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Nathan Okurut, Andrie Schoombee and Servaas van der Berg

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Nathan Okurut
Makerere University & University of Stellenbosch
Andrie Schoombee
University of Stellenbosch
Servaas van der Berg
University of Stellenbosch

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Introduction

Uganda is one of the few African countries which has experienced quite substantial growth in the period since 1990. Growth of GDP has been estimated at 6.9% per annum for the period 1990-2002, compared to only 2.6% for all African countries and Uganda's own far weaker performance of 2.9% in the 1980s (World Bank 2004: 183)

As a consequence of this growth, Appleton (2001: 4) has estimated, based on household surveys, that the poverty headcount (defined relative to a poverty line close to the widely used dollar a day) has declined substantially: From 56% in 1992 to 34% in 1999/2000 – mainly because mean consumption per adult equivalent rose by 4.7% per annum over this period (its distribution worsened slightly). Wider measures of poverty (the poverty gap ratio P_1 and the poverty severity ratio P_2) declined even more than the poverty headcount ratio (P_0), thus indicating that the poorest gained much from this growth (Appleton 2001: 27, Table 2). This decline in poverty is confirmed by panel data that show similar declines in the poverty headcount ratio over the same period (Lawson *et al.* 2003: 6). Nevertheless, this is a relatively strict poverty definition, and poverty is still widespread, particularly in the Northern region, where the panel data also seems to indicate most poverty persistence (Lawson *et al.* 2003: 7). Uganda is still a very poor country, as judged by the fact that its per capita income of \$240 in 2002 is scarcely above half the average level for all African countries (\$450) and for all low income countries (\$430) (World Bank 2004: 16). Admittedly, exchange rates exaggerate Uganda's poverty, and converting using PPP dollars gives a somewhat better picture. But even then, at \$1360 versus Africa's \$1700 and the average for low income countries of \$2110, Uganda is still amongst the world's very poorest countries, despite its more recent commendable growth performance, and it needs much more growth to reduce poverty (World Bank 2004: 16).

It is against this context of poverty that the issue of credit in Uganda should be seen. In an impoverished country, albeit one experiencing rapid economic growth, opportunities of individuals and therefore indeed opportunities for macro-economic growth are likely to be constrained by lack of access to resources to invest. It is in this way that micro-finance builds a bridge between micro-economic opportunities for individuals and macro-economic performance of the economy. Moreover, another micro-macro-linkage is also of relevance: where macro-economic reforms have been introduced, including macro-economic financial reforms, it is important to ask whether they have contributed towards improving access of the poor to formal credit, and if not, what role informal credit plays.

This paper focuses on identifying the factors that influence credit demand and also those that result in the poor being credit rationed by lenders. An understanding of both these sets of determinants could assist policy formulation to enhance the welfare of the poor through improved credit access. In this respect we were fortunate in having a dataset that contains questions not only on actual credit given, but also on loans applied for. This allows us to investigate both credit demand and credit supply, and to model these using observed household and individual characteristics.

The paper is organised as follows: The next section investigates the role of credit in the development process, as it has become evident from the relevant literature. We then look at credit in Uganda and turn to formally modelling both credit demand and credit supply, with the latter in particular dealing with the important. Finally, our concluding remarks draw some inferences from the models and speculate as to what this may imply for the role of formal and informal credit institutions in the context of a very poor country.

The role of credit in development

In a developing country context, credit is an important instrument for improving the welfare of the poor directly (consumption smoothing that reduces their vulnerability to short term income shocks) (Binswanger and Khandker 1995; Heidhues 1995; Nwanna 1995) and for enhancing productive capacity through financing investment by the poor in their human and physical capital. An investigation of household credit thus has implications that link together micro-level analysis with factors that determine long term macro-economic performance.

In Uganda, mainly macro-level policies were implemented from the early 1990s to improve the efficiency of the financial sector. These included liberalisation of interest and foreign exchange rates, as well as government divesting from the management of public sector banks. However, as has also often been experienced in other developing countries, deregulation of the formal financial sector has not increased access to formal finance for the Ugandan poor. This failure of the formal financial sector to serve the poor has forced them to rely on informal finance (Musinguzi and Smith 2000), as is often the case in developing countries.

The demand for credit for productive investments usually comes from those poor who are less risk-averse and enables them to overcome liquidity constraints, making it possible to undertake investment that can boost production, employment and income. Credit for consumption purposes can have a long term positive impact on household productivity, allowing acquisition of skills or improvement in health status if such loans are used for education or health care. These may enhance or at least preserve the productivity of the labour force. The credit market is also, at least potentially, an important instrument for consumption smoothing.

Commercial banks constitute the formal lenders in Uganda and access to them is restricted to a small proportion of the population who can meet their stringent requirements, which include high minimum balances for account opening, onerous collateral requirements for loans, and long and costly bureaucratic processes. Banks are,

furthermore, mainly urban based, thereby adding the burden of transport costs if the predominantly rural population wishes to use bank facilities. As a result of constrained access to formal credit, the poor rely almost exclusively on the informal financial sector. Informal lenders innovatively seek to solve the problems of high risk, high cost and low returns that banks face when serving the poor.

In practice households apply for credit, but lenders determine how much credit is allocated to them, based on their perception of the household's creditworthiness. This often results in credit rationing, that reflects the lender's perception of the household risk profile. Understanding which factors influence credit rationing highlights specific interventions that may raise the creditworthiness of households, to the advantage of both lenders and households. From the lender's perspective, improved creditworthiness of borrowers will reduce risk of default and improve profitability and financial sustainability. From the household side, increased creditworthiness means increased access to credit, which may provide a possible escape route from poverty.

