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MEMBERSHIP SIZE AND FUNDS MOBILIZATION AMONG INFORMAL FINANCIAL GROUPS IN RURAL ZAIRE: A CLUB THEORY APPROACH

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Abstract

A formal model of informal financial groups is developed. A system of equations is estimated by a two stage method to evaluate key characteristics of the organizational form of informal financial groups in Zaire. Income, transaction costs, and gender ratio were found to be some of the significant explanatory variables.

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Introduction

The underdevelopment of the formal financial system in Zaire--bank density ratio estimated to be 420 thousand inhabitants per bank branch (Cuevas)--represents a major limitation in mobilizing domestic funds, and expanding investment and consumption opportunities. The inadequate infrastructure of communications, and a rapidly deteriorating road network, along with the prevailing macroeconomic and financial constraints, make it infeasible for the formal financial system to directly provide financial services to rural households and enterprises (Cuevas et al., Financial Times).

On the other hand, there is an active informal financial market operating in Zaire (Pizarro, Marx, and Canessa; A. Young; Cuevas et al). A variety of informal financial groups (IFGs) as well as moneylenders, moneykeepers, and traders have been identified. Unquestionably, the magnitude of funds mobilized through informal financial intermediaries, and especially through IFGs, is substantial. In one region of Zaire, an IFG mobilizes an average of 255 thousand zaires per year. With a significant number of IFGs per village (five on average), this represents an enormous amount of capital mobilized in the villages.

Several types of IFGs are found in Zaire. They are categorized as either rotating saving and credit associations (ROSCAs), or savings groups. ROSCAs have members who make regular contributions to a fund which is given, in whole or in part, to each member in rotation (Ardener). Savings groups are defined as "an association where a core of

participants agree to save regularly on a contractual basis. The savings might be used for member and/or non-member loans on a interest or interest-free basis" (Schrieder, pp.60).

This paper draws upon the economic theory of clubs to model and analyze IFGs in rural Zaire. A framework that incorporates transaction costs into a formal model of IFGs will be first developed. This model will permit the estimation of certain key characteristics of the organizational form of IFGs. These characteristics are the membership size of the IFG, the size of the fund, and the provision of reciprocity. Studying IFGs should provide insights toward developing alternative formal organizational forms that will make the supply of financial services in the rural areas more efficient.

Informal Financial Group Model

IFGs operate in a market that is contractual in nature. Transactions generally occur through an agreement (or contract) between two or more parties for the doing/or not doing something specific in the future. In addition, information asymmetries--when one of the parties involved in the transaction has more information regarding the conditions that surround the transaction than the other--are present. Assuming that information has value, and that there are costs of acquiring information, incentive problems of moral hazard and adverse selection arise which increase transaction costs. There is difficulty in distinguishing whether the parties involved are being honest and disclosing all relevant information (adverse selection); and whether the parties involved will do what is required in the contract (moral hazard).

The organizational structure and mode of operation of IFGs with its accompanying incentive mechanisms, are designed to minimize transaction costs--problems of negotiation,

monitoring, information, and enforcement of contracts, or agreements (Williamson). The absence of collateral requirements and interest charges points to the greater efficiency in information, monitoring, and enforcement of contracts by IFGs in contrast to formal financial intermediaries.

The economic theory of clubs is the foundation of the theoretical model developed below to explain the organization and performance of IFGs. The essence of the economic theory of clubs is that the quality of services received from a public good by any one member deteriorates as the number of members who use it rises.

A club or association is defined as "a voluntary group deriving mutual benefit from sharing one or more of the following: production costs, the members' characteristics, or a good characterized by excludable benefits" (Sandler and Tschirhart, pp.1482). The IFG clearly fits this general definition. The membership shares in the provision of the fund, thus sharing in production costs. The fund is characterized by excludable benefits, since non-members cannot consume the fund.

IFGs are modeled assuming that the membership is homogeneous, and that tastes and endowments of members of a particular group are identical. As in the Buchanan model, the homogeneous members equally share the public good and its associated cost, there exists no discrimination against any of the members, and the club can costlessly exclude all non-members. Preferences are represented by well-behaved utility functions. Since members are assumed to be totally homogeneous, the analysis of the organizational structure of IFGs can be carried out in terms of a representative member.

