Paper prepared for the 123rd EAAE Seminar

PRICE VOLATILITY AND FARM INCOME STABILISATION

Modelling Outcomes and Assessing Market

and Policy Based Responses

Dublin, February 23-24, 2012

Microfinance for Agricultural Firms

- Credit Access and Loan Repayment in Tanzania -

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Abstract

On the example of a commercial microfinance institution (MFI) in Tanzania this paper investigates first whether agricultural firms have a different probability to get a loan and whether their loans are differently volume rationed than loans to non-agricultural firms. Second, we analyze whether agricultural firms repay their loans with different delinquencies than non-agricultural firms.

Our results reveal that agricultural firms face higher obstacles to get credit but as soon as they have access to credit, their loans are not differently volume rationed than those of non-agricultural firms. Furthermore, agricultural firms are less often delinquent when paying back their loans than non-agricultural firms.

Our findings suggest that a higher risk exposition of agricultural firms does not necessarily lead to higher credit risk. They also show that the investigated MFI overestimates the credit risk of agricultural clients and, hence, should reconsider its risk assessment practice to be able to increase lending to the agricultural sector. In addition, our results might indicate that farmers qualify less often for a loan as they do not fit into the standard micro credit product.

Keywords: Agricultural Finance, Access to Credit, Loan Repayment, Microfinance Institutions

JEL classification: G21, G32, Q14

1. INTRODUCTION

Agricultural income is generally considered to be volatile due to its dependencies to production (weather, pests and diseases) and market (commodity prices) risks (Paxon, 1992; Heimfarth & Musshoff, 2011). Income volatility can even be more severe in the absence of suitable agricultural insurance products (Rosenzweig & Binswanger, 1993), which is especially the case for small scale farmers in developing countries (Roth et al., 2007; SwissRe, 2011). This also affects the share of income available for loan repayment of agricultural borrowers, which in consequence can lead to higher loan defaults (Barry, 2001). This seems especially plausible for small scale farm households which only have limited potential to compensate income fluctuations. Therefore, financial institutions in developing countries are still cautious to lend to small farmers (Zeller et al., 1997), a behavior which might also be attributed to the characteristics of financial sectors and to the history of agricultural finance in developing countries (Maurer, 2011).

Financial sectors in developing countries are often characterized by low financial intermediation (i.e. bank credit in relation to the Gross Domestic Product), low diversification

[1] The views expressed in this paper are entirely those of the author and do not necessarily represent those of KfW.

but high profitability. Consequently, large shares of financial assets are held by few highly profitable regular banks which mainly focus on urban situated large enterprises (IFC, 2010). As long as profits are high and competition is low regular banks will continue to focus only on highly collateralized investments with low credit risks, which are rarely found in the micro, small and medium enterprise (MSME) sector and especially not amongst small scale agricultural producers. Also, most regular banks are not adapted to serve MSMEs of which most operate informally, and hence are neither registered nor have a proper book keeping, which could serve as a basis for client assessment. As a result many MSMEs do not have access to credit and other financial services (CGAP, 2010).

This situation is even worse in the lesser populated rural areas where reaching and monitoring clients is relatively expensive for lenders compared to the densely populated urban areas. As most of the agricultural production takes place in rural areas lending to the agricultural sector remains low. From a macroeconomic point of view this is surprising as the agricultural sector in developing countries usually contributes large shares to the Gross Domestic Product and should therefore be more in the focus of lenders. Beside its economic importance the agricultural sector also employs the major part of the rural labor force of which a large share is considered to be poor and thus the development of the agricultural sector could help to increase the income of farmers.

Frequently, it is reported that farmers in developing countries are credit rationed (Simtowe et al., 2008). But most of the investigations on access to credit for farmers have two major shortcomings: First, they generally do not consider comparisons with other sectors. Therefore, it is difficult to judge whether credit rationing is a general problem in the investigated economy or a phenomenon that only appears in the agricultural sector. Second, they only focus on access to credit but cannot account for the credit risk even if some of these investigations like Petrick (2004) and Foltz (2004) link rationing effects to firm characteristics. Furthermore, it is not possible to draw conclusions on whether credit rationing is rationale from a financial institution perspective as de Meza & Webb (1992) argue that credit rationing is consistent with an efficient market allocation.

The contribution of this paper is therefore twofold. Based on data from a commercial microfinance institution (MFI) in Tanzania we first investigate whether farmers have a different probability to access credit and also whether the loan amounts they receive differ from those of non-agricultural loan applicants. Second, we compare the number of missed loan installments of agricultural clients with those of non-agricultural clients of the MFI in order to investigate whether the loan repayment behavior of farmers differs from non-agricultural clients of the bank. By our knowledge this is the first paper which simultaneously investigates access to credit and the repayment behavior of agricultural borrowers.

The remainder of the paper is organized as follows: In the second part, we will provide a brief overview of the microfinance development and present an approach of credit rationing which MFIs apply to manage their credit risk. This leads to our research hypotheses. In the third part, the data are presented and the analytical methods which are applied to investigate the

hypotheses will be discussed. After the discussion of the results in the fourth part, the paper ends with conclusions and suggestions for future research.

2. LITERATURE REVIEW AND HYPOTHESES

2.1. Access to Finance for Agricultural MSMEs

Driven by negative experiences of the supply-led development finance period in the 1960s and 1970s and the failure of state owned development banks in the 1980s (Maurer, 2011) governments and central banks in many developing countries have started to constantly improve the regulatory and operating environment in the financial sector (IBRD, 2010; CGAP, 2010). These improvements were important preconditions for the successful development of the commercial microfinance industry which is driven by various attempts such as developing regular banks to better serve MSMEs and professionalizing existing and creating new MFIs (BMZ, 2004; Maurer, 2011). Thereby informal MSMEs represent the target clients of MFIs as informal MSMEs are normally neglected by regular banks. Rather than applying the conventional, collateral based lending approach followed by regular banks or the joint liability principle of group lending mostly applied by non-commercial MFIs, the type of commercial MFIs we investigate in this paper uses individual cash flow and income based lending techniques instead. Thereby the family and the business income, i.e., the total household income, determines the repayment capacity of a loan applicant and is the basis for the decision of the MFI whether a loan is granted and how much credit will be disbursed. As reliable income statements or balance sheet data are hardly available in the informal MSME sector, MFIs themselves carry out detailed assessments of loan applicants to evaluate their repayment capacities. In addition, the loan repayment is decoupled from the success of the financed investment and so the applicant is aware that he still has to pay back the loan even if the investment fails. As the agricultural income usually contributes less than 50 % to the household income of farmers in developing countries (Christen & Pearce, 2005), the latter is of special importance for lending to agricultural MSMEs[2].

