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Does pre-defined flexibility come with the cost of higher credit risk? Evidence from agricultural micro lending in Madagascar

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Abstract

Using a unique dataset from a commercial microfinance institution in Madagascar, this paper investigates how the provision of microfinance loans with (in)flexible repayment schedules affects loan delinquencies of agricultural borrowers. We estimate different repayment functions to compare loan delinquencies of agricultural and non-agricultural borrowers and apply a quasi-experimental approach to investigate whether introducing flexible repayment schedules affects loan delinquencies of seasonal agricultural borrowers. In this attempt, three different delinquency categories reflecting different levels of credit risk are assessed. Our results reveal that loan delinquencies of non-seasonal agricultural borrowers without grace periods are not significantly different from those of non-farmers. Furthermore, we find that seasonal agricultural borrowers with grace periods show significantly higher delinquencies than non-farmers. Within the group of agricultural borrowers we find that introducing grace periods increases delinquency levels only in the lowest delinquency category, while we find no significant effect in the higher delinquency categories.



1. 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 & Morduch, 2000; Jain & 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. In particular, longer-term projects need time to mature before they generate returns sufficiently high enough to repay loan installments. Consequently, 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, while microfinance has reached many urban entrepreneurs, there are still important deficits in serving 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 & Rosenzweig, 1986). Especially here, standard loans with inflexible repayment schedules, which cannot account for seasonal cash-flow patterns of agricultural producers, seem to be unsuitable.

The provision of microfinance loans with flexible repayment schedules (namely flex loans) is, therefore, supported in the literature with an agricultural context (e.g., Llanto, 2007; Meyer, 2002; Dalla Pellegrina, 2011; Weber & Musshoff, 2013). Nonetheless, despite the potential of flex loans to increase the outreach of MFIs, most MFIs are still reluctant to make repayment schedules more flexible. They likely fear that repayment schedule flexibility jeopardizes

repayment quality. However, there is only very little evidence on the effects of flexible repayment conditions on credit risk in (agricultural) microfinance.

Therefore, the objective of this paper is to contribute to filling this gap by providing empirical evidence on how the provisioning of flex loans (with pre-defined grace periods) affects loan delinquencies of agricultural microfinance borrowers. In order to do so, we will estimate different repayment functions with unique data provided by an MFI in Madagascar that started its business operation with standard loans and introduced flex loans with pre-defined grace periods subsequently. This is done to compare delinquencies of agricultural and non-agricultural borrowers. The repayment functions are estimated by different Tobit models for three different loan delinquency categories. In addition, we investigate within the group of farmers whether introducing flexible repayment schedules affects loan delinquencies of seasonal agricultural borrowers. This is done by applying different propensity score matching methods in order to compare flex loans with standard loans that were disbursed to farmers before flex loans were introduced by the MFI.

To our knowledge, we are the first to empirically investigate the delinquency effects of pre-defined grace periods in general and for Africa in particular. Our findings will, thus, provide evidence on how repayment flexibility affects credit risk. Moreover, as flex loans are seen as a prerequisite for the financial inclusion of agricultural firms, our investigations can help MFIs to explore the potential of pre-defined grace periods.

The rest of this paper is organized as follows: In the second part, we will provide a brief overview on how different repayment terms determine projects financed by MFIs in developing countries. Furthermore, we will discuss the findings of empirical and experimental literature investigating the effects of repayment flexibility on loan delinquencies. In the third part, the lending procedures of the MFI investigated within this paper will be presented, leading us to our research hypotheses. In the fourth part, the data for our investigations and our empirical approach are discussed. After the discussion of the results in the fifth part, the paper ends with conclusions and suggestions for further research.

2. Literature review

The impacts of microfinance on MSMEs in developing countries are currently controversially discussed. Microfinance has achieved the financial inclusion of millions of micro, small, and medium entrepreneurs that previously had no access to financial services (Love & Peria, 2012).

But after only thirty years since the foundation of the first Grameen Bank, there are already signs 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 Grameen Bank started its operation in Bangladesh, applying a new cash-flow based lending technique to address MSMEs that were considered too risky by existing conventional banks. Driven by the support of donors, development finance institutions, and commercial banks, MFIs can be found all over the world today, although mainly in urban areas (Llanto, 2007).

One of the main reasons for the success of MFIs is the provision of standard loans. Standard loans are widely used by MFIs. Repayment installments of standard loans are adapted to the income of the borrower, including the cash flow levels of the financed project and other income sources of the borrower's household (Armendáriz de Aghion & Morduch, 2010). However, 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). 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. As a 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 increase the repayment incentive for clients with continuous cash flows but limit the focus of MFIs to projects fulfilling the product requirements (Weber & Musshoff, 2012). Unsurprisingly, most MFI clients are traders with fast turnovers, using their loans to mainly finance working capital. The share of long-term loans offered by MFIs remains low, especially loans to entrepreneurs with seasonal returns typically found in the agricultural sector (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 & Rosenzweig, 1986). For this reason, loans with flexible repayment schedules harmonized with agricultural production cycles are often suggested in the agricultural economics literature (Meyer, 2002; Dalla Pellegrina, 2011; Weber & 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 & Musshoff (2012) 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 & Pearce, 2005; Llanto, 2007). Despite the potential of flexible repayment schedules to increase the outreach of MFIs, most MFIs are still reluctant to make repayment schedules more flexible. They might fear that more flexibility reduces repayment quality (Jain & Mansuri, 2003). However, there is only very little evidence revealing how flexible repayment conditions affect credit risk in microfinance.