Members' characteristics will be viewed by other members as generating an increase in utility, so utility is now dependent on both the shared good and on member characteristics which are either private or semi-public, shared goods (De Serpa). The model could easily be extended to include members' characteristics that generate a decrease in utility. For example, emergency loans that are not mandated by the group can be given from one member to another member. The emergency loan can then be thought of as a private good whose existence is created around a shared good, the fund. This relationship is facilitated by information. Likewise, mutual aid can be thought of as a shared good whose existence is created around the fund, and whose relationship is facilitated also by information. It is the introduction of the information variable that represents the major alteration of Buchanan's model.

The utility function for the ith individual, Ui, is

$$Ui=Ui(yi,F(Z),W(Z),N(Z))'''' i=1,...,N', \tag{1}$$

yi is the quantity of a composite pure-private good consumed by individual i. The marginal utility of yi is also assumed to be positive, $\partial Ui/\partial yi>0$.

The fund, F, is the quantity of the impure public good which the individual receives. F is equal to the individual's contribution, X, times the number of members in the group. The impure public good, F, is available to all members in identical amounts. The marginal utility of F is assumed to be positive, $\partial Ui/\partial F>0$.

Z is a variable representing information. It is an exogenous variable in the model. Information positively affects the size of the group, the size of the fund, and the provision of reciprocity. It is the current information set that the organizer(s) have access to that is relevant. Information at the village level is generated interpersonally. Information regarding trustworthiness of a particular person as a supplier in the outputs of the group can be collected from other members who have had dealings with that person, from direct observation, or from conversations. Profiles can thus be constructed by reports from several people, and by different means. Information affects the size of the fund positively, $\partial F/\partial Z > 0$.

Each potential member of the club exhibits non-negative characteristics which are supplied to other members of the group, and will be denoted as reciprocity, W. Reciprocity represents members' income, as well as other forms of aid. Reciprocity is thus a vector of characteristics, which is assumed non-negative. It is a function of mutual trust and confidence, and it does not exhibit the characteristics of a public good.

Each member of the club jointly consumes the semi-public good, the fund, and the characteristics of its members, denoted as reciprocity, which can also be thought of as a semi-public good. The amount of reciprocity provided by each member is a function of the information set, and it is assumed that information affects reciprocity positively, $\partial W/\partial Z > 0$. The marginal utility of reciprocity is positive, $\partial Ui/\partial W > 0$. $W = \Sigma ai$, where W is the supply of the members' characteristics. ai = (a1i, a2i, ... , aji), which is the vector of non-negative amounts of characteristics that each member possesses. Reciprocity is used as a form of insurance, but can also be thought of as an open line of credit. Its use is tied to being a member in the group, and the cost associated with having access to it is similarly providing

the same service to other members in the group. It is acknowledged that reciprocity exists to a degree in most village settings in developing countries, but we are concerned only with the reciprocity that is mandated in the group. The consumption of reciprocity is uncertain. Yet, its very existence is a cause for its inclusion in the utility function. The greater the reciprocity that can be supplied, the greater the utility.

The size of the group, N, is affected positively by the information set, $\partial N/\partial Z > 0$. The greater (or better) the information, the larger will be the size of the group. The size of the group can also be thought of as a variable representing trust and/or confidence. As the group becomes larger, implying a more extended information set, distrust and a loss of confidence in the group may arise. This is due, in part, to the associational factor, where at a particular size, a member may no longer feel a part of the group. Also, there are difficulties in assimilating information, especially when the information begins to be passed on from one level to another. In other words, a member may only know several other members well. As the group grows in size, the information on other members may be acquired through members in the group not well known to member one. The use of this "secondary" information may eventually lead to a loss of trust and confidence in the group. This is affected by how the change in the membership size affect utility, $\partial Ui/\partial N > 0$ when $N < N^{\wedge}$, and $\partial Ui/\partial N < 0$ when $N > N^{\wedge}$, where $N^{\wedge}$ is the critical group size.

