SCHRIFTEN DER GESELLSCHAFT FÜR WIRTSCHAFTS- UND SOZIALWISSENSCHAFTEN DES LANDBAUES E.V.

Hering, I., Mußhoff, O.: Dynamic Incentives in Microfinance – What about the Farmers? In: Kühl, R., Aurbacher, J., Herrmann, R., Nuppenau, E.-A., Schmitz, M.: Perspektiven für die Agrar- und Ernährungswirtschaft nach der Liberalisierung. Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Band 51, Münster-Hiltrup: Landwirtschaftsverlag (2016), S. 223-233.

Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Bd. 51, 2016, S. 223 – 233

DYNAMIC INCENTIVES IN MICROFINANCE – WHAT ABOUT THE FARMERS?

Imke Hering [1] *and Oliver Mußhoff*

Abstract

Dynamic incentives have become a common measure in microfinance institutions (MFI) to counteract the risk of default and to strengthen the borrower's identification with his microlender. This article focuses on relaxation in loan volume rationing in the course of the bank-borrower relationship. More particularly, we consider the differentiation in lending policies faced by farmers and non-farmers and match our findings with the repayment performances of both client groups. By means of a rich data set for the years 2007 until 2013 provided by a MFI in Azerbaijan, we demonstrate that farmers face a higher degree of loan volume rationing but outperform the non-farmers with respect to loan repayments. Moreover, our results reveal that progressive lending can contribute to risk management in MFIs. In conclusion, we deduce that the MFI could benefit from reconsidering the current lending policy.

Keywords

Microfinance; Risk management; Dynamic incentives; Lending relationships; Azerbaijan

1 Introduction

On November, 7th 2014 the European Investment Bank agreed to launch a € 25 million loan for small and medium sized enterprises (SME) in Azerbaijan (EIB, 2014). Considering this large-scale loan and the corresponding high demand for financial support in the private sector, it is all the more of mutual interest to use the aid in the most efficient way. However, in less developed economies, microfinance institutions (MFI) face two main daily challenges: first, the acquisition of clients and the establishment of stable bank-borrower relationships to assure the viability of the bank; and secondly, the assurance of loan repayment.

With respect to the first challenge, the rural areas dominated by agricultural production bear a particularly rich acquisitory potential for the MFIs. Unfortunately, as a number of studies reveals, MFIs are more hesitant to provide financial assistance to farmers than to non-farmers (GINÉ ET AL., 2012; PETRICK, 2004; WEBER AND MUSSHOFF, 2012). Nevertheless, empirical findings confirm that farmers do not necessarily default more often (RAGHUNATHAN ET AL., 2011; WEBER AND MUSSHOFF, 2012) and accordingly deserve the opportunity to become business partners for banks.

Regarding the second challenge, namely the repayment of loans, MFIs apply several risk management instruments. Apart from demanding collateral, MFIs rely on so-called dynamic incentives, which enhance the motivation of the borrowers to repay their loans on time (PETERSEN AND RAJAN, 1994). Progressive lending belongs to such dynamic incentives. This measure overcomes information asymmetries in rationing the loan volume for first-time borrowers and rewards accurate repayment behavior by increasing the available loan amount for the following loan(s) (ARMENDÁRIZ AND MORDUCH, 2010; BEHR ET AL., 2011).

[1] Georg-August-Universität Göttingen, Department für Agrarökonomie und Rurale Entwicklung. Platz der Göttinger Sieben 5, 37073 Göttingen. E-Mail: imke.hering@agr.uni-goettingen.de

However, on the basis of progressive lending, BEHR ET AL. (2011) reveal that borrowers who received more than two loans have almost the same default rate as first time borrowers. This is in line with VOGELSANG (2003) who finds that repeated borrowing even enhances the probability of late payment. These findings on repeated clients do not differentiate between agricultural and non-agricultural borrowers, though.

The aim of this study is twofold. First, we explore the application of progressive lending and whether it is differing for farmers and non-farmers. For this purpose we analyze the relaxation of loan volume rationing in the course of the bank-borrower relationships for both client groups. Secondly, we verify if a differentiation of those two borrower types can be justified by their repayment behavior with respect to the loan number. To our knowledge this is the first study that simultaneously examines the dynamics in loan volume rationing and loan repayment for different client groups. Furthermore, this study contributes to research on banking relationships with special respect to agricultural borrowers.

The remainder of this paper is structured as follows. In the second section we derive our hypotheses. In section 3 the data is described and the applied empirical methods are introduced. The descriptive statistics and results of the study are discussed and presented in section 4. Lastly, we come to a conclusion in section 5.