As the microfinance approach has proven its success of sustainable-inclusion of formerly financially excluded MSMEs, successfully operating commercial MFIs can currently be found in many developing countries. But most of these MFIs still operate in urban areas. Like for regular banks also for commercial MFIs the biggest challenges to access rural MSMEs are high transaction costs and dealing with agricultural specific credit risks. The latter might also explain why empirical research on access to finance frequently suggests that agricultural firms are credit rationed (Beck et al., 2003; Bell et al., 1997; Diagne et al., 2000; Foltz, 2004; Petrick, 2004; Simtowe et al., 2008). This would be especially the case if agricultural firms were also relatively

[2] For further information on the principles of microfinance the reader is referred to Armendáriz & Morduch (2010) and Turvey & Kong (2007).

credit rationed, i.e., in comparison to other sectors. This question cannot be answered by the existing literature on access to finance for agricultural firms.

As most of the risks inherent to agricultural MSMEs are similar to non-agricultural MSMEs (Maurer, 2010), the commercial microfinance approach seems appropriate to also address the financial needs of small farmers in developing countries. Hence, it is not surprising that a recent approach to enhance the access to finance for agricultural MSMEs is driven by the commercial microfinance industry. Christen & Pearce (2005) have presented the principles of this new "Agricultural Microfinance Model". This model adapts the general microfinance approach for agricultural MSMEs. By taking into account the production specifics of the agricultural sector the core of this model is the adaptation of standard loan products so that repayment schedules can reflect the cyclical cash flows of agricultural borrowers[3] .

However, as only few MFIs have started to implement the Agricultural Microfinance Model and existing investigations of access to finance for agricultural firms do not allow for comparisons with other sectors our first hypothesis (H) is as follows:

H_1 "different probability": The probability to have access to credit is significantly different for farmers compared to non-agricultural entrepreneurs.

2.2. Credit Rationing

Whilst risk adjustments of interest rates are one option to account for different credit risks (Jaffee & Stiglitz, 1990), most MFIs are bound by unique interest rates. This seems counterintuitive as increasing loan sizes also increase the credit risk (Barry, 2001; Hodgeman, 1960; Jaffee & Stiglitz, 1990). As MFI loans to MSMEs are usually too small to make individual credit pricing cost efficient, MFIs are not able to reflect the risk heterogeneity among loan applicants by adjusting interest rates individually. Based on the assumption that smaller loan sizes reduce potential credit losses they reflect the risk heterogeneity by loan volume rationing instead. Jaffee & Modigliani (1969) presented the theoretic model for this approach which measures the degree of rationing as the difference between the loan amount requested by the loan applicant and the loan amount disbursed by the financial institution. Of cause, the loan volume is not the only determinant of credit risk which can also depend on the applicant's repayment capacity and his sector affiliation (Barry, 2001). Pederson & Zech (2009) even see sector related risks as the most important part of the credit risk.

Therefore, our second hypothesis is the following:

H_2 "different volume": The magnitude of volume rationing is significantly different for farmers compared to non-agricultural entrepreneurs.

[3] For further reading on the development of rural microfinance also see Hatarska & Holtmann (2006), Kono & Takahashi (2010) and Meyer & Nagarajan (2006).

2.3. Loan Repayment

Surprisingly, most of the investigations on agricultural credit rationing, e.g., Simtowe et al. (2008), do not measure the extent of credit rationing directly from bank information which by definition should be the most straight forward way of measuring. Jaffee & Modigliani (1969) already stated that the reason for not using direct measures might be the limited data availability. Using bank information would furthermore have the advantage that it allows for the investigation of the loan repayment performance of borrowers, which might also explain the loan granting behavior of financial institutions.

Literature which addresses loan repayment aspects with a focus on agricultural MSMEs is scarce and includes Fidrmuc & Hainz (2010), which state higher loan default rates for farmers in Slovakia. Furthermore, there are Baele et al. (2010), who find in their duration analysis focused on loan defaults in Pakistan ambivalent effects for the agricultural sector depending on the underlying distribution of the applied hazard function. In contrast, Vogel (1981) investigates the loan repayment behavior of bank clients in Costa Rica and finds (under the condition of subsidized interest rates) lower loan default rates for farmers compared to non-agricultural borrowers. Vogel (1981) attributes these effects mainly to the incentive for agricultural clients to have continuing access to credit if repayment is prompt and the decentralized and extensive client assessment procedures of the loan granting financial institution. These aspects also play an important role in commercial microfinance practice (Turvey & Kong, 2007).

As the findings for loan repayment are ambivalent our third hypothesis is as follows:

H_3 "different delinquencies": Loan delinquencies of agricultural loans are significantly different from those for loans to other sectors.

Whilst the investigation of loan repayment for agricultural firms is scare, simultaneous investigations of both, access to finance and loan repayment are non-existent for the agricultural sector. Thus, further investigations will provide a valuable contribution to the agricultural credit rationing literature.

3. DATA AND METHODS

3.1. Data

The data we use for our empirical analysis was provided by AccessBank Tanzania Ltd (ABT), a commercial MFI with a special focus on MSMEs. The bank operates in Tanzania as a fully-fledged commercial bank and is owned by the five founders the Access Microfinance Holding, the Belgian Investment Company for Developing Countries, KfW (the German Development Bank), the International Finance Corporation and the African Development Bank. During the first four years of operation from 2007 to 2011 the bank has grown steadily and currently runs six branch offices in greater Dar es Salaam. ABT disburses all loans in the local currency Tanzania Shilling (TZS) and the procedures of the bank are specially designed and only allow for disbursing individual loans. At the moment, the bank offers one loan product in the micro segment and loans to agricultural entrepreneurs are granted under the same

procedures like any other micro loan. Hence, they are not yet adapted for the agricultural production cycles and have fixed repayment schedules and maturities without grace periods. Besides, loans ABT offers deposits, automatic teller machine (ATM) services, money transfers (domestic and international) and mobile phone banking services.

