# ADVERSE SELECTION OR ADVERSE INCENTIVE?:

# THE ROLE OF COLLATERAL IN AGRICULTURAL MICROFINANCE

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**Abstract**

Financial institutions still neglect to address agricultural clients. The main reasons for that are their perception that farmers bear higher risks than non-farmers and that their loan products are inadequate to accommodate the needs of agricultural entrepreneurs. As a result, many farmers still lack access to external finance. The aim of this paper is to investigate determinants of credit risk for agricultural loans disbursed by a Microfinance Institution (MFI) in Azerbaijan. In this context special attention is paid to repayment flexibility and the role of collaterals. MFIs are among the first financial institutions recently focusing on farmers with new loan products.

We find that farmers are less risky than non-farmers, which is surprising because the opposite is widely believed. We furthermore find that the level of collateral has a negative influence on credit risk. Beyond that, we find that repayment flexibility increases credit risk.

*JEL-Classification:* Q12, Q14

*Keywords:* microfinance, collaterals, Tobit Model, credit risk, small-scale farmer

# 1 Introduction

The success story of microfinance institution's (MFIs) in fighting for poverty reduction dates to the 1980s and was rewarded with the Nobel Prize for Peace for Muhammad Yunus in 2006. The success of MFIs is based primarily on two factors: High standardization of loan products enables the MFIs to keep costs low by decreasing transaction costs and to benefit from technical economies of scale (Meyer, 2002). The group lending approach and its impact on repayment rates is the second key to success in terms of MFIs. However, there is evidence that the group lending approach is not the best method in every region, especially in rural areas, and thus, agriculture dominant areas (Armendáriz de Aghion and Morduch, 2010).

Considering the absence of social pressure within the individual lending technique, MFIs have to create other incentives to achieve a good repayment performance. On the one hand, progressive lending is a tool to do so because the client is able to lend higher amounts based on the length and quality of his credit history. Therefore, the first loan can be seen as a good way for the bank to assess the client's attitude towards repayment (Armendáriz de Aghion and Morduch, 2010). On the other hand, credit rationing, where the granted loan amount falls below the client's applied amount, is used by MFIs to cope with risk and high transaction costs. With respect to credit rationing, farmers especially can cause high transaction costs for the MFI because monitoring and evaluating their business is even more difficult than it is for non-farmers (Petrick, 2005). In addition to these aspects, there is the higher risk exposure. The production of a farmer, in contrast to other businesses depends on factors which are subject to a high level of risk. Unpredictable weather conditions, diseases and volatile market prices are affecting the success of agricultural production tremendously (Christen and Pearce, 2005). These risk factors make farmers a more risky clientele from the point of view of

the MFI. That is why in rural areas, and therefore agriculture dominant areas, there is still a lack of external financing (Miranda and Gonzalez-Vega, 2011) in comparison to other regions where an oversupply of microloans can be found (Vogelgesang, 2003).

Beyond the mentioned approaches to cope with the absence of social pressure, namely joint liability, within the individual lending technique most MFIs require the pledge of collaterals. Cassano et al. (2013) worked out that collaterals for commercial MFIs are more of a commitment of the borrower than a security. As a result, pledged assets or the word of a guarantee have more of an ideal value. In contrast to that, collaterals for regular banks are a real security and are used as a repayment source if a loan defaults (Armendáriz de Aghion and Morduch, 2010; Churchill, 1999). Even then, there is first evidence about the impact of collaterals on the repayment performance in microfinance (Vigenina and Kritikos, 2004), there is none particularly for farmers.

However, the higher risk exposure is not the only specific characteristic of farmers. Farmers face an unsteady cash flow caused by seasonality. As a result of seasonality, financing with the highly standardized loan (here and after: Standard Loan) of the MFIs is very difficult. The farmer has to repay almost the entire amount to the bank before he generates any revenue (Morduch, 1999; Hamp and Laureti, 2011). To overcome the problems with farmers as clients and to enter the rural market, MFIs have developed special loan products. In particular, loan products with a broader level of flexibility due to repayment schedules (here and after: Flex Loan) are a topic that MFIs have to deal with (Meyer, 2002). This flexibility is given by granting grace periods, which give the possibility to temporarily abandon payments. There are already a few studies concerning the higher credit risk of farmers in general (Vogel, 1981; Raghunathan et al., 2011; Weber and Musshoff, 2013) and the effect of Flex Loans on the repayment performance (Godquin, 2004; Field et al., 2011; Weber and Musshoff, 2013), but there

is no final statement because of different results.

This paper explores the different credit risk of farmers in comparison to non-farmers. Beyond that, we try to give first empirical evidence of the role of collaterals in microfinance. The focus here is the impact of collaterals on the repayment performance of farmers because MFIs still neglect addressing farmers as a costumer group. Moreover, Flex Loans, as a tool of handling the seasonality of farmers and improving repayment performance, are investigated as well. In order to do so, this paper analyzes a data set from a leading MFI in Azerbaijan. The MFI under consideration is interesting to investigate because the pledge of collaterals is compulsory and the impact of collaterals on the repayment performance has not yet been investigated in Azerbaijan. Furthermore, there is a long history of Flex Loan usage.

