How flexible repayment schedules affect credit risk in microfinance

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Abstract

Purpose – Using a unique dataset of a commercial microfinance institution (MFI) in Madagascar, this paper investigates how the provisioning of microfinance loans with inflexible (standard loans) and flexible (flex loans) repayment schedules affects loan delinquencies of agricultural borrowers. Flexible repayment schedules allow a redistribution of principal payments during periods with low agricultural returns (grace periods) to periods when agricultural returns are high.

Design/methodology/approach – Taking into account the censored structure of our data, we estimate three different Tobit models for loan delinquencies of agricultural and non-agricultural micro-borrowers who received loans with and without grace periods.

Findings – Our results reveal that there are no significant delinquency differences between farmers and non-farmers who received standard loans. Furthermore, our results reveal that farmers with flex loans but without grace periods show significantly higher delinquencies than non-farmers with standard loans. We also find that this effect disappears as soon as farmers with flex loans were granted grace periods.

Research limitations/implications – Even if we can show that the provisioning of loans to farmers with grace periods does not increase the credit risk for the MFI, our results might

change with more business experience and also with an increasing number of loans disbursed by the MFI to agricultural farmers.

Practical implications – We find that flexible repayment schedules seem to be the core attribute to keep the credit risk of flex loans on the level of standard loans. Also, our findings confront the widespread wisdom that lending to agricultural firms is generally associated with higher credit risk than lending to non-agricultural firms.

Originality/value – To our knowledge, we are the first to investigate the effects of repayment schedule flexibility on loan delinquencies in general and for agricultural firms in particular.

Keywords: agricultural finance, loan repayment, microfinance, microfinance institutions
JEL Codes: G21, G32, Q14

Introduction

Lending techniques applied by microfinance institutions (MFIs) are adequate to reflect the business conditions of many micro, small and medium enterprises (MSMEs). Loan sizes are adapted to the borrowers' incomes based on intensive client assessments, relationships are established by carefully increasing loan amounts for good borrowers, and loan products are standardized by offering mainly annuity loans with loan repayment starting immediately after loan disbursement (namely standard loans). Product standardization is even considered as one of the main reasons for the high repayment rates and, hence, the success of microfinance (Armendáriz de Aghion and Morduch, 2000; Jain and Mansuri, 2003). But product standardization also has several drawbacks.

When repayment schedules cannot be harmonized with the occurrence of investment returns, the number of potential projects that can be realized is limited. In order for a project to be financed, fast turnovers and regular cash flows of nearly the same level are required. But especially longer term projects need time to mature before they generate returns sufficiently high enough to repay loan installments. In consequence, profitable investments might not even be realized due to mismatches between cash flow and repayment obligations (Field *et al.*, 2011). Most MFI clients are, hence, traders, using their loans to finance working capital, but the share of loans for long-term projects, however, remains low (Dalla Pellegrina, 2011).

Moreover, whilst microfinance has reached many urban entrepreneurs, it still needs to serve its mission for MSMEs in rural areas, particularly for entrepreneurs in the agricultural sector (Hermes *et al.*, 2011; Llanto, 2007). Most agricultural production types are characterized by a high level of seasonality leading to mismatches between expenditures during planting season

and revenues at the time of harvest (Binswanger and Rosenzweig, 1986). Especially here, standard loans with inflexible repayment schedules, which cannot account for seasonal cash-flow patterns of agricultural producers, seem to matter.

The provisioning of microfinance loans with flexible repayment schedules (namely flex loans) is, hence, stipulated by the literature (e.g., Llanto, 2007; Meyer, 2002; Dalla Pellegrina, 2011; Weber and Musshoff, 2013). But despite the potential of flex loans to increase the outreach of MFIs, most MFIs are still reluctant to make repayment schedules more flexible. They might fear that repayment schedule flexibility jeopardizes repayment quality. But there is no empirical evidence that could support this concern.