The loan granting process of ABT is typical for commercial MFIs involved in individual lending: First, through a rapid appraisal of a loan applicant (for simplicity reasons subsequently referred to as client) a specially trained loan officer decides whether the client is eligible, i.e., the client can provide a proof of identification, is minimum 18 years old and the cash flow of his business seems sufficiently high to repay a loan. The loan request which leads to the rapid appraisal can either come directly from the client through a loan application form or can be stimulated by the loan officer who directly contacts the entrepreneur (direct marketing). Through the rapid appraisals about 30 % of all loan requests are rejected. Provided that the minimum criteria are given, the loan officer will then continue with an in depth client assessment. During the in depth client assessment detailed information about the client's private and business income as well as expenses are collected in order to calculate the loan repayment capacity. In a third step these information are cross-checked through the loan officer by asking family members and referees of the applicant whether the information provided is reliable. Also the client has to provide some collateral. As the liquidation of collateral for small loan amounts is costly and often legally difficult in contrast to conventional banking, the role of collateral in microfinance is mainly to serve as incentive for the borrower to repay. Furthermore, it avoids client over-indebtedness as the client would not be able to pledge the same collateral item for a loan application with another bank. The fourth and final step in the loan granting process is the loan decision in the credit committee. In the credit committee the loan officer presents the results of his in depth client assessment and suggests the loan maturity and the amount he would grant based on his assessment. Credit committees are held daily in ABT decentralized on branch office level. Besides the presentation of the loan officers' client assessment results, these committees consist of at least one experienced senior loan officer or the branch office manager and other loan officers working in the area. Based on the joint opinion of the credit committee, the requested loan amount and loan maturity will be fully approved or it will be fully or partly rejected. The loan decision is based on the client's repayment capacity, his transparency and the reliability of the information he provided.

The dataset we use comprises all micro loans ABT has disbursed since the first month of operation in November 2007 until the end of April 2011. Our data were extracted from the Management Information System (MIS) of the bank and include loan and respective client data. The loan data (e.g. number of installments, interest rate) are generated automatically by the MIS as soon as a loan is disbursed. The client data which are generated through the in-depth client assessments by the loan officers are entered manually into the MIS. Consequently, we had to clean the client data for obvious data entering errors and outliers, which was jointly conducted with the management of ABT. Furthermore, we excluded those loan applications that were withdrawn by the client before the bank has made a loan decision, loans that were still in the

decision process and loans with incomplete client or loan data. After the data cleaning process for initially 22,978 requested micro loans the remaining sample consists of 21,334 requested working capital and investment loans including 538 loans for agricultural production purposes.

3.2. Methods

In order to investigate H_1 "different probability", we estimate a Probit-Model for the probability of a loan application to be approved. Before we can investigate H_2 "different volume", the magnitude of volume rationing, we have to test whether there is a conditional dependency between the credit approval and the loan volume decision as both decisions are made within the same credit committee. Should they depend on each other the application of a limited dependent variable model as suggested by Tobin (1958) or Heckman (1979) to estimate H_2 "different volume" would be appropriate. We therefore test for the conditional dependency between both decisions following Greene (2003, p 770). The basic idea of this test is to compare a separate estimation of both decisions by a Probit-Model and a truncated OLS-Model as proposed by Cragg (1971) against the estimation of the loan volume decision by a Tobit-Model. Liebe (2007, p 191) also applies this test which involves a Likelihood-Ratio-Test and indicates a conditional dependency of both decisions if:

$$\lambda = -2 \cdot (LT - (LP + LO)) \quad (1)$$

with LT, LP and LO as the Log-Likelihood of the Tobit-, Probit- and the truncated OLS-Model (under the condition that all three models are estimated with the same variables) and λ the test statistic which is Chi-Square distributed at degrees of freedom equal to the number of independent variables in each of the estimated models. If there is no conditional dependency the application of a limited dependent variable model would lead to biased as well as inconsistent results. In our case with 21 independent variables, λ is 46.8 at a significance level of 10 % and the term on the right hand side is 10,778. This result clearly reveals that both decisions are independent from each other and therefore have to be estimated separately. We therefore estimate the magnitude of volume rationing by a truncated ordinary least square (OLS-) Model for all loans that were approved.

The probability of receiving a loan and the magnitude of volume rationing are therefore estimated as follows:

$$P(K_{i,t} > 0) = \alpha + \beta \cdot a_i + \gamma \cdot c_{i,t} + \delta_t + \varepsilon \cdot s_i + u_{i,t} \quad (2)$$

$$K_{i,t} = \alpha + \beta \cdot a_i + \gamma \cdot c_{i,t} + \delta_t + \varepsilon \cdot s_i + v_{i,t} \quad (3)$$

In equation (2) the dependent variable $P(K_{i,t} > 0)$ denotes the probability that the bank disburses a loan amount K greater than zero. In equation (3) the dependent variable $K_{i,t}$ denotes the loan amount disbursed by the bank to a client i who applied for the loan in year t. Furthermore α is a constant, a_i is a (dummy) variable accounting for the *agricultural sector affiliation* of the client, $c_{i,t}$ is the vector of client characteristics (e.g. *age*), δ_t is a time constant

for the year t of loan application, s_i is a vector of dummy variables accounting for the branch offices of ABT where the loan decision was made, γ and ε are parameter vectors and $u_{i,t}$ and $v_{i,t}$ denote the over i and t independently and identically distributed error terms with a mean of zero and a variance of σ_u^2 and σ_v^2 respectively.

We measure the extent of volume rationing through equation (3) indirectly by including the *requested loan amount* in the vector $c_{i,t}$ of client characteristics. Therefore ceteris paribus lower disbursed loan amounts indicate a higher magnitude of credit rationing. In contrast to that, Jaffee & Modigliani (1969) define the magnitude of volume rationing as the difference between the *requested loan amount* and the *disbursed loan amount*. However, a direct measurement might has the advantage that the extent of volume rationing can be derived directly but has the disadvantage that a specific influence (e.g. linear relationship) of the requested loan amount on the magnitude of volume rationing is assumed. As higher loan volumes increase the credit risk (Barry, 2001; Jaffee & Stiglitz, 1990), we see the requested loan amount as one of the key determinants for volume rationing.

In order to examine H_3 "different delinquencies", we estimate an OLS-Model for all loans disbursed by ABT and use the number of delinquent loan installments of each loan as the dependent variable.

The repayment performance is estimated as follows:

$$D_{i,t} = \alpha + \beta \cdot a_i + \gamma \cdot l_{i,t} + \delta \cdot c_{i,t} + \varepsilon_t + \epsilon \cdot s_i + e_{i,t} \quad (4)$$

Herein the dependent variable $D_{i,t}$ denotes the number of missed installments of a loan, which was disbursed in year t. Furthermore $l_{i,t}$ is a vector of loan characteristics (e.g. *annual interest rate*), ε_t is a time constant for the year t of loan disbursement, ϵ is a parameter vector and $e_{i,t}$ is the over i and t independently and identically distributed error term with a mean of zero and a variance of σ_e^2. And all other vectors and variables are similar to equation (2) and (3).