The majority of the existing research is experimental, focusing on the effects of flexible repayment schedules on loan repayment. In a field experiment in India, Field & Pande (2008) randomly assign microfinance loans to mostly non-agricultural 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 borrowers of the same MFI, Field et al. (2011) complement their first investigations by analyzing the effect of a two-month grace period¹ on loan delinquencies of non-agricultural borrowers. They find higher loan delinquencies for loans with grace periods. In a similar experiment with randomly assigned loans to borrowing groups in India, Czura et al. (2011) extend the earlier research and implicitly address potential cash-flow shortfalls of the borrowers. Therefore, they focus on dairy farmers. This is motivated by the purpose of loan use. All borrowers in their experiment use 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 is expected to occur a certain time after loan disbursement, and, hence, the borrower would suffer a cash-flow shortfall at that point in time. Czura et al. (2011) assign different loan types to the borrowers: standard loans, loans with pre-defined grace periods, and loans with flexible grace periods where the borrower is allowed to postpone up to two repayment installments at any time three months after

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

loan disbursement². Their results show that loan delinquencies of loans with pre-defined grace periods are not different from those of standard loans, while loans with flexible grace periods show significantly higher arrears at the end of the loan cycle. 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 may not necessarily affect repayment quality. Moreover, the experimental results with pre-defined grace periods from Czura et al. (2011) suggest that there is not necessarily a need for a maximum repayment flexibility, i.e., the MFI instead of the client decides when grace periods are appropriate. Given the framework conditions in microfinance, where in-depth client assessments of MFI staff are done because the clients themselves often do not or are not able to document their business activities, this seems plausible; leaving borrowers with the decision when grace periods should be applied might overwhelm them. Moreover, for the pre-definition of grace periods, the forecast of future cash-flows is necessary. Here, taking into account future financing events (e.g., the exact timing when cows stop giving milk) is a prerequisite for pre-defined grace periods and is also a further development of established microfinance principles which, in the case of standard loans, are based on looking into the past to assess future cash flows of clients.

3. Lending procedures of the MFI investigated and hypotheses

3.1 Lending procedures of the MFI investigated

The MFI investigated in this paper is AccèsBanque Madagascar (ABM), a commercial MFI with a special focus on MSMEs, operating as a fully-fledged commercial bank and owned by its founders³. ABM was founded in 2007 and now offers its services through 17 branch offices in Madagascar, disbursing all loans in local currency, Madagascar-Ariary (MGA). The branch network of ABM reaches far beyond the capital, Antananarivo, where ABM began its business. In 2013, the authors undertook extended field visits to different branch offices of ABM where standard loans and flex loans are offered. The procedures of the bank are specially designed and only allow for disbursing individual loans. No group loans are offered. At the moment, there are

² Given the monthly repayment plans, the postponement of two installments is similar to a two-month grace period.

Two months 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 only costs and no returns.

³ Access Microfinance Holding AG, BFV-Société Générale, KfW, IFC, Triodos-Doen Fund.

six different business loan products in the micro segment: standard loans, housing loans, emergency loans for unforeseen private expenditures (e.g., accidents), flex loans with/without grace periods, warehouse receipt loans⁴, and value chain loans in cooperation with an input supplier⁵. Besides loans, the bank offers different types of deposits and 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. In addition to intensive on-site client assessments, this includes the verification of investigated information and securities 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 & Morduch, 2000, 2010).

In Madagascar, about 70% of the total population (most of it living in rural areas) is employed in the agricultural sector, and the mainly small scale agricultural sector contributes about 35% to the country's GDP, after the (mainly informal) services and (mining) industries sectors. Hence, for ABM to successfully reach small entrepreneurs in rural areas it has to ultimately acknowledge agricultural production circumstances and simultaneously consider the local specifics in the microfinance sector. Our field studies reveal that the competition in Madagascar's formal microfinance sector can generally be considered as high for urban areas and moderate for rural areas. In rural areas, most of ABM's flex loans are disbursed. There are two competitors for ABM in agricultural lending that offer similar products. ABM introduced flex loans four years after its foundation but only in selected branch offices in rural areas. In this attempt, standard loans had to be adapted. Except for animal producers and dairy farmers, all farmers are considered as seasonal by the bank. Seasonal agricultural loan applicants with more than 50 % of their income generated through primary agricultural production receive a flex loan. The loan applicant cannot decide which loan type he will receive; this decision is made by the bank ex-ante, i.e., before the loan assessment takes place. The reason is that flex loans can only be

⁴ ABM owns the warehouses and takes stocks of crops (currently only rice) from farmers (at market prices) as loan collateral. During the loan repayment period, the stock can be reduced according to the changing collateral requirements. ABM charges the client with a stock depositing fee. Besides getting the stock as collateral accepted, the farmer benefits from increasing crop prices after the harvesting season.

⁵ ABM cooperates with an input supplier for poultry production. If a loan applicant fulfills the requirements to raise a high-yield poultry breed, he will use the loan from ABM to buy a full package to raise these chickens from the input supplier (chicken, vaccination, feed). Thus, the farmer generates higher returns through a better chicken breed, and the bank reduces its risk that the client's business will work out unsuccessfully.

assessed by special loan officers of ABM which are able to assess standard loans and flex loans. This is especially relevant because most agricultural firms in Madagascar have also non-agricultural income sources.

The main difference between standard loans and flex loans during the loan assessment is how future cash flows of the client are considered to determine the client's repayment capacity, i.e., the amount the client is able to use for loan repayment per month as loans of ABM must be repaid on a monthly basis. Typically for standard loans, the cash flows of the client during a given period before the loan application are expected to also occur in the future. This is the standard approach in microfinance. The repayment capacity is calculated by ABM on the average monthly cash flow minus all the client's private expenditures. The remainder is then reduced by 30% to allow covering unforeseeable expenses (e.g., accidents) without jeopardizing loan repayment. Especially for flex loans, the common practice of transferring past cash flows into the future would be misleading as most farmers (despite the high seasonality of expenditures and returns) usually rotate crops year by year. Furthermore, commodity prices vary. Thus, the responsible loan officer structures together with the client a cash flow calendar by assessing not only plantation and harvesting periods but also all related costs and returns of an agricultural activity on a monthly basis. Because most farmers' agricultural activities are diversified, this needs to be done for all agricultural activities of the farmer. As most farmers also have income from non-agricultural sources, these sources also need to be considered. The higher a seasonal farmer is diversified, the less likely it is he will c.p. face months with negative cash flows and, hence, negative repayment capacities.