The rest of this paper is structured as follows: In the second section an overview about the already existing findings is given and our research hypotheses are derived. In the third section the dataset and the descriptive statistics are shown. After that, the econometric model is explained in the fourth section. This is followed by the estimation results and the discussion in section five. Finally, a conclusion and outlook is given in section six.

## 2 Literature Review and Hypotheses

Farmers have two characteristics which differentiates them from the standard clientele of an MFI. First, there are additional risk factors that farmers have to cope with, because farmers are operating in an environment that is influenced by some risk factors which are not so relevant for non-farming businesses. To begin with, there is a particular pronounced "yield risk"; the main effect of this risk factor is connected to weather conditions. Hence, if a bad weather situation occurs it affects all fields of the farm or

even all farmers of a region. Binswanger and Rosenzweig (1986) do not only mention the risk directly influenced by the weather, but also the ”lifecycle risk”. This risk is based on the lifecycles of machinery and animals. A sudden malfunction and drop out of the machinery, a disease affecting the animals or an accident can cause significant changes in the production process. Additionally, there is the market risk. The volatility of world market prices affects the inputs and the outputs of farmers. At the time when production is planned, the future prices for the output are unknown (Binswanger and Rosenzweig, 1986). Subervie (2008) shows that the vulnerability to world market prices is influenced by factors on a macroeconomic level such as characteristics of infrastructure or of provided financial services. With poor infrastructure or a lack of access to external finance, farmers are not able to cope or smooth the effects of the instability of the world market price (Subervie, 2008), which is often the case in developing countries. All in all from a bank´s perspective, farmers face a higher credit risk of their production in comparison to normal businesses (Christen and Pearce, 2005).

The risk factors which are attached to their production are making the cash flow of farmers uncertain and they are not able to smooth the cash flow with revenues of former projects. As a result, there is a mismatch between the installments and the cash flow. There are already some findings concerning the repayment quality of farmers. However, to our knowledge, we are the first to investigate the credit risk of agriculture clients in Azerbaijan. Therefore, our first hypothesis is **H1 ”credit risk”:** Farmers have a different credit risk than non-farmers.

An important way to cope with risk for MFIs is to apply cash flow based lending in contrast to asset based lending as regular banks do. The cash flow based lending approach is the method that commercial MFIs use to try to manage their risk. It is a

mixture of the group lending approach and the asset or collateral based approach of regular banks (Churchill, 1999). In the case of cash flow based lending, the granted amount of the loan depends on the cash flow or income stream of the household. This cash flow based lending of MFIs distinguishes itself from the asset based lending which is applied by regular banks. In the case of asset based lending, the collateral is required and its value is used as a benchmark for the size of the loan. In the case of a default, the value of the collateral balances out the damage for the bank (Armendáriz de Aghion and Morduch, 2010). The majority of commercial MFIs applying individual lending typically require collaterals as well. However, they do not rely on them because the cash flow is the part taken under consideration for the granted amount (Pischke, 2002). As a result, the attitude towards the pledged collaterals is much more flexible and therefore non-traditional collaterals are pledged. If MFIs take collaterals, they see it as more of a commitment of the borrower to pay back and not as a real protection in the case of a default of the loan (Cassano et al., 2013; Churchill, 1999). Churchill (1999) points out that collaterals are "[…], an important reminder in the back of the borrower's mind". That is why the value of the collateral differs from the point of view. For the borrower, the value is much higher and a potential loss is more serious (Cassano et al., 2013; Pischke, 2002). Vigenia and Kritikos (2004) give evidence that this works out in Georgia; they show that the higher the potential loss for the borrower is, the better is the repayment performance.

However, collaterals are not used in the classical way of reducing risk because the aim of requiring them is not to sell them if a loan defaults (Churchill, 1999). As a result, collaterals cannot be seen as a typical repayment source for MFIs (Cassano et al., 2013). Binswanger and Rosenzweig (1986) point out that collaterals are a way to shift the risk exposure of a loan from the lender to the borrower, if there are constant interest rates

which is the case for most microfinance loans. However, there is the possibility that the opposite is the case. Thus, higher collaterals might increase the risk exposure because they could deter clients which would like to finance a safe project and might allure predominantly riskier projects (Stiglitz and Weiss, 1981).

While there is already some empirical evidence regarding the impact of collaterals as incentives for a good repayment performance of non-farmers (Vigenina and Kritikos, 2004), there is none for farmers. However, especially for farmers the role of collaterals as a risk managing tool must be even more important. Therefore, we analyze the role of collateral on the repayment performance of farmers. To our knowledge, we are the first to investigate the impact of monetary meaningful collaterals for farmers in microfinance and therefore our second hypothesis is **H2 "collaterals":** There is a significant effect of collaterals on repayment performance for farmers.