We include for each loan the maximum number of loan installments that could be missed in the vector $l_{i,t}$ of the loan characteristics. Thus, our approach investigates the frequency rather than the severity (e.g. how long the missed loan installment was not paid) to measure the riskiness of the clients. Rosenberg (1999) states that beside the frequency also the severity of delinquencies is an important indicator for credit risk as frequent delinquencies increase the risk for loan defaults. We cannot only focus on defaulting loans, e.g. in the case of ABT loans which are delinquent for more than 30 days. The reason is that the average loan default rate of ABT (below 3 % of disbursed loans) and the number of 414 agricultural loans which ABT has disbursed so far is low and therefore a default analysis would be of low statistical robustness. We argue that an analysis of the frequency of delinquencies provides a good indication whether borrowers are in serious loan repayment troubles. In this context, Schicks (2011) states that microfinance clients in Ghana make hard sacrifices only to be able to pay their loan installments on time. In addition, MFIs will usually not wait until the client has not paid a subsequent loan installment and rather visit the client soon after the missed due date to prevent a loan default.

Table 1 shows the descriptive statistics of the dependent and independent variables and the expected direction of the influence of the independent variables for each of our three models.

Table 1: Descriptive Statistics and Expected Directions of Effects

		Descriptive Statistics		Expected Direction of Effects			
		Access/Delinquencies		Access		Delinquencies	Explanation
Variable Name	Unit[1]	Mean	SD	Probit[2]	OLS[2]	OLS[2]	
Agricultural Sector Affiliation[3]	1/0	0.03	-	?	?	?	risk exposition of farmers leads to differences in credit access and delinquencies
Household Income	ThsTZS	958	1,212	↑	↑	0	a higher income increases access to credit but does not affect delinquencies
Requested Loan Amount	ThsTZS	3,229	2,744	↓	↓	-	larger loan sizes are more likely to be denied and to be volume rationed
Disbursed Loan Amount	ThsTZS	2,428	2,456	-	-	↑	larger loans show higher delinquencies
Age	years	39.14	8.39	↑	↑	↓	older experienced clients have better access to credit and show lower delinquencies
Female	1/0	0.40	-	↑	↑	↓	women have better access to credit and show lower delinquencies
Family Members	number	5.01	1.08	↑	↑	↓	a larger family size increases credit access and reduces delinquencies
Higher Education	1/0	0.24	-	↑	↑	↓	a higher level of education increases credit access and reduces delinquencies
Repeat Client	1/0	0.37	-	↑	↑	↓	customer-lender relationships increase access to credit and reduces delinquencies
Deposit	1/0	0.74	-	↑	↑	↓	customer-lender relationships increase access to credit and reduces delinquencies
Annual Interest Rate	%	55.93	6.62	-	-	0	increasing interest rates have no effect on delinquencies
Maximum Installments	number	7.15	3.45	-	-	↑	longer loan maturities increase loan delinquencies
Number of Missed Installments	number	1.20	2.03	-	-	-	dependent variable for equation (3)
Year of Loan Application 2007	1/0	0.02	-	?	?	-	
2008	1/0	0.21	-	?	?	-	
2009	1/0	0.29	-	?	?	-	year of loan application affects access to credit differently
2010	1/0	0.31	-	?	?	-	
Year of Loan Disbursement 2007	1/0	0.01	-	-	-	?	
2008	1/0	0.14	-	-	-	?	
2009	1/0	0.25	-	-	-	?	year of loan disbursement affects loan delinquencies differently
2010	1/0	0.29	-	-	-	?	
Branch Office Number 1	1/0	0.30	-	?	?	?	
2	1/0	0.31	-	?	?	?	branch offices affect access to credit and delinquencies differently
3	1/0	0.16	-	?	?	?	
4	1/0	0.16	-	?	?	?	

[1] ThsTZS, thousand Tanzania Shilling; As ABT records the monthly household income in ten ranges, we use the mean of each range to calculate the household income for each client

[2] ↑, positive influence on dependent variable; ↓, negative influence on the dependent variable; ?, no a priori hypothesis on the influence on the dependent variable; -, not relevant for the respective estimation.

[3] Comprises only primary agricultural producers, i.e., livestock, crop as well as fruit and vegetable producers.

Source: own elaboration

The vector $\mathbf{c}_{i,t}$ of client characteristics includes *household income, requested loan amount, disbursed loan amount, age, gender, number of family members*, whether the client has a *higher education* (university level, medium technical college, diploma, advanced diploma), whether the client is a *repeat client* or has a *deposit* with ABT. The vector $\mathbf{l}_{i,t}$ of loan characteristics includes the *annual interest rate* and the *maximum installments*. For the continuous independent variables we also included them in a squared form in order to check for other than linear influences on the dependent variables.

In order to be able to investigate the influence of time (*Year of Loan Application, Year of Loan Disbursement)* and branch office (*Branch Office Number*) effects, we excluded the year 2011 and branch office number five to avoid perfect multi colinearity. Furthermore this allows us to use the current year and the lastly opened branch office number five as benchmarks in the analysis. Consequently, the estimated influences for time and branch office effects on the dependent variables have to be interpreted in relation to year 2011 and branch office number five, respectively.

That ABT has started its operation late in 2007 is also indicated by the descriptive statistics in Table 1. First the loan applications and loan disbursement increase strongly after 2007. Second the different shares of the total loan applications for each branch office show that ABT has started operation with only one branch office in 2007. Hence, branch offices which started to operate earlier in time show the largest shares of loan applications.

The test for homoscedasticity was rejected at a low significance level (p-value < 0.01) for the access to credit as well as the repayment performance estimation.

4. RESULTS

The results for the estimation of the Probit-Model (probability of receiving loan) and the truncated OLS-Model (magnitude of volume rationing) are shown in Table 2. The first column indicates the name of the independent variables with “Square” indicating the quadratic term. The explanatory power of both models is considered as high because 89.30 % of the observations are correctly predicted using the Probit-Model and the $\mathbf{R}^2$ equals to 0.87 for the truncated OLS-Model.