The group cost function in producing the fund and providing reciprocity is C(F, W, N, Z). Since these costs are equally shared, the cost function for the representive member can now be expressed as,

$$Ci=C(F,W,N,Z)/N \tag{2}$$

The effects of the production of the fund, reciprocity, and group size on costs are assumed positive, i.e., $\partial C/\partial F>0$, $\partial C/\partial W>0$, and $\partial C/\partial N>0$. Information affects costs negatively, $\partial C/\partial Z<0$.

The members' resource constraint is given as,

$$I_i \geq y_i - C(F,W,N,Z)/N \tag{3}$$

where Ii is the individual's income, and the price of the private good yi is one. Note that the individual's resource constraint does not explicitly recognize the opportunity cost of the member's contribution to the fund due to the member's position in the rotation. The assumption of zero opportunity costs for the contributions made makes the total contributions equal to the size of the fund received by the member, regardless of their position in the rotation.

The model can now be expressed as follows:

$$\max U_i[y_i,F(Z),W(Z),N(Z)] s.t. \left[I_i - y_i - \frac{C(W,F,N,Z)}{N} \right] \tag{4}$$

Empirical Model

The organizational structure is defined by the size of the group and the size of the fund, and reciprocity. These three variables are endogenous and are determined simultaneously. Hence, the empirical model will be a simultaneous equation model. The unit of

observation is the group. The simultaneous equation model to be estimated is set forth as follows:

$$F=B_0+B_1N+B_2Z+B_3I+B_4TC+B_5TG+B_6SR+B_7FV+u \quad (5)$$

$$N=B_0+B_1F+B_2W+B_3Z+B_4TC+B_5TG+B_6SR+B_7I+u \quad (6)$$

$$W=B_0+B_1N+B_2Z+B_3I+B_4TC+B_5TG+u \quad (7)$$

where, F=size of the fund; N=size of the membership;

W=mutual aid/reciprocity; Z=information vector; I=income; TC=transaction costs vector; TG=type of group;

SR=speed of rotation; FV=fixed vs variable contribution

Measurement of Variables and Data Sources

Data collection took place between September and December 1989. Interviews with 89 leaders of IFGs and 193 interviews with members of IFGs were carried out.

Organizational structure of IFGs will be defined in terms of the size of the membership, the size of the fund (output level), and whether other goods/services are produced, in particular reciprocity (mutual aid). The size of the membership and fund are self-explanatory. A binary variable measures the production of mutual aid/reciprocity.

Information will be proxied by the following three variables: (i), the occupational composition of the IFG (V1); (ii), the number of years the group has existed (V2); (iii), the gender composition of the IFG (V3), measured as the percentage of total membership accounted for by the dominant gender.

Income (I) is measured as the average income of all members in each group. Other explanatory variables thought to be relevant are the group's operational mode--speed of rotation (SR) and fixed vs variable contributions (FV).

Costs will be measured in two ways. First, by the time the members spend in fulfilling the conditions of membership. This variable (TC1) is derived by multiplying the size of the membership by 10 minutes if a collector is designated to collect contributions, and by one hour if a meeting must occur to assemble and distribute the fund. Second, costs will be measured by the degree of regulatory action. This variable (TC2) is derived by multiplying the size of the membership by the number of explicit sanctions imposed on members who violate the conditions of membership.

Econometric Method

The relationship between the size of the membership and production of various goods/services cannot be described with a single equation because of the joint dependence that exists. The application of ordinary least squares to an equation belonging to a system of simultaneous equations yields biased and inconsistent parameter estimates.

The presence of a dichotomous, or binary endogenous variable taking the value of 1 if reciprocity is provided and 0 otherwise results in several problems associated with the use of 2SLS. The application of OLS to this particular equation results in estimators that are not being fully efficient due to the error term not being normally distributed, and the posibility that the expected value of reciprocity may lie outside of (0, 1). Johnson states that "Fitting linear regression of y on x'b is unlikely to approximate the true probability over the middle range and gives nonsense results at the extremities" (Johnson, p.227). Therefore,

Maddala's two-stage procedure for estimating models with mixed qualitative and continuous variables is used in estimating the simultaneous equations model (Maddala, pp.244-245).

