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Very preliminary draft
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The Economics of Rotating Savings and Credit Association: Evidence from Ethiopia.

Abbi M. Kedir[1]

Abstract

Using a unique individual level data on the membership of Rotating Savings and Credit Associations (ROSCAs) collected in 1994 from seven major urban centres in Ethiopia, we provide one of the few econometric tests of the economic theory of ROSCAs. In recognition of the heterogeneity of rosca types across space, we provide basic information about the characteristics of roscas in urban areas of Ethiopia. In addition, we use individual and household level data to describe the characteristics of both rosca participants and non-participants. The findings from the descriptive part of the analysis indicate that most of the rosca members are female, relatively richer and the major motive to join roscas is to buy consumer durables. For instance, Over 45% of households reported that they joined roscas with a purpose to buy durables. In terms of frequency of saving, most rosca members tend to save weekly and monthly, the latter being the predominant choice and a non-negligible amount is being mobilise through the informal institutions. The econometric evidence shows an inverse relationship between volume of rosca contribution and size of rosca as predicted by theory. In addition, we find an inverse relationship between frequency of rosca draw/saving and amount of saving. The welfare position of the household-food expenditure- has been found to be a significant determinant of the volume of rosca contribution but not the decision to join rosca. Most of our findings are consistent with findings elsewhere.

I. INTRODUCTION

Informal finance, once the preserve of anthropologists and sociologists, is progressively capturing the attention of a growing number of economists. The common view among economists is that informal credit markets are not competitive. In addition, government intervention is recommended by many to address imperfections and failures in the formal credit market (Besley, 1994). But subsidised government interventions also proved a failure mainly due to implementation inefficiency and informational uncertainty. It is well known fact that problems associated with informational asymmetries, moral hazard, adverse selection are difficult to interpret for the design of specific policies and institutions. Therefore given current knowledge and ambiguity of theory with respect to policy formulation and institutional design, more

analysis of the performance of informal financial markets is crucial (Diagne and Zeller, 2001; van den Brink and Chavas, 1997). There are probably two reasons for the growing interest to investigate informal finance among economists. First, the findings from field research in several developing countries suggest that the role of informal finance in resource mobilisation and resource allocation is quantitatively significant. Second, disappointment with the effectiveness of formal financial systems in fostering economic growth has led to a reevaluation of the role of informal finance (Callier, 1990).

One of the most important informal financial institutions is referred to as ROSCAs. These partnerships are formed by a group of participants who make regular contributions to a fund, which is given to each contributor in turn until each member has received the fund. The allocation procedure of the Rosca determines the net benefit that each member derives and is thus an important factor in the success of Roscas. Usually, the rosca leader[2] or 'banker' decides the order of recipients, taking into account the latest information available on need or capacity to pay and thus minimising the risk of default. A *random* rosca (i.e. the common form of roscas in Ethiopia) allocates its pool of funds based on random drawing of lots, with the winning member receiving the pool for the specific period; this process is repeated with each previous recipient of the pool being excluded from the draw until each participant has received the pool once. A *bidding* rosca, is one where participants bid competitively for the pool which is allocated to the higher bidder. As in other roscas, participants receive the pool only once over the life of the specific rosca and this form of rosca is common in Taiwan. (Anderson and Baland, 2002; Besley et al, 1993). Low income countries have developed nonmarket institutions such as Roscas for coping with risk and to improve credit access. The fund collected from individual contributions by rosca members is a useful risk sharing arrangement esp. in the face of idiosyncratic risks. It can be used to purchase indivisible durable consumption goods and to smooth consumption during transitory shocks. Roscas bring borrowers and savers together, with early recipients of the fund/pot being borrowers and the late ones savers. Savings through roscas can be thought of as gains from trade that arise in inter-temporal contracting between individuals.