Therefore, the objective of this paper is to provide first empirical evidence how the provisioning of flex loans affects loan delinquencies of agricultural MFI borrowers. In order to do so, we estimate for a unique dataset provided by an MFI in Madagascar different Tobit-Models for delinquencies of agricultural and non-agricultural micro loans with and without repayment flexibility. This will allow us to investigate how the provisioning of flex loans affects loan delinquencies of agricultural firms, a group that is most affected by cyclical cash-flow patterns.

To our knowledge, we are the first who investigate the effects of repayment schedule flexibility on loan delinquencies in general and for agricultural firms in particular. Our findings will, thus, provide evidence whether the benefits of flexible repayment schedules are diminished by higher credit risk. Moreover, as flex loans are seen as a prerequisite for the financial inclusion of agricultural firms, our findings for loan delinquencies will allow for conclusions whether their financial inclusion will be sustainable.

The rest of this paper is organized as follows: In the second part, we will provide a brief overview about the motivation for different lending principles currently applied in microfinance and how these principles determine the projects financed by MFIs in developing countries. This leads us to our research hypotheses. In the third part, the data and the econometric model are discussed. After the discussion of the results in the fourth part, the paper ends with conclusions and suggestions for further research.

Literature Review and Hypotheses

The impacts of microfinance on developing countries are currently controversially discussed. Microfinance has achieved the financial inclusion of millions of micro, small and medium entrepreneurs that had no access to financial services before (Love and Peria, 2012). But after only thirty years since the foundation of the first Grameen Bank, there are already signals of microcredit over-supply and even borrower over-indebtedness, especially in emerging countries (Taylor, 2011; Vogelgesang, 2003). However, the contribution of microfinance to investment stimulation, employment generation, and economic development is less controversial (Duvendack *et al.*, 2011; Pande *et al.*, 2012).

In 1983, the first Grameen Bank started its operation in Bangladesh, applying a new cash-flow based group lending technique to address MSMEs that were considered too risky by existing conventional banks. Compared to conventional banking, group lending does not require the borrower to provide economically meaningful collateral as it transfers loan repayment obligations to a group of borrowers. The joint liability of the borrower group also overcomes adverse selection, moral hazard and contract enforcement problems which, in consequence, led to high loan repayment rates (Armendáriz de Aghion and Morduch, 2000). But group lending reaches its limitations in sparsely populated rural areas. Here, social ties among people might be strong, but participating in group meetings on a regular basis is time consuming and costly for the members. Also in cities, where people rarely know each other, group lending is less adequate (Armendáriz de Aghion and Morduch, 2000). However, in urban areas, the economic activity and, hence, the demand for credit is high. In order to overcome these limitations, the individual lending approach was introduced in microfinance. This approach combines the cash-flow based lending technique of group lending and the individual liability principle of conventional banking (Armendáriz de Aghion and Morduch, 2010). Driven by the support of donors, development finance institutions, and commercial banks, individual lending MFIs can today be found all over the world, although mainly in urban areas thus far (Llanto, 2007).

One of the main reasons for the success of MFIs is the provisioning of standard loans. Standard loans are widely used by group lending and individual lending MFIs. Despite the fact that repayment installments of standard loans are adapted to the income of the borrower, including the cash flow of the financed project and other income sources of the borrower's household (Armendáriz de Aghion and Morduch, 2010), repayment schedules of standard loans cannot be harmonized with the cash flow occurrence of the borrower. Thus, standard

loans might be adequate for businesses generating fast returns on a regular basis, e.g., petty traders (Llanto, 2007). But especially for longer-term projects, standard loans seem counterintuitive as such projects need time to mature before first returns are realized. Only if an entrepreneur is able to smooth temporary cash-flow shortfalls of the financed project by other income sources can the project be financed. In consequence, profitable projects cannot be realized at all or only with higher repayment risks when cash flow and repayment obligations do not match (Field *et al.*, 2011). Hence, product standardization might reduce default risks for clients with continuous cash flows but limit the focus of MFIs to projects fulfilling the product requirements (Weber and Musshoff, 2013). Unsurprisingly, most MFI clients are traders with fast turnovers, using their loans to finance mainly working capital. The share of long-term loans offered by MFIs and especially loans to entrepreneurs with seasonal returns typically found in the agricultural sector, however, remains low (Dalla Pellegrina, 2011).

