Factors Affecting Repayment of Loans by Micro-borrowers in Tunisia: An Empirical Study

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Abstract
This research studies the relevance of explanatory factors of the lack of reimbursement in microfinance conceived on the side of the socio-economic and demographic characteristics of the micro-borrowers. In fact, these factors have generally been little discussed in the literature. This research, falls under this objective to explore the context of the microfinance as regards lack of reimbursement and to find solutions to minimize this risk of insolvency. In other words, the issue is connected to the identification of the influence of the characteristics specific to the micro-borrowers on the probability so that an individual carries out a lack of reimbursement. To study the determinants of the reimbursement rate of the micro-borrowers, this paper is divided into three principal parts. First of all, on the basis of the theoretical framework, we will focus ourselves particularly, on the explanatory factors of the lack of reimbursement in microfinance which are related to the particular characteristics of the micro-borrowers, and we will try also to formulate the fundamental assumptions of our research. Then, we will discuss our sample and our results of estimates in order to treat our fundamental question of research. At this level, we will try to empirically analyze the validity of the assumptions by the presentation and the analysis of the principal results, in order to identify the explanatory factors of the lack of reimbursement on the side of the micro-borrowers.

Keywords: Microfinance, Micro-borrower, Tunisia

The problems of lack of reimbursement on the side of micro-borrowers and the formulation of hypotheses
The theoretical literature shows that, the microfinance is a tool to eradicate poverty. This discipline made proof, through various approaches, of its capacity to provide financial services for populations excluded from traditional finance (Vincent, 2005). However, Microfinance provides examples of successes but remains also distinguished by certain cases of bankruptcies, (Sharma and Zeller., 1997). In fact, the evaluation of the situation of refunding of the micro-borrowers passes by the evaluation of their particular characteristics

1 The analysis of Sharma and Zeller (1997) and Godquin (2004) show that, the probability of no payment increases with the size of the loan granted to the borrower.
which influence the probability of realization of a lack of reimbursement (M. Jonathan, 1999).

The objective of this paragraph is to identify the influence of the factors related to the particular characteristics of the micro-borrowers on the lack of reimbursement. Then, it is necessary through this work to stop on this idea and to examine the explanatory factors of the lack of reimbursement of the micro-borrowers. Indeed, many empirical researches found a relation between several variables characterizing the micro-borrowers with the lack of reimbursement. This makes it possible to put the characteristics of the micro-borrowers at the center of attempt in our research. Therefore, it is important to categorize the micro-borrowers according to the factors affecting refunding and to define a standard profile of solvent micro-borrowers.

Thus, while wondering about the influence of the particular characteristics related to the micro-borrowers on the probability of the lack of reimbursement, consulted research show that they interact differently according to the area and the person. For that, the field of research suggests a classification of research according to the demography, professional experience or the socio-economic origin. At this level, Zghal (2004) proposes an application of research to specific groups of micro-borrowers. The specification of a group is done according to a whole of characteristics such as age, gender, formation, location, marital status, branch of industry, nature of the project, number of dependent children, the amount of loan etc…

In its structure, the lack of reimbursement is bad for the microfinance institution as for the micro-borrower. It is a phenomenon to be avoided, (Elizabeth Littlefield and Rosenberg, 2004). For this reason, many studies continue to concentrate on the factors which influence such a defect, (Shaw. J., 2004).

Problems involved in the socio-economic characteristics of the micro-borrowers
In what follows, we base ourselves on the follow-up of the micro-projects, geographical area, amount of the loan, branch of the industry, nature of the project and the distance between the institution and the residence of customer as crucial factors of the socio-economic characteristics being able to condition the defect of refunding.