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The controversy surrounding the literature on the motives of rosca membership is active and researchers are continuously making contributions to the debate. The theoretical and empirical literature on the economics of roscas advances various reasons why individuals/households join roscas. The motives for rosca participation include, among others, the need to acquire *consumer durables* (Hinda and Kirton, 1999; van den Brink and Chavas, 1997; Besley and Levenson, 1996; Levenson and Besley, 1996; Besley et al 1993); *intrahousehold conflict in resource allocation* (Anderson and Baland, 2002; Ardener and Burman, 1995); *insurance* (Klonner, 2003; Calomiris and Rajaraman, 1998); *self-control over the use of funds in the presence of time inconsistent preferences* (Gugerty, 2003) and *handling social pressure* (Ambec and Treich, 2003). After reviewing the debates in the literature, it is fair to conclude that no consensus on the issue of why agents save in roscas. In practice we observe individuals/household join roscas for multiple reasons without a focus exclusively on one motive as indicated in the brief review here.

Roscas have interesting features. They tend to exploit a comparative advantage in monitoring and enforcement capacity. The former has become known since Stiglitz(1990) as the peer monitoring view. Therefore, the very low default rate among members of these institutions is attributed from the absence of informational problems, such as adverse selection and moral hazard – problems that are responsible for the failure of banks and crop insurance schemes in LDCs and elsewhere. ROSCAs are common not only in LDCs but also in newly industrialised countries such as Taiwan and in developed countries such as the United states mainly formed by immigrant communities which are more likely to be rationed from the credit market (Handa and Kirton, 1999; Levenson and Besley, 1996; Besley, 1995; Srinivasan, 1995; Bonnet, 1981; Besley et al 1993).

In Ethiopia, roscas are widespread both in urban and rural areas and are referred to as *equb*. Households participate in *equbs* regardless of their race, religion and their socio-economic status. Particularly, *equbs* are important sources of finance for households

[2] They are known by the name of ROSCA judges or organiser in Ethiopia.

who are potentially to be credit constrained[3]. The sum mobilised by roscas is enormous. The estimates reported by Bouman (1995) indicate that saving mobilised by equbs is equivalent to 8 to 10 percent of GDP in Ethiopia. In our current sample, the reported saving mobilised is 1,147,948 Ethiopian birr[4] and this is the total sum of funds as reported by 284 equb members. Surprisingly, there are not many studies on Ethiopian roscas. The very limited literature that exists is very descriptive at best and outdated at worst (Aredo, 1993; Begashaw, 1978). Therefore, it is imperative to provide a rigorous and empirical evidence on the workings of this fascinating financial institutions.

We are interested to provide an econometric test to the rosca theory developed by the seminal contribution of Besley et al (1993) using individual data from urban Ethiopia. Particularly we will test whether size of rosca contribution is negatively related to size of rosca in the Ethiopian context. We handle this by estimating an equation of monthly rosca contribution using different functional forms. There is very limited quantitative evidence on determinants of rosca participation particularly at an individual level and we will model that using the Heckman selectivity model. Gugerty (2003) argues that roscas provide a collective mechanism to discipline their members to save, in the presence of time-inconsistent preferences. In our setting, this argument can be tested by investigating the relationship between household income and rosca participation. As motives to save are increasing in income as shown by Levenson and Besley (1996), one expects rosca participation and rosca contributions to increase with household income. We estimate a probit equation predicting the probability that an individual participates in a rosca. As argued earlier, very little econometric tests are conducted to corroborate or challenge the economic theory on roscas. Our work will be one of the very few tests of the economic theory of roscas on a data set from Sub-Saharan Africa.

Our data gives us a unique opportunity to undertake the tasks we set out to do because it contains individual level, household level and rosca level characteristics. It also has information on participants and non-participants of formal and informal financial

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[3] Kedir and Disney (2003) indicate the prevalence of credit constraints using the same data used in this study. According to their findings, over 26% of households in the 1994 sample are credit constrained.

[4] The Ethiopian birr is the national currency. The exchange rate is £1=15.2 as of 1/12/03. Therefore, the saving mobilised by our equbs is equivalent to £75,522 which amounts to a per capita saving of £266 or 4042 Ethiopian birr and this is a substantial amount of money holding by Ethiopian standards.

institutions[5]. Our test is conducted on urban household data set where the formal sector is believed to be dominant and it is interesting to examine the characteristics of urban dwellers that participate in informal saving institutions. This can be a fundamental starting point to answer some thorny issues such as the potential complementarity/substitutability of formal and informal financial institutions.

The remainder of this paper is structured as follows. Section two provides an outline of the relevant parts of the theoretical model developed by Besley et al (1993) and its applicability in the context of the Ethiopian rosca - *equb*. Section 3 discusses the data used in this study and provides some descriptive statistics about *equb* and its members in Ethiopia. Section 5 discusses the results. Finally the paper concludes and indicates future research direction.