Agricultural production is often characterized by a high level of seasonality which frequently leads to periodical imbalances between expenditures in the planting and revenues in the harvesting seasons (Binswanger and Rosenzweig, 1986). For this reason, loans with flexible loan repayment schedules harmonized with agricultural production cycles are often stipulated in the agricultural economics literature (Meyer, 2002; Dalla Pellegrina, 2011; Weber and Musshoff, 2013). In this context, Meyer (2002) argues that firms in Bangladesh with significant agricultural income would be better served with loan repayment schedules matching expected cash flows and shifting principal repayment to the time of harvest. Also, Dalla Pellegrina (2011) states that compared to (flexible) loans of informal money lenders and conventional banks, standard loans of MFIs are less suitable to finance agricultural projects. Weber and Musshoff (2013) find in their MFI analysis in Tanzania that standard loans might be the reason why agricultural firms have lower credit access probabilities than non-agricultural firms. The absence of adequate loan products for agricultural firms is, hence, considered to be one reason why the penetration of agricultural clients by MFIs is still low (Christen and Pearce, 2005; Llanto, 2007).

In addition to inadequate loan products, the outreach of MFIs to rural areas where most of the agricultural production takes place is compared to urban areas constrained by higher operational costs. The reason is that distances are larger and population densities are lower, making it more time and fuel consuming for banks to approach and to monitor borrowers (Armendáriz de Aghion and Morduch, 2010; Caudill *et al.*, 2009). Collection costs are considered to be one of the largest operational cost components in microfinance (Shankar,

2007). Reducing the number of repayment installments by provisioning flex loans could contribute to reduce operational costs, specifically collection costs. This might lead to efficiency gains for MFIs. This will, similar to advanced banking technologies such as mobile phone banking (Hermes *et al.*, 2011), ultimately lead to lower interest rates for the borrower in a competitive market. Gaining efficiency is especially relevant when MFIs operate in saturated markets or intend to approach new market segments associated with higher operational costs (Caudill *et al.*, 2009). Rather than increasing efficiency by disbursing larger loans sizes, an attempt that recently has been criticized to cause a mission-drift of MFIs from poor towards wealthier borrowers (Hermes *et al.*, 2011); the reduction of operational costs allows MFIs to approach new market segments (Caudill *et al.*, 2009) and to finance projects with lower returns (Armendáriz de Aghion and Morduch, 2010).

Despite the potential of flexible repayment schedules to increase efficiency and outreach of MFIs, most MFIs are still reluctant to make repayment schedules more flexible. They might fear that more flexibility reduces repayment quality. However, there is no empirical evidence that could support this concern. Most research focusing on the effects of flexible repayment schedules on loan repayment is based on filed experiments, and the results are mixed. In a field experiment in India, Field and Pande (2008) randomly assigned microfinance loans to borrowing groups of a MFI with either monthly or weekly repayment installments. They find that different repayment schedules have no significant influence on loan delinquencies. In a later experiment with the same MFI, Field *et al.* (2011) complement their first investigations by analyzing the effect of a two-month grace period[1] on loan delinquencies of borrowers. They find higher loan delinquencies for loans with grace periods. However, despite their randomization, the granting of grace periods was arbitrary and did not depend on the underlying cash-flow patterns of the borrowers. Hence, they were not able to control whether the investigated borrowers needed the grace period to compensate cash-flow induced liquidity shortfalls. In a similar experiment with randomly assigned loans to borrowing groups in India, Czura *et al.* (2011) tried to extend the earlier research and addressed potential cash-flow shortfalls of the borrowers implicitly. Therefore, they only focused on dairy farmers. This was motivated by the purpose of loan use. All borrowers in their experiment used the loans to buy lactating dairy cows, i.e., cows that were giving milk at the time of purchase but that would stop giving milk for two months after the lactation phase. This event was expected to occur a certain time after loan disbursement, and, hence, the borrower would suffer a cash-flow

[1] During a grace period the borrower only needs to partly fulfill his repayment obligations (principal, interests). The graced repayment obligations are postponed to future, usually when returns occur.

