the accumulated savings. Participation in a rosca thus increases woman's welfare at the expense of her husband. We also show that rosca contributions follow an inverted-U relationship with woman's bargaining position within the household. The empirical tests carried out on our original data set give support to our explanation.

6. Appendix

6.1. Taylor approximation of conditions (2.10) and (2.12)

First note that the ex ante condition (2.12), can also be written as follows:

$$\phi^{T_H}(\rho+\pi)D < \sum_{t=0}^{T_H}\phi^t(1+\rho)\left(u(Y_h+Y_w) - u(Y_h+Y_w-s_{Ht})\right): \tag{6.1}$$

Using equation (2.8), a first-order Taylor expansion of the right hand side of (6.1) yields:

$$\begin{aligned}
&\sum_{t=0}^{T_H}\phi^t(1+\rho)\left(u(Y_h+Y_w) - u(Y_h+Y_w-s_{Ht})\right) \approx \sum_{t=0}^{T_H}\phi^t(1+\rho)\left[u'(Y_h+Y_w-s_{Ht})\,s_{Ht}\right]\\
=\;& (1+\rho)\,\phi^0 u'(Y_h+Y_w-s_{H0})\,s_{H0} + (1+\rho)\,\phi^1 u'(Y_h+Y_w-s_{H1})\,s_{H1}\\
&+\ldots + (1+\rho)\,\phi^{T_H}u'(Y_h+Y_w-s_{HT_H})\,s_{HT_H}\\
=\;& (1+\rho)\,u'(Y_h+Y_w-s_{H0})\sum_{t=0}^{T_H}s_{Ht} = (1+\rho)\,u'(Y_h+Y_w-s_{H0})
\end{aligned} \tag{6.2}$$

Hence condition (6.1) approximately becomes:

$$\phi^{T_H}\frac{(\rho+\pi)}{(1+\rho)}D \;\gtrsim\; u'(Y_h+Y_w-s_{H0}): \tag{6.3}$$

Similarly, the incentive compatibility condition (2.10) can be rewritten as follows:

$$(\rho+\pi)D > \sum_{t=0}^{\infty}\phi^t(1+\rho)\left(u(Y_h+Y_w+m_t^a) - u(Y_h+Y_w)\right): \tag{6.4}$$

Using the optimality of future consumption °ows (equivalent to (2.8)), the right hand side of (6.4) can be approximated as:

$$\begin{aligned}
&\sum_{t=0}^{\infty}\phi^t(1+\rho)\left(u(Y_h+Y_w+m_t^a) - u(Y_h+Y_w)\right) \approx \sum_{t=0}^{\infty}\phi^t(1+\rho)\left[u'(Y_h+Y_w+m_t^a)\,m_t^a\right]\\
&\approx (1+\rho)\,u'(Y_h+Y_w+m_0^a);
\end{aligned} \tag{6.5}$$

Hence condition (2.10) becomes:

$$\frac{(\rho+\pi)D}{(1+\rho)} \gtrsim u'(Y_h+Y_w+m_0^a): \tag{6.6}$$

Note that as $u(\phi)$ is concave, it necessarily follows that the right hand side of (6.3) is higher than the right hand side of (6.6). The discussion about changing values of ϕ, ρ and π follows easily.

6.2. Alternative Probit estimates of Roscas Participation

Dependent variable: participation to at least one rosca

Variable	$\frac{\partial F}{\partial X}$	St. error	P-value	$\frac{\partial F}{\partial X}$	St. error	P-value
Female	0.216	0.040	0.000	0.217	0.0397	0.000
Couple	-0.132	0.050	0.007	-0.127	0.050	0.010
Female£couple	0.218	0.073	0.001	0.174	0.073	0.009
Total Hhold Income	5.9e-07	1.7e-06	0.736	1.2e-06	1.7e-06	0.492
(Total Hhold Income)^2	-1.1e-10	5.6e-11	0.043	-4.8e-11	4.3e-11	0.265
Years in Kibera	0.005	0.006	0.415	0.004	0.006	0.470
(Years in Kibera)^2	0.0003	0.0002	0.220	-0.0003	0.0002	0.245
Children expenses	6.8e-06	5.6e-06	0.223	5.7e-06	5.4e-06	0.287
Luxury expenses	1.9e-05	1.6e-05	0.242	2.0e-05	1.6e-05	0.212
Number of children	-0.013	0.009	0.139	-0.0166	0.009	0.054
Primary school degree	-0.054	0.0269	0.044	-0.048	0.0267	0.067
Age	0.058	0.008	0.000	0.058	0.008	0.000
(Age)^2	-0.007	.0001	0.000	-0.0007	0.0001	0.000
Working female£couple				0.236	0.055	0.000
Female income£couple	3.2e-05	8.6e-06	0.000			
(Female income£couple)^2	-2.4e-10	1.46e-10	0.089			
Number of observations	1264			1264		
$\hat{A}^2$ - statistic	389			394		
Pseudo R^2	0.271			0.274		