II. Theory

We adopt the relevant aspects of the Besley et al (1993) two-good model that derives results for random roscas because these are the predominant types of roscas found in Ethiopia. In addition, the model compares lifetime utilities of individuals with and without rosca membership. Given the fact that we have individual data, it is more appropriate to work under that framework and put the predictions of the model to test. The model makes the following assumptions. A group of n individuals would like to own an indivisible durable good. The individuals have no access to credit markets. Each individual lives for T years, receiving an exogenous flow of income over a lifetime of $y>0$. Individuals have identical, intertemporally additive preferences. The services of the durable good are not fungible across individuals. In other words, the good yields a constant flow of services and an individual must own it to benefit from its services.

If $v(1,c)$ is the utility from non-durable consumption, c, if the durable is owned and $v(0,c)$ is the same utility if the durable is not owned, $\delta v(c) = v(1,c) - v(0,c)$. Given θ as the probability of owning the good, the expected utility is

[5] Even if the latter is the focus of this study, we link our current analysis with participation in formal

$$v(\theta, c) = \theta v(1, c) + (1-\theta) v(0, c) \qquad (1)$$

The model results are validated by imposing the conditions that δ v(c)>0 and δ v'(c) ≥ 0 and these conditions are assumptions about the structure of preferences. The first condition states that the durable is liked by the individuals and the second assumes that the marginal utility of non-durable consumption is not decreasing by owning the indivisible good suggesting complimentarity between durable services and non-durable consumption.

The theoretical literature on roscas argues that agents gain from intertemporal trade by joining rosca. This implies that the lifetime utility of the individual who decides to save alone (i.e. autarky) is lower relative to the individual who joins a (random) rosca. The following few lines briefly show the comparison of lifetime utilities from saving with and without rosca membership.

Utility from Autarkic Saving

An individual may save B at a constant rate (y-c) over an interval [0,t]. Under autarky, the individual maximises his/her lifetime utility by choosing t and c.

$$\underset{t,c}{Max}\{(T-t)*[v(1,y)] + t*[v(0,c)]\} \qquad (2)$$

s.t.

t*[y-c]=B and $0 \leq c \leq y$

where y= income of the individual.

T-t= a period or the years the individual lives without saving to buy the durable good

B= total saving upto point t or cost of the indivisible

(y-c)= contribution each time

The first term of (2) represents the utility if the individual owns the durable and the second term refers to lifetime utility if the individual does not own the durable. Solving the constraint for t and substitution into (2) gives the maximand;

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financial institutions in the future.

$$T * v(1, y) - B\left[\frac{v(1, y) - v(0, c)}{y - c}\right] \qquad (3)$$

To simplify the expression suppose $\mu(q) = \min_{0 \le q \le 1}[\frac{v(l, y) - v(q, c)}{y - c}]$ which is the cost function measuring the extent of welfare improvement. Note that $0 \le q \le 1$ and it is obvious that under autarky q=0. Hence the individual's utility under autarky is;

$$w_a = T * v(1, y) - B * \mu(q) \qquad (4)$$

The first term represents lifetime utility if the durable were free, while the second term is the minimum utility cost of saving up for the durable. The minimisation trades off the benefit of a shorter accumulation period against the benefit of higher consumption during this period. Under autarky, no individual has the durable good before t at which time all n individuals have it. Each person saves at the rate (y-c)=B/t and after an interval t/n, there are enough savings to buy an indivisible good. This makes autarky inefficient because the individual will have to wait until t to have enough saving to buy the durable good. Saving through random rosca avoids the inefficiency given the cost function $\mu(.)$.