shortfall at that moment. Czura *et al.* (2011) assigned different loan types to the borrowers: standard loans, loans with pre-defined grace periods, and loans with flexible grace periods where the borrower was allowed to postpone up to two repayment installments at any time three months after loan disbursement[2]. Their results show that loan delinquencies of loans with flexible grace periods were not different from those of standard loans. Their experimental results for the effect of grace periods are also supported by Godquin (2004), who investigates the loan repayment behavior of MFI borrowers in Bangladesh, finding that loans with grace periods have significantly lower loan delinquencies than standard loans. These findings suggest that switching from standard loans to flex loans must not necessarily affect repayment quality. Moreover, these findings support the argument that decreasing the number of repayment installments bears potential to increase efficiency of MFIs as flex loans are not associated with higher loan defaults.

The current research on flex loans has two major shortcomings. First, stipulations of the agricultural finance research for flex loans are based on credit access investigations and solely for standard loans with inflexible repayment schedules (Llanto, 2007; Dalla Pellegrina, 2011; Weber and Musshoff, 2013). Nonetheless, this is not surprising because only few MFIs started targeting agricultural firms with flex loans thus far. Second, the investigations on loan delinquencies (Czura *et al.*, 2011; Field *et al.*, 2011; Field and Pande, 2008; Godquin, 2004) are mostly based on field experiments, and findings still need to be verified in practice; and despite that many of the existing MFIs use individual lending techniques, this research solely investigates the repayment behavior in group lending contexts.

Taking into account the attributes of standard and flex loans and the findings in the literature for the effects of flexible repayment schedules on loan repayment for firms with cyclical cash flows, our hypotheses (H) are the following:

H1 “Farmer Standard”: The credit risk of farmers with *standard loans* is not different from those of non-farmers with standard loans.

H2 “Farmer Flex”: The credit risk of farmers with *flex loans without grace periods* is not different from those of non-farmers with standard loans.

H3 “Farmer Flex Grace Period”: The credit risk of farmers with *flex loans and grace periods* is not different from those of non-farmers with standard loans.

[2] Given the monthly repayment plans, the postponement of two installments is similar to a two month grace period. Two month is the average resting phase of a dairy cow between two lactation periods. During the resting phase the cow produces no milk, and, hence, generates no returns but only costs.

Econometric Model and Data

Econometric Model

The econometric model for the repayment analysis is the following:

$$D_{i,t} = \alpha + \beta^{b} \cdot as_i + \beta^{d} \cdot asg_i + \beta^{h} \cdot af_i + \beta^{l} \cdot afg_i + \beta^{m} \cdot nsg_i + \beta^{n} \cdot nf_i + \beta^{o} \cdot nfg_i + \boldsymbol{\gamma} \cdot \mathbf{c}_{i,t} + Y_t + \boldsymbol{\varepsilon} \cdot \mathbf{s}_i + u_{i,t} \quad (1)$$

In equation (1) $D_{i,t}$ denotes the number of delinquent loan installments (delinquencies) of a loan which was disbursed in year t to a client i. Furthermore, α is a constant, as_i is a dummy variable accounting for farmers with standard loans, asg_i is a dummy variable accounting for farmers with standard loans and grace periods[3], af_i is a dummy variable accounting for farmers with flex loans, afg_i is a dummy variable accounting for farmers with flex loans and grace periods, nsg_i is a dummy variable accounting for non-farmers with standard loans and grace periods, nf_i is a dummy variable accounting for non-farmers with flex loans, nfg_i is a dummy variable accounting for non-farmers with flex loans and grace periods. Moreover, $\mathbf{c}_{i,t}$ is the vector of client and loan characteristics[4], Y_t is a time constant for the year t of loan application, $\mathbf{s}_i$ is a vector of dummy variables accounting for the branch offices where the loan was disbursed, $\boldsymbol{\gamma}$ and $\boldsymbol{\varepsilon}$ are parameter vectors and $u_{i,t}$ denotes the over i and t independently and identically distributed error term with a mean of zero and a variance of σ_u^2.