Access to credit

The failure of formal banks to serve the poor is due to a combination of high risks, high costs and consequently low returns associated with such business.

In the credit market, the exchange between borrowers and lenders does not occur simultaneously. The delay involved in discharging the debt obligation exposes the credit transaction to considerable risk. To lower these risks, banks perform three tasks: they screen potential borrowers to establish the risk of default; they create incentives for borrowers to fulfil their promises; and they develop various enforcement actions to make sure that those who are able to repay, do so. When transacting with the poor, these actions are difficult and costly to undertake, and in an international context, most Ugandans can be regarded as poor. The scarcity of information results in information asymmetries between the poor and banks. To address this problem, banks usually attach collateral requirements to loans. Collateral not only assists in determining creditworthiness, but also solves the incentive and enforcement problems.

Unfortunately, conventional collateral requirements usually exclude the poor, who seldom have sufficient forms of conventional title, resulting in banks failing to meet the poor's demand for credit.

Informal lenders have often, however, innovatively succeeded in limiting loan default. For instance, by lending to groups of borrowers, the joint liability and social collateral that is created ensure the strict screening of members, the incentive to honour commitments and members of the group monitoring each other's actions. Intensive loan collection (monthly or more frequently) and loan supervision measures have been found not only to be effective in limiting default, but also to pass cost-benefit analyses (Hulme and Mosley 1996:24-25). Another set of measures utilised by informal lenders to limit loan default is to provide repayment incentives, including pardoning part of the final interest payment if all repayments are received on time; speeding-up subsequent loan approvals; and increasing borrowers' credit limits if repayments are made on time (Hulme and Mosley 1996:60-65; Schmidt and Zeitinger 1994:57). Credit availability, and timeous access to it, is of prime importance to the poor.

In addition to the high risk problem, high operating costs (e.g. salaries for highly skilled personnel, standardised procedures for transactions) relative to the quantity of credit demanded inhibit banks from serving the poor. Informal lenders have also succeeded in lowering these high unit costs. In the case of group lending, for example, social collateral mechanisms have been used to decrease the information costs associated with screening potential loan applicants: groups choose their own members, and their previous savings and loan repayment history is known.

Moreover, the banks are not alone in facing high costs. Poor clients also encounter substantial transaction costs (e.g. time and transportation costs) in dealing with banks, *inter alia* because banks are often not conveniently located. This costly access for the poor is considerably decreased by informal lenders, e.g. by locating close to their clients, and by speedier loan approvals.

Credit rationing

Access to credit does not imply that the demand for credit will be satisfied. Lenders determine how much credit is allocated based on the probability of loan default, often resulting in credit rationing. The probability of default may be influenced by a number of factors that include the expected returns of the project, the terms of the loan, market imperfections and borrower characteristics.

The expected return on the borrower's proposed investment project plays a key role in influencing the lender's credit rationing behaviour (Kochar 1997: 344). Here the interest rate plays the role of a screening device. If the expected return is less than the principal loan amount plus interest (the terms of the loan), then the probability of default will be high. In such a scenario, the optimal lender's decision will be either to ration the borrower by granting a smaller amount than originally applied for or to completely reject the loan application.

Credit markets are characterized by imperfect information that disables interest rates from playing their classical market-clearing role (Baydas *et al.* 1994: 280). Information asymmetry in credit markets arises because borrowers have better information about their potential risk of default than the lenders (Aleem 1990: 330). This asymmetry is compounded in informal credit markets by the fact that the credit histories of borrowers are not documented and pooled. The costs of acquiring this information are very high, both in terms of time and financial resources. The other complication is its reliability. If lenders collect such information from the potential borrowers themselves, borrowers are likely to give an exaggerated view of their creditworthiness. This raises the need to validate such information from other sources. Furthermore, if lenders try to collect such information from other community members, there is a tendency to withhold information if the one soliciting such information is a stranger. Should lenders increase the lending rate to compensate for the higher cost of information gathering or the level of reliability of the information, this may result in adverse selection and moral hazard, both forms of behaviour of borrowers which may negatively affect the lenders' returns on loans.

Adverse selection occurs where borrowers with safe (and low default risk) projects decide to opt out of the credit market in the face of rising interest rates, while more risky projects with potential higher returns but with higher probability of default are attracted into the market. An increase in the interest rate increases the probability of attracting projects with high probability of default, which in turn reduces the profitability of lending operations.

A rise in the lending rate may also create a moral hazard problem, where borrowers with low risk projects shift to high risk projects that promise higher returns but with high probability of default. For this reason lenders faced with information asymmetry and lack of control over actions of borrowers tend to design credit contracts that will induce borrowers to take actions that enhance the likelihood of repayment and also attract low risk borrowers. The lenders may therefore find it optimal to charge lower than equilibrium interest rates and use non-price mechanisms to ration credit (Hoff and Stiglitz 1990: 238).

The specific borrower characteristics that influence the informal lenders' credit rationing behaviour include strength of previous business relationships, reputation in the market, acceptance of interlinked credit contracts, debt-service capacity and wealth status. Aleem (1990: 333) argues that informal lenders mainly use the established relationship with borrowers as a screening and credit rationing mechanism. The longer the previous business relationship, the lower will be the probability of the borrower being credit rationed. Bell (1990: 312) further points out that because it takes long to build a relationship with informal lenders (a minimum of one year), borrowers tend to stick to particular informal lenders so as to avoid the long screening process and high probability of loan applications being rejected by new lenders.