Utility from Saving through Random Rosca

Suppose there is a random roscca formed by n members and they meet at equally spaced dates upto t (i.e. t/n, 2t/n,…,t) with contributions at each meeting. Individuals save at rate B/t and expect to receive the durable t[(n-1)/2n] sooner. Clearly, all members of a random rosca are better by saving through the rosca than saving alone except for the last recipient of the pot. A representative member of the rosca views his receipt date for the pot as a random variable, $\tilde{\tau}$, distributed uniformly on the set {t/n, 2t/n,…,t}. Given c, each member's lifetime utility is the random variable;

$$\tilde{\tau} * v(0, c) + (t - \tilde{\tau}) * v(1 - c) + (T - t) * v(1, y) \qquad (5)$$

Since $E(\tilde{\tau}) = \left[\frac{n+1}{2n}\right] * t$, each member's ex-ante welfare[6] is;

[6] It can easily be shown that $t - \tilde{\tau} = (\frac{n-1}{2n}) * t$ because $\tilde{\tau} = (\frac{n+1}{2n}) * t$.

$$w_c = t*[(\frac{n+1}{2n})*v(0,c)+(\frac{n-1}{2n})*v(1,c)]+(T-t)*v(1,y) \qquad (6)$$

The group's problem is now to choose t (hence c) to maximise (6). Besley et al (1993) have shown that the maximum life time utility for the representative random rosca member is

$$w_r = T*v(l,y) - B\mu[\frac{(n-1)q}{2n}] \qquad (7)$$

Clearly the utility under random rosca (w_r) is greater than the utility under autarky (w_a) since $\mu'(.) > 0$ and $(\frac{n-1}{2n}) < 1$. As postulated earlier, welfare is equivalent to the difference between what lifetime utility would be were the durable a free good and the minimal (expected) utility cost of saving for its purchase. This cost is lower under (7) than under (4) which makes random roscas as efficient routes of saving as opposed to saving alone (autarky). The model showed the gains from inter-temporal trade as the major motivation of the rosca. One of the most important theoretical predictions expressed in the constraint of equation (2) is the inverse relationship between amount of contribution per unit of time (i.e. y-c) and size of rosca (n). We know that t*(y-c)=B or y-c=B/t or B/n. in the words of Besley et al (1993) this means "…the duration of the Rosca will be inversely proportional to the rate at which the group saves…". Alternatively, the larger the size of the individual contribution per rosca member, the smaller the number of rosca members and the shorter the rosca duration.

III. Data and Descriptive statistics

The data used in this study were collected in 1994 from seven urban centres in Ethiopia. A total of 1500 households were interviewed to provide information on household demographics, income, expenditure, education, assets, health and individual/household participation in formal and informal financial institutions. The information on equbs asks whether any member of the household is a member of equb, the frequency of saving per month, amount of equb contribution per month, amount paid out by equb and amount expected to be received from equb. We linked the identification (id) code of equb members with the id code from the demographic file to define individual characteristics of equb participants such as gender, age, level of

schooling, labour market status, ethnic origin and religious affiliation. Due to the rich array of information at our disposal we also defined equb specific characteristics such as size of equb contribution and size of equb. From other sections of the data we defined household specific characteristics such as household welfare indicators such as total household expenditure, food expenditure, household size, demographic composition and location.

The data sheds light on some of the controversial questions in the literature. For instance, we are interested to know the answer for the questions; *Why do households save through equb?* Table 1 lists, in order of importance, the purpose of membership in equbs as reported by participants. Consistent with the lumpy durable purchase argument, over 45 percent of our respondents save to buy consumer durables. By far, this is the most important reason why individuals in urban Ethiopia join equb. About one-fifth (20%) of the individuals joined equb to save without mentioning the reason why the saving is being made. This can defensibly be thought of as precautionary saving which can be put to use in times of shocks (e.g. consumption smoothing). A non-negligible proportion of respondents join equb to use the funds for investment reasons (about 17.4) and just under 10 percent of them save for altruistic reasons either to support some of their family member and/or friends.

Table 1: Purpose of Equb Membership

Purpose	Number of rosca members (%)
To buy consumer durables	176 (45.2)
To save	81 (20.8)
To start/ expand business	68 (17.4)
To help friends and solve family problem	32 (8.1)
Other (rent, education expenses, building a house …etc)	28 (7.1)
To buy food	10 (2.5)
To repay debts/to pay water and electricity bills	7 (1.7)
All	389 (100)

N.B. More than one purpose has been given by respondents but only the primary reason has been counted to compute the frequencies reported in the table.

Before the discussion of the basic information about equbs and the characteristics of equb participants as well as non-participants, we briefly look at who from a given household is more likely to be a member of equb. As expected, table 2 indicates that household heads and their partners are the ones who usually join equbs given their strength in income generation capacity relative to other household members. However, children and other household members can also make savings through roscas. This can be taken as an indirect evidence of the existence of child labour.