2 Hypotheses

In general MFIs perceive agricultural clients as more risky than other clients. The higher risk perception is caused by the following reasons: cyclical or irregular cash flows accompanied by relatively high capital intensity, weather and price risk, as well as the threat of diseases (BINSWANGER AND ROSENZWEIG, 1986; JAINZIK AND POSPIELOVSKY, 2014; PEDERSON AND ZECH, 2009). There is a wide range of literature that deals with the differentiation between agricultural borrowers and non-agricultural clients in microfinance environments. Farmers and rural borrowers are usually more credit-constrained than non-farming clients (GINÉ ET AL., 2012; SIMTOWE ET AL., 2008; WEBER AND MUSSHOFF, 2012).

Yet, the application of progressive lending in particular has not been considered for farming clients. We investigate if farmers only face an initial barrier when demanding credits, but are granted an equal relaxation in volume constraint as non-farmers in the course of the relationship. Therefore, we derive our first hypothesis:

Hypothesis 1: In the course of the bank-borrower relationship, the decrease in loan volume rationing is different for farmers and non-farmers.

Among studies on the repayment behavior of agricultural borrowers, WEBER AND MUSSHOFF (2012) observe that farmers default less often. Likewise, VOGEL (1981) detects lower delinquency rates for farmers compared to non-farmers among microborrowers in Costa Rica. When looking at dependence on continuous credit access, VOGEL (1981) concludes that farmers are eager to pay on time due to the limited availability of loans in rural areas. Based on these findings we formulate our second hypothesis:

Hypothesis 2: In the course of the bank-borrower relationship, the probability that non-farmers default is higher than for farmers.

3 Dataset

To analyze the dynamics in loan volume rationing and repayment behavior, we utilize a rich dataset provided by the AccessBank Azerbaijan, which was founded in 2002. The Access-

Bank Azerbaijan neglected financing agricultural borrowers during their first business years but later on recognized the market potential for loans dedicated to the agricultural sector (JAINZIK AND POSPIELOVSKY, 2014). To meet the special needs of agricultural borrowers, they also offer an Agro Loan since 2007, which targets households that are engaged in any type of agricultural production. In fact, the conditions of the Agro Loan are based on the standard micro-loans. However, there are some key differences. First, loan officers are specially trained to assess the risk connected to the loan purpose. Second, the challenge of cyclical cash flow in agricultural production is met by the availability of grace periods in installment payment. Third and lastly, due to the longer production cycle, the maximum maturities are extended. Nevertheless, the pricing for Agro Loans is exactly the same as for standard micro-loans to avoid manipulations of loan applications (JAINZIK AND POSPIELOVSKY, 2014). Since this bank is exclusively doing business with individual borrowers, the pledge of collateral is compulsory in the majority of cases. Real estate, vehicles, home equipment, stock and guarantors are accepted as collateral.

The original dataset contains information generated by the AccessBank's Management Information System on 595,066 business loans between the years 2002 and 2013. Apart from information on credit features (such as credit volume, interest rate, value of collateral), socioeconomic characteristics of the credit borrowers (gender, marital status) are also available. Moreover, the data contain repayment statistics of each borrower.

It is cleaned of outliers and obvious data entering errors. Additionally, to ensure the comparability of lending policies and repayment behavior for farmers and non-farmers, we exclude all clients that received a loan before the year 2007 since loans for agricultural purposes were not disbursed before. Finally, we utilize 479,326 observations on business loans disbursed between 2007 and 2013 for agricultural and non-agricultural purposes. To differentiate between farmers and non-farmers, the group of farmers only consists of agricultural primary production and excludes any upstream and downstream business.

4 Estimation Methods

We first analyze the extent of loan volume rationing for different client groups – farmers and non-agricultural clients – in the course of the bank-borrower relationships. The dependent variable accounting for loan volume rationing is the ratio of pledged collateral and approved credit volume per loan. This indicator of the degree of loan volume rationing is in line with BEHR ET AL. (2011). Due to lending policies of the AccessBank consisting of long-term agreements (five to ten years) the registered volumes of collateral of the borrowers remain as constant numerators. Accordingly, the ratio of collateral and disbursed amount can display the development of loan volume in the course of repeated borrowing. Since the loan volume ratio is strictly positive, we choose to model the response using GLMs[2] as introduced by NELDER AND WEDDERBURN (1972). The linear predictor is structured as follows:

$$\eta_i = \beta_0 + \beta_1 F_i + \beta_2 L_i + \beta_3 F L_i + \beta_4 Q_i + \beta_5 F Q_i + \beta_6 Y_i + \beta_7 C_i + \beta_8 S_i. \quad (1)$$

In the analysis, a farmer-dummy F_i captures the general discrepancy between farmers and non-farming clients. Moreover, we include loan dummies L_i which control for the effect of loan number on loan volume rationing and interaction dummies between loan number and farmer FL_i. In each case, we choose the first loans as the reference dummy. Furthermore, year-quarter dummies Q_i account for seasonal effects, and interaction dummies FQ_i display the particular effect of seasonality on agriculture-based borrowing. The reference categories for the year-quarter dummies in our estimation are the third year-quarters. According to the

[2] For further introduction into GLMs see Fahrmeir et al. (2013).