In equation (1), it is obvious that we consider eight different client groups, thereof the eight group, non-farmers with standard loans without grace periods, consequently serves as the reference group. This reference group is plausible for three reasons: First, it comprises the majority of all borrowers of ABT; second, this group can be observed since the MFI was founded, and, third, this group is the benchmark for the ABM management to judge the success of any product modification. Because we focus in our analysis on farmers with standard loans without grace periods, farmers with flex loans without grace periods and farmers with flex loans with grace periods the results for these groups are reported and further interpreted in the results section.

In order to investigate our hypotheses we investigate the number of loan installments the client missed to pay for 1, 15 and 30 days when due. These measures are applied by the bank

[3] A graced installment is defined by the bank as a repayment installment with a principal amount ≤ 53 % of the average principal amount. The average principal amount is defined as the monthly annuity payment calculated based on the interest rate and the maturity of the loan.

[4] The disbursed loan amount, age, sex, marital status, family size, work experience of the client, whether the client is a repeat client or holds a deposit with ABM, and the number of loan installments due at the time of extracting the data from the MIS.

to investigate the risk of her credit portfolio. Given the censored structure of our delinquency measures, we estimate equation (1) by three different Tobit models for all micro loans the bank disbursed until the date we extracted our data from the MIS.

The test for homoscedasticity was rejected on a high significance level.

Data

The econometric model is applied to a unique dataset provided by Accès Banque Madagascar (ABM). ABM is a commercial MFI with a special focus on MSMEs, operating as fully-fledged commercial bank and owned by their founders[5]. ABM was founded in 2007 and now offers its services through 16 branch offices in Madagascar and disburses all loans in local currency, Madagascar-Ariary (MGA). The procedures of the bank are specially designed and only allow for disbursing individual loans. No group loans are offered. At the moment, two different business loan products in the micro segment, standard loans and flex loans are offered. ABM started to offer flex loans in 2011. The flex loans are only disbursed by specially trained loan officers and can account for agricultural production specifics also by granting grace periods if this is necessary to match cash flows with repayment obligations. Thus, a farmer is generally able to receive a standard loan or a flex loan. Both, the decision whether a farmer receives a flex loan and whether a farmer is granted a grace period, are made by the bank based on the underlying cash-flow patterns of the farmer. It is also possible to grant grace periods for standard loans but the combination of standard loan and grace period is relatively seldom. Besides loans, ABM offers various types of deposits, automatic teller machine (ATM) services and (domestic and international) money transfer services.

The loan granting process of ABM is typical for commercial MFIs involved in individual lending and is similar to other banks of the Access Microfinance Holding AG (Weber and Musshoff, 2013). In addition to intensive on-site client assessments, this includes the verification of investigated information through cross-checks carried out by the loan officer and a decentralized loan decision on the branch office level through a credit committee. The whole assessment approach allows for the reduction of information asymmetries for the bank to a large extent which, apart from the cash-flow based approach, is one of the core principles of microfinance (Armendáriz de Aghion and Morduch, 2000, 2010).

Our dataset comprises all micro loans (standard loans and flex loans) that ABM has disbursed between February 2007 (the first month of operation) and May 2012, the month we received our data from the bank. Our data were extracted from the Management Information System

[5] Access Microfinance Holding AG, BFV-Société Générale, KfW, IFC, Triodos-Doen Fund.

(MIS) of the bank and includes loan and respective client data. The loan data (e.g. loan amounts, disbursement dates, branch office numbers) are generated automatically by the MIS as soon as a loan is disbursed. The client data, which are generated through the client assessments by the loan officers, are entered manually into the MIS and had to be cleaned for obvious data entering errors and outliers. After the data cleaning process, the remaining population consists of 93,985 disbursed working capital and investment loans, including 3,113/2,221 loans to agricultural entrepreneurs disbursed as standard loans/flex loans.