For months with negative repayment capacities, flex loans allow for granting grace periods, which are pre-defined as they rely on the cash-flow forecast jointly undertaken by the loan officer and the farmer. Grace periods in ABM are defined by months with loan repayments below the debt-service that would be due with the application of a standard loan. There are also possible consecutive grace periods, and cash-flow analyses are verified by credit committee members for each loan on the branch level. One further difference to standard loans is the frequency and the purpose of client visits after loan disbursement. The final decision, however, whether a farmer is granted a grace period is made by the bank and is based on the estimated future cash-flow patterns of the farmer which were identified during the client assessment by the loan officer and the farmer. It is also possible to grant grace periods for standard loans in exceptional cases. Consequently, ABM applies a system of pre-defined grace periods and does not allow the farmer

to choose on a later stage which installments to be graced, e.g., when the cash-flow forecast deviates from the cash-flow realized. If the farmer decides not to accept the grace period decision, the loan cannot be disbursed.

Besides the crop calendar and grace periods, flex loans differ from standard loans also by their post-disbursement characteristics. While with standard loans only one visit is foreseen to keep in contact with the client before the first repayment installment (for standard loans typically one month after disbursement), one additional visit takes place with flex loans. The purpose of these visits is to verify that the loan was used to finance the intended activity. The reason for this verification is that for the cash-flow estimation the returns of the financed activity were considered, and a deviation (e.g., when the farmer plants another crop) increases the probability that the client runs into repayment problems. The expert interviews conducted during our field visits reveal that despite ABM's additional efforts for flex loans, the costs of flex loans are only 4-6% higher when compared to standard loans. This leads to only slightly higher p.a. interest rates for flex loans.

3.2 Hypotheses

Considering the findings in literature from Czura et al. (2011) for the effects of pre-defined grace periods on loan delinquencies as well as the loan assessment procedures of ABM and the attributes of ABM's standard and flex loans, we will investigate the effects of pre-defined grace periods on loan delinquencies along the following four hypotheses (H):

H1 "Standard effect": The credit risk of farmers with standard loans is not different from those of non-farmers with standard loans.

H2 "Flex effect": The credit risk of farmers with flex loans without grace periods is not different from those of non-farmers with standard loans.

H3 "Grace period effect": The credit risk of farmers with flex loans with grace periods is not different from those of non-farmers with standard loans.

H4 "Introduction effect": The credit risk of farmers with flex loans (treatment group) with grace periods is not different from those of farmers with standard loans (control group).

4. Data and econometric approach

4.1 Data

Our dataset comprises all micro loans (standard loans and flex loans) that ABM has disbursed between February 2007 (the first month of operation) and December 2012, the month we received our data from the bank. Our data was extracted from the Management Information System (MIS) of the bank and includes loan and respective client data. The loan data (e.g. disbursed loan amounts, disbursement dates, branch office numbers) is generated automatically by the MIS as soon as a loan is disbursed. The client data, which is generated through the client assessments by the loan officers, is entered manually into the MIS and needs to be cleaned for obvious data entering errors and outliers. After the data cleaning process, the remaining population consists of 80,519 disbursed working capital and investment loans, including 2,790 loans to agricultural entrepreneurs disbursed as standard loans and 2,928 disbursed as flex loans.

The descriptive statistics of micro-borrowers of ABM are provided in Table 1, along different client groups, and in Table 2, along three different delinquency categories. The three delinquency categories measure the number of loan installments a client failed to pay for more than 1, 15, and 30 days when due, respectively. These categories are derived from the portfolio at risk (PAR) measure applied in banking for monitoring loan portfolio risk on a daily basis. The PAR indicates the share of loans which are overdue by a certain number of days from the moment the loan portfolio analysis is carried out. The limitation of the PAR measure is its validity, limited strictly to the moment when the loan portfolio is analyzed. For this reason, the categories we apply take the frequency of loan delinquencies over the whole loan repayment period into account⁶. Consequently, our delinquency categories I, II, and III indicate increasing credit risk, whereas the third, the number of loan installments that were missed by 30 days or more, indicates the highest credit risk⁷.

[Insert Table 1 about here]

In Table 1 the mean comparison tests (t-test) between agricultural clients with standard loans/flex loans and non-agricultural clients reveal that mean values of *loan delinquencies* in ABM are

⁶ Alternatively, we could investigate the probability that a loan is overdue once for a certain number of days, but such an analysis could not explore all the repayment information available.

⁷ As soon as a loan is overdue for 30 days or more, the bank has to reserve loan loss provisions, resulting in effective costs on the profit and loss statement until the installment is paid. These costs are additional to those caused by higher administrative efforts to prevent loan default.

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 delinquency levels for seasonal agricultural producers. Table 1 further reveals large *business income* disparities between farmers and non-farmers, here with seasonal producers having only about 15% of the *business income* of non-farmers. This might be explained to a large extent by the geographical distribution of ABM clients. The five 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, especially farmers with seasonal production types. With the exception of branch office number five, it is obvious that there is no strong regional focus for standard loans disbursed to farmers. Furthermore, the *gender* distribution is of interest, where our data reveal a male-dominated agricultural sector and a female-dominated non-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*, i.e., clients who received a loan from ABM before, which is not surprising because flex loans were only introduced in ABM at the end of 2010.