Table 2: Estimation Results for Credit Access[1]

Variable			Probability of Receiving a Loan - Probit						Disbursed Loan Amount - OLS				
Name		Unit[2]	Coefficient	Slope	Standard Error	z-value	p-value		Coefficient	Standard Error	t-value	p-value	
Intercept			0.27		0.23	1.16	0.25		-405.12	119.23	-3.40	7.00E-04	***
Agricultural Sector Affiliation[3]		1/0	-0.17	-0.03	0.08	-2.33	0.02	**	-15.92	37.61	-0.42	0.67	
Household Income		ThsTZS	1.10E-03	1.73E-04	4.77E-05	26.57	7.27E-118	***	0.13	0.03	4,48	7.65E-06	***
Household Income Square			-1.99E-07	-3.13E-08	9.26E-09	-23.41	4.41E-102	***	-9.09E-06	6.55E-06	-1.39	0.17	
Requested Loan Amount		ThsTZS	-1.70E-05	-2.68E-06	1.48E-05	-1.16	0.25		0.58	0.04	13.73	1.14E-42	***
Requested Loan Amount Square			-3.25E-09	-5.12E-10	1.28E-09	-2.55	0.01	**	1.89E-05	4.10E-06	4.60	4.22E-06	***
Age		years	0.01	1.20E-03	0.01	0.74	0.48		-3.47	5.36	-0.65	0.52	
Age Square			-1.84E-04	-2.89E-05	1.27E-04	-1.51	0.15		0.06	0.06	1.02	0.31	
Female		1/0	4.90E-03	7.82E-04	0.03	0.19	0.85		-47.11	13.08	-3.60	3.00E-04	***
Family Members		number	0.10	0.02	0.02	5.17	8.05E-08	***	-14.72	11.53	-1.28	0.20	
Family Members Square			-8.44E-03	-1.30E-03	1.51E-03	-5.31	2.41E-08	***	2.94	1.04	2.83	4.70E-03	***
Higher Education		1/0	-0.26	-0.44	0.03	-8.97	1.45E-20	***	43.97	16.21	2.71	0.01	***
Repeat Client		1/0	0.53	0.08	0.03	16.96	2.20E-59	***	318.16	14.65	21.72	2.71E-103	***
Deposit		1/0	0.93	0.20	0.03	34.98	5.01E-259	***	107.30	17.35	6.19	6.35E-10	***
Year of Loan Application	2007	1/0	-0.61	-0.14	0.09	-6.58	1.57E-11	***	273.21	54.25	5.04	4.79E-07	***
	2008	1/0	-0.71	-0.14	0.05	-14.20	7.76E-50	***	9.22	24.86	0.37	0.71	
	2009	1/0	-0.19	-0.03	0.05	-3.95	4.54E-05	***	232.43	21.07	11.03	3.26E-28	***
	2010	1/0	-0.02	-2.87E-03	0.04	-0.38	0.68		71.53	18.56	3.86	1.00E-04	***
Branch Office Number	1	1/0	-0.44	-0.08	0.06	-5.99	1.60E-12	***	329.90	24.93	13.23	8.96E-40	***
	2	1/0	-0.11	-0.02	0.07	-1.45	0.09	*	195.68	22.96	8.52	1.67E-17	***
	3	1/0	-0.21	-0.04	0.07	-2.75	1.60E-03	***	56.88	31.51	1.80	0.07	*
	4	1/0	-0.28	-0.05	0.07	-3.73	1.77E-05	***	57.82	24.03	2.40	0.02	**
Number of observations			21,334						18,101				
Model Significance			Likelihood-Ratio-Test (21): 5,510 [p-value < 0.01]						F-Test (21, 18,079): 2,638 [p-value < 0.01]				
(pseudo) R-square			0.30						0.87				
Percent Correctly Predicted			89.30 %						n.a.				

[1] ***,**,* indicate a significance on 1%, 5% and 10% level respectively.

[2] ThsTZS, thousand Tanzania Shilling; as ABT records the monthly household income in ten ranges, we use the mean of each range to calculate the household income for each client.

[3] Comprises only primary agricultural producers, i.e., livestock, crop as well as fruit and vegetable producers.

Source: own elaboration

Our results for the *agricultural sector affiliation* reveal that there are significant differences between agricultural and non-agricultural clients for the probability of receiving a loan (p-value = 0.02). In fact, agricultural clients of ABT have a lower probability of receiving a loan. Thus, we can accept H_1 "different access". For those agricultural clients who have access to credit, the magnitude of volume rationing is not significantly different (p-value = 0.67) than for other clients of ABT. Therefore, we have to reject H_2 "different volume".

Our finding that agricultural clients have a lower probability of receiving a loan is in line with the findings of most of the empirical literature on agricultural credit rationing, which frequently reports that agricultural clients are credit rationed (Diagne et al., 2000; Petrick, 2004; Simtowe et al., 2008). We now can show that these findings still hold in comparisons to other sectors indicating that agricultural clients also face relatively higher obstacles to have access to credit. However, we will later discuss why this effect is only significant for the probability of receiving a loan but not for the magnitude of volume rationing.

We further find a significantly positive influence of the *household income* for the probability of receiving a loan (p-value < 0.01) and the disbursed loan amounts[4] (p-value < 0.01) indicating that higher household incomes increase the probability of receiving a loan but also reduce the extend of volume rationing. For the probability of receiving a loan this effect is relatively decreasing with increasing income as the significant (p-value < 0.01) quadratic term reveals. Taking into account the underlying principles of the cash flow based microfinance approach and the in depth loan assessment procedures of ABT this is not surprising.

When looking at the influence of the *requested loan amount* we further find that the *requested loan amount* does negatively influence the probability of receiving a loan as the significant quadratic term (p-value = 0.01) reveals. The magnitude of volume rationing is significantly lower (p-value < 0.01) for larger requested loan amounts. This effect even is significantly inreasing as the positive and significant (p-value < 0.01) quadratic for the magnitude of volume rationing reveals. These findings are ambivalent as they reveal that applicants who request larger loan amounts have a lower probability to receive a loan but as soon credit access is given larger loans are significantly less volume rationed. Whilst the first seems plausible the latter is surprising as larger loan sizes bear higher default risks. As Baele et al. (2010) assume that larger firms receive larger loan sizes this result also indicates that smaller firms have better credit access but are more likely to be volume rationed than bigger firms.

The client's *age* neither influences the probability to get a loan (p-value = 0.48) nor the magnitude of credit rationing (p-value = 0.52). Hence, the age seems to play no important role for the loan decision of ABT that is not surprising for two reasons. First, as we have included the educational level of the loan applicants, all formal education which is generated during the life cycle is accounted by this variable. Second, as the mean of the maturity of all loans

[4] We would like to remind the reader that we use an indirect approach to measure the magnitude of volume rationing. Thus a positive influence on the loan amount disbursed indicates a lower magnitude of volume rationing.

disbursed by ABT is about nine month, the risk that the client runs into serious health problems (which is more likely for older clients) that could endanger loan repayment is limited.

With regard to *gender affiliation*, the probability of receiving a loan is highly independent from gender (p-value = 0.85) being contradictory to Reed (2011) and Armendáriz & Morduch (2010, p 219) who find that women have better credit access than men. However, as soon as women receive a loan, they are significantly (p-value < 0.01) stronger volume rationed than men indicating that loans to women seem to have higher repayment capacities than men.