Empirical Findings and Implications

Table 1 presents the estimates for the reciprocity equation. The coefficient, the type of group (TG), is significant at a five percent confidence level. The gender ratio (V3) is significant at a ten percent confidence level, and is of the expected sign. IFGs that are predominantly made up of members of the same gender are more apt to provide mutual aid for the members. All other explanatory variables were found to insignificant at a ten percent confidence level.

Table 2 presents the estimates for the size of the group equation. Transaction costs (TC1, TC2) were found to be significant at a one percent confidence level, and were of the expected sign. The size of the fund (F) is significant at a one percent confidence level, and is of the expected sign. Income (I) was also found to be significant at a five percent confidence level, and affects the size of the group positively. All other explanatory variables were found to be insignificant at a ten percent confidence level. The information vector was hypothesized to positively affect the size of the group yet was found to be insignificant. This may be a product of the grouping of ROSCAs and savings groups into one sample. Structural differences are thought to exist owing to the different objectives underlying the two types of IFGs. Further, the R-squared value is 0.88 which indicates that variation in the size of the group is explained in large part by the explanatory variables. The explanatory variables were also found to have a significant influence on the size of the group as measured by the F test at a five percent confidence level.

Table 3 presents the estimates for the size of the fund. The size of the group (N) and transaction costs (TC2) were both found to be significant at a one percent confidence level, and were of the expected sign. Income (I) and the type of group (TG) was found to be significant at a five percent confidence level. Income was of the expected sign. All other variables were found to be insignificant. As stated previously, the insignificance of the information vector may be the result of a structural differences between the two types of IFGs. The R-squared value is 0.30. The explanatory variables were found to have a significant influence on the size of the fund as measured by the F test at a five percent confidence level.

In summary, the income level of members, and group transaction costs appear to play an predominant role in determining group organizational structure. In addition, gender dominance in group membership explains significantly the production of mutual aid/ reciprocity in informal financial groups. Further analysis of this model should focus on the differences detected between group types, and alternative definitions of the information factor.

Table 1. Second Stage Logit Estimation for the Reciprocity Equation

Variable	Coefficient	Std. Error	T-ratio[1]
intercept	-3.34880	2.70224	-1.239
TG	3.13445	1.61447	1.941**
N	-.477592E-02	.110041E-01	-.434
V1	-.991953E-02	.183871E-01	-.539
V2	-.317407E-01	.113148	-.281
I	-.398624E-07	.737834E-06	-.054
TC1	-.186037E-01	.172956E-01	-1.076
TC2	.514947E-02	.952476E-02	.541
V3	.290747E-01	.213392E-01	1.363***

Number of Observations is 55.

Table 2. Second Stage OLS Estimation for the Size of the Group Equation

Variable	Coefficient	Std. Error	T-ratio[1]
intercept	-20.5241	33.7198	-.609
TG	-2.46473	13.6707	-.180
V1	.288397E-01	.232884	.124
SR	15.7919	17.2535	.915
W	10.2761	12.7343	.807
I	.162119E-04	.903897E-05	1.794**
TC1	.537602	.198004	2.715*
TC2	.739010	.523559E-01	14.115*
V3	-.168543	.282588	-.596
F	.165119E-03	.533902E-04	3.093*

R-squared is .87889 and F is 36.28592.
Adjusted R-Squared is .854672
Number of Observations is 55.

Table 3. Second Stage OLS Estimation for the Size of the Fund

Variable	Coefficient	Std. Error	T-ratio[1]
intercept	40270.6	110921.	.363
TG	-46024.2	34150.9	-1.348***
N	1082.20	367.393	2.946*
V1	401.195	613.425	.654
SR	279.813	45906.5	.006
FV	8469.08	39553.4	.214
I	.343075E-01	.243454E-01	1.409***
TC1	-180.604	583.457	-.310
TC2	-811.807	302.688	-2.682*
V3	-192.873	775.407	-.249

R-squared is .30100 and F is 2.15307.
Adjusted R-Squared is .161199.
Number of Observations is 55.

[1] Note: Coefficients marked with (*) are significant at a 1% confidence level, those marked with (**) are significant at a 5% confidence level, and those marked with (***) are significant at a 10% confidence level.

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