[Insert Table 2 about here]

In Table 2, the descriptive statistics are provided along our three delinquency categories and account only for delinquent loans. The number of observations, reported at the bottom of Table 2, indicates a declining number of loans with delinquencies from the first to the third delinquency category. The distribution amongst different client groups reveals that most loans with delinquencies are standard loans disbursed to non-farmers (given the large share of this client group in Table 1, this is not surprising). Moreover, our data reveal that the share of this group increases from the first to the third delinquency category. Furthermore, the distribution of the *fixed assets*, *business income*, *business expenses*, and the *disbursed loan amount* is remarkable. Here, the data shows the lowest mean value of *fixed assets* and, hence, physical collateral in the highest delinquency category. Vice versa, the highest mean value of *business income*, *business expenses*, and consequently *disbursed loan amounts* can be found in the third delinquency category. Furthermore, more clients in the highest risk category are younger, female, unmarried, live in smaller families, have less *work experience*, and as the variables *deposit* and *repeat client*

reveal, have weaker relationships with ABM than in delinquency categories I and II. Our data, furthermore, shows an increasing number of loans with delinquencies over time in all three risk categories, which mainly indicates ABM's loan portfolio growth rather than annual differences in credit risk. The same accounts for the distribution of delinquent loan installments among the 17 different branch offices.

4.2 Econometric approach

Given the structure of our data with a large share of loans not being delinquent, i.e., with delinquency observations censored at the threshold of zero we consider the following latent variable model to investigate our hypotheses H1 "Standard effect," H2 "Flex effect," and H3 "Grace period effect":

$$y = \begin{cases} y^* & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases} \quad (1)$$

With y being the observed and y^* being the latent variable which only can be observed for values greater than zero. The latent variable is described as follows:

$$y^* = y_{i,t}^* = \alpha + \beta^b \cdot as_i + \beta^d \cdot asg_i + \beta^h \cdot af_i + \beta^l \cdot afg_i + \beta^m \cdot nsg_i + \beta^n \cdot nf_i + \beta^o \cdot nfg_i + \boldsymbol{\gamma} \cdot \mathbf{x}_{i,t} + Y_t + \mathbf{u} \cdot \mathbf{s}_i + \boldsymbol{\varepsilon}_{i,t} \quad (2)$$

In equation (2), $y_{i,t}^*$ denotes the number of delinquent loan installments (delinquencies) of a loan 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 periods⁸, 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, and nfg_i is a dummy variable accounting for non-farmers with flex loans and grace periods. Moreover, $\mathbf{x}_{i,t}$ is the vector of client and loan characteristics⁹, Y_t is a time constant for the year t of loan disbursement, \mathbf{s}_i is a vector of dummy variables accounting for the branch offices where the loan was disbursed, $\boldsymbol{\gamma}$ and \mathbf{u} are parameter

⁸ A graced installment is defined by the bank as a repayment installment with a principal amount ≤ 50 % 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.

⁹ The vector includes fixed assets (log), business income (log), business expenses (log), disbursed loan amount (log), age, gender, 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.

vectors, and $\epsilon_{i,t}$ denotes the over t and i distributed error term where we relaxed the assumption of homoscedasticity.

In equation (2), it is obvious that we consider eight different client groups, thereof the eight groups, non-farmers with standard loans without grace periods and disbursed before and after flex loans were introduced serves as the reference group. This reference group is reasonable for three reasons: First, it comprises the majority of all borrowers of ABM; 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 for H1 “Standard effect” on farmers with standard loans, for H2 “Flex effect” on farmers with flex loans without grace periods, and for H3 “Grace period effect” on farmers with flex loans with grace periods, only the results for these groups are interpreted in detail in the results section. Furthermore, our estimation results for the branch office vector and the time constants are not reported in the results section. In our estimation, the number of passed loan installments is considered as an additional control variable because not all loans have been fully repaid, and the dependent variable is not a relative measure.

For the investigation of H4 “Introduction effect” we apply a quasi-experimental approach and investigate the effect of introducing flex loans with grace periods on loan delinquencies. We apply propensity score matching (PSM), and based on the independent variables *disbursed loan amount, gender, age, deposit* we identify a sample of agricultural borrowers with standard loans that were disbursed before flex loans were introduced (control group) and which is similar to the group of agricultural borrowers with flex loans with grace periods (treatment group). The average treatment on the treated effect (ATT) is assessed using Nearest Neighbor Matching and Kernell Matching respectively (Blundell & Dias, 2009) with bootstrapped standard errors. In all three ATT assessments we control for the same client and loan characteristics as well as loan disbursement time and branch level effects as in equation (2). Hence, in contrast to our investigations for H1, H2, and H3 where we compare delinquency levels of farmers with non-farmers, with the ATT assessment we conduct a delinquency comparison within the group of farmers and investigate the effect of introducing pre-defined repayment flexibility.

We estimate our latent variable in equation (2) using a Tobit model (with standard errors clustered at branch level) for each of our delinquency categories. The ATT procedure is conducted three times for each of the three delinquency categories (DC). By applying our second and third delinquency category (DC II, and III), we extend the approach of Raghunathan et al.

(2011) and Al-Azzam et al. (2012) by two additional risk measures. Although the credit risk increases from the first to the third delinquency indicator, all three indicators provide a good judgment for credit risk. This is because first, performance bonuses paid to loan officers decrease with increasing portfolio risk levels (starting with one day delinquencies). Second, the internal procedures of the bank require that loan officers start reminding clients about their next repayment installment (either by phone or by person) three days before payment is due. Thus, it is very unlikely for clients to forget to repay.

5. Results and discussion

The results of the three Tobit estimations (repayment function) are presented in Table 3. The explanatory power of the three models is considered to be moderate with a R^2 of 0.07, 0.09, and 0.12 for the DC I, II, and III, respectively.

[Insert Table 3 about here]

Our results reveal no significant delinquency differences between farmers and non-farmers, both with standard loans and without grace periods. This leads us to an acceptance of our first hypothesis, H1 “Standard effect,” which hypothesizes that delinquencies of farmers with standard loans are not different from those of non-farmers with standard loans. Taking into consideration that farmers with standard loans are non-seasonal farmers 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. However, these results confront the widespread wisdom that agricultural borrowers are generally riskier 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 Weber & Musshoff (2012). These results are consistent over all three delinquency categories.