Beyond the higher risk exposure there is the seasonality of the cash flows of farmers. As a result, business only generates revenues at a certain time within the year (Jain and Mansuri, 2003). The revenues take place during harvesting time. Correspondingly, the expenditures have to be made before planting time (Binswanger and Rosenzweig, 1986). However, the Standard Loan, which is one of the factors of success in microfinance, is organized like an annuity loan. As a result, the client is facing a rigid installment schedule. The repayment starts right after or very shortly after the disbursement date (Hamp and Laureti, 2011; Armendáriz de Aghion and Morduch, 2000). As a consequence, taking a Standard Loan leads to the situation that the farmer has to repay almost the entire disbursed amount before any revenue has been realized (Morduch, 1999). Non-farming businesses are normally not subject to seasonality, therefore, the generated cash flow of their financed project is simultaneous with the installment payments. Additionally, they are able to cross-finance their loan with

revenues of former or other projects. That is why the Standard Loan is better fitted to projects financed by non-farmers (Armendáriz de Aghion and Morduch, 2010; Morduch, 1999). Financing with Standard Loans is difficult for farmers, especially for farmers in developing countries. They are highly dependent on seasonality because they are typically unable to compensate it with modern techniques (Christen and Pearce, 2005).

Beyond credit rationing, dynamic incentives to increase repayment and progressive lending to meet the special needs of farmers as clients, there are already different approaches to challenge these problems. Meyer (2002) established in his study in Bangladesh, that farmers who have a cyclical cash flow, a loan which is organized like a fixed date loan, would be the best alternative. As a result, farmers would have to pay a lump sum in the end of the loan at the harvesting time. Christen and Pearce (2005) developed an approach which consists of ten features concerning the needs of a loan product which should help to overcome this mismatch between a rigid installment schedule and unsteady cash flows. One of their primary findings is that agricultural borrowers need an external financing with a flexible repayment schedule which can match and fit cyclical cash flows.

However, Hamp and Laureti (2011) point out that Flex Loans are triggering off a lower level of willingness to pay the money back. Thus, it is important for MFIs to figure out the trade-off between flexibility of a loan product and its incentive to pay back. Additionally, MFIs are still skeptical concerning the quality of the repayment performance due to Flex Loans. However, there has been some research done which does not establish a uniform reasoning for this fear. Godquin (2004) found out that loans with grace periods have fewer delinquencies. Furthermore, Weber et al. (2013) reveal that farmers having a Flex Loan with a grace period have lower levels of

delinquencies than Flex Loans without grace periods. Thus, granting grace periods influences the repayment performance in a positive way. Field et al. (2011) did a field experiment to determine the impact of the design of loans through MFIs. They proved that for an MFI located in Kolkata, India, that granting a two-month grace period and introducing flexibility leads to a higher level of delinquencies. However, they argue that granting a grace period attracts more risky investments while, those investments are more profitable on average. Moreover, Standard Loans with an immediate start of repayment are like a selection for less risky clients in advance. The borrowers who can meet these schedules are likely to have a big portfolio of income sources which leads accumulated to a steady cash flow; therefore, these farmers would be able to pay back the credit regardless (Armendáriz de Aghion and Morduch, 2010; Morduch, 1999). To our knowledge, we are the first that are observing the effect of Flex Loans on the repayment performance as a way of capturing the seasonality and the higher risk exposure of farmers in Azerbaijan. As a result, our third hypothesis is **H3 "Farmer Flex Loan":** Farmers with Flex Loan and non-farmers with Standard Loans have a different credit risk.

## 3 Data

The dataset has been provided by the AccessBank of Azerbaijan and has been generated from their Management Information System. The AccessBank was founded in 2002 (Access Holding, 2013). The data contains all loans from the initial foundation of the bank in 2002 until February 2013.

The bank provides a broad portfolio of products and is offering loans, saving accounts, credit cards and a money and payment services. The main clientele which is targeted with these products are micro and small enterprises. However, the AccessBank holds a full banking license and can therefore serve larger businesses as well. The three

different loans within the business loan portfolio currently offered by the AccessBank are outlined in Table 1.

**Table 1: Business Loans of the AccessBank of Azerbaijan**

| | Micro Loan | | Loan for Small and medium sized enterprises (SME) |
|---|---|---|---|
| | Standard Loan | FlexLoan | |
| Amount in USD | 100 – 30,000 | 100 – 30,000 | Up to 3,000,000 |
| Maximum Maturity | 48 months | 48 months | 60 months |
| Interest Rate per Month | 1.58% - 2.75% | 1.58% - 2.75% | Depending on the amount, term, provision, financial condition and credit history |
| Grace Periods | No | Yes | No |
| Collateral | Real estate, vehicles, home equipment, stock and guarantor | | |

Source: AccessBank 2013b

The Flex Loan was first launched in 2007. With this product the AccessBank is targeting the needs of its clients, since the majority of their business is agriculture based. As a result of the importance of agriculture in rural areas, the rural population benefits from the Flex Loan (AccessBank, 2013a). As it is shown in Table 1, beyond the conditions of the Standard Loan, the Flex Loan allows for granting grace periods which gives flexibility to the loan (AccessBank, 2013b).