The follow-up of the micro-projects: Honlonkou and al. (2001), Khandker (1998), Meehan (2000) have leads to the results according to which the lack of follow-up of the financed projects, inappropriate periods of withdrawal, diversion of the appropriations to the consumption or the refunding of the usurers and the perception of the public financing called "cold money" are all assimilated as a deciding factors of a lack of reimbursement of the microcredit. Moreover, Honlonkou and al. (2006)2, Morduch et al. (2002) also showed that, the frequent visits of the personnel of the microfinance institution had a positive impact on refunding. By opposition, Zeller and Meyer (2002) and Maria Nowak (2005), find that the visits of the personnel of the microfinance institution could involve a rise in the costs of transaction. Consequently, the latter think that, the rise in the costs of transaction is connected

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2 Honlonkou and al. (2006), tried to identify certain causality between the defect of refunding and the personal characteristics related to the borrowers of an institution of microfinance.
to the costs of transport, and it will have a negative impact on the rates of refunding. But the microfinance institution increase its reimbursement rate by the adoption of an adequate supervision after obtaining the credit through the monitoring of the borrower in residence, application of penalty and interest on arrears in the event of no refunding: dissuasive suggestions such as the publication of photographs and names of the failing ones and sending a letter of congratulations at the end of refunding (Zeller and alii, 1998; M. Sharma M., 1998; Zaman., 2000).

**The geographical area:** With regard to the relation between the geographical area of the micro-borrower and the lack of reimbursement, Servet (2006) and Sajeda et al. (2003), find that the risk of no refund of a microcredit depends also on the geographical establishment of the concerned project. In the rural zones in particular, the borrowers can be far away from the counters of the microfinance institution.

More significant this distance is, more the risk of credit is high insofar as the follow-up of the loan is less rigorous because of the generated cost. Moreover, according to Morduch (2005) in rural areas, the financing of the agricultural projects assume specific risks related to the economic and naturalness context. We can conclude that, the urban zone decreases the probability of lack of reimbursement. Moreover, by studying the influence of the geographical expansion on banking efficiency, F. Bedecarrats and R. Marconi (2009) show that, it is more delicate to remotely control the micro-projects which are geographically outdistanced compared to the seat. Indeed, when microenterprises are located far from the microfinance institution or from their seats, the cost of information would increase the costs of communication and travel for the two parts. However, in many configurations the microfinance institution seeks the customers in more moved away geographical areas because the recipients of microcredit do not have bank accounts and thus they must move to refund.

**The amount of the loan:** An additional determinant of the defect of refunding in microfinance, is related to the amount of the loan. Therefore, we note that while trying to identify the causes of unpaid through the synthesis of several studies, (Honlonkou and al., 2006 and Morduch and al, 2002) we have found that the insufficiency of the amounts of credit to finance the projects is an important factor of a bad performance of refunding. In the same way, Sharma and Zeller (1997) found that the coefficient of the amount of the loans is significant and negative. This result was also confirmed by M. Labie and M. Mees (2005) and M. Labie M. and J. Sota (2004, p.19). Indeed, the negative sign is theoretically explained by the fact that the amount of the loans increases the profit associated with the moral risk. However, V. Hartarska and D. Nasdolnyak (2007) showed that, the majority of the not refunded loans with maturity were completely refunded a year later. In this context, the moral risk is interpreted as the choice of a project with a longer maturity (and a higher awaited value) than that of the loan rather than the choice of a riskier project. The negative sign relating to the amount of the loan can also be associated with the problems whose borrower can face to refund a higher amount over a given period (usually a year). It may be that for a given maturity, the loans of significant size do not meet with the requirements of the borrowers and are not appropriate to the local economy (R. Mersland and R. Strøm, 2008; 2009).

For a particular borrower and a duration of a given loan, it is shown (Lhériau, 2005, p.23-24) that, the probability of refunding decrease with the size of the loan. The speed of the evolution of the probability of no refund with the size of the loan changes according to the
initial equipments of the borrowers and the costs which they associate with the strategies of moral risk and the strategic defect. In addition, the microfinance institution cannot reach a perfect rate of refunding on the basis of the several inciting mechanism. In order to not exceed the new target threshold of defect, the microfinance institution will grant higher loans to the borrowers slightly risky (R. CulI, A. Demirguc-kunt and J. Morduch, 2006).

The branch of the industry: Khawari (2004) identifies other factors affecting refunding in microfinance and they are focused on the bond between the financed branch of the industry, the nature of the project of the micro-borrowers and the lack of reimbursement. We note that, according to their studies, the microfinance institutions finance frequently the activities belonging to the innovating sectors in the service, small trades, craft industry and agriculture. Indeed, Ndimanya (2002, p.14), Honlonkou et al. (2006) found that, the percentage of credit allocated with agriculture influences negatively the performance of refunding. This idea can be explained by the threats attached to the rain agriculture. This result justifies the weak engagement for the financing of the agriculture.