Table 2: Who is the Who is the member of equb? Frequency by city

Relationship to the Head	**Numbers (%)**
Head	258 (64.1)
Spouse/partner of head	105 (24.9)
Children	30 (7.5)
Others	10 (2.5)
All	403(100)

Table 3 gives the background information on the equbs that our respondents joined. The size of equbs is modest 24 being the median number of members and the duration of roscas is on average one year. But over 25 percent of the equbs last longer than 52 weeks and 10 of them running for over 100 weeks. This is a similar length of time as found by Anderson and Baland (2002) for roscas in a Kenyan slum. The most common forms of equb meetings are the ones taking place weekly (in about 38 percent of the cases) and monthly (in over 50 percent of the cases). This is mainly due to the necessity of a stable source of income to make equb contributions which often coincides with the monthly rosca cycle.

Table 3: Basic information on equbs

Variable	**All roscas**
Number of members (median)	24
Weeks existed (median)	52
Contribute daily (% of roscas)	2.8
Contribute weekly	37.7
Contribute fortnightly	6.1
Contribute monthly	49.6

Monthly contribution (median)	50
No of observations	362

We then briefly examine the broad characteristics of the individuals who participate in roscas and those who did not. Table 4 compares the characteristics of these two groups of individuals and we highlight the most notable ones. It is evident that equb members are richer, live in households with large number of members and children. This suggests that equbs are not necessarily saving arrangements either for the poor (e.g. large households) or the rich (e.g. total/food expenditure). They are used by both types of households. The proportion of females in equbs is much higher than among non-equb members. Another interesting finding is the high proportion of illiterate individuals among non-equb members. Most of the equb members are either primary or secondary school graduates. It is interesting to know that even individuals with higher degree qualification (individuals with a high propensity to save through interest bearing formal routes) are members of equb.

Table 4: Characteristics of Equb and non-Equb participants

Variable	**Rosca members**	**Non-rosca members**
Mean characteristics		
Total monthly rosca contribution (mean)	179.85	
Age	23.9	27.8
Household total expenditure	891.0	742.7
Household food expenditure	580.7	453.9
Household size	6.71	5.98
Number of children	2.1	1.92
Percentages		
Females	68.2	53.6
Illiterate	12.22	33.1
Primary schooling	33.03	23.4
Secondary schooling	35.1	35.0
Tertiary schooling	7.5	8.5
Number of observations	**362**	**1164**

IV. Empirical Estimates

Determinants of equb participation

To investigate the determinants of equb participation, we estimate a probit equation predicting the probability of participation. In order to examine the implications of the above model, we also estimate an equation of monthly equb contribution. We do so under different functional forms. First we allow for the possibility that the estimation of total equb contribution is not independent of the probability of joining an equb. As an alternative to the Heckman selectivity model, we could have used a Tobit estimation where it would have been implicit that a zero equb contribution is equivalent to choosing not to participate in an equb. This route seems somewhat restrictive given that the decision to participate in an equb can be a separate phenomenon to simply making very small contributions. Second, we estimate the contribution equation using OLS. We discuss of the results in the following few paragraphs.

Table 5 reports the results from the probit regression of the probability that an individual belongs to equb[7]. First we discuss the impact of individual characteristics on equb participation. The age of the individual is significantly related to the probability of joining equb. The relationship is quadratic (U-shaped) and it suggests that the demand for indivisible goods tends to be lower among the young and higher among the elderly. The result is different from findings found elsewhere (see Anderson and Baland, 2002 for Kenya; Levenson and Besley, 1996 for Taiwan). Gender is the most important determinant of rosca participation and females have a higher probability of being rosca members (Anderson and Baland, 2002). To capture the impact of cultural factors on rosca participation we include religion and ethnic dummies as regressors. The result shows that muslims are less likely to join equb. This is surprising because Muslims often do not use banks as saving vehicles because such deposits are interest bearing. Our expectation was to observe them to use equbs which are interest free saving schemes. Ethnic identity is not significant suggesting that

[7] Note that this is the first stage equation of the Heckman selectivity model.

belonging to a specific ethnic group is not associated with the possibility of informal collective arrangements in urban Ethiopia. As proxies for familiarity or trust , the ethnic dummies were expected to be significant. Among the education variables, only one is negative and significant. If the individual has finished a secondary education, he/she is less likely to join equb and this might relate to the limited access that secondary graduates have to regular employment income in Ethiopia.