The reputation of the potential borrower is another important yardstick that influences the informal lenders' credit rationing behaviour (Siamwalla *et al.* 1990: 281). Since loans in the informal financial sector are mainly character loans (i.e. not backed by any

collateral security), the borrower's reputation is of significant importance to the informal lender. For this reason, informal lenders invest both financial resources and time to gather information about potential borrowers from people known to them both in the market place and the villages where borrowers reside. The reputation of the borrower determines the probability of wilful default, which may be assessed through how he has performed in the repayment of loans borrowed from other people. Borrowers with poor reputations will more likely be credit rationed.

The informal lenders' assessment of the borrowers' debt service capacity (outstanding debt as proportion of total household income) will also influence the probability of their being credit rationed (Zeller, 1994: 1896). If the debt-income ratio is higher, the potential borrower is more likely to be credit rationed. However, the composition of the borrowers' outstanding debt is of significance to the informal lenders' credit rationing behaviour. If the outstanding debt is mainly from the formal financial sector, the informal lender may not be threatened, as he may expect to have a better chance of recovering his money as compared to the formal lender. In such a scenario the potential borrower may be less credit rationed.

The borrowers' acceptance of interlinked credit contracts also determines their likelihood of being credit rationed (Udry, 1990: 252).¹ An interlinked credit contract acts as a disguised form of collateral that reduces the adverse selection and moral hazard problems and consequently reduces the probability of default. It also provides an added incentive for the borrower to repay the loan. Bell (1990: 312) argues that there is an effective enforcement mechanism for interlinked credit contracts through co-operation among informal lenders. For example, if a farmer who has a contract with a trader/lender that links his borrowing to marketing his output then tries to sell his agricultural output through another trader, this trader/lender may deduct the loan plus interest and pass it on to the original trader/lender that the borrower is trying to dodge.

¹ The interlinked credit contract is where a credit transaction involves interdependent exchanges in two or more markets which are simultaneously agreed upon (Basu, 1983). For example, a trader/money lender extends credit to farmers on condition they market their output through him.

The ease of enforcing the interlinked credit contracts explains why borrowers who accept them are less likely to be credit rationed.

Credit in Uganda

The data source for most of the analysis is the Uganda National Household Survey 1999/2000, undertaken by the Uganda Bureau of Statistics (UBOS) with technical support of the World Bank. This dataset has been used by a number of researchers for a wide range of purposes (e.g. Appleton 2001; Lawson *et al.* 2003)), but to our knowledge no work has yet been published on the credit situation based on this survey. The sample size of 10 692 households was drawn using a multi-stage stratified random sampling technique with probability proportionate to size, based on the 1991 census as the sampling frame. Each district was stratified into enumeration areas categorized as urban, other urban and rural. The first stage of sampling involved the selection of enumeration areas, the second stage the sampling of households.

For this paper, the term “formal credit” or “formal financial institutions” will be confined to formal banks only. All other credit sources (friends/relatives/community funds, co-operative credit societies/NGOs, money lenders/commercial firms or government agencies) will be dealt with collectively as informal lenders. Formal credit is supplied by the formal financial sector that is regulated by the Central Bank under the Financial Institutions Statute of 1993. In the survey data, the formal sector was coded as banks. The informal financial sector is the unregulated sector, comprising of all the remaining lenders. A regulatory framework has been passed since to regulate microfinance institutions under the Microfinance Deposit-taking Institutions Act (MDI) of May 2003, but the law has not yet been enforced and no such law existed at the time of the 1999/2000 household survey.

Although credit is of crucial importance from both a consumption and an investment perspective, availability of credit is fairly constrained, particularly from formal credit sources. Overwhelmingly, credit-constrained Ugandans turn to informal credit sources. Thus, fewer than 10% of the adult sample (18 years and above) contained in the Uganda

National Household Survey 1999/2000 had applied for credit in the past twelve months, as Table 1 shows, and fewer than 5%² of those who did apply for credit (i.e. less than 0.5% of the total sample) had applied for such credit from banks. This may to some extent be a response to the supply of credit: Both access to banks and the known credit criteria of banks may have eliminated them as a potential source of credit for most potential borrowers. There is still a large unmet need for credit: Of those who did not apply for credit, only 44% indicated that they did not need such credit; the remainder were mainly pessimistic about their own ability to access such credit (Table 2).

Credit Status	Region				Sector		National
	Central	Eastern	Northern	Western	Urban	Rural	Total
Never	5 757	5 484	3 665	5 802	4 227	16 302	20 708
Applied	27.8%	26.5%	17.7%	28.0%	20.6%	79.4%	100.0%
	91.6%	88.7%	98.8%	88.0%	88.8%	90.7%	90.3%
	36	13	11	49	69	38	109
Bank	33.0%	11.9%	10.1%	45.0%	64.5%	35.5%	100.0%
	0.6%	0.2%	0.3%	0.7%	1.5%	0.2%	0.5%
	494	687	190	744	463	1 633	2 115
Informal	23.4%	32.5%	9.0%	35.2%	22.1%	77.9%	100.0%
	7.8%	11.1%	4.9%	11.3%	9.7%	9.1%	9.2%
	6 287	6 184	3 866	6 595	4 759	17 973	22 932
Total	27.4%	27.0%	16.9%	28.8%	20.9%	79.1%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Because of some missing urban/rural values, rows do not all add up.