The dataset under consideration contains 705,739 loans. The analyses are focused on two of the business loans of the AccessBank, namely Standard Loans and Flex Loans. After cleaning the data there are still 595,066 loans left for the analyses. To distinguish between farmer and non-farmer, the purpose of credit is viewed in a narrow sense. This means downstream and upstream businesses of agriculture are seen as non-farmers.

The descriptive statistics are provided in Tables 2 and 3. Farmers with a Flex Loan (N=4,041) and farmers with a Standard Loan (N=133,373), as well as non-farmers with a Flex Loan (N=1,296) have been compared with non-farmer clients with a Standard Loan (N=456,356). For all variables the mean and the standard deviation (SD) are given for the three different groups. To establish a first impression, a t-test is used for comparing the means of the different groups.

The credit risk of these different groups is presented in this analysis by three different levels of the Credit Risk Indicator (here and after: CRI), namely CRI1, CRI2 and CRI3. To investigate the CRI, the Portfolio at Risk (here and after: PAR) is considered. PAR is defined as the number of installments which were paid late by at least 1, 15 or 30 days in relation to the installments which were paid on time. One possible case could be a loan with 12 installments and 3 installments which are paid back ten days late. The CRI1 for this loan would be a result 0.25. Table 2 gives a look at the Credit Risk Indicators and Loan Characteristics.

**Table 2: Descriptive Statistics – Credit Risk Indicator and Loan Characteristics**

| | | Farmer | | Non-farmer | |
|---|---|---|---|---|---|
| | | Flex Loan | Standard Loan | Flex Loan | Standard Loan (reference group) |
| | | N = 4,041 | N = 133,373 | N = 1,296 | N = 456,356 |
| | Unit | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| CRI1 | Share | 0.0206*** | 0.0152*** | 0.0489*** | 0.0313 |
| | | (0.08134) | (0.0635) | (0.1261) | (0.0972) |
| CRI2 | Share | 0.0065*** | 0.0020*** | 0.0162*** | 0.0032 |
| | | (0.0547) | (0.0316) | (0.0788) | (0.0381) |
| CRI3 | Share | 0.0056*** | 0.0017*** | 0.0131*** | 0.0023 |
| | | (0.0515) | (0.0295) | (0.0720) | (0.0341) |
| Disbursed Amount | USD | 5,048.19*** | 2,349.56*** | 8,213.20*** | 2,946.66 |
| | | (4,410.906) | (1,844.848) | (7,941) | (3,489.628) |
| Collateral[a] | USD | 15,357.33*** | 6,380.32*** | 70,664.01*** | 11,222.69 |
| | | (23,092.8) | (10,140.6) | (23,842.6) | (115,992.5) |
| Existing deposit | 1/0 | 0.6008*** | 0.6517*** | 0.6844*** | 0.3215 |
| | | (0.4898) | (0.4764) | 0.4649 | (0.4671) |

Source: Author's calculations; t-test in comparison to non-farmer with Standard Loans; *p< 0.05, **p< 0.01, ***p< 0.001; Standard deviation in parentheses.

[a] The collaterals are only available for the last loan of every client. However, the value for the collaterals is assumed for all loans requested by the client.

Farmers with a Flex Loan have a lower CRI1 but a higher CRI2 and CRI3 in comparison to non-farmers with a Standard Loan. Farmers with a Standard Loan have significantly lower CRIs over all three levels in comparison to non-farmers with a Standard Loan. In contrast to that, non-farmers with a Flex Loan have a significantly higher credit risk than non-farmers receiving a Standard Loan. Beyond that, there can be a difference seen in the disbursed amounts and the pledged collaterals, which are accumulated over time. Obviously, the disbursed amounts for Flex Loans are higher than for Standard Loans. The distribution of the collaterals indicates that there is a

difference on how high the loans are covered on average between the different groups. The ratio between the disbursed amount and the pledged collateral is relatively low for farmers in comparison for non-farmers. The average ration of Standard Loans of non-farmer to collaterals is approximately 380%. Flex Loans of farmers have on average a value of pledged collaterals of about 300% of the disbursed amount, which is relatively low in comparison to non-farmers with a Standard Loan. For farmers receiving a Standard Loan, this value is even lower at roughly 270%. In relation to the share of an existing deposit, it can be seen, that non-farmers with a Standard Loan are less likely to have a deposit than the other three groups.