Results

The descriptive statistics of agricultural and non-agricultural micro-borrowers of ABM are provided in Table 1. Here, the mean comparison tests (t-test) between agricultural and non-agricultural clients with standard loans and flex loans and non-agricultural clients reveal that *loan delinquencies* in ABM are significantly different between farmers with standard/flex loans and non-farmers with standard loans. This finding is consistent over all of our three delinquency measures. Moreover, farmers with flex loans show the lowest delinquency levels. Taking into account that most of the farmers with flex loans have seasonal production types (e.g. crop production), the mean comparison tests imply the lowest credit risk for seasonal agricultural producers. However, as these comparisons do not allow taking additional borrower characteristics (e.g. grace periods) into account, results have to be interpreted with care. Table 1 further reveals large *household income* disparities between farmers and non-farmers, here with seasonal producers having only about 15% of the disposable income of non-farmers. This might be explained to a large extent by the geographical distribution of ABM clients. The four branch offices of ABM currently offering flex loans are situated in rural and semi-rural areas where incomes are generally lower than in urban areas. The income differences might also explain why *disbursed loan amounts* are lower for farmers and especially farmers with seasonal production types. Furthermore, interesting is the *gender* distribution, where our data reveals a male-dominated agricultural sector. Also, agricultural clients with flex loans have much more *work experience* than non-farmers. On the other hand, the group of farmers with flex loans reveals a much lower share of *repeat clients*, which is not surprising because flex loans were only introduced in ABM at the end of 2010.

[Insert Table 1 about here]

The results for the three Tobit estimations (delinquencies) are displayed in Table 2. The explanatory power of the three models is considered to be moderate with a pseudo R^2 of 0.04, 0.08, and 0.1 for the 1, 15, and 30 days delinquency measures, respectively.

[Insert Table 2 about here]

The results of our Tobit estimations reveal no significant delinquency differences between farmers and non-farmers with standard loans and without grace periods. This leads us to an acceptance of our first hypothesis, H1"Farmer Standard." Taking into consideration that most farmers with standard loans are animal producers with continuous returns, this result does not seem surprising. Thus, our results reveal that standard loans seem to be adequate for farmers with continuous returns and are in line with the findings of Weber and Musshoff (2013). However, these results confront the widespread wisdom that agricultural borrowers are generally riskier for the bank than non-agricultural borrowers. This at least applies for agricultural producers with non-seasonal production types. Hence, our results are in line with the findings of Vogel (1981), Raghunathan *et al.* (2011) and Field *et al.* (2011). These results are consistent for all three delinquency measures applied.

We additionally find significant differences between farmers with flex loans and non-farmers with standard loans (both groups without grace periods). Farmers with flex loans show significantly higher delinquencies than non-farmers with standard loans. This leads us to a rejection of our second hypothesis H2 "Farmer Flex," which hypothesizes that delinquencies of farmers with flex loans and without grace periods and non-farmers with standard loans are not significantly different. Whilst the provisioning of flex loans seems to be a prerequisite to create credit access for farmers with seasonal production types (Dalla Pellegrina, 2011; Weber and Musshoff, 2013), flex loans seem to provide no guarantee when dealing with repayment risks of seasonal agricultural producers. These results are consistent for two of the three delinquency measures applied, i.e., the number of loan installments that were missed by at least one day and by at least 15 days.

The question of whether grace periods affect the repayment behavior of borrowers with flex loans is the motivation for our third hypothesis H3 "Farmer Flex Grace Period," which hypothesizes that loan delinquencies of farmers with flex loans and grace periods are not significantly different from those of non-farmers with standard loans. We find indeed that this group does not repay its loans with different delinquencies than non-farmers with standard loans and without grace periods and we, hence, can accept our third hypothesis. Our results support the argument that grace periods are a crucial attribute for flex loans to bridge the wedge between discontinuous returns and continuous repayment obligations resulting from provisioning standard loans. However, it needs to be stated that our results are only robust for the first delinquency measure, i.e., the number of loan installments that were missed by at

least one day. For both of the other estimations, the insignificance is rather a result of a limited number of observations than reflecting an inexistent effect.

Summary and Conclusion

One of the main reasons for the success of microfinance is the provisioning of standard loans with loan repayments starting immediately after loan disbursement. But even if repayment installments of standard loans are adapted to the income of the borrower, repayment schedules cannot be harmonized with the cash flow occurrence. This might be the reason for the low penetration of entrepreneurs with seasonal returns which are typically found in the agricultural sector. Most MFIs are still reluctant to make repayment schedules of standard loans more flexible as they fear that more flexibility might reduce repayment quality.