² This is a similar proportion to the 6% of loans which Aliber (2002: 16) found to have been made by banks in a 2001 survey covering 155 informal sector operators in central Kampala.

Reason	Region				Sector		National
	Central	Eastern	Northern	Western	Urban	Rural	Total
	2 359	2 045	1 889	2 847	2 109	6 921	9 140
Does Not Need credit	25.8%	22.4%	20.7%	31.2%	23.4%	76.6%	100.0%
Does not know where to apply	41.5%	38.0%	52.5%	50.2%	50.8%	43.2%	44.9%
No supply available locally	1 026	903	777	1 142	551	3 288	3 848
Does not have required security	26.7%	23.5%	20.2%	29.7%	14.4%	85.7%	100.0%
Interest too high	18.1%	16.8%	21.6%	20.1%	13.3%	20.5%	18.9%
	583	553	493	603	246	1 978	2 232
	26.1%	24.8%	22.1%	27.0%	11.1%	88.9%	100.0%
	10.3%	10.3%	13.7%	10.6%	5.9%	12.4%	11.0%
	1 216	1 408	312	678	860	2 713	3 614
	33.7%	39.0%	8.6%	18.8%	24.1%	75.9%	100.0%
	21.4%	26.1%	8.7%	12.0%	20.7%	17.0%	17.8%
	300	135	74	278	239	542	787
	38.1%	17.2%	9.4%	35.3%	30.6%	69.4%	100.0%
	5.3%	2.5%	2.1%	4.9%	5.8%	3.4%	3.9%
	196	344	56	124	148	567	720
Other	27.2%	47.8%	7.8%	17.2%	20.7%	79.3%	100.0%
	3.5%	6.4%	1.6%	2.2%	3.6%	3.5%	3.5%
Total	5 680	5 388	3 601	5 672	4 153	16 009	20 341
	27.9%	26.5%	17.7%	27.9%	20.6%	79.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100%	100%	100.0%

Modelling credit demand

A large number of socio-economic factors all play a role in determining whether credit is applied for, the amount applied for, the amount of credit provided, and credit rationing (the difference between the amount applied for and the amount of credit obtained). This can be expressed in terms of the following models:

$$C = \beta_0 + \beta_{1i}X_i + \varepsilon \dots\dots\dots \text{(eq. 1)}$$

where C stands for credit, β_0 and β_{1i} are parameters to be estimated, X_i is a vector of socio-economic explanatory variables, and ε is the error term.

The analysis is performed at the individual level, with the full dataset containing individuals 18 years or above. However, in models dealing with the amount of credit, only those who actually applied for credit are retained in the sample. Where the dependent variable measures values, ordinary OLS regression is subject to possible sample selection bias. In these cases, we employ a Heckman two-stage model,

separating the selection model (determining e.g. who apply for credit) from the equation of interests, e.g. how much credit they applied for. Where the dependent variable is dichotomous, logit regressions are used. We also employ a multinomial logit to estimate the determinants of the selection into borrowing from banks or from informal lenders rather than not borrowing at all.

The variables used in this analysis are the following:

Table 3 Variables for the Study

<i>Definition and unit of measurement</i>
Credit borrowing status (=1 if applied for credit, otherwise zero)
Credit rationing status (=1 if credit rationed, otherwise zero)
Amount of credit applied for in Uganda shillings
Amount of credit received in Uganda shillings
Natural log of age of borrower
Sex of borrower (=1 if male, otherwise zero)
Natural log of dependency ratio
Natural log of highest education level, measured in completed years of schooling
Migration status of household head (=1 if household head migrated to current location, otherwise zero)
Natural log of household expenditure (measured in US dollars) per adult equivalent household member
Natural log of value of household assets (measured in US dollars) per adult equivalent household member
Natural log of household land holding, measured in acres per adult equivalent household member

Note: Natural logs were taken of most variables, to reflect their likely proportional effects on credit status, and adult equivalent household members were calculated following World Bank (2002) as $AE = 1 + 0.7(N1 - 1) + 0.5N2$, where

AE = Adult Equivalent

N1 = Number of adults aged 15 or above

N2 = Number of children aged less than 15.

Table 4 below shows a number of logit models of credit demand (the dependent variable is whether people ever applied for credit) at the national level, as well as for each of the four regions and separate urban and rural models. As can be seen, a large number of variables play a statistically significant role in credit demand, and most of them fit *a priori* expectations. At the national level, credit demand increases significantly with the age of the respondent as well as his/her education level and the level of household expenditure per adult equivalent household member. It is, unsurprisingly, higher for

males than for females, and households with a higher dependency ratio (as measure of household composition) appear to demand more credit. Credit demand is less in households which have lost more days to illness in the past 30 days and for households with more land assets per adult equivalent, but at the national level other assets do not appear to play a significant role. Regional location in the central or western regions increase credit demand, but urban location seems to have no separate influence. play and gender on their own seem to play no significant role, but they do play a role in interaction. Factors that were held constant (i.e. entered in the regressions but which generally did not show a significant impact on credit demand) were urban location, household size, and non-land asset holdings per adult equivalent.