The *family size* plays a significant role for the probability of receiving a loan and for the magnitude of volume rationing. The larger the family size, the higher the probability of receiving a loan (p-value < 0.01) and the lower the magnitude of volume rationing (p-value < 0.01). This influence of the family size is decreasing for the probability of receiving a loan as the significant quadratic terms (p-value < 0.01) reveals. This finding suggests that an increasing family size not only affect household expenses but might also increase the client's repayment capacity for a loan.

The *educational level* of the client influences the probability of receiving a loan significantly negative (p-value < 0.01) and the magnitude of volume rationing significantly positive (p-value = 0.01). The first is surprising and in contrast to Briggeman et al. (2007) who find that a higher educational level leads to a higher likeliness of having credit access. The latter seems plausible as a higher educational level might increase the business abilities of a loan applicant and hence the credit risk might decrease.

The borrower-lender-relationship indicated by the variables *repeat client* and *deposit* have a significant positive influence on the probability of receiving a loan (p-value < 0.01 and p-value < 0.01 respectively) and reduce the magnitude of volume rationing (p-value < 0.01 and p-value < 0.01 respectively). Hence, we confirm the findings of the borrower-lender-relationship research by attributing a high relevance to bank client relations for credit access (e.g. Berger & Udell, 2002; Petersen & Rajan, 1994).

Time (*Year of Loan Application)* effects indicate that the probability of receiving a loan and the magnitude of volume rationing differs with only few exceptions significantly between years. These differences are not surprising as Tanzania's economy is prospering and therefore the economic activity especially in and around urban areas increases which, in turn, increases bank lending (CGAP, 2010). This argument is supported by increasing probabilities of receiving a loan over the period 2008-2010 (compared to benchmark year 2011). Furthermore the time effects for the probability of receiving a loan could indicate an increasing business experience of ABT. This process typically goes along with adjustments of the (risk) management procedures which might explain the fluctuations of the magnitude of volume rationing over the years.

Also the branch office (*Branch Office Number*) effects indicate that the probability of receiving a loan and the magnitude of volume rationing differs significantly between branch offices. In fact, we find that in comparison to benchmark branch office number five the probability of receiving a loan and the magnitude of volume rationing is lower for all other branch offices. As all our investigated micro loans in ABT are approved on branch office level,

branch office effects can account for differences in the economic activity and sector concentrations within the business range of the branch offices. They could furthermore indicate that the management and thus the loan granting process of ABT differs amongst branch offices.

The results for the estimation of the OLS-Model for the loan repayment are given in Table 3.

Table 3: Estimation Results for Credit Repayment

Variable			Delinquencies - OLS[1]				
Name		Unit[2]	Coefficient	Standard Error	t-value	p-value	
Intercept			1.17	1.20	0.97	0.33	
Agricultural Sector Affiliation[3]		1/0	-0.182471	0.08	-2.23	0.03	**
Household Income		ThsTZS	-3.91E-06	4.41E-05	-0.09	0.93	
Household Income Square			5.57E-09	9.35E-09	0.60	0.55	
Disbursed Loan Amount		ThsTZS	8.11E-05	2.23E-05	3.63	3.00E-04	***
Disbursed Loan Amount Square			-1.08E-08	1.80E-09	-5.98	2.28E-09	***
Age		years	0.03	0.01	2.31	0.02	**
Age Square			-3.06E-04	1.30E-04	-2.35	0.02	**
Female		1/0	0.12	0.03	4.42	9.79E-06	***
Family Members		number	-5.61E-02	2.38E-02	-2.35	0.02	**
Family Members Square			4.32E-03	2.06E-03	2.10	0.04	**
Higher Education		1/0	0.04	0.03	1.36	0.17	
Repeat Client		1/0	-0.05	0.03	-1.70	0.09	*
Deposit		1/0	-1.76	0.05	-36.43	4.11E-280	***
Annual Interest Rate		percent	0.00	0.04	0.07	0.94	
Annual Interest Rate Square			-1.28E-04	3.58E-04	-0.36	0.72	
Maximum Installments		number	0.18	7.78E-03	22.55	4.91E-111	***
Year of Loan Disbursement	2007	1/0	-0.37	0.18	-2.04	0.04	**
	2008	1/0	-0.38	0.05	-7.33	2.41E-13	***
	2009	1/0	-0.12	0.06	-2.07	0.04	**
	2010	1/0	-0.31	0.04	-7.22	5.51E-13	***
Branch Office Number	1	1/0	0.19	0.03	5.60	2.41E-08	***
	2	1/0	0.07	0.04	1.97	0.05	**
	3	1/0	0.21	0.04	5.40	6.76E-08	***
	4	1/0	0.17	0.04	4.70	2.68E-06	***
Number of observations[4]				17,553			
Model Significance				F-Test (24, 17,528): 251 [p-value < 0.01]			
R-square				0.24			

[1] ***,**,* indicate a significance on 1%, 5% and 10% level respectively

[2] ThsTZS, thousand Tanzania Shilling; As ABT records the monthly household income in ten ranges, we use the mean of each range to calculate the household income for each client.

[3] Comprises only primary agricultural producers, i.e., livestock, crop as well as fruit and vegetable producers.

[4] Compared to the OLS-Model in Table 2, we had to discard those loans where the first due date was not reached at the time we extracted our data.

Source: own elaboration

Our findings indicate that loan delinquencies differ significantly between agricultural and non-agricultural clients (p-value = 0.03). Consequently, we can confirm H_3 "different delinquencies". Agricultural clients report significantly lower numbers of missed installments indicating lower delinquencies compared to non-agricultural clients. This is surprising as due to production and market risks attributed to agricultural production literature often assumes the opposite (Zeller et al., 1997). Our findings are in line with Vogel (1981) and we can confirm his results in the African context and under the condition of unsubsidized interest rates. However, as we do not only focus on defaulted loans these results have to be interpreted with care.

We further find no significant influence for *household income* on loan delinquencies (p-value = 0.93) which seems plausible as the extent of volume rationing mainly depends on the household income of the client and the loan amounts disbursed are adjusted accordingly. This result also confirms the irrelevance of income for loan repayment as stated by Kropp et al. (2009).

When looking at the influence of the *disbursed loan amount* we further find significantly higher (p-value < 0.01) loan delinquencies for larger disbursed loan amounts (with decreasing effects) which is in line with Barry (2001), Hodgeman (1960) and Jaffee & Stiglitz (1990) who attribute a higher credit risk to larger loans. As Baele et al. (2010) assume that larger firms receive larger loans, this result indicates lower delinquencies for smaller firms. Consequently as smaller loans require less *household income* this finding is in line with the argument of Turvey & Kong (2007) and Vogel (1981) that the repayment incentive of the formerly financially excluded poor are strong.