M. Zeller and M. Sharma (1998) led a study on the performances of refunding in Bangladesh and showed that the reimbursement rate is high when the borrower not considering agriculture as a principal activity. Moreover, Zeller (1994) analyzed the rationing of credit by proving that it is dependent on a whole of determinants such as in particular the branch of the industry to be financed. This author also recommend that the needs and the risks change according to the branch of the industry of the borrower. At this level, M. Zeller, G. Schrieder, J. von Braun and F. Heidhues (1993) stipulate that, the agricultural loans are risky, expensive and are particularly difficult to set up. Contrary, M. Zeller, G. Schrieder, J. von Braun and F. Heidhues (1997) think that the practice of the breeding combined with agriculture increases the risks and makes dubious the probability of refunding. The results of their studies confirm that these two activities which are more exposed to the risks affect negatively the rates of refunding. In the same way, Sharma and Zeller (1998) discovered also that the number of years of experiment of the borrower in agriculture had a negative impact on the capacity of refunding. Lastly, more the borrower is old, less he is innovating and this impact is close with that to the age of the owner.

A. Honlonkou, D. Acclassato and V.C. Quenum (2001) discovered on that on the side of the borrower, the possession of equipment, approximated by the level of richness exerts a positive effect on the performance of refunding. The level of richness of the owner is also conditioned by the possession of domestic animals being able to be easily resold. In addition, the practice of the breeding would have a positive influence on the capacity of refunding.

The nature of the project: With regard to the relation between the nature of the project of the borrower and the delay of refunding, we note that the executives of the institutions of microfinance consider that the projects of creation are profitable projects, and they indicate that, the projects of extension are associated with a reimbursement rate more than for creation.

The distance between the institution and the residence of the customer: By examining the relation between the distance separating the bank from the borrower and the lack of reimbursement, B. Coleman (2006) showed that the effect of this distance is positive for the men and negative for the women. The negative result of the female gender can be explained by the absence of means of displacement of the latter. This report will have negative repercussions materialized by weak contacts with the cases and therefore, the no respect of
their engagement. Later, A. Honlonkou and al. (2006) show that the distance of the borrower from his case could negatively affect refunding. The positive influence of the distance between the microfinance institution and the micro-borrower is unexpected, but it can be justified. More the customer is outdistanced more fund administrators seek to ensure sufficient conditions for repayment. This increases the performance of the borrowers to refund. Moreover, the capacities of supervision of the agents of credit charged to collect the funds are higher when the dwelling of the borrower is outdistanced from the bank (Labie, 2004).

The preceding discussion materialized by, the follow-up of the micro-projects, the geographical area, the amount of the loan, the branch of the industry, the nature of the project and the distance between the institution and the residence of the customer, suggest that, these factors influence significantly and positively the lack of reimbursement of the micro-borrowers. Our objective is to check this influence. Consequently, in the light of what was advanced, the subjacent assumption which we will test is as follows:

**Assumption 1:** There is a positive relation between the lack of reimbursement and the socio-economic characteristics of the micro-borrowers represented by, the follow-up of the micro-projects, the geographical area, the amount of the loan, the branch of the industry, the nature of the project and the distance between the institution and the residence of the customer.

**Problems involved in the demographic characteristics of the micro-borrowers**

The problems associated with the demographic characteristics of the micro-borrowers can be concretized by a whole of factors which can assign the lack of reimbursement such as particularly: the gender, the age, the marital status, the number of dependent children, the educational level and the former experiment with the microfinance institution.