Equations 2 to 7 in Table 4 represent credit demand models for different regions or for the urban or the rural sector. Interestingly, the underlying model seems to be confirmed for most of the equations, with many of the same variables remaining significant, and the signs of most of the parameters remaining constant. Notably, however, the male dummy is insignificant in the case of Northern region, but positive and significant in all three other regions as well as both the urban and for the rural sector. Eastern region is the only region where migration has a statistically positive effect on credit demand.

Table 4: Logit regressions of whether people have applied for credit from banks or informal lenders

Equation no:	1	2	3	4	5	6	7
Dependent variable: Applied for credit from bank or informal sector							
Explanatory variables	NATIONAL	REGIONAL MODELS				RURAL-URBAN MODELS	
		Central	Eastern	Northern	Western	Rural	Urban
Ln (age)	0.737 (10.24)***	0.724 (4.88)***	0.568 (4.21)***	0.866 (3.20)***	0.869 (7.52)***	0.661 (8.67)***	1.306 (6.23)***
Dummy: Male	0.684 (11.54)***	0.665 (5.46)***	0.870 (7.76)***	0.345 (1.55)	0.615 (6.56)***	0.766 (11.94)***	0.312 (1.99)**
Ln (hhsize)	-0.033 (0.62)	0.016 (0.15)	-0.112 (1.16)	0.568 (2.72)***	-0.113 (1.17)	0.066 (1.14)	-0.459 (3.31)***
Ln (years of education)	0.037 (8.24)***	0.039 (3.47)***	0.045 (5.15)***	0.056 (3.13)***	0.030 (4.61)***	0.031 (6.60)***	0.052 (3.08)***
Ln (dependency ratio)	0.473 (5.92)***	0.296 (1.66)*	0.516 (3.29)***	0.768 (2.50)**	0.546 (4.55)***	0.378 (4.36)***	0.711 (3.48)***
Ln (hhexp)	0.376 (6.78)***	0.587 (4.95)***	0.092 (0.93)	0.571 (3.08)***	0.485 (5.07)***	0.355 (6.01)***	0.356 (2.70)***
Dummy: Migration	0.053 (0.90)	-0.036 (0.29)	0.387 (3.51)***	-0.086 (0.37)	-0.137 (1.39)	-0.022 (0.34)	0.256 (1.59)
Ln (land/adult equivalent)	-0.051 (2.29)**	-0.055 (1.22)	-0.039 (1.09)	0.210 (1.85)*	-0.066 (1.59)	-0.107 (4.15)***	-0.032 (0.78)
Ln (assets/ adult equivalent)	-0.036 (1.07)	-0.215 (3.10)***	-0.153 (2.41)**	0.246 (2.18)**	0.103 (1.88)*	0.047 (1.31)	-0.049 (0.61)
Dummy: Urban	-0.017 (0.19)	-0.114 (0.64)	0.448 (2.67)***	-0.512 (1.36)	-0.354 (2.18)**		
Dummy: Central region	0.209 (1.76)*						
Dummy: Eastern region	0.682 (6.14)***						
Dummy: Western region	0.790 (7.18)***						
Constant	-7.263 (18.38)***	-7.703 (9.21)***	-4.178 (5.74)***	-10.113 (7.11)***	-7.758 (11.68)***	-6.909 (16.35)***	-7.604 (7.20)***
Observations		3920	4165	2290	5158	13705	1828
LR chi2	606.37	106.46	184.29	74.95	221.36	429.98	89.35
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0607	0.0469	0.0637	0.0811	0.0584	0.0494	0.0694

Absolute value of z-statistics in parentheses

** significant at 10%; ** significant at 5%; *** significant at 1%*

Given the overwhelming extent to which credit demand is observed in the informal financial sector rather than from formal banks, one would expect models of informal credit demand to have much the same patterns as that for aggregate credit demand. Table 5 shows this indeed to be the case and needs no further discussion: Though the parameters change slightly, in terms of the signs and the significance of the relationships this is a replica of the previous table.

Table 5: Logit regressions of whether people have applied for credit from banks or informal lenders

Equation no:	1	2	3	4	5	6	7
Dependent variable: Applied for credit from bank or informal sector							
Explanatory variables	NATIO-NAL	REGIONAL MODELS				RURAL-URBAN MODELS	
		Central	Eastern	Northern	Western	Rural	Urban
Ln (age)	0.692 (9.46)***	0.605 (3.94)***	0.533 (3.91)***	0.910 (3.28)***	0.847 (7.23)***	0.622 (8.08)***	1.235 (5.53)***
Dummy: Male	0.658 (10.92)***	0.610 (4.86)***	0.856 (7.58)***	0.221 (0.97)	0.606 (6.37)***	0.751 (11.59)***	0.175 (1.05)
Ln (hhsiz)	-0.062 (1.13)	-0.087 (0.80)	-0.150 (1.55)	0.591 (2.73)***	-0.073 (0.74)	0.034 (0.57)	-0.483 (3.26)***
Ln (years of education)	0.036 (7.89)***	0.036 (3.19)***	0.045 (5.13)***	0.055 (3.08)***	0.029 (4.32)***	0.029 (6.27)***	0.050 (2.85)***
Ln (dependency ratio)	0.465 (5.70)***	0.287 (1.54)	0.520 (3.28)***	0.671 (2.15)**	0.541 (4.41)***	0.384 (4.37)***	0.637 (2.89)***
Ln (hhexp)	0.325 (5.73)***	0.513 (4.18)***	0.047 (0.47)	0.591 (3.11)***	0.430 (4.42)***	0.327 (5.47)***	0.248 (1.74)*
Dummy: Migration	0.045 (0.74)	-0.045 (0.36)	0.406 (3.66)***	-0.204 (0.82)	-0.172 (1.71)*	-0.026 (0.41)	0.274 (1.59)
Ln (land/adult equivalent)	-0.052 (2.28)**	-0.061 (1.30)	-0.041 (1.12)	0.235 (2.00)**	-0.055 (1.30)	-0.115 (4.44)***	-0.025 (0.59)
Ln (assets/adult equivalent)	-0.053 (1.55)	-0.223 (3.09)***	-0.158 (2.45)**	0.244 (2.10)**	0.068 (1.22)	0.049 (1.37)	-0.140 (1.63)
Dummy: Urban	-0.116 (1.19)	-0.188 (1.00)	0.434 (2.55)**	-0.711 (1.75)*	-0.566 (3.20)***		
Dummy: Central region	0.252 (2.06)**						
Dummy: Eastern region	0.748 (6.58)***						
Dummy: Western region	0.849 (7.51)***						
Constant	-6.787 (16.86)***	-6.675 (7.71)***	-3.746 (5.09)***	-10.424 (7.12)***	-7.331 (10.87)***	-6.585 (15.44)***	-6.440 (5.70)***
Observations	15533	3920	4165	2290	5158	13705	1828
LR chi2	525.63	81.23	177.71	68.65	195.84	393.2	65.47
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0542	0.0378	0.0623	0.0778	0.0529	0.0460	0.0567