The significant positive influence (p-value = 0.02) of the client's *age* on loan delinquencies indicates higher and as the significant quadratic term (p-value =0.02) reveals also diminishing loan delinquencies for older clients. This is in contrast to the literature which often attributes more business experience to older clients (e.g. Briggemann et al., 2007) leading to lower loan delinquencies. The reason might be that there are more unforeseen household expenses with increasing age, e.g., expenses for depending relatives that endanger loan repayment.

With regard to *gender affiliation*, we find significantly higher (p-value < 0.01) loan delinquencies for women than for men. This is in contrast to Armendáriz & Morduch (2010, p 219) stating that women are the more reliable borrowers. This finding might explain why women constitute only 40 % of all ABT borrowers.

The *family size* has a significant negative (p-value = 0.02) influence on loan delinquencies. This effect is increasing as the significant quadratic term (p-value = 0.04) reveals. This result supports our argument that an increasing family size not only increases household expenses but might also increase the repayment capacity.

The *educational level* of the client has no significant influence on loan delinquencies (p-value = 0.17). On the one hand, this is surprising as we would have expected that a higher level of education leads to a higher repayment reliability. On the other hand, this finding is in line with the adequacy of the microfinance approach to address informal MSMEs, which can mainly be found amongst the poorer and hence also lower educated population.

The influence of the borrower-lender relationship on loan delinquencies indicates for both variables *repeat client* (p-value = 0.09) and *deposit* (p-value < 0.01) that delinquencies are significantly lower for those clients who have received a loan from ABT before and for those clients holding a deposit with ABT. These findings indicate that the information gained by the bank through established business relationships with their clients improve loan repayment. The finding on deposits might also highlight the importance of deposits as cash collateral which the bank can debit in the case of delinquencies.

For the annual *interest rate* we find no significant influence on loan delinquencies (p-value = 0.94). This emphasizes the irrelevance of interest rates to account for individual credit risks in the microfinance context as the volume rationing approach is applied and is thus in line with Jaffee & Modigliani (1969).

We further find a significant and positive influence (p-value < 0.01) for the *maximum installments* on loan delinquencies. This corresponds with Baele et al. (2010) who show that the likelihood of loan defaults increase with increasing loan maturities.

Time (*Year of Loan Disbursement)* effects indicate that the loan repayment differs significantly between years. In fact, loan delinquencies fluctuate over years but were always lower in the past compared to benchmark year 2011.

With regard to branch office (*Branch Office Number*) effects, our results indicate that loan repayment differs significantly between branch offices. As the management of each branch office is expected to adjust the credit risk management according to the prevailing economic activity within its business range, loan delinquencies should not differ amongst branch offices. Consequently, our results support the argument that branch differences can be attributed to the management practice of the branch offices rather than to the economic activity within the range of the branch offices.

5. CONCLUSION AND OUTLOOK

Although it is frequently reported that agricultural firms are credit rationed, most investigations in this context focus on the borrower perspective to investigate the access to credit for farmers but neglect the point of view of financial institution. As the loan repayment is an important determinant for the loan granting decision of financial institutions, our analysis focuses on the financial institution perspective. Thereby, we investigated for ABT a MFI in Tanzania, first, whether agricultural firms have a different probability of receiving a loan and whether they are differently volume rationed than non-agricultural firms. Second, we analyzed whether agricultural firms repay their loans with different delinquencies than non-agricultural firms. In order to do so, we estimated a Probit-Model for the probability of receiving a loan, a truncated OLS-Model to investigate the magnitude of volume rationing for all accepted loan applications and an OLS-Model to investigate the loan delinquencies of all microloans disbursed by ABT. Our results reveal that agricultural firms face higher obstacles to get credit but as soon as they have access to credit their loans are not differently volume rationed than the loans of non-agricultural borrowers. Furthermore, our results show that agricultural borrowers are less often delinquent than non-agricultural borrowers when paying back their loans.

Our findings suggest that lending to agricultural firms does not necessarily lead to higher credit risk if the risk exposition of agricultural firms is addressed adequately by the lender. For the case of ABT this leads to an overestimation of the credit risk of agricultural clients as the lower loan delinquencies account for those agricultural firms that have received a loan. ABT should thus reconsider its risk assessment practice for agricultural firms. But even if the bank overestimates the credit risk of agricultural clients, our results might also indicate that farmers

qualify less often for a loan as they do not fit into the standard micro credit product. This is suggested by the lower probability of receiving a loan for agricultural firms, whilst they face no difference for the magnitude of volume rationing. This argument is further supported by the fact that most of ABT's agricultural clients are livestock producers where cash flows are ceteris paribus less volatile than, e.g., in crop production. However, the fact that agricultural firms are more often completely denied access to credit than non-agricultural firms seems to be in conflict with the idea of a broader provision of financial access for agricultural firms. Loan products for agricultural firms should therefore at least allow for flexible repayment schedules to avoid that agricultural firms are denied credit because their cash flows do not allow for a continuous loan repayment. In this regard, we also argue that as long as offered loan products cannot account for agricultural production specifics, the exploitation of the microfinance potential for agricultural firms will be limited. This will necessarily affect a successful outreach of MFIs into rural areas where agricultural production plays an important role.

Even though we can show that access to credit and loan repayment is different for agricultural firms, the current regional focus of ABT only allows for lending to agricultural firms in the greater Dar es Salaam area. Hence, our results might change in a rural setting. Besides general differences of the rural economic environment, the production type of agricultural firms might also differ in rural areas. Our results might also change in different country contexts. We therefore see a high relevance for future research to verify our findings for rural areas, different production types and for different countries. A further field of research might be the application of an approach similar to that in the present study for MFIs which have already introduced agricultural micro finance products. This will allow for investigations whether the Agricultural Microfinance Model of Christen & Pearce (2005) really is the key to overcome the obstacles of agricultural finance in developing countries.

ACKNOWLEDGEMENTS

The authors are grateful to Access Microfinance Holding AG and LFS Financial Systems GmbH in Berlin for the provision of data, in particular to Juergen Rausch and his colleagues from the LFS IT department. Furthermore we would like to thank Patrick Schoeneborn and Christoph Diehl for contributing their expertise and helpful comments.

REFERENCES

Armendáriz, B., and J. Morduch. "The economics of microfinance". The MIT Press, Cambridge 2010.

Baele, L., M. Farooq, and S. Ongena. "Of religion and redemption: evidence from default on islamic loans". CentER Discussion Paper, 2010-136 (2010): 1-46.

Barry, P.J. "Modern capital management by financial institutions: implications for agricultural lenders". *Agricultural Finance Review* 61(2001): 103-122.