We additionally find no significant differences between farmers with flex loans and non-farmers with standard loans (both groups without grace periods). This leads us to an acceptance of our second hypothesis, H2 “Farmer Flex,” which hypothesizes that delinquencies of farmers with flex loans and non-farmers with standard loans are not significantly different. The provision of flex loans without grace periods does not lead to higher delinquencies for these loans. These results are consistent for all three delinquency categories applied. Despite the seasonality of this group of farmers (eligibility criteria for flex loans), grace periods were not foreseen in the repayment

schedule structured by the loan officer. From a risk perspective our results reveal that there is no reason to assume otherwise.

The question of whether grace periods affect delinquency levels of farmers with flex loans and with grace periods was the motivation for our third hypothesis, H3 “Grace period effect,” 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 and without grace periods. Here, we find significant positive effects over all three delinquency categories¹⁰. This leads us to a rejection of our third hypothesis. Our results are in contrast with the findings from (Czura et al; 2011) revealing no delinquency differences between standard loans without grace periods and loans with pre-defined grace periods at the end of the loan cycle. Our findings, hence, indicate that seasonal farmers with flex loans and grace periods struggle more to repay their loans than non-farmers without grace periods. The magnitude of these differences is large, ranging between +25% (delinquency category I) and +87% (delinquency category II). However, our results only allow to judge the repayment performance up to two overdue installments. We are, therefore, not able to verify whether the loan is fully repaid at the end of the loan cycle. This might be the case because of the MFI restructuring non-performing loans.

Of our control variables (client and loan data) we find the results for *fixed assets*, the *marital status*, the number of *family members*, and the bank-customer relationship indicated by *deposit* and *repeat client* to be of special interest. Our results reveal that there is a significant and negative influence of the amount of *fixed assets* held by a client. This indicates that material collateral plays a significant role in the repayment behavior in Madagascar and plays an active role in microfinance risk management as it does in conventional lending. Given the focus of microfinance on social collateral, this result is surprising. Furthermore, we find that married clients show significantly lower delinquencies than clients who are single and that this effect is most pronounced in the third risk category. A similar effect can be stated for the number of family members, where an increasing number of family members leads to a better repayment performance. This might be explained by additional income available from other family members apart from the project financed by the loan. For the client-customer relationships indicated by whether the client holds a *deposit* with the bank and whether the client was granted a loan before,

¹⁰We checked the robustness of these results by estimating Probit models in addition to our Tobit models. In that case $y^* = y$ for any scenario in equation (1). The estimation results are reported in Annex 1 and reveal that the changes of standard errors did not affect significance levels of coefficients in any of the three delinquency categories.

we find that holding a deposit significantly improves the repayment quality, while being a *repeat client* significantly increases delinquencies. The latter is surprising and might indicate a less strict loan assessment for consecutive loans, possibly because of positive experiences with past loans or a declining repayment incentive for clients as soon as the consecutive loan is granted.

When comparing these results for loan delinquencies with the delinquency mean comparisons presented in table 1 it is obvious that the group of agricultural borrowers with flex loans shows on average lower delinquencies than non-farmers. Hence, the investigated MFI is, despite the negative effect of grace periods on loan delinquencies, able to select seasonal agricultural clients whose characteristics (e.g., *age, family members*) can compensate that effect. The investigated MFI should, therefore, focus on seasonal clients by taking into account the effects of client characteristics on loan delinquencies. Alternatively or additionally, the MFI should verify whether pre-defined grace periods are truly the best option for flexible repayment terms.

The ATT effects resulting from our propensity score matching procedures are presented in Table 4 for the DC I, II, and III, respectively.

[Insert Table 4 about here]

How the introduction of flex loans with grace periods affects loan delinquencies of farmers was the question of H4 “Introduction effect,” suggesting that loan delinquencies of farmers with flex loans with grace periods (treatment group) are not different from those of farmers with standard loans disbursed before flex loans were introduced (control group). Our results reveal that in the first delinquency category there are significantly higher delinquencies in the treatment group, while this effect disappears in the second and third delinquency category. The magnitude of this effect is less pronounced than for the comparison between agricultural and non-agricultural clients, as the treatment group shows only about 10% higher delinquency levels than the control group in the first delinquency category. Nevertheless, this result leads us to the rejection of our fourth hypothesis.

Our results suggest that the decision and, hence, the procedures of the investigated MFI to grant pre-defined grace periods from a delinquency perspective are not adequate to keep delinquency levels of loans with grace periods on the level of standard loans (without grace periods). However, this effect is less pronounced within the group of agricultural clients. During our field visits, which also included numerous flex loan assessments and credit committees, we experienced that the grace period decision is the most difficult task in flex loan assessments.

Farmers know exactly that grace periods, due to the longer outstanding loan amount, can increase the total interest to be paid for the loan. For this reason, some farmers try to negotiate the number of graced installments to a minimum. Given the, in comparison to standard loans, higher interest rates for flex loans and, furthermore, given that disbursed flex loans are only about half the size of standard loans, it remains to be answered to which extent the observed levels of loan delinquencies affect the profitability of the flex loan product. It should be considered that only about 50% of all loans disbursed by the investigated MFI are overdue by at least one day, and less than 3% of all clients are overdue by more than 30 days.

6. 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. Although standard loans allow adapting repayment installments 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 out of fear that more flexibility might reduce repayment quality.

Therefore, the objective of this paper is to contribute to filling this gap by providing empirical evidence on how the provisioning of flexible microfinance loans with pre-defined grace periods (flex loans) affects loan delinquencies of agricultural microfinance borrowers. In order to do so, we estimate different repayment functions with unique data provided by an MFI in Madagascar which started its business operation with standard loans and introduced flex loans with pre-defined grace periods subsequently. This is done to compare delinquencies of agricultural and non-agricultural borrowers. The repayment functions are estimated by different Tobit models for three different loan delinquency categories. In addition, we investigate within the group of farmers whether introducing flexible repayment schedules affects loan delinquencies of seasonal agricultural borrowers. This is done by applying different propensity score matching methods in order to compare flex loans with standard loans which were disbursed to farmers before flex loans were introduced by the MFI.