Absolute value of z-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

What, then, determines whether potential borrowers apply for credit, whether it be from formal banks or informal sources of finance? As noted above, credit demand by itself may reflect a response to credit supply: Both access to banks and the known credit criteria of banks may have eliminated them as a potential source of credit for most potential borrowers, and the cost of credit at different institutions and bureaucratic

requirements may also play a role. Thus borrowers may self-select to apply for credit or not, based on their perceptions of their likely success and the likely conditions under which they would be able to obtain such a loan. It is important to note, though, that informal lenders cover a wide variety of institutions, with a variety of conditions also for lending. Models of choice between different institutions with the observed socio-economic variables pertaining to individuals and households are thus likely to reflect only a small part of the borrowers' choice. Nevertheless, the multinomial logit in Table 6 tries to do exactly this, modelling respondents' choice between applying for loans from formal banks, from informal lenders, or not at all (the reference value). The model shows that a large number of variables have an impact on whether respondents apply for informal finance rather than not applying at all, and naturally these are similar to the variable that played a role in the logit models. However, it is notable that very few variables – apart from the regional and urban dummies – significantly distinguish a choice for bank rather than informal or no credit, and these are the same variables determining the choice for informal loans. In the cases of age, gender, education, the dependency ratio and household expenditure, the coefficients are larger for banking credit, i.e. these factors make it more likely that people will demand credit, particularly bank credit. Significantly, bank credit is associated with an urban location but not with any region, whereas urban location plays no significant role in the choice for informal credit, but region does.

Table 6: Multinomial Model for Choice between Formal and Informal Sector Credit

	Bank		Informal	
	Coefficient	z	Coefficient	z
Ln (age)	1.594424	4.83***	0.703101	9.59***
Dummy: Male	1.13186	3.71***	0.664542	11.03***
Ln (hhsz)	0.4045353	1.70*	-0.05814	-1.05
Ln (years of education)	0.1070029	2.78***	0.036015	7.95***
Ln (dependency ratio)	0.768567	2.27**	0.469867	5.75***
Ln (hhexp)	1.001784	4.54***	0.336724	5.92***
Dummy: Migration	0.1706792	0.63	0.046337	0.76
Ln (land/adult equivalent)	0.0239181	0.26	-0.0524	-2.28**
Ln (assets/adult equivalent)	0.1427821	1.05	-0.05076	-1.48
Dummy: Urban	-0.4061195	-0.88	0.2452	2.00**
Dummy: Central region	-0.7271588	-1.41	0.742074	6.53***
Dummy: Eastern region	-0.0732661	-0.16	0.844338	7.47***
Dummy: Urban	0.9192231	2.84***	-0.10108	-1.04
Constant	-18.36531	-10.59***	-6.89725	-17.06***
Reference Category: Those who did not apply for any credit				
Log likelihood	-4917.6395			
Number of observations	15533			
LR chi2(26)	694.27			
Prob > chi2	0.0000			
Pseudo R2	0.0659			

* significant at 10%; ** significant at 5%; *** significant at 1%

We now turn to modelling the amount of credit demanded. There is a potential sample selection bias here, though, as those who do demand some credit are not representative of the full sample, but systematically differ from the full sample, as the results thus far have illustrated. Thus OLS regressions of the amount of credit demanded would give biased results. Heckman (1990) has shown that such bias is equivalent to missing variable bias, and can be overcome by including the inverse Mills ratio from the sample selection equation in the equation of interest. We thus use a Heckman two-stage selection model, where the selection into the sample of those who demand credit is first modelled, and the inverse Mills ratio (λ) from this regression is incorporated into the equation of interest. The equation of interest includes age, education, household expenditure per adult equivalent, household composition (dependency ratio) and migration status. The selection equation includes variables relating to gender, household size, land and other assets, regional dummies, and an urban dummy.

As can be seen from Table 7, lambda is indeed significant in the model of interest, indicating that OLS regression would have produced biased estimates. Sample selection bias thus does exist, and the Heckman two-step selection model is appropriate to eliminate such bias. The results show that age, education and household expenditure levels per adult equivalent have a significant and positive effect on the level of credit demanded.