FAO (2015), the third year-quarter is the harvest-quarter for the main crops (grain and potatoes) in Azerbaijan. Among others, BEHRMAN ET AL. (1997) and KHANDKER (2012) find that seasonality in crop supply and commodity prices affects household earnings (farming households) and the disposable incomes of non-farming households as well. Year dummies Y_i for the year of loan disbursement control for time effects. Finally, several socioeconomic variables S_i as well as loan characteristics C_i for borrower *i* are introduced as control variables.

After investigating the bank's lending policies with respect to loan volume rationing, we analyze the determinants of repayment behavior by means of the logit model. The binary dependent variable Y_i equals one if the loan *i* features at least one default in installment payment of at least one day and zero otherwise. The probabilities $\pi_i = P(Y_i = 1|\eta_i)$ of the response Y_i are modeled as follows (FAHRMEIR ET AL., 2013):

$$\pi_i = exp(\eta_i)/1+exp(\eta_i). \quad (2)$$

The linear predictor η_i is specified by a set of covariates that is already presented in equation (1). In both models we adjust standard errors for the branch offices.

5 Results

In the following, we provide descriptive statistics in subsection 5.1. Subsequently, the results on loan volume rationing and repayment behavior are presented and discussed in subsection 5.2 and 5.3, respectively.

5.1 Descriptive Statistics

In Table 1, we present descriptive statistics for loan-specific characteristics as well as socioeconomic variables. We first consider loan-specific characteristics, which reveal that on average non-farmers can offer more collateral (7,321 USD) when compared to farmers (5,713 USD). Similarly, the disbursed amount for non-farmers (3,123 USD) exceeds the farmer's loan amounts (2,459 USD). In microfinance, the number of installments, which are mostly paid in a bi-weekly schedule, represents the loan maturity. The statistics show that the maturity of farmers' loans is slightly higher, with on average 14.00 installments compared to 13.66 installments for non-farmers. The mean interest rate for agricultural loans, around 2.82 percent, is higher than for other loans, which is about 2.73 percent on average.

Table 1: Descriptive statistics

		Non-farmer N=350,722				Farmer N=128,604			
Variable	Unit	Mean	SD	Min	Max	Mean	SD	Min	Max
Loan-specific characteristics									
Collateral	USD	7,321	12,027	1.00	200,80 0	5,713	6,267	70.00	154,203
Disb. amount	USD	3,123	3,547	100	30,000	2,459	2,012	169	30,000
Installments	Number	13.66	4.19	1.00	120.00	14.00	3.27	2.00	62.00
Interest rate	Percent	2.73	0.59	0.00	3.50	2.82	0.20	0.00	3.00
Socioeconomic characteristics									
Male	1/0	0.73	0.44	0.00	1.00	0.87	0.33	0.00	1.00
Married	1/0	0.74	0.44	0.00	1.00	0.84	0.36	0.00	1.00

Notes: Author's calculation. This table displays the descriptive statistics for loan-specific and socioeconomic characteristics. Collateral is the value of pledged collateral in USD. The value of the collateral remains nearly constant over time due to the fact that AccessBank Azerbaijan applies long-term collateral agreements (five to ten years) at the beginning of the lending relationship (JAINZIK AND POSPIELOVSKY, 2014). SD indicates the standard deviation. Min and Max indicate minimum and maximum, respectively.

Regarding the socioeconomic variables, we can state that the agricultural borrower is more often male (87 percent male borrowers) than the non-agricultural borrower (73 percent). Likewise, the married-dummy reveals a higher percentage for farming borrowers, with 84 percent compared to 74 percent for non-farmers. Overall, the majority of both borrowing farmers and non-farmers is male and married.

As mentioned in Section 4, our central variable for analyzing the loan volume rationing for farmers and non-farmers is the ratio of pledged collateral and approved credit volume per loan. In Table 2, the development of the mean of loan volume ratio by loan number for farmers and non-farmers is illustrated. In some cases, our observations on approved loans sum up to nineteen loans. However, after the fifth loan, we combine the additional loans in one variable (>=6) since we have comparably few observations for the following loans. The progressive lending in terms of a decreasing loan volume ratio is consequently applied for both client groups. Up to the third loan, we can observe that the loan volume ratio for farmers is significantly higher. Loan number 4 reveals an almost nonexistent difference between the loan volume ratios of the client groups. For the fifth loan and for loan number 6 and so forth, the ratio for non-farmers is higher but the difference in mean is not statistically significant.