Beck, T., A. Demirgüc-Kunt, L. Laeven, and V. Maksimovic. "The determinants of financing obstacles". *Journal of International Money and Finance* 25(2006): 932-952.

Berger, A.N., and G.F. Udell. "Small business credit availability and relationship lending: the importance of bank organisational structure". *The Economic Journal* 112(2002): F32-F53.

Briggeman, B., C. Towe, and M. Morehart ."Credit access: implications for sole-proprietor household". Selected Paper 174722. Annual Meeting. Portland, Oregon. American Agricultural Economic Association 2007.

Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung. Referat: Entwicklungspolitische Informations- und Bildungsarbeit. "Sektorkonzept 124, Finanzsystementwicklung", Bonn 2004.

Christen, R.P., and D. Pearce. "Managing risks and designing products for agricultural microfinance: features of an emerging model". Occasional Paper, No. 11, August 2005.

Consultative Group to Assist the Poor (CGAP)/World Bank Group. "Financial access 2010 – the state of financial inclusion through the crisis". 2010.

Cragg, T.G. "Some statistical models for limited dependent variables with application to the demand for durable goods". *Econometrica* 39(1971): 829-844.

De Meza, D., and D.C. Webb. "Efficient credit rationing". *European Economic Review* 36(1992): 1277-1290.

Diagne, A., M. Zeller, and M. Sharma. "Empirical measurements of households' access to credit and credit constraints in developing countries: methodological issues and evidence". FCND Discussion Paper 90. International Food Policy Research Institute, Washington 2000.

Fidrmuc, J. and C. Hainz. "Default rates in the loan markets for SMEs: evidence from Slovakia. *Economic Systems* 34(2010): 133-147.

Foltz, J.D. "Credit market access and profitability in Tunisian agriculture". *Agricultural Economics* 30(2004): 229-240.

Greene, W. "Econometric analysis". Prentice Hall, New Jersey 2003.

Hartaska, V., and M. Holtmann. "An overview of recent developments in the microfinance literature". *Agricultural Finance Review* 66(2006): 165-147.

Heckman, J. "Sample selection bias as a specification error". *Econometrica* 47(1979): 153-161.

Heimfarth, L. E., and Musshoff, O. "Weather index-based insurances for farmers in the north China plain – an analysis of risk reduction potential and basis risk". *Agricultural Finance Review* 71(2011): 218 – 239.

Hodgman, D.R. "Credit risk and credit rationing". *The Quarterly Journal of Economics* 74(1960): 258-278.

International Bank for Reconstruction and Development/World Bank. "Doing business 2011: making a difference for entrepreneurs". 2010.

International Finance Corporation. "Scaling-up SME access to financial services in the developing world". Financial Inclusion Experts Group, October 2010.

Jaffee, D.M., and F. Modigliani. "A theory and test of credit rationing". *The American Economic Review* 59(1969): 850-872.

Jaffee, D.M., and J. Stiglitz. "Credit rationing". In: Friedman, B.M. and Hahn, F.H. (Ed.) Handbook of Monetary Economics, Volume II, Elsevier Science Publisher B.V. 1990.

Kono, H., and K. Takahashi. "Microfinance revolutions: its effects, innovations, and challenges". *The Developing Economies* 48(2010): 15-73.

Kropp, J.D., C.G. Turvey, and D.R. Just. "Are the poor really more trustworthy? A micro-lending experiment". *Agricultural Finance Review* 60(2009): 67-87.

Liebe, U. "Zahlungsbereitschaft für kollektive Umweltgüter – Soziologische und ökonomische Analysen". VS Verlag für Sozialwissenschaften. Wiesbaden 2007.

Maurer, K. "Where is the risk? Is agricultural banking really more difficult than other sectors?". Paper prepared for the KfW Financial Sector Development Symposium 2010.

Maurer, K. "Mobilising capital for the poor – How does structured finance fit in emerging markets?". In: Köhn, D. (Ed.) "Mobilizing capital for emerging markets - What can structured finance contribute?". Berlin-Heidelberg 2011.

Meyer, R.L., and G. Nagarajan. "Microfinance in Developing Countries: Accomplishments, Debates, and Future Directions". *Agricultural Finance Review* 66(2006): 193-167.

Paxon, C.H. "Using weather variability to estimate the response of savings to transistory income in Thailand". *The American Economic Review* 82(1992): 15-33.

Petersen, M.A., and R.G. Rajan. "The benefits of lending relationships: evidence from small business data". *The Journal of Finance* 49(1994): 3-37.

Petrick, M. "A microeconometric analysis of credit rationing in the Polish farm sector". *European Review of Agricultural Economics* 31(2004): 77-101.

Reed, L.R. "State of the microcredit summit campaign report 2011". Microcredit Summit Campaign 2011.

Rosenberg, R. "Measuring microcredit delinquency: ratios can be harmful to your health". Occasional Paper No.3. The Consultative Group to Assist the Poorest. Washington 1999.

Rosenzweig, M.R., and H.P. Binswanger. "Wealth, weather risk and the composition and profitability of agricultural investments". *The Economic Journal* 103(1993): 56-78.

Roth, J.R., M.J. McCord, and D. Liber. "The landscape of microinsurance in the world's 100 poorest countries". Micro Insurance Centre, April 2007.

Schicks, J. "The over-indebtedness of microborrowers in Ghana - An empirical study from a customer protection perspective". ACCION Center for Financial Inclusion, Washington DC. 2011 (forthcoming).

Simtowe, F., A. Diagne, and M. Zeller. "Who is credit constrained? Evidence from rural Malawi". *Agricultural Finance Review* 68(2008): 255-272.

Swiss Reinsurance Company (SwissRe). "World insurance in 2010. Premiums back to growth – capital increases". No 2/2011.

Tobin, J. "Estimation of relationships for limited dependent variables". *Econometrica* 26(1958): 24-36.

Turvey, C.G., and R. Kong. "Vulnerability, trust and microcredit. The case of China's rural poor". United Nations University, Research Paper No. 2008/52 2008.

Vogel, R.C. "Rural Financial Market Performance: Implications of Low Delinquency Rates". *American Journal of Agricultural Economics* 63(1981): 58-65.

Wenner, M., S. Navajas, C. Trivelli, and A. Tarazona. "Managing Credit Risk in Rural Financial Institutions in Latin America". Inter-American Development Bank. Washington 2007.

Zeller, M. A. Diagne, and C. Mataya. "Market Access by Smallholder Farmers in Malawi: Implications for Technology Adoption, Agricultural Productivity, and Crop Income". FCND Discussion paper No. 35. September 1997.