Table 7: Heckman two-step Selection Model for Value of Credit Demanded – Full Sample

Variable	Coefficient	z
Equation of Interest: Dependent Variable = Ln(amount demanded)		
Ln (age)	0.7879672	5.95***
Ln (years of education)	0.0494393	7.83***
Ln (hhexp)	1.138865	17.62***
Ln (dependency ratio)	0.1913572	1.55
Dummy: Migration	-0.0721738	-0.85
Constant	-3.862741	-5.44***
Selection Equation		
Dummy: Male	0.4136614	14.56***
Ln (hhsz)	0.135271	5.26***
Ln (land/adult equivalent)	-0.0214245	-1.82
Ln (assets/adult equivalent)	0.0477313	3.25***
Dummy: Urban	0.0523577	1.16
Dummy: Central region	0.2020333	3.67**
Dummy: Eastern region	0.3948463	7.51***
Dummy: Western region	0.4264011	8.16***
Constant	-2.310538	-29.2***
lambda	-0.8648873	-4.28***
rho	-0.5018	
sigma	1.7235829	
Number of observations	16783	
Censored observations	15302	
Uncensored observations	1481	
Wald chi2(5)	478.71	
Prob > chi2	0.0000	

* significant at 10%; ** significant at 5%; *** significant at 1%

Credit supply

In principle, it is possible for credit supply to be constrained by the available demand for credit. This may particularly occur in a situation where the cost of credit, whether in the form of interest rates or other aspects, is perceived to be too onerous. For most credit in Uganda, however, this is unlikely to be the case, given the overwhelmingly large need for credit as referred to above, and the fact that credit sources are so constrained. Credit supply is thus more likely to be constrained by perceptions on the part of lenders of the ability of prospective borrowers to repay their loans. The scarcity of credit is indicated by the fact that credit provided is rationed to just over 56% of credit applications of both bank and informal lender applicants; amongst informal lenders, friends and relatives meet a far higher proportion. However, surprisingly, by far the majority of those who apply for credit successfully obtain some credit: Table 8 shows that only one in nine of applicants for informal credit were unable to obtain any credit, and a slightly greater proportion of one in five of those who applied for bank credit. Even more surprising, three-quarters of all applicants for credit (and particularly of applicants for informal credit) received as much as they applied for. Table 9 contains a logit model showing the determinants of credit rationing.

Table 8: Credit Rationing Status for Sample

Source of credit	Rationing Status			Total
	Totally rationed (applied, but received no credit)	Partly rationed (received portion of what was applied for)	Not rationed (received full amount applied for)	
Informal	226	265	1 499	1 990
	11.4%	13.3%	75.3%	100%
Formal	20	24	61	105
	19.1%	22.9%	58.1%	100%
Total	246	289	1 560	2 095
	11.7%	13.8%	74.5%	100%

This raises interesting and rather puzzling questions about whether credit constraints are indeed binding. One possible interpretation may be that those who are unlikely to obtain credit do not apply, i.e. that credit rationing takes place by self-selection on the part of borrowers. Of the 11 201 who needed credit, 4401 or 39% self-selected not to apply (Table 2), a quite substantial proportion. An alternative explanation may be that there is not so much a credit constraint operating, as most people can obtain credit, even if less than they request. By this view, credit demand may be constrained by high costs of credit, whether these be interest rates or other compliance costs (including collateral).

Evidence on whether lenders themselves are credit constrained is limited. Barr et al. (2004:13) report that about one third of all NGOs in Uganda are involved in micro-credit or finance more generally, but that the median NGO has only 150 borrowers. Furthermore, their sample is “dominated by three NGOs responsible for three quarters of all loans granted”. Barr *et al* (2004: 30-1), point out that *‘For the many Ugandan NGOs involved in micro-credit... insufficient access to credit would seriously limit their operations. As anticipated, we find a significant relationship between borrowing and micro-credit activities: those NGOs who borrow are more likely to be involved in micro-credit. What remains unclear, however, is whether it is those NGOs able to borrow who venture into micro-credit or whether banks lend to those NGOs who involve themselves in micro-credit’*. Availability of funds for other micro-lenders is less clear, but rapid economic growth may have been contributed to more micro-lenders being in a position to advance loans.

Modelling the amount of credit supplied requires once again eliminating possible sample selection bias by utilising the Heckman two-stage selection model (Table 9). In this case, the selection equation considers gender, regional dummies, an urban dummy, and the dependency ratio. The equation of interest contains age; household expenditure, land and other asset holdings, all per adult equivalent; and household size. We find that household expenditure, household assets (excluding land) and household size all influence credit supply significantly and positively, and that once again the inverse Mills ratio, λ , is highly significant, indicating that this procedure was indeed

necessary to overcome the biased results that OLS would have given in the presence of sample selection bias.