Table 2: t-test for loan volume ratio by loan number for non-farmers and farmers

Loan number	Client group	Observations	Mean	SD	Diff. in mean	
1	Non-farmer	173,951	2.197	1.446	-0.364	***
	Farmer	71,536	2.561	1.407		
2	Non-farmer	84,480	2.164	1.229	-0.175	***
	Farmer	34,655	2.338	1.182		
3	Non-farmer	50,055	2.068	1.178	-0.126	***
	Farmer	15,356	2.194	1.111		
4	Non-farmer	26,014	2.000	1.152	-0.008	
	Farmer	5,254	2.008	1.043		
5	Non-farmer	11,058	1.944	1.109	0.047	
	Farmer	1,411	1.897	1.000		
>=6	Non-farmer	5,164	1.911	1.109	0.087	
	Farmer	392	1.823	0.950		

Notes: Author's calculation. This table summarizes the results of a two-sided t-test comparing the means of loan volume ratio of non-farmers and farmers by loan number. The loan volume ratio is a ratio of the volume of collateral and the disbursed amount per loan. After the fifth loan, we combine additional loans in variable >=6. The symbols *, **, and *** denote significance at the 5%, 1%, and 0.1% levels. SD indicates the standard deviation

The dependent variables of the GLM and logit model as well as the number of observations are summarized in Table III. We have 128,604 observations of agricultural loans and 350,722 observations of loans to other clients. Again, we first consider the loan volume ratio, which later becomes the dependent variable, to obtain the extent of loan volume rationing for both client groups with respect to the loan number. The mean of loan volume ratio is significantly lower for non-farmers (2.144) compared to farmers, with an average ratio of 2.425.

Table 3: t-test for dependent variables in GLM and logit model

			Non-farmer N=350,722		Farmer N=128,604			
	Variable	Unit	Mean	SD	Mean	SD	Diff. in mean	
GLM	Loan volume ratio	-	2.144	1.327	2.425	1.309	-0.281	***
Logit model	Late payment	1/0	0.177	0.382	0.108	0.310	0.069	***

Notes: Author's calculation. This table summarizes the results of a t-test for the dependent variable loan volume ratio of the GLM and the default rate illustrated by the variable late payment of the logit model. Non-farmers are tested against farmers. The loan volume ratio is a ratio of the volume of collateral and the disbursed amount per loan. The binary variable late payment equals one if at least one installment of the loan was at least one day late and zero otherwise. The symbols *, **, and *** denote significance at the 5%, 1%, and 0.1% levels. SD indicates the standard deviation.

For the logit model, the dependent variable is binary and equals one if the loan features at least one default in installment payment. For 10.8 percent of agricultural loans, at least one installment payment is at least one day late. In contrast, our results on non-farmers show that 17.7 percent of the loans feature at least one default in installment payment. Again, the difference in the mean for late payment is statistically significant.

5.2 Loan Volume Rationing

In our first analysis, we examine the application of loan volume rationing in the course of the bank-borrower relationship by means of the GLM. Table 4 displays the results of the estimation with the loan volume ratio as the dependent variable. The results of the baseline regression for all observed loans are displayed in Model I. We can show that the loan dummies for all observed loans are not statistically significant. In contrast, the year dummies feature statistical significance and are increasingly negative. This finding suggests that the bank does not apply a targeted decrease in loan volume rationing in the course of repeated borrowing and that the observed decrease in loan volume rationing in subsection 5.1 is part of the general adjustment of lending policies of the bank in the course of the business activity.

With respect to the year-quarter dummies, it can be shown that seasonality generally affects lending policies. Considering the negative coefficient of the number of installments, which illustrates the loan maturity, we conclude that a higher rationing goes along with shorter loan maturities for clients. At the same time, higher volume rationing is accompanied by higher interest rates.

In terms of socioeconomic characteristics, we pay further attention to the positive coefficient of the dummy for male borrowers which indicates a higher rationing for men. This finding contradicts AGIER AND SZAFARZ (2013) as well as BELLUCCI ET AL. (2010), who state that women are discriminated against with respect to availability and conditions of loans. Furthermore, the results reveal that married borrowers experience a higher rationing.