Therefore, the objective of this paper is to provide first empirical evidence how the provisioning of microfinance loans with flexible repayment schedules affects loan delinquencies of agricultural borrowers. Flexible repayment schedules allow a redistribution of principal payments during periods with low agricultural returns (grace periods) to periods when agricultural returns are high. In order to do so, we estimate for a dataset provided by a MFI in Madagascar different Tobit models for the delinquency of agricultural and non-agricultural microfinance loans with/without flexibility.

Our results reveal that there are no significant delinquency differences between both farmers and non-farmers with standard loans, indicating that standard loans seem to be appropriate for farmers with continuous returns. Furthermore, our results reveal that farmers with flex loans and without grace periods show significantly higher delinquencies than non-farmers with standard loans. We also find that this effect disappeared as soon as farmers with flex loans were granted grace periods.

Our findings suggest that financing agricultural micro-borrowers does c.p. not increase the credit risk for the financial institution if farmers receive standard loans without grace periods or flex loans with grace periods. This finding confronts the widespread wisdom that lending to agricultural firms is generally associated with higher risk than lending to non-agricultural firms. Most of the investigated clients with standard loans are animal producers with continuous returns, suggesting the adequacy of standard loans for agricultural producers with continuous returns. Furthermore, almost all clients with flex loans are (seasonal) crop producers suggesting that the provisioning of loans to that group needs to be carefully implemented when it comes to the decision of whether or not to grant grace periods. For this

group, grace periods seem to be the key attribute to keep the repayment quality on the level of non-agricultural clients with standard loans.

Because the cost, of borrowing for flex loans is slightly higher compared to standard loans, and flex loans without grace periods show higher delinquency levels than non-agricultural clients with standard loans, there is further investigation needed to determine whether the higher borrowing costs can compensate for the higher delinquency levels of that group. For clients with flex loans and grace periods, the higher costs of borrowing do not need to compensate for higher credit risks. Moreover, grace periods increase the time span the principal amount is outstanding and, hence, increase the returns of the MFI. But it also has to be considered that the generally time-consuming client assessment procedures in microfinance are even more sophisticated and, therefore, costly for the agricultural sector. The cash flow of borrowers depends much more on market price developments and unforeseeable weather events which need to be judged carefully by the loan officers and the credit committee. Thus, the higher delinquency levels of flex loans without grace periods might also be related to inadequate decisions whether these clients actually needed grace periods to match their returns with their debt obligations. Judging the need for grace periods conservatively might increase the costs of borrowing. But as our results reveal, in the long term this might be better than increasing the costs of lending due to higher collection efforts when loans are in arrears. Even if we can show that the provisioning of loans to farmers with grace periods does not increase the credit risk for the MFI, our results might change with more business experience and also with an increasing number of loans disbursed by the MFI to agricultural firms.

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Table 1: Descriptive Statistics

Variable[1]	Unit[2]	Farmer[3] Standard Loan		Farmer[3] Flex Loan		Non-Farmer	
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Delinquencies (PAR 1)	number	1.18***	1.97	0.84***	1.45	1.30	2.21
Delinquencies (PAR 15)	number	0.11***	0.69	0.06***	0.39	0.16	0.90
Delinquencies (PAR 30)	number	0.07***	0.58	0.03***	0.29	0.10	0.75
Household Income	ThsMGA	1,945***	2,714	575***	853	3,623	6,758
Household Expenses	ThsMGA	1,633***	2,511	357***	694	3,268	6,483
Disbursed Loan Amount	ThsMGA	1,107***	1,677	624***	788	1,166	1,974
Age	years	40.61***	10.26	41.67***	11.07	39.80	9.74
Marital Status (Married)	1/0	0.88***	-	0.89***	-	0.85	-
Gender (Female)	1/0	0.52***	-	0.26***	-	0.59	-
Family Members	number	4.77***	1.89	5.55***	2.15	4.66	1.86
Work Experience	month	86.62***	65.70	165***	115	107.47	74.31
Repeat Client	1/0	0.35***	-	0.11***	-	0.38	-
Deposit	1/0	0.68***	-	0.71***	-	0.65	-
Number of Observations, thereof	number	3,113		2,221		88,651	
with grace period s	number	73		188		1,505	

[1] PAR, Portfolio at risk; PAR 1, PAR 15, PAR 30 indicate the number of loan installments that were missed by ≥ 1, ≥ 15 and ≥ 30 days respectively when due.