Except for demographic variables, most of the household characteristics were not found to be significant including the measure of household welfare. The household welfare measure is food expenditure instead of total expenditure because we believe that total household expenditure is endogenous to equb participation. Hence we estimated the equation using food expenditure because it is independent of durable good expenditure. This variable is found to be insignificant[8]. Household size is negatively related to participation while the number of economically active members and the elderly has a positive and significant impact on equb participation probability. The negative coefficient for household size is consistent to the argument that larger households are more likely to be income-poor and hence do not have the means to participate. For regressors such as the number of children we expect an increase in the need to join equb as the number increases. The positive link emerges from the estimates but it is not significant.

Table 5: Probability of *Equb* participation: first stage of Heckman selectivity model

Variable	Marginal Effects
Constant	0.147 (1.5)
Individual characteristics	
Age	-0.024 (5.6)***
Age ^{2}	0.0002 (4.9)***
Female	0.934 (66.4)***
Other Christians (excluded)	
Orthodox Christian	-0.072 (1.1)
Muslim	-0.067 (2.5)**
Primary (excluded)	

[8] However, when we include total household expenditure, we obtained a significant positive coefficient for this regressor. The square term is found to be insignificant as in the case of food expenditure.

No education	0.013 (0.5)
Secondary Schooling	-0.069 (2.1)**
Higher education	-0.042 (1.5)
Household characteristics	
Total food expenditure	0.5D-04 (1.2)
Total food expenditure ^{2}	-0.4D-08 (0.3)
Kids below 6 (excluded)	
Household size	-0.051 (2.9)***
Children aged 6 to 15	0.024 (1.3)
Members aged 16 to 55	0.065 (3.5)***
Elderly aged above 55	0.106 (3.7)***
Actual 1s and 0s correctly predicted	96.9%
Log-likelihood	-158.59
No of observations	1478

N.B. t-ratios in parentheses. Other controls included but not reported due to statistical insignificance are dummies indicating location, ethnicity and labour market status of the individual.

Determinants of size of equb contribution

The major part of our study is to provide econometric tests of the theoretical predictions advanced in the rosca literature which include the inverse relationship between rosca size and rosca contribution; and also between the frequency of draw and the volume of saving per unit of time. Table 6 presents the different estimation results on determinants of size of equb contribution using individual, household and equb level characteristics. The results under the different functional forms are consistent with the theoretical predictions reproduced above. Column 1 gives the second stage estimates of the Heckman selectivity model. The significant inverse Mill's ratio clearly shows the dependence of the decision to join equb and the decision on the amount of equb contribution conditional participation. Age of the individual is a significant determinant of equb contribution. There is no significant quadratic relationship between the age of the participant and the size of the contribution. Gender of the individual has a significant impact on contribution. In conjunction with the findings from the first stage estimates, this indicates that females are not only more likely to join equb but they also tend to make more monthly equb contribution. As expected, the

labour market situation of the individual is also a significant determinant of the size of contribution. It is also convincing to observe, a significant and positive relationship between wage employment and equb contribution. Household food expenditure has a significant non-linear relationship. The result suggests that as household welfare increases the contribution to equb increases but not monotonically as it falls at high level of food expenditure. Except for the number of elderly household members, none of the demographic variables were significant determinants of contribution. Relative to being living in a household that is in Mekele, individuals who live in the rest of the six urban centres make more equb contribution. With regard to equb level characteristics, the size of equb (i.e. number of members in an equb) is inversely related with monthly equb contribution. This is consistent with the theoretical prediction discussed earlier and the findings by Hinda and Kirton (1999) for Jamaica. The prediction regarding the relationship between frequency of draw/saving and volume of saving is also supported. For instance, if the individual belongs to a daily equb, the saving allocations per unit of time decrease. However, in weekly and monthly roscas, the members are often well-off with regular incomes (e.g. employees with monthly salaries) and hence the contributions increase if the individual is a member in an equb with weekly and monthly allocations.