In Model II, the degree of loan volume rationing in the course of the relationship is differentiated between farming and non-farming clients by introducing a dummy for farmers alongside interaction dummies between farmers and loan number and between farmer and year quarter. The positive coefficient of the farmer-dummy reveals that the degree of loan volume rationing is generally significantly higher for farmers than for non-farmers. This finding confirms our first hypothesis, namely farmers and non-farmers experience a different loan volume rationing from their bank. The result of discrimination between farmers and non-farmers is in line with several studies (PETRICK, 2004; SIMTOWE ET AL., 2008; WEBER AND MUSSHOFF, 2012; ZELLER ET AL., 1998). Whereas the loan dummies for all loans are not statistically significant, the increasingly negative interaction dummies of loan dummy and farmer feature statistical

significance. Hence, the volume restriction relaxes significantly in the course of the relationship for farmers and the farming client group experiences a targeted progressive lending. It appears that the bank perceives agricultural borrowers as more opaque and thus reacts to the reduction in information asymmetries by increasing the loan volume of additional loans for their agricultural clients.

Seasonal effects also have a particular influence on farmers' loans. The interaction dummy for the second year-quarter (Farmer_quarter 2) reveals that farming clients face an even stricter rationing at this time. According to the FAO crop calendar for Azerbaijan (FAO, 2015), the second year-quarter (April until June) is marked by sowing and growing major crops, combined with higher demand for production facilities and decreasing fodder stocks and crop sales. Visibly, the AccessBank reacts to shortages that might affect repayment abilities of farmers by increasing the degree of rationing in the second year quarter.

Table 4: Results of the GLM on the influence on loan volume rationing

Loan volume ratio	Unit	Model I			Model II		
		Coeff.		Robust Std. Err.	Coeff.		Robust Std. Err.
Farmer	1/0				0.1968	***	0.0423
Loan 2	1/0	0.0063		0.0225	0.0486		0.0285
Loan 3	1/0	-0.0159		0.0263	0.0431		0.0303
Loan 4	1/0	-0.0336		0.0320	0.0479		0.0326
Loan 5	1/0	-0.0410		0.0411	0.0508		0.0376
Loan >=6	1/0	-0.0340		0.0484	0.0593		0.0425
Farmer_loan 2	1/0				-0.0869	*	0.0365
Farmer_loan 3	1/0				-0.1006	*	0.0488
Farmer_loan 4	1/0				-0.1599	**	0.0503
Farmer_loan 5	1/0				-0.2024	***	0.0538
Farmer_loan >=6	1/0				-0.2202	***	0.0557
Number of installments	Number	-0.0284	**	0.0097	-0.0333	**	0.0109
Number of installments sq		0.0007	**	0.0003	0.0008	**	0.0003
Interest_Rate	Percent	0.0826	***	0.0232	0.0734	**	0.0238
Quarter 1	1/0	0.0520	***	0.0054	0.0553	***	0.0060
Quarter 2	1/0	0.0135		0.0072	0.0045		0.0085
Quarter 4	1/0	0.0074		0.0043	0.0090		0.0047
Farmer_quarter 1	1/0				-0.0050		0.0103
Farmer_quarter 2	1/0				0.0329	**	0.0100
Farmer_quarter 3	1/0				-0.0134		0.0077
D_2008	1/0	-0.1404	***	0.0262	-0.1534	***	0.0269
D_2009	1/0	-0.1183	***	0.0277	-0.1552	***	0.0283
D_2010	1/0	-0.1682	***	0.0337	-0.2199	***	0.0319
D_2011	1/0	-0.1494	***	0.0301	-0.2103	***	0.0270
D_2012	1/0	-0.2919	***	0.0327	-0.3664	***	0.0275
D_2013	1/0	-0.3962	***	0.0420	-0.4759	***	0.0355
Male	1/0	0.1296	***	0.0223	0.1098	***	0.0178
Married	1/0	0.0562	***	0.0119	0.0429	***	0.0095
Constant		0.8263	***	0.0950	0.8928	***	0.0972
Number of observations		479,296			479296		
Log pseudolikelihood		-857,845			-856,393		
AIC		3.5795			3.5735		
BIC		-6,113,918			-6,116,678		

Notes: Author's calculation. This table displays the influence of loan number and client group on loan volume rationing. The Loan volume ratio is the dependent variable in the GLM and a ratio of the volume of collateral and the disbursed amount per loan. In Model I the baseline regression is provided. Model II instead, differentiates between farming and non-farming clients. The symbols *, **, and *** denote significance at the 5%, 1%, and 0.1% levels. AIC indicates Akaike information criterion and BIC indicates Bayesian information criterion. Standard errors are adjusted for the branch offices.