Looking at the clients characteristics from a broader perspective, in Table 3, the differences between the four groups can be seen as well. Farmers are on average significantly older (with Flex Loan: 47 years old; with Standard Loan: 48 years old, on average) compared to non-farmers with a Standard Loan (45), while even non-farmers with a Flex Loan are significantly older. Additionally, agriculture clients are more likely to be male (93%; 87%). Moreover, only 72% of the non-farmers with a Standard Loan are male. Differences can be recorded in relation to marital status and family size as well. The share of married farmers is considerably higher in comparison to non-farmers irrespective of whether the farmer receives a Standard Loan or a Flex Loan. The share of being a repeated client is approximately 55% for non-farmer clients receiving a Standard Loan; the share for repeated non-farmers having a Flex Loan is significantly higher. On the contrary, farmers having a Flex Loan have a significantly smaller share of being a repeated client.

**Table 3: Descriptive Statistics – Client Characteristics**

| | | Farmer | | Non-farmer | |
|---|---|---|---|---|---|
| | | Flex Loan | Standard Loan | Flex Loan | Standard Loan (reference group) |
| | | N = 4,041 | N = 133,373 | N = 1,296 | N = 456,356 |
| | Unit | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Age | Years | 46.80*** | 47.49*** | 45.34** | 44.63 |
| | | (10.158) | (11.211) | (9.68) | (10.66) |
| Gender | 1/0 | 0.9327*** | 0.8742*** | 0.8094*** | 0.7152 |
| | | (0.2506) | (0.3316) | (0.3929) | (0.4513) |
| Marital Status | 1/0 | 0.8500*** | 0.8450*** | 0.8002*** | 0.7433 |
| | | (0.3571) | (0.3619) | (0.4000) | (0.4368) |
| Family Member | Number | 5.3061*** | 5.2431*** | 4.5131** | 4.3876 |
| | | (1.7824) | (1.7554) | (1.6222) | (1.5480) |
| Repeated client | 1/0 | 0.5367 | 0.4744*** | 0.6844*** | 0.5497 |
| | | (0.4987) | (0.4993) | (0.4649) | (0.4975) |
| Seasonal Cash Flow | % | 32.07 | 21.52 | 0 | 0 |

Source: Author's calculations; t-test in comparison to non-farmer with Standard Loan; $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$; Standard Deviation in parantheses.

As it can be seen in the last row of Table 3, the percentage of farmers with a seasonal cash flow is considerably different between farmers having a Flex Loan and farmers having a Standard Loan. 30.8% of the farmers with a Flex Loan announce that their sector of credit is crop, fruit or vegetable production. The rest are animal producers which tend to face a more continuous cash flow in general. However, the purpose of credit of the animal producers in this group is to generate a cash flow which is not continuous. In the group of farmers with a Standard Loan, the share of animal producers is higher. As a consequence, only 21.52% of the farmers indicate a sector of credit which is affected by seasonality.

## 4 The Econometric Model

To investigate the credit risk, the CRI is considered. As mentioned in the descriptive statistics section, the value of the variables CRI1, CRI2 and CRI3 reach positive values for these observations which have been overdue at least once. For the rest of the observations, the value equals zero. Relating to the structure of the dataset under consideration, the Tobit Model is chosen to be applied for testing the hypotheses. The Tobit Model has been developed especially for datasets which are truncated or censored on one or two sides. The case under consideration is censored at zero and has no upper

limit (Tobin, 1958; Verbeek, 2012; Wooldridge, 2009).

For every level of CRI, one independent Tobit Model is estimated. The equation for the estimation is as follows:

$$D_{i,t} = \beta_0 + \beta_1 \cdot fsl_{i,t} + \beta_2 \cdot ffl_{i,t} + \beta_3 \cdot nffl_{i,t} + \beta_4 \cdot collateral_i + \beta_5 \cdot collateral \cdot farmer_i + \boldsymbol{\gamma} \cdot character_{i,t} + \boldsymbol{\delta} \cdot branch_i + \boldsymbol{\rho} \cdot year_t + u_{i,t} \quad (1)$$

*D* is the dependent variable and represents the CRI for a loan of a certain client *i* and a certain year *t*. The independent variable $\beta_0$ is the intercept of the model. The dummy $fsl_{i,t}$ represents all farmers having a Standard Loan. Besides, $ffl_{i,t}$ are farmers having a Flex Loan. Simultaneously, the dummy $nffl_{i,t}$ stands for non-farmers with a Flex Loan. The group of non-farmers with a Standard Loan is the reference group and therefore is not accounted for in the equation. This group represents the standard client of MFIs and has existed since the foundation of the AccessBank in Azerbaijan, and thus, is a good reference group in this case. As a result, the reference group consists of all non-farmers irrespective of whether they have a Standard Loan or a Flex Loan. To show the effect of collaterals on the repayment performance, two additional terms have to be introduced. The variable $collateral_i$ shows the effect of pledged collaterals on the CRI of non-farmers because they are the reference group in this case. To investigate whether there is a difference between the effect of the collaterals for non-farmers and farmers, the interaction term $collateral \cdot farmer_i$ is introduced. The term indicates the difference of the effect of the pledged collaterals on the credit risk for farmers in comparison to non-farmers. $Character_{i,t}$ is a vector which contains loan and personal characteristics. The variables of the vector are: disbursed amount, existing deposit, age, gender, marital status, family member and repeated client. Furthermore, $branch_i$ represents the different branch offices of the AccessBank of Azerbaijan and $year_t$ is a variable which

stands for the year of the disbursement. Finally, $u_{i,t}$ is the error term.