Table 9: Heckman two-step selection model for amount of credit supplied – full national sample

Variables	Coefficient	z
Equation of Interest: Dependent Variable = ln(credit supplied)		
Ln (age)	0.1852863	1.42
Ln (years of education)	1.251206	16.64***
Ln (assets/adult equivalent)	0.200708	4.04***
Ln (land/adult equivalent)	0.0398247	1.26
Ln (hhsizsize)	0.9184691	10.26***
_cons	-6.047192	-9.35***
Selection Equation		
Dummy: Male	0.3962362	13.67***
Ln (dependency ratio)	0.2001147	5.02***
Dummy: Urban	-0.0873971	-2.2**
Dummy: Central region	0.4384083	7.37***
Dummy: Eastern region	0.6359955	11.08***
Dummy: Western region	0.7649601	13.6***
Constant	-2.146089	-35.73***
Lambda	-0.3938001	-2.4**
rho	-0.27247	
Sigma	1.4453099	
Number of observations	20003	
Censored observations	18730	
Uncensored observations	1273	
Wald chi2(5)	618.6	
Prob > chi2	0.0000	

Concluding remarks: Implications of the data and some remaining puzzles

This Ugandan survey has allowed us to investigate the household and individual characteristics that act as determinants of both the demand and the supply of formal and informal credit. Not many household level datasets contain enough information to model both sides of the credit market, even if we were constrained by knowing little about the institutions who provided the credit and the conditions under which such credit was granted or refused.

Our results show that credit demand (both whether individuals apply for credit and the volume of credit they apply for) can be fairly well modelled using socio-economic characteristics of households, even though a large number of people who did not apply for credit did so because they had little expectation of obtaining it. However, on the supply side the issue is not as clear, once people apply for credit, since so few people who apply are completely refused such credit. Self-selection (not to apply) may be part of the explanation for this. The characteristics of borrowers do not allow us to predict who will be credit rationed, i.e. despite having all this information about individuals and households, there is some additional process that determines who will get funds and how much they will get that remains almost completely opaque. It is possible that most who seek credit would be able to obtain it, but costs and conditions may be prohibitive for some high risk borrowers. Alternatively, the lender may decide not to lend the full amount and not leave it to the borrower to decide. Credit supplied by lenders is determined to a large extent by regional residence, although observed socio-economic variables such as household expenditure per adult equivalent, value of assets, amount of land owned and even education all seem to play a role. But the models, however large the statistical relevance of the *individual* explanatory variables, cannot accurately portray the rationing decision process, particularly by informal financial lenders. Random selection or selection by non-observed factors play a larger role than the demographic and socio-economic factors included in the models in determining whether an applicant for credit is credit rationed. This probably reflects character references and

community information not observed in household datasets. But from the perspective of understanding the credit granting process, it is these informal institutions that need to be understood most, for their willingness to lend reduces credit constraints for a sizable proportion of the population, allowing borrowers both to smooth consumption and thereby improve their long run welfare, and to invest in productive activities or human capital, to lift their long run constraints.

This being the case, there must be other, non-observed characteristics of borrowers to which informal lenders respond, or they must be adequately able to ensure compliance in such ways that they need not ration credit more strictly. In the absence of both these two possibilities, informal credit would soon dry up completely, as informal lenders would fail to remain viable. If credit risk assessment by informal credit lenders considers factors not ordinarily readily observable, it supports the view that character reference is the main criterion informal lenders consider in granting and rationing credit, and that socio-economic variables remain subsidiary to such character references. Socio-economic status may have a greater effect on the terms on which credit is granted; our data source unfortunately could not provide enough information in this regard.

Presuming that such informal sectors lenders are rational and appropriately assess risk, their dependence on character references raises interesting and indeed important questions about the ability of formal banks to do likewise, in a context in which they are less likely to have comparable information about the risk status of the individuals concerned. Such information is costly to obtain for formal financial institutions, emphasising the important role of informal credit in a developing country where most of the population is poor. But informal credit (like formal credit to the poor) is in turn likely to be more expensive, *inter alia* because of lack of legislative measures for enforcing repayment for informal loans.³

³ Fernando (1998) points to the importance of social mechanisms for such enforcement to reduce the need for collateral costs to lenders in a developing country context.

Elsewhere in the world, nevertheless, banks play an important role in serving the poor. This they do by adjusting their traditional means of operation to curtail the high costs and risks. Serving the poor has been achieved by replicating what informal intermediaries do to solve these problems or by linking with existing informal intermediaries. The entrance of banks in this market segment has also resulted in increased competition, which should result in lowering the price of credit for the poor.

Governments need to acknowledge that banks will only serve the poor if it is profitable to do so. Given that the implementation of either of the two abovementioned strategies implies additional costs for banks, governments have to provide incentives for banks to undertake these activities, e.g. subsidies, tax breaks or grants to at least cover the initial costs of banks to enter this market segment, if they wish banks to develop as institutions that can provide credit to substantial proportions of the population.

All of the above raises the interesting question: Are there indeed credit constraints operating, or is credit demand just in the final instance limited by high costs, including compliance costs, that smother all potential demand for loans where returns are too low? The mechanisms operating to ration credit appear to be a mixture of self-selection not to apply for credit due to high costs (for those whose envisaged returns are insufficient to repay such loans), credit rationing by lenders (not supplying the full amount requested), and perhaps also borrowers deciding not to take up the full amount offered due to high costs.

Thus this household dataset has confirmed what the literature on informal finance tells us, particularly regarding the large role of non-observed variables such as character references. But it has also shown that credit constraints are not necessarily all that binding where borrowers are prepared to pay relatively high costs on their loans. This may be an encouraging sign that the perceived lack of micro-credit need not constrain macro-economic growth, where lucrative investment opportunities exist to warrant borrowing at high interest rates. However, the macro-economic situation in Uganda, with high economic growth sustained over a substantial period, may have lifted some of

the constraints which may be more binding in other poor countries, such as scarcity of credit. In this respect the Ugandan case may be atypical.

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