5.3 Repayment Behavior

Table 5 displays the probabilities of defaults for at least one installment payment of at least one day. We first consider Model I, which does not differentiate between farmers and non-farmers. The influence of loan number of all observed loans on the probability of late payment is captured by means of loan dummies. As in the GLM, the first loan works as the reference-dummy. We find that the probability of defaults is decreasing significantly for the second and third loan. Considering seasonality, the positive and statistically significant coefficients of the dummies for the first and second year-quarter reveal that the probability for defaults in all observed loans is higher for loans that were disbursed in the first half of the year, compared to loans disbursed in Quarter 3 (reference dummy). In contrast, loans disbursed in the fourth year-quarter are less likely to feature a default.

Table 5: Results of the logit model on the repayment behavior

Late payment	Unit	Model I			Model II		
		Coeff.		Robust Std. Err.	Coeff.		Robust Std. Err.
Farmer	1/0				-0.4879	**	0.1727
Loan 2	1/0	-0.1443	**	0.0611	-0.2375	***	0.0661
Loan 3	1/0	-0.1642	*	0.0788	-0.2874	**	0.0830
Loan 4	1/0	-0.1521		0.0961	-0.2851	**	0.0925
Loan 5	1/0	-0.1466		0.1075	-0.2799	**	0.1053
Loan >=6	1/0	-0.1018		0.1502	-0.2622		0.1425
Farmer_loan 2	1/0				0.3062	***	0.0756
Farmer_loan 3	1/0				0.3411	**	0.1126
Farmer_loan 4	1/0				0.2643	*	0.1177
Farmer_loan 5	1/0				0.0384		0.1816
Farmer_loan >=6	1/0				0.2283		0.2073
Number of installments	Number	0.0580	***	0.0143	0.0655	***	0.0134
Number of installments sq		-0.0006	*	0.0003	-0.0008	**	0.0003
Interest_Rate	Percent	-0.1420	***	0.0319	-0.1342	***	0.0298
Quarter 1	1/0	0.1726	***	0.0267	0.1573	***	0.0238
Quarter 2	1/0	0.1210	***	0.0230	0.1256	***	0.0204
Quarter 4	1/0	-0.0680	**	0.0220	-0.0592	**	0.0191
Farmer_quarter 1	1/0				0.0708		0.0495
Farmer_quarter 2	1/0				-0.0283		0.0395
Farmer_quarter 3	1/0				-0.0169		0.0467
D_2008	1/0	0.1903		0.1099	0.2198	*	0.1109
D_2009	1/0	-0.1418		0.1156	-0.0633		0.1099
D_2010	1/0	-0.0926		0.1316	0.0102		0.1191
D_2011	1/0	-0.3416	**	0.1024	-0.2251	**	0.0856
D_2012	1/0	-1.1800	***	0.1122	-1.0360	***	0.0911
D_2013	1/0	-5.9318	***	0.3338	-5.7916	***	0.3490
Male	1/0	-0.2193	***	0.0501	-0.1725	***	0.0443
Married	1/0	-0.4791	***	0.0267	-0.4523	***	0.0213
Constant		-1.1347	***	0.1743	-1.2291	***	0.1597
Number of Observations				479,296			479,296
Log pseudolikelihood				-199,479			-198,801
Wald chi2				3398.6 ($p < 0.001$)			72949.07 ($p < 0.001$)
Pseudo R^2				0.0485			0.0517

Notes: Author's calculation. The table shows the probabilities of defaults in installment payment of at least one day. The symbols *, **, and *** denote significance at the 5%, 1%, and 0.1% levels. Standard errors are adjusted for the branch offices.

Considering the dummies for the years 2011, 2012, and 2013, it can be stated that the significantly negative coefficients show that the probability of default decreases in these years. This finding may reflect the experience gains of both loan officers and borrowers. With respect to loan characteristics it can be stated that longer loan maturities and lower interest rates increase the default probabilities. Finally, the results reveal that male borrowers and married borrowers are less likely to default.

By introducing a farmer dummy and interaction dummies of loan number and farmer as well as of year-quarter and farmer in Model II, we distinguish the aforementioned described effects on repayment for the client groups. Here, we observe that the coefficient of the farmer dummy is statistically significant and negative, which confirms the general lower default probability of farming clients already shown in the descriptive statistics. This result confirms our second hypothesis stating that the farmers' default probability is lower than for non-farmers. Findings from RAGHUNATHAN ET AL. (2011), VOGEL (1981) and WEBER AND MUSSHOFF (2012) also support similar results. One possible reason for this outcome may be that farmers are more afraid to be denied future access to loans when not behaving properly. They may have a higher intrinsic motivation to repay their installments on time since there are generally fewer possibilities to obtain financial assistance in rural areas. This assumption would be in line with VOGEL (1981).