## 5 Estimation Results and Discussion

Table 4 shows the estimation results of three Tobit Estimations, one per CRI. Furthermore, the results show the effect of collaterals on the repayment performance. In addition to that, the differences between the two client groups, farmers and non-farmers, and the loan products can be seen along with socio-economic variables.

**Table 4: Tobit Estimations concerning the different loan products and the collaterals[a]**

| Variable | Unit | CRI1[b] | CRI2[b] | CRI3[b] |
|---|---|---|---|---|
| Farmer & Standard Loan (*fsl)* | 1/0 | -0.0168*** | -0.0572*** | -0.0437*** |
| | | (0.00229) | (0.00238) | (0.00348) |
| Farmer & Flex Loan (*ffl)* | 1/0 | 0.0444*** | 0.210*** | 0.294*** |
| | | (0.00903) | (0.00360) | (0.00556) |
| Non Farmer & Flex Loan (*nffl)* | 1/0 | 0.156*** | 0.550*** | 0.686*** |
| | | (0.0126) | (0.00311) | (0.00358) |
| Collaterals | USD | -0.000000793*** | -0.00000556*** | -0.00000829*** |
| | | (7.74e-08) | (5.18e-08) | (8.39e-08) |
| Collateral · Farmer | - | 0.000000655*** | 0.00000503*** | 0.00000727*** |
| | | (0.000000179) | (0.000000120) | (0.000000136) |
| Disbursed Amount | USD | 0.000000988** | 0.0000430*** | 0.0000605*** |
| | | (0.000000352) | (0.000000376) | (0.000000420) |
| Age | number | -0.00204*** | -0.00505*** | -0.00633*** |
| | | (0.0000633) | (0.0000538) | (0.0000794) |
| Gender | 1/0 | -0.0131*** | 0.0572*** | 0.0747*** |
| | | (0.00150) | (0.00225) | (0.00333) |
| Marital Status | 1/0 | -0.0508*** | -0.132*** | -0.142*** |
| | | (0.00154) | (0.00218) | (0.00321) |
| Family Member | number | -0.00814*** | -0.0331*** | -0.0423*** |
| | | (0.000416) | (0.000498) | (0.000734) |
| Repeated Client | 1/0 | -0.0351*** | -0.00752*** | 0.0372*** |
| | | (0.00134) | (0.00208) | (0.00303) |
| N | | 595,066 | 595,066 | 595,066 |
| Uncensored observations | | 95,547 | 6,938 | 4,287 |
| Log-pseudolikelihood | | -171,648.17 | -31,641.61 | -21,850.904 |
| Pseudo $R^2$ | | 0.0987 | 0.1018 | 0.1106 |

Source: Author's calculations

[a] Robust standard errors in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. The reference group is Non-farmer with a Standard Loan. The branch offices and years were included in the estimation, but are not shown here.

[b] CRI indicates the ration of the installments which were missed by at least 1, 15 and 30 days in relation to the paid installments.

The first hypothesis "H1 credit risk" stipulates that farmers have a different credit risk in comparison to non-farmers. To analyze this hypothesis, the CRI of farmers with a Standard Loan are compared with non-farmers receiving the same type of loan. As can be seen in Table 4, the first hypothesis can be accepted for all levels of CRI. However, the significant negative coefficients for *Farmer & Standard Loan* indicate that being a farmer has a negative impact on the CRI and therefore a positive impact on the

repayment performance. A possible explanation is that the majority of the farmers who receive a Standard Loan are not subject to seasonality. This can also be seen in the descriptive statistics: only 21.52% of the farmers receiving a Standard Loan have a seasonal cash flow. As a result, the majority of these farmers are animal producers, and are therefore facing a more continuous cash flow. That is why the repayment schedule of the Standard Loan better fits their repayment capacity. These results are consistent with those of Vogel (1981), Raghunathan (2011) and Weber et al. (2013).