Our results reveal that loan delinquencies of non-seasonal farmers and seasonal farmers without grace periods are not significantly different from those of non-farmers. Furthermore, we find that seasonal farmers with grace periods show significantly higher delinquencies than non-farmers.

Within the group of farmers we find significant differences between loans disbursed to farmers before the introduction of flex loans and loans with grace periods disbursed to farmers only in one of the three delinquency categories investigated.

Our findings suggest that financing agricultural micro-borrowers does c.p. not increase the credit risk for the investigated MFI if non-seasonal farmers receive standard loans. These findings confront the widespread wisdom that lending to agricultural firms is associated with higher credit risk than lending to non-agricultural firms. Because the investigated agricultural clients with standard loans are non-seasonal agricultural producers, our results suggest the adequacy of standard loans for agricultural producers with continuous returns. Furthermore, all clients with flex loans are seasonal agricultural producers, suggesting that the provisioning of loans to that group needs to be carefully implemented when it comes to the decision of granting grace periods.

However, within the group of farmers, the procedures of the MFI in granting grace periods seem to be working sufficiently, as delinquency effects are only significantly different in the lowest delinquency category. Nevertheless, the system of pre-defined grace periods applied by the investigated MFI does not seem to be adequate for agricultural firms if the idea of the MFI is to keep credit risk level of flex loans on the level of standard loans. However, our investigations only shed light on the relative credit risk effect of grace periods while the MFI also takes the absolute credit risk (which is low for the investigated MFI) into account. Moreover, to decide whether the flex loan product is cost-covering and, hence, can be offered by the investigated MFI sustainably, a cost-benefit analysis would be necessary. Such an analysis would need to take into account all costs of lending, including additional efforts for the more complex cash-flow forecast, the additional on-site visits, the lower disbursed loan amounts; but also likely higher interest earnings due to less principal payments during grace periods. Based on such an analysis, the long-term potential of the investigated flex loans for the financial inclusion of seasonal agricultural firms could be assessed. Such an analysis, however, is beyond the scope of this paper. Furthermore, the cash flow of borrowers also depends on unexpected weather and especially extreme weather events which were not addressed within this paper. In the case of Madagascar, excessive rains in rice production and typhoons are most relevant. The identified higher delinquencies of seasonal agricultural borrowers with grace periods might be a consequence of such weather events. Hence, investigations in this regard could help to better understand the effects of such (extreme) weather events on credit risk and could provide

important information whether there is a need, e.g., for insuring the MFI's agricultural loan portfolio or offering insurance products linked to individual loans.

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Table 1: Descriptive Statistics – Client Groups

Variable ¹	Unit ²	Farmer ³ Standard Loan		Farmer ³ Flex Loan		Non-Farmer ⁴	
		Mean	SD	Mean	SD	Mean	SD
		Delinquency I	number	1.10***	2.00	0.69***	1.40
Delinquency II	number	0.11***	0.72	0.05***	0.37	0.16	0.90
Delinquency III	number	0.07***	0.60	0.02***	0.30	0.10	0.75
Fixed Assets	ThsMGA	2,848***	8,647	1,734***	2,215	3,093	14,642
Business Income	ThsMGA	1,993***	3,716	569***	987	3,680	6,697
Business Expenses	ThsMGA	1,679***	3,515	353***	805	3,327	6,449
Disbursed Loan Amount	ThsMGA	1,550**	1,881	846***	890	1,651	2,274
Age	years	40.60***	10.13	41.42***	10.77	39.82	9.67
Gender (Female)	1/0	0.50***	-	0.26***	-	0.60	-
Marital Status (Married)	1/0	0.89***	-	0.90***	-	0.86	-
Family Members	number	4.13***	1.76	5.01***	2.05	3.96	1.70
Work Experience	month	107***	133	214***	226	127	155
Deposit (Yes)	1/0	0.80***	0.40	0.85***	0.36	0.80	0.39
Repeat Client (Yes)	1/0	0.45***	0.50	0.21***	0.41	0.48	0.50
Passed Installments	number	8.47	4.13	5.34***	3.81	8.49	3.92
Disbursement Year	2007 (Yes)	1/0	0.01***	-	0.00***	-	0.04
	2008 (Yes)	1/0	0.07***	-	0.00***	-	0.10
	2009 (Yes)	1/0	0.11***	-	0.00***	-	0.15
	2010 (Yes)	1/0	0.20	-	0.02***	-	0.21
	2011 (Yes)	1/0	0.30***	-	0.27	-	0.27
	2012 (Yes)	1/0	0.31	-	0.71***	-	0.23
Branch Office N ^o	1 (Yes)	1/0	0.03***	-	0.00***	-	0.07
	2 (Yes)	1/0	0.07***	-	0.00***	-	0.19
	3 (Yes)	1/0	0.03**	-	0.00***	-	0.08
	4 (Yes)	1/0	0.06***	-	0.00***	-	0.09
	5 (Yes)	1/0	0.26***	-	0.00***	-	0.12
	6 (Yes)	1/0	0.05***	-	0.00***	-	0.08
	7 (Yes)	1/0	0.08	-	0.00***	-	0.08
	8 (Yes)	1/0	0.09	-	0.26***	-	0.09
	9 (Yes)	1/0	0.06***	-	0.15***	-	0.03
	10 (Yes)	1/0	0.11***	-	0.28***	-	0.03
	11 (Yes)	1/0	0.02***	-	0.00***	-	0.06
	12 (Yes)	1/0	0.06***	-	0.00***	-	0.02
	13 (Yes)	1/0	0.04***	-	0.27***	-	0.01
	14 (Yes)	1/0	0.02	-	0.00***	-	0.02
	15 (Yes)	1/0	0.02***	-	0.00***	-	0.02
	16 (Yes)	1/0	0.00***	-	0.00***	-	0.01
	17 (Yes)	1/0	0.00***	-	0.04***	-	0.00
Number of Observations, thereof	number	2,790		2,928		74,801	
with grace periods	number	35		1,893		409	

¹ Delinquencies I, II and III 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. Comprises only primary agricultural producers, i.e., livestock, crop, as well as fruit and vegetable producers.