According to the distribution of branch offices of AccessBank Azerbaijan, we can state that there is a relatively high concentration of offices in the urban region surrounding the capital Baku. The provisioning of branch offices is far below that level in the heartland. Hence, the discrepancy in office supply, solely based on the case of the AccessBank Azerbaijan, would confirm the assumption of weaker financial infrastructure in rural areas.

Moreover, the coefficients of the loan dummies in Model II are statistically significant and increasingly negative. Hence, it can be concluded that the probability of late payments decreases with each additional loan. A study by VOGELSANG (2003) shows the same effect for late payments of at least ten days in a case study in Bolivia. These results support the reliability of progressive lending as a measure of risk mitigation. However, the positive coefficients of the interaction dummies of farmer and loan number two, three and four indicate that the default reducing effect of loan number has to be confined to the group of non-farming clients. Seemingly, if a farming borrower decides to pay late or not to repay the loan at all, he/she behaves as such at an earlier point of time in the bank relationship, rather than for later loans. When matching this finding with the descriptive statistics in subsection 5.1, one may conclude that the defaulting farming borrowers await the concessions in loan volume until the loan volume ratio of farmers equals the loan volume ratio of non-farmers. In Table 2 we demonstrate that the discrepancy between farming and non-farming borrowers in loan volume rationing is significantly higher for farmers, up to the fourth loan. Then again, it is also likely that the investigated bank anticipates the higher default probability of farming borrowers at the beginning of the relationship in their volume rationing policies. Nevertheless, this lending strategy of the bank is arguable, especially considering the general lower default rate among farmers. Likewise, the investigated decreasing default probability in the course of the relationship with non-farmers should encourage the bank to apply a targeted decrease in loan volume rationing that depends on the loan number. This could also enhance the repayment motivation of the non-farming clients and probably reduce the overall default rate among non-farmers.

6 Conclusion

We investigate the effect of repeat loans on lending policies and repayment performances for agricultural and non-agricultural borrowers in Azerbaijan. From our results we confirm that the studied MFI applies progressive lending, but also notice that farmers and non-farmers do not face the same lending policies. In general, farmers face a significantly higher loan volume rationing, and thus receive smaller loan amounts when offering the same amount of collateral as non-farmers per loan. This 'rationing-gap' is most relevant at the beginning of the relationship. However, the farmers experience a statistically significant increase in loan volume in the course of the relationship which cannot be confirmed for non-farmers. In fact, the latter client group does not experience a targeted decrease in loan volume rationing. Yet, based on the results on repayment performances, this discrimination cannot be justified. We find that, in general, farmers are less likely to default. Furthermore, the obtained effects of loan number on the repayment performance of non-farmers show that the likelihood of defaults decreases significantly with every additional loan. In contrast, this positive influence of loan number on the repayment performance cannot be confirmed for farmers. Although we do not know if our findings would still hold given that both client groups faced the same level of volume rationing and decrease in loan volume ratio in the course of the relationship, we are nonetheless convinced that the results give substantial evidence on the lending policies of the bank and repayment behavior of borrowers. Finally, we furthermore demonstrate that seasonality is particularly relevant for the repayment performances of non-farmers.

Against the background of the EIB-loan that is to be disbursed via the AccessBank in Azerbaijan, it might be worthwhile for the MFI to reassess loan volume rationing policies for farmers and non-farmers as well, so that the full potential of borrowers could be exploited. Moreover, the observed seasonality-dependent repayment performances of agricultural and non-agricultural loans indicate that the availability and use of grace periods could contribute to risk mitigation for standard business loans as well.

These results are, however, obtained from a single Azerbaijani MFI. Therefore, we hesitate to generalize our findings or to recommend an equal treatment of these two client groups in every country context. For future research, it might be interesting to conduct a cross-country comparison, notably between countries of different economic dependency on agriculture. It would also be interesting to analyze progressive lending and repayment with a differentiation between the agricultural production types such as crop and animal production, which are accompanied by different cash flow structures. The statistical significance of the year-quarter-dummies reveals that external factors such as price volatilities also affect rationing and repayment, and should therefore be respected in future analyses more specifically.

Finally, we have to state that we only have data on accepted loan applications and no further insights on selection bias. The fact that the awareness of collateral is a condition to receive a loan from the investigated bank indicates a concentration on wealthier clients, a tendency which is already confirmed by CULL ET AL. (2007) and HERMES AND LENSINK (2007) for the case of individual-based lending. Considering the rich dataset provided, we are nonetheless convinced that our findings are relevant to implement an efficient allocation of financial resources among borrowers.