The results show the impact of the pledged collaterals on the repayment performance of non-farmers. It can be seen that the coefficients of the variable *collaterals* are significantly negative and therefore collaterals seem to have a positive impact on the repayment quality of non-farmers. Furthermore, the interaction term *collateral:farmer* indicates that collaterals have a significant effect on the repayment performance for farmers on all levels of CRI. Consequently, the second hypothesis "H2 collaterals" can be accepted, i.e., it can be said that the collaterals are not only a commitment of the borrower as it is widely believed. Surprisingly, the coefficient is positive and therefore indicates that pledged collaterals have a negative impact on the repayment quality of farmers. Thus, collaterals cannot be seen as a risk managing tool for MFIs to capture the special risk situation of farmers. The opposite seems to be the case. Pledged collaterals are worsening the repayment performance. Kropp et al. (2009) have similar findings from an experiment which showed that poorer participants of their experiment have higher repayments. They argue that this could be the result of the clients demand for future access to external finance and their fear of being excluded. This effect might be even stronger for farmers since they still have lower access to finance. Beyond that, the effect of decreasing repayment quality with increasing levels of collaterals could be based on the crowding out effect. Crowding out indicates that economic incentives are

only a part of affecting human behavior. There are intrinsic incentives as well which are relevant for individuals in order to maximize their utility (Hirschauer and Zwoll, 2008). To transfer this effect onto the findings of this paper would mean the following: The lower the collaterals are, the higher is the intrinsic motivation to pay back the loan in time. Furthermore, there is a decrease of the willingness to pay back the loan with increasing monetary incentives like the collaterals (Frey and Jegen, 2001). Another explanatory approach could be that with a relatively high amount of pledged collaterals, the possibility that projects are granted increases. Hence, with granting higher collateralized projects, riskier projects are more likely to be granted. Thus, the combination of the already high risk associated production environment of farmers, along with the fact that riskier projects are financed, could establish a mixture of risk factors which leads to the observed results that the higher the collaterals, the worse is the repayment performance of farmers.

The third hypothesis "H3: Farmer Flex Loan" stipulates that granting a Flex Loan to farmers does significantly change the credit risk in comparison to non-farmers with a Standard Loan. The results show that there is a significant difference for all three levels of CRI. As a result, the third hypothesis cannot be rejected. The significant positive coefficients for the variable *Farmer & Flex Loan* indicate that granting grace periods has a negative effect on the repayment performance of farmers with a Flex Loan and it is even increasing over all three levels of CRI. This is in line with the results of Field et al. (2010) who have similar findings from a field experiment. They argued that granting a grace period allures more risky projects. In our data set, the share of the farmers having a seasonal production, and therefore seasonal cash flow, is higher in the *Farmer & Flex Loan* group. Obviously, granting Flex Loans does not help to smooth the effects of seasonality, primarily because there are other risk components that are also

influencing the cash flow and thus the repayment performance. A possible explanation for this goes in line with Field et al. (2011); hence, granting grace periods could attract riskier projects. However, there are studies that display contrasting results. Weber et al. (2013) found out that there is no difference in the repayment performance between farmers with a Flex Loan and non-farmers in Madagascar. Moreover, Godquin (2004) has evidence that grace periods have a positive impact on the repayment performance.

## 6 Conclusion

MFIs are still deterred from entering the rural and therefore agriculture market. Basically, farmers are facing several risk factors which are attached to their production and seasonality. As a result their cash flows are unsteady and unpredictable. Within the combination of individual lending, where creating incentives to replace the joint liability is already a topic, as well as the higher risk exposure of farmers, collaterals might be an appropriate tool to manage the higher risk. For MFIs beyond that, there are already established mechanisms, namely Flex Loans which are used to cope with seasonality. Therefore, this paper explores whether the higher risk exposure of farmers really affects the repayment quality in contrast to non-farmers. Beyond that, the aim of the paper is to give empirical evidence, whether pledged collaterals affect the repayment of farmers and can be used as a risk managing tool. Furthermore, we aim to determine whether Flex Loans can balance out seasonality.

Our finding is that pledged collaterals have an effect on the repayment performance of farmers. However, our findings give an indication that the role of collaterals cannot be seen as a risk managing tool for banks. The combination of granting riskier projects and the already riskier business environment for farmers provides a risk combination which affects the repayment performance in a negative way. As a result, collaterals do have an effect on the repayment performance but they are not suitable as a risk managing tool

for MFIs to capture the higher risk exposure of farmers. There is a need for other approaches of hedging the higher risk exposure of farmers, which might be hedging either the price risk or the weather related production risk.

However, the higher risk exposure of farmers is not the only reason that MFIs are deterred from entering rural and, therefore, agricultural markets. Seasonality is another important aspect which can increase the possibility of a bad repayment performance for farmers as seen from the point of view of the MFI. Our results show that farmers do not have higher delinquencies in general, but it depends on whether their cash flow is seasonal or not. Farmers with a steady cash flow and having a Standard Loan have good repayment performances. Besides that the most farmers are facing a seasonal cash flow which makes creates issues with repayment performances. Therefore, Flex Loans were introduced to help mitigate this problem. Unfortunately, the problems that are occurring with a seasonal cash flow are not balanced out with offering Flex Loans in this case. Moreover, Flex Loans with a grace period even have a negative impact on the repayment performance of farmers. The reason for this might be that aside from seasonality, other risk components still have an influence on the cash flow, and thus, the repayment performance.