[2] ThsMGA, thousand Malagasy-Ariary. Mean values for dummy variables (1/0) indicate ratios.

[3] Farmer Standard Loan, farmer with standard loan; Farmer Flex Loan, farmer with flex loan; Non-Farmer, non-farmer with standard loan; ***,**,* indicate a significant mean difference between farmers with standard loans and farmers with flex loans compared to non-farmers on a 1%, 5% and 10% level respectively. Comprises only primary agricultural producers, i.e., livestock, crop as well as fruit and vegetable producers.

Table 2: Estimation Results

Variable	Unit[2]	Tobit-Estimations[1]		
		PAR 1[3]	**PAR 15**[3]	**PAR 30**[3]
Intercept		-0.349	-10.03***	-14.45***
		(0.261)	(0.953)	(1.399)
Farmer[4] with Standard Loan (**as**)	1/0	-0.0548	-0.374	-0.549
		(0.0902)	(0.321)	(0.463)
Farmer[4] with Standard Loan and grace period (**asg**)	1/0	0.683	-0.495	-0.965
		(0.436)	(2.108)	(3.132)
Farmer[4] with Flex Loan (**af**)	1/0	0.524***	1.188*	0.0920
		(0.125)	(0.468)	(0.727)
Farmer[4] with Flex Loan and Grace Period (**afg**)	1/0	0.180	-0.684	-0.639
		(0.317)	(1.691)	(2.614)
Disbursed Loan Amount	ThsMGA	0.0000353	0.000244***	0.000400***
		(0.0000200)	(0.0000586)	(0.0000807)
Disbursed Loan Amount Square	-	-4.57e-10	-1.03e-08**	-2.18e-08***
		(1.41e-09)	(3.92e-09)	(5.85e-09)
Age	years	0.0293*	0.0283	0.0414
		(0.0120)	(0.0418)	(0.0597)
Age Square	-	-0.000657***	-0.00103*	-0.00148*
		(0.000140)	(0.000495)	(0.000714)
Gender (Female)	1/0	0.00263	-0.0805	-0.0472
		(0.0338)	(0.106)	(0.147)
Marital Status (Married)		-0.592***	-0.968***	-1.271***
		(0.0498)	(0.151)	(0.207)
Family Members	number	-0.197***	-0.211	-0.199
		(0.0307)	(0.113)	(0.158)
Family Members Square	-	0.0132***	-0.00651	-0.00864
		(0.00278)	(0.0117)	(0.0166)
Work Experience	month	-0.00289***	-0.00631**	-0.00740**
		(0.000592)	(0.00196)	(0.00280)
Work Experience Square	-	0.00000537***	0.00000901	0.0000110
		(0.00000154)	(0.00000535)	(0.00000787)
Deposit	1/0	-2.474***	-4.970***	-5.846***
		(0.0457)	(0.129)	(0.176)
Repeat Client	1/0	0.663***	0.726***	1.079***
		(0.0348)	(0.110)	(0.152)
Number of Observations, thereof		65,535	65,535	65,535
Consored at the threshold of zero		35,605	63,377	63,377
Log-Likelihood Value		-102,432.68	-19,668.59	-12,801.863
(pseudo) R-square		0.04	0.08	0.09

[1] ***,**,* indicate a significance on 1%, 5% and 10% level respectively. Estimation results based on the reference group "Non-farmer with standard loan without grace periods". Robust standard errors in parentheses. Estimation results for the other client groups listed in equation (1), the vector of branch offices, and year dummies are not provided here.

[2] ThsMGA, thousand Malagasy-Ariary.

[3] Indicates the number of loan installments that were missed by > 1, >15 and >30 days respectively when due.

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