**The Gender:** With regard to the relation between the gender of the borrower and the lack of reimbursement, Gary, Dunford, Wamer Woodworth (1999) showed that the borrowers of female gender do not realize significantly a higher performance of refunding. Even if the coefficient is positive, it is not significant. The fact that on average the women present a probability of defect weaker can be partially justified by the fact that they receive on average smaller loans. Therefore, the gender influences refunding and the men have a tendency to better refund than the women. This result goes against what is usually marked in the literature which supposes that the reimbursement rate of women is definitely higher than those of men because the first appear more disciplined vis-a-vis the expectations of the banks. However, M. Chirwa and Milner J. (1997) noted that, the gender is not a significant factor of the reimbursement rate in the context of Malawi. Moreover, B. Granger (2006) stipulates that, Grameen Bank is had by the poor (particularly and primarily women) whereas, the other banks are had by the rich person (primarily men). In addition, Enda considers that the woman refunds her credit better. G. Vincent (2005) and Hofmann and Kamala (2001, p.9) specify that the programs of microfinance show the wisdom of the poor and particularly women who are regarded as excellent recipients and who are sometimes better than the other borrowers (men). Moreover, this criterion can have a higher weight at the time of the arrival of an event: the marriage, death of a husband, divorce, saving or some female activities. The financing of the women seems to be less risky.

At this level, Servet (2006) and Pitt and Khandker (1998) indicate that the women refund better than the men and exploit more the resources of the microfinance to the profit of the
family and the children. The authors affirm that does not want to say that the women are poorer than the men but their incomes are lower than those of the men. Consequently, we regard the gender as a determining factor of the defect of refunding.

**The age:** Concerning the relation between the age of the borrower and the lack of reimbursement, Servet (2006) finds in several investigations that, the young people are compared to very risky borrowers. So the risk of delay decreases with the marriage of the borrower and thus, a married customer is less risky than a single person. In fact, it is the family stability of married which pushes the latter with being powerful in its refunding. It is logical to think that the experiment also plays in the favor of the borrower and thus, to envisage a weaker reimbursement rate for the youngest borrowers. Indeed, this criterion of age was frequently used by the Tunisian Solidarity Bank for the choice of the borrowers (Benarous, 2004). This bank prefers to grant credit to young people and it is a significant criterion insofar as the bank seeks a population of young, courageous, and motivated contractors. Thus, the project constitutes the only guarantee for the banker. It is an objective element and it is a significant index of its profitability. In addition, the criterion of age is significant in the strategy of Enda because the young people have a significant role in the development of the companies of which they are not only the recipients but also, the potential actors.

**The marital status and the number of dependent children:** According to the relation between the marital status and the number of dependent children of the borrower and the lack of reimbursement, we note that, the women, more often unmarried, will have a priori fewer guarantees to obtain external financings (S. Brana, 2008). In other words, the marital status of the borrowers can condition the capacities of the latter to refund their loans. More, there are children in the family of the borrower, more this one is insolvent.

**The educational level and the former experiment with the microfinance institution:** Concerning the relation between the educational level and the former of experiment of the borrower and the lack of reimbursement, we note that the reimbursement rate was influenced by the human capital. Indeed, formal education makes it possible to structure the ways of thinking and to reinforce the cognitive capacities of the active micro-borrower and the future contractor (Y. Hardy, 2007), and it can be assimilated as a significant source of competences, capacity to solve problems, motivation, knowledge, self-confidence, etc…

The accumulation of these competences makes it possible to the individuals to adapt to the new changes such as the taking risk, and to the entrepreneurial act which can lead to a new activity with high added value. Thus, contractors profit from their knowledge and their contacts better generated by the education system to acquire necessary resources and to identify and exploit the occasions of businesses. In other studies, as that of Lasch et al. (2004) the most educated contractors are able to identify and/or to carry out the outputs of these opportunities. In the same way, according to Servet (2006), the majority of the studies on the determinants of the rates of refunding integrate variables related to the educational level and the former experiment of the borrower with his bank. Brigitte Helms (2007) shows that these experiments can contribute to the integration and the accumulation of a new knowledge and also make it possible to the individuals to become more productive and creative and, consequently, more likely to define and structure a new solutions to the existing problems (F. Bthier, S. Larivièrè and F.Martin, 2004) and to discover and exploit opportunities.
The preceding discussion materialized by the gender, the age, the marital status, the number of dependent children, the educational level and the former experiment with the microfinance institution, suggests that, these factors influence significantly and positively the lack of reimbursement of the micro-borrowers. Our objective is to check this report. Consequently, in the light of what was advanced, the additional assumption A1.2 that we will test is as follows:

**Assumption 2:** There is a positive relation between the lack of reimbursement and the demographic characteristics of the micro-borrowers represented by, the gender, the age, the marital status, the number of dependent children, the educational level and the former experiment with the microfinance institution.