For further findings it would be interesting to apply this approach in other countries. Especially for the findings with the collaterals it could be beneficial to investigate an MFI where the pledge of collaterals is not compulsory. Beyond that, the application of a sequential Logit Model could be an interesting approach towards obtaining further information. With this model it would be possible to apply only one estimation instead of three. As a result, the effect on the repayment performance would not be divided into the three CRI levels and an overall effect could be shown and interpreted. However, the sequential Logit Model has drawbacks that would need to be considered, for example,

the fact that the launched CRI from this paper could not be used. While applying the sequential Logit Model, the information regarding the repayment performance is reduced to different categories and some features of our dataset would not come into the picture.

## References


Access Holding, 2013: http://www.accessholding.com/Our_Network/ABA/; Accessed May 24th , 2013.

AccessBank, 2013a. Available at: http://www.accessbank.az/en/news/recognized-as-best-new-product/; Accessed May 24th , 2013.

AccessBank, 2013b. Available at: http://www.accessbank.az/en/page/business_credit/#contentLeft; Accessed May 24th , 2013.

Armendáriz de Aghion, B., Morduch, J., 2000. Microfinance beyond group lending. *Economics of Transition*. **8**, 401–420.

Armendáriz de Aghion, B., Morduch, J., 2010. The economics of microfinance. The MIT Press, Cambridge, London.

Binswanger, H. P., Rosenzweig, M. R., 1986. Behavioural and material determinants of production relations in agriculture. *Journal of Development Studies*. **22**, 503–539.

Cassano, F., Jõeveer, K., Svejnar, J., 2013. Cash flow vs. collateral-based credit. *Economics of Transition*. **21**, 269–300.

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

Churchill, C. F., 1999. Client-focused lending: the art of individual lending. Calmeadow.

Field, E., Pande, R., Papp, J., Rigol, N., 2011. Debt structure, entrepreneurship and risk: Evidence from microfinance. Harvard Working Paper.

Frey, B. S., Jegen, R., 2001. Motivation crowding theory. *Journal of economic surveys*. **15**, 589–611.

Godquin, M., 2004. Microfinance repayment performance in Bangladesh: How to improve the allocation of loans by MFIs. *World Development.* **32**, 1909–1926.

Hamp, M., Laureti, C., 2011. Balancing flexibility and discipline in microfinance: Innovative financial products that benefit clients and service providers. Available at SSRN 2155291.

Hirschauer, N., Zwoll, S., 2008. Understanding and managing behavioural risks: the case of malpractice in poultry production. *European Journal of Law and Economics.* **26**, 27–60.

Jain, S., Mansuri, G., 2003. A little at a time: the use of regularly scheduled repayments in microfinance programs. *Journal of Development Economics*. **72**, 253–279.

Meyer, R. L., 2002. The demand for flexible microfinance products: Lessons from Bangladesh. *Journal of International Development*. **14**, 351–368.

Miranda, M. J., Gonzalez-Vega, C., 2011. Systemic risk, index insurance, and optimal management of agricultural loan portfolios in developing countries. *American Journal of Agricultural Economics.* **93**, 399–406.

Morduch, J., 1999. The microfinance promise. *Journal of economic Literature*. **37**, 1569–1614.

Petrick, M., 2005. Empirical measurement of credit rationing in agriculture: A methodological survey. *Agricultural Economics.* **33**, 191–203.

Pischke, J. D. von, 2002. Innovation in finance and movement to client-centered credit. *J. Int. Dev*. **14**, 369–380.

Raghunathan, U. K., Escalante, C. L., Dorfman, J. H., Ames, G. C. W., Houston, J. E., 2011. The effect of agriculture on repayment efficiency: a look at MFI borrowing groups. *Agricultural Economics*. **42**, 465–474.

Stiglitz, J. E., Weiss, A., 1981. Credit rationing in markets with imperfect information. *The American economic review*. **71**, 393–410.

Subervie, J., 2008. The variable response of agricultural supply to world price instability in developing countries. *Journal of Agricultural Economics*. **59**, 72–92.

Tobin, J., 1958. Estimation of relationships for limited dependent variables. *Econometrica: Journal of the Econometric Society.* **26**, 24–36.

Verbeek, M., 2012. A guide to modern econometrics. John Wiley & Sons Ltd., The Atrium, Southern Gate, Chichester, West Sussex, England.

Vigenina, D., Kritikos, A. S., 2004. The individual micro-lending contract: is it a better design than joint-liability?: Evidence from Georgia. *Economic Systems.* **28**, 155–176.

Vogel, R. C., 1981. Rural financial market performance: Implications of low delinquency rates. *American Journal of Agricultural Economics.* **63**, 58–65.

Vogelgesang, U., 2003. Microfinance in times of crisis: The effects of competition, rising indebtedness, and economic crisis on repayment behavior. *World Development.* **31**, 2085–2114.

Weber, R., Musshoff, O., 2013. Can flexible microfinance loans improve credit access for farmers? *Agricultural finance review.* **73**, 255–271.

Wooldridge, J. M., 2009. *Introductory econometrics: a modern approach.* South-Western, Cengage Learning.