⁴ Non-Farmer, non-farmer with standard or flex loan; ***, **, * indicate a significant mean difference between farmers with standard loans/farmers with flex loans compared to non-farmers on a 1%, and 5% level, respectively.

Table 2: Descriptive Statistics – Delinquency Categories

Variable ¹	Unit ²	DC I ³		DC II ³		DC III ³		
		Mean	SD	Mean	SD	Mean	SD	
Farmer Standard Loan	1/0	0.03	-	0.03	-	0.02	-	
Farmer Flex Loan (FL)	1/0	0.01	-	0.00	-	0.00	-	
Farmer FL + Grace Period	1/0	0.02	-	0.02	-	0.01	-	
Non-Farmer Standard Loan	1/0	0.93	-	0.94	-	0.95	-	
Fixed Assets	ThsMGA	2,896	11,179	2,700	9,162	2,614	9,561	
Business Income	ThsMGA	3,532	6,235	4,050	6,459	4,439	7,187	
Business Expenses	ThsMGA	3,181	6,036	3,648	6,235	4,031	6,999	
Disbursed Loan Amount	ThsMGA	1,688	2,287	1,935	2,578	2,020	2,560	
Age	years	39.49	9.48	38.30	9.08	37.84	8.80	
Gender (Female)	1/0	0.57	0.49	0.58	0.49	0.58	-	
Marital Status (Married)	1/0	0.85	0.36	0.81	0.39	0.81	-	
Family Members	number	3.87	1.75	3.34	1.70	3.27	1.69	
Work Experience	month	127	150	118	109	117	111	
Deposit (Yes)	1/0	0.73	0.45	0.49	0.50	0.45	-	
Repeat Client (Yes)	1/0	0.50	0.50	0.46	0.50	0.49	-	
Passed Installments	number	9.76	3.40	10.28	3.59	10.59	3.70	
Disbursement Year	2007 (Yes)	1/0	0.03	-	0.04	-	0.04	-
	2008 (Yes)	1/0	0.10	-	0.15	-	0.15	-
	2009 (Yes)	1/0	0.16	-	0.19	-	0.19	-
	2010 (Yes)	1/0	0.23	-	0.24	-	0.26	-
	2011 (Yes)	1/0	0.34	-	0.32	-	0.32	-
	2012 (Yes)	1/0	0.14	-	0.06	-	0.04	-
	Branch Office N ^o	1 (Yes)	1/0	0.07	-	0.07	-	0.07
2 (Yes)		1/0	0.19	-	0.23	-	0.26	-
3 (Yes)		1/0	0.08	-	0.10	-	0.11	-
4 (Yes)		1/0	0.10	-	0.13	-	0.13	-
5 (Yes)		1/0	0.13	-	0.11	-	0.10	-
6 (Yes)		1/0	0.08	-	0.08	-	0.07	-
7 (Yes)		1/0	0.08	-	0.05	-	0.05	-
8 (Yes)		1/0	0.10	-	0.11	-	0.11	-
9 (Yes)		1/0	0.03	-	0.02	-	0.02	-
10 (Yes)		1/0	0.04	-	0.03	-	0.03	-
11 (Yes)		1/0	0.05	-	0.04	-	0.03	-
12 (Yes)		1/0	0.02	-	0.00	-	0.00	-
13 (Yes)		1/0	0.01	-	0.01	-	0.01	-
14 (Yes)		1/0	0.01	-	0.00	-	0.00	-
15 (Yes)		1/0	0.01	-	0.01	-	0.01	-
16 (Yes)		1/0	0.00	-	0.00	-	0.00	-
17 (Yes)		1/0	0.00	-	0.00	-	0.00	-
Number of Observations	number	33,340		4,004		2,403		

¹ Farmer Standard Loan, farmer with standard loan; Farmer Flex Loan (FL), farmer with flex loan; Non-Farmer Standard Loan, non-farmer with standard loan; Farmer comprises only primary agricultural producers, i.e., livestock, crop, as well as fruit and vegetable producers.

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

³ Delinquency Category (DC) I, II, and III indicate mean values and standard deviations for all variables for groups with missed loan installments of ≥ 1 , ≥ 15 , and ≥ 30 days, respectively, when due.

Table 3: Estimation results – Tobit model

Variable	Unit ²	Tobit Estimations ³		
		DC I ⁴	DC II ⁴	DC III ⁴
Intercept		3.792*** (0.0990)	6.626*** (0.238)	7.519*** (0.258)
Farmer ¹ Standard Loan (as)	1/0	-0.0508 (0.0861)	-0.0689 (0.412)	-0.0437 (0.533)
Farmer ¹ Flex Loan (af)	1/0	-0.0851 (0.0732)	-0.00893 (1.104)	-0.645 (2.087)
Farmer ¹ Flex Loan + Grace Period (afg)	1/0	1.072*** (0.114)	2.916*** (0.816)	2.373* (0.930)
Fixed Assets (Log)	ThsMGA	-0.0908** (0.0134)	-0.431*** (0.0456)	-0.556*** (0.0672)
Business Income (Log)	ThsMGA	-0.181 (0.174)	0.479 (0.347)	0.990 (0.547)
Business Expenses (Log)	ThsMGA	0.145 (0.138)	-0.213 (0.286)	-0.446 (0.413)
Disbursed Loan Amount (Log)	ThsMGA	0.0739 (0.0593)	0.801*** (0.188)	0.853*** (0.253)
Age	years	-0.0278** (0.00212)	-0.0512*** (0.00845)	-0.0675*** (0.0131)
Gender (Female)	1/0	-0.00855 (0.0562)	-0.113 (0.107)	-0.0568 (0.106)
Marital Status (Married)		-0.543*** (0.0402)	-0.631*** (0.137)	-0.658** (0.208)
Family Members	number	-0.0899*** (0.0211)	-0.467*** (0.0354)	-0.555*** (0.0468)
Work Experience	month	-0.000201 (0.000162)	-0.00126*** (0.000323)	-0.00151*** (0.000385)
Deposit (Yes)	1/0	-2.337*** (0.0949)	-4.839*** (0.251)	-5.624*** (0.306)
Repeat Client (Yes)	1/0	0.553*** (0.0651)	0.463** (0.152)	0.739*** (0.177)
Passed Installments	number	0.469*** (0.0198)	0.493*** (0.0396)	0.577*** (0.0531)
Year Dummies		Yes	Yes	Yes
Branch Office Dummies		Yes	Yes	Yes
Number of Observations, thereof		75,347	75,347	75,347
Censored at the threshold of zero		43,994	71,520	73,013
Log-Likelihood Value		-109,283.19	-21,058.06	-13,081.22
(pseudo) R-square		0.07	0.11	0.12