On the basis of the arguments presented above, the conceptual model suggested in this study is presented in following figure:

**Figure 1:** Factors of the lack of reimbursement from the side of the micro-borrowers

**Assumption 1:** The factors related to the socio-economic and demographic characteristics of the micro-borrowers are the possible sources of the delay of refunding

**Assumption 1.1:** There is a positive relation between the delay of refunding and the socio-economic characteristics of the micro-borrowers represented by, the follow-up of the micro-projects, the geographical area, the amount of the loan, the branch of the industry, the nature of the project and distance between the institution and the residence of the customer.

**Assumption 1.2:** There is a positive relation between the delay of refunding and the demographic characteristics of the micro-borrowers represented by, the gender, the age, the marital status, the number of dependent children, the educational level and the former experiment with the microfinance institution.

The results of the estimates

We formulated a principal assumption (A1) according to which the particular characteristics of the micro-borrowers are the possible sources of the lack of reimbursement. More clearly, the empirical part of this paper has as objective to study the relation between the particular characteristics of the micro-borrowers with the dependent variable, the probability of the lack of reimbursement. With this intention, our primary stage consists in determining the nature of the joint effects and the marginal effects of each factor which generates the lack of reimbursement. Thus, we resort to the logistic law whose function of repair is written as follows:

\[ F(x) = \frac{\exp(x)}{1+\exp(x)} \]  

(1)

Concerning the marginal effects of each indicator measuring the particular characteristics of the micro-borrowers, elasticities \( \beta_i \) of the model are determined by the following formula:
At this level, the estimators of the parameters $\beta_i$, are those of maximum of likelihood (log likelihood). In addition, we proceeded for the delight of the quality of prediction of the model, to evaluate its quality to predict the values 0 and 1 of the lack of reimbursement. With this intention, we fix a threshold of probability equalizes to 0.5. what gives the two following central assumptions:

$$A_0: \text{Delay} = 1 \quad \text{if} \quad \text{Delay} \geq 0.5$$
$$A_1: \text{Delay} = 0 \quad \text{if} \quad \text{Delay} < 0.5$$

Thus, under the null assumption, the model can be specified with a predicted probability higher than the threshold and consequently the micro-borrowers carry out a lack of reimbursement.

**Table 1**: Diagnosis of the quality of the logit model for the probability of the delay of refunding

<table>
<thead>
<tr>
<th>Classification</th>
<th>Rate of prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of good predictions for the bad micro-borrowers (Delay =1)</td>
<td>0.76</td>
</tr>
<tr>
<td>Percentage of good predictions for the good micro-borrowers (Delay=0)</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Source: our calculations starting from the data base of microfinance institutions, 2010.

On the basis of the table 1, our results show that the micro-borrowers carrying out a lack of reimbursement (bad micro-borrowers) are 541 cases out of 710 which were well predicted with a rate of prediction of the model equal to 0.76 (correct forecasts). With regard to the micro-borrowers not having a lack of reimbursement (goods micro-borrowers), they are 192 cases out of 289, which have well predicted with a rate of prediction of the model equal to 0.66. Thus, it is relatively a good model and the choice of the logit model seems to be justified in this case. The estimate of this model for purpose unites was carried out according to the maximum of probability, and which gives the following results:

**Table 2**: Result of estimate with the dependent variable: Lack of reimbursement

<table>
<thead>
<tr>
<th>Characteristics of the micro-borrowers</th>
<th>Joint effects</th>
<th>Marginal effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>z-stat</td>
</tr>
<tr>
<td>Marital status</td>
<td>-0.055</td>
<td>-0.35</td>
</tr>
<tr>
<td>Branch of industry</td>
<td>-1.03</td>
<td>-1.2</td>
</tr>
<tr>
<td>Nature of the project</td>
<td>0.14</td>
<td>0.92</td>
</tr>
<tr>
<td>Former experiment</td>
<td>0.32***</td>
<td>8.23</td>
</tr>
<tr>
<td>Number of dependent children</td>
<td>0.102</td>
<td>1.34</td>
</tr>
<tr>
<td>Amount of the loan</td>
<td>-2.81***</td>
<td>-10.6</td>
</tr>
<tr>
<td>Geographical area</td>
<td>-0.38</td>
<td>-0.91</td>
</tr>
<tr>
<td>Distance</td>
<td>0.015*</td>
<td>2.34</td>
</tr>
<tr>
<td>Follow-up of the micro-projects</td>
<td>-0.74***</td>
<td>-4.15</td>
</tr>
<tr>
<td>Educational level</td>
<td>0.0018</td>
<td>0.02</td>
</tr>
</tbody>
</table>
The estimates exposed by the table 2 emphasize the crucial role played by the characteristics of the micro-borrowers in the determination of the reimbursement rate and this idea is consolidated empirically by the presence of an acceptable explanatory capacity of the model (fairly coefficient of determination) and thus, an acceptable quality of adjustment.

This result implies that the variables selected are dependent on the particular characteristics of the micro-borrowers. In other words, we can conclude that this percentage is sufficient as a percentage to explain the qualitative variable. Moreover, the test of total significativity of Chi-square shows that, the model is overall significant (p-value=0.000), which makes it possible to reject the null assumption which stipulates that the coefficients are equal to zero.

The results of our empirical investigation show that, on the one hand, the analysis of the effects of the variables relating to the geographical area, the branch of the industry, the nature of the project, the marital status, the number of the dependent children and the educational level of the micro-borrowers, on the lack of reimbursement are not statistically significant.

By opposition, in the case of our sample, the microfinance institution would gain as regards refunding, if it is interested in the visit of the agent to the micro-projects of the micro-borrowers, the amount of the loans granted to the customers, the distance separating the institution from the residence of the micro-borrower and the former experiment with its microfinance institution. Therefore, the microfinance institution can be based on certain criteria more than of others before granting the credit with an aim of increasing the probability of refunding.

For better justifying the choice of the logit model, we have to propose an approximated value of the realization of the estimators of the various parameters of the explanatory variables in the case of a probit model and a simple model for 999 Tunisian micro-borrowers. In this case, the most probabilistic model is that which tests better the significativity of the joint effects of the explanatory variables and also the probability of accepting the assumption of non-nullity.

With this intention, one notes that Blinear is the estimator in a linear model and Bprobit is the estimator in a probit model. So the table below summarizes the choice between the three models in question.

**Table 3:** Criterion of selection of the logit model

<table>
<thead>
<tr>
<th>Characteristics of the micro-borrowers</th>
<th>Estimate using the linear model (Blinear = 0.252BLogit)</th>
<th>Estimate using the probit model (Bprobit = 0.63BLogit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Former experiment</td>
<td>0.0802</td>
<td>0.2016</td>
</tr>
</tbody>
</table>
Our results affirm the predictive capacities of the logit and linear model in comparison with the two other models and reveal that these two last are skewed and no convergent. This choice is determined on the basis of estimated coefficient and thereafter according to a probabilistic procedure which clearly establishes the no linearity (which must be estimated by the method of the maximum of likelihood as a measure of adjustment) and penalizing the introduction of the additional parameters. At this level, the table shows that, the logit model is very adapted to specify our model as well as possible.

**Conclusion**

The results obtained from this analysis validate our assumption according to which the defect of refunding results from the particular characteristics related to the profiles of the micro-borrowers. Thus, the results show that, the refunding of the microcredit rests on specific characteristics related to the vulnerable micro-borrowers and excluded from the traditional financial system. This makes it possible to advance possible suggestions and recommendations to improve operation of the microfinance institutions likely to multiply the creation of the micro-projects and especially to support employment and the development in other localizations and branches of industry. Thus, this analysis could lead to strategic actions targeted to precede the constraints which limit the chances of the success of the micro-projects.

It rises from these results in term of track of economic policy, the need to increase the number of visits among micro-borrowers, adopt an adequate supervision after obtaining the micro-credit, increase and revise the amount of the loan, evaluate the experiment of the customer in entrepreneurship, take into account the geographical distance between the microfinance institution and the customer. In spite of the central questions raised by our analysis and relating to the socio-economic and socio-demographic characteristics of the micro-borrowers, it is also important to examine the role of the agent of credit in the reduction in the defect of refunding of the microfinance institution.

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