6.3. Alternative OLS estimates of Rosca Contributions

Dependent variable: amount of individual monthly contribution to rosca(s)

Variable	Coe®.	St. error	P-value	Coe®.	St. error	P-value
Female	96.59	214.7	0.653	66.14	211.2	0.754
Couple	297.0	249.7	0.235	272.9	245.6	0.267
Female£couple	-467.9	289.4	0.107	-435.4	272.7	0.111
Food expenses	0.108	0.054	0.046	0.102	0.053	0.056
(Food expenses)^2	-4.9e-06	3.4e-06	0.152	4.6e-06	3.4e-06	0.172
Years in Kibera	-17.68	23.68	0.456	-18.16	23.28	0.436
(Years in Kibera)^2	1.129	0.932	0.226	1.122	0.917	0.222
Children expenses	-0.020	0.017	0.238	-0.035	0.017	0.048
Luxury expenses	0.040	0.076	0.598	0.022	0.075	0.770
Number of children	-41.62	34.40	0.227	-29.47	34.01	0.387
Primary school degree	13.73	95.22	0.885	-18.22	94.33	0.847
Age	79.13	35.46	0.026	68.66	35.07	0.051
(Age)^2	-1.013	0.496	0.042	-0.864	0.491	0.080
Working female£couple	331.43	132.2	0.013			
Female income£couple				0.073	0.018	0.000
(Female income£couple)^2				0.000	0.000	0.001
Constant	-1100	646.2	0.090	-853.9	640.9	0.184
Number of observations	321			321		
F ¡ statistic	1.99			2.62		
$\overline{R}^2$	0.042			0.070		

References

[1] Ardener, S. (1964) \The comparative study of rotating credit associations", Journal of the Royal Anthropological Institute of Great Britain and Ireland, 94 (2), 202-229.

[2] Besley, T., S. Coate, and G. Loury (1993) \The economics of rotating savings and credit associations", American Economic Review, 83, 792-810.

[3] Besley, T., S. Coate, and G. Loury (1994) \Rotating savings and credit associations, credit markets and e±ciency", Review of Economic Studies, 61, 701-719.

[4] Besley, T. and A. Levenson (1996) \The role of informal ¯nance in household capital accumulation: evidence from Taiwan", Economic Journal. 106, 38-59.

[5] Bouman, F. (1977) \Indigenous savings and credit societies in the third world: A message" Savings and Development, 1, 181-218.

[6] Bourguignon, F., M. Browning, P. Chiappori, and V. Lechene (1992) \Incomes and outcomes: a structural model of intrahousehold allocation", mimeo, DELTA-Paris.

[7] Bourguignon, F., M. Browning, P. Chiappori, and V. Lechene (1993) \Intrahousehold allocation of consumption: a model and some evidence from French data", Annales d'Economie et de Statistiques, 29, 137-56.

[8] Bruce, J. (1989) \Homes divided". World Development, 17(7), 979-991.

[9] Calomiris, C. and I. Rajaraman (1998) \The role of ROSCAs: lumpy durables or event insurance", Journal of Development Economics, 56, 207-216.

[10] Geertz, C. (1962) \The rotating credit association: a `middle rung' in development". Economic and Development and Cultural Change, 10, 241-263.

[11] Gugerty, M.K. (1999) \Preliminary evidence on rotating savings and credit associations (roscas) in Kenya: `You can't save alone"'. Mimeo, Harvard University.

[12] Handa, S. and C. Kirton (1999) \The economics of rotating savings and credit associations: evidence from the Jamaican `Partner"', Journal of Development Economics, 60, 173-194.

[13] Hoddinott, J. and L. Haddad (1995) \Does female income share in°uence household expenditure? Evidence from Cote d'Ivoire", Oxford Bulletin of Economics and Statistics, 57(1), 77-97.

[14] Kovsted, J. and P. Lyk-Jensen (1999) \Rotating savings and credit associations: the choice between random and bidding allocation of funds", Journal of Development Economics, 60, 143-172.

[15] Krahnen, J.P. and R. H. Schmidt (1994) Development Finance as Institution Building: A New Approach to Poverty-Oriented Banking, Westview Press, Boulder/Oxford.

[16] Levenson, A. and T. Besley (1996) \The anatomy of an informal ¯nancial market: rosca participation in Taiwan", Journal of Development Economics, 51, 45-68.

[17] Phipps, S. and P. Burton (1993) \What's mine is yours?: the in°uence of male and female patterns of household expenditure", mimeo, Dalhousie University.

[18] Thomas, D. (1990) \Intra-household resource allocation: an inferential approach", Journal of Human Resources, 25(4), 635-664.

[19] van den Brink, R. and J-P. Chavas (1997) \The microeconomics of an indigenous African institution: the rotating savings and credit association", Economic Development and Cultural Change, 745-772.