References

AGIER, I. and A. SZAFARZ (2013): Microfinance and gender: is there a glass ceiling on loan size? In: World Development 42:165-181.

ARMENDÁRIZ DE AGHION, B. and J. MORDUCH (2010): The economics of microfinance, 2nd ed. The MIT Press, Cambridge, Massachusetts.

BEHR, P., A. ENTZIAN and A. GÜTTLER (2011): How do lending relationships affect access to credit and loan conditions in microlending? In: Journal of Banking and Finance 35: 2169-2178.
BEHRMAN, J.R., A.D. FOSTER and M.R. ROSENZWEIG (1997): The dynamics of agricultural production and the calorie-income relationship: evidence from Pakistan. In: Journal of Econometrics 77: 187-207.
BELLUCCI, A., A.V. BORISOV and A. ZAZZARO, (2010): Does gender matter in bank-firm relationships? Evidence from small business lending. In: Journal of Banking and Finance 34: 2968-2984.
BINSWANGER, H.P. and M.R. ROSENZWEIG (1986): Behavioural and material determinants of production relations in agriculture. In: Journal of Development Studies 22: 503-539.
CULL, R., A. DEMIRGÜÇ-KUNT, and J. MORDUCH (2007): Financial performance and outreach: a global analysis of leading microbanks. In: The Economic Journal 117: F107-F133.
EIB (EUROPEAN INVESTMENT BANK) (2014): EIB launches operations in Azerbaijan: support to SMEs through AccessBank. Available: http://www.eib.org/infocentre/press/releases/all/2014/2014-249-eib-launches-operations-in-azerbaijan-support-to-smes-through-accessbank.htm (accessed November 9, 2014).
FAHRMEIR, L., T. KNEIB, S. LANG and B. MARX (2013): Regression. 1st ed., Springer, Berlin Heidelberg.
FAO (2015): GIEWS Country Brief Azerbaijan. Available: http://www.fao.org/giews/countrybrief/country.jsp?code=AZE (accessed April 16, 2015).
GINÉ, X., J. GOLDBERG and D. YANG, (2012): Credit market consequences of improved personal identification: field experimental evidence from Malawi. In: American Economic Review 102: 2923-2954.
HERMES, N. and R. LENSINK (2007): The empirics of microfinance: what do we know? In: The Economic Journal 117: F1–F10.
JAINZIK, M. and A. POSPIELOVSKY (2014): Busting agro-lending myths and back to banking basics: a case study of AccessBank's agricultural lending. In: D. Köhn (ed.), Finance for Food, Springer, Berlin Heidelberg: 115-135.
KHANDKER, S.R. (2012): Seasonality of income and poverty in Bangladesh. In: Journal of Development Economics 97: 244–256.
NELDER, J.A. and R.W.M. WEDDERBURN, (1972): Generalized Linear Models. In: Journal of the Royal Statistical Society, Series A (General) 135: 370-384.
PEDERSON, G.D. and L. ZECH, (2009): Assessing credit risk in an agricultural loan portfolio. In: Canadian Journal of Agricultural Economics 57: 169-185.
PETERSEN, M.A. and R.G. RAJAN (1994): The benefits of lending relationships: evidence from small business data. In: The Journal of Finance 49: 3-37.
PETRICK, M. (2004): A micro econometric analysis of credit rationing in the Polish farm sector. In: European Review of Agricultural Economics 31: 77-101.
RAGHUNATHAN, U.K., C.L. ESCALANTE, J.H. DORFMAN, G.C.W. AMES and J.E. HOUSTON, (2011): The effect of agriculture on repayment efficiency: a look at MFI borrowing groups. In: Agricultural Economics 42: 465-474.
SIMTOWE, F., A. DIAGNE and M. ZELLER, (2008): Who is credit constrained? Evidence from rural Malawi. In: Agricultural Finance Review 68: 255-272.
VOGEL, R.C. (1981): Rural financial market performance: implications of low delinquency rates. In: American Journal of Agricultural Economics 63: 58-65.
VOGELSANG, U. (2003): Microfinance in times of crisis: the effects of competition, rising indebtedness, and economic crisis on repayment behavior. In: World Development 31: 2085–2114.
WEBER, R. and O. MUSSHOFF, (2012): Is agricultural microcredit really more risky? Evidence from Tanzania. In: Agricultural Finance Review 72: 416-435.
ZELLER, M., A. DIAGNE AND C. MATAYA, (1998): Market access by smallholder farmers in Malawi: implications for technology adoption, agricultural productivity, and crop income. In: Agricultural Economics 19: 219-229.