¹ Comprises only primary agricultural producers, i.e., livestock, crop, as well as fruit and vegetable producers.

² ThsMGA, thousand Malagasy-Ariary.

³ ***, ** indicate a significance on 1%, and 5% levels, respectively. Standard errors clustered for branch-offices in parentheses. Reference group for all client groups in the upper block is “Non-farmer standard loan without grace periods”; reference year for the year dummies is 2012, for the vector of branch offices, branch office one.

⁴ Delinquency Category (DC) I, II, and III indicate the number of loan installments that were missed by ≥ 1 , ≥ 15 , and ≥ 30 days, respectively, when due.

Table 4: Results of propensity score matching

Delinquency category (Matching method)	Number of observations of		ATT	Standard error¹	t-value²
	treated	control			
DC I (Kernell)	1,942	3,765	0.107	0.042	2.563***
DC I (Nearest Neighbor)	1,942	1,948	0.192	0.059	3.226***
DC II (Kernell)	1,942	3,765	0.008	0.013	0.622
DC II (Nearest Neighbor)	1,942	1,948	0.014	0.021	0.644
DC III (Kernell)	1,942	3,765	0.003	0.009	0.323
DC III (Nearest Neighbor)	1,942	1,948	0.008	0.018	0.457

¹ ***, ** indicates a significance on 1% level.

² Bootstrapped standard errors with 100 replications.

Annex 1: Robustness check – Probit model

Variable	Unit ²	Probit Estimations ³		
		DC I ⁴	DC II ⁴	DC III ⁴
Intercept		-0.0731 (0.0568)	-1.883*** (0.0957)	-2.347*** (0.116)
Farmer ¹ Standard Loan (as)	1/0	0.0236 (0.0272)	-0.00269 (0.0518)	-0.00389 (0.0651)
Farmer ¹ Flex Loan (af)	1/0	-0.0394 (0.0523)	-0.00593 (0.143)	-0.0748 (0.224)
Farmer ¹ Flex Loan + Grace Period (afg)	1/0	0.329*** (0.0386)	0.455*** (0.0762)	0.322** (0.103)
Fixed Assets (Log)	ThsMGA	-0.0199*** (0.00345)	-0.0643*** (0.00582)	-0.0733*** (0.00685)
Business Income (Log)	ThsMGA	-0.0476 (0.0353)	0.0506 (0.0608)	0.115 (0.0663)
Business Expenses (Log)	ThsMGA	0.0372 (0.0293)	-0.0201 (0.0499)	-0.0497 (0.0546)
Disbursed Loan Amount (Log)	ThsMGA	-0.0189 (0.0103)	0.121*** (0.0184)	0.116*** (0.0215)
Age	years	-0.00690*** (0.000525)	-0.00758*** (0.000890)	-0.00873*** (0.00107)
Gender (Female)	1/0	-0.0000203 (0.0101)	-0.0161 (0.0175)	-0.00225 (0.0211)
Marital Status (Married)		-0.147*** (0.0150)	-0.0933*** (0.0249)	-0.0800** (0.0295)
Family Members	number	-0.0131*** (0.00310)	-0.0723*** (0.00565)	-0.0765*** (0.00669)
Work Experience	month	-0.0000233 (0.0000362)	-0.000181*** (0.0000461)	-0.000199*** (0.0000467)
Deposit (Yes)	1/0	-0.494*** (0.0127)	-0.730*** (0.0187)	-0.749*** (0.0225)
Repeat Client (Yes)	1/0	0.170*** (0.0104)	0.0732*** (0.0182)	0.105*** (0.0219)
Passed Installments	number	0.110*** (0.00214)	0.0627*** (0.00329)	0.0686*** (0.00385)
Year Dummies		Yes	Yes	Yes
Branch Office Dummies		Yes	Yes	Yes
Number of Observations		75,347	74,962	74,947
Wald χ^2 (40/39/38); Prob > χ^2		9,498.39; 0.0000	3,798.39; 0.0000	2,918.17; 0.0000
Log pseudolikelihood		-45,614	-12,897	-8,640
R-square		0.11	0.15	0.17

¹ Comprises only primary agricultural producers, i.e., livestock, crop, as well as fruit and vegetable producers.

² ThsMGA, thousand Malagasy-Ariary.

³ ***, ** indicate a significance on 1%, and 5% levels, respectively. Robust standard errors in parentheses. Reference group for all client groups in the upper block is “Non-farmer standard loan without grace periods”; reference year for the year dummies is 2012, for the vector of branch offices, branch office one.

⁴ Delinquency category (DC) I, II, and III indicate whether an installment of a loan was at least once overdue by ≥ 1 , ≥ 15 , and ≥ 30 days for DC I, II, and III, respectively.