Column 2 gives the OLS regression estimates assuming exogeneity of the frequency of rosca contribution. All the above significant results hold except for dummies for gender, most of location dummies and one of the frequency of draw variables (i.e. weekly). The most important point to bear in mind here is that the theoretical predications with regard to frequency of draw, size of equb and size of equb contribution are still confirmed by our results. One interesting result relates to ethnic identity. If the individual is from the Gurage ethnic group (a group mainly engaged in running small and big businesses), rosca contribution increase. In addition, anecdotal evidence abounds about the strict saving behaviour of this group which might have been picked up here.

Table 6: Regression results for the determinants of amount of Equb contribution

Variables	Heckman 2-stage (1)	OLS[9] (2)
Constant	-	2.344 (4.1)***
Individual characteristics		
Age	-0.0479 (1.7)*	-0.061(2.0)**
Age ^{2}	0.3D-03 (0.8)	07D-03(1.4)
Female	1.228(2.9)***	-0.170(0.6)
Employed	0.575 (3.6)***	0.630(3.8)***
Other ethnic groups(excluded)		
Amhara	-	0.253(1.5)
Oromo	-	-0.016(0.1)
Tigre	-	0.214(0.9)
Gurage	-	0.416(2.3)**
Household characteristics		
Food expenditure	0.002(7.7)***	0.002(6.5)***
Food expenditure ^{2}	-0.4D-06(3.2)***	-0.3D-06(2.4)**
Elderly aged above 55	0.386(2.4)**	0.359(2.4)**
Mekele (excluded)		
Addis Ababa	0.666(2.9)***	0.378(1.1)
Awasa	0.792(2.6)**	0.422(1.0)
Bahar Dar	0.979(3.5)***	0.686(1.9)*
Desie	0.698(2.1)**	0.295(0.7)
Diredawa	1.017(2.8)***	0.889(2.0)**
Jimma	0.863(2.8)***	0.614(1.6)
Rosca characteristics		
Size of rosca	-0.003 (3.3)***	-0.003(3.2)***
Fortnightly (excluded)		

[9] To allow for the endogeneity of the frequency of saving through equb, we will produce also IV estimates using pay period (i.e. for the wage income of equb members) as potential instruments.

Daily [a]	-1.495(3.4)***	-1.678(3.6)***
Weekly [a]	0.389(2.1)**	0.176(0.9)
Monthly [a]	1.172(5.9)***	0.928(4.3)***
Lambda	0.890 (4.0)***	-
F-statistics	16.99	14.11
R^2	0.55	0.56
No of observations	349	349

N.B. [a] Treated as endogenous in the last column. Instruments are variables indicating whether the wage pay period is daily, weekly and monthly. Ethnic and Religion dummies were used as identifying restrictions in the Heckman Two Stage model. ***; ** and *=significant at 1, 5 and 10 percent respectively. Schooling and demographic composition variables were included as controls in all functional forms but not reported as they were insignificant.

Conclusion

The study presented some econometric evidence using data on equbs (Ethiopian roscas) from seven major urban centres in Ethiopia. A number of theoretical predictions have been supported by our data. We obtained an inverse relationship between equb contribution and size of equb (Besley et at 1993; Hand and Kirton, 1999); most of the equb participants join the informal saving scheme to buy consumer durables (Handa and Kirton, 1999); the larger proportion of rosca members are females (Anderson and Baland, 2002); a negative relationship between frequency of draw and volume of saving; and, finally, richer households tend to join equb (Levensohn and Besley, 1996).

Some of the future possible direction of this study include the need to allow for the endogeneity of the frequency of saving in the contribution equation. Because our data consist of information on employment of individuals, we will produce also IV estimates using pay period as potential instruments. More important and worthwhile future exercise is the investigation of household participation in formal and informal financial institution. Again very little is known about the micro-level determinants of *individual/household* participation in the various instruments. We focus on saving through banks and roscas as these represent the prevalent forms of saving. Some work has already been done. Bivariate probit equations estimated to test whether saving in formal institutions (banks) are substitutes/complements for saving in informal

institutions (such as equbs). The results indicate a statistically significant term for ρ which suggests that informal saving mechanisms are perfect substitutes for the formal saving institutions in the urban centres of